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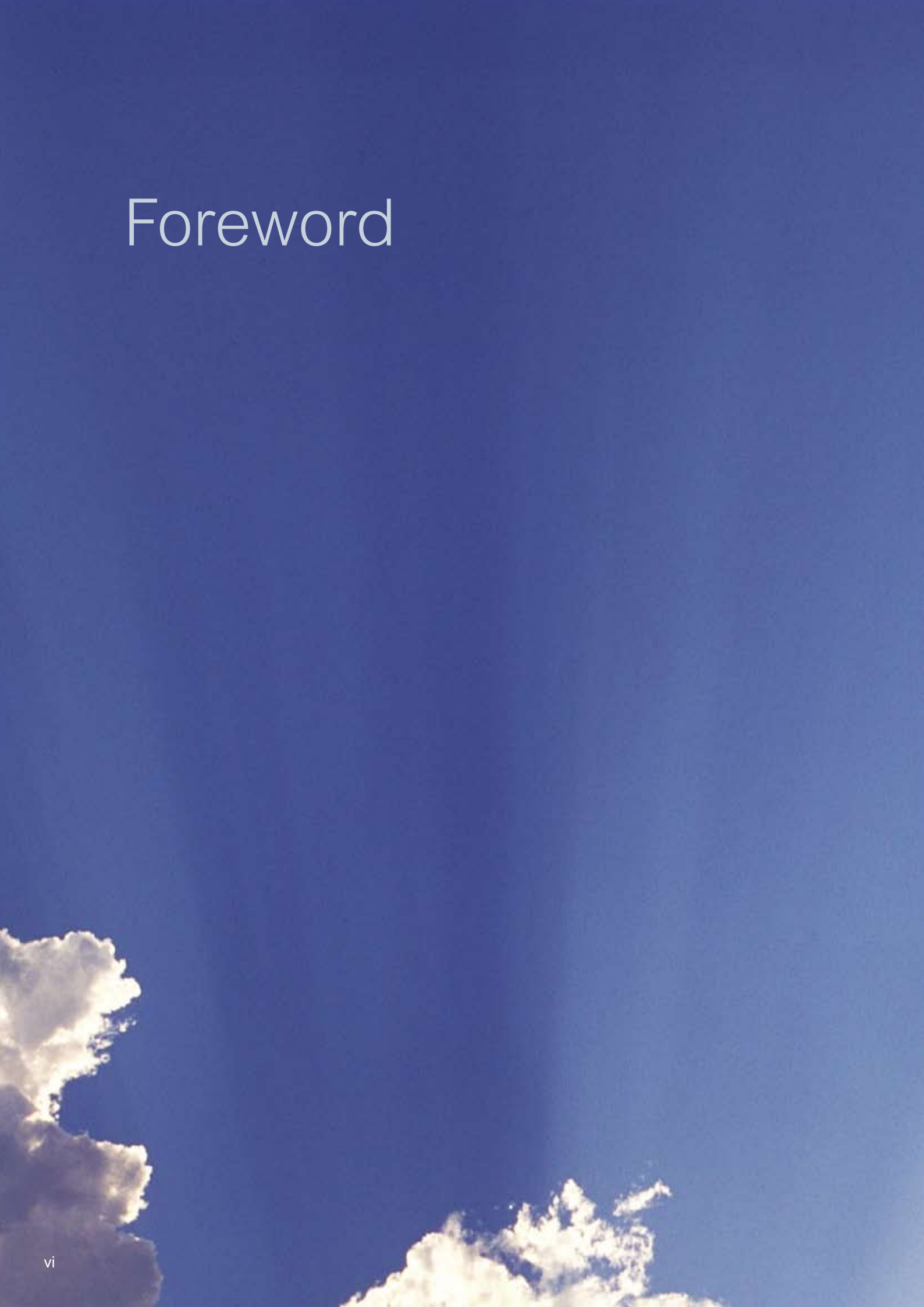
Foreword



Floods Review:
Independent Chair's opening letter

25 June 2008

Dear Secretaries of State,

You asked me to undertake a comprehensive review of the lessons to be learned from the summer floods of 2007. This is my Final Report.

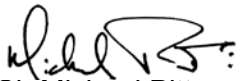
Over the last 10 months the Review Team and I have examined over 1000 written submissions, consulted widely, considered the experiences of other countries and visited the communities affected by flooding. We have observed at first hand extraordinary hardship. Even now many thousands of families are still living in some form of temporary accommodation. Throughout, we have given priority to the interests of the victims of the floods, whether they are residents, business owners or farmers, and this report is written with them firmly in mind.

The floods of last year caused the country's largest peacetime emergency since World War II. The impact of climate change means that the probabililty of events on a similar scale happening in future is increasing. So the Review calls for urgent and fundamental changes in the way the country is adapting to the likelihood of more frequent and intense periods of heavy rainfall. We have searched for practical solutions to highly complex problems and thought carefully about the public interest. Our recommendations are challenging and strong national leadership will be needed to make them a reality.

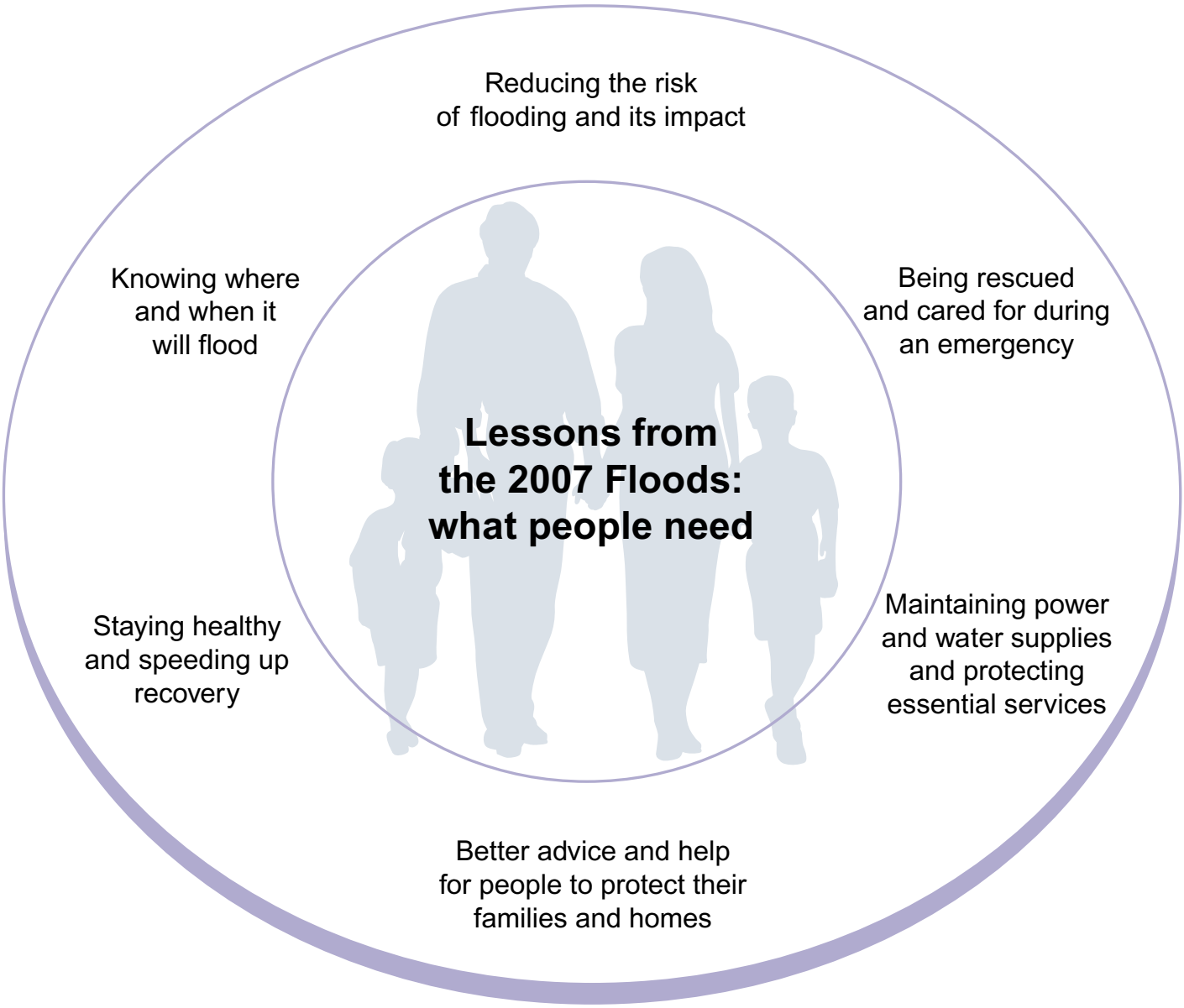
- We believe that there must be a step change in the quality of flood warnings. This can be achieved through closer cooperation between the Environment Agency and Met Office and improved modelling of all forms of flooding. The public and emergency responders must be able to rely on this information with greater certainty than last year.
- We recommend a wider brief for the Environment Agency and ask councils to strengthen their technical capability in order to take the lead on local flood risk management. More can be done to protect communities through robust building and planning controls.
- During the emergency itself, there were excellent examples of emergency services and other organisations working well together, saving lives and protecting property. However, this was not always the case; some decision making was hampered by insufficient preparation and a lack of information. Better planning and higher levels of protection for critical infrastructure are needed to avoid the loss of essential services such as water and power. There must be greater involvement of private sector companies in planning to keep people safe in the event of a dam or reservoir failure. Generally, we must be more open about risk.
- We can learn from good experience abroad. People would benefit from better advice on how to protect their families and homes. We believe that levels of awareness should be raised through education and publicity programmes. We make recommendations on how people can stay healthy and on speeding up the whole process of recovery, giving people the earliest possible chance to get their lives back to normal.

Finally, I would like to thank again everyone who has helped us with the Review and given so generously of their time. This includes the expert members of the Science and Engineering Panel who provided vital technical support and advice. Also, it has been a privilege chairing the Review Team who have worked hard and remained committed throughout. Their ideas, policy analysis and focus on the best interests of the public have all been outstanding. We reached agreement on all matters, although the ultimate responsibility for the contents of this Report rests entirely with me.

Yours sincerely,



Sir Michael Pitt
Independent Chair


Reducing the risk of flooding and its impact
Knowing where and when it will flood
Being rescued and cared for during an emergency
Lessons from the 2007 Floods: what people need
Staying healthy and speeding up recovery
Maintaining power and water supplies and protecting essential services
Better advice and help for people to protect their families and homes

Executive summary

The events of summer 2007

ES.1 Last summer's flooding was exceptional. We witnessed the wettest summer since records began, with extreme levels of rainfall compressed into relatively short periods of time. Readers of this report will be familiar with the pictures on television and in newspapers – striking images of Tewkesbury Abbey, reporters standing knee deep in water in empty housing estates and shots of flooded infrastructure.

ES.2 The hard facts are even more compelling. 55,000 properties were flooded. Around 7,000 people were rescued from the flood waters by the emergency services and 13 people died. We also saw the largest loss of essential services since World War II, with almost half a million people without mains water or electricity. Transport networks failed, a dam breach was narrowly averted and emergency facilities were put out of action. The insurance industry expects to pay out over £3 billion – other substantial costs will be met by central government, local public bodies, businesses and private individuals.

ES.3 To put the events into context, there were over 200 major floods worldwide during 2007, affecting 180 million people. The human cost was more than 8,000 deaths and over £40 billion worth of damage. But even against that dramatic back-drop, the floods that devastated England ranked as the most expensive in the world in 2007.

> *The thing that really freaked everyone out with this last flood was that it happened in the summer … and it just came so quickly, before anyone could really act.*
>
> **(Householder, West Oxfordshire)**
>
> *It happened really quickly, it just came. It was like a river coming down the street.*
>
> **(Householder, West Berkshire)**

ES.4 Some areas were particularly badly affected. In June, the focus was on South Yorkshire and Hull. In July, it was Gloucestershire, Worcestershire and the Thames Valley. Many more areas were affected to a lesser but still significant degree.

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The biggest civil emergency in British history

Gloucestershire was one of the regions most affected by the summer floods. The loss of Mythe water treatment works left 350,000 people without mains water supply for up to 17 days. Castle Meads electricity substation was shut down leaving 42,000 people without power in Gloucester for up to 24 hours. Some 10,000 people were left trapped on the M5, and many other commuters were left stranded on the rail network. The impact of the floods rendered thousands of people homeless.

"In terms of scale, complexity and duration, this is simply the largest peacetime emergency we've seen." – Chief Constable Tim Brain

ES.5 Moreover the problems did not go away quickly. Tens of thousands of people were rendered homeless, and businesses were put out of action for months on end. Even now thousands of people are still out of their homes – a situation which is worrying and perplexing a year after the original events.

How the Review has reached its conclusions

ES.6 The Review began in August 2007. The Government asked that the process should be both thorough and independent; a fair assessment of what happened and what we might do differently. This final report is positive where it can be, but demanding where change is needed.

ES.7 Four principles have guided the Review and the conclusions we have reached. First, and most importantly, **we start with the needs of those individuals and communities who have suffered flooding or are at risk**. What we now do must make a real difference on the ground, improving the quality of people's lives. Our recommendations reflect this determination. Second, **change will only happen with strong and more effective leadership across the board**. At the national level, this will ensure that our recommendations are driven through, at the local level, this will improve the way we deal with the immense challenges faced by communities before, during and after flooding. Third, **we must be much clearer about who does what**. Our recommendations will ensure that people and organisations are held to account, structures are simple and outcomes are more certain. Fourth, **we must be willing to work together and share information**. We recognise there are issues of commercial confidentiality and security, but we firmly believe that the public interest is best served by closer cooperation and a presumption that information will be shared. We must be open, honest and direct about risk, including with the public. We must move from a culture of 'need to know' to one of 'need to share'.

ES.8 These principles have been translated into recommendations through a rigorous and extensive evidence gathering exercise. The original call for evidence and formal briefings generated a wealth of material. This was supplemented by visits to the areas affected, and discussion with key organisations at a national level.

ES.9 The interim conclusions were published in a report in December, and views were sought during a consultation exercise lasting three months. We held conferences in every region, with well over 1,000 professionals from relevant fields attending to share their views. Public meetings took place in affected areas and national seminars were addressed. More visits took place, and discussions were broadened and deepened.

ES.10 External analysis has also been vital. We commissioned social research and took scientific and engineering advice from the world's leading experts. And we have visited a number of countries in order to draw on best practice from overseas.

ES.11 The result is one of the widest ranging policy reviews ever carried out in the UK, backed up by an extensive body of evidence, advice and independent thought. This evidence is captured in the full Report which accompanies this summary, along with a range of supporting technical material.

Knowing where and when it will flood

Taking an overview of risk

ES.12 The scale of the problem is, as we know, likely to get worse. We are not sure whether last summer's events were a direct result of climate change, but we do know that events of this kind are expected to become more frequent. The scientific analysis we have commissioned as part of this Review (published alongside this Report) shows that climate change has the potential to cause even more extreme scenarios than were previously considered possible. The country must adapt to increasing flood risk. As the Stern Report outlined, adaptation is crucial to deal with the unavoidable impacts of climate change to which the world is already committed.

'Adaptation is the only response available for the impacts that will occur over the next several decades before mitigation measures can have an effect.'

Stern Review: The Economics of Climate Change.

ES.13 One of the tasks for the Review has been to take the ideas set out in Stern and translate them into practical actions. We see some examples of this already, such as changes to the way the Highways Agency is building roads or the choices developers are making about flood defence and drainage.

ES.14 As a country, we are well-placed to adapt with both the resources and the capability. But direction must come from Government. It is difficult for any single organisation, even those as large as the major infrastructure companies, to interpret the volume and complexity of the technical data involved. Even if they can, the choices any individual firm makes will not always reflect the true costs and benefits to society as a whole. So the Government should drive adaptation forward, facilitating and regulating the pace of change.

Updating *Foresight: Future Flooding*

The *Foresight: Future Flooding* Study *(2004)* provided an assessment of flood risk in the UK over a 30 to 100 year timescale to help inform long-term policy. The Review commissioned work to update this study as part of our evidence gathering.

The key message from the update is that the effects of climate change may be more extreme than had previously been estimated. In particular:

- the potential increases in rainfall volume and intensity, and temperature, are greater; and
- there is a greater risk of extreme sea-level rise.

The update also highlighted the increased risk that we will face from surface water flooding in the future and how land use is an important tool in managing that risk. With the uncertainty associated with a changing climate, the update recommended that strong governance and investment will be required to tackle the increased risks.

ES.15 This government leadership must extend to a coherent operational approach. Perhaps the most significant feature of last summer's events was the high proportion of surface water flooding compared with flooding from rivers. Currently, no organisation is responsible for overseeing and planning for surface water flooding, creating problems which were particularly evident in places like Hull and parts of Sheffield. There are no warnings for this type of flooding, which can occur very rapidly, and people, including the response organisations, were not well prepared.

ES.16 Surface water flooding is complex and affected by many factors, such as the capacity of the sewerage/drainage system, saturated ground and high river levels that prevent the system from discharging. The responsibilities for certain drainage assets remain unclear, a situation that frustrated the public during the summer 2007 floods. This lack of transparency in ownership and the complexity involved could be reduced by having a single national organisation with an overarching responsibility for all types of flooding. That is why we believe that government leadership should be supported by clear oversight of all flood risk management activity and the Environment Agency's risk management responsibilities extended accordingly.

RECOMMENDATION 1: Given the predicted increase in the range of future extremes of weather, the Government should give priority to both adaptation and mitigation in its programmes to help society cope with climate change.

RECOMMENDATION 2: The Environment Agency should be a national overview of all flood risk, including surface water and groundwater flood risk, with immediate effect.

Forecasting, modelling and mapping

ES.17 Science and engineering is crucial to understanding flood risk and will become even more significant as we adapt to the increased risk that climate change will bring. Last summer's floods demonstrated that the UK has come a long way in terms of weather forecasting and flood prediction, but there is further to go. Predicting where flooding will occur and the potential consequences is vital if managers, emergency planners and responders are to reduce risk and the effects of flooding.

ES.18 The UK's understanding of the risk of

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flooding from rivers and coasts is advanced – the Environment Agency has well-developed maps and models to assess and predict this risk – but information relating to surface water (and groundwater) flood risk is limited. Both the weather forecasts and the warnings given during the June floods were less accurate than those for July. This was due to the nature of the weather system that caused the extreme rainfall during June, and the fact that a significant proportion of the flooding was surface water.

ES.19 We welcome the commitment shown by the Environment Agency to improve the tools and techniques that are currently available for predicting and modelling river flooding in order to cover a wider range of events. The Review considers that the greatest advances are needed in areas of greatest risk – significant depths and high velocities. Six inches of fast-flowing water can knock someone off their feet and two feet of water is enough to float a car. As well as posing a specific risk to individuals, the depth of the flood water hampered rescue efforts, making evacuations dangerous for both the evacuee and the emergency services.

ES.20 The Environment Agency's proposed strategic overview role means that it will be better placed to provide a warning system to cover surface water flooding. It will need to work with its partners – especially with the Met Office – to develop the tools and techniques required. It is vital that the Environment Agency also engages with those responsible for different aspects of the drainage and sewerage system – including local authorities, water companies, internal drainage boards, highways authorities, navigation authorities and riparian owners.

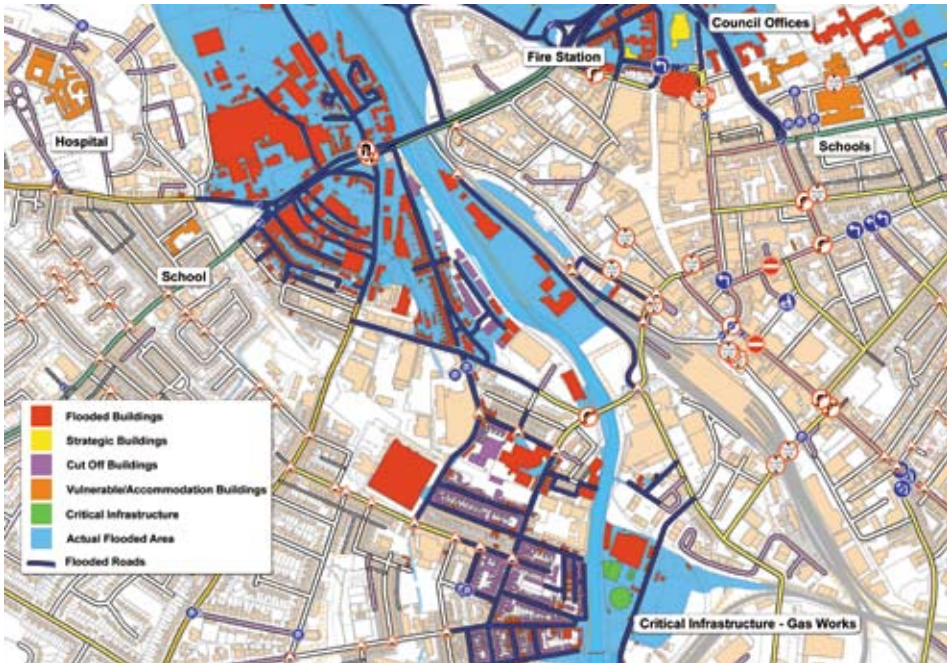
ES.21 The relationship with the Met Office is particularly important. Weather prediction forms a crucial part of flood risk management and the Met Office is a world leader. There is room for improvement, particularly in relation to increased lead times for predicting events, probabilistic forecasting and more accurate local-scale forecasts at a city or town level. Closer working should deliver real changes in technical capability. This will improve the usefulness and reliability of extreme rainfall forecasts and warnings, which are essential for providing effective warnings for rapid response catchments and surface water flooding. We believe this closer working will best be achieved through a joint centre.

The Atlantis project

The Atlantis Programme brings together a number of government organisations, including the British Geological Survey, the Centre for Ecology and Hydrology, the Environment Agency, the Met Office, Ordnance Survey and the United Kingdom Hydrographic Office, in order to improve government's topographical, geological and hydrological data.

The Atlantis Programme shows that government organisations can work together successfully and deliver better modelling and mapping outcomes as a result.

ES.22 All of these improvements will greatly advance the capabilities of public bodies. The benefits will be seen not only for flood forecasting, but also in defence and the provision of advice on climate change. The Met Office and Environment Agency should engage with Local and Regional Resilience Forums to ensure that these enhancements meet the requirements of emergency responders and manage expectations as to what is feasible and at what cost. Better forecasting and more accurate prediction of where and when flooding will occur are priorities and fundamental to saving lives and protecting property.



Source: Ordnance Survey – Strategic Flooding Document 2007© Environment Agency Licence A809

RECOMMENDATION 3: The Met Office should continue to improve its forecasting and predicting methods to a level which meets the needs of emergency responders.

RECOMMENDATION 4: The Environment Agency should further develop its tools and techniques for predicting and modelling river flooding, taking account of extreme and multiple events and depths and velocity of water.

RECOMMENDATION 5: The Environment Agency should work with partners to urgently take forward work to develop tools and techniques to model surface water flooding.

RECOMMENDATION 6: The Environment Agency and the Met Office should work together, through a joint centre, to improve their technical capability to forecast, model and warn against all sources of flooding.

Reducing the risk of flooding and its impact

ES.23 The events of the summer would have been significantly worse had measures not been in place to prevent flooding and mitigate its impact. The range of measures was tested to the full, and there are important lessons to be learned about their effectiveness. All those responsible for managing the risk of flooding, or those personally at risk, need to be clear about what can be done to manage risk effectively.

Building and planning

ES.24 Many submissions to the Review call for a complete end to building on the flood plain. This is not realistic. The country cannot end all development along the Thames, or bear the costs of siting critical infrastructure, such as water treatment works or power stations, away from the water supplies they need to function.

ES.25 That does not mean that our institutional frameworks should not be stronger. Development control is a central part of the process of managing flood risk, by avoiding development in risk areas where possible and, where such building does take place, by ensuring that risk is reduced both to the development itself and for those living nearby. Planners and developers must pay proper regard to the risks, as should those purchasing properties. We believe that the latest Government guidance – PPS25 – should deliver this, and that it should be strengthened if it does not.

It is all to do with greed and building. They keep building and building. They don't care about where they build as long as they can get their money.

(Householder, West Oxfordshire)

Stop building on flood plains.

(Householder, Darfield Barnsley)

ES.26 More can be done to protect existing properties. Paving over front and rear gardens is having a significant impact on the natural drainage of surface water in our towns and cities, reducing the volume of water soaking into the ground. There was significant support for the proposal in our interim report to remove the right of householders and business owners to lay impermeable surfaces. Such a move would mean that people would require planning permission if they chose impermeable surfaces, but not if they chose other surfaces such as gravel or permeable paving.

ES.27 The Government announced in February 2008 that householders will no longer be able to lay impermeable surfaces in front gardens as of right. The Review welcomes this. The Government is of the view that there is insufficient evidence that hard paving back gardens and other areas is having as much impact on increasing the rate and speed of surface runoff. We believe that it makes sense to retain as much natural drainage as possible, including back gardens.

ES.28 Developers have an automatic right to connect new developments to public sewers once planning permission has been granted. This places an additional strain on existing sewerage and drainage networks, exacerbating the problems of flooding. The Government is currently considering whether the automatic right should be removed so that developers will have to consider their impact on the sewerage and drainage networks, and make greater use of sustainable drainage systems. Conventional drainage systems were placed under strain during the 2007 floods and we do not consider it sensible to allow new connections of surface water drainage to the sewerage system to take place unchecked.

ES.29 Property-level resistance and resilience can also help minimise damage from floodwaters. Resistance measures are aimed at keeping water out of buildings, or at least minimising the amount that enters by the use of barriers such as door guards to seal entry points. Resilience measures are aimed at minimising the damage when a building is flooded, thereby facilitating the quickest possible recovery.

ES.30 Where development (following the strict application of planning guidance) is allowed on the floodplain, buildings should be made flood resilient. The Government has recently produced guidance to developers on flood-resilient construction. Developers and architects should be incorporating such measures into designs for the future. The simplest way of ensuring that new buildings do incorporate appropriate measures would be to include a requirement in Building Regulations. The Government has indicated that it aims to do this when they are next revised in 2010. The Review welcomes this intention. We also believe that similar standards of construction should be required in properties undergoing major refurbishment in flood risk areas.

ES.31 We recognise that it will take time to incorporate resistance and resilience requirements into Building Regulations for properties in flood risk areas, and would like to see local authorities and social housing organisations take a leading role in increasing uptake. In the meantime, local authorities have

powers to make home improvement grants and duties to promote business continuity which can encourage change immediately. The considerable waste of resources and unnecessary hardship caused by poor planning and the use of inappropriate building methods are serious shortcomings that must be addressed.

RECOMMENDATION 7: There should be a presumption against building in high flood risk areas, in accordance with PPS25, including giving consideration to all sources of flood risk, and ensuring that developers make a full contribution to the costs both of building and maintaining any necessary defences.

RECOMMENDATION 8: The operation and effectiveness of PPS25 and the Environment Agency's powers to challenge development should be kept under review and strengthened if and when necessary.

RECOMMENDATION 9: Householders should no longer be able to lay impermeable surfaces as of right on front gardens and the Government should consult on extending this to back gardens and business premises.

RECOMMENDATION 10: The automatic right to connect surface water drainage of new developments to the sewerage system should be removed.

RECOMMENDATION 11: Building Regulations should be revised to ensure that all new or refurbished buildings in high flood-risk areas are flood resistant or resilient.

RECOMMENDATION 12: All local authorities should extend eligibility for home improvement grants and loans to include flood resistance and resilience products for properties in high flood-risk areas

RECOMMENDATION 13: Local authorities, in discharging their responsibilities under the Civil Contingencies Act 2004 to promote business continuity, should encourage the take-up of property flood resistance and resilience by businesses.

Local flooding and drainage

ES.32 Direction and leadership from the centre needs to be matched at the community level. That is why one of the central themes in this Report is the importance of local leadership.

ES.33 With no clear coordination and structure, responses to flood risk are piecemeal and not necessarily prioritised. Each of the organisations with a responsibility for flood management assets tends to carry out maintenance and improvement work independently, as there is currently little incentive to do otherwise. Investment decisions made in isolation can lead to inefficiencies and can even increase the risk of flooding.

"The authorities weren't making good decisions, it was as if they didn't know what they were doing."

(Business owner, Hull)

ES.34 The Review believes that the role of local authorities should be enhanced so that they take on responsibility for leading the coordination of flood risk management in their areas. Local authorities already have a substantial role because of their responsibilities for ordinary watercourses, drainage, highways and planning. Their place-shaping role and local democratic accountability will help to ensure that the right local action is taken.

Leeds leads

"In principle, the concept of a local authority leading or co-ordinating a statutory-based partnership of stakeholders, each with a role in ensuring that there is an effective, proportionate and funded strategy towards the management of flood risk at the 'local level', is something we would welcome and mirrors the situation we are working towards in Leeds." – Leeds City Council

ES.35 Inaction on local flooding is exacerbated by unclear ownership and responsibilities. Many of the people affected by the events of summer 2007 did not know who to turn to and their problems were passed from one organisation to another. This kind of experience has also been reflected in submissions to the Review from the public and local communities themselves. We believe that local authorities, as part of their leadership role, should investigate these local flooding problems and work with the Environment Agency, water companies, the Highways Agency, internal drainage boards, riparian owners and other relevant parties to establish the source of problems and where the responsibility lies for addressing them. An important decision which government needs to make to support this work is where responsibility for sustainable urban drainage systems (SUDS) should rest.

ES.36 A better understanding of each local authority's drainage and watercourse system will be central to these improvements. We believe that a local register of all the flood risk management and drainage assets (both underground and overland), including details of their condition and responsible owners, should be compiled by local authorities. The Review also believes that the Environment Agency, as part of its strategic overview role, should work with local authorities and their partners to make the process work.

ES.37 Much of the evidence received by the Review, including from water companies, suggests that voluntary agreements to share information would not work in practice. The Review therefore believes that a duty should be placed on all stakeholders with responsibilities relating to flood risk to record and share relevant information and expertise.

ES.38 However, the last twenty or thirty years have seen the technical departments of local authorities significantly diminished and in some places closed or merged. The tension in the system between demand for housing and risk of flooding is not always properly addressed. Around a quarter of the homes flooded during the summer were built during the last twenty-five years in areas of flood risk.

ES.39 Local authorities need the capability and powers to commission expert advice and to ensure that local communities are properly protected. This means more resource for local authorities, and fits well with the localism agenda. But to be meaningful in practice and make a real difference to the quality of decision making, local government and society must begin to value more highly the importance of technical and engineering skills.

ES.40 Water companies also play a particularly important role given their responsibilities for sewerage. Evidence from the summer demonstrated that insufficient capacity of drainage systems can play a crucial part in surface water flooding – events in Hull showed both the importance of the water companies' role and the limitations of current standards. It is simply not feasible to increase the capacity of the whole sewerage system, but it is possible to introduce changes and investment choices which avoid making problems worse. In order to incentivise water companies, proper provision needs to be made by Ofwat as the regulator of the industry.

RECOMMENDATION 14: Local authorities should lead on the management of local flood risk, with the support of the relevant organisations.

RECOMMENDATION 15: Local authorities should positively tackle local problems of flooding by working with all relevant parties, establishing ownership and legal responsibility.

RECOMMENDATION 16: Local authorities should collate and map the main flood risk management and drainage assets (over and underground), including a record of their ownership and condition.

RECOMMENDATION 17: All relevant organisations should have a duty to share information and cooperate with local authorities and the Environment Agency to facilitate the management of flood risk.

RECOMMENDATION 18: Local Surface Water Management Plans, as set out under PPS25 and coordinated by local authorities, should provide the basis for managing all local flood risk.

RECOMMENDATION 19: Local authorities should assess and, if appropriate, enhance their technical capabilities to deliver a wide range of responsibilities in relation to local flood risk management.

RECOMMENDATION 20: The Government should resolve the issue of which organisations should be responsible for the ownership and maintenance of sustainable drainage systems.

RECOMMENDATION 21: Defra should work with Ofwat and the water industry to explore how appropriate risk-based standards for public sewerage systems can be achieved.

RECOMMENDATION 22: As part of the forthcoming and subsequent water industry pricing reviews, Ofwat should give appropriate priority to proposals for investment in the existing sewerage network to deal with increasing flood risk.

Flood defence

ES.41 It is not for this Review to consider precise levels of future flood defence spending. The Government has to reach decisions about the investment in this area in light of other priorities. Nevertheless, the Review welcomes the increase in funding announced by the Government in July 2007. Moreover, with the evidence of increasing risks from climate change and the additional challenges identified in this report, we believe it is sensible for the Government to plan on the basis of above inflation settlements in future Government spending rounds.

ES.42 In our interim report, we set out the importance of a long-term approach to expenditure on flood risk management. We recognised that the climate is changing, that flood risk is increasing and that a more sustained and transparent approach to managing the risk is needed. That conclusion has received wide support.

ES.43 A long-term investment strategy should set out the investment needs for flood risk management in England within a policy framework for delivering long-term, sustainable flood risk mitigation measures. It should provide the broad framework for the programme and timetable for investment, with the understanding that more detail will be available for the years most immediately ahead. The approach would be similar to the Government's Building Schools for the Future programme or its ten-year transport funding plan. In their submissions to the Review, the Government and the Environment Agency supported the recommendation and indicated that work had already begun to develop the investment strategy. We believe such a move should and would have cross party support.

ES.44 This long term approach should not simply assume that the costs of flood risk

management will be met centrally. There are direct beneficiaries from flood defence work, and aligning those who benefit with those who pay will bring greater efficiency and greater responsiveness from those carrying out the work.

ES.45 We have seen and heard of many local groups who want to take action to alleviate flood risk in their communities. At the moment, this kind of scheme can end up being too low a priority for the Environment Agency. The Government should be encouraging more local communities to promote innovative schemes, including contributing towards the costs themselves, with appropriate technical support from local authorities and the Environment Agency. Locally funded flood defences should become a bigger feature of this country's flood risk management, not an exception brought about through unusual circumstances as they are now.

ES.46 Funding from all sources needs to be spent effectively. Many of the responses received by the Review have blamed the extent of the flooding last year on rivers no longer being dredged and vegetation and debris being allowed to build up.

ES.47 Our analysis shows that dredging and other maintenance is important, but not the complete answer many people believe. We have no significant evidence that insufficient maintenance had any major impact on last summer's events. The Environment Agency and local authorities make substantial investment in maintenance, and we believe it is generally sufficient to deliver the necessary work.

ES.48 However, we do believe that the work carried out by the Environment Agency is not as transparent as it could be. Many responses stated that they never see the Environment Agency clearing rivers of vegetation or dredging, despite the fact that we know the works have taken place. The Agency should publish its schedules of work, along with internal drainage boards and local authorities, to ensure that the maintenance work that they perform is recognised.

> *"What I mean is that they knew, so they knew all day it were going to happen, they were expecting so why couldn't we have temporary defences that might have, might not have saved everybody."*
>
> **(Householder, Darfield Barnsley)**

ES.49 'Strategic sandbagging' can be successfully used alongside roads or adjacent to important buildings to prevent them from flooding, but the work needs to be done properly by experts. The Review was unable to obtain any significant evidence that sandbags were particularly effective during the 2007 summer floods in providing protection to individual households.

ES.50 Nevertheless, sandbags are still widely regarded as an important focus for community action and they should not simply be withdrawn. The general provision of sandbags should be phased out in favour of better products such as kite-marked flood boards, air brick covers and other forms of temporary defence.

ES.51 One flood defence measure which has proved to be increasingly successful is use of natural processes such as using farmland to hold water and creating washlands and wetlands. Keeping water away from urban areas and slowing its progress to minimise run-off proved successful in the summer. Natural processes are even more effective for smaller

scale events. However, this activity is most effective and sustainable when there is proper dialogue between the authorities and landowners, and it is carried out in a deliberate and pre-planned way.

RECOMMENDATION 23: The Government should commit to a strategic long-term approach to its investment in flood risk management, planning up to 25 years ahead.

RECOMMENDATION 24: The Government should develop a scheme which allows and encourages local communities to invest in flood risk management measures.

RECOMMENDATION 25: The Environment Agency should maintain its existing risk-based approach to levels of maintenance and this should be supported by published schedules of works for each local authority area.

RECOMMENDATION 26: The Government should develop a single set of guidance for local authorities and the public on the use and usefulness of sandbags and other alternatives, rather than leaving the matter wholly to local discretion.

RECOMMENDATION 27: Defra, the Environment Agency and Natural England should work with partners to establish a programme through Catchment Flood Management Plans and Shoreline Management Plans to achieve greater working with natural processes.

Modernising flood risk legislation

ES.52 The legislative framework for flood risk management is fundamental. The management of flood risk requires concerted action by public and private bodies, and this must be properly supported by appropriate legislation.

ES.53 The statutory basis for flood risk management is contained in several pieces of primary legislation. This body of legislation has developed over time, either to effect changes to primary legislation to meet identified needs or in response to institutional change. The result is a mix of different Acts: a point that is reflected in comments the Review has received about the need to streamline the current laws.

The majority of submissions agree that a single unifying act with 'clear responsibilities and obligations' is a good idea. Essex County Council points out that: *"There is much confusion between partner agencies and the public."*

ES.54 We have considered the present arrangements against the needs of today as set out in our recommendations and, as far as can be foreseen, the future. Current legislation provides for a bygone era of flood defence, not modern flood risk management, and does not deal with other sources of flooding such as surface water. The future framework should, in particular, designate the roles and responsibilities needed for the management of flood risks from all sources. We have noted that the Government's draft legislative programme for 2008/9 includes consultation on a draft Floods and Water Bill. We strongly welcome this, and encourage the Government to make space in the parliamentary timetable for its rapid implementation.

RECOMMENDATION 28: The forthcoming flooding legislation should be a single unifying Act that addresses all sources of flooding, clarifies responsibilities and facilitates flood risk management.

Insurance

ES.55 The insurance industry played a major role in helping the country recover from last summer's floods. They presented the insurance industry with one of its biggest ever challenges, exceeding all events since flood cover became a standard feature. There were at least 180,000 claims as a consequence of the floods, (130,000 home, 30,000 business and 20,000 motor), the equivalent of four years' normal claims. The estimated insurance cost of direct damaged caused by the flooding in June and July 2007 is approximately £3 billion.

ES.56 The Review considers the insurance industry to have generally responded well to the summer 2007 floods, having been presented with one of its biggest ever challenges. As soon as the scale of the floods became apparent, insurers implemented their major event plans. Nevertheless, insurers could have improved their service through better communications, managing expectations and being clearer and more consistent about the claims process. A small but significant number of households did not experience the quality of service received by many. We are clear that the impact on households of poor claims handling can be significant.

"What annoys me is that it's been, what is it now 118 days something like that since the first flood came and we still haven't had anything from the insurance, we've had all the schedules and everything but we've had no response from that at all."

(Householder, Darfield Barnsley)

"My insurance have been fantastic, absolutely fantastic, all my work is finished and I have paid out for everything I've put down they have never said they needed proof or anything…."

(Householder, Darfield Barnsley)

"Our insurance company has been fantastic, but the loss adjustor has been a nightmare, so in the end going up and up in the chain of insurance people I got them to get rid of our loss adjustors and I deal with the insurance company direct."

(Householder, Darfield Barnsley)

Insurance Survey

The Review commissioned a survey on people's experience of insurance in the aftermath of the summer floods.

The majority (72 per cent) were satisfied with how their claims were handled. However, 22 per cent were dissatisfied because homes took too long to repair, it was difficult to get information, and it took too long to get advice and deal with problems.

Over half of the respondents, 56 per cent, have had their claim concluded and of these, 66 per cent were concluded within 6 months of initially submitting their claim. For 10 per cent it took over 9 months.

ES.57 We believe that the insurance industry should develop voluntary guidance to cover reasonable expectations of service performance from insurers. It should include a commitment to provide a plan for each claim, and explain the minimum service standards people can expect. It should help raise standards of service among poor performers and improve the relationship between company and policyholder.

ES.58 Looking more broadly and based on the evidence of the 2007 summer floods, we do not believe that there is a need to change the current system of provision of flood insurance. We support the Statement of Principles which underpins wide availability. The benefits of having insurance are clear. The ability to replace damaged possessions and repair buildings has been crucial to minimising the impact on people's health and wellbeing. Yet there are still many people who do not take up insurance. This needs to be addressed through better public education and publicity.

ES.59 Buying insurance is one of the few times when a household or business will think about risk. It is clear from the Review's work that flood risk is not well understood by most people, unless they have had direct experience. The inclusion of a leaflet or a link to the main flood risk information website is another route to raise awareness of flood risk and will be an effective method for some. In addition, where insurance is provided through a broker there are clear opportunities to draw the attention of customers to flood risk and the measures that they can take. BIBA has indicated to the Review that its members would be happy to help raise awareness of flood issues at renewal.

ES.60 There are particular concerns for low income households. The events of the summer reinforced the message that low income households are least able to recover from the financial impact of flooding and that the cost of insurance is a key factor. Supporting uninsured households has proven to be a significant issue for some areas which were worst affected by the flooding.

ES.61 Schemes for low income households do exist. Premiums can be cost effective, with some policies costing as little as 60 pence per week. *Insurance for all: A good practice guide* gives social housing providers with the information they need to set up and run insurance-with-rent schemes. Wider use and application of these schemes will help to reduce the impact of future flooding events, and should be encouraged.

RECOMMENDATION 29: The Government and the insurance industry should work together to deliver a public education programme setting out the benefits of insurance in the context of flooding.

RECOMMENDATION 30: The Government should review and update the guidance *Insurance for all: A good practice guide* for providers of social housing and disseminate it effectively to support the creation of insurance with rent schemes for low income households.

RECOMMENDATION 31: In flood risk areas, insurance notices should include information on flood risk and the simple steps that can be taken to mitigate the effects.

RECOMMENDATION 32: The insurance industry should develop and implement industry guidance for flooding events, covering reasonable expectations of the performance of insurers and reasonable actions by customers.

Being rescued and cared for during an emergency

Information provision

ES.62 Organisations with responsibilities for informing and warning the public must also improve their performance. There are weaknesses in the system. Responsibility is split between agencies, notably the Met Office and the Environment Agency. During the floods, people experienced the effects of the lack of joined-up communication across these agencies. There was no single authoritative voice, no proper forecasting and warning system for surface water flooding, and a general need for more accurate, targeted and earlier warnings.

ES.63 Improving technology will allow these agencies to predict and monitor with ever greater accuracy. Once the information is available, it must be shared in a form that can be used. For some organisations, like infrastructure operators, that means tailored site information. For emergency responders, that means earlier but more tentative warnings. Last summer, too much information was given to people without clear explanation or pre-determined triggers for action. The public received technical warnings which they could not interpret or the warnings were too late – in many cases after they had already been flooded. Coherence is a central part of this. Joint warnings, issued by the Environment Agency and the Met Office, should be significantly easier to understand.

"I just want advanced warning from the authorities."

(Business owner, Hull)

"You look on the internet and you look on three different internet browsers. Three different programmes for weather and all have three different reports but same area and you are like which one, I will look out of window. Do you know what I mean?"

(Business owner, Barnsley)

ES.64 Interpretation is a challenge for emergency responders as well as the public. During an emergency, local authorities and the police have to cope with large amounts of fast-moving and technical information relating to the scale of the flood. Modern technology can provide a more effective approach, using electronic information and mapping which is already available at control rooms operated by organisations like the Environment Agency and Met Office. The real time mapping and visualisation of flooding is something which should be available at every Gold Command.

RECOMMENDATION 33: The Environment Agency should provide a specialised site-specific flood warning service for infrastructure operators, offering longer lead times and greater levels of detail about the velocity and depth of flooding.

RECOMMENDATION 34: The Met Office and the Environment Agency should issue warnings against a lower threshold of probablity to increase preparation lead times for emergency responders.

RECOMMENDATION 35: The Met Office and Environment Agency should issue joint warnings and impact information on severe weather and flooding emergencies to responder organisations and the public.

RECOMMENDATION 36: The Environment Agency should make relevant flood visualisation data, held in electronic map format, available online to Gold and Silver Commands.

RECOMMENDATION 37: The Environment Agency should work with its partners to progressively develop and bring into use flood visualisation tools that are designed to meet the needs of flood-risk managers, emergency planners and responders.

Response frameworks

ES.65 Mutual aid arrangements enabled local organisations engaged in the emergency response to seek urgent support from other parts of the country. There were many examples of effective assistance, including the loan of equipment, such as pumps or boats, and personnel. Well-established and effective arrangements already exist for the provision of mutual aid between police forces and fire and rescue services. Mutual aid was also used by the Environment Agency, which moved staff between offices.

ES.66 However, there were few structured arrangements for mutual aid beyond these organisations. In a few cases ad-hoc mutual aid arrangements worked well; good communications between those involved meant that the necessary resources were received promptly. But, others reported that when their agency had been called upon to help, their personnel were poorly integrated into the response effort. People working in Silver Commands rotated frequently with little consistency or knowledge transfer and at times the command structures did not know how to make best use of the additional personnel.

ES.67 These weaknesses need to be addressed. We consider it particularly important that Local Resilience Forums, and local authorities, are clear about the capabilities available through mutual aid schemes at a regional and national level.

ES.68 Many organisations carried out flood rescue in the summer, including the Fire and Rescue Service, the Maritime and Coastguard Agency, the Royal National Lifeboat Institution and the Armed Forces. Voluntary organisations were sometimes first on the scene and added significantly to the response efforts. All of these organisations are highly valued by the public and were praised for their dedication and contribution.

ES.69 However, a lack of clarity about who was responsible for carrying out and coordinating flood rescue placed both the public and responders at unnecessary risk. The timeliness and effectiveness of the response were diminished by the absence of common operational and command frameworks. Further, a number of voluntary search and rescue organisations experienced difficulty in engaging with the response effort. Given the multiplicity of coordinating organisations, responders were often unclear about the roles of each of the organisations and who was taking the lead. This caused delays and frustration on the ground in fast-moving and stressful circumstances.

ES.70 The Review believes that clarifying and communicating the role of each of these bodies would improve the response to flooding. However, we are concerned that the systems, structures and protocols developed to support national coordination of multi-agency flood rescue assets remain ad-hoc. We believe that the Fire and Rescue Service should take on a leading role in this area, based on a fully funded capability. This will be most effective if supported by a statutory duty.

ES.71 The loss of Mythe water treatment works left some 350,000 people without mains water for more than two weeks. This created the major challenge of providing large volumes of drinking water. Severn Trent Water's contingency plans were unable to meet the scale of the supply required. An extensive and effective logistical operation for the sourcing and distribution of bottled water was set up to meet the needs of the public. Special arrangements, involving the Armed Forces, had to be established.

ES.72 In accordance with existing regulation, at least 10 litres of water were supplied to each affected person. However, while 10 litres of water may have been acceptable in meeting the immediate and essential needs in the initial stages of the emergency, it was insufficient to meet the longer term needs of the public. There were particular problems for vulnerable groups such as the chronically sick and those with young children.

RECOMMENDATION 38: Local authorities should establish mutual aid agreements in accordance with the guidance currently being prepared by the Local Government Association and the Cabinet Office.

RECOMMENDATION 39: The Government should urgently put in place a fully funded national capability for flood rescue with Fire and Rescue Authorities playing a leading role, underpinned as necessary by a statutory duty.

RECOMMENDATION 40: Defra should amend emergency regulations to increase the minimum amount of water to be provided in an emergency, in order to reflect reasonable needs during a longer-term loss of mains supply.

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"There were policemen and firemen walking up and down Wilson Street and they were bring babies in carry cots out – they were really helpful."

(Householder, East Riding)

They were in a big rubber boat going round the estate helping people out and my granddaughter and grandson were carrying the old folks out to the centre and doing them beans on toast and all sorts. The local lads have been brilliant and the firemen were marvellous and the Salvation Army were out of this world, they were brilliant.

(Householder, Toll Bar, Doncaster)

The local response

ES.73 The scale of the 2007 floods stretched local emergency response resources to the limit and beyond, and responders in some areas were not well prepared. In part, this can be explained by the unprecedented nature of the events. But it is also clear that, in some areas, there were no agreed protocols between responders setting out responsibilities for assessing the potential impact of such a severe weather event and triggering an appropriate multi-agency response. This gap, crucial to the initiation of an effective emergency response, needs to be filled.

ES.74 Upper tier local authorities are the appropriate organisation to assess the potential impact of local floods based on previous experience, assessments by their staff and advice of other emergency responders. Similarly they are well placed to take the lead for triggering multi-agency arrangements, though where a Gold Command is established, the police should convene and lead the multi-agency response.

ES.75 Commands activated in the summer were effective in coordinating the local response, often with reassuring and high-level visible leadership. However, in some areas, responder organisations had difficulty in engaging effectively with the local response effort, possibly because Silver Commands were activated instead of Gold. This also hindered the involvement of the media, which meant that essential public information did not get through. Although these areas coped, the strategic perspective brought by Gold Command elsewhere improved the way the emergency was handled. Likewise, there were clear benefits where Gold Commands were activated at an early stage on a precautionary basis and this approach should be adopted more widely.

ES.76 The operation of Gold and Silver commands was most effective where high quality emergency response accommodation and facilities were available and this should become the norm. Also, Commands would benefit in the future from the availability of enhanced IT and digital flood visualisation tools, as they become available to multi-agency responders.

ES.77 Other operational matters were important. There were many instances of motorists and rail passengers being stranded in transit due to disruption on the road and rail networks as a result of the flooding.

ES.78 By far the most serious incident on the roads occurred on Friday 20 July, when an estimated 10,000 motorists in south west England were trapped overnight between junctions 10 and 12 of the M5 and on surrounding roads. While emergency responders were able to cope, accommodating a number of people in rest centres overnight, we are concerned that motorists could have experienced much greater hardship at other times of the year.

ES.79 The Review commends the Highways Agency for their initiative in developing measures to provide emergency welfare support to motorists stranded on the road network. However, these arrangements are still relatively new and need time to bed in. Also, it is clearly preferable, wherever possible, to prevent people from being stranded on the road network in the first place.

ES.80 The disruption of the rail network left many members of the public stranded on trains and at railway stations. At Gloucester railway station on Friday 20 July, about 500 people were stranded after the rail network failed. There was no pre-planned arrangement for providing emergency humanitarian support to rail passengers analogous to that provided by the Highways Agency to motorists. We believe that the rail industry should ensure that the needs of stranded rail passengers are factored into emergency plans.

ES.81 The contribution of the Armed Forces to the emergency response during the floods was universally praised by responders and members of the public. The principle underpinning Armed Forces' involvement in civil operations in the UK is that they should only be available on request as a last resort, for example when the civil authorities have exhausted all alternative sources of capability and there are insufficient resources to cope with an emergency situation. During the flooding, assistance from the Armed Forces was administered centrally and also at the request of Gold and Silver Commands.

ES.82 Armed Forces personnel possess a wide range of leadership skills, expertise and knowledge which were useful to Gold Commanders during the flooding, as well as to local and regional resilience forums and lead government departments. The Armed Forces should never be expected to take the lead for responding to civil emergencies but the Review believes that the Cabinet Office and the MoD should identify how the experience and expertise of Armed Forces personnel could be made more readily available.

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RECOMMENDATION 41: Upper tier local authorities should be the lead responders in relation to multi-agency planning for severe weather emergencies at the local level and for triggering multi-agency arrangements in response to severe weather warnings and local impact assesments.

RECOMMENDATION 42: Where a Gold Command is established for severe weather events, the police, unless agreed otherwise locally, should convene and lead the multi-agency response.

RECOMMENDATION 43: Gold Commands should be established at an early stage on a precautionary basis where there is a risk of serious flooding.

RECOMMENDATION 44: Category 1 and 2 responders should assess the effectiveness of their emergency response facilities, including flexible accommodation, IT and communications systems, and undertake any necessary improvement works.

RECOMMENDATION 45: The Highways Agency, working through Local Resilience Forums, should further consider the vulnerability of motorways and trunk roads to flooding, the potential for better warnings, strategic road clearance to avoid people becoming stranded and plans to support people who become stranded.

RECOMMENDATION 46: The rail industry, working through Local Resilience Forums, should develop plans to provide emergency welfare support to passengers stranded on the rail network.

RECOMMENDATION 47: The Ministry of Defence should identify a small number of trained Armed Forces personnel who can be deployed to advise Gold Commands on logistics during wide-area civil emergencies and, working with Cabinet Office, identify a suitable mechanism for deployment.

National response

ES.83 The exceptional scale and variety of the summer 2007 floods, coupled with the widespread disruption of essential services, made regional and national support integral to the response. Certain departments played a particularly prominent role, notably Defra as the central government department with lead responsibility for flooding, the Cabinet Office and Communities and Local Government as the lead department for the recovery phase.

ES.84 The flooding in June 2007, was judged, on the basis of initial reporting from the Environment Agency, to be within the capacity of local responders to manage. COBR was therefore not formally activated, although Defra and the Environment Agency provided a continued oversight of the response. COBR was however activated during the July 2007 floods. The trigger was a forecast by the Environment Agency – which turned out to be broadly accurate – that the scale of the flooding would be severe and on a par with that in 1947. COBR was also active for the subsequent civil emergencies, including the prolonged interruption to water supplies following the loss of the Mythe water treatment works and the threat to Walham electricity substation, as well as later flooding events in the Thames Valley.

ES.85 The activation of COBR in July 2007 was welcomed by Gold Commands, and played an important role. Departments felt that the response during July was better coordinated and more focused than during June 2007. This experience points to earlier activation of COBR on a precautionary basis in the future in the event of serious flooding.

ES.86 The last national flooding exercise was in 2004 and the Review notes that another national flooding exercise is not expected before 2010. Whilst we accept that there must be reasonable time for planning, and for the new National Flooding Frameworks to bed in, we believe that a national exercise on flooding should be prioritised in addition to local and regional events.

RECOMMENDATION 48: Central government crisis machinery should always be activated if significant wide-area and high-impact flooding is expected or occurs.

RECOMMENDATION 49: A national flooding exercise should take place at the earliest opportunity in order to test the new arrangements which central government departments are putting into place to deal with flooding and infrastructure emergencies.

Maintaining power and water supplies and protecting essential services

Taking a systematic approach to preventing disruption

ES.87 The floods had a dramatic effect on electricity substations, water and sewage treatment works, and the road and rail network. The consequence of loss of essential services provided by these sectors extended well beyond the areas that were flooded and served as a reminder of the need to pay greater attention to improving the resilience of critical infrastructure against flooding.

ES.88 The approach taken by the Government to mitigating the risks to critical infrastructure from flooding and other natural hazards has been uncoordinated and reactive. There is no central understanding of the level of risk to which critical infrastructure, and hence wider society, is exposed; and there is no centrally defined standard against which to drive action.

ES.89 The public need to be reassured that essential services are resilient to flooding and other forms of disruption. Government needs to respond by taking action to enable infrastructure operators and local responders to mitigate these risks, especially for 'Single Points of Failure'. There is a requirement for a more systematic approach to understanding the vulnerability of critical infrastructure and to driving up resilience. We welcome the Government's commitment to do this and propose that they create a national framework to help reduce the risks to the delivery of

essential services resulting from natural hazards.

ES.90 The framework should balance risks and costs across sectors and aim to:

- reduce risk to the most important infrastructure assets resulting from natural hazards through a careful assessment of vulnerability and decisive action based on new centrally defined standards;
- provide appropriate economic incentives to infrastructure operators to increase the resilience of infrastructure; and
- enhance the capacity to act quickly when faced with unexpected events through the introduction of mandatory business continuity planning.

You got four litres per person per day… but there people abusing it. [People with] shopping trolleys trying to flog it.

(Householder, Upton)

RECOMMENDATION 50: The Government should urgently begin its systematic programme to reduce the disruption of essential services resulting from natual hazards by publishing a national framework and policy statement setting out the process, timescales and expectations.

RECOMMENDATION 51: Relevant government departments and the Environment Agency should work with infrastructure operators to identify the vulnerability and risk of assets to flooding and a summary of the analysis should be published in Sector Resilience Plans.

RECOMMENDATION 52: In the short-term, the Government and infrastructure operators should work together to build a level of resilience into critical infrastrucure assets that ensures continuity during a worst-case flood event.

RECOMMENDATION 53: A specific duty should be placed on economic regulators to build resilience in the critical infrastructure.

RECOMMENDATION 54: The Government should extend the duty to undertake business continuity planning to infrastructure operating Category 2 responders to a standard equivalent to BS25999, and that accountability is ensured through an annual benchmarking exercise within each sector.

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Better planning through information sharing

ES.91 During summer 2007 emergency responders needed more information the location of critical sites, their vulnerability to flooding, the likely consequences of their loss and interdependencies between sectors. The information available was at best inconsistent, and at times unavailable. Agencies were severely hampered in their ability to respond quickly as events unfolded.

ES.92 The duties under the Civil Contingencies Act for Category 2 responders to cooperate and share information were shown to be insufficient. Critical infrastructure providers must become much more active in local and national emergency preparedness and response,with greater contact between the public and private sectors at national and local levels.

ES.93 We also need to be more direct with the public about risk. The balance between protecting information about critical infrastructure sites for security reasons and the need to share information with local agencies about such sites to protect them from flooding needs to be rethought. Guarding against one risk can exacerbate the other. As the summer floods showed, actual risk to these sites is much higher than communicated risk, and the public were shocked by the loss of essential services. Responders were poorly prepared, and levels of protection of these key sites did not match the public's expectations. Critical infrastructure operators and security organisations should be more open about the risks which exist and play a fuller part in civil protection arrangements.

RECOMMENDATION 55: The Government should strengthen and enforce the duty on Category 2 responders to share information on the risks to their infrastructure assets, enabling more effective emergency planning within Local Resillience Forums.

RECOMMENDATION 56: The Government should issue clear guidance on expected levels of Category 2 responders' engagement in planning, exercising and response and consider the case for strengthening enforcement arrangements.

Effective management of dams and reservoirs

ES.94 The events which occurred at Ulley reservoir, Rotherham, highlight the potential risks facing communities living in dam inundation areas. Around 1,000 people were evacuated and main roads (including the M1) were closed. The absence of prior information with which to prepare contingency plans meant responders had to improvise by drawing floods maps and making evacuation plans on the spot. Had the incident happened in a more densely populated area it is doubtful if this improvised approach would have been adequate.

ES.95 The UK has an excellent record of dam and reservoir safety. Nevertheless, some still pose significant risks to people and property. Much depends on the location and maintenance of the reservoir, rather than size. As such, we support the proposal of the Environment Agency in its biennial report that the Reservoirs Act should be amended to provide better, risk-based, criteria for targeting regulation.

ES.96 But the lesson of Ulley is that we must also be prepared for failure. At present, security concerns mean that the UK has one of the world's most secretive regimes in relation to dam inundation. But this has meant that responders cannot be as ready to respond as they should be, whether the breach occurs because of a malicious attack or natural failure. The Review considers it essential that LRFs should have the information they need to undertake effective planning, and to engage fully with downstream communities. This would bring the UK into line with other parts of the world, where evidence suggests that involving the community in local planning increases awareness and lessens the risk of fatalities and damage. This should include identification for the public of evacuation routes and procedures for the public to follow where destruction of buildings and loss of life could occur.

"I know we're not supposed to have the inundation plans, but I think I've still got some locked in a cupboard from when we got them years ago. They might come in handy if something goes wrong."

Emergency planner, Midlands

RECOMMENDATION 57: The Government should provide Local Resilience Forums with the inundation maps for both large and small reservoirs to enable them to assess risks and plan for contingency, warning and evacuation and the outline maps be made available to the public online as part of wider flood risk information.

RECOMMENDATION 58: The Government should implement the legislative changes proposed in the Environment Agency biennial report on dam and reservoir safety through the forthcoming flooding legislation.

Better advice and help for people to protect their families and homes

Raising awareness before the emergency

ES.97 The public need to be aware of a flooding risk before they can take action to minimise it. But even being aware of risk may not be enough – of those we talked to who actually knew prior to the floods that they were at risk, relatively few had done anything to prepare.

ES.98 The public need to be educated about flood risk. With climate change likely to lead to more varied weather patterns and a greater risk of flooding, householders and businesses need properly consider risks and take precautionary action in the same way as they do against other hazards, such as fire.

We were assured that our house wouldn't flood.

(Householder, At risk, West Oxfordshire)

When we bought the house in '99, the solicitor didn't tell me it was on a flood plain, but then you speak to people that lived here years and know Catcliffe, and the worse thing they say to you is 'oh, I could have told you that'.

(Householder, Rotherham)

ES.99 Increased risk awareness is important but it must sit alongside advice on effective actions to limit the impact of flooding, otherwise all that may be achieved is a heightened sense of anxiety and helplessness. During the summer 2007 floods, the public were confused by the numerous sources of information relating to flood mitigation measures, health advice, and actions to take before and during flooding. Not only did the multiple sources mean that people did not know where to look for advice, but the information given was often inconsistent. Therefore, the Review believes that the Government should decide which flood prevention and mitigation advice is essential and it should brand this as the definitive advice via a public information campaign.

ES.100 One powerful step the Government could take would be to significantly increase the take-up of flood warning schemes. In our interim report, we noted the limited participation and proposed that an 'op-out' rather than 'opt in' approach should be adopted. Government accepted the recommendation, but the issue is not yet resolved. We believe it should be an urgent priority.

ES.101 A proportion of property owners and tenants do not even realise that they live on a floodplain. There is currently no requirement for people purchasing a property to be informed about flood risk by estate agents, lawyers or the previous owner. Vendors, unless asked, do not have to disclose whether they are aware of the property ever having flooded. Flood risk or flood history discovered at an advanced stage of the purchase process can be costly if transactions are aborted after money has been spent by the potential purchasers.

ES.102 Home Information Packs (HIPs) were introduced in August 2007 and provide house buyers with some of the information they need to make an informed choice about a property they wish to buy. Flood risk from groundwater, rivers and the coast is not a mandatory search element of the HIP. The only question asked on flooding in the HIP relates to surface water flooding and arises in the mandatory drainage and water search, which covers the risk of flooding due to an overloaded public sewer. We believe this requirement should be extended. With additional information, purchasers can ask more inormed questions – not only of the property owner, but also of the Environment Agency or local authority – such as what flood defences exist locally and whether flood warning is available.

RECOMMENDATION 59: The Risk and Regulation Advisory Council should explore how the public can improve their understanding of community risks, including those associated with flooding, and that the Government should then implement the findings as appropriate.

RECOMMENDATION 60: The Government should implement a public information campaign which draws on a single definitive set of flood prevention and mitigation advice for householders and businesses, and which can be used by media and the authorities locally and nationally.

RECOMMENDATION 61: The Environment Agency should work with local responders to raise awareness in flood risk areas and identify a range of mechanisms to warn the public, particularly the vulnerable, in response to flooding.

RECOMMENDATION 62: The Environment Agency should work urgently with telecommunications companies to facilitate the roll-out of opt-out telephone flood warning schemes to all homes and businesses liabile to flooding, including those with ex-directory numbers.

RECOMMENDATION 63: Flood risk should be made part of the mandatory search requirements when people buy property, and should form part of Home Information Packs.

Warnings and advice

ES.103 One of the striking lessons about public warning during the flooding was the varying impact of information. The public's response to the flooding differed according to whether people were aware of the risks and able to take action as a consequence. Different people responded to different kinds of contact. In some areas telephone warnings worked well, while in others face-to-face contact was more effective.

> *Well if there is an advice line or internet, there are loads of ways of getting messages or being able to find information like a flood line. If there is one, I don't know.*
>
> **(Business owner, Barnsley)**
>
> *They send out warnings and you could come onto the local radio. The internet I wouldn't know where to start so it is no good for elderly people and they are saying get onto the internet and you will find out.*
>
> **(Businesses, Barnsley)**
>
> *There was no information from the Government or any organisation to help you as old folks. The only thing they tell you is what's on TV or in the papers.*
>
> **(Householder, West Berkshire)**

ES.104 Door-to-door calls were viewed as particularly effective and were welcomed by residents, as also witnessed during preparations for coastal flooding on the East Coast in November 2007. This is a simple but effective method which can be put into effect quickly while additional warning methods are explored. The method is already used in a number of areas, where its effectiveness as a method of disseminating information before flooding and once flooding has receded is well understood. Some LRFs have plans which utilise resources of the police, other local community groups and Environment Agency staff where appropriate.

ES.105 Telephone contact with the authorities was a key source of information, particularly for those directly affected. But many people were passed from organisation to organisation

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when seeking advice. In some instances, the publicising of several different telephone lines left people confused about which one to ring. Nevertheless, there were also success stories. Members of the public were able to get the Environment Agency's Floodline and other organisations such as Hull and Barnsley councils set up flood information lines for the local community. These services made use of local authority contact centres, which are now a regular part of service delivery and should be more widely used during emergencies.

ES.106 Many people were frustrated at having to access a number of websites to find information on flood-related issues such as the disconnection or restoration of electricity and water supplies, health notices and flood warnings. Many websites were poorly constructed or crashed under the volume of information requests. Some people could not find the information they needed as they did not know where to start looking. It would be of great value if a single website provided links to all other websites needed for a comprehensive set of advice on flood-related matters, including where to go for more specific information and what to do during the emergency. This could be the area's LRF website, with all Category 1 responders linking back to this 'hub'.

ES.107 We also note the value of the high media profile for local leaders, as achieved by council leaders and Gold Commanders in a number of areas affected by the floods. For example, in Doncaster, the elected Mayor's high visibility provided reassurance to the public during the severe flooding which affected the city in June 2007. In Gloucestershire, the Gold Commander adopted a similarly successful high profile, using the media as a way of communicating advice to the public and providing visible leadership at the local level. All local leaders need to play their part in this, and local authorities should share the load with the uniformed services.

RECOMMENDATION 64: Local Resilience Forums should continue to develop plans for door-knocking, coordinated by local authorities, to enhance flood warnings before flooding and to provide information and assess welfare needs once flooding has receded.

RECOMMENDATION 65: The Met Office and Environment Agency should urgently complete the production of a sliding scale of options for greater personalisation of public warning information, including costs, benefits and feasibility.

RECOMMENDATION 66: Local authority contact centres should take the lead in dealing with general enquiries from the public during and after major flooding, redirecting calls to other organisations when appropriate.

RECOMMENDATION 67: The Cabinet Office should provide advice to ensure that all Local Resilience Forums have effective and linked websites providing public information before, during and after an emergency.

RECOMMENDATION 68: Council leaders and chief executives should play a prominent role in public reassurance and advice through the local media during a flooding emergency, as part of a coordinated effort overseen by Gold Commanders.

The role of communities and individuals

There were 12 and 13 year olds looking after the old folk of our village and all of a sudden beans and soup appeared from nowhere and they were looked after but it was from our village ourselves no emergency services.

(Householder, Toll Bar, Doncaster)

People in our community went round every bungalow and collected medications, went and got prescriptions, fetched them back and they were visited and kept up to date but that's from people in our community no doctor came.

(Householder, Toll Bar, Doncaster)

ES.108 Community action was one of the most striking impacts of the summer floods. It has considerable potential for the future. In a wide area emergency, the authorities are overwhelmed and people have little choice other than to help themselves.

ES.109 There are many property level measures which can be taken – air brick covers, gates for doors, repositioning of electrical sockets and boilers. Also, many people have the option to sign up for warning schemes such as Flood Warnings Direct. And we continue to urge people to take the simple step of preparing their own flood kit.

ES.110 Many communities showed themselves willing to pull together. Helping neighbours became second nature, and we have heard many stories of community spirit and engagement. So we strongly endorse the announcements in the National Security Strategy relating to the promotion of Community Resilience by government in partnership with local organisations.

RECOMMENDATION 69: The public should make up a flood kit – including personal documents, insurance policy, emergency contact numbers (including local council, emergency services and Floodline), torch, battery or wind-up radio, mobile phone, rubber gloves, wet wipes or antibacterial hand gel, first aid kit and blankets.

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RECOMMENDATION 70: The Government should establish a programme to support and encourage individuals and communities to be better prepared and more self-reliant during emergencies, allowing the authorities to focus on those areas and people in greatest need.

Staying healthy and speeding up recovery

Health and wellbeing

ES.111 The summer 2007 floods had a significant impact on people's health and wellbeing. Many people suffered from illnesses, ranging from coughs and colds to bronchitis and heart attacks, and this affected family life and relationships. Some individuals have likened their flooding experience to bereavement, going through similar emotions such as shock and disbelief, anger, blame and finally acceptance. Psychological impacts included increased levels of anxiety during periods of rainfall,and as a result of temporary living arrangements, dealing with insurers/ builders and financial difficulties.

ES.112 There were many instances of individuals, businesses and the voluntary and community sector receiving inconsistent health information and support. In some cases, health advisors said it was safe to stay in flooded properties, yet in others families were told to leave their homes immediately due to health risks from fungal spores. Builders were unable to find advice on whether renovating damp properties posed health risks. Public authorities and the insurance industry issued conflicting advice on the removal and disposal of water-damaged items from houses and businesses.

ES.113 Clear and consistent health advice needs to be widely available to all people affected, both during the response and throughout recovery. The advice should cover hazards to both physical and mental health. It should be widely available across a range of media, such as the internet and in leaflets available at health centres. Consideration should also be given to raising health awareness in advance of an emergency.

ES.114 Our own research work shows that people affected by the summer floods suffered illness in large numbers, putting localised strain on NHS services and causing widespread absence from work or school. One of the most significant challenges for responders in future must be to provide sufficient support. Those charged with leading recovery locally should tackle health problems early and minimise the distress people feel. Getting this right needs proper monitoring arrangements. National

NHS reporting systems did not pick up serious local pressure points. Local Recovery Co-ordinating Groups need to take this task on, and redeploy resources accordingly.

I've got a little boy of three. We went to Scarborough for the day and he won't go in the sea because he is scared he was going to get flooded, it's a psychological effect on the kids.

(Householder, Sheffield)

I've been told that it's alright to live in a damp house with children with asthma, and I've been told [separately] that it's dangerous, so who do you trust?

(Business owner, Hull)

There were kids body surfing in the filthy, polluted floods, and their parents were just watching them … they just didn't realise the potential health problems that the floods brought.

(Householder, West Oxfordshire)

Yeah and that's when people started with headaches, sickness, rashes.

(Households, Sheffield)

ES.115 We have also encountered significant dissatisfaction with the time it took to dry out and stabilise properties after extensive flooding. But evidence shows that there is a continuing and significant detrimental effect on families' mental and physical health when they have to stay out of their homes for months at a time. Technological improvements can be made to speed up the process of building recovery, and these should be urgently pursued.

RECOMMENDATION 71: The Department of Health and other relevant bodies should develop a single set of flood-related health advice for householders and businesses which should be used by all organisations nationally and locally and made available through a wide range of sources.

RECOMMENDATION 72: Local response and recovery coordinating groups should ensure that health and wellbeing support is readily available to those affected by flooding based on the advice developed by the Department of Health.

RECOMMENDATION 73: The Government, the Association of British Insurers and other relevant organisations should work together to explore any technological or process improvements that can be made to speed up the drying out and stabilising process of building recovery after a flood.

RECOMMENDATION 74: The monitoring of the impact of flooding on the health and wellbeing of people, and actions to mitigate and manage the effects, should form a systematic part of the work of Recovery Coordinating Groups.

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Roles and responsibilities during recovery

"The role of Government Offices needs to be defined in relation to response and recovery…"

Hull City Council

"… there needs to be as much coherence and consistency as possible …"

Leeds City Council

Roles and responsibilities during recovery

ES.116 As with the response phase, clarity over roles and responsibilities is crucial to the effective management of recovery. Evidence to the Review shows that recovery arrangements following the floods generally worked well, with strong collaborative working between key government departments and agencies, and between regional and local bodies. Outcomes were most successful where there was clear leadership, where roles and responsibilities were understood, and where local authorities worked systematically with communities. However, there were inconsistencies in the approaches taken, and in some cases this reduced the effectiveness of the recovery phase. The public also perceived differences in treatment within communities which led in some cases to annoyance and frustration.

ES.117 Communities and Local Government was responsible for cross-government delivery of the flood recovery programme ensuring that Government departments and other national and regional bodies had a shared understanding of policies and priorities, and that they contributed fully and effectively to the recovery effort. At the local level, local authorities are ideally placed to understand the varied flood recovery needs of different neighbourhoods within their areas and in summer 2007 local authorities naturally understood that they would be looked upon to play a key leadership role in recovery efforts. Local Recovery Co-ordination Groups (RCGs) took up responsibility for recovery as Gold Commands began to wind down, with the expectation that they would eventually pass responsibility over to mainstream programmes. This clear leadership at the national and local levels should be the basis for planning for future emergencies.

ES.118 The events of last summer also highlighted the benefits to be gained from local areas working together and sharing best

practice on the management of recovery work. RCGs sought advice from authorities who had dealt with recovery following previous flooding emergencies. The Review considers that this experience is valuable and should be captured and shared with others in the immediate aftermath of an emergency. National Recovery Guidance should reflect this, and Government Offices (GOs) should work with organisations such as the Local Government Association to translate this into practice.

ES.119 GOs also have an important role in co-ordinating cross-area recovery. GOs were the principal conduit for gathering information from affected local authorities and relaying this to central government. Likewise, local responders used the GOs as the first port of call for requests for advice or assistance from central government. This role continued into the recovery phase. However, there were no previously established structures in place to undertake this work, which caused difficulties in some GOs. This should become an agreed part of future recovery operations.

RECOMMENDATION 75: For emergencies spanning more than a single local authority area, Government Offices should ensure coherence and coordination, if necessary, between recovery operations.

RECOMMENDATION 76: Local authorities should coordinate a systematic programme of community engagemment in their area during the recovery phase.

RECOMMENDATION 77: National and local Recovery Co-ordinating Groups should be established from the outset of major emergencies and in due course there should be formal handover from the crisis machinery.

RECOMMENDATION 78: Aims and objectives for the recovery phase should be agreed at the outset by Recovery Coordinating Groups to provide focus and enable orderly transition into mainstream programmes when multi-agency coordination of recovery is no longer required.

RECOMMENDATION 79: Government Offices, in conjunction with the Local Government Association, should develop arrangements to provide advice and support from experienced organisations to areas dealing with recovery from severe flooding emergencies.

RECOMMENDATION 80: All central government guidance should be updated to reflect the new arrangements for recovery and Local Resilience Forums should plan, train and exercise on this basis.

Recording and reporting

ES.120 The floods of summer 2007 generated the requirement for effective information flows to a wide range of national, regional and local organisations. Local authority leadership of the recovery phase meant that they were tasked with providing information to central government through GOs. Central government, in turn, provided information on the overall recovery position. This created a bureaucratic burden, particularly for local government. More attention should be given to agreeing the criteria, definitions and mechanisms for reporting in advance, including who needs information, what information they need and the format they need it in.

ES.121 One of the main indicators used during both the response and recovery phases to measure the scale of damage and speed of recovery was that of 'households affected' – replaced later by the indicator on 'households who are still displaced'. The information was also used to support the targeting of resources and actions to maximise their impact.

ES.122 Perhaps most importantly for those affected, getting people back into their homes is a very clear signal of progress and of the effectiveness of the efforts being made by all those engaged in the recovery phase. When published, the figures have attracted wide interest and both government and the insurance industry have been called to account. This is necessary – the number of people out of their homes is a matter for concern and has remained unacceptably high.

Being forgotten

"Just because we're in temporary accommodation and no one's in any real danger, the government and media have forgotten about us, they think we've recovered from it when in actual truth, we're nowhere near recovering." (Householder, Hull)

Number of people still out of homes

Local authorities have estimated that 4,750 households were still out of their homes at the end of May 2008.

RECOMMENDATION 81: There should be an agreed framework, including definitions and timescales, for local-central recovery reporting.

RECOMMENDATION 82: Following major flooding events, the Government should publish monthly summaries of progress of the recovery phase, including the numbers of households still displaced from all or part of their homes.

Funding for recovery

"Most local authorities do think it prudent to have adequate reserves, but the extent of these has to be weighed against the investment needs for services" – Local Government Association

ES.123 The total cost of the summer 2007 floods runs into billions of pounds. Damage caused by the floods affected individuals, homeowners, farmers and businesses as well as public buildings and infrastructure such as schools and roads. Funds to cover the repair and replacement of goods and property, and to compensate for loss of business, came from a number of sources and via an assortment of funding mechanisms. In some cases people were happy with the speed of payment and the amounts given. However, in many cases there were concerns that advice on funding was inconsistent and the procedures for obtaining funds were complex and inflexible.

ES.124 Problems with funding systems were twofold - some organisations at the local level had not made proper arrangements to cope with significant financial shocks, and there was no coherent pre-agreed system for funding at the national level. The Review believes that financial assistance can be revised to improve speed, simplicity and certainty, and that a new funding approach could minimise unnecessary expenditure and maximise value for money for public finances collectively, rather than for central or local government alone.

ES.125 Local organisations must prepare themselves better. Most of the losses incurred during the summer were insurable, either through commercial insurance or through

self-insurance and use of reserves. Local authorities in particular already have clear direction to build contingency into their financial arrangements. As with all other aspects of the response to emergencies, local organisations must expect to manage their own problems in the first instance and only seek support in the most difficult of circumstances.

ES.126 Emergencies can cause very serious financial problems. Individual authorities can face expenditure for which insurance is unavailable or unreasonably expensive. In the past, just as during the summer floods, central government has recognised this through generous ad hoc funding schemes. But the temporary and uncertain nature of this approach undermines efficiency, and encourages local authorities to over or under-provide for disasters. The Review believes that there is a strong argument for a scheme to be created specifically to fund the capital costs of recovery from exceptional emergencies such as the floods of 2007. The new scheme would receive funding from relevant central government departments, be delivered through a single funding gateway and supported by the work of GOs. Such an arrangement would end the current piecemeal approach and allow for more accurate financial planning by local authorities. Effectively, it would be a form of public sector self-insurance for the most serious events.

Hull Flood Recovery Grant

The Flood Recovery Grant Scheme (FRG) was a new grant scheme established in June 2007 and administered by CLG for local authorities. The scheme was intended to support local flood recovery work, particularly for people in greatest and most immediate need. The grant was paid to lower-tier local authorities on the basis of the number of households affected by flooding (those where water entered the property, not just the grounds).

In Kingston upon Hull, one of the areas worst affected by the summer floods, £2.7 million has been paid through the FRG scheme. Some of this money has been used to pay hardship funds to some of the worst affected residents in Hull. Elsewhere, money has been used to provide activities to support families living in caravans.

RECOMMENDATION 83: Local authorities should continue to make arrangements to bear the cost of recovery for all but the most exceptional emergencies, and should revisit their reserves and insurance arrangements in light of last summer's floods.

RECOMMENDATION 84: Central government should have pre-planned rather than ad-hoc arrangements to contribute towards the financial burden of recovery from the most exceptional emergencies, on a formula basis.

Normalisation and regeneration

The Carlisle floods

"In the immediate aftermath of the floods in January 2005, Carlisle City Council… knew that it just wasn't enough to get the city back to normal, we had to do much better than that – so our mantra in the early days became 'Let's get Carlisle back to normal – but better.' Our key task was to oversee the flood recovery process, but we took the opportunity at that early stage to use our multi-agency group in developing a vision for the physical, social and economic regeneration in Carlisle and make the case for Carlisle Renaissance."

(Maggie Mooney, Town Clerk and Chief Executive, Carlisle City Council)

ES.127 Recovering from the 2007 summer floods will be a long-term process taking many months if not years. Determining when an area has 'recovered' depends on the objectives established at the outset. In some cases, this will involve returning affected areas to their previous condition - 'normalisation'. In others, the recovery phase will be seen as the opportunity for long-term economic development. The Review has found a number of regeneration programmes which followed emergencies in the UK and overseas, including after the Carlisle floods of 2005, the hurricane and subsequent flooding in New Orleans and the fire at the Buncefield oil storage depot, Hemel Hempstead.

ES.128 Evidence to the Review has shown that most local authorities agree that longer-term regeneration and economic development should be considered at an early stage of the recovery process. But evidence also shows that most authorities have opted for normalisation rather than regeneration. This represents a missed opportunity. So Recovery Co-ordination Groups, in establishing the aims and objectives for the recovery phase, must consider the strategic choice between normalisation and regeneration of an affected area.

RECOMMENDATION 85: Local Recovery Coordination Groups should make early recommendations to elected local authority members about longer-term regeneration and economic development opportunities.

How do we know this Review will make a difference?

"…recommendations… should be led nationally, down through the regions to the local level, to ensure consistency and development across the board. The big question now is whether there is the political will to enforce these…."
(Emergency Planning Society)

"The report is a terrific foundation to identify the lessons from the 2007 floods… The challenge, to ensure we really learn the lessons, will be to get commitment from senior government to maintain the pressure for progress on the recommendations."
(London First)

ES.129 The recommendations in this Report are directed towards a range of government departments and agencies. Lead amongst these is Defra, as department with responsibility for flood risk management. Defra has already shown itself willing to take on a leadership role, and we understand that it will co-ordinate both the response to this Review and the wider programme of change. The Departmentment has already begun work on the new National Framework for flooding emergencies.

ES.130 But a positive approach and administrative structures are not enough alone. This programme of work must have teeth. Defra should set out publicly how the Government can be held to account and how progress can be monitored. This work must be overseen by a top official, with regular reporting to Defra Ministers and Board.

ES.131 Defra cannot tackle this job alone. The issues considered in this Report are many and varied, and go far beyond Defra's direct interests. In order to support Defra, there should be a new Cabinet Committee to deal with flooding, much as we have already for terrorism and pandemic influenza. A Cabinet Committee will provide clear ministerial leadership across government, and ensure that other important departments like CLG, Cabinet Office and BERR play their part. As a Cabinet Committee, its business will take precedence within government over other matters. It is a step which raises the status of flooding to bring it alongside the other most serious risks we face.

RECOMMENDATION 86: The Government should publish an action plan to implement the recommendations of this Review, with a Director in Defra overseeing the programme of delivery and issuing regular progress updates.

RECOMMENDATION 87: The Government should establish a Cabinet Committee with a remit to improve the country's ability to deal with flooding and implement the recommendations of this Review.

Oversight at the national level

ES.132 The work carried out in government has to be done together with external organisations. Just as at the local level, the multi-agency approach has to be the cornerstone of improving our ability to deal with flooding emergencies. However, at present there is no single body at the centre of government to make this happen.

ES.133 Key decisions must still sit with government itself, but local responders and the private sector need influence and to be more closely involved. Submissions to the Review from key external organisations, notably local government and critical infrastructure operators, have made this clear. The creation of a National Resilience Forum, with representatives of local response organisations and government, would give the kind of multi-agency strategic oversight that we believe is necessary to make the recommendations in this Report work

ES.134 We have also considered how delivery should be monitored at a national level once the Review is shut down. The Environment, Food and Rural Affairs (EFRA) Select Committee has followed the progress of our Review and there has been a sharing of ideas. We believe the Committee should build on its own longstanding interests in flood risk management by reviewing progress against our recommendations. The Committee will have a particular interest when the government's response and Action Plan are published in late summer or early autumn. In addition, we would encourage the Committee to make an assessment of progress once departments have had time to undertake some of the more substantial policy and operational changes.

RECOMMENDATION 88: The Government should establish a National Resilience Forum to facilitate national level multi-agency planning for flooding and other emergencies.

RECOMMENDATION 89: The EFRA Select Committee should review the country's readiness for dealing with flooding emergencies and produce an assessment of progress in implementation of the Review's recommendations after 12 months.

Scrutiny at the local level

In its submission to the Review, Severn Trent Water, commented on the company's experience of attending the Scrutiny Inquiry conducted by Gloucestershire County Council following the floods of summer 2007:

"Severn Trent Water has experienced the benefits [that] attending the Gloucester Scrutiny enquiry can bring. We have been able to inform and reassure the communities we serve by demonstrating what we as an organisation are doing to make our networks more resilient and what contingency arrangements we have in place to respond to an emergency in their community."

ES.135 National and regional oversight must be matched locally and we consider that there is a role for scrutiny committees of local councillors. Overview and Scrutiny committees are now a well-established feature of local government. They provide a strong focus for public interest in key areas of local service delivery, and ensure that organisations are held to account publicly. As one step removed from the service providers, they can consider the position across the piece. The model is already used successfully on a national basis to improve local oversight of NHS services.

ES.136 The wide range of organisations which have a part to play in reducing the impacts for future flooding in local areas means that the scrutiny model is particularly well-suited. Scrutiny committees have successfully examined the events of last summer in areas such as East Riding of Yorkshire, Gloucestershire, Doncaster and Berkshire, taking evidence from public and private sector bodies. These have been most effective where a public report has been produced, and specific actions identified. Indeed, the lessons they have identified have provided useful information for this Review. Full reports of this kind might only need to be undertaken from time to time, but an assessment of progress against actions would have most effect if published at least annually.

ES.137 The other element of work at the local level to achieve improvement following flooding events is internal analysis to learn and share lessons. In this respect, there will be a need for responders to evaluate and share operational and specialist lessons from the response and recovery phases and some of the areas under discussion. Local Resilience Forums will need to play a role in identifying and implementing these lessons.

Gloucestershire Scrutiny Inquiry

In the aftermath of the summer floods, Gloucestershire County Council set up a Scrutiny Inquiry to look at how the emergency services, local authorities and utility companies dealt with the event. The 11-week inquiry highlighted several critical local issues of concern, which included the inadequacy of flood warning systems, the lack of knowledge for the county's drainage system, and the vulnerabilities of single points of failure within the county's critical infrastructure. Once agreed, the County monitored the progress of the recommendations at regular intervals, ensuring that progress can be systematically checked.

RECOMMENDATION 90: All upper tier local authorities should establish Oversight and Scrutiny Committees to review work by public sector bodies and essential service providers in order to manage flood risk, underpinned by a legal requirement to cooperate and share information.

RECOMMENDATION 91: Each Oversight and Scrutiny Committee should prepare an annual summary of actions taken locally to manage flood risk and implement this Review, and these reports should be public and reviewed by Government Offices and the Environment Agency.

RECOMMENDATION 92: Local Resilience Forums should evaluate and share lessons from both the response and recovery phases to inform their planning for future emergencies.

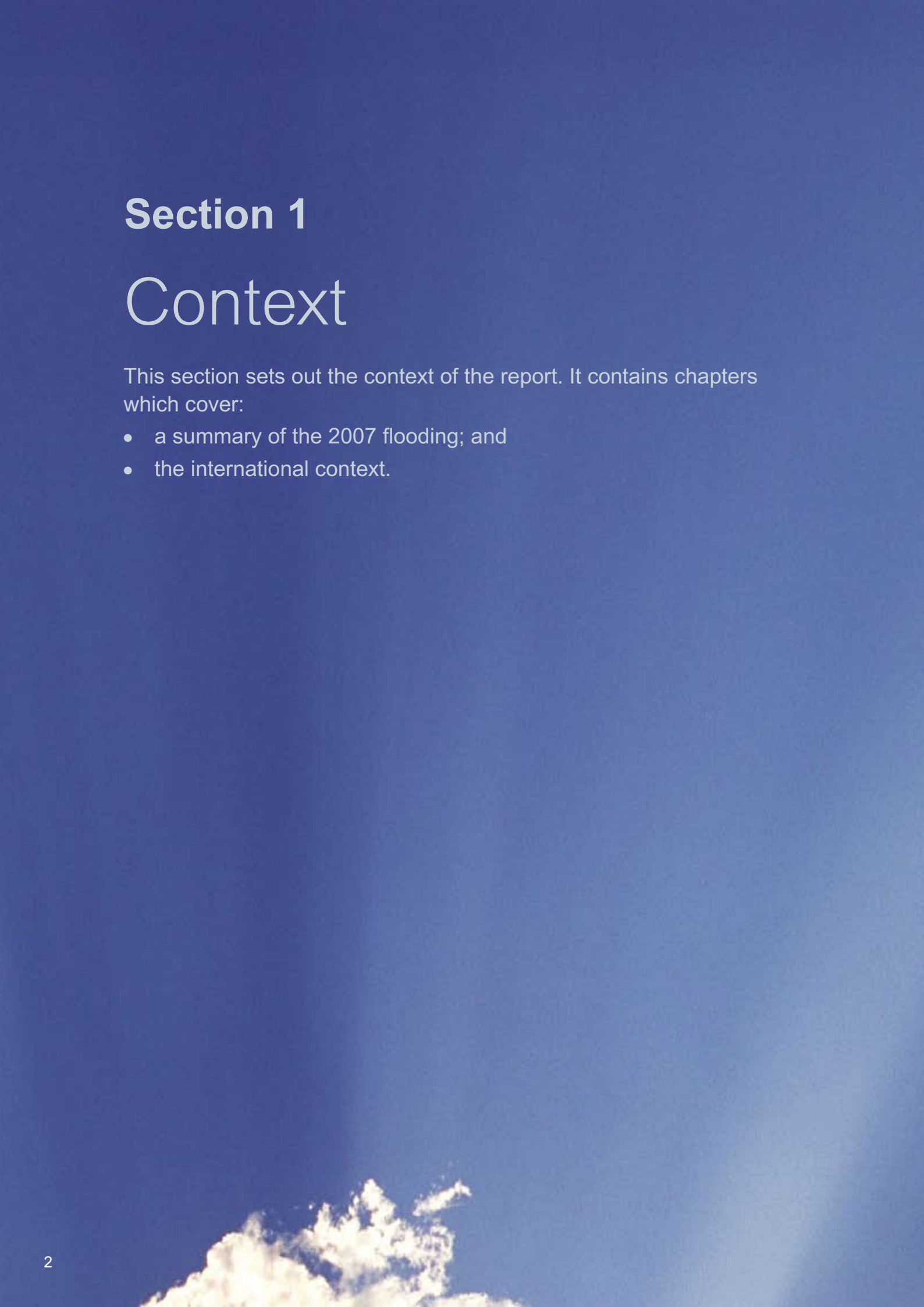
ES.138 The Review is now complete. The Government will consider our recommendations and respond. Full details of how to comment on the issues we address in this Report, or to access any of the papers (including all the evidence that was considered), are set out in Chapter 31 of the main document.

Section 1

Context

This section sets out the context of the report. It contains chapters which cover:

- a summary of the 2007 flooding; and
- the international context.



A summary of the 2007 flooding

This chapter describes the exceptional events that took place during summer 2007. It contains sections on:

- the weather situation;
- the UK weather forecast;
- flood defences;
- the flooding;
- the effects of the floods on people, businesses, agriculture and heritage sites;
- the UK situation in June 2008; and
- key dates.

Introduction

1.1 The floods that struck much of the country during June and July 2007 were extreme, affecting hundreds of thousands of people in England and Wales. It was the most serious inland flood since 1947.

1.2 In the exceptional events that took place, 13 people lost their lives, approximately 48,000 households and nearly 7,300 businesses were flooded and billions of pounds of damage was caused. In Yorkshire and Humberside, the Fire and Rescue Service launched the "biggest rescue effort in peacetime Britain".[1] Across Gloucestershire, 350,000 people were left without mains water supply – this was the most significant loss of essential services since the Second World War. Other critical infrastructure was damaged and essential services including power supplies, transport links and telecommunications were disrupted.

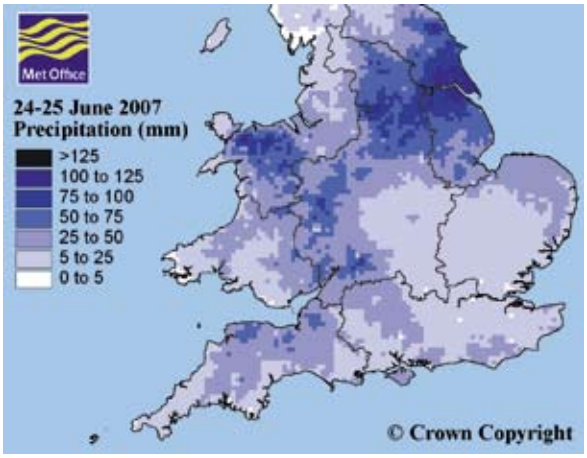
The weather situation

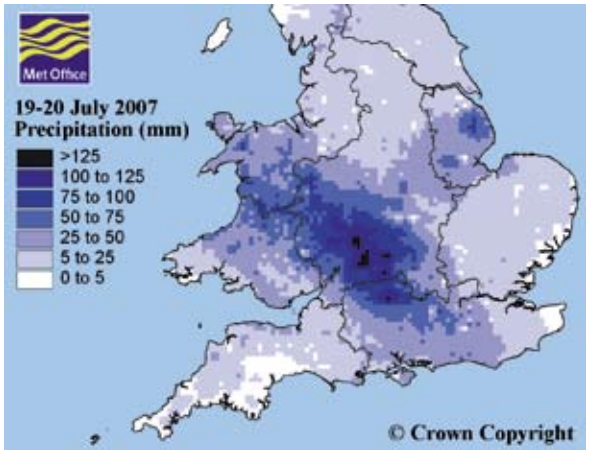
1.3 The rainfall during June and July 2007 was unprecedented. The severe flooding which followed came after the wettest ever May to July period since national records began in 1766. Met Office records show that the total cumulative rainfall in May, June and July 2007 averaged 395.1mm across England and Wales – well over double usual levels.

1.4 The exceptionally heavy rain resulted in two severe and disruptive flooding events; the first during the week of 20 June and the second during the week of 18 July. A clear indication of where the heavy rain fell can be seen in the maps of precipitation levels for England and Wales during 24–25 June and 19–20 July 2007, (Figure 1.) This heavy rainfall was the result of an unusual pattern of weather that can be attributed to two major causes: the position of the Polar Front Jet Stream and high North Atlantic sea surface temperatures.

[1] General Secretary Matt Wrack, Fire Brigades Union Press Release 28 June 2007

Figure 1 – Precipitation Levels for England and Wales during 24–25 June and 19–20 July 2007





The Polar Front Jet Stream

1.5 The Polar Front Jet Stream is a key factor in the UK's weather. Found at around 35,000 feet and reaching speeds of 300 miles per hour, this ribbon of wind is formed by temperature differences in the upper atmosphere between cold polar air to the north and warm tropical air to the south. At this boundary, weather fronts develop which bring heavy rain and strong winds. For much of summer 2007, the Jet Stream was stronger and further south than normal resulting in many heavy rain-producing weather systems crossing southern and central areas of the UK. Figure 2 shows the relative positions of the Jet Stream in July 2006 and July 2007 for comparison.

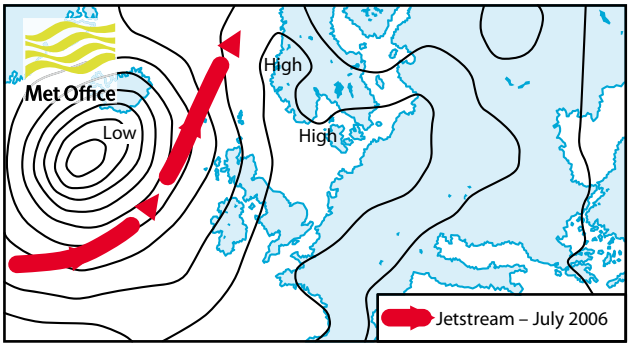
North Atlantic sea surface temperatures

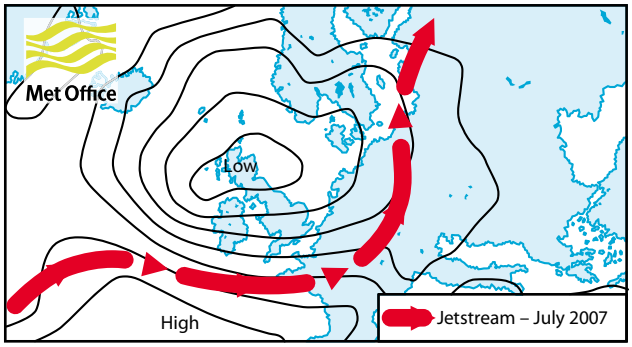
1.6 The temperatures of the North West Atlantic Ocean waters were above normal for much of spring and early summer 2007. Consequently the air mass above the ocean was warmer and held more moisture. When this air mass was forced to rise as a result of frontal activity, more rain formed. This rain fell throughout the spring and culminated in the main events of 24–25 June and 19–20 July, as the weather fronts in the slow-moving depressions passed over the country.

The UK weather forecast

1.7 The Met Office is responsible for forecasting the weather and issuing National Severe Weather Warnings, through the National Severe Weather Warning Service (NSWWS) to customers when hazardous or severe weather has the potential to cause danger to life, or widespread disruption to communications or transport. The Met Office works with the Environment Agency to provide weather forecast and tide warnings and it is the Environment Agency's responsibility to issue river and coastal flood warnings to partners and the public.

Figure 2 – Relative positions of the Jet Stream in July 2006 and July 2007





The Met Office forecast

1.8 The levels of rainfall in summer 2007 were generally well predicted by the Met Office – in particular, the weather forecasts preceding the major July flooding were the most detailed and accurate to date for a major flooding event in the UK. Nonetheless submissions to the Review suggest responders found the weather forecast updates from the Met Office confusing at times.

1.9 Early warnings giving three days notice of severe weather were issued to both NSWWS customers and the public before the two major flooding events. The early severe weather warnings were distributed direct to emergency response organisations via email and fax, and Met Office Public Weather Service Advisors around the country worked with responders to deal with the impact. There was sufficient lead time for some mitigation plans to be put in place. Subsequent focused warnings about the areas at greatest risk of disruption were provided as confidence in the forecasts grew.

The Environment Agency forecast

1.10 The Environment Agency forecast flood levels and issued warnings relatively accurately. However, problems arose in four of eight Environment Agency regions across England and Wales affected by the floods.

The Thames region

1.11 In the Thames region, the Environment Agency's rainfall runoff forecasting model for the Thames and its tributaries worked well and the magnitude (but not the timing) of the event was well forecast. However, on the mornings of 21 and 25 July the Regional Telemetry System partially failed, thus providing no data to the National Flood Forecasting System (NFFS). A total of 24 telemetry outstations out of 632 (4 per cent) experienced some kind of failure during the event, while in other cases poorly configured outstations caused unnecessary alarm errors. On one site, due to a river alarm that failed, a flood warning was issued two hours after flooding had commenced. In total, 448 out of 1,925 (23 per cent) properties in the region affected by main river flooding were in areas that did not receive a warning in time.

The Midlands region

1.12 In the Midlands, a small number of the Environment Agency's river level gauges reached their recordable limit, were inundated by flood waters or lost power, while others were inaccessible due to the extreme flood conditions and could not therefore be read. The rapid water level rise on some watercourses meant that it was not possible to give warnings two hours in advance. On two occasions, flood warnings were issued after flooding had already occurred.

The North-East region

1.13 In a number of locations in the North East, warnings were received after surface water flooding had already affected properties. The absence of high-resolution rainfall radar coverage across the whole of the North-East region limited the potential to predict rainfall and forecast flooding.

The Anglian region

1.14 In the Anglian region, a number of flood warnings and severe flood warnings were issued in areas that did not experience any significant flooding, which suggests that some warning thresholds were set too low. The NFFS was not operational in the Anglian region at the time, and this limited the warning service available. Existing forecasting models and tools had generally been calibrated against winter flood events, presenting challenges in predicting flood peak travel times during the summer floods.

Flood defences

1.15 The majority of flood defences, both those on rivers and those against coastal surges, are maintained by the Environment Agency. Others are maintained by local authorities, internal drainage boards, businesses and individuals. These defences are typically designed to withstand an event with an annual 1 in 100 chance of occurring.

1.16 In England and Wales, during the floods of June and July 2007, 9 per cent (1,016 km) of man-made raised flood defences were put to the test. However, due to the scale of the event approximately 50 per cent (525 km) of the raised flood defences were overtopped by the sheer volume of water.[2]

1.17 Overall, the defences held up well with less than 0.2 per cent of the total defences failing physically, breaking down or failing to operate as expected. The failure of these defences did not significantly affect the overall level of flooding due to overtopping and the magnitude of the event.

The flooding

1.18 Flooding occurs from a number of sources. **River (fluvial) flooding** occurs as a result of water overflowing from river channels, **surface water (pluvial) flooding** when natural and man-made drainage systems have insufficient capacity to deal with the volume of rainfall, **groundwater flooding** when the level of water underground rises above its natural surface and **coastal flooding** when the sea level rises above the level of coastal land.

1.19 The events of the summer were characterised by fluvial and pluvial flooding: rivers flooded surrounding areas and, following the exceptionally high rainfall, there was direct flooding of areas with insufficient drainage capacity.

Fluvial flooding

1.20 The two key factors in fluvial or river flooding are:

- the volume of rainfall; and
- the capacity of the ground and rivers to absorb and transport the water.

1.21 In a typical summer, river, groundwater and soil moisture levels are usually low, providing capacity to absorb heavy rainfall and reducing the likelihood of flooding. However, in May and early June 2007, the weather was particularly wet, so river, groundwater and soil moisture levels were already high when the intense rain fell in June and July, exacerbating the flooding.

Pluvial flooding

1.22 The critical factors for pluvial or surface water flooding are:

- the volume of rainfall;
- where it falls; and
- its intensity.

1.23 In urban areas, sudden and intense rainfall cannot drain away as quickly as it can in rural areas where the soil is exposed. Due to its nature, surface water flooding is hard to predict and the scope for providing warnings is limited. Significant flooding occurred in areas that had not previously flooded because of this.

The Environment Agency figures

1.24 In our interim report we attributed a third of the flooding to main river flooding or a combination of main river and surface water and two thirds of the flooding to inadequacies in surface water drainage systems. These figures were obtained from the Environment Agency but have since been questioned.

1.25 The Environment Agency figure was calculated by subtracting the number of properties definitively flooded, in whole or in part, from main rivers from the total number of properties flooded. The number of properties therefore quoted as flooded from surface water included flooding from a wide range of sources that were not main rivers, for example ditches and groundwater. More importantly, this figure included properties flooded by sewers and drains which could not discharge properly because many urban river channels ran close to full (without overtopping). Integrated modelling has shown that where river channels run close to full, the capacity of surface water sewerage outfalls and potentially other drainage outfalls is significantly affected.

[2] Environment Agency update on failed assets May 2008

1.26 Many of the properties included by the Environment Agency in their 'surface water flooding' category actually flooded from a combination of factors. Unfortunately, due to the way that the data was collected, the two-thirds figure quoted cannot be further clarified. Nevertheless, surface water flooding was a major issue in the events of last summer and will remain a significant problem in the future.

The June event

1.27 Heavy rainfall from severe thunderstorms affected much of northern England on 14–15 June. Whilst this caused comparatively little flooding itself, it did saturate the ground. This amplified the impact of heavy rain on 24–25 June, after which the weather remained unsettled and wet until the end of the month.

1.28 The heaviest rain in June occurred in Yorkshire, Humberside, Lincolnshire, Derbyshire and Worcestershire. Four times the average June rainfall fell in places on the North York Moors and in the South Pennines. In Hull, 8,600 homes (20,000 people) and 1,300 businesses were flooded as a result of the city's drainage network being overwhelmed by heavy and prolonged rain. In Sheffield, the Neepsend electricity substation was shut down with the loss of power to 40,000 people. Over 1,000 people were evacuated from villages near the Ulley reservoir dam near Rotherham after a torrent of water caused significant structural damage to the dam. This led to the M1 being closed for 40 hours as a precaution.

The July event

1.29 The second main flooding event was due to exceptionally heavy rainfall on 19–20 July, with a slow moving depression centred over south-east England moving northwards during the day. The flooding was exacerbated once again because the ground was still saturated from the previous month's rain.

1.30 The heaviest rain in July occurred in Warwickshire, Worcestershire, Gloucestershire, Herefordshire, Shropshire and Oxfordshire. There was nearly four times the July average rainfall in the Malverns and the Cotswolds. Tewkesbury was particularly hard-hit with Severn Trent Water's Mythe water treatment works flooding. This left 350,000 people without mains water supply for over two weeks. Around 10,000 people were left stranded on the M5 and surrounding roads as drivers were forced to abandon cars, and 500 people were stranded at Gloucester railway station as the railway network failed.

1.31 The Fire and Rescue Service, the Armed Forces, the Environment Agency and the National Grid erected temporary defences at Walham electricity substation, which saved it from flooding and helped protect the power supply to 500,000 people in Gloucestershire and South Wales. However the Castle Meads electricity substation was shut down whilst temporary defences were put in place, which left 42,000 people without power in Gloucester for up to 24 hours.

The effects of the floods

The effects on people

1.32 The Review commissioned qualitative research, carried out in October 2007, to look into the effects of the floods on individuals. The Review also commissioned qualitative research, carried out in April 2008, to look at the health impacts of the floods and the performance of the insurance industry. Both pieces of research were carried out by the independent research agency GfK NOP Social Research and the full reports are available for download from the Review website: www.cabinetoffice.gov.uk/thepittreview.

1.33 The scale and speed of the floods in summer 2007 came as a shock. Even if people were aware that heavy rain was forecast, they did not expect it to affect them, and certainly not so seriously. Most people had never experienced flooding like this before and did not know how to react – what preventative steps to take or who to call for help.

1.34 Some did take steps to protect their property, moving their possessions upstairs or attempting to prevent water ingress. Many people were forced to evacuate their homes, either staying with friends or relatives or being transferred to rest centres or temporary accommodation. This caused fear and distress as people worried that their homes would be damaged further by the flooding or targetted by opportunist thieves in their absence.

1.35 After the flood, many people were unable to return home and disrupted living patterns led to family and personal stress. Some families who did return home were confined to using only the upper floors, while others moved into caravans located on their driveways.

1.36 The loss of water and power supplies caused feelings of fear and helplessness. Where water supplies were lost, bowsers and bottled water were made available in various locations. But it was difficult for vulnerable people and those without transport or enough physical strength to collect the water and take it back to their homes. Scarcity of water caused arguments and tension in local communities. In addition, the loss of power meant people could not get information from television, mains radio and the internet. It also prevented people from communicating with others, as many modern landlines and mobile telephones require power to charge batteries.

1.37 Walls and floors were soaked, and the mud, silt and sewage carried by the flood waters caused considerable damage to people's homes. In addition, there were reports that contamination resulted in a continuous bad odour as well as infestations of rats, mosquitoes and flies. People also reported physical health problems, including diarrhoea, asthma, sore throats, cold sores and bad chests, all of which may have resulted from the damp living conditions and overall contamination of their homes.

1.38 Presented with one of their biggest ever challenges, insurers responded quickly to the events, implementing major crisis measures to respond to the overwhelming demand. In the majority of cases people were dealt with quickly and efficiently by their insurer and loss adjustor. There were incidents, however, where it took several days for customers to be able to make contact with their insurer and even longer for their loss adjustor to contact them. Loss adjustors are a crucial first step in the claims process and in some cases initial lack of availability delayed the clean-up process. Many people were uninsured and for them, after the flooding, advice on where to start and what to do was less easily available. They did however receive a limited amount of money for repairs and support through public funds including grants from local authorities and the Department of Work and Pensions (DWP), as well as support from the voluntary and community sector.

The effects on businesses

1.39 Many businesses suffered flooded sales premises, together with damage to stock and equipment. In addition, the loss of power and communications led to missed orders and enquiries. It took considerable time for many businesses to get back to normal, as there were delays caused by paperwork that had been lost in the flooding, which led to problems making insurance claims, tracing orders or filling in tax returns. Businesses in the tourism and leisure sector suffered with fewer customers and lost revenue. Some hotels benefited from people displaced by the floods, demand for takeaways increased with people unable to cook and building firms were inundated as the recovery process began.

1.40 All the Regional Development Agencies (RDAs) affected by the flooding of June and July put in place specific flood recovery schemes for small to medium enterprises. These schemes have usually taken the form of a grant of up to £2,500. In total RDAs have currently committed over £11 million in support for businesses affected by the floods.

1.41 Months after the summer floods, many thousands were still experiencing inconvenient disruption to their everyday lives. Many families were forced to spend the Christmas holidays in temporary accommodation; hundreds of school children in some of the worst affected regions were still being taught in temporary classrooms; and businesses were still far from fully recovered and trading at pre-flood levels.

The effects on agriculture

1.42 The most significant impact on the farming sector was in respect of crop losses. In some cases, agricultural land floods either by design or as a result of a typical winter weather event. However, as the flooding occurred in the summer months, the impact was magnified as growing crops are more vulnerable. Approximately 42,000 hectares of agricultural land across England flooded last summer, slightly over 0.5 per cent of the total area. Of this, 15,600 hectares were grassland

(including grazing, hay and silage fields) and arable and fodder crops made up the remaining 26,300 hectares.[3] Due to the relatively small area affected, there was no noticeable effect on UK food prices.

1.43 It is estimated that the number of farms affected was between 2,600 and 5,000. Taking into account that some crops from flooded fields were lost entirely, whereas others could be salvaged, albeit with a potential reduced yield and quality, total losses are estimated at £11.2 million. This equates to average losses of between £2,670 and £6,675 per farm although the Review has heard of large variations, from minimal losses to over £500,000. Typically damage to growing crops is uninsurable and with average farm incomes per head in 2007 at £13,349,[4] some farms are likely to have been severely affected.

1.44 Dairy and livestock farmers also faced a number of problems during and after the flooding. In some cases they had to save their animals from drowning or prevent them from drinking contaminated water. Livestock was lost: a reported 1,000 sheep were killed in Staffordshire and several thousand chickens drowned in Lincolnshire. Dairy and livestock farms suffered from loss of grazing and forage crops, creating additional expenditure on animal feed as well as affecting growth rates and milk production.

1.45 To date, there is no accurate assessment of the overall economic impact of the floods on agriculture but with indirect costs such as land reinstatement, the effect of interrupted crop rotations, additional management time and cashflow/finance issues factored in, it is likely to be in the region of tens of millions of pounds, and well beyond the support available through government funds and insurance.

The effects on heritage sites

1.46 English Heritage and National Trust visitor attractions were significantly affected by the floods of last summer, as well as numerous World Heritage Sites, suffering both physical damage and lost revenue. World Heritage Sites affected included Birdoswald Roman Fort (part of the Hadrian's Wall Site), Fountains Abbey, Ironbridge Gorge, Derwent Valley Mills and Blenheim Palace. Many listed properties were also affected.

The UK situation in June 2008

1.47 One year on from the 2007 summer floods, communities are still recovering and are not likely to be back to normal for many months to come. Figures from the Association of British Insurers (ABI) show that there were at least 180,000 claims (130,000 home, 30,000 business and 20,000 motor) following last summer's floods. By the beginning of June 2008, the ABI estimated that over 90 per cent of all claimants had received at least an interim payment.

1.48 The percentage of domestic claims that have been settled is steadily increasing, up from 42 per cent in mid-December 2007 to 60 per cent in mid-February 2008. At the end of March 2008, the ABI estimated that 71 per cent of domestic claims and 40 per cent of business claims had been settled in full.

1.49 Approximately 14,500 households were provided with alternative accommodation by insurers. At the end of May 2008, local authorities estimated that 4,750 households were still not back in their homes. The ABI predict that 96 per cent of policyholders who moved to alternative accomodation will have moved back in by the summer of 2008.

1.50 Funding of up to £87 million has been made available by various government departments and agencies to assist the affected regions and help those in greatest need. This includes funding for schools, transport and businesses.

1.51 In addition to this, the European Commission has granted European Union Solidarity Fund aid to the UK with a net value of £31 million to help deal with the damage caused by the floods. The new fund will be made available to local authorities, police authorities and fire and rescue services to offset costs incurred in dealing with the 2007 floods and their knock-on effects.

[3] Impact of 2007 summer floods on agriculture, ADAS (FINAL) Food and Farming Group, Defra January 2008
[4] www.defra.gov.uk/news/2008/080131d.htm

1.52 One year on, many people continue to suffer the long-term disruption that the summer floods of 2007 caused. Some areas are still recovering from the floods and as recent flood events in Oxfordshire and Somerset show the threat of flooding remains an ever-present danger to individuals and communities in the UK. It is recognised that, although many aspects of the response to last summer's floods were positive, there are lessons to be learnt to improve the way we deal with flooding in the future.

Key Dates

- 14 – 19 June: Met office issues Flash Warnings of Severe Weather (heavy rain) associated with thunderstorms, severe thunderstorms strike and flooding is reported in Northamptonshire, West Midlands, Staffordshire, Herefordshire, Worcestershire and Yorkshire.
  One man dies after being swept away by a bursting river in North Yorkshire.
  Evacuations take place in all areas from homes and schools but blocked roads and disrupted rail services leave people stranded and hamper rescue efforts.
- 21 June: Overnight rain causes floods in Boscastle, three years after record floods hit the village.
- 22 June: Met Office issues Early Warning of Severe Weather.
- 23 June: Ingham rainfall radar station in Lincolnshire is hit by lightning and put out of action. Ingham provides rainfall information for eastern and north eastern England.
- 24 – 28 June: Flooding is reported in East Anglia, Staffordshire, Lincolnshire, Nottinghamshire, Shropshire, Worcestershire and Yorkshire. Torrential rain causes surface water flooding in Hull, a result of the city's drainage network being totally overwhelmed, leaving 30,000 people homeless. In Yorkshire and Humberside the fire brigade launch the "biggest rescue effort in peacetime Britain". Neepsend electricity substation is inundated and shut down with a loss of power to around 40,000 people around Sheffield. One man dies while attempting to clear debris from a manhole in Hessle. Elsewhere there are another three flood-related fatalities. Around 1,000 people are evacuated from villages near the Ulley reservoir dam, after a torrent of water caused significant structural damage. This led to the M1 being closed for 40 hours as a precaution.
- 28 June: Home Office figures show that 3,500 people have been rescued from flooded homes and a further 4,000 call-outs were made by the fire, ambulance and police services.
- 2 July: The Department for Environment Food and Rural Affairs (Defra) announces an increase in funds for flood protection to £800 million by 2010/11.
- 3 July: Forecasters warn of treacherous weather for the rest of July.
- 7 July: Gordon Brown visits flood victims in Yorkshire. He announces a £14 million support package for the areas affected by the recent floods as well as changes to the Bellwin scheme to make it easier for local councils to claim back additional costs from the government. In the support package, £10 million will go to local authorities in flood hit areas to support the work that they and other organisations are already doing to help recovery, £3 million from the Department for Transport to help with the cost of repairing roads and bridges; and a contingency reserve of £1 million that may be drawn upon as needed by the Department for Work and Pensions. ABI estimates the damage from the floods at £1.5 billion.
- 12 July: Secretary of State for Environment Food and Rural Affairs in a statement to the House of Commons announces there will be an independent review into the floods.
- 13 July: Communities and Local Government (CLG) release initial payments of £8 million as part of the Government's support package.
- 14 July: Met Office issues a Severe Weather Warning of 50mm rain in some parts of the country for the day.
- 16 July: Met Office predicts heavy rain, thunderstorms and even tornadoes, as strong winds and low pressure sweeps across England. The Environment Agency issues severe weather warnings in the north-east. Much of Yorkshire and parts of north-east England are already saturated from the previous rain in June.

- 17 – 19 July: The Met Office issues an Early Warning of Severe Weather, tropical storms, mini tornadoes and torrential rain hit parts of England causing flooding and leave hundreds of people stranded.
- 20 – 22 July: Flooding reported across Gloucestershire, Buckinghamshire, Oxfordshire, Worcestershire, West Midlands and Warwickshire. Overnight on the 20/21 up to 10,000 people are left stranded on the M5 as drivers are forced to abandon cars. 500 people are stranded at Gloucester railway station as the railway network fails. Rest centres are set up for 2000 people unable to get home. In total 6,000 people stay in 10 rest centres overnight. A further £2 million of the Flood Recovery Grant is allocated.
- 22 – 23 July: Further flooding is reported in Herefordshire. Oxfordshire. Gloucestershire and in particular Tewkesbury, Gloucester and Oxford. Severn Trent Water's Mythe water treatment works in Tewkesbury is flooded leaving 350,000 without water for over two weeks. The fire and rescue service, the Armed Forces, the Environment Agency and the National Grid erect temporary defences at Walham electricity substation saving it from flooding and protecting 500,000 people from losing power. Central Networks' Castle Meads electricity substation is shut down; this leaves 42,000 people without power.
- 24 July: CLG announces a further £10 million to supplement the existing flood recovery grant made available to local authorities. Over 1 million litres of water have been distributed in Gloucestershire. A further 700 bowsers are also placed in priority areas in the county. The Red Cross launches its National Floods Appeal.
- 25 July: Flooding hits the Thames region and evacuations take place in Oxford. The Chancellor of the Exchequer announces a package of measures for individuals and businesses affected by severe flooding bringing forward legislation that will allow the Commissioners of HM Revenue and Customs (HMRC) to waive interest and surcharges on tax paid late due to the floods.
- 26 – 27 July: A heavy downpour of rain falls across England, causing localised flooding in Gloucestershire. A father and son are found dead at Tewkesbury Rugby club. They were attempting to pump water out of the premises, but were overcome by fumes from the pump. A further 2.5 million litres of bottled water are distributed, with over 1,000 bowsers now put out across Gloucestershire.
- 27 July: Department for Children Schools and Families (DCSF) announce they are providing £10 million funding designed to cover short term costs incurred in getting children back into schools by the start of term.
- 7 August: Water supply fully restored in Gloucestershire.
- 8 August: Sir Michael Pitt is appointed by the Secretary of State for the Environment, Food and Rural Affairs to chair an independent review into the floods of June and July 2007.
- 10 August: DCSF announce a £4 million funding package for schools and children's services in areas affected by the July floods.
- 14 August: Department for Culture Media and Sport (DCMS) announce a £1 million cash injection to promote tourism, rural destinations and visitor attractions.
- 16 August: £6.2 million was allocated under new flood recovery scheme announced from the July floods.
- 20 August: The Government submitted an application to the European Union Solidarity Fund (EUSF), requesting help in meeting the uninsurable costs of the floods.
- 24 August: a further £1.2 million was allocated from the flood recovery scheme.
- 5 October: The Red Cross begin making grants to local authorities and charities from its National Floods Appeal to support people affected by the floods.
- 10 October: The first EFRA select committee hearing.

- 10 December: CLG announce that the EU propose to grant EUSF aid totalling €162.388 million to help deal with damage caused by floods in England, Northern Ireland and Wales in June and July. The exchange rate was fixed at the rate at the time of application, so it is expected to equate to around £110 million (with a net value of £31 million).
- 17 December: The Pitt Review launch an interim report of initial findings on the lessons to be learnt from last summers floods.
- 31 January: A further £1 million was released to the 9 Local Authorities with a large number of households still displaced from the flood recovery scheme.
- 4 March: An additional chapter to the Interim Report, covering the recovery phase, is published.
- 17 March: Sir Ken Knight, the Government's Chief Fire and Rescue Adviser, publishes the final report on his review of the operational response and role of the Fire and Rescue Service during national flooding incidents.
- 6 May: The Government announces it is able to set up a Restoration Fund of almost £31 million for English local authorities affected by the floods to support their continued efforts to rebuild their communities because of the success of the UK in bidding for the EUSF.
- 7 May: Environment, Food and Rural Affairs Committee publish report on Flooding.
- 25 June: Pitt Review published.

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The international context

Alongside evidence from the events of the summer and discussion of the wider UK context, the Review has also considered international best practice. This chapter explores how selected countries deal with the risk and impact of flooding. It contains sections on:

- managing flood risk;
- raising public awareness of flooding; and
- reducing the disruption on critical infrastructure.

Introduction

2.1 The summer floods of 2007 were a dramatic reminder of just how vulnerable the country is to major flooding. But our experience was by no means unique. To put the events into context, during 2007 there were over 200 major floods worldwide, affecting over 180 million people. The human cost of all the floods in 2007 was more than 8,000 deaths and over $23 billion worth of damage.[1] But even against that dramatic back-drop, the floods that devastated England last year ranked as the most costly flood in the world in 2007.

2.2 Flooding affects countries in different ways depending on climate, governmental structures and socio-economic conditions. The causes and types of flooding may differ for each country – for example, Canada and the United States face flooding from ice thaws, while countries such as Burma or Bangladesh face seasonal monsoon winds which bring massive rainfall. The Review has found that all countries face similar issues and problems, such as raising risk awareness, adaptation to climate change and the use of flood defences.

2.3 Countries are also reaching similar conclusions on how to deal with flooding, such as moving towards risk-based approaches to flood management, the need for better information sharing, and better warning and forecasting procedures. Seeing these approaches being taken internationally is an indication that countries can often learn from one another.

2.4 Since the interim report we have considered how other countries are dealing with the issues addressed by the Review. This has taken the form of a series of visits to the Netherlands, France, Sweden and the United States, as well as desk-based research. This international evidence forms an important part of our evidence base.

[1] Figures from the Centre for Research on the Epidemiology of Disasters, Université Catholique de Louvain, at www.cred.be

Managing flood risk

Climate change: a global challenge

2.5 The Review has found strong evidence that concerns about climate change are driving significant reform in flood risk management and related areas. Evidence of how seriously the international community is taking this includes the formation of the United Nations Intergovernmental Panel on Climate Change (IPCC) to evaluate the impact of climate change and provide advice to governments.

2.6 In the UK, both the *Foresight Future Flooding* report (2004) and the Stern Review (2006) have been internationally recognised as credible studies looking into climate change. Other countries such as Sweden, Iceland and Germany are taking similar steps in researching the effects and consequences of climate change on their own population and economy.[2] The Review recognises the importance of informing everyone – from the government to the general public – of the seriousness of climate change and its impact on everyday life. Some governments are still hesitant because the nature and pace of climate change is uncertain but, as the Swedish government report *Sweden Facing Climate Change* (2007) states, there is sufficiently robust information for governments to start adapting to climate change at once.

Sweden Facing Climate Change report, 2007

The Swedish Government's report *Sweden Facing Climate Change* (2007) evaluated the implications of possible climate change scenarios at the regional and local level, including an estimation of the costs. It addressed how the government should plan for the impact that climate change will have on Sweden, considered roles and responsibilities for government and authorities, as well as the impact climate change will bring in terms of economic development, agriculture, national infrastructure, communication, transport, tourism, the environment and human health.

The Swedish report reinforced the key message that climate change will have a dramatic impact on the country unless there is swift action from the government to adapt. The report stated that climate change will mean rising temperatures, causing dramatic changes in the weather, with more serious seasonal precipitation and more intensive torrential rain. This will increase flooding of lakes and watercourses, and threaten coastal settlements as well as towns and cities in low-lying areas. The increased frequency of flooding will have a considerable impact on buildings and critical infrastructure, such as dams; put a greater strain on existing drainage systems; and increase the chances of landslides. Small changes in seasonal differences will have a considerable impact on ecosystems and the biodiversity of natural habitats. The quality of Sweden's drinking water will be affected by increased flooding; there will be greater chances of chemical and microbial pollution; the increased frequency of flooding will threaten lives, particularly the vulnerable; and there will be an increased risk of water-borne diseases. Any predicted benefits from climate change will be heavily outweighed by the serious consequences from it.

While the scenarios in the report do not necessarily apply to countries other than Sweden, it does show the impact climate change could have on daily lives. For governments, it shows the need to adapt to climate change soon, the need for greater research into the effects of climate change on their country, and the need to improve current infrastructure to cope. For individuals, the report highlights the risks they will face from more frequent flooding, the individual costs involved from energy consumption and the impact on human health.

[2] The Swedish Government's *Sweden Facing Climate Change* report, 2007; the Icelandic Government's *Climate Change Strategy*, 2007; and the German Government report *Taking Action Against Global Warming*, 2007

Flood insurance

2.7 In the UK, flood insurance is usually provided as part of business and household insurance. Generally, this is not the case internationally. Other countries approach flood insurance differently and, while they may not necessarily apply directly to the UK-context, there are some issues which are of interest.

2.8 The immense economic losses following recent major flooding across the world have highlighted the need for proper financial arrangements to insure against losses. For example, damage from the central European floods in 2002 is estimated to have cost €18 billion,[3] of which only €3 billion was borne by private insurers. This resulted in the governments of the countries affected, such as Germany and Austria, bearing the majority of the costs. The European Union Solidarity Fund was in part created to address the burden EU member states were carrying in the event of a major natural disaster.

2.9 The insurance industry is best placed to cope and deal with flooding when flood cover is included in basic insurance policies. In many countries around the world, the failure to adopt this approach has led to low uptake. Flood insurance is widely available, but is usually offered as an extension of an existing policy, such as fire policy. Low penetration of flood insurance can be explained by the fact that customers deem the extra cover to be too expensive, as is the case in Canada, or that there simply is no need for extra flood coverage because there is an expectation that the state will provide financial assistance, as in Italy or Germany.[4]

2.10 A common strategy for increasing uptake of flood insurance is through outreach programmes and media campaigns, including campaigns targeting younger generations, which help raise awareness and encourage people to become more resilient and better prepared for flooding. The Review has found that countries such as the Netherlands and the United States are addressing the need to ensure more people are aware of the risks they are facing from flooding. Outreach programmes such as FloodSmart[5] in the United States form an important tool to change behaviour and encourage personal responsibility. Through leafleting, poster and radio campaigns, FloodSmart highlights the risk people face, and the economic and emotional impact of flooding. It has helped gradually to increase the number purchasing flood insurance in the US.

2.11 Other countries also recognise the importance of proper schemes to provide insurance coverage for low-income sections of society. In France, where flood insurance take-up is high, anyone who purchases car, home or business insurance is automatically covered for all natural disasters through a uniform surcharge. This has made insurance more affordable for the poorest living in areas at risk of flooding, who might otherwise have been excluded from flood insurance schemes simply because the premiums would have been too great a burden.

2.12 Considering flooding as one among many natural disasters provides a potential solution to some of the problems countries face in providing flood insurance cover for the vulnerable and poor, and in spreading the risk among policy-holders. However, setting the right premium to make the insurance programme sustainable has been one of the problems the French system has faced. Since its creation in 1982, it has had to be raised several times. Originally the premium was set at 9 per cent but has subsequently risen to 12 per cent, reflecting the increasing costs associated with some of the major disasters that have affected the country, such as the 2001 floods in north-west and central France. The French government has also had to make several injections of funds to make up shortfalls.

[3] Munich Re, *Annual Review: Natural Catastrophes 2002*, 2003
[4] Swiss Re, *Floods – An Insurable Risk? A Market Survey*, 1998
[5] The FloodSmart scheme is sponsored by the National Flood Insurance Program (NFIP).

Flood defence

2.13 Evidence from overseas shows that flood risk management needs to move on from hard defences to softer approaches. Hard defence structures have proven successful abroad, but questions are being raised about escalating costs in a changing climate. In the Netherlands, which has a strong tradition of investing in vast engineering flood defences such as the Deltaworks project, the concern is whether expensive flood defences are sustainable in the face of the challenge posed by climate change. The maintenance costs of the existing defences are increasing and the construction of new defences will also have to be funded.

Deltaworks project, the Netherlands

The Deltaworks project is a series of large dams, sluices and storm barriers, built to protect the Netherlands from flooding. After the devastating North Sea floods in 1953, which killed 1,835 people in the Netherlands alone, it has successfully protected the country from major flooding since the first storm barrier was completed in 1958. It is an example of the great lengths the Dutch government goes to defend the country from one of its biggest natural threats.

To understand why the Dutch government puts such massive investment into flood defences, we have to understand the scale of the risk that the Netherlands has always faced. Over two-thirds of the country is below sea level and some 90 per cent of its economic assets are under threat from flooding. The main rivers, the Rhine and Meuse, are far larger than those found in the UK, and the Netherlands effectively acts as the drainage basin for much of the water flowing from Germany, France, Belgium and Switzerland. In response to the scale of the problem, the Dutch government has invested heavily in flood defences to a very high standard – up to 1 in 10,000 year events for the central regions of the country. Whilst primarily built to defend the country from flooding, the Deltaworks project has also resulted in other benefits such as improved freshwater supply for agriculture, better transport links for business and thriving nature reserves.

The Dutch are realising the extent to which huge investment is required to maintain the Deltaworks project, particularly in light of future climate change predictions. Under current thinking, it is predicted that the dykes will have to be raised to mitigate the effects of rising sea levels and the dams will have to be closed more often in the future. This will result in a greater cost burden for maintaining the existing flood defence projects, which in turn will also have a knock-on effect on the costs of new defences. Dutch officials have told the Review that there is a concern as to how sustainable such projects are, and that the government is looking at risk-based measures to protect the country that will include use of flood mitigation techniques other than hard flood defences and raising public awareness and preparedness for flooding.

2.14 Alternatives to hard flood defence structures include approaches such as expanding river capacity in the Room for the River[6] project in the Netherlands. The Dutch are recognising that greater consideration should be given to moving away from simply raising dykes and hard defences, and towards increasing the capacity of rivers to cope with greater volumes of water. Although many of these alternative approaches are highly engineered and the Room for the River project still requires investment of over €2 billion, the Dutch government hope that the project will be sustainable and that working with natural processes will bring benefits including improving the quality of the environment of the river basin and building better capacity to cope with predicted climate changes.

Housing, land use and planning

2.15 Other countries have recognised that the problems caused by flooding and climate change are exacerbated by changes in land use. Increasing populations and expanding urbanisation have led to the hardening over of natural surfaces through paving and construction. The central European floods in 2002, which affected parts of Germany, Austria and the Czech Republic, have been partly attributed to urbanisation and the resulting increase in direct surface runoff into rivers.[7] The European Union recognises that building on flood plains has reduced natural absorption rates and increasing flooding incidences,[8] but European countries are by no means the only ones to acknowledge this. In fact, many studies across the world have found a direct correlation between urbanisation and increased river flows.[9]

2.16 Local and national governments play a central role in flood risk management. Legislative frameworks on building and planning are decided by the national government, but most planning decisions are exercised by local authorities on a case-by-case basis. In countries with low population density like the United States or Canada, flooding is less of a problem compared to countries with higher population densities like the UK. There have been instances in the United States where the authorities have relocated entire villages away from a flood risk area. However, in countries such as the Netherlands where land is at a greater premium, there is a recognition that better land use decisions have to be taken.[10] More attention is being paid to planning policy and a more stringent control of land use and development planning is being established, similar to the Planning Policy Statement 25 (PPS25) in the UK.

2.17 Increasingly, countries are turning to sustainable urban drainage systems (SUDS) to reduce the impact of development on flooding. As will be discussed in Chapter 7, SUDS are a range of sustainable methods of managing surface water runoff, such as swales, detention basins or permeable surfaces. In the German state of North Rhine-Westphalia, a programme of financial incentives has been used to encourage the development of new or retrofitted green roofs, a technique that can be used to reduce and control storm runoff. It has been a great success in encouraging homeowners to install SUDS[11] and shows that financial incentives can be effective.

Raising public awareness of flooding

2.18 Informing the public of the risks they face before, during and after a flood event is now commonplace, and most governments issue guidance on how to act in the event of a flood.[12]

6 The Dutch Cabinet Spatial Planning Key Decision, *Ruimte voor de Rivier*, 2006
7 Risk Management Solutions, *Central Europe Flooding, August 2002: Event Report*, 2003
8 EU Research: *Floods: Managing the risks of flooding in Europe*, at http://ec.europa.eu/research/environment/newsanddoc/article_3249_en.htm
9 A study of the Upper Thames Region watershed in Ontario, Canada, by N. Nirupama and S. P. Simonovic, *Is Urbanization Increasing Flood Risk?*, 2004
10 The Dutch government, *Policy Change for Flood Defence in the 21st Century*, 2006
11 G. Lawlor *et al, Green Roofs: A Resource Manual for Municipal Policy Makers*, 2006
12 Many countries researched have government-backed websites dedicated to giving public information on how to act in event of a flood. A selection of these include: *Public Safety Canada* (Canada) at www.publicsafety.gc.ca; Department of Civil Protection (Italy) at www.protezionecivile.it/cms/attach/vademecum_xi_1_19.pdf; or the *New South Wales State Emergency Service* (Australia) at www.ses.nsw.gov.au/topics/2227.html

They follow some key principles including use of clear and simple language, use of real-time data and explanations of any technical terms that might be used such as descriptions of risk levels.[13] A wide range of media are used, including television, radio and increasingly the internet, but also other sources such as mobile telephone or teletext services, as is the case in Germany, to cater for different audiences.

2.19 All the countries the Review has looked at recognise the central importance of raising the public's awareness of flooding. In the Netherlands, the Dutch population has grown accustomed to government intervention which has resulted in high levels of confidence that the government can stop flooding from occurring. We have been told that the success of engineering projects to keep water out for over 50 years, such as the Deltaworks project, has resulted in public complacency. People just do not believe that flooding will happen to them. In the Netherlands, a survey conducted for the Ministry of the Interior found that only 3 per cent of the population had made some preparations for flooding; 60 per cent were not aware of the risks they face; and 80 per cent felt safe in their environment.[14] The Taskforce Flood Management Organisation[15] (TMO) was created in 2006 to consider the country's state of readiness and re-educate the population as to the risks they face.

2.20 The ability of individuals and organisations to respond to flooding events is based on the accuracy and timeliness of information, including flood risk maps, weather forecasting and real-time data. The effective delivery of such information requires good cooperation between meteorological forecasters and hydrological centres, as well as the emergency services and the media. Both the Bayern Flood News Service[16] and the French central flood forecasting service (SCHAPI)[17] have developed similar visualisation tools that successfully convert all the flood data from real-time river monitoring systems into simple online maps. The colour-coded warning system corresponds to the flood threat level colour-coded systems, ensuring consistency. This visualisation allows the user to see easily whether rivers and localities are at risk from flooding.

2.21 Close cooperation between meteorological and hydrological forecasters enables more consistent, timely and accurate information to be delivered to the public. In Sweden, meteorology and hydrology services sit within a single organisation, the Swedish Meteorological and Hydrological Institute (SMHI), and this structure has facilitated consistent single-source information for public services such as emergency responders. France has also recently moved towards this model, with the creation of SCHAPI to ensure better collaboration with the French meteorological service, Météo-France. As will be discussed in more depth in Chapter 4, SCHAPI benefits from co-location with Météo-France. Closer cooperation has modernised flood forecasting in France, and has helped to ensure that warnings are accurate, timely and consistent. The re-organisation of SCHAPI has helped generate a high level of understanding among the public of flood warnings and what to do in event of a flood.

[13] European Exchange Circle on Flood Forecasting (EXCIFF), *Good Practice for Delivering Flood-Related Information to the General Public*, 2007

[14] The Ministry of the Interior and Kingdom Relations (BZK), *PerceptionAudit campaign*, 2008

[15] Taskforce Management Overstromingen (TMO)

[16] Bayern Hochwassernachrichtendienst, at www.hnd.bayern.de

[17] Central Service for Hydrometeorology and Flood Forecasting (SCHAPI) Flood Vigilance Maps, at www.vigicrues.ecologie.gouv.fr

Communicating risk to the public effectively

2.22 Greater public awareness of risk can help reduce the impact of floods on individuals. Communication strategies are an important component of any policy to manage the risks of flooding, as the Dutch government is recognising.[18] The provision of better information on the risk of floods and its consequences results in increased awareness and preparedness among citizens and businesses alike. The *Denk Vooruit* (Think Ahead) campaign has been central to the latest approach by the Dutch government in re-educating the public about the risks they still face. Its aims are simple: to raise awareness of existing risks; to clarify individual roles and responsibilities; and to outline action plans for members of the public. Its key message, 'Emergencies cannot be planned. Preparations can', encourages people to realise that they have the power to influence something that could happen to them. Television and radio advertising campaigns help emphasise the core messages, and websites have been set up which allow individuals to see what risks they face in their area, the probability of a disaster and the consequences for human health and well-being.[19]

2.23 Increasingly, awareness of flood risk also begins in the classroom. According to the International Strategy for Disaster Reduction report by the United Nations, initiatives aimed at teaching risk reduction to school children, help them "fulfil a role … to serve as agents of disaster risk reduction".[20] In countries as far afield as Bangladesh,[21] the Netherlands[22] and the United States,[23] learning kits have been developed to engage children through games, stories and rhymes, and then to teach concepts such as 'risk reduction' or 'hazards'. In France, risk education has been successfully integrated into the national curriculum to sensitise school children to risk reduction.[24] The joint initiative by the ministries of National Education, Health and the Interior has meant that risk education is part of the national curriculum for around 12 million students from primary to tertiary levels. Teachers are given training and are able to inform children of risks, preventive measures, survival techniques, emergency drills and their responsibilities in a disaster. Early indications in France suggest that the initiative has been successful in getting schools to develop specific risk reduction plans and carry out exercises.

Reducing the disruption to critical infrastructure

2.24 Countries are recognising that emergencies can and do cause severe and widespread damage to the functioning of society. Major terrorist attacks such as these on September 11, 2001 in the United States, the bombings in Madrid in 2004 and London in 2005, as well as serious flooding, have brought home to governments the need to put in place contingency plans to identify the threat to critical infrastructure and minimise disruption. The Review has found that countries are beginning to plan on an all-hazards approach, that tackles both security threats and natural hazards such as flooding.

2.25 Other countries are far more willing to share information about critical infrastructure than the UK. In France, there is a general openness about risk information. Local city mayors, responsible for public safety in their communes, have access to potentially sensitive information on critical infrastructure in order

[18] The Dutch government, *Policy Change for Flood Defence in the 21st Century*, 2006
[19] *Denk Vooruit* campaign at www.crisis.nl and the Risk Maps website at www.risicokaart.nl
[20] International Strategy for Disaster Reduction, *Towards a Culture of Prevention: Disaster Risk Reduction Begins at School*, 2007
[21] The 'Know Risk = No Risk' campaign in Bangladesh has been developed in the local language Bangla, and has been gradually introduced into primary and secondary schools in Bangladesh
[22] *Droppie Water* interactive website for children, at www.droppiewater.nl
[23] The Masters of Disaster education pack developed by the American Red Cross helps teachers to teach students about disaster safety by integrating core lessons into the regular curriculum, such as art, maths, science and social studies
[24] Article 5 of Law 2004–811, which was rephrased in the Education Code Article L.312-13.1
See www.assemblee-nationale.fr/12/proposition/pion2775.asp (in French)

to develop suitable local emergency plans in which utility operators are also involved. Even countries which were previously reluctant to disclose information on critical infrastructure and the impact of its failure from flooding are beginning to see the counter-argument for putting information in the public domain. The United States Army Corps of Engineers (USACE), the federal body whose responsibilities include engineering projects to mitigate flooding, has recently overcome its previous reluctance to publish inundation maps of dams. Maps are now published because this enables the USACE to warn the public to take the risk of dam failure seriously and prepare themselves accordingly.

2.26 The Review has also found that other countries have taken a more systematic approach to assessing the risks to critical infrastructure. As outlined in Chapter 15, plans such as the National Infrastructure Protection Plan (NIPP) in the United States and the Protection of Vital Infrastructure project in the Netherlands, show how some countries have developed strategies to analyse the vulnerability of critical infrastructure; to ensure the effective distribution of funding and resources to protect critical infrastructure; and to set out clear actions for operators to minimise the disruption and consequences of failure of critical infrastructure. These plans help to manage risks, threats and vulnerabilities of critical infrastructure more systematically and effectively.

Continuity of essential services

2.27 Businesses are becoming more aware of the need for business continuity planning to form an integral part of good business practice. Recent global events such as the central European floods in 2002 have highlighted the consequences of major losses to business and critical infrastructure. A survey of European business continuity management (Marsh, 2008)[25] has shown that there is greater business continuity awareness among European firms, and that firms are starting to see business continuity as good practice in the management of their overall operational risks. Businesses are moving away from seeing business continuity management as merely a compliance or insurance-related measure. But the Review has found that although business continuity is still in its infancy, governments can take a lead in promoting business continuity, as is the case in France.

2.28 The French government has recently passed a law on the security of critical infrastructure,[26] which includes a business continuity plan requirement. Set up in response to the recent influenza outbreak, the law applies more generally to the wider context of increased threats such as terrorism or flooding. The law requires individual operators to draft classified Operator Security Plans[27] which are known only by the operator and the government. Each plan is individual and is drawn up based on individual circumstances and the needs of the operator, but may include elements such as improving defences and setting out evacuation arrangements.

[25] Marsh, *The Upside to business continuity*, 2008

[26] Details from the French Republic's Decree No. 2006-212 on the security of important vital activities, *La Sécurité des activités d'importance vitale*, 2006

[27] Plan de Sécurité d'Opérateur (PSO)

Section 2

Knowing when and where it will flood

This section covers:

- taking an overview of risk; and
- forecasting, modelling and mapping.

Taking an overview of risk

This chapter examines how the risk of flooding is managed, now and in future. It contains sections on:

- climate change impacts; and
- managing risks strategically.

Introduction

3.1 This chapter looks at how our climate is changing and how this affects flood risk management now and in the future. We explore the need for strong central and local government leadership on adapting to climate change and the need for a strategic approach to be taken to flood risk management in light of the increased risk.

3.2 The Review believes that the Environment Agency is best placed to take on a strategic overview role for all sources of flood risk. This chapter looks at the function of Regional Flood Defence Committees (RFDCs) in helping the Environment Agency to fulfil this role and how Catchment Flood Management Plans (CFMPs) will provide one of the essential tools for managing flood risk strategically.

Climate change impacts

3.3 The extent of the linkage between climate change effects and the summer 2007 floods has been a topic of much discussion. Although no single event can be directly attributed to climate change, it can provide an indication of the scale and nature of events in the future.

3.4 The summer 2007 floods occurred due to an unusual weather pattern (see Chapter 1). The location and strength of the Polar Front Jet Stream is subject to natural variation but the warmer sea temperature experienced is consistent with the expected effects of climate change. Warmer temperatures enable more water to be stored in storm clouds, and this will have contributed to the extreme rainfall volumes.

3.5 The Centre for Ecology and Hydrology (CEH) published a paper *The summer 2007 floods in England and Wales – a hydrological appraisal*,[1] after the launch of our interim report. This report looked at the hydrological situation during the summer 2007 floods, placed it in a historical context and evaluated the evidence for long-term increases in the magnitude of major river floods.

3.6 This report concludes that, based on the evidence of rainfall and river levels, statistically the sequence of events during summer 2007 was very unusual. The associated river flooding does not conform to any currently anticipated climate change scenarios which predict drier summers with less frontal rainfall. However, while there is not yet sufficient observational evidence of an increase in the frequency of intense summer storms, these types of storms, which triggered the extreme convective rainfall in 2007, are expected to form part of climate change in the future.

[1] The summer 2007 floods in England and Wales – a hydrological appraisal, T.J. Marsh and J. Hannaford, Centre for Ecology and Hydrology, 2007

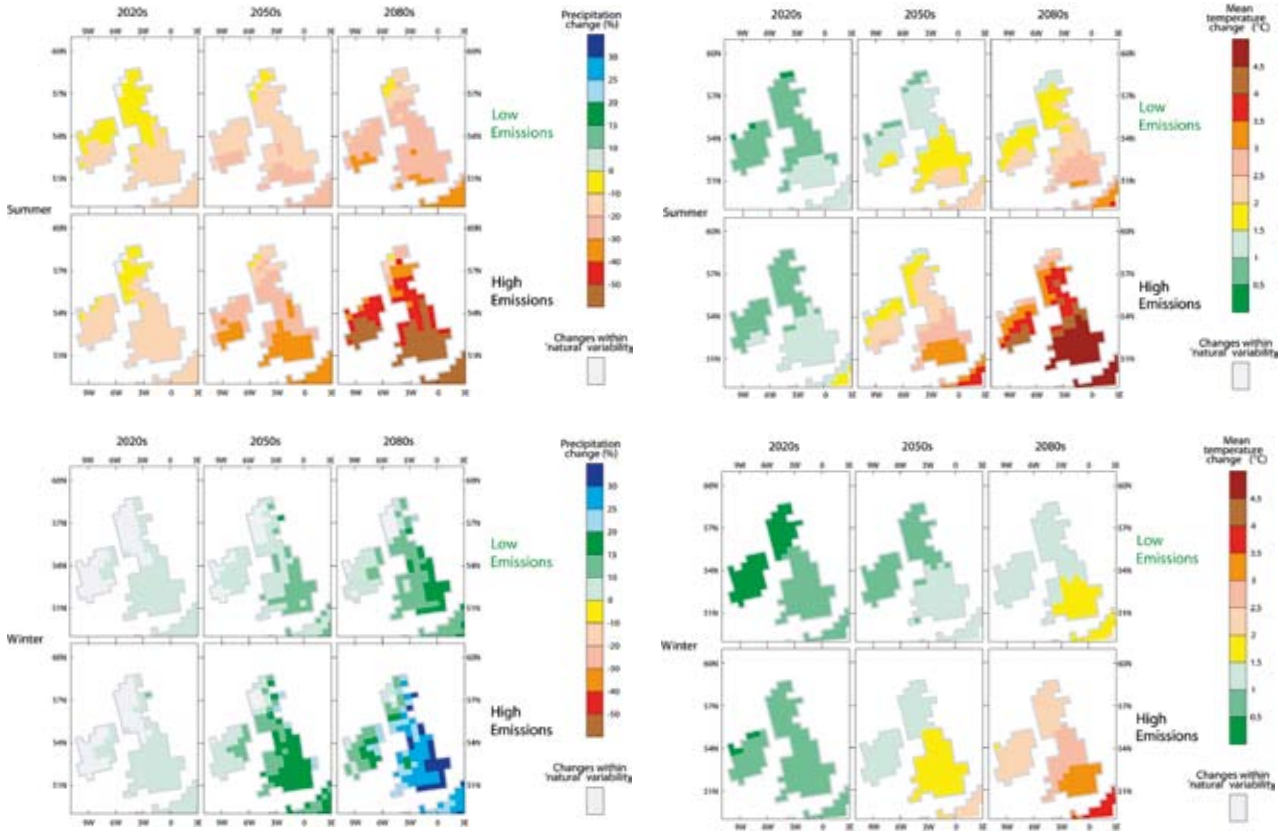
3.7 If we are to meet the long-term challenge that climate change presents, a combination of mitigation (i.e. reducing greenhouse gas emissions) and adaptation (i.e. changing the way we live to deal with the impacts of climate change) will be needed.

3.8 To understand how to adapt to climate change, we need to have an appreciation of what changes might occur, especially in terms of extreme events, and on what timescales. Average global temperatures rose by 0.6°C during the twentieth century, and changes in society in terms of population, technology, the economy, mitigation and adaptation will determine how temperatures will change in the future.

3.9 In 2002, the UK Climate Impacts Programme (UKCIP) produced climate change scenarios for the UK (UKCIP02). Figure 3 shows the predicted temperature and precipitation changes for the UK in summer and winter. The headline results from UKCIP02 were:

- **temperatures will increase** by up to 3°C by the 2050s. There will be greater warming in the summer and autumn, and there will be more summer warming in the South East than the North West of the UK;
- **there will be changes in precipitation,** with winters being up to 25 per cent wetter and summers possibly being up to 40 per cent drier by the 2050s and there will also be significant decreases in snowfall;
- **the global sea level will rise** by up to 36 cm by the 2050s, and there are vertical land movements in the UK (with much of southern Britain sinking and much of northern Britain rising), leading to regional differences in relative sea levels; and
- **the number and intensity of extreme events will increase**, including heatwaves, downpours and storm surges.

Figure 3 – UKCIP02 predictions of temperature and precipitation changes for summer and winter



Foresight update

The *Foresight Future Flooding Study (2004)* provided visions of flood risk in the UK over a 30 to 100 year timescale to help inform long-term policy.

The Review commissioned work to reassess the drivers and responses to flood risk examined in the Foresight 2004 report and identify any new drivers or responses which may have become significant. This update considered evidence and research that had become available since 2004, including evidence gathered in relation to the summer 2007 floods.

There are two main changes to the risks faced from climate change since the assessment in 2004, which are:

- **the potential increases in rainfall volume and intensity, and temperature, are greater than previously assumed.** New analyses indicate the potential for even warmer and wetter winters together with summers that are also warmer but not quite so dry as previously predicted. The potential range of future climates is, therefore, rather more like a Mediterranean climate than a Maritime-Northwest European one. For instance, under the worst case scenario, total winter precipitation increases by 40% as compared with the 25% estimated in 2004. This means we may have to cater for bigger increases in river flows than previously envisaged; and

- **there is a greater risk of extreme sea-level rise.** Coastal flood risk remains one of the biggest risks the UK faces and, although the mean estimates of sea-level rise have not changed since 2004, larger rises of up to 1.6m, due to melting of large ice-sheets in Greenland and West Antarctica, are now a small, but real possibility by 2080. Communities living behind good coastal defences currently protecting them against a flood with a chance of occurrence of 1 in 100 each year could experience a drop in standard of protection by the end of the century to as low as 1 in 5 each year if we were to follow a business-as-usual flood management policy. Coastal flooding is therefore one of the key priority areas for better science, innovative engineering and social policy development.

This report highlights a number of key policy issues which the Review has considered:

- **intra-urban flood risk will increase.** Future risk from intra-urban flooding (or surface water flooding) may rise to be of the same order as fluvial and coastal flood risk. Confused governance is recognised as a barrier to flood risk management in this area, and this will need to be resolved before progress can be made;

- **land use is an important tool in managing flood risk.** Influencing where to place new development is now recognised as a key tool in managing flood risk; however, this needs to be balanced against other economic, social and environmental needs, including the demand for new housing. Finding space through our towns and cities to accommodate flood flows ranging in the extreme up to 40% greater than today's values presents a great challenge to urban planning but the evidence shows that it is among the most important opportunities for flood risk management;

- **uncertainty in a changing climate.** There are high levels of uncertainty associated with a number of drivers and responses to flood risk. Adaptability therefore needs to be incorporated in any decisions taken to manage flood risk, including options for incremental enhancements to be made at minimal cost and having the ability to reverse decisions if necessary. This is especially important in urban areas where different types of flooding, and hence different policy areas, interact.

Foresight update *(continued)*

- **investment will be required to sustain and improve flood risk management.** The 2004 report roughly estimated the costs to maintain current levels of flood risk. However, this did not include timings for investment, as many of the costs will be front-end loaded. Work is urgently needed to refine the figures and provide central government with a more reliable evidence base from which to set the level of investment for flood risk management; and

- **strong governance will be required to implement a range of flood risk management solutions.** There is no single response that will reduce flood risk substantially and that is completely sustainable. Different response measures will vary under different scenarios, and the Government needs to support the concept of a portfolio of responses to decreasing flood risk, which should include structural and non-structural solutions. The Government will also need to take into account social justice implications associated with a planned flood risk management response.

3.10 Research of this kind is continuing to develop; for example, the UKCIP02 scenarios are due to be updated in November 2008 and will employ recent advances in climate science to better quantify some of the uncertainties associated with climate modelling. This version will allow users to interrogate the projections to produce customised probabilistic outputs on projected climate change for the UK. As part of this Review, we commissioned a qualitative update of the *Foresight Future Flooding* report published in 2004[2] (see text box).

3.11 Climate change is already high on the agenda, both nationally and internationally. There has been considerable discussion in central government and the media about mitigating against climate change effects – without tough and timely mitigation measures, the costs of adaptation will increase and it will become more difficult to adapt. However, the Review believes that efforts to reduce emissions need to be combined with adaptation measures to reduce society's vulnerability to climate change. These measures will have to be proactive and we need to understand which of these measures can be taken immediately.

Managing risks strategically

3.12 Dealing with the increased risks that we will face due to climate change, for flooding as well as other extreme natural hazard events, will require a joined-up approach to ensure preparedness for different eventualities. For example, managing the water cycle as a whole makes sense as there might be severe drought problems one year and severe flooding the next. The 2007 floods followed two years of drought and heatwaves which themselves had been preceded by some years of flooding.

Climate change adaptation

3.13 To manage the impact that climate change is already having – as well as the impact that it will have in the future – society will need to start adapting immediately and in a coherent fashion. If it does not, the problem will simply be deferred to the next generation, and the costs will increase. The Government's Stern Review on the economics of climate change[3] concluded that:

> *"if we don't act, the overall costs and risks of climate change will be the equivalent of losing at least 5 per cent of global GDP [Gross Domestic Product] each year".*

According to the *Foresight Future Flooding report (2004)*, the average annual cost of flood damage alone could rise from £1 billion to a worse case of around £27 billion by 2080 – and flooding poses the biggest climate change-related threat to the UK.

3.14 In general terms, adaptive responses to climate change are those that minimise the risk for present and future generations. Any flood risk management solutions need to be able

[2] Foresight Future Flooding report (2004)
[3] Stern Review on the Economics of Climate Change (2006)

to be modified cost-effectively, with minimal extra resources, in the future. That is why the word 'adapting' is more appropriate than 'adaptation' – it suggests that we will need to keep changing to be able to deal with future challenges.

3.15 Flood risk management approaches in the past have tended to promote the use of large-scale physical infrastructure (i.e. flood walls) that has been 'over-designed' to cope with the unknown effects of climate change. However, there is now increasing interest in alternative sustainable adaptation measures, such as including property resilience measures and the use of sustainable drainage systems (SUDS), to enable a flexible approach to adaptation to be taken.

Thames Estuary 2100 – Incremental adaptation

The Thames Barrier was raised for the 100th time last year, 25 years after it first became operational, to protect London from flooding. Since then, the Barrier has already been raised a further nine times which may give an indication as to what is likely to happen in the future. If this is the case, there will need to be consideration as to how increased risk can be dealt with and how the Barrier will need to be adapted.

When the Barrier was built, the fact that sea levels would rise was known and was factored into its design so that it would continue to provide a high standard of protection well into the twenty-first century. What the designers did not know was the degree of impact climate change might have on future sea level rise and flood risk. Although we still cannot definitively predict the future, we can take current estimates and use them to plan and prepare for what might happen. This is the challenge faced by the Environment Agency's Thames Estuary 2100 (TE2100) project – to develop a flood risk management plan for the Thames estuary through to the end of the century.

Thames Estuary 2100 – Incremental adaptation *(continued)*

This plan is scheduled to be presented to the Government by 2010. It will recommend measures to manage future flood risk and when they will need to be implemented, depending on the future scenario for climate change.

In creating the plan, the Environment Agency is taking a new approach that could have wider implications. By modelling the impacts on the estuary of a number of increasingly severe climate change predictions, and how effectively they can be managed through a range of approaches, the Environment Agency is building up a picture of what might need to be done in the future and under what circumstances. The package of solutions it is investigating will be based upon responding to current climate change guidance but will also be assessed for its adaptability to a worst-case scenario if it is found in the future that sea levels are rising at a faster rate than predicted.

By taking this sustainable approach, the Environment Agency can avoid investing in over-engineered flood defence infrastructure which ultimately may not be required, but can identify what needs to be done to keep different flood risk management options open for the future. The plan will ensure that, by keeping pace with the increasing risk, the right solutions can be implemented at the right time.

3.16 Any adaptation measures that are implemented will need to be assessed for their effect, not only on the immediate area but also elsewhere in the locality: for example, a flood wall might prevent one area flooding but may transfer the flood peak further downstream, causing another area to flood. The Review believes that the most effective measures will be those that are adopted widely, are sustainable and complement each other; to ensure this, there needs to be overarching guidance as to how to progress.

3.17 All of the lessons to be learned from the summer 2007 floods – in terms of flood risk management, the protection of critical infrastructure, emergency response and recovery – are forms of adaptation, and involve modifying our environment and behaviour to make us more resilient to the risk of flooding.

Central government leadership

3.18 Adaptation is complicated and in some cases contentious and needs concerted action to work. The Review received a number of submissions which felt that central government should take the lead on adapting to climate change and should coordinate adaptation programmes to ensure a consistent and effective approach. The Government needs to outline the risks, explain how these can be dealt with through a combination of mitigation and adaptation, and set out what individuals can do to help. The Government also needs to demonstrate that progress is being made, and develop and publicise an action plan addressing the long-term requirements. There is widespread support for this approach, with over 80 per cent of people looking to the Government to provide leadership on preparing for climate change.[4]

3.19 Sheffield City Council shares our view that the Government should lead on promoting flexible approaches to adaptation:

> *"Government and the other agencies need to be more committed to developing [adaptation] capacity through establishing personal, business and community learning alliances to begin to help these to adapt existing drainage systems to climate change, especially where the risks cannot be managed by 'hard' systems, such as new sewers."*

3.20 The Government has already made good progress in promoting the importance of climate change adaptation through the following initiatives:

- the Climate Change Bill which will require the Government, on a regular basis, to assess risks to the UK from climate change and publish a programme of how it plans to address these risks. The aim is for the Bill to receive Royal Assent in summer 2008;
- the Adaptation to Climate Change Programme, a cross-Government programme based within Defra to coordinate the Government's work on adaptation in England, bringing together both completed and continuing work by Government and the wider public sector. Phase One of the programme concentrates on developing a statutory framework to support adaptation policy. Phase Two is the National Adaptation Programme which will set out publicly the proposals for meeting adaptation objectives, revised on a rolling five-yearly basis, to ensure that adaptation measures continue to evolve to deal with the future challenges of climate change; and
- the Adaptation Toolkit, a *Making Space for Water* project to help communities adapt to the future impacts of coastal erosion and flooding.

3.21 The Stern Review highlights the fact that, although some adaptation will occur autonomously, other aspects of adaptation, such as major infrastructure and development decisions, will require greater foresight and planning. The Review recognises that this may include the need for Government intervention to lead and coordinate adaptation approaches. The Local Government Association (LGA) believes that:

> *"…it is vital that Government puts in place a robust statutory and regulatory framework together with robust targets and standards that all should adhere to."*

Local authority adaptation

3.22 As we explore in later chapters, the summer 2007 floods showed that local authorities should take an enhanced leadership role in tackling local flood risk (see Chapter 6). This means that local authorities will play a crucial role in adapting to climate change.

3.23 The LGA's Climate Change Commission

[4] YouGov survey for the Association of British Insurers, August 2007 (2012 respondents)

published a report at the end of 2007[5] on how local authorities are facing up to the challenge of adapting to climate change. The report included a survey conducted by the Local Government Analysis and Research group with surprising results:

> *"Only 15 per cent of councils had included adaptation of their own buildings and facilities into their climate change strategy, and only 7 per cent had included adaptation of their housing stock. Some 80 per cent of those surveyed felt that their local authority had not been effective in adapting to climate change."*

3.24 However, there are examples of good practice in a number of regions:

- many local authorities have signed up to the 'Nottingham Declaration on Climate Change' – a statement of commitment to developing mitigation and adaptation measures to counter climate change;
- Leeds City Council has produced its own ambitious climate change strategy. The strategy sets out key recommendations targeting the city's public and private sector organisations including business, developers, education, volunteer groups and health; and
- Oxford County Council has worked with UKCIP to prepare a pilot version of a **L**ocal **CL**imate **I**mpacts **P**rofile (LCLIP) to act as a useful model for other local authorities. Kent County Council has also produced an outline LCLIP examining the impacts of extreme weather events on the county in the last 10 years.

3.25 While central government has a significant role in leading and providing guidance on adaptation to climate change, **the Review would welcome local authorities mirroring this leadership** by identifying adaptation requirements for their own buildings, infrastructure and services. The loss of local services, like schools and roads, during the summer 2007 floods demonstrated how vulnerable they can be if these changes do not happen. Local government should also raise the awareness of adaptation, and encourage and provide guidance to individuals, businesses and the public sector to take the necessary steps to reduce their own vulnerability to climate change in the future.

Barriers and limits to adaptation

3.26 There are limitations to adaptation. It can only reduce the effects of a changing climate, and natural and technical constraints will limit the approaches that can be adopted. There are other barriers to the take-up of adaptation measures; uncertainty about climate change information makes it difficult to plan the level of protection required, there is a lack of incentives to invest in adaptation when the short-term benefits may not be that obvious and there are also financial constraints.

3.27 The Review recognises that adaptation is a difficult and complex subject. Indeed, the discussions we have had about the changes that might be required to manage future flooding shows that organisations already realise they face difficult choices. All of the issues discussed in this section will need to be addressed and the Government should urgently engage with all parts of society to establish the way forward. An ABI survey into public attitudes towards climate change revealed that the public would welcome a national debate on adaptation issues to establish what steps should be taken at national, local, business and individual levels.

3.28 The summer 2007 floods revealed our vulnerability to extreme events which, according to predictions, are highly likely to occur more frequently in the future. The Review believes that adaptation is key in helping society to cope with a changing climate and that central government, in conjunction with local government, needs to take the lead on raising the importance of adaptation.

3.29 The effectiveness of this approach will also depend on the commitment and credibility of the Government – it will need to lead by example by ensuring that it has adapted its own buildings and assets to the increased risks of climate change.

[5] A climate of change: final report of the LGA Climate Change Commission 2007

RECOMMENDATION 1: Given the predicted increase in the range of future extremes of weather, the Government should give priority to both adaptation and mitigation in its programmes to help society cope with climate change.

Kent County Council – Adapting to climate change

Kent is particularly vulnerable to the impacts of climate change because of its long coastline, south-eastern position, population density and mobility, and its proximity to the continental mainland. County-wide adaptive action is therefore a high priority for Kent County Council's community leadership role and for Kent's local strategic partnership.

Kent County Council is implementing a comprehensive climate change action plan which comprises three main themes:

- carbon management;
- service adaptation; and
- community leadership

Kent's new Local Area Agreement contains, for the first time, a high-level priority to deliver a "low carbon, climate change resilient Kent", supported by a national improvement indicator. This priority reflects the recognition that tackling climate change is an issue for economic development and regeneration in Kent, linking with business opportunities and resilience, and is not just an environmental issue.

Kent County Council – Adapting to climate change *(continued)*

All of Kent County Council's service areas are now required to demonstrate an understanding of how the changing climate affects their business model now and in the future and this has been a mandatory part of business plans since April 2008. The process is supported by tailored workshops with service managers and front-line staff, to introduce climate risk and provide a common methodology for identifying and prioritising vulnerabilities, opportunities and actions.

In applying this approach, Kent County Council have recognised the importance of preparing for both long term climatic changes and extreme weather events, including flooding, which are likely to have the greatest direct impact on council services and the community as a whole. Flood risk from all sources is a key component of their service adaptation framework and is a key issue for planning policy across the county.

Kent County Council realises that adaptation is still a new concept and that the quality and depth of understanding has been variable to date. However, it believes it has a good foundation upon which to build and has identified a number of quick win adaptation actions such as minor adjustments to council policy and processes, definitions of ring-fenced budgets, seasonal patterns in ways of working and demand for services.

Strategic flood risk management

3.30 Clear government leadership needs to be translated into practice. If flood risk management is to form part of our response to the challenge of adaptation, we must make sure that central government is able to offer strategic coordination of delivery.

3.31 In Chapter 1 we describe the uniqueness of the summer 2007 floods. Compared with other floods in recent years, there was a significant proportion of surface water flooding in addition to flooding from rivers. Currently, no organisation is responsible for surface water flooding; this was particularly evident during the summer 2007 floods in places like Hull and parts of Sheffield. There are no warnings for this type of flooding, which can occur very rapidly, and people, including the response organisations, were unprepared. The effects of climate change will increase the risk from all sources of flooding, including surface water flooding, as well as other natural hazards.

3.32 Surface water flooding is also complicated. There are many factors that affect the system's ability to drain water, including saturated ground and high river levels that prevent the system from discharging. The sewerage system is complex. Responsibilities for certain drainage assets remain unclear, a situation that led to frustration among the public during the summer 2007 floods. This complexity and lack of transparency could be improved by having a single organisation with an overarching responsibility for all types of flooding.

> *"Nobody knew what they had to do or where they were going. If it happens again there needs to be somebody else. Some team that are in charge to co-ordinate." (Householder, Rotherham)*

3.33 The *Foresight Future Flooding* report (2004) and the 2008 qualitative update stated that due to climate change, it is likely that:

> *"… future risk from the intra-urban system [flooding in urban areas] might rise by the 2080s to be of the same order as fluvial and coastal flood risk."*

This statement reinforces the need to look at all sources of flooding to assess the risk and take steps to manage that risk.

The Environment Agency's strategic overview role

3.34 The Department for the Environment, Food and Rural Affairs (Defra) 2005 response document *Making Space for Water* stated that, to facilitate a joined-up, risk-based approach to flooding, the Government would need to work towards giving the Environment Agency a strategic overview of all flooding (including surface water and groundwater flooding) and coastal erosion risks. **The Review welcomes the significant progress that has already been made**, with the Environment Agency taking on a coastal strategic overview role on 1 April 2008 which involves looking at coastal erosion in addition to all sea flooding. Work is in progress for the Environment Agency to take on an inland strategic overview role.

3.35 The Environment, Food and Rural Affairs (EFRA) Select Committee's report, published in May 2008, supported the proposal for a strategic overview body and concluded that the Environment Agency is the best-placed organisation to take on that role. It stated that the Environment Agency should continue to devote the majority of its resources to river and coastal flood risk management, as these still pose the highest risk. However, it recognised that surface water flooding was a significant issue during summer 2007 and will continue to be a risk in the future, and that responsibility for managing surface water flooding needs to be determined.

Coastal flood risk – the biggest threat

The *Foresight Future Flooding (2004)* report highlighted the significant risk we face from coastal flooding due to rising sea levels and storm surges. Previous extreme surge events, such as that during the winter of 1953, have led to a considerable loss of life and damage to property. This risk will intensify in the future with climate change bringing increases in mean global sea-level and also the frequency of extreme weather events. The Foresight report estimated that, if current expenditure (as of 2004) on coastal defences were continued, eventually it would not be possible to maintain the same standard of protection and there would be a potential for a twenty-fold increase in local risk to the coastal floodplain.

An Association of British Insurers report on coastal flooding, published in 2006, also emphasised the risks faced from coastal flooding. It estimated that the number of properties at risk of coastal flooding in eastern England, following a rise in sea levels of 0.4m, would rise by 48% from 270,000 to 404,000 and the cost of a single major coastal flooding event would rise to between £7.5 billion and £16 billion. The 2008 update to the Foresight report (see text box) also states that there is a small but feasible possibility of a sea-level rise of 1.6 m by 2080. In November 2007 the UK was reminded of the threat that it faces from coastal flooding when a storm surge came extremely close to breaching defences along the East Coast.

3.36 In our interim report the Review stated that the Environment Agency should have a national overview of all forms of flooding. The majority of people who responded to our consultation have agreed that this is the right way forward to help reduce the confusion over responsibilities and to allow a joined-up approach to be taken. However, there have been some suggestions about how to ensure that the Environment Agency works effectively in this new role; these include resourcing and organisational issues. For example, the LGA has stated that:

> *"… the EA is already under-resourced for the functions it is currently responsible for and the proposal [to give the Environment Agency a strategic overview] would require a step change in its existing capabilities to ensure that it is able to pick up these burdens effectively. It will also need to have robust powers to ensure that local partnerships work and that all agencies play their part."*

3.37 The Environment Agency, in its evidence to the EFRA Select Committee and in its own review into the summer 2007 floods, explains that it sees its role as being one of *"national leadership, coordination and advice to bodies"* and that local authorities would have the main responsibility for surface water planning and management as they have a far greater understanding of the local issues. The Environment Agency envisaged that it would not have any new regulatory role over local authorities but that it would define the tools and methodologies to be used and would also oversee the system by providing quality assurance.

3.38 The Review understands that roles and responsibilities linked with the Environment Agency taking a strategic overview need to be clearly defined and that resourcing will need to be taken into account. Although the Environment Agency has begun to build up its expertise and capabilities with a view to taking on this role, further work will be needed to enable it to carry out the full range of responsibilities effectively. There will need to be close cooperation between the Environment Agency and local authorities, which could be facilitated through Regional Flood Defence Committees (RFDCs). However, we do not believe that it is necessary for the Environment Agency to have any new regulatory role over local authorities.

3.39 A number of people have suggested an alternative approach based on a single, separate flood agency with responsibility for all aspects of flooding, from forecasting and warning through to emergency response, crisis management and post-flood recovery.

Evidence to the Review suggests that this idea has only limited support and the EFRA Select Committee rejected the idea. Many felt that the development of a new organisation would be an unwelcome distraction that would hamper progress in this area at a point when rapid progress is needed. Some were also concerned that an organisation focused purely on flooding, without the links to the water cycle and the environment that the Environment Agency has currently, could be damaging.

3.40 The Review is pleased that the Environment Agency has already started to take on an overview role in relation to all sources of flooding, including work on groundwater flooding (see Chapter 4), mapping surface water flooding hotspots and developing a protocol with water companies on data needs. The urgent requirement for an organisation to have oversight of all sources of flooding, and the proactive steps that the Environment Agency is already taking, leads the Review to believe that the Environment Agency should begin to take on this role immediately. We recognise, however, that an incremental approach to enhancing the Environment Agency's current role to include the different responsibilities will be needed. The first step in this process should be the development of the right tools to understand surface water flood risk. This approach will allow each of the functions to be fleshed out gradually, enabling the Environment Agency to build up its expertise and ensure that each of the different roles can be properly resourced. The exact responsibilities will also need to be covered by legislation (see Chapter 8).

RECOMMENDATION 2: The Environment Agency should progressively take on a national overview of all flood risk, including surface water and groundwater flood risk, with immediate effect.

The role of Regional Flood Defence Committees

3.41 RFDCs support all of the Environment Agency's flood defence functions, particularly the drainage of land and the provision of flood warning systems. The Environment Agency has various statutory powers that operate through the RFDCs, including:

- the maintenance and improvement of sea and tidal defences and of watercourses designated as main rivers;
- the installation and operation of flood warning equipment; and
- advising riparian owners and internal drainage boards.

3.42 RFDCs also provide significant input in their areas to the Environment Agency's flood defence policies, business plan and programme of work, and monitor the Agency's performance against those plans. They determine the local levy on council tax for flood risk management work that does not meet the priority threshold of the Environment Agency's central government grant.

3.43 Each committee has around 20 members, with the chair and other members chosen by the Secretary of State for the Environment, Food and Rural Affairs, two members chosen by the Environment Agency (but who are not Agency staff) and the majority of members chosen by the constituent councils. RFDCs therefore provide a strong link between the Environment Agency and local authorities to ensure that local flood risk management issues are dealt with.

3.44 The RFDCs' role is currently being reviewed in order to strengthen their link with the Environment Agency and to improve processes and clarify responsibilities. The aim is to ensure transparency in the prioritisation and allocation process for flood defences and to improve local input into setting flood risk management priorities and promote ownership.

3.45 The Review strongly advocates local government leadership in relation to local flood risk management. We believe that there is an opportunity for the RFDCs to have a stronger role (through the Environment Agency's strategic overview) to aid local authorities in this task. They should utilise their position between the national and local level to help communication and provide advice.

Catchment Flood Management Plans

3.46 The Environment Agency's strategic overview role should be aided by the production of Catchment Flood Management Funds (CFMPs), which will help deliver an overarching understanding of all flood risks.[6]

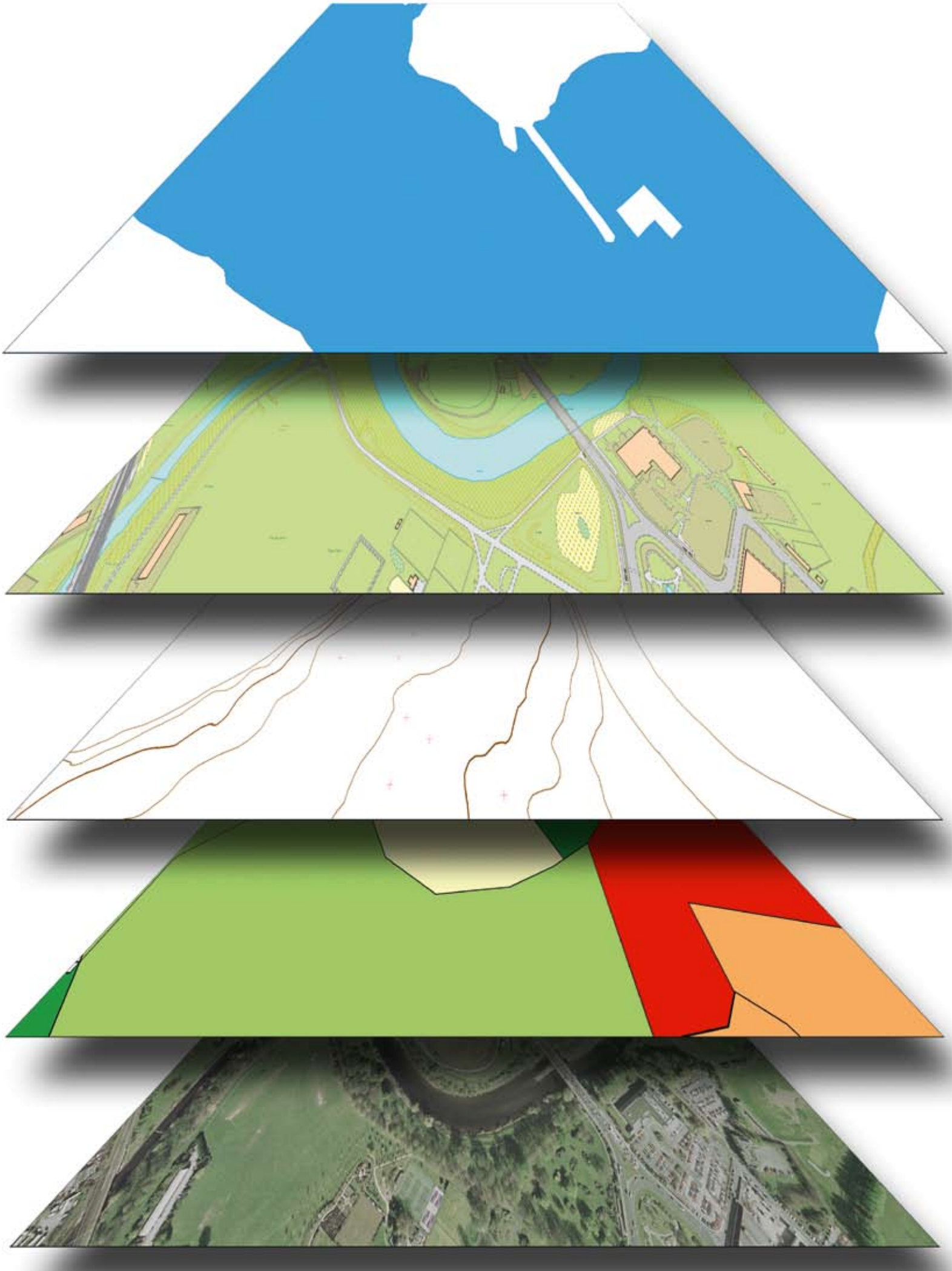
3.47 CFMPs are a planning tool developed by the Environment Agency to investigate and define long-term sustainable policies for flood risk management on a river catchment basis by working in partnership with other key decision-makers. The Review believes that CFMPs will be one of the principal tools to enable the Environment Agency to fulfil its strategic overview role effectively, assuming they properly capture all flood risk. The approach of understanding the risk on a catchment basis is consistant with the EU Floods Directive (see Chapter 8 for more details).

3.48 CFMPs should be based on strategic assessments of current and future flood risk from all sources (including rivers, sewers, coasts and groundwater) within a catchment area in order to understand both the probability and impact of flooding and the effect of existing risk reduction measures. The scale of this risk should then be quantified in economic, social and environmental terms. CFMPs should also help identify opportunities for reducing flood risk on a catchment scale while maintaining, and even enhancing, natural and historic assets and recognising the constraints that may arise.

3.49 There has been some criticism of the draft CFMPs that have been produced so far. The EFRA Select Committee's report in May 2008 stated that they did not effectively address typical 'inland' kinds of flood risk such as surface water flooding, and the Public Accounts Committee (PAC), in its December 2007 report on building and maintaining flood defences, suggested that they should be reviewed to identify the structures that are most at risk. The PAC also raised concerns that the Environment Agency had taken six years to complete its first six CFMPs and that the remaining 60 would not be completed until December 2008.

3.50 The Review recognises these concerns and the fact that CFMPs will be a key vehicle for the Environment Agency in delivering its strategic overview role. We therefore support the recommendation made by the PAC that the remaining plans should be completed by December 2008, as the original deadline for these plans has already been missed. The Review has received assurance from the Environment Agency that all plans will be completed by the end of 2008. There have been concerns from local authorities that they have not been as closely involved with the production of CFMPs for their area as they should have been. The Review therefore urges the Agency to engage with all the main stakeholders as soon as possible to ensure that their vital local knowledge is included.

[6] There are also Shoreline Management Plans, which provide a framework for dealing with coastal flooding and erosion over a large area and may cover a number of communities and sea defences



Forecasting, modelling and mapping

This chapter examines the science and technology behind weather forecasting, flood modelling and mapping. It contains sections on:

- understanding the risks from flooding;
- weather forecasting;
- river, surface water and groundwater flood modelling; and
- integrated approaches to forecasting, modelling and mapping.

Introduction

4.1 The role of science and engineering is crucial in understanding flood risk, and this role will become even more significant as we look to adapt to the increased risk that climate change will bring. The summer 2007 floods demonstrated that the UK has come a long way in terms of weather forecasting and flood prediction, but it also highlighted that there are considerable improvements to be made – especially in terms of surface water flooding and multiple flood events.

4.2 This chapter explains what is meant by flood risk, and looks at the science and technology behind weather forecasting and flood modelling and mapping. It examines how these help to reduce the risk, provides details of the current situation and what enhancements are proposed for the future.

4.3 To ensure that the technological advances in flood forecasting are of value, it is equally important that the issue of communicating meaningful and useful warnings is addressed and improved. We discuss this further in Chapter 21.

Understanding the risks from flooding

4.4 When experts talk about flood risk, they are not simply talking about the likelihood of somewhere being flooded but also the potential impact of the flooding. Understanding where flooding might occur and the potential consequences is vital if flood risk managers, emergency planners and responders are to reduce flood risk and the effects of flooding.

4.5 Flood risk can be calculated by combining the probability of flooding occurring with the consequences of that level of flooding.

opposite page: mapping layers by kind permission of Ordnance Survey. Crown copyright.

The likelihood of flooding occurring is often expressed either in terms of a chance (1 in 100 chance of flooding occurring in any one year) or a probability (1 per cent annual probability of flooding).

4.6 In the past, flood risk has been described by a 'return period' (such as 1 in 100 years), but this can cause confusion when people who have already been flooded believe that they will not be flooded again for a long time. In reality, even when flooding is calculated as a 1 in 100 year event, there is still a 1 per cent chance of flooding the following year.

Recurrence of summer 2007 floods

The probability of the levels of rainfall at specific locations during the summer 2007 floods has been accurately compiled, with a maximum of a 1-in-1000 annual chance being calculated for the level of rainfall at Pershore College (Hereford and Worcestershire). Although we stated in our interim report that the level of flooding that occurred during the summer 2007 had an annual probability of 1-in-150, it is in fact virtually impossible to assign a meaningful probability on the whole sequence of events. This is due to the complexity of combining the chances of all the individual, coincidental events and the sheer scale of the flooding.

The range of durations and geographical spread of the summer 2007 floods made them extremely unusual. But widespread summer flooding will happen again in the future and it is impossible to say precisely when and where. The country must, therefore, be prepared for extreme flooding events, especially due to the increased risk associated with the changing climate.

4.7 The consequences of flooding are the harm that it causes in social terms (for example, loss of life, injury, stress and disruption to daily life), economic terms (for example, damage to property, businesses, roads and infrastructure) and environmental terms (for example, damage to land and wildlife).

4.8 We appreciate that the UK's understanding of the risk of flooding from rivers and coasts is well advanced, the Environment Agency has well-developed maps and models to assess and predict this risk, but information relating to surface water (and groundwater) flood risk is more limited. This was evident from the summer 2007 floods as both the weather forecasts and the warnings during the June floods were less accurate than those for the July floods. This was due to the nature of the weather system that caused the extreme rainfall during June, and the fact that a significant proportion of the flooding was the result of surface water runoff.

Weather forecasting

4.9 Weather prediction forms a crucial part of flood risk management; the ability to predict severe weather, days in advance, provides a first indication of possible coastal, river and surface water flooding events. The Met Office's forecasting ability has improved continuously over the last three decades, with roughly a day's extra lead time for extreme meteor ological events gained every ten years.

4.10 The weather events which caused the summer 2007 flooding were generally well forecast, with the forecasts leading up to the July event being the most accurate and detailed ever provided by the Met Office for any major flooding event in the UK. However, the Review believes that there is still opportunity for improvement; the benefits that need to be realised are as follows:

- **longer lead times.** Evidence suggests that increased lead times for predicting events are directly related to reductions in the damage caused to properties and infrastructure. Improving the science within the models and increasing the quantity and quality of observations used in the models will both help to achieve this;
- **probabilistic forecasting.** The implementation of 'ensemble modelling' (explained below) will enable the most likely and the most extreme scenarios to be identified and shared with emergency responders to facilitate better preparedness; and

[1] The summer 2007 floods in England and Wales – a hydrological appraisal, T.J. Marsh and J Hannagford, Centre for Ecology and Hydrology, 2007

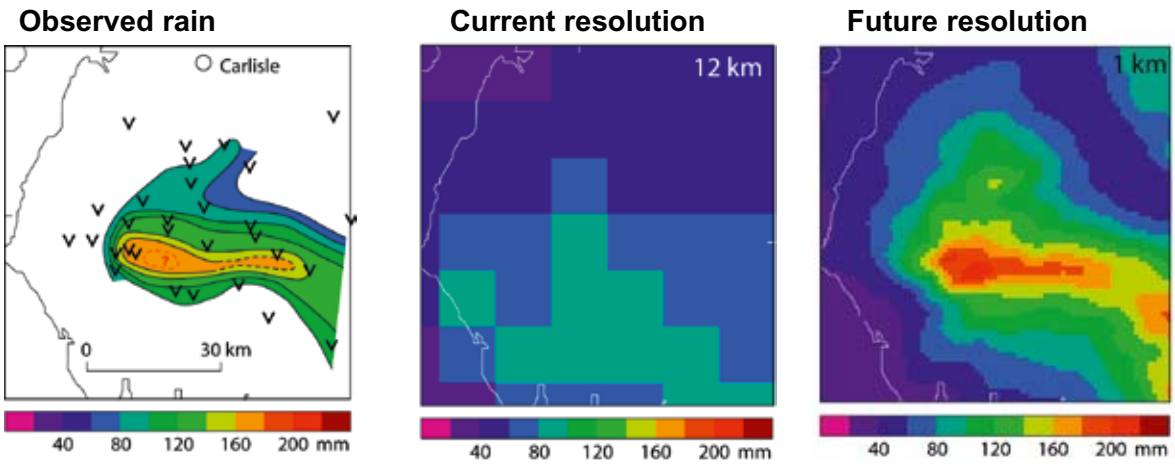
- **more accurate local-scale forecasts.** Enhancements to the resolution of forecasting models (through advances in computing capacity) will allow forecasters to identify where rainfall will be heaviest at a city or town level. This will improve the usefulness and reliability of extreme rainfall forecasts and warnings, which will be essential for providing effective warnings for rapid response catchments and surface water flooding.

4.11 The Met Office uses a suite of computer forecasting models to predict the atmospheric state over a range of areas and timescales. Typically, numerical weather prediction (NWP) models are run once from a given set of initial conditions, which model the observed conditions, to produce a single forecast. Despite vast improvements in these models over the years, large errors can still occur, even over relatively short forecast ranges, due to the chaotic nature of the atmosphere and the fact that the initial conditions will always be subject to a degree of uncertainty. Tiny errors in the state of the initial conditions can be amplified to create large inaccuracies in the predicted weather forecast.

4.12 To combat this problem, an 'ensemble' suite of forecasts can be run. Instead of running a single model with one set of initial conditions, the model is run a number of times starting with slightly different initial conditions to reflect levels of uncertainty. The resulting forecasts are known as an 'ensemble' and can be evaluated to determine the most probable forecast sequence. If the ensemble produces a set of forecasts which are fairly similar then there can be high confidence that the forecast will reflect reality. If it produces a wide range of different weather scenarios then the forecast is less certain. The ensembles can therefore give an indication of the most likely scenario (the scenario which is reproduced most frequently by the forecasts) and the worst-case scenario.

4.13 The resolution of the model determines the accuracy and timeliness of the forecasts, and the specificity of the warnings given. A high-resolution model (1.5 km) was run for a brief period during the summer 2007 floods to test its capabilities and demonstrated the significant improvement this model can achieve. The higher resolution model has also been used retrospectively to assess how accurate it would have been during the 2005 Carlisle floods if it had been available; the enhancement with this model is very apparent in Figure 4.

Figure 4 – Benefits of improved resolution (Carlisle flooding in 2005)



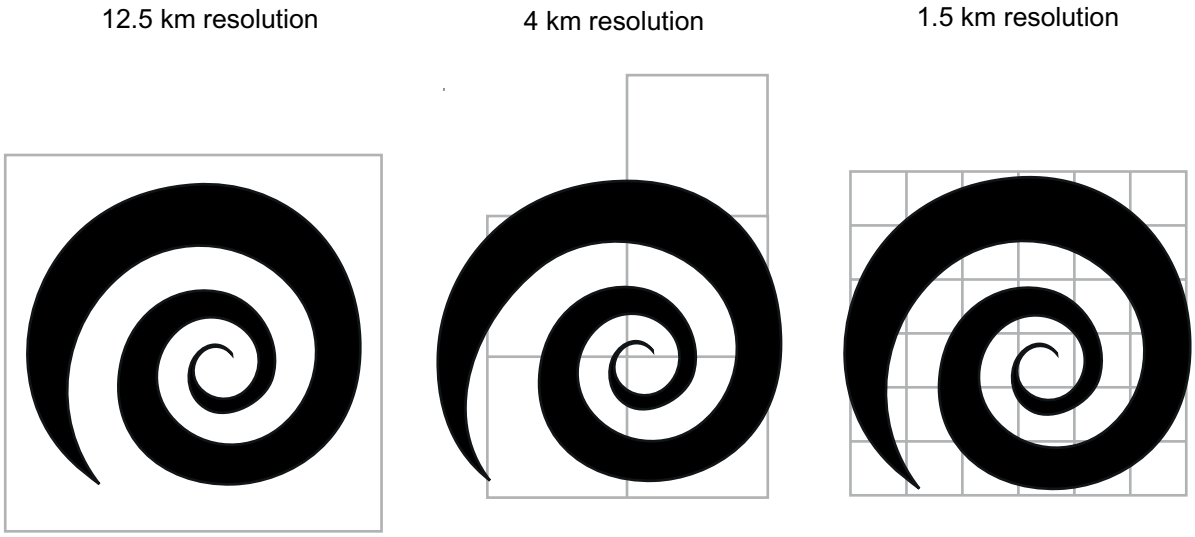
Model resolution

The resolution of a model refers to the grid box size (or area) over which the model calculates an average prediction. It can be compared to the resolution of an image from a digital camera. A digital camera image is broken down into pixels: just as more than one pixel is required to represent a particular object, more than one grid box is required to represent a particular weather feature.

The current computing system performs most of its operations at a 12.5 km resolution (i.e. on a grid box size of 12.5 km x 12.5 km) covering Europe, complemented by a 4km model over the UK.

However, even though the models at a 4 km resolution can produce very good information about general weather conditions, they are inadequate when forecasting convective rainfall because the thunderstorms that cause this type of rain are typically up to 10 km across; this is beyond the limit of the resolving capabilities of the 4 km model. If the model was able to perform at a 1.5 km resolution, a typical thunderstorm would be covered by approximately seven times more grid boxes than the 4 km resolution model, creating a much more accurate representation (i.e. a clearer picture) of the weather feature.

The figure below depicts a typical 10 km diameter thunderstorm against the grid boxes of 12.5, 4 and 1.5 km resolution models. The information within each grid box, or pixel, is averaged by the model. The more grid boxes covering a particular weather feature, the more accurate the representation will be (so, if related back to the camera, the clearer the image will appear).



At 1.5 km resolution, forecasts of extreme rainfall could be made on a city scale, rather than on a regional scale, which would greatly enhance capabilities to provide surface water flooding and rapid response catchment warnings.

4.14 The resolution of the model and ensemble forecasts is limited by the supercomputing capacity available to the Met Office. The current high-performance computing (HPC) capability is, however, reaching the end of its useful life and a new machine is due to be installed in 2009 (with a further upgrade in 2011).

4.15 This will provide the ability to operate the models at a 1.5 km resolution continuously over the entire UK (rather than just for brief periods of time over smaller regions, as is currently the case) to provide an opportunity to produce warnings for surface water flooding with useful lead times. The further enhancement in 2011 will allow a small ensemble of forecasts to be developed, enabling probabilistic forecasts to be produced. This will allow a baseline quantitative risk assessment capability (i.e. with specific probabilities) to be established, and will mean that responders are able to prepare for both the most likely and also the worst-case scenarios.

4.16 All of these improvements will greatly advance the Met Office's capabilities, not only for flood forecasting, but also in terms of benefits to other sectors (including civil contingencies, defence and the provision of climate change advice). To ensure that these enhancements meet the requirements of the end users, the Met Office should engage with Local and Regional Resilience Forums, not only to establish these requirements but to also manage expectations as to what is feasible and at what cost. It is important that the improvements should be driven by user need, rather than simply a desire for improvement. If the system delivers over-specification, it will not be cost-effective.

4.17 In order to realise these benefits for responders, the Met Office should make choices which accelerate the pace of development wherever possible.

RECOMMENDATION 3: The Met Office should continue to improve its forecasting and predicting methods to a level which meets the needs of emergency responders.

4.18 The use of weather radar was mentioned in a number of submissions to the Review, especially from RFDCs and Leeds City Council. RFDCs advocate the use of weather radar (when used in conjunction with detailed topographic information) to identify the areas that are most at risk from surface water flooding, and Leeds City Council is in favour of weather radar being used to help emergency responders ensure that resources are targeted at the most vulnerable areas during an emergency. They have purchased licences to provide live access to the Met Office's rainfall radar data, using a system called 'Enviromet', to officers in land drainage, emergency planning and highway maintenance. This enables them to identify which areas are being worst affected (and which are most likely to flood) and therefore target resources accordingly.

'Enviromet' display – Leeds City Council

4.19 The Met Office believes that weather radar (alongside higher-resolution rainfall forecasting) can form part of the solution to providing a surface water flooding warning system if set in the context of closer working with the Environment Agency and a programme of education that includes the possibility of using a probabilistic approach to warning. This is discussed in more detail in Chapter 21.

Weather radar

The Met Office uses a network of weather radars (13 in the UK) with three ranges of resolution (1 km, 2 km and 5 km) to provide continuous, real-time information on rainfall over almost all of the UK's land areas and inshore waters. Four new network sites are planned for 2008, with one replacing an existing site to make 16 in total, which will improve the coverage over some densely populated areas that are not currently covered by higher-resolution radar.

The advantages of using weather radar are that it can provide detailed and instantaneous rainfall rates over a wide area. It can locate frontal and convective precipitation, and can monitor their movement and development. It can also be used for short-range forecasts through extrapolation and incorporated into weather prediction models.

The disadvantages are that weather radar can be subject to technical and meteorological difficulties (although most of these can be adjusted for), and that it does not show rainfall at the surface. In addition, weather radar can display non-meteorological echoes because of its angle of elevation: too low and it cannot pick up rainfall due to obstacles on the ground, and too high and the estimate of rainfall actually hitting the surface becomes less accurate.

River and coastal flooding modelling

4.20 The Review recognises that considerable progress has been made in modelling and mapping risk from river and coastal flooding in the UK over the last 10 years:

- in 2000, the Environment Agency published indicative flood maps online,
- since 2004, these indicative flood maps have included an extreme flood outline – for floods with a 0.1 per cent chance of occurring,
- the National Flood Risk Assessment (NaFRA) was produced in 2004[2]; and
- the *Foresight Future Flooding* study on current and future flood risk was published in 2004, with a qualitative update produced later in 2008 (see link on Review's website)[3].

4.21 The Environment Agency's indicative flood maps provide an assessment of the flood risk across England and Wales, and give details of the areas that could be affected by flooding from rivers and the sea, the location of flood defences and an indication of the areas that would benefit from them during a major flooding event.

4.22 The maps are divided into flood-risk zones that relate to the areas that would be affected by differing probabilities of flooding events (flood defences are not taken into account, as these can be breached or overtopped). These probabilities are 1 per cent for river flooding, 0.5 per cent for coastal flooding and 0.1 per cent from river or coastal flooding (an extreme event).

4.23 The flood probability zones are used and defined in the Government's planning policy (see Chapter 5 for more information on PPS25) to provide guidance on development on the floodplain. The flood maps provide a good indication of the areas that are at risk of flooding, but they do not provide specific information about the risk to individual properties at the level of detail required. For example, details such as how high a property's floor needs to be above ground level are not available and would be difficult to acquire.

4.24 The indicative flood maps offer a variety of services:

- they are a vital awareness-raising tool for the public, who are able to input their postcode and find out if they are at risk;
- they are essential in helping the Environment Agency to manage flood risk and give an indication of where an automatic warning service should be provided;

[2] www.rasp-project.net/SR659-NationalFloodRiskAssessment_2004.pdf
[3] www.cabinetoffice.gov.uk/thepittreview

- emergency services and local authorities use them to help to develop emergency plans and risk assessments;
- planning authorities incorporate the information from indicative flood maps into their decision-making processes relating to planning applications;
- they help utilities companies to understand their flood risk and hence enable them to make business continuity decisions; and
- the insurance industry uses them to calculate risk (and hence premium rates).

4.25 There is a continuing programme of work to improve the indicative flood maps. As flood models are improved and more detailed information on defences (and the areas that benefit from them) is assimilated, results will be fed into this improvement work.

4.26 The National Flood Risk Assessment (NaFRA) covers the whole of England and Wales, and builds on the indicative flood maps through Risk Assessment for Strategic Planning (RASP). RASP uses a probabilistic approach that takes into account the location, type, condition and performance of flood defences. The three risk categories are:

- **low:** less than 0.5 per cent chance of flooding;
- **medium:** 0.5–1.3 per cent chance of flooding; and
- **high:** more than 1.3 per cent chance of flooding.

4.27 NaFRA results are provided to the Association of British Insurers (ABI) and the financial services industry, enabling them to offer their services to those who live in flood-risk areas. NaFRA enables insurance premiums to take into account the benefits of flood defences: without it, premiums would be higher for those who live in flood plains but are adequately protected.

4.28 NaFRA was first run in 2004 and was re-run in 2006 to improve the data. But there are still uncertainties in the results due to method and data limitations. A project has been initiated to eliminate some of these uncertainties, with the potential for a further re-run later in 2008.

4.29 The Review believes that both the indicative flood maps and the NaFRA map provide an essential range of services across a number of sectors, and significantly help to reduce flood risk by raising the awareness of that risk and enabling people and organisations to prepare themselves. **We welcome the continuous updating of flood maps, and would encourage the Environment Agency to devote further resources to this exercise.**

Limitations of flood mapping

4.30 The Environment Agency monitors rainfall, river levels and sea conditions 24 hours a day. This information is combined with weather and tidal data from the Met Office to provide local area warnings on the possibility and severity of flooding.

4.31 Together with its partner organisations, the Environment Agency has made significant progress in developing and improving its modelling and forecasting capabilities. In general, the Environment Agency's warnings and forecast flood levels during summer 2007 were relatively precise. However, problems did arise:

- certain properties were affected by both surface water flooding and river flooding (known as coincident flooding) and therefore some properties were already flooded by the time the river flooding warning was issued by the Environment Agency;
- the Environment Agency's maps and models use historical data to help understand and predict future flooding. However, the summer 2007 floods were so extreme that relevant data was limited, and river levels in some areas rose far more quickly than during any previous flooding. The rapid response (the speed of the water level rise) of a number of river catchments meant that some warnings could not be given within the two-hour target timescale;

- many rivers flooded at the same time during the summer 2007 floods, causing the water to back up and lead to unexpectedly high and faster-reacting river levels. This is something that had not been considered in much detail before then; and
- some of the telemetry systems failed, either physically (4 per cent of river level gauges and 2 per cent of rainfall gauges) or because they were unable to be read as the event exceeded their operational capabilities (3 per cent of river level gauges and 1 per cent of rainfall gauges), although most of the faults were repaired quickly. There is also evidence to suggest that there is a lack of telemetry coverage in certain areas, especially in smaller tributaries, which exacerbated the problem.

4.32 The Environment Agency has been working to resolve some of the problems with its telemetry system through the installation of new rain and river gauges and the introduction of back-up servers to the flood warning system to ensure that alarms can still be provided on the gauges even in extreme flooding events.

4.33 The Review welcomes the commitment shown by the Environment Agency, through its Flood Risk Science Programme, to develop the tools and techniques that are currently available for predicting and modelling river flooding to cover a wider range of events. In the short term, this could include running data from the summer 2007 floods through the Environment Agency's modelling and mapping systems as part of historical data capture. In the longer term, this will require running different extreme scenarios through the systems, and making sure that the possibility of multiple flood events occurring both simultaneously and within different overlapping time periods is taken into account.

4.34 The Review considers that the biggest risks people face from inland river flooding are due to significant depths and high velocities; 6 inches of fast-flowing water can knock someone off their feet and 2 feet of water is enough to float a car. Although most of the summer 2007 flooding was not of a particularly high velocity (unlike the flooding experienced in Boscastle in 2004), significant depths were reached in some places. As well as posing a specific risk to individuals, in some cases the depth of the flood water hampered rescue efforts, making evacuations dangerous for both the evacuee and emergency responders.

4.35 The Environment Agency has now identified 'rapid response catchments' (i.e. areas with particularly steep and narrow catchments that channel water, causing high velocities) and has committed to engaging with emergency responders to discuss their requirements in this area. The November 2007 EU Floods Directive (mentioned in Chapter 8) requires that flood depths and velocities in high-risk areas are mapped. The Environment Agency will be taking forward this work in preparation for its implementation.

4.36 Although some advances have already been made in this area, and the EU Floods Directive will ensure that flood-risk assessments include multiple events, coincident flooding, depths and velocities, the Review believes that further enhancements to the Environment Agency's modelling and mapping tools should be urgently progressed. This will help to ensure that the rescue capabilities to emergency responders are not hindered unnecessarily and that the risk of loss of life is reduced in future flooding events.

RECOMMENDATION 4: The Environment Agency should further develop its tools and techniques for predicting and modelling river flooding, taking account of extreme and multiple events and depths and velocities of water.

Surface water flooding

4.37 In contrast to river and coastal flooding, capabilities to map and model (and hence provide warnings for) surface water flooding are very limited.

What is surface water flooding?

4.38 In this report, the Review refers to 'surface water flooding' as flooding that occurs due to extreme rainfall and the inability of the water to drain away quickly enough, hence forming pools of water. Pools may also form due to water coming out of drains at other locations. However, the reasons for a lack of drainage capability can be quite varied and are often interlinked. For example, an urban sewerage system (designed to convey surface water runoff into a nearby watercourse) might be unable to discharge water if the watercourse levels are too high, which was the case in certain areas of Sheffield during the summer 2007 floods. This particular type of flooding, where the urban drainage and sewerage system links to the river system, is often referred to as 'coincident flooding' (see *Foresight Future Flooding Qualitative Update 2008*).

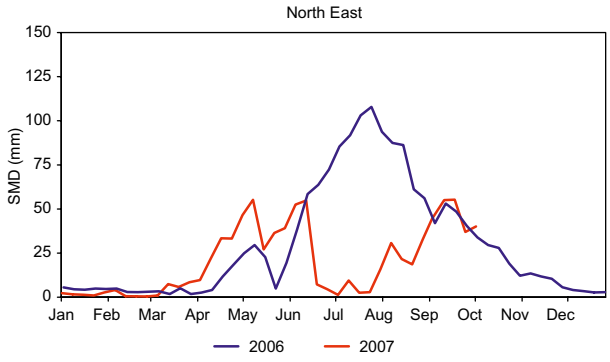
4.39 Many factors affect the likelihood of surface water flooding:

- **intensity of rainfall:** rainwater drains away naturally over long periods of time, but if rain falls in intense bursts, the drainage system may be unable to cope. The probability of this type of intense rainfall occurring in the future is likely to increase due to climate change;
- **the location of the rainfall:** the direction of travel of surface water is directly influenced by the topography of an area. Small changes in the location of rainfall can have a significant impact on where the water ends up;
- **the capacity and condition of the sewerage and drainage system:** this will obviously affect the rate at which rainwater can drain away, but the system is complicated. A number of different people and organisations are responsible for different parts of the system (these roles and responsibilities are described in more detail in Chapter 6), and this is not always transparent. In addition, most of the UK sewerage system was built before the Second World War, and so deterioration is another key issue;
- **the type of surface material:** the permeability of surface material affects the amount of runoff. Urban areas are more susceptible to surface water flooding than rural areas because they are characterised by a significant quantity of built-up (and hence impermeable) areas. Chapter 5 discusses urban creep in more detail;
- **the saturation (or the soil moisture deficit) of the ground:** if the ground is saturated, or in fact too dry, any rain that falls will be converted into runoff (see text box below on soil moisture deficit);
- **river levels:** high river levels will hinder the sewerage system's ability to discharge water; and
- **planning and development:** pressure to increase the amount of housing will reduce the amount of permeable space available and is also likely to reduce the number of open watercourses (many will be converted to culverts – see Chapter 5 for more detail). Sustainable drainage systems can be incorporated into new property developments to help to reduce the surface water runoff and these are considered in Chapter 6.

Soil moisture deficit

Groundwater levels and the saturation level (or soil moisture deficit) of the soil are different phenomena. Groundwater flooding is a complicated process of water being absorbed by sub-surface aquifers and then recharged over a period of time. Soil moisture deficit describes the level of saturation, with the actual figure being how much more water the soil could absorb before being fully saturated, so a soil moisture deficit of zero would mean that the soil is fully saturated.

The Environment Agency currently records soil moisture deficit levels to monitor the water table in the context of drought situations. The Review believes that this monitoring capability should also be used for flood risk management. The saturation level of the ground is especially important for surface water flooding where the amount of run off will depend on the volume of water which can soak into the ground (the converse case of the ground being too dry also affects surface water flooding as the water just bounces off the ground). During the summer 2007 floods, conditions prior to the flooding were such that the ground was already saturated due to heavy rainfall in May and early June and so the soil moisture deficit values were close to zero. This is in stark contrast to the soil moisture levels recorded in summer 2006 (see graph below for the Environment Agency's North East region).



4.40 All of the factors listed above affect and are influenced by a wide cross-section of societal factors. To begin to understand how surface water flooding happens, and hence to be able to develop modelling and mapping techniques, the Review believes that organisations such as the Environment Agency, the Met Office, water companies, local authorities, planning and highways authorities, and riparian owners will all need to work together to pool their expertise and data.

Identifying vulnerable areas

4.41 In response to the recommendation in the Review's interim report that the Environment Agency (supported by other organisations) should urgently identify the areas that are at highest risk from surface water flooding, the Environment Agency has carried out research into developing a surface water flooding alert system for its professional partners. It has improved dialogue with Local Resilience Forums (LRFs), local authorities, water companies and other stakeholders with the aim of sharing existing knowledge of historic surface water flooding.

4.42 To formalise this process, the Environment Agency set up a national project on surface water flooding in April 2008. The main objective of this project is to produce a national set of data to identify areas most naturally vulnerable to this type of flooding by 1 August 2008 and to collect further remaining data on historic surface water flooding by 2010. This should enable local authorities and utility companies to carry out more detailed studies in the highest risk areas and create better plans for dealing with the risk. In collating this data, the Environment Agency will work with its partners to define how the data will be used and what should be included.

Surface Water Flooding maps

Although the summer 2007 floods highlighted the risk of surface water flooding, affecting many areas which had not previously flooded, this risk and the requirement for more data and better modelling tools was identified in the *Foresight Future Flooding report (2004)*.

A number of submissions to the Review have indicated that some organisations have already started to look at how to map the risk from surface water flooding. Examples are:

- Risk Management Solutions (RMS) who provides products and services for the management of insurance catastrophe risks. These tools are widely used by the insurance industry to inform the pricing and management of risk from natural and man-made hazards. RMS has been working over the past couple of years to upgrade their existing UK Inland Flood Model, employing numerical approaches to produce a new, fully probabilistic model covering all sources of inland flood risk. The enhanced model provides information on the flow from major and minor rivers, surface water flow from both rising groundwater and intense rainfall, and drainage overflow in urban areas. The upgrade also incorporates an increased understanding of flood defences by including data from the Environment Agency Flood Defence Database and accounts for the downstream impact of flooding in the event of upstream defence failures.

Surface Water Flooding maps *(continued)*

- Micro Drainage is a drainage engineering software developer whose software is currently used by many of the UK's sewerage consultants and water companies. They have been working with West Berkshire County Council since the summer 2007 floods to produce a 3-D computer flood model for Thatcham as a method of testing the model's capabilities. The model[4] utilised the latest runoff model[5] and data of the July 2007 rainfall to identify the main flood flow paths, depths, velocities and sinks. It also identifies which elements of the drainage system are critical. This model has helped West Berkshire County Council to establish the current level of protection, test proposed mitigation measures, establish appropriate drainage maintenance and structural improvement regimes and inform their emergency procedures and responses.

4.43 The Review commissioned analysis of a number of different approaches to modelling surface water flooding, looking at their effectiveness and providing a basic cost-benefit analysis. The results of this work are set out below.

[4] An ADI computational model
[5] ReFH model

Evaluation of Modelling Approaches to Urban Flood Risk

The purpose of this evaluation was to assess the feasibility of flood risk modelling and mapping in urban areas, and to indicate the different modelling approaches.

The five approaches considered in this assessment were:

- *Topographic index analysis* – This is a basic terrain model with no rainfall input. There is no correlation between the model's outputs and areas of known flooding, and so it would be of little use.
- *2D overland routing of uniform rainfall event* – This model makes no allowance for differences in rainfall, and assumes that every area has a uniform capacity to drain water. It could be used for high level analysis but significantly overestimates the extent of flooding.
- *Decoupled sewer model and 1D overland routing* – This model takes account of the effect of drainage by using a detailed sewerage network model. It is the most accurate method of identifying properties on water company registers but underestimates the spatial extent of flooding.
- *Decoupled sewer model and 2D overland routing* – This model includes 2D surface runoff data and detailed sewerage network data, but does not include assessment of below-ground flooding mechanisms. It produces a much better estimate of the spatial extent of flooding but fails to identify some properties on water company registers.
- *Coupled sewer model and 2D overland routing* – This model combines surface runoff data, detailed sewerage network data and a full 2D model of above-ground flooding. It does not include below-ground flooding mechanisms but this could be added. It gives a very accurate assessment of the spatial extent of flooding but fails to identify some properties on the water company registers.

The figure below shows how different modelling approaches can produce very different results. Each image maps a flooding event with an annual 1-in-30 chance of occurring. The red line indicates the actual extent of flooding at that level.

a) 2D overland routing of uniform rainfall event

b) Decoupled sewer model and 2D overland routing

Evaluation of Modelling Approaches to Urban Flood Risk (continued)

There are some important messages for our assessment of potential progress on mapping surface water flooding.

- tools exist that can reliably and accurately model surface water flooding in urban areas;
- the costs of the different models can vary widely owing to the information and detail required and the cost of accurate modelling can be high if models of sewerage networks have to be built from scratch;
- simplified modelling is possible at relatively low cost but is far less reliable and probably only suitable for high level risk assessments on an area wide basis. Such approaches are not suitable for assessment at the level of detail of individual streets or for producing solutions to flooding; and
- surface water (or urban) flooding can be accurately modelled and mapped but further work is required to understand user needs and the costs associated with meeting those needs. There also needs to be an assessment of what information is currently available and where that information can be obtained.

4.44 The Environment Agency's proposed strategic overview role means that it will be well placed to provide a modelling and warning system to cover surface water flooding. It will need to work with its partners, especially with the Met Office, to develop the tools and techniques required to model surface water flooding.

4.45 It is vital that the Environment Agency also engages with those responsible for different aspects of the drainage and sewerage system – including water companies, local authorities, internal drainage boards, highways authorities, navigation authorities and riparian owners. This will help the Environment Agency to understand how surface water runoff is discharged by the system, what knowledge and data gaps are present and what steps need to be taken to fill them.

RECOMMENDATION 5: The Environment Agency should work with partners to urgently take forward work to develop tools and techniques to model surface water flooding.

Groundwater flooding

4.46 Groundwater flooding is caused by the emergence of water on the surface due to the water table rising. It can result in the flooding of surface or sub-surface infrastructure (for example, basements or sewers) and can cause damage to foundations by reducing their load-bearing capacity. The damage associated with groundwater flooding is believed to be significantly greater than that associated with river and surface water flooding, due to the fact that the water can remain above the surface for long periods of time. It is estimated that around 1.6 million UK properties are currently at risk from flooding associated with groundwater-dominated catchments.

4.47 Although groundwater flooding was not a major contributor to the summer 2007 floods, it did significantly affect certain areas and remained a serious threat in the months following the flooding.

4.48 The Review is aware that, although groundwater flooding has been recognised by flood risk managers as an important element of flood risk, no organisation has responsibility for it and at present it is not well understood. The Environment Agency has established monitoring and warning arrangements for the chalk aquifers in its South-West, Southern and Thames regions (which are most at risk of groundwater flooding), but there are still significant technical problems associated with groundwater flood risk assessment. This is because the models that have been designed for conventional hydrological events have a limited applicability to groundwater.

4.49 The Environment Agency has been investigating ways to develop its groundwater capabilities through the cross-government *Making Space for Water* programme and the Review welcomes this. It has looked at establishing a national database of flooding from all sources, as well as extending its flood risk maps and warning service to cover groundwater flooding. This work has partly been done in preparation for the implementation of the EU Floods Directive, which is discussed in more detail in Chapter 8.

4.50 Following the summer 2007 floods, the Environment Agency commissioned a report from the CEH to assess the groundwater flooding risk for the autumn and winter. It concluded that there was a risk in certain areas, but that this risk would depend on the amount of rainfall received during the autumn. As it transpired, there was no significant rainfall during the autumn and groundwater levels were able to stabilise. However, the report prompted the Environment Agency to undertake a national groundwater level scenario-forecasting exercise in October 2007. A reappraisal exercise took place in February 2008 following the heavy rainfall during January.

4.51 In response to the urgent recommendation made in the Review's interim report, that more frequent and systematic monitoring of groundwater levels should be undertaken, the Environment Agency is continuing to develop its activities. This includes collecting historic groundwater flooding information, extending the monitoring and warning systems and awareness-raising activities.

4.52 The Review welcomes the progress made by the Environment Agency and applauds its commitment to trying to develop its understanding of groundwater flooding. We hope that this work will be facilitated by the Environment Agency's strategic overview role where the responsibility for groundwater flooding can be fully established (see Chapter 3).

Integrated approaches to forecasting, modelling and mapping

4.53 Flood risk needs to be managed in a joined-up way; all sources of flooding need to be considered, as do all parts of the drainage system. Organisations and individuals will need to work together to enhance their understanding of the problems and to develop solutions that will reduce the risk of flooding.

4.54 Programmes, projects and working groups have already been set up to combine the expertise and data that is held within the disparate range of organisations involved and to facilitate closer working. This is particularly pertinent to government organisations, as there should be more of an incentive for them to work together to realise efficiencies and to provide cost savings.

4.55 The summer 2007 floods emphasised the need for organisations to work closer together and many submissions and comments to the Review highlighted the confusion between information received from the Met Office and information received from the Environment Agency.

Sharing information

4.56 The Review believes the sharing of information to be vital to effective flood risk management. Much work has been done by different organisations to collect and record datasets relating to flood forecasting and modelling. These now need to be integrated to fully realise the benefits.

4.57 There are a number of barriers that may hinder this integration, including compatibility and cost. The Review strongly believes that, because the sharing of information is integral to flood risk management, all efforts should be made to overcome these barriers.

4.58 Thus, integration will require information to be produced using consistent software compatible with the technical capabilities of the end user. The Environment Agency must work with partners to examine the range of

software available and to provide guidance on how data should be collected and recorded for consistency.

4.59 Many government organisations currently charge for information (albeit often at discounted rates) to recover data acquisition costs. The Review appreciates that this is part of agreed business models, but a recent study for the Department for Business, Enterprise and Regulatory Reform (Newbury *et al.* 2007) indicated that a move towards a near-zero cost access to data for UK Trading Funds (e.g. the Met Office, Ordnance Survey, Hydrographic Office) would lead to considerable net benefits to the economy. **We would welcome further consideration of this approach**.

4.60 As part of efforts to share information more efficiently, the Atlantis Programme was set up in 2004. Its aims are to develop, maintain and promote the use of a definitive national dataset comprising topographical, geological and hydrological data.

4.61 The Atlantis Programme was established by a number of government organisations:

- the British Geological Survey, which maps the geology of the landscape;
- the Centre for Ecology and Hydrology, which has expertise in flood modelling and holds river catchment and depth profiles;
- the Environment Agency, which holds detailed information on the river network and maintains this information;
- the Met Office, which produces weather forecasts and records precipitation measurements;
- the Ordnance Survey, which collects detailed data on contours, surface material type and discrete geographical features; and
- the United Kingdom Hydrographic Office, which charts the world's oceans and provides other navigational and hydrographic information.

4.62 The Review welcomes the Atlantis Programme as a way of improving the ability of organisations to consolidate their data and to provide further detail on the layout of infrastructure and topographical features. This consolidation could provide a platform for more accurate modelling and scenario planning to be developed.

Integrated working

4.63 The Review's interim report highlighted the need for closer working between the different organisations involved in flood risk management. Following the conclusions made in our report, progress has been made towards integrating data, and facilitating the identification and collection of new data to fill existing gaps. For example:

- **Extreme Rainfall Alert.** The Met Office and Environment Agency have launched an Extreme Rainfall Alert (ERA) pilot service on a UK-wide basis for six months. The service has been developed in consultation with the Energy Networks Association and is designed to provide an early indication of extreme rainfall and the implied risk of surface water flooding. The potential value of this pilot will be enhanced with the release of the Environment Agency indicative surface water 'hotspots' which will assist emergency responders in prioritising their response efforts; and
- **Distributed Flood Forecasting.** This is a new method to provide indicative flood forecasts 'everywhere' by running a model on the Environment Agency's existing NFFS platform. This approach uses a chosen grid size (say 1 km), underpinned by a Digital Terrain Model (DTM) and feeds in information from the Environment Agency's telemetry systems and the Met Office's grid-based weather forecasts. This tool does not replace the Environment Agency's River Forecasting models on major rivers, but would work in parallel to accelerate the Environment Agency's programme of improvement works as flow forecasts from small un-gauged catchments would be made available for the Environment Agency to feed into its main river models. By supplementing

current systems, this model will provide a significant additional understanding of real-time flood risk and will be a key building block to further developments.

4.64 The Review places a high priority on the issue of integrated working between the main organisations with responsibilities for and information relating to forecasting, modelling and mapping flood risk. We welcome the progress that has been made in this area through the creation of an Inter-Agency Working Group (see text box below) and an Envronment Agency/Met Office Joint Steering Group.

Inter-Agency Working Group for forecasting and flood warning

The Environment Agency, Met Office, Ordnance Survey and Centre for Ecology and Hydrology decided to establish an Inter-Agency Working Group (IAWG) to provide options and recommendations for the Review on how the key agencies can work together to deliver world-leading flood forecasting and warning services for England and Wales.

The IAWG met over a period of approximately five weeks to discuss and set out a number of proposals:

- **provision of probabilistic flooding alert to professional partners.** Many stakeholders, for example, emergency responders and owners of critical infrastructure, have expressed a requirement for longer lead times for flooding events. Developments in technology could enhance the capability to produce earlier probabilistic forecasts;
- **Distributed Flood Forecasting and resulting alert products.** Work needs to progress on the Distributed Flood Forecasting approach to enable flow forecasting capabilities for locations where there are currently none, the creation of a spatial display of flood risk on a country-wide scale, the capability to forecast for un-gauged and rapid response catchments and longer lead times;
- **provision of a Surface Water Alert Service.** This consists of three approaches:
  1. alert of extreme rainfall – see above;
  2. identification of hotspots and development of a surface water flood map. The Environment Agency has already made progress on this and an indicative map of the hotspots should be available in August 2008; and
  3. development of surface water action plans by responsible authorities. There is currently no agreed remit to plan responses to surface water flooding.
- **education of professional partners.** If new forecasting tools and techniques are to be effective, the professional partners utilising them will need to be educated in their use. This is especially the case with probabilistic forecasting as there will need to be guidance on how to react to such warnings;
- **better presentation of information.** The output from the Atlantis Programme will provide a common reference framework for producing and presenting data. This should facilitate agencies sharing information and delivering a consistent message to the public and other stakeholders;
- **better media management.** The creation of a central media coordination group, which includes press office members from each of the IAWG organisations, to deliver a consistent message as above;
- **better utilisation of information sets.** The Atlantis Programme should be used as a vehicle for improving data interoperability (compatibility) and exchange of information. This will enable high risk areas to be prioritised in terms of maintenance, investment emergency plans and resources; and

Inter-Agency Working Group for forecasting and flood warning (continued)

- **options for closer working between the Environment Agency and the Met Office.** Initial discussions between the Environment Agency and the Met Office about working closer together on forecasting and warning have produced a preliminary range of options:
  - **status quo.** Both the Environment Agency and the Met Office continue with existing work programmes and initiatives and continue to work together under the existing Joint Steering Group arrangement;
  - **accelerated status quo.** As above but with modest additional resources to enable progress to be made more rapidly;
  - **step change in investment.** Significant investment to enable both the Environment Agency and the Met Office to undertake an enhanced programme of projects working together to agreed objectives under the existing structural arrangements; and
  - **joint centre approach.** The creation of a national weather/flood forecasting alert service which builds on, rather than replaces, the services currently provided.

4.65 The Review believes that in order to significantly advance the UK's forecasting and flood warning systems, the Environment Agency and the Met Office should work closer together and pool their expertise to deliver an integrated model for rainfall and subsequent flooding.

4.66 The Environment Agency and the Met Office, in parallel with the IAWG, have been investigating other options for implementation of a joint capacity which are:

- **virtual Environment Agency national centre** – dispersed team delivering National broad-scale river and tidal flood warnings to professional partners;
- **national Environment Agency operations centre** – dedicated team delivering National broad-scale river and tidal flood warnings to professional partners;
- **embedding staff in each other's operations centres** – this would be undertaken at a time of major flooding events. It would require a national Environment Agency operations centre;
- **dispersed Environment Agency/Met Office national operations centre** – national broad-scale river and surface water flood forecasting and alerts service to national partners; and
- **Co-location of national operations centre** – national broad-scale river and surface water flood forecasting and alerts service to national partners.

These options are being developed further, costed and assessed through the Environment Agency/Met Office Joint Steering Group.

4.67 The Review welcomes the work carried out by the Inter-Agency Working Group; this has provided a foundation on which to take forward improvements in forecasting, modelling, mapping and warning systems.

4.68 The summer 2007 floods exposed gaps in our capabilities in relation to forecasting and flood warnings. The Review understands that there are complex issues that need to be resolved but we strongly believe that advances can be made over the next few years. Surface water flooding in particular highlights the need for extreme rainfall prediction and flood modelling to be better integrated.

4.69 The Review strongly believes that in order to maximise advances in forecasting and flood modelling and warning there must be joint working between the Environment Agency and the Met Office. There also has to be a step change in terms of investment to allow joint research to be undertaken and potential capabilities to be realised.

4.70 The Environment Agency and the Met Office should take this opportunity to significantly enhance the UK's flood forecasting abilities and show a willingness to be open to a number of options including a joint centre.

4.71 The Review believes that there should be co-location of appropriate expert staff at a national level from the Environment Agency and the Met Office to integrate the process of weather forecasting and flood modelling and warning. The Review understands that this is a significant change to current arrangements and we do not take the option lightly. The evidence we have received from international examples such as France (SCHAPI) and Sweden (SMHI) (see case study box below) and from submissions to the Review suggest that this approach would maximise the potential enhancements that can be made in the quickest time.

4.72 The Review appreciates that a more in depth assessment of the different joint working options needs to be undertaken to establish the issues and costs involved. We therefore urge the Joint Environment Agency/Met Office Steering Group to take forward the work to consider the different joint working options as quickly as possible.

RECOMMENDATION 6: The Environment Agency and the Met Office should work together, through a joint centre, to improve their technical capability to forecast, model and warn against all sources of flooding.

Close cooperation between hydrological and meteorological services

SCHAPI and Météo-France

The Central Flood Forecasting and Warning Service (SCHAPI) in France was created in 2003 as part of the Ministry of Ecology and Sustainable Development, following severe flooding events, such as the 2001 flood which affected parts of northwest and central France, including Paris itself. The floods highlighted several weaknesses in the previous French flood forecasting and warning system, including the disjointed structure of the forecasting bodies, poor efficiency of flood warnings and a lack of understanding among the general public.

SCHAPI is based in Toulouse, alongside the national meteorological service, Météo-France. Both organisations benefit from the co-location of their office buildings and closer cooperation between meteorological and hydrological experts. This working arrangement has ensured better flood forecasting coordination and technical support and improved flood warnings, including flood vigilance maps. The new relationship between hydrologists and meteorologists has improved anticipation of flood events, through monitoring data from 22 regional flood forecasting centres which extend to 17,000 km of the rivers in France. SCHAPI now aims to provide warnings up to 24 hours ahead of a storm event. The time frame for warning depends on the speeds and flows of the rivers, but can range from up to three days for the River Seine to significantly shorter lead times in river basins that rise much more quickly. There are still limitations, particularly the ability to pinpoint a flood to a street-specific location. In addition, while technologically-advanced river monitoring and radar is used to gather information on possible rainfall events, it is still difficult to accurately forecast flash flood events.

Close contact with Météo-France has modernised the information process of floods, ensuring that SCHAPI can provide flood information to the public and media that is reliable, timely and consistent. One of their key tools is online 'vigilance maps'[6], which are updated twice a day, and more frequently if necessary during an event. The general public have responded well to the new procedures, and according to SCHAPI's own statistics[7], three-quarters of the general public felt that they understood the vigilance maps, with around 80 per cent feeling sufficiently informed.

Before 2003, the responsibilities and organisational structures were much more disjointed and, confused than they are presently in England and Wales. The responsibility for flood warnings lay with the Ministry of the Environment from 1979 – 1999 and it suffered from having its staff dispersed across the country with no centralised technical support. The synergy between the meteorological and hydrological agencies remained poor in spite of signed agreements between the Director of Water and Météo-France.

Despite the problems with the French system before the creation of SCHAPI, significant reforms and positive changes have been made in the last 4-5 years. The French have demonstrated that in order to achieve considerable advances in weather forecasting and flood modelling and warning, the meteorological and hydrological agencies need to be located in the same area. At present SCHAPI is located in a new, but separate, building on the Météo-France site, however, they are examining the possibility of physically locating the national weather and forecasting teams within the same building.

[6] Central Flood Forecasting Service (SCHAPI) Flood Vigilance Maps, at www.vigicrues.ecologie.gouv.fr.

[7] Dr Francoise Bénichou and Jean-Michel Tanguy presentation for the World Meteorological Organisation symposium on Multi-Hazard Early Warning Systems for Integrated Disaster Risk Management entitled *Lessons Learnt from France's Awareness System for Enhanced Emergency Preparedness and Response Authorities*, 2006.

Close cooperation between hydrological and meteorological services *(continued)*

SMHI

The Swedish Meteorological and Hydrological Institute (SMHI) is a government agency which sits under the Ministry of the Environment and uses meteorological, hydrological and oceanographic expertise to provide public services, the private sector and the general public with important decision-making tools relating to the weather, water and climate.

SMHI's services include data collection, weather forecasting, warnings for extreme weather and other hazardous events, providing advice on interpretation of the warnings, inter-agency cooperation and research and development.

This joined-up approach to environmental hazards allows SMHI to provide wide-ranging information; from details of an impending storm, the spread of radioactive dust from a breakdown at a nuclear power plant, through to long-term climate change decisions.

The scope of SMHI is broader than that of SCHAPI and the fact that it is a single organisation, and has been for a number of years, means that it cannot easily be compared to structures in the UK. However, there are many similar lessons that we can learn from this joined-up approach such as joint weather and flood warnings, improved modelling and efficiency savings.

Section 3

Improved planning and reducing the risk of flooding and its impact

This section covers:

- building and planning;
- local flooding and drainage;
- flood defence;
- modernising flood risk legislation; and
- insurance.

Building and planning

This chapter examines building and planning controls that govern development in flood risk areas and measures that can be taken to make properties more flood resilient. It contains sections on:

- new development in flood risk areas;
- local planning decisions; and
- property level resilience and resistance measures.

Introduction

5.1 Around 10 per cent of properties in England are located on the floodplain. In addition, 11 per cent of new homes in England have been built in flood hazard areas since 2000.[1] This combination of a large number of existing properties and the need to manage further development emphasises the vital importance of strong planning controls.

5.2 The images of flooded developments during the summer of 2007 brought home vividly the importance of well-informed development control decisions. They also demonstrated that it is not possible to defend against all flooding and that surface water flooding can occur in areas that are not considered to be floodplain. This chapter considers both development control and the need for more flood-resilient properties.

New development in flood risk areas

5.3 We start from the view that any individual who buys a newly-built property should have a reasonable expectation that the property will not be prone to flooding and if, exceptionally, the property is built on the floodplain, the flood risk should be mitigated as far as possible. If properly applied, current government policy on development and flood risk – Planning Policy Statement 25[2] (PPS25) – supports this expectation.

5.4 Many of the submissions to the Review supported a strong presumption against building on the floodplain, although some would have liked the Review to go further. The Review received a number of submissions focused on proposed new development in areas, and in some cases specific development sites, that had flooded during the summer 2007 floods. Royal Sun Alliance said:

[1] House of Commons Communities and Local Government Committee, Planning gain supplement (London: Stationery Office, 2006), HC 1024

[2] www.communities.gov.uk/documents/planningandbuilding/pdf/planningpolicystatement25.pdf

"The floods of this summer demonstrated the risks of building on floodplains. R&SA would question whether it is ever going to be feasible to adequately defend properties built in areas of severe flood risk from flooding."

5.5 Around a quarter of properties that flooded in summer 2007 had been built in the last 25 years. A number of images of flooded properties from summer 2007 showed modern developments that had flooded. This reinforces the Review's conviction that strong controls on development on the floodplain are needed.

5.6 Development control is an essential element of flood risk management. The *Foresight Future Flooding* report recognised new development as one of the key factors that could increase flood risk in the future: therefore decisions made now about where to build houses could have a real impact on future flood risk.

"Influencing where to place new development is now recognised as a key tool in managing flood risk; however this does need to be balanced against other economic, social and environmental needs including the demand for new housing."

5.7 CLG estimates that nearly 16,000 dwellings were built in high flood risk areas in 2006 (not taking into account the precense of defences). The Review is of the opinion that, wherever possible, new development should not take place in flood risk areas and that there should be a strong presumption against building on the floodplain. Several submissions from the public called for an end to all new development on the floodplain, while others argued against a complete ban but were in favour of rigorous controls. Tewkesbury Borough Council noted in its response that many councillors "*do not generally accept that any building should take place in the floodplain*". However, the Review recognises that in some places, such as in London or Lincolnshire, this will not be possible. This approach is supported by the recent EFRA Select Committee report on flooding: "*Most witnesses did not support an outright ban on development in the floodplain. Hull City Council told us that 95 per cent of Hull was in a high flood risk area, and an 'overcautious' approach would result in no more development.*"

The Government's national policy on development on the floodplain is set out in PPS25. This policy promotes a strategic approach to managing flood risk: ensuring that flood risk is considered at all stages of the planning process; stressing the importance of flood risk assessments and consideration of all sources of flooding; and linking floodplain zones to appropriate development types. Alongside this policy, the Government has given the Environment Agency statutory consultee status in relation to all flood risk areas. Call-in powers have been made to address those cases where a local authority intends to approve a major planning application (ten or more dwellings) despite sustained objections from the Environment Agency. This means the decision can be considered by the relevant Government Office to decide whether to call it in so that the Secretary of State can make the final decision on whether the development can go ahead.

PPS25 is accompanied by a living practice guide. This was under consultation for six months and a revised version was published in June 2008. This should help ensure that the provisions of PPS25 are properly understood and includes useful case studies. It has been updated to include lessons relating to the summer 2007 floods, including a strong emphasis on understanding surface water flood risks. The guide also provides links across to other relevant planning statements such as PPS1[3] (Sustainability) and its climate change supplement. This supplement is particularly important as the value of land use planning in adapting to climate change is well recognised.

[3] ODPM, 2005. *Planning Policy Statement 1: Delivering Sustainable Development*

The Environment Agency has published guidance for developers '*building a better environment*' which sets out the key considerations for developers in relation to PPS25 and flags up the importance of flood risk assessments. The Royal Institute of British Architects is also producing guidance called '*Living with Water: Sustainable design for areas at risk of flooding*' for architects to encourage the development of more innovative solutions to development in flood risk areas.

Avoiding development on the floodplain

5.8 The strong presumption against developing on the floodplain in PPS25 is supported by the 'sequential test'. This test is essentially a means of avoidance planning – development should be directed to areas with the least risk of flooding. The test should be applied at the earliest stage possible – the Regional Spatial Strategies stage, when areas for significant development are determined – and should continue throughout the development cycle of Local Development Frameworks and individual development sites.

5.9 PPS25 and the sequential test split the floodplain into several probability zones and identify development that is compatible with each risk zone. For example, no residential development should take place in flood zone three (the highest flood probability zone). Table 1 below gives a brief summary of the flood zones.

Table 1 – PPS25 flood probability zones

Flood Zone	Definition	Examples of appropriate uses
One	Low probability – less than 0.1% chance of river or sea flooding in any year.	All uses of land.
Two	Medium probability – between 1%–0.1% chance of river flooding or between 0.5%–0.1% chance of sea flooding.	Water compatible uses. Less vulnerable uses such as shops and offices. More vulnerable uses such as hospitals and homes.
Three A	High probability – 1% or higher chance of river flooding or 0.5% or higher chance of sea flooding.	Water compatible uses. Less vulnerable uses. More vulnerable uses and essential infrastructure only allowed if exception test is passed. Highly vulnerable uses, such as basement dwellings and permanent caravan parks, are not permitted.
Three B	The Functional Floodplain – land where water has to flow or be stored in times of flood.	Only water compatible and essential infrastructure (subject to passing the exception test) is permitted.

5.10 Flood zone development is an approach adopted in a number of countries, including France and the USA. In the USA, its flood zones are linked to insurance provision. France links flood zones with hazards, such as flood velocity and depths. In England, consideration of flood velocity or depths will occur at the SFRA stage if the proposed development is in zones two or three. Mapping of flood velocities and depths could usefully be linked to enhance the flood zone approach in PPS25.

Flood risk assessments

5.11 The Review believes that the starting point for proper building and planning control is the development of a good flood risk assessment. Assessments can be produced at various levels to support different planning documents and strategies, such as Regional Spatial Strategies. Regional and local authorities should actively consult on Regional Spatial Strategies and Local Development Frameworks and should be clear about how their proposals deal with issues such as flood risk. The Review believes that the public should actively engage in these strategic consultations, when various options are discussed, instead of leaving their involvement until the point when an individual development proposal is put forward. The public should also be able to ask their local authority what flood risk assessments have been carried out for their community.

5.12 Table 2 below sets out strategies and corresponding flood risk assessments.

Table 2 – Planning strategies and flood risk assessments for England

Strategies	Flood Risk Assessment	Development stage and benefits
Regional Spatial Strategy (RSS)	Regional Flood Risk Assessment	An RSS will set indicative allowances for development in the region. A flood risk assessment should be used to make sensible allocation decisions and a high level sequential test should be applied. The RSS is open to public scrutiny. In England just under 90% of land is within Flood Zone 1 (lowest risk), so at a regional scale there will be many opportunities to locate development in this zone.
Local Development Framework	Strategic Flood Risk Assessment (SFRA)	The Local Development Framework is a collection of local development documents. These should reflect the Council's strategic planning policies and approach to flood risk set out in its core strategy. Flood risk should be factored into the detailed allocation of land use types across the local area. The SFRA will be more detailed than a regional flood risk assessment and provide a comprehensive assessment of flood risk for all types of flooding from across the local authority area. The SFRA provides the evidence for zoning and application of the sequential test. It is a publicly available document, as are Local Development Documents.

Strategies	Flood Risk Assessment	Development stage and benefits
Individual planning application	Site Flood Risk Assessment	A developer will submit an individual planning application and should submit an appropriate Site Flood Risk Assessment. Many planning applications are objected to by the Environment Agency on the basis of a lack of a flood risk assessment. The site specific assessment will provide more detail on the individual site risk and the impact of the proposed development on its own flood risk and that of neighbouring areas. If Local Development Documents are clear about the local planning authorities' approach to flooding, individual planning applications should reflect this both in terms of type of development proposed and any mitigation strategies (if in a flood risk area).

5.13 All local authorities should have produced, or be in the process of producing, an SFRA. These assessments enable local authorities and other interested parties to assess the flood risk in their area and facilitate the application of the sequential test. They should cover all sources of flood risk and be available to members of the public. They are generally produced for local authorities by consultants, and it was suggested to the Review that they are of varying quality. In part this could be due to the availability of data, cooperation between relevant organisations, and also the ability of the local authority to act in the 'intelligent client' role. It is hoped that, through the changes suggested elsewhere in this report, these issues will be resolved. Defra has commissioned a project to assess the coverage and adequacy of current SFRAs.

5.14 There may also be opportunities to reduce the costs and increase the benefits of SFRAs through local authorities sharing assessments, where appropriate. For example, where local authorities share the same catchment, it may be more effective to consider the catchment as a whole rather than repeating a significant amount of the same modelling work for two SFRAs. The Review understands, for example, that Doncaster is carrying out the development of its SFRA with Barnsley.

North-East Yorkshire Strategic Flood Risk Assessment

Ryedale District Council, Scarborough Borough Council and the North York Moors National Park Authority formed a partnership to enable a single SFRA to be prepared for the entire Upper Derwent catchment. This approach ensured that the policy recommendations and guidance within the SFRA reflected hydrological boundaries and was consistent across local authority areas. It also simplified the consultation process.

5.15 The Local Development Framework should set out areas that have the potential for development. The sequential test, supported by the SFRA, should be applied at this stage as well, and the local authority should aim to identify sites for development, including opportunities to manage and reduce flood risk to the community, such as water storage, large scale SUDS and exceedance routes, to help manage the residual risk to sites (see Chapter 6). It is at this point that real opportunities for the development of a wider range of approaches to managing local flood risk can take place.

5.16 The Review understands that local authorities are at different points in the development cycle, but it is clear that the

production of an SFRA, if not already carried out, should be a priority and any Local Development Framework amended accordingly. Where an SFRA has already been carried out but does not include an assessment of surface water flooding, the SFRA should be updated.

Applying PPS25 to surface water flood risk

PPS25 applies to all sources of flood risk. An SFRA should assess surface water flood risk and identify critical drainage areas. Good information is therefore needed from sewerage undertakers and other sources, including local knowledge, historic flooding and risk modelling. Local authorities should ensure that SFRAs carried out on their behalf adequately address this type of flooding. A thorough assessment of all flood risk is vital at the SFRA stage as the sequential test should be applied to proposed development in respect of all flood risk areas, not just development that is proposed in relation to the floodplain. Any site specific flood risk assessment should also thoroughly address the issue of surface water flood risk and its mitigation.

Developing an individual site

5.17 Once the location of the development has been determined, consideration of the development's layout is the next important stage. A site-specific flood risk assessment should be carried out for any individual development that is given the go-ahead and the sequential approach applied, as a site may have lower risk points on which the main buildings should be located. The assessment should be carried out on behalf of the developer, should be proportionate to the flood risk of the site and should take account of other assessments that have been produced. It should consider not just the development's risk of flooding but also the impact that the development will have on flood risk elsewhere.

Worcestershire Waterworks

When Worcester Waterworks was decommissioned the owners, Severn Trent Water, in partnership with the City Council planning department and the Environment Agency, agreed a scheme to restore the land to a public park, Gheluvelt Park. Major improvements to flood management were achieved by removing a flood wall, removing 17 brick and concrete tanks, recontouring the site and restoring the active floodplain.

Housing was developed on an adjoining site, not at risk of flooding. A local river (Barbourne Brook) was also broken out of its culvert and allowed to flow freely through the park and into the river.

Worcester was flooded during the summer 2007 floods and the design worked. The park kept flood levels down in the city by providing a much-needed extra four hectares of flood storage capacity (and throughflow of flood water) and the new housing on its edge did not flood.

5.18 Guidance published by the Royal Institute of British Architects (RIBA) this summer will highlight some of the approaches architects can take to make developments more resilient in flood risk areas, including through careful site layout, building design and the use of resilient materials, which is covered later on in this chapter. PPS25 encourages developers and local authorities to seek "*opportunities to reduce the overall level of flood risk in the area through the layout and form of the development.*"

5.19 PPS25 actively encourages the appropriate application of SUDS, as do Building Regulations (part H)[4].

[4] Building Regulations 2000. Approved Document H: H3 *Rainwater Drainage* website: www.planningportal.gov.uk/approveddocuments

Stamford Brook development and the restoration of Sinderland Brook

Sinderland Brook was canalised in the 1970s by the local water authority. In the late 1990s a proposal to restore the brook and its floodplain was prepared by the National Trust, the implementation of which became a condition of the Development Agreement between the developers (Redrow Homes and Taylor Wimpey) and the Trust. The aim of the project was to transform the canalised watercourse, which was previously restricted to a floodplain offering only limited protection to the development site and established residential properties to the north, to a dynamic meandering river allowed to adjust within its own semi-natural floodplain.

This project has turned a previously canalised and straightened brook back into a meandering stream with its natural floodplain. At 1.8 km, this is the largest river restoration project in England. The initial 1.3 km of the restoration scheme was funded by the National Trust and the developers, with the Environment Agency contributing to the final phase of around 500 metres.

The development also includes a sustainable urban drainage system (SUDS). Surface water run off from roofs, parking courts and driveways is piped into a series of temporary ponds (swales) that run through the development through wildlife corridors. The water can be stored safely in the ponds, which allow the water either to percolate back into the ground or discharge into the restored Sinderland Brook river corridor. The SUDS system has been designed to store a 1 in 100 annual chance of occurring flood event.

A key feature of the Sinderland Brook restoration is a restored and dynamic river environment, which contributes notably to local environmental quality and which significantly enhances flood protection for the site and an established residential community to the north. Not only has the level of flood risk been reduced from 1:35 years to 1:300 years, the Sinderland Brook restoration rationalised the flood envelope such that the developers could actually build more houses on the site.

85 per cent of respondents to a recent stakeholder survey, which included local residents, agreed that the landscaping of the development and the river restoration had improved the local area.

5.20 Many concerns have been raised with the Review about the impact new development is having on neighbouring existing developments. This issue was raised during visits to Gloucestershire and from submissions from Tewkesbury in particular. PPS25 is clear that new development should not result in increased flood risk elsewhere, and individual site flood risk assessments should demonstrate how this is being ensured. We endorse this approach.

Local planning decisions

5.21 PPS25 states that, following the application of the sequential test, and where there is no suitable land in lower risk zones, development may go ahead in exceptional cases – the so-called 'exception test'. However, in applying this test the local planning authority must demonstrate that other sustainability criteria outweigh the flood risk, that the risk can be mitigated and that the site is safe. Local authorities have a strong leadership role here in ensuring that flood risk is properly reflected in these deliberations.

5.22 Local authorities can fulfill this role by ensuring that they understand the risk faced in their area (from all sources of flooding) and have clear planning policies, the technical capability to assess submissions by developers and their partners, and good links with relevant departments, such as emergency planners. Local authorities in Norfolk, for example, actively involve their emergency planners in the planning process.

Developer contributions

5.23 Where development is exceptionally permitted in flood risk areas, developers should contribute the full costs of any new defence or mitigation measures that are required as a result, including future maintenance costs. Consideration needs to be given to what is termed 'the life of the development' and to potential climate change impacts. This can be done through a Section 106 agreement under the Town and Country Planning Act[5] which allows a local planning authority to enter into an agreement with a developer to fund specific measures related to individual developments.

5.24 The Home Builders Federation noted in its submission to the Review that: "*On the matter of developers making full contributions to the cost of flood defences, where this is apportioned to the site being developed this should not be a problem. However, if this involves contributions to cover a historic lack of investment in the surface water infrastructure we would express a concern about the implications.*"

5.25 The Town and Country Planning Association in its submission to the Review highlighted the lack of local authority supplementary policy documents on developer contributions that address flood risk management infrastructure needs. They examined the policies of several of the local authorities that had experienced flooding in summer 2007. Some local authorities also indicated in their response to the Review that a full contribution could put developers off some sites that the authority wished to regenerate. Most local authorities recognised that for developers to contribute, dialogue between the authority and the developer needs to take place at an early stage. A clear policy statement can help this process. **Therefore, the Review would welcome where they have not already done so, local authorities developing and publishing a policy on developer contributions in relation to flood risk management**.

5.26 In future, where development is being considered at an early stage as part of a wider plan, the Community Infrastructure Levy[6] currently under development by the Department for Communities and Local Government (CLG) may be an appropriate funding tool to pay for wider flood risk infrastructure needs. This levy is aimed at funding infrastructure needs across a wider area than individual sites, and some submissions noted that it may be a way of raising funds for more strategic surface water management opportunities, such as water storage or large-scale sustainable drainage systems that benefit more than one development.

5.27 PPS25 was published in December 2006. The Review has received generally positive feedback on PPS25, with most organisations of the view that it is going in the right direction and that it needs to be given time to 'bed in' and take effect. West Berkshire Council's review into last summer's floods concluded that: "*The advice issued by the Government in Planning Policy Supplement [sic] 25 provides clear guidance on the process and criteria for the building on and development of areas prone to flooding.*"

RECOMMENDATION 7: There should be a presumption against building in high flood risk areas, in accordance with PPS25, including giving consideration to all sources of flood risk, and ensuring that developers make a full contribution to the costs both of building and maintaining any necessary defences.

[5] *Town and Country Planning Act 1990:* www.opsi.gov.uk/ACTS/acts1990/Ukpga_19900008_en_1.htm
[6] www.communities.gov.uk/publications/planningandbuilding/infrastructurelevyguidance

Planning capability

5.28 In order to deliver effective development control to manage flood risk and climate change, local planning authorities need to be able to deal with a range of strategic and technical matters. They need both the capability and capacity to handle planning applications. They need time not only to consider the applications when they are submitted but also to engage with developers, the Environment Agency, local authority members and other interested parties in advance of any specific applications, as this can be the time when more effective schemes can be considered. In evidence to the Review, the Association of Drainage Authorities highlighted the benefits of engagement at an early stage of preparing the site layout plan.

5.29 In Chapter 6 we highlight the importance of local authorities having their own technical capability. This is also the case for development control, ensuring that applications are scrutinised effectively and supporting assessments such as SFRAs and other flood risk assessments are properly developed and assured. The general capacity and capability of local planning authorities were queried in the EFRA Select Committee report, which called on the Government and the Local Government Association to carry out a survey of the present ability of local authorities to implement PPS25. **The Review welcomes this suggestion**.

5.30 In addition, the Environment Agency, as the flood risk adviser, needs to ensure that it has enough planning advisers and technical staff to deal with planning applications and queries promptly and effectively. It needs to have the technical capability to deal with all sources of flooding. The Review notes that the Environment Agency is increasing its planning liaison staff substantially over the next three years in recognition of the increasing demands in this area.

The Environment Agency identified its Planning Liaison Service, which acts as a consultee to developers on pre-application discussions and local planning authorities on planning consultations, as being a crucial element of its business.

Over the period 2006–09 an additional £2.8 million has been invested in the Planning Liaison Service to create around 60 additional planning posts. The Environment Agency sees this as an illustration of the importance that it attaches to planning as a means of avoiding future flood risk.

5.31 The Review has received encouraging information from the Royal Town Planning Institute that flood risk and climate change are well addressed in current planning training. It is important that planners, as part of their continuing professional development, ensure that they are fully up to date on these issues. Local authorities in high flood risk areas should make provision for this training. Local authorities can also ensure that training is more effective by bringing together building controllers, emergency planners and other technical staff for training days; this will build understanding of their respective areas and how they relate to both national and local issues.

5.32 CLG and the Environment Agency have also been holding road shows on PPS25 and its implementation for both local authority planners and Environment Agency planning liaison officers. In addition, they are carrying out a series of training events for Government Offices and planning inspectors so that they clearly understand the relevant guidance. The Review is of the opinion that, if local planning authorities are to take a strong role in this area, they need to have confidence that the planning system will support their application of PPS25. **We welcome the work under way to deliver this**.

Monitoring planning decisions in flood risk areas – HLT5 Report

The Environment Agency's High Level Target 5 requires it to report to Defra and CLG on the impact of its technical advice on flood risk to local planning authorities in England. The report highlights where advice has been followed and where planning decisions have gone ahead despite sustained Environment Agency objections. The most recent report for the period April 2006 to March 2007 indicated that local planning authorities in England gave permission for 13 major developments to go ahead against Environment Agency advice on flood risk. Of these objections, five related to concerns about surface water drainage and the potential increase in flood risk for neighbouring areas.

The number of planning applications requiring detailed consideration on flood risk grounds declined slightly (down from 11,403 in 2005/06 to 10,854 in 2006/07). However, the proportion of flood risk assessments submitted with planning applications, but considered unsatisfactory by the Environment Agency, increased. The lack of a satisfactory flood risk assessment accounted for 62% of all initial objections.

Monitoring and enforcement

5.33 One of the biggest development control issues raised with the Review was the monitoring and enforcement of development conditions after approval has been granted. Local authorities and the Environment Agency have indicated that they do not have the resources to monitor whether development conditions have been adhered to; generally, the only inspection that takes place is reactive, following complaints. Clearly this is not satisfactory where flood risk is concerned – the reactive point may only occur when the development or neighbouring properties have flooded. Local planning authorities should develop a system of monitoring for development control decisions; this could be through an extension of the existing building control system for Building Regulations. In high flood risk areas this should be a priority issue for the local authority.

Cypress Gardens is an estate in Longlevens, Gloucester, built within the last ten years on lowlying land adjacent to a brook. It was severely affected by both the June and July events, with flood water from both the brook and overflowing sewers causing water levels to reach 4 feet in some properties. In contrast, the surrounding area seemed to cope. There has been criticism that insufficient attention had been paid to the drainage of the estate and to maintenance of the brook and flood defences. However, the developers counter that all relevant planning and building approvals were granted.

Moving PPS25 forward

5.34 The Review has received evidence from CLG on its plans to develop a full evaluation strategy for PPS25 by December 2008. This will seek to measure the effectiveness of PPS25 and the new call-in powers by drawing together data from a range of sources that monitor PPS25, including:

- data on planning applications approved against Environment Agency advice, from the Environment Agency's High Level Target 5 (HLT5) monitoring of local authority performance on planning applications involving flood risk;
- data from HLT5 and Government Offices on how the Flooding Direction is working;
- feedback from Government Offices on how PPS25 is being reflected in regional and local plans;
- feedback from stakeholders (including from the June 2008 round of regional seminars); and
- Defra research into the coverage and adequacy of SFRAs.

5.35 CLG is working with Defra, the Environment Agency and the Association of British Insurers to bring together all relevant data on the effectiveness of PPS25. **The Review welcomes this approach and trusts that any improvements that this work identifies will be reflected in relevant guidance.**

RECOMMENDATION 8: The operation and effectiveness of PPS25 and the Environment Agency's powers to challenge development should be kept under review and strengthened if and when necessary.

Urban creep

5.36 'Urban creep' refers to the cumulative impact that paving over front and rear gardens is having on our towns and cities. This can have a significant impact on the natural drainage of surface water, as water that previously soaked into the ground has nowhere to go and can increase the risk of surface water flooding. Additional home improvements, such as the addition of conservatories for example, can also make increased demands on surface water drainage systems. Many responses to the Review felt that the summer 2007 floods were in part a result of the loss of many permeable surfaces in urban areas. There was significant support for the proposal to remove the right of householders and business owners to lay impermeable surfaces. Such a move would mean that people would require planning permission if they chose impermeable surfaces, but not if they chose permeable surfaces such as gravel or permeable paving. Some councils such as Oxford are already encouraging a move to the use of permeable surfaces in new developments. Slough District Council noted:

> *"In our urbanised area the permissive planning rights of householders have been found to have increased flood risk significantly in two ways. The construction of structures, in flood flow paths, has resulted in a significant increase in the width of the flooded area, as the flow spreads to find a clear path. The hard landscaping of both front and rear gardens without provision of drainage has significantly increased the incidence of localised surface water flooding."*

Permeable Paving

There are several types of permeable paving including:

- gaps between the concrete/stone slabs to allow water to drain through to a porous sub surface;
- porous concrete paving to allow water to drain directly through the paving slabs to a porous sub surface;
- grass paving which has a mesh cover to ensure rigidity; and
- gravel or other similar products overlaying a porous sub surface.

5.37 Concerns were also raised, however, that any new process to tackle this issue should not overburden the planning system. The changes will need to be well publicised and associated guidance will need to be produced and readily available. Planning permission will then need to be sought only where the materials are not permeable, minimising any additional strain on the system.

5.38 In some high flood risk areas, permitted development rights in relation to back gardens have already been removed, for example in relation to extensions. This does not necessarily mean that changes cannot be made, but planning permission and greater consideration of design and materials are required. While the cumulative impact of paving over front gardens is well documented, there is less information on the impact of paving over and building on back gardens. The Review is of the opinion that such building will, however, clearly have an impact as it further reduces opportunities for surface water to soak into the ground.

5.39 The Government announced in February 2008 in *Future Water*, its new water strategy, that householders will no longer be able to lay impermeable surfaces in front gardens as of right. This change is due to be implemented in October 2008. In evidence to the Review the Government has suggested that two guides will be prepared to accompany this change: one targeting householder needs and one focused

on the construction industry. The Review understands that work is now taking place to address this issue in relation to businesses and the Government hopes to consult on this in summer 2008. **The Review welcomes this**.

5.40 The Government is of the view that there is insufficient evidence that hard paving back gardens and other areas is having as much impact on increasing the rate and speed of surface runoff as front gardens. The Review believes, however, that it makes sense to retain as much natural drainage as possible in the urban environment and therefore would also like to see the Government explore this issue further and come forward with and consult on proposals in relation to back gardens. There will be a number of land uses, such as roads and public buildings, that involve significant use of impermeable surfaces and the Review would encourage Government to explore more generally the impact of widespread use of impermeable surfaces across all uses.

RECOMMENDATION 9: Householders should no longer be able to lay impermeable surfaces as of right on front gardens and the Government should consult on extending this policy to back gardens and business premises.

Sewerage systems – the automatic right to connect

5.41 Our interim report recognised that many of the public sewerage systems appeared to be under strain during the summer 2007 floods. The capacity of the public sewerage system to deal with additional surface water flows is limited, unless expensive and disruptive works are carried out; it therefore makes sense to place some checks on the system that allows surface water connections. OFWAT said:

> *"We support an approach that would keep excessive rainwater out of sewers since making all combined sewers bigger would be both prohibitively expensive and would not address flooding from sea, rivers or surface water flow once sewers and drains are overwhelmed."*

5.42 The Review received a significant number of responses supporting the conclusion in the interim report. Most felt that removal of the automatic right to connect would encourage greater consideration of SUDS.

5.43 Thatcham Town Council, reflecting upon its own experiences during the flooding said:

> *"A significant number of flooding incidences have been exacerbated by the increasing inability of existing drainage/sewer systems to cope with moderate rainfall due to new development connecting into existing, already overloaded, systems. We believe that this would push developers into looking at SUDS options rather than relying on mains systems. SUDS should be a first option and this will be the ethos around our Supplementary Planning Document."*

5.44 Sheffield City Council pointed out:

> *"In many urban areas the public sewers are the only possible option for surface water discharge. The discharge can and should be strictly limited, but enforcement of soakaways in restricted locations on top of impermeable sub-strata will only result in increasing ground water problems for adjacent buildings, particularly on sloping ground."*

5.45 The Government's *Future Water* strategy included consultation on a review of S106 of the Water Industry Act (1991). This proposes a number of options for amending the right to connect, including an outright refusal and a range of options that might be combined together to promote greater consideration of alternative options. Conclusions from this consultation are due later this year.

5.46 While the Review does not have a preferred approach in relation to the five options proposed in the *Future Water* consultation, it does not support a complete ban. For some developments there may be no alternative but to connect to the public sewer system, and the surface water will need to go somewhere. However, a system that makes developers stop and think about

alternative approaches to dealing with surface water flooding is consistent with the Review's approach in Chapter 6 in advocating a more flexible and risk-based approach to managing the whole drainage system.

RECOMMENDATION 10: The automatic right to connect surface water drainage of new developments to the sewerage system should be removed.

Property level resilience and resistance measures

5.47 The events of summer 2007 demonstrated the devastating impact that flooding can have on homes and businesses: some 4,750 households are still displaced as a result. The Review's Insurance and Health Impacts Survey (see Chapter 9) demonstrates the large proportion of households that had to move out of their homes in the summer (62 per cent) and long lengths of time out (around 12 per cent have waited six months or longer). It is crucial to acknowledge in policy-making the emotional impact of being displaced for long periods of time and having to cope with the repair process. This can have a significant effect on people's well-being.

5.48 Resilience and resistance measures can help to minimise the damage from flood water and greatly reduce the length of time needed for recovery of a building. Resistance measures are aimed at keeping water out of buildings – or at least minimising the amount that enters, through the use of barriers (such as door guards to seal entry points). Resilience measures (for example, the use of waterproof plaster or stone flooring) are aimed at minimising the damage caused when a building is flooded, allowing recovery to take place as quickly as possible.

5.49 A study by the ABI and the Building Research Establishment[7] reported that resistance and resilience measures can often mean that essential services can be maintained during a flood event and flooded properties can be cleaned, dried and restored with the minimum of disruption.

5.50 Recent research by Defra[8] showed the economic benefits of resistance and resilience measures. Resistance measures designed to keep water out are worthwhile for properties with an annual chance of flooding of 2 per cent or above and, for the most frequent floods, the benefits outweigh the up-front investment by a factor of between 5-to-1 and 10-to-1. Resilience measures are worthwhile if incorporated into the design of a new property or when installed in a building which is being extensively refurbished. In these situations the extra cost is relatively low compared to standard materials, with resilience measures becoming cost beneficial for properties with a four per cent or greater annual chance of flooding.

[7] Association of British Insurers, 2002, Assessment of the cost and effect on future claims of installing flood damage resistant measures

[8] Entec/Greenstreet Berman (2008) Developing the Evidence Base for Flood Resilience. Research Report prepared for the Joint DEFRA/EA Flood and Coastal Erosion Risk Management Research Programme

Resilience measures – the power to make a huge difference

A house near Worcester flooded in 2000 and then again in summer 2007. Following the flooding of the lower ground floor in 2000 (making the affected rooms unusable for seven months), the householder put in place a series of resilience measures, including:

- replacing doors with lightweight versions that could be removed and taken upstairs if necessary;
- moving electricity sockets higher up the walls;
- laying down concrete floors and adding cement-type plaster to the walls; and
- using yacht varnish to make wooden skirting boards water-resistant.

These measures meant that, after the house was flooded in summer 2007, the householder was able to disinfect the affected rooms and let them dry out. The rooms were only unusable for four weeks, and the householder did not have to make an insurance claim. She was able to move back in once a breach in the concrete floor had been repaired, with the only loss being a carpet. The householder says: "*it [the resilience measures] made a huge difference to me – coupled with the fact that there was no need for an insurance claim. And, yes, I am a total convert!*"

5.51 Despite the obvious benefits of resilience measures, take-up is still low. Even in properties that were refurbished after the floods, the Review found little evidence of simple, low-cost measures being taken (such as moving electrical circuits to a higher position). In discussions that the Review held with Hull City Council, they revealed that they had looked at simple measures that could be implemented for some of the housing for which they were responsible. In one sheltered housing scheme they laid a solid screed floor down, although they still put carpets on top. In many properties they moved boilers to a more suitable location. Some tenants rejected changes because they were reluctant to accept that they might flood again.

5.52 A study by Norwich Union of 1,500 UK residents living in areas hit by the summer 2007 floods revealed that people had done little or nothing to reduce the risk of future damage. Some 83 per cent of people living in Gloucester, Tewkesbury, Hull, Sheffield and Rotherham believe that there is nothing they can do to protect their homes from flooding, and 95 per cent have not taken any measures that could help to prevent (or significantly reduce) the stress and emotional trauma of future similar events.

5.53 Some 46 per cent of people surveyed said that they had chosen not to make any changes to their property because they "wanted their home put back exactly as it was before". Others (46 per cent) said that they did not think it was their responsibility to make changes – that this lay with their local authority or with the Government.

5.54 These findings are especially alarming as the survey was undertaken in severely flood-hit areas not long after the event. And evidence shows that public awareness diminishes greatly following a year or so without any flooding – highlighting how difficult it is to get people to change their behaviour.

Norwich Union's study of 1,500 UK residents living in areas hit by summer 2007's floods revealed that:

- only 5 per cent of people have taken measures that could help to prevent (or significantly reduce) the stress and emotional trauma of future similar events;
- 83 per cent of people believe there is nothing they can do to protect their homes from flooding;
- 46 per cent of people said that they had chosen not to make any changes to their property because they "*wanted their home put back exactly as it was before*";
- another 46 per cent said that they did not think it was their responsibility to make changes;
- 31 per cent of people said that they did not know what they could do to protect their homes;
- 21 per cent of people said that it would be too much hassle to make their homes flood-resilient, and another 20 per cent believed that it would be too expensive; and
- nationally, 79 per cent of people think there is nothing that can be done to protect homes from flooding other than moving furniture or using sandbags.

5.55 Recent research (Entec/Greenstreet Berman) commissioned by Defra also looked into the nature of some of the barriers to change. The survey indicated that, whilst householders and small business could often recognise the benefits, including reductions in the disruption caused by floods, long-term financial savings and feelings of greater safety, the main factors deterring take-up were:

- low awareness of the available measures, with only one in ten householders being able to think of a flood resilient measure;
- concerns about impacts on the appearance of the property;
- not wishing to be reminded of the risk; and
- concern that such measures might adversely affect property values or make them hard to sell.

5.56 In addition, while the research indicates the clear benefits of resistance and resilience measure in properties at high flood risk (see above), the Defra study suggests that individual householders and businesses might not perceive the benefits in the same way. Insurance covers many of the financial effects of flooding. But current evidence suggests insurers generally reduce excesses in response to property risk mitigation measures, but rarely reduce the cost of the annual premiums. This means the financial benefits to the individual householder or business are more limited, with the research indicating that measures only become financially beneficial to householders and small businesses if flood risk is extremely high at the 10–20 per cent annual risk level or above. But while insurers would gain much of the financial benefits of these measures, they too have little incentive to invest in making properties resilient to future flooding when they know customers can simply move to another insurer.

Designing resilience and resistance into new buildings

5.57 In view of this evidence, the Review believes it is important that developing flood-resilient properties should become the norm rather than the exception. The Government has produced guidance for developers on flood-resilient construction, but the Review found little evidence that such measures are actually being incorporated – developers report that they are low on most customers' list of priorities.

5.58 Flood-resilient construction techniques have improved significantly over the years and have been used to good effect in a number of countries in Europe such as the Netherlands, France and Germany. The Water Law introduced in Saxony in 2004 requires everyone who has properties in flood risk areas to take mitigating actions to protect their property (e.g. through resistance and resilience measures) within their means.

5.59 The simplest (and perhaps the only) way of ensuring that appropriate flood-resilient measures are taken is to include a requirement in Building Regulations – a proposal that received strong support from a wide range of stakeholders following the publication of our interim report.

5.60 The Government has indicated that it intends to include such a requirement in the next version of the Building Regulations, subject to the necessary consultation and impact assessment, which is due to be published in 2010. **The Review welcomes this intention.**

5.61 RIBA is due to issue guidance on '*Sustainable design for areas at risk of flooding*' later this year. As it states in *Living with Water: Visions of a Flooded Future*, new challenges drive innovation in design and construction. A more concerted effort, one that harnesses the drive and ambition of both the public and the private sector, will be needed if the challenges of climate change are to be met. The Government should work with the building industry and with organisations such as RIBA to encourage flood-resilient design and development. RIBA is already taking this forward. **The Review welcomes RIBA's plan later this summer to launch a competition in association with Norwich Union that will challenge architects to design a flood-proof house**.

National competition – innovating flood resilient design

Norwich Union are proposing the launch of a national competition, in partnership with RIBA, asking architects to design a flood-proof house. It is hoped that this will present some innovative solutions to the problem of building on floodplains, and that the winning design can then be implemented into the house builder's developments.

They believe that this competition will make a real difference to the national debate of where, and how, to build sustainable properties. It is hoped that this competition, which is due to be launched during the summer of 2008, will generate viable solutions.

Retro-fit to existing buildings

5.62 New properties make up only around 1 per cent of the total property stock every year in the UK, and so the need to adapt existing properties (10 per cent of which are situated in flood-risk areas) is a major challenge. The typical cost of properly applying resilience and resistance measures to an existing property can range from £3,000 to £10,000 for a single residential home. Installing measures at the point of refurbishment can reduce the cost. Some extremely beneficial measures might not end up costing any more than standard repairs, and could pay for themselves following a single flood event.

5.63 However, the Defra analysis described above indicates that while there can be clear benefits, insurance could be having a particularly significant impact. Insurance premiums generally do not reflect changes made and insurers will generally not pay for 'betterment' of a property, but only for like-for-like repairs. Some companies will, however, allow the policyholder to pay the extra for flood-resilient repair, but there is little awareness of the risks and options.

[10] Bowker P, 2007, Flood Resistance and Resilience Solutions: An R&D scoping study, R&D Technical Report

5.64 The Review has heard examples of insurers and loss adjusters being flexible in certain instances following the summer floods. Some customers wanted to do things differently with their properties, for example, changing the type of plaster or laying concrete floors rather than wood. In discussions between the insurers and the customers, some of the insurers paid for these alterations without passing on any of the additional costs.

5.65 The ABI has produced two leaflets on resilient repairs for handout following a flood. One leaflet is aimed at loss adjusters to raise their awareness at what is possible and the other is aimed at policyholders. In evidence to the Review, the Chartered Institute of Loss Adjusters said:

> *"Whilst we see the benefit of advocating such repairs it presents difficulties as insurers will generally not meet the extra costs. The potential for disputes with policyholders over costs which will not be covered is significant and can easily damage the prospects of a smooth claim."*

5.66 The Review considers that the reluctance to consider resilience measures by a significant number of those affected by flooding illustrates the need to extend building regulation coverage in this area to refurbishments. The Review considers that the Building Regulations should be extended to ensure that where a property in a high flood-risk area is undergoing significant refurbishment (for whatever reason), flood-resilient or flood-resistant materials should be used. This is consistent with the building regulations on thermal efficiency. Where it differs is that it will not be applicable to every property – criteria will need to be developed to identify which properties the regulations apply to. The regulations will also need to indicate what is considered to be major refurbishment.

5.67 This proposed extension to the Building Regulations received widespread support from the stakeholders who responded to our interim report. It has the advantage of increasing resilience in the existing stock that is most at risk (including those properties that are undergoing refurbishment because of flooding), while ensuring that the issue of improvements in relation to insurance is addressed (insurers will pay for improvements that are subject to a legal requirement). The Local Government Association said:

> *"The current system of reinstating materials and fixtures and fittings that are inappropriate in a flood risk area is completely at odds with the principles of sustainable development and waste reduction"*

5.68 In response to this suggestion, insurers flagged up the possibility that it would lead to higher premiums as they absorbed extra costs. The Review is of the opinion, however, that many straightforward resilience measures will be no more costly than normal reinstatement measures. Costs are also likely to fall in the long term as measures become more mainstream. Making the existing housing stock more resilient should also lead to long-term benefits for the insurance industry overall.

RECOMMENDATION 11: Building Regulations should be revised to ensure that all new or refurbished buildings in high flood-risk areas are flood-resistant or resilient.

Technical advice

5.69 With the incorporation of flood-resilient and flood-resistant requirements into Building Regulations, there may be issues of capacity and capability. It will be important that high-quality advice, products and installers are widely available. This will avoid slowing down the restoration of homes after flooding and causing further distress.

5.70 The incorporation of appropriate flood-resilient and flood-resistant measures into properties depends on high-quality advice, products and installation. It is essential that the right measures are identified and that they are tailored to the property in question. This means that it is important to have a good idea of the type, depth and velocity of potential future floods. Surface Water Management Plans, once developed, should be used to identify residual risk and to indicate locations where measures might be appropriate.

5.71 While some flood-resilient measures (such as waterproof lining and painting) are relatively easy and generally have universal benefits, individuals who are considering more advanced work – particularly putting in place resistance measures aimed at keeping flood water out – should always seek advice to ensure that they are not wasting money. People should also be careful to avoid any flood-resistant measures that could potentially be dangerous – such as measures that actually end up causing long-term structural damage to the outside walls.

5.72 Mechanisms need to be in place to ensure that property owners are aware of their specific risks and of what they can do. It will also be important that such advice guards against taking large-scale resistance measures that could actually make the impact of flooding worse for others, for example by directing the water into other properties.

5.73 Although there is a British Standards Institution kitemark for flood protection products, there is currently a lack of providers of specialist advice. The Review understands that the Royal Institution of Chartered Surveyors (RICS) is looking into setting up a qualification scheme to ensure that surveyors (some of whom work for insurers) have the specialist knowledge to carry out flood-risk assessments of properties and to ensure that the appropriate measures are installed. Such assessments might cost between £500 and £1,000, according to RICS. **The Review would welcome the development of such a scheme**.

Increasing the take-up of resilience and resistance measures

The role of public bodies

5.74 The Review recognises that it will take some time to incorporate resilience and resistance requirements into the Building Regulations, and would like to see local authorities and social housing organisations playing an important role in increasing the voluntary take-up of such measures. One way of doing this is leading by example, and using flood-resilient materials in the refurbishment of houses, schools and other properties.

Flood resilient repairs to council homes

Flood resilient repairs to hundreds of council homes in Toll Bar, Doncaster, damaged by the floods in the summer of 2007, mean that returning residents are now better equipped to recover from any future floods.

St Leger Homes of Doncaster, the organisation that manages 22,000 homes on behalf of Doncaster Council, has implemented a series of 'flood resilient' repairs to 138 properties in the area.

Special modifications include waterproof plaster and wall covering as well as chemical waterproofing of concrete floors. Waterproof medium density fibreboard (MDF) will be used instead of traditional wooden skirting boards and architraves.

The homes, originally planned for improvements under Doncaster Council's Decent Homes Scheme in 2009/10, have been brought forward in the scheme and the flood resilient repairs will form a part of wider improvements to kitchens, bathrooms and electrical wiring.

Work is currently underway on a pilot property in Villa Gardens, with the remaining homes planned to be finished by August 2008.

5.75 Some respondents to the interim report have suggested that all public authorities should do this – including central and regional government. The Review notes that building resilience is one of the measures addressed by the Code for Sustainable Homes which applies to public buildings.

5.76 Funds to help communities recover are often channelled through local authorities, and these bodies should consider in each case whether it is appropriate to use the money to improve property resilience. Local authorities in affected areas should also make use of their powers under the Regulatory Reform (Housing Assistance) (England and Wales) Order 2002 to extend home improvement grants and loans to householders and businesses that wish to restore their properties using flood-resilient or flood-resistant materials.

Local authority grant scheme

In light of the summer 2007 floods that affected the area, Cheltenham Borough Council (CBC) received a government Flood Recovery Grant totalling £646,500, available to be spent as they wished and intended to support the work of the authority in helping those in greatest need get back on their feet.

CBC allocated £50,000 of its Flood Recovery Grant to flood resilience grants for property owners, up to the value of £500 per property.

The £500 grant is primarily for 'flood protection' measures; however, CBC has not ruled out giving grant assistance for 'flood resilience' measures and has referred enquirers on this to the guide *After a Flood, How To Restore Your Home* produced by the Environment Agency in partnership with the Construction Industry Research and Information Association (CIRIA).

The scheme has been promoted at two public meetings. In addition a letter containing relevant information and an application form for the scheme was sent to the 150 properties that were so severely affected that the occupants had to move out.

To date 50 grants have been made, accounting for £20,905 of the budget. Some 22 of the claims, totalling £9,773, have already been paid.

RECOMMENDATION 12: All local authorities should extend eligibility for home improvement grants and loans to include flood resistance and resilience products for properties in high flood-risk areas.

Defra grants pilot

5.77 The Review has received evidence from Defra on its recently completed pilot scheme to pay for grants for the installation of flood resistance and resilience measures. The pilot was developed to help Defra take a decision on whether the funding (or partial funding) of these measures should feature in their long-term approach to flood risk management. The pilots were concentrated in areas where properties were at risk from flooding, but were unlikely to receive any flood defence schemes in the foreseeable future. The pilot results will help inform their understanding of the effects of financial incentives on the uptake of resistance and resilience measures.

5.78 Six pilot schemes were commissioned in:

- Uckfield, East Sussex
- Bleasby, Nottingham
- Sunderland Point, Morecambe, Lancashire
- Kirkby-in-Furness, Cumbria
- Appleby, Cumbria
- Dunhills Estate, Halton, Leeds

These areas provided a range of different properties and flooding types. Many were in rural areas.

5.79 The results from these pilots are currently being considered alongside the evidence from the accompanying research project on barriers to uptake. In evidence to the Review, Defra indicated that it intends to consult on its approach to resilience during summer 2008. **The Review welcomes this and other approaches that encourage the uptake by households and businesses of resilience and resistance measures**.

Businesses

5.80 There are clear benefits to installing flood-resilient or flood-resistant measures in business premises as well as in private homes. Buildings should be able to be reoccupied more quickly as a result, and the amount of time and money needed to get back into operation should be reduced.

5.81 Businesses need to assess the risk of flooding and the potential impact on their trade. While the Review found that businesses were generally very proactive in recovering from the floods, they were less well prepared in terms of pre-flood resilience.

5.82 Again, take-up of flood-resilient or flood-resistant measures – even in flood-hit areas – is low. Resilience measures should be included in all business continuity plans created by organisations in flood-risk areas. Such measures provide long-term benefits, and generally represent a sound business investment. They should always be encouraged.

Businesses – Impact of the summer floods

The Chartered Management Institute in its report, Business Continuity Management (March 2008) carried out a survey of businesses and organisations to find out how far they had been affected by some high profile disruptive incidents during the previous 12 months (which covered the summer 2007 flood events). In respect to flooding, the proportion of businesses reporting severe disruption was:

- 33 per cent in Yorkshire and the Humber;
- 25 per cent in the West Midland;
- 16 per cent in the South West; and
- 9 per cent in London and the South East.

In respect to those respondents affected by flooding:

- the average period of disruption was 8.75 days;
- 12.2 per cent said they had taken measures to mitigate against the effect of flooding; and
- 1.6 per cent said they were considering relocation to premises less vulnerable to flooding.

5.83 The Review welcomes the ABI's decision to highlight resilience measures in its recently published guidance on insurance for small businesses (see Chapter 9). But we would like to see the insurance industry doing even more to increase the take-up of these measures by businesses, for example by reflecting risk mitigation measures in premiums.

5.84 Local authorities can also play a role. In carrying out their responsibilities under the Civil Contingencies Act to promote business continuity, they should be encouraging the consideration of flood-resilient and flood-resistant measures. Business continuity guidance should reflect the benefits of such measures.

RECOMMENDATION 13: Local authorities, in discharging their responsibilities under the Civil Contingencies Act 2004 to promote business continuity, should encourage the take-up of property flood resistance and resilience by businesses.

[11] www.managers.org.uk/listing_1.aspx?id=10:106&id=10:9&doc=10:5128

Chancellors
For Sale
SOLD
Bellard

Local flooding and drainage

This chapter examines how flood risk can be managed at the local level. It contains sections on:

- managing local flood risk;
- bridging the skills and capacity gap;
- managing water on the surface; and
- understanding and managing the sewerage system.

Introduction

6.1 Chapter 3 looked at taking a strategic approach to flood risk management. This chapter looks at how flood risk management should be dealt with at a local level and in particular the management of surface water flooding. It considers the structures, information and skills necessary to understand and manage the risks and the range of techniques and approaches available.

Managing local flood risk

> *"They're all pointing the finger at each other saying you're responsible – one party's blaming another" (Business, Sheffield)*

6.2 The summer 2007 floods demonstrated the requirement for new arrangements to be put in place to deal with surface water flooding. As chapter 4 explains, very little is known about surface water flood risk as current modelling techniques and technology are not designed to consider the complexities of this type of flooding. There is also a distinct lack of clarity around the responsibilities of the relevant organisations, resulting in frustration for the public and emergency responders. To tackle the problem of surface water flooding, there needs to be an improved understanding of local flood risk in general, and much better coordination of the organisations involved.

At present, responsibilities for managing surface water drainage are split between:

- the Environment Agency, which has responsibility for river and coastal flooding and a general supervisory role for all flooding but no statutory role in relation to surface water flooding;
- water companies, which have a duty (under Section 94 of the Water Industry Act 1991) to 'effectually drain' areas for which they are responsible, but it is not clear what this means in practice and they are not responsible for runoff from open land;
- local authorities, which are responsible for ordinary watercourses and parts of the drainage system, including drainage from public spaces and local highways;
- the Highways Agency, which maintains drainage from the strategic road network (i.e. trunk roads and motorways);
- internal drainage boards, which are responsible for land drainage and water levels within their drainage districts (which are mostly in rural areas); and
- others involved in a more limited capacity, such as navigation authorities (e.g. British Waterways) and riparian owners.

6.3 With no clear coordination and structure, the Review has found that responses to local flood risk are piecemeal and not necessarily prioritised. Each of the organisations with a responsibility for certain assets tends to carry out maintenance and improvement works independently, as there is currently little incentive to do otherwise. This results in investment decisions being made in isolation, which at best leads to inefficiencies and at worst actually increases the risk of flooding.

6.4 Local Authorities are well placed to take the lead in managing local flood risk. The Local Government Act (2000) calls on local authorities to take a community leadership role and the Review believes this is needed in relation to managing local flood risk. They have a broad sweep of service delivery responsibilities that affect or are affected by flood risk, such as land use planning, land drainage (including highways), building control and emergency response. Local authorities, through their community role, already have links with most of the main organisations including water companies, landowners and individual householders and businesses. Detailed local knowledge is also essential in tackling surface water flooding, with risk assessment greatly dependent on local features and an understanding of areas of historical flooding.

6.5 Local authorities already play a central role in response and recovery activities during and after a flood. The Review believes that local authorities' roles should be enhanced to take on responsibility for leading the coordination of surface water flood risk management and improving knowledge of all local flood risk in their areas. This is consistent with their place-shaping role. Local democratic accountability should also help to ensure that sufficient action is taken.

6.6 In order to carry out this role, local authorities will need the assistance of all organisations involved in managing flooding and drainage. The Environment Agency's role of oversight of all flood risk will be important in developing the risk management framework under which local authorities will operate. The Environment Agency thus needs to work with local authorities and other partners to develop tools to understand flooding risks and provide guidance on how to manage them. Also, local authorities will need to be aware of all flood risk in their areas, as surface water flooding is often an interaction between intense rainfall, the river network, drainage systems and groundwater levels. They will also need to work with neighbouring local authorities where they share catchments and make relevant information available.

Local government tiers

6.7 Responses to the Review have asked for clarity on which tier of local government should take on this leadership role. The Review believes that upper tier and unitary authorities

should be given the new coordinating responsibilities and hence become accountable for managing local flood risk. This reflects their greater engineering capacity, their local strategic overview and their ability to manage flood risk where it crosses district boundaries. They should more readily be able to afford and attract high quality flood risk and drainage engineers. Where both county and district authorities exist, the latter will still be the local planning authority and a strong working partnership between the two levels of authorities will be essential.

Funding

6.8 The Local Government Association stated in its submission to the Review that it believes the Government will need to set out a clear investment strategy, with timescales, to ensure that local authorities will not be taking on additional burdens without clear resources or support. The Review recognises that a new duty on local authorities to manage local flood risk will have resource implications. While the Review does not attempt to determine the precise levels of funding that would be necessary to support this work, Government will need to discuss with Local Authorities how new roles and tools will be funded.

Retaining flexibility

6.9 In taking forward their new role, upper tier authorities will want to assess the current situation for managing local flood risk in their areas. The Review recognises that some district councils are very active in managing their local flood risk and the upper tier authority may wish to retain the existing arrangements. Different areas will have different needs and whilst the upper tier local authority would remain accountable, they may decide to delegate work where they feel it is appropriate. This could include the coordination and production of surface water management plans. Agency powers could be delegated to lower tier local authorities, Internal Drainage Boards, water companies or other organisations as the upper tier authority sees fit. The Association of Drainage Authorities said:

> *"Internal drainage boards have a good record of working closely with local authorities and have a detailed local knowledge of drainage networks and localised flooding of both a pluvial and fluvial nature. If local authorities were to continue to be positioned ... as the lead authority in local flood risk management, ADA believes that where internal drainage boards exist they would be invaluable to those authorities' efforts."*

RECOMMENDATION 14: Local authorities should lead on the management of local flood risk, with the support of the relevant organisations.

6.10 The Review received a number of submissions from Members of Parliament explaining the flooding situation in their constituencies. Very often they found themselves being drawn in to try to resolve situations in which frequent flooding was occurring and having a significant impact on the wellbeing of those affected, but for which no organisation was willing to accept responsibility. Many of the people affected did not know who to turn to with their problems and were being passed from one organisation to another. This kind of experience has also been reflected by many of the submissions to the Review from the public and local communities themselves. Tim Boswell M.P. noted a significant amount of his constituency work was spent on:

> *"arguments about the failure of local drainage systems, which usually boil down to a series of unresolved issues between the EA, Highways Authority, District Council and also possibly private riparian owners. We do need I feel some system of decision making or "clearing house" for getting those local disputes resolved and the necessary remedial action before floods return."*

6.11 The Review believes that local authorities, as part of their leadership and community wellbeing role, should positively investigate these local flooding problems and work with all relevant parties to establish the source of the problem and where the responsibility lies for addressing it. The development of an asset register, which is covered in more detail later in this chapter, should help reduce the occurrence of these disputes. Where ownership of drainage assets is resolved, this information should be added to the asset register to ensure this record is maintained.

RECOMMENDATION 15: Local authorities should positively tackle local problems of flooding by working with all relevant parties, establishing ownership and legal responsibility.

Coordination and information sharing

6.12 To understand an area's vulnerability to flood risk, the drainage and watercourse system of that particular area needs to be fully understood. In the interim report, the Review recommended that a local register of all the relevant flood risk management and drainage assets (both underground and overland), including details of their condition, effectiveness and responsible owners, should be compiled by local authorities. From evidence submitted to the Review, this recommendation was generally accepted as an essential tool in managing flood risk.

"Three months after the floods we still do not know who owns the drain and who is responsible for its maintenance" Parish Councillor Mrs E. Robinson, Hull

6.13 However, a number of concerns were raised, including:

- the availability of the required information. Water companies may hold information on the public sewerage system but there are still many privately owned sewers. This situation may be improved if the proposal for water companies to adopt private sewers that feed into the public sewerage system goes ahead;
- the need to determine responsibility for gathering the information where it is not readily available, as this may prove resource-intensive;
- the need to establish standard methods of data-gathering and to ensure consistency in using these methods;
- the need to identify compatible software to consolidate the data (Leeds City Council, for example, raised the issue that although Yorkshire Water had provided it with some asset data, it was only available on a stand-alone computer and in a format incompatible with their own data); and
- the lack of incentive, without a statutory duty on the different stakeholders involved, to share information.

6.14 The Review believes that developing and maintaining an asset register in relation to drainage and flood risk management infrastructure will be vital in understanding flood risk. Much of the evidence received by the Review (including evidence from the water companies) suggested that voluntary agreements to share information would not work in practice. The Review therefore believes that a duty should be placed on flood risk stakeholders to record and share relevant information and expertise. This should also extend to the gathering of information that is not currently available but is deemed to be necessary for understanding the risk. There should also be a requirement for this information to be presented in a standard format and compatible with other types of information in a geographical information system. We understand from East Riding Council, for example, that there is a standard asset management system in relation to highways.

6.15 The Review appreciates that, although this register will be crucial in helping to tackle surface water and all local flood risk, the task of gathering and maintaining the data will be resource intensive for local authorities and all the other stakeholders with a requirement to share information. Information that has already been collected and recorded should be shared with the local authorities. In areas where data has not been recorded, there will need to be a clear understanding of priorities. Hull City

Council has recently asked for a range of information from its local water company to improve its Strategic Flood Risk Assessment. Information requested includes hydraulic models or model results; maintenance records; capacity studies; failure scenario studies; and recent improvements.

6.16 The Review would welcome the Environment Agency, as part of their strategic overview role, working with local authorities and water companies to establish exactly what data is required to manage local flood risk. The Review is pleased to note the work that the Environment Agency is taking forward with water companies to develop a protocol on data collection and sharing. This process should take a risk-based approach and, although a map of the main drainage systems in all locations should be established, it may only be necessary to have specific detailed information in the areas at highest risk.

6.17 Asset registers will also inform maintenance regimes and identify areas of particularly high risk. The process of establishing where all drainage and watercourse systems are and their ownership and condition will allow local authorities to produce and publish a maintenance schedule for their own assets as well as providing guidance to riparian owners as to how they should maintain their assets. Water companies would also find it useful to understand how other maintenance regimes fit alongside their own, as an appreciation of the whole system may enable them to evaluate their own regimes more effectively.

RECOMMENDATION 16: Local authorities should collate and map the main flood risk management and drainage assets (over and underground), including a record of their ownership and condition.

Integrated Urban Drainage (IUD) Pilot Schemes

The Integrated Urban Drainage (IUD) Pilot Schemes were set up by Defra under the *Making space for water* programme to help develop good practice guidelines and inform new policy direction. The aim of the IUD pilots is to *"reduce flood risk in urban drainage systems and contribute to improved urban water quality."*

Fifteen pilot studies were initiated across the country to provide an integrated approach to managing urban drainage flooding.

Individual IUD pilot schemes will be published in summer 2008 with a final summary report due to be produced in autumn 2008, key messages that are emerging include:

- the need for strategic planning as this can identify opportunities for 'economies of scale';
- the importance of local public engagement;
- the value in looking at opportunities to prioritise local infrastructure funding across organisations; and
- the requirement for organisations to share relevant information to enable better risk assessments to be produced.

The experience gained from these pilots will be used to develop guidance for the production of Surface Water Management Plans

Leeds City Council

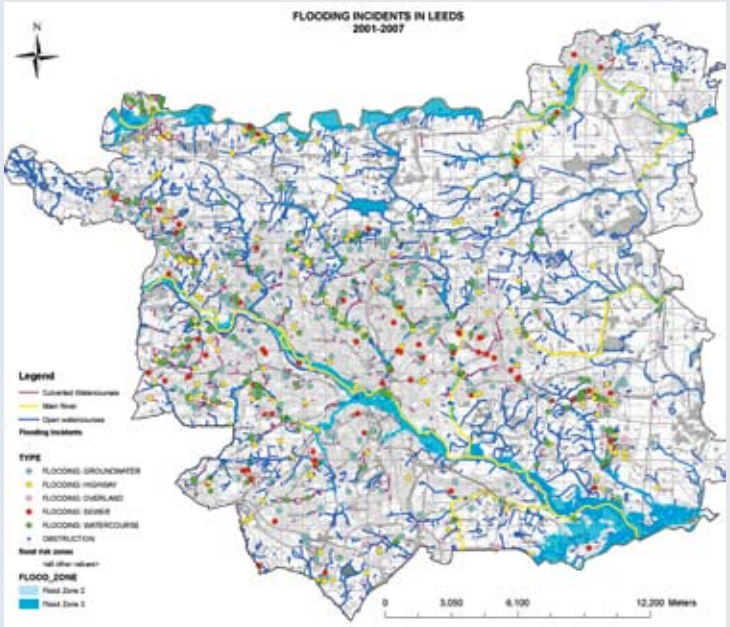
Leeds experienced serious flooding in 2005, with more minor flooding occurring during the summer of 2007. Leeds City Council put in place a Water Asset Management Working Group with an action plan and budget of approximately £1 million per annum. The majority of this budget has been spent on centralising the maintenance of Leeds City Council's watercourses through a process of identifying and recording their location and condition and thereby developing a maintenance regime accordingly.

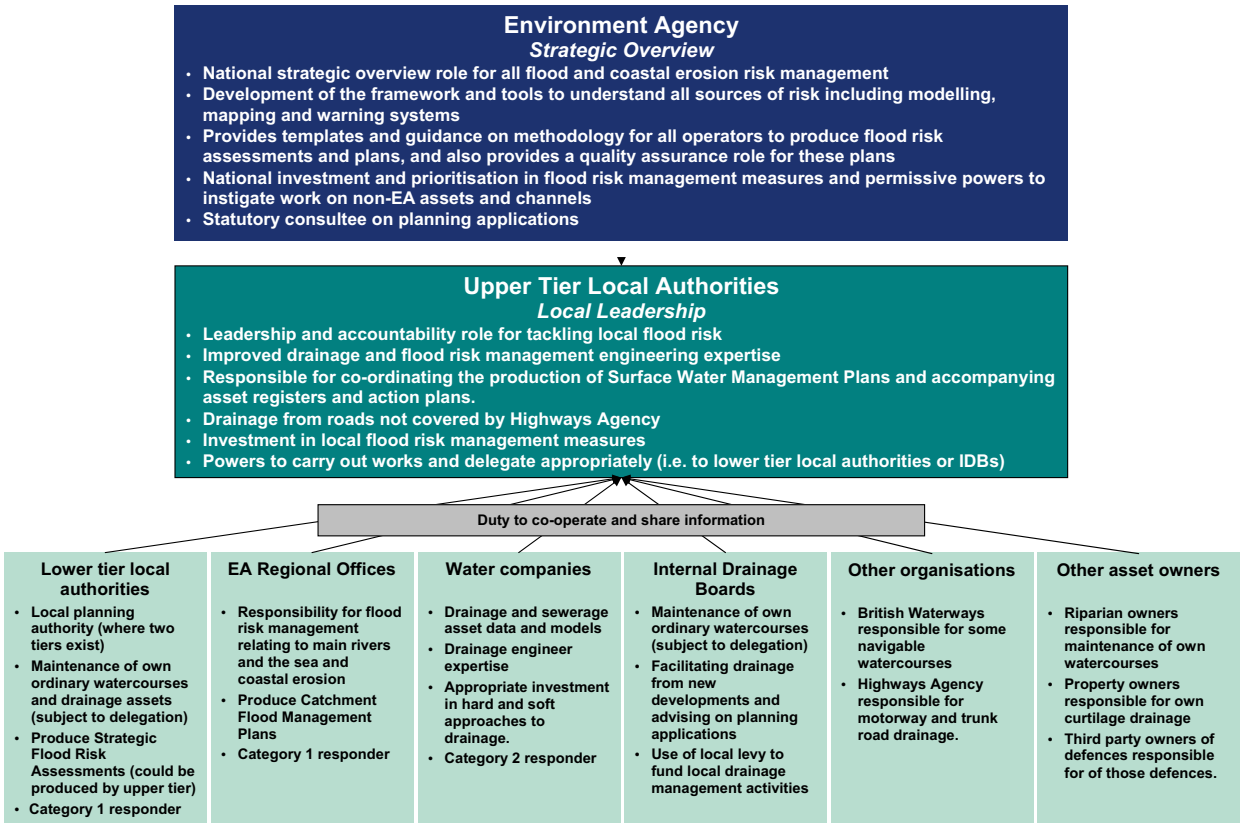
This process has included:

- inspection of culverts using CCTV and recording their location and condition;
- improving GIS records of assets and locating gullies using GPS;
- risk assessment of hazardous bodies of water (e.g. Waterloo Lake);
- recruiting additional land drainage staff;
- performing a fortnightly pre-emptive clearance of drainage hotspots; and
- A 50 per cent increase in its fleet of gully-sucking vehicles.

Map of culverts in Leeds

Map of gullies in Leeds





Surface water management plans

6.18 Surface water management plans (SWMPs) are referred to in Planning Policy Statement 25 (PPS25) as a tool to manage surface water flood risk on a local basis by improving and optimising coordination between relevant stakeholders. The Review is of the opinion that SWMPs should be used by local authorities to help manage all local flood risk and will be equally applicable to urban and rural areas. The Review believes that upper tier and unitary authorities should be responsible for the coordination of their production

6.19 Key to the development of SWMPs will be the availability of good SFRAs and Catchment Flood Management Plans. These will help determine the scale and scope of any plan and the flood risk of the area.

6.20 SWMPs will build on SFRAs and provide the vehicle for local organisations to develop a shared understanding of local flood risk, including setting out priorities for action, maintenance needs and links into local development frameworks and emergency plans. These plans would be supported by the asset register outlined above. The preparation of SWMPs will require the support of all the relevant organisations in the area that have responsibilities in relation to flood risk.

6.21 If SWMPs are able to influence both planning and flood risk management investment decisions as envisaged, they should deliver:

- coordinated and prioritised investment strategies to provide the biggest reduction in flood risk for the amount of money invested;
- clarification of roles to reduce duplicated effort across different organisations, enabling greater use of SUDS to help avoid large investments in unsustainable hard infrastructure; and
- identification of new development approaches that minimise (or even reduce) surface water flood risk of existing development.

6.22 The obvious benefit of understanding and being able to mitigate surface water flood risk is a reduction in flooding, even with the predicted increased risk due to climate change, because water will be more effectively managed on the surface and directed away from property. This

would have additional benefits for householders and businesses as it should enable the continuation of competitively priced insurance for more policyholders in at risk areas. The other major and often overlooked benefit is that water quality will improve, with fewer incidents of combined sewer overflows causing untreated sewage to enter watercourses and less contaminated surface water runoff.

6.23 The Environment Agency and water companies have also been suggested for the role of coordinating the production of SWMPs, although both received only limited support. The Review believes that they will play an important role in supporting local authorities, for example through the Environment Agency's strategic overview role and responsibility for main rivers and the water companies' provision of data and expertise. The local authorities' existing community leadership role, however, makes them best placed to bring together all the stakeholders needed to make these plans work.

RECOMMENDATION 17: All relevant organisations should have a duty to share information and cooperate with local authorities and the Environment Agency to facilitate the management of flood risk.

RECOMMENDATION 18: Local Surface Water Management Plans, as set out under PPS25 and coordinated by local authorities, should provide the basis for managing all local flood risk.

Bridging the skills and capacity gap

6.24 The use of more advanced scientific and engineering methods for forecasting, risk analysis, appraisal and design in management of flood risk, and the increased responsibilities for the Environment Agency and local government, will require new approaches. Local authorities will need a strong technical centre, including relevant engineering specialists. This will enable an 'intelligent client' function within these authorities, capable of commissioning and challenging expert external advice. They will be central to ensuring that local communities are properly protected and that development that increases the risk of flooding does not take place. It also means that local authority members will need to be able to prioritise actions on flood risk against other issues of concern to the local authority, with the confidence that local authority officers understand both the technical and local issues under consideration.

6.25 The Review is aware of the challenge that we have set in the face of dwindling engineering departments in many local authorities. Many submissions welcomed the Review's focus on the local authorities' role in managing flood risk, while raising real concerns about the current engineering capacity at this level. They noted the decline in numbers of drainage engineers in local authorities – and across the profession more generally. Maidstone Borough Council said:

> *"Local Authority drainage units were mostly disbanded following water privatisation and the discontinuance of the Agency Agreement in the early 1990's. These recommendations … will virtually require their re-establishment. Skills necessary currently reside within the EA, water companies and civil engineering consultancies."*

6.26 However, it is important to note (as can be seen in the range of topics the Review has covered) that modern flood risk management is not just about engineering; it draws on a range of expertise, including environmental science, land use planning, building control, emergency planning and, with the increasing promotion of SUDS, landscape architects. Working together, these professionals can help to redesign, adapt and shape local communities to cope with flooding.

Flood risk engineering capacity and capability

6.27 Concern about the lack of specialised engineers in flood risk management posts is not new. The 2001 Institution of Civil Engineers (ICE) Presidential Commission report Learning to Live with Rivers[1] suggested that its proposals might not be taken up because *"the appropriate*

[1] http://www.ice.org.uk/rtfpdf/iceflooding.pdf

technical skills are lacking within the industry, from drainage engineers in local authorities to river engineers in the Environment Agency and skilled hydraulic specialists in universities".

6.28 Without the appropriate technical renaissance of local authorities, there is a danger that many of our recommendations will not be delivered effectively. The creation of private water companies in late 1989 led to the departure of a large number of engineers from local authorities to fill posts in these companies. It has been suggested that many water companies have the skills base in relation to drainage engineering which could be used to assist local authorities in delivering their role. Furthermore, these engineers have moved out of local authorities, many have not been replaced. In recent times the technical departments of local authorities have significantly diminished and, in some places, merged. Much of the engineering specialism in local authorities is now limited to highway engineering.

6.29 The ICE report Engineering Skills for Flood Risk Management[2] (2004) identified a significant shortage of flood risk engineers in public sector organisations. According to the report, there is *"currently perceived to be an 11 per cent shortage of public sector professionals working in flood risk management, which is projected to rise to 19 per cent five years hence"*. The Association of Consulting Engineers also reports vacancy levels of 12–15 per cent in the sectors of civil engineering most relevant to flood management. In evidence to the Review, both York City Council and Hull City Council indicated that they had experienced difficulties in attracting flood risk engineers.

6.30 In discussions that the Review has had with local authorities and engineering professionals, the reasons given for posts remaining unfilled include:

- low salary levels for flood risk engineers (particularly in the public sector);
- the lack of perceived value given to working for local authorities;
- the requirement in many posts to carry out a broad range of roles, such as stakeholder engagement, rather than focusing on core engineering skills; and
- the simple shortage of suitably qualified graduates (see below)

6.31 Many local authorities rely heavily on consultant engineers to provide a range of flood risk management services, such as the production of SFRAs and delivery of drainage strategies. The Review recognises that consultants will still play a major role, but that there will be real benefits in having in-house expertise, including getting maximum value out of partnerships with consultants.

6.32 The Review has received evidence of the benefits when councils have kept their engineering expertise. Many of these authorities are well advanced in understanding how to tackle local flooding issues. Councils such as Leeds, Cambridge and Telford and Wrekin are leading the way in developing tools and techniques to help them manage flood risk effectively, often working with government to ensure that national policy reflects local needs.

6.33 The Review has seen evidence of a rising recognition among local authorities of the need to employ good flood risk professionals. Gloucestershire County Council, for example, has advertised for a Head of Flood Alleviation and Drainage Management to lead on the development of the county's flood risk management strategy. The council is also in the process of advertising for further engineering posts.

6.34 If local authorities are to lead on local flood risk management, they, with the Government, will have to address the skills gap. The Review has received a range of suggestions, including that:

- smaller local authorities could pool their resources and share professional expertise (this is not dissimilar to what has been suggested for coastal engineers);
- county councils could take a leading role and develop a flooding specialism at the county level that district authorities could draw on; and

[2] http://www.ice.org.uk/downloads//flood_risk_skills.pdf

- councils could also "grow their own" in-house technical resources. For example, York City Council, faced with a shortfall in engineering technicians, has begun in-house training of candidates to fill the gap (see box below).

City of York Council – developing its engineering skills

City of York Council's Engineering consultancy developed a post for a technical support officer. Post holders do not need engineering qualifications but an interest in the area. They support three engineering teams and if they like the role, the Council puts them through a training course to gain either an Ordinary National Certificate or Higher National Certificate in civil engineering. Four out of five jobholders have taken this route.

Designed originally as almost an 'apprenticeship' for a school leaver, postholders have tended to be university graduates from a range of disciplines, including archaeology and media studies. Whilst they start off as a junior assistant, with experience they move forward to producing preliminary details, minor design schemes and minor projects and eventually managing individual projects under the supervision of a senior engineer. Some have moved on to technician roles within established engineering companies. One jobholder has gone on to study for a degree in civil engineering.

6.35 Landform[3] recently surveyed 107 members, 77 of whom were local authority officers (and many of whom were engineers). The consensus was that: *"most local authorities have lost their drainage expertise and with it their local knowledge. There was recognition of the importance of local expertise and many respondents were looking to the Environment Agency to help support this"*. Landform recommended the gradual building up of capacity through trial projects and mentoring, which was supported by the majority of respondents. The Review welcomes the role of organisations such as Landform to help build up expertise in local authorities.

6.36 The ICE report discovered that there did not appear to be a shortage of flood risk engineers in engineering consultancy companies. This may be due in part to the quality of work on offer but also to the level of salaries on offer. An assessment of salaries showed that flood risk engineers tended to be among the most poorly-paid engineers, with the lowest salaries being found in the public sector. Therefore, if local authorities wish to attract high-calibre candidates, they will need to demonstrate their commitment by offering attractive remuneration packages.

Institute of Civil Engineers Salary Survey 2007

The most recent salary survey across the engineering industry was carried out by the ICE in 2007. Basic income starts at £23,083 on average for the under 24s, rising steadily in line with increasing age to reach a peak of £55,200 when members are in their early 50s. The overall average basic income is £45,099. When secondary income, bonuses and overtime are added, this becomes an average total income of £49,990. A local authority might, therefore, expect to pay between £45,000 and £55,000 (net) for a well qualified senior engineer.

RECOMMENDATION 19: Local authorities should assess and, if appropriate, enhance their technical capabilities to deliver a wide range of responsibilities in relation to local flood risk management.

Capacity in the Environment Agency

6.37 The Environment Agency has itself recognised the need to attract and retain more core flood risk engineering professionals (see below). It has a number of vacancies for flood risk posts (around 200 as of May 2008) and has examined salaries, career progression and internal development of its own graduates and staff.

[3] http://www.ciria.org/landform/ – Local Authority Network on Drainage & Flood Risk Management.

6.38 Engineering salaries were also identified as an issue within the organisation and it has adjusted its pay scales to attract more engineering graduates. The Environment Agency has a special career grade for graduates entering its national scheme, which is aimed at 'fast-tracking' them towards Technical Specialist and Team Leader positions.

Building capacity for the future

6.39 The shortage of appropriately skilled engineers is by no means restricted to the field of flood management. The shortage needs to be seen in the context of a widespread engineering skills shortage. The only long-term solution to building capacity in this area is to increase the number of engineering graduates.

6.40 Many of those involved in this area point to the decline in the numbers of students studying A-level mathematics combined with the lack of attraction for many students of civil engineering as a degree course. There are concerns that, at the age of 16 when A-level choices are being made, clear advice is not being given to explain that A-level mathematics is a prerequisite for many technical degrees such as engineering, and that engineering is not being adequately promoted. The decline in the number of universities offering civil engineering courses has also been highlighted to the Review.

6.41 The report *Engineering UK 2007: A Statistical Guide to Labour Supply and Demand in Science, Engineering and Technology*[4] found that around 70 per cent of 16–19 year olds in the UK felt either "not at all" or "not very" well informed about the work of engineers. This suggests that routes to engineering careers are already being cut off at an early stage.

6.42 The Review has identified a range of more specialised skills that will be required to deliver against this report, for example advances in digital mapping and modelling. These require more advanced engineering skills, in areas such as hydrology, and often require postgraduate study. However, the Review understands that in this area the UK is also falling behind. The Engineering UK 2007 report found that: *"more than half of students across all taught postgraduate engineering courses at UK universities are domiciled outside the EU"*.

6.43 In response to the 2004 ICE report, Defra, the Environment Agency and ICE published an action plan in 2005 to tackle the issues it raised. An industry forum was established to take forward the actions, but it has not met since December 2006. This is disappointing. As part of its strategic overview role, the Review would encourage the Environment Agency to work with ICE and Defra to publish not only progress against actions by the end of 2008 but also to consider, in light of the Review and its recommendations, whether further action is necessary, particularly in relation to local authority needs.

6.44 The Review believes that public sector organisations and society in general need to value more highly the importance of technical and engineering skills. Science and engineering professions will be at the forefront in tackling the impacts of climate change. As such, they will represent some of the most interesting and challenging jobs of the future.

Managing water on the surface

Designing for exceedance

6.45 'Designing for exceedance' refers to the process of designing and managing sewerage and drainage systems to reduce the problems that arise when flows occur that exceed their capacity.[5] It includes consideration of both underground systems and overland flood conveyance.

6.46 Underground conveyance cannot economically or sustainably be built with enough capacity for the most extreme events, so there will be occasions where the surface water runoff volume will exceed the capacity of the sewerage system. When this happens, the excess water will be conveyed above ground along footpaths and streets, between buildings and across open land, causing properties in

[4] Engineering and Technology Board, December 2007.
[5] Designing for exceedance in urban drainage – good practice. D Balmforth et al, 2006.

the vicinity to flood. Therefore, much can be done to reduce flooding if this surface flow is proactively managed.

6.47 Surface pathways should be linked together in much the same way as conventional drainage to provide a system of waterways that effectively conveys the excess water out of developed areas and prevents it from pooling at low spots (unless these are specifically designed as a storage area). When designing these surface pathways, it should be remembered that they will only rarely convey significant flows and they will be used for other purposes on a day-to-day basis. Safeguards and appropriate maintenance will be needed to ensure the continued availability of the pathway as a flood channel. Public safety must be considered when the channel is used for conveyance, as significant depths and velocities can build up. Measures will need to be put in place to clear out any sediment, litter or polluting material after flood events.

6.48 In some urban areas where there may not be enough space to provide sufficient surface pathway conveyance capacity, surface storage areas can be developed to attenuate the flow. A number of considerations need to be taken into account when designing these storage areas, including:

- the depth which water might reach and whether this will be an unacceptable risk to public safety;
- the length of time it will take to drain the area; and
- whether the temporary storage of flood water will affect the area's normal use.

6.49 A good example of this type of storage area is an existing car park, where water can accumulate up to kerb height. This approach means there is unlikely to be any significant structural damage to the site after flooding, health and safety risks are minimal due to relatively low depths and as long as the area can be adequately drained after the event normal use can be quickly restored.

6.50 If the volume of storage is very large, the potential to use sacrificial areas should be considered. These are areas of low-value land where excess water can be directed and retained for longer periods of time, with the stored water either infiltrating slowly into the ground and/or evaporating over time.

Sustainable Drainage Systems (SUDS)

6.51 SUDS are designed to mimic the natural movement of water and slow down the process of the water getting into the watercourse. They can channel the flow of water above ground and reduce the burden on the piped sewerage system.

6.52 SUDS fall into three main categories

- **source control and prevention techniques:** these are designed to reduce the volume of water discharged from a developed site as close to the source as possible. They can help to restore underground water resources. They include green roofs, permeable pavements, rainwater harvesting, and infiltration trenches and basins;
- **permeable conveyance systems:** these channel the runoff slowly towards the watercourses through a process of filtering and storage and through the reduction of water through evaporation and infiltration. They include filter drains and swales (long, straight, grassy depressions); and
- **passive treatment systems:** these use natural processes to break down pollutants from surface water runoff, as well as reducing flood risk. They usually involve storage of water and include filter strips, detention basins, retention ponds and wetlands.

6.53 SUDS can be incorporated at different levels:

- at an individual property level (e.g. water butts, green roofs and permeable driveways);
- at a community level (e.g. swales, detention basins and porous paving of highways); and
- at a strategic level (e.g. large balancing ponds and wetlands).

However care needs to be taken when considering using SUDS as not all SUDS are suitable in all areas and may affect drainage in other localities.

6.54 The main barrier to the incorporation of SUDS in developments is their adoption once they have been designed and constructed. This is not so much of an issue in relation to property-level SUDS, which tend to be low maintenance, benefit a single property and should be the responsibility of the property owner but community and strategic-level SUDS are a different matter and their adoption is a topic of much debate. Defra's consultation on improving surface water drainage[6] suggests three options for who should be responsible for the adoption of community and strategic SUDS: local authorities; sewerage undertakers (i.e. water companies); or specialist SUDS drainage companies.

Local authorities

6.55 Local authorities have many responsibilities which link to the implementation of SUDS, such as land use planning, local highways, managing open spaces, maintenance of ordinary watercourses (where there is no internal drainage board) and general sustainability. If local authorities had the responsibility for adopting and maintaining SUDS, their strategic role in regeneration and the supply of new housing would allow them to ensure not only that SUDS were incorporated into plans but also their sustainable implementation. The skills that local authorities would require as an 'intelligent client' for SWMPs would also prove beneficial in understanding the use of SUDS.

Sewerage undertakers

6.56 Sewerage undertakers are currently responsible for surface water drainage from premises into public sewers. Taking ownership of SUDS would put them in a good position to provide an integrated surface water drainage and underground sewerage system. Potential gaps in knowledge and powers in relation to public open spaces could be filled by local authorities.

6.57 Although sewerage undertakers would need to develop new expertise to manage SUDS effectively, this should be a matter of adapting existing processes rather than starting afresh (as may be the case with local authorities). Sewerage undertakers also have the ability to charge their customers for the provision of this additional service, so funding could be easier. However, sewerage undertakers are not statutory consultees for individual planning applications; if they were to adopt SUDS, there may be a need for a greater level of their involvement in the planning system.

Specialist SUDS drainage companies

6.58 Specialist companies could be created to manage SUDS. They could exist within the same regulatory system under which sewerage undertakers currently operate, or could operate within a new regulatory framework that may negate the need for competition, with a sole provider for a particular region.

[6] http://www.defra.gov.uk/corporate/consult/water-drainage.

Case study – Dunfermline Eastern Expansion

The Dunfermline Eastern Expansion (DEX) is a 5.5 km^2 site which lies to the east of Dunfermline. It is a showcase site for the use of SUDS in Scotland. Initially designed and planned in the early 1990s, the construction of the infrastructure on this predominantly green field site started in 1997 and finished two years later with the infill development of a mixture of industrial, commercial, residential and recreational areas scheduled to take place over the next 20 years.

The ground on the site is predominantly low permeability clay soil and so infiltration methods have been limited. Much of the road system is drained using filter drains and swales which discharge into extended detention basins and wetlands which attenuate storm flow and also serve adjoining housing developments. The treatment of surface water runoff is achieved through a system of ponds and wetlands prior to discharge to the watercourse. The wetland is located in a public park area and permeable paving has been used in a local supermarket car park which is connected to the wetland by infiltration basins.

The significant size and the long timescale for the development of DEX has meant that an overall SUDS design is essential. Watersheds, divided into sub-catchments, connect to a spinal SUDS network of retention basins, swales, ponds and wetlands. Flows are attenuated and discharged at a controlled rate to the existing watercourses. As well as their role in attenuating, SUDS are used on DEX to treat the water through fore bays and reed beds.

The cost of using conventional drainage systems in this development would have been too prohibitive and would have required a 5km sewer to the Forth River. Therefore SUDS were promoted by consultants and the developer to achieve an economic solution to the problem.

However adoption issues have presented barriers to the use of SUDS on the DEX site. The highway authority were initially unwilling to accept responsibility for any other drainage methods other than piped systems or soakaways. They did however agree to adopt most of the strategic road system, including the swales, filter drains, and offlet kerbs. Local councillors were also concerned about the safety of the public near open water; however, barrier planting and shallow reed planted margins removed their apprehension.

Resolving ownership

6.59 The Review believes that either local authorities or the sewerage undertakers would be best placed to adopt SUDS. We are of the opinion that establishing specialist SUDS drainage companies would exacerbate the existing problem of too many organisations being involved in flood risk management, creating a fragmented approach. Defra is consulting on who best should lead. We hope that the Government will announce its conclusions before the end of the year.

RECOMMENDATION 20: The Government should resolve the issue of which organisations should be responsible for the ownership and maintenance of sustainable drainage systems.

Understanding and managing the sewerage system

Sewerage standards

6.60 Surface water flooding was a striking feature of the summer 2007 flooding. Urban areas were particularly susceptible, because sudden and intense rainfall cannot drain away as easily as in rural areas where the soil is exposed. In many urban areas, the natural land drainage has all but been removed by impermeable surfaces, so avoiding flooding depends almost entirely on piped drainage system and any subsequent pumping.

6.61 One of the most notable examples of this was in Hull, where the inability of these systems to cope meant that a large part of the city was flooded, resulting in damage to 7,200 residential households and 1,300 business. Water and sewerage companies were blamed in many flood-hit areas – many local authorities said that water companies have a duty to effectually drain an area under Section 94 of the Water Industry Act 1991 and that they failed to do this. However, this relates only to public sewers and hence drainage of buildings and yards. Sewers are not supposed to have a land drainage function, and for instance may not take highway drainage.

6.62 Public sewers do and will continue to have a key role to play in minimising surface water flooding and it is essential that we have the right framework to best target investment in construction and maintenance programmes. However, the dependence on public sewers in many urban areas due to the removal of the natural land drainage system and failure to develop SUDS means that expectations of public sewer performance can sometimes be considerably in excess of what can be provided at reasonable cost.

The June 2007 floods in Hull

There have been a number of reports about the flood events in Hull, particularly focussing on the issues around surface water and drainage.

- The report produced by an Independent Review Body concluded that Hull's pumped drainage and public sewerage system was overwhelmed by the extreme volume of water and that the pumping system may not have been designed to cope with the design guidance for a 1-in-30 chance event; and
- Yorkshire Water believed that no sewerage system would have been able to cope with the intense rainfall.
- Another study suggested that the rainfall in Hull was less than a 1-in-30 chance event when considered over short durations and that the sewerage system should have been able to cope.
- Expert opinion to Ofwat concluded that 'special' aspects of the Hull drainage system would not have helped in such a heavy and prolonged storm: in particular the land drainage and watercourse inputs into the piped network would have been a significant reason for the sewers becoming full in some areas, with overland flows from outlying rural areas and higher ground perhaps contributing.

6.63 Dependence on the public sewerage system continues to increase. While this works well generally, any piped network only has a fixed capacity and in the face of further urbanisation and predictions of more frequent intense rainfall events[7], it is not sustainable to rely entirely on the public sewerage system to cope with extreme wet weather events, or simply keep increasing underground pipe capacity.

6.64 There are about 320,000 km of public sewers and around 150,000 km of private sewers in England and Wales. Around seven per cent were built before 1885 and the majority

[7] Foresight Future Flooding, Office of Science and Technology, 2004.

were built before the Second World War. While most generally work well, they cannot cope with the most extreme events and in a limited number of cases there is clear under capacity. Even now, there is currently no absolute requirement for flood protection in sewerage systems, although Ofwat do measure the performance of the sewerage system through their Level of Service Indicator DG5[8] which is a register of the number of properties at high risk of flooding from sewers. This is being reviewed to ensure consistency across companies.

6.65 As part of their work to develop best practice guidance on sewerage standards, Ofwat undertook a recent survey of the 10 sewerage undertakers in England and Wales to determine what design standard they were using in planning public sewerage schemes. The survey showed that the most widely recognised guidance documents were the Ofwat registers and *Sewers for Adoption* issued by Water UK. Sewers for Adoption is guidance primarily provided to developers, where developers wish to have their constructed sewers adopted by a water and sewerage company. Currently, Sewers for Adoption is not a mandatory requirement and is generally used by water companies to create their own internal standards. In practice, companies use a range of standards of protection from 1-in-20 to 1-in-50 annual chance events for internal property flooding and 1-in-10 to 1-in-30 for external flooding. Standards for each company were reportedly not generally affected by the specifics of the location of the scheme or the driver for the scheme, although there were some exceptions in particularly sensitive or critical areas.

6.66 While 'no flooding in a 1-in-30 storm' is generally seen as a goal for urban public sewer systems, it has only become common from 2006. Given that less than one per cent of the national sewerage network is newly built each year, it means that relatively little will have been built since 2006 and so the overwhelming majority of public sewers will be at much lower standards. Unadopted private sewers systems may also be at lower standards.

Fixed-likelihood or risk-based standards?

6.67 There are two approaches to defining minimum standards:

- likelihood, which controls or measures the frequency of flooding; or,
- a broader risk-based approach taking account of the consequences of flooding as well as likelihood.

6.68 For coastal and fluvial flooding, flood risk management is moving towards a risk-based approach, where both the probability and consequence of flooding are taken into account. Investment is being targeted towards maintenance and improvement of those assets that contribute most towards risk reduction. However, the current process for designing and assessing sewers tends to be related to the likelihood of events, rather than being a risk-based approach that takes account of the consequences of flooding as well as the likelihood.

6.69 Standards that vary on a case-by-case basis are more demanding in terms of application and decision-making, but are more flexible and usually deliver better value for money. Variable standards allow the acceptable frequency of flooding to be related more directly to the consequences. For example, they take into account that the frequency of 300 mm flooding of a highway or public open space is not comparable to 300 mm flooding of areas of high-density properties.

6.70 Lack of a risk-based system makes it difficult to take an integrated-system approach that recognises the interconnectivity of different drainage systems, especially during extreme events. A risk-based approach would facilitate coordination between the responsible bodies, which is important in progressing integrated urban drainage. This in turn would maximise the value from investment and deliver transparency in planning and clarity in individual responsibility for action. It is the performance of the integrated urban drainage as a whole that is important, and the performance of the individual components needs to be considered in that context.

[8] www.ofwat.gov.uk/aptrix/ofwat/publish.nsf/Content/losindicators

New design standards

6.71 The Review received a good response to its interim conclusion proposing that Defra and Ofwat worked with the water industry to explore how an appropriate risk-based approach for public sewerage systems can be achieved. The overwhelming evidence from water companies and industry experts was that there should be a move away from national fixed standards based on likelihood to a risk-based approach which gave better consideration to the system as a whole and represented the best value for money. For example one submission said there is a *"need to move away from a national application of design standards and management approaches towards an integrated drainage management approach"*.[9] Some evidence suggested that a mandatory fixed standard would not even be possible, as for some cases it could amount to more than a million pounds a property.

6.72 In evidence to the Review, Ofwat stated that they believed the use of a fixed standard, based on the likelihood of flooding (overloading of sewers), is appropriate for the adoption of new sewers, since it would not be practical to require every developer to undertake a cost benefit analysis on all new drains and for water utilities to undertake quality assurance. In these circumstances, the water industry and commentators generally accept that a design standard for protecting property from flooding of a 1-in-30 event strikes about the right balance between the cost and inconvenience of flooding and the cost of higher standards for sewerage systems. But the Review has also heard of problems when the standards of sewers for new developments take no account of future hard surfacing or the detrimental effect they can have on the rest of the system it is joining on to. The Review understands from the Water Research Centre, that it will begin work reviewing the guidance in the next year or so and will be looking at the potential to take better account of a risk-based approach.

6.73 Ofwat is also clear that there needs to be a risk-based approach when considering the whole system, such as for upgrades. Ofwat wants to require companies to work towards a risk-based approach to ensure that investment in maintaining and improving the public network is targeted on areas where the risk from flooding is greatest. It has a number of work-strands going forward into the 2009 pricing review, including:

- producing guidance to water companies on the implementation of public sewerage standards;
- carrying out a review of the water company sewer flooding at-risk registers to ensure consistency between registers and outputs achieved;
- an analytical framework for assessing critical asset resilience to flooding; and
- continuing work on climate change policy.

6.74 The Review welcomes the work that Ofwat has already done to help facilitate improvements to the sewerage systems. Water companies should use the guidance to identify where investment needs to be targeted and make the case to Ofwat in the forthcoming pricing review.

6.75 There is also work being done to update the Sewerage Rehabilitation Manual (SRM) to provide sewerage risk management guidance for water utility business planning. The Review understands that the SRM, the development of which is funded by water companies, is not freely available to local authorities. Given the proposed new local leadership role for local authorities (see earlier in this chapter) and the key role that the sewerage network plays in the integrated drainage system, the Review sees benefit in the SRM being shared with local authorities.

6.76 Defra has informed the Review that, as part of the transfer of private sewers initiative, they are working with Ofwat in reviewing design and construction standards for new sewers and that this should reach conclusions in late 2008. They are looking at moving to a major/minor storm drainage concept (see text box below). This could include a fixed universal design standard for the underground piped (minor) system, but with much more capacity in the overground (major) system in areas of high

[9] Ofwat Hull flooding June 2007, Expert Opinion, January 2008.

flood risk. It is becoming increasingly apparent that it is not economic or sustainable to build the underground piped system to sufficient capacity to cope with extreme events and the Review encourages better use of above ground capacity such as the use of nominated roads as flood channels to improve the integrated management of extreme wet weather events in a sustainable way.

Major/minor storm drainage systems

One of the obvious limitations to any underground piped network is that it has a finite capacity and in extreme rainfall events this capacity can be exceeded.

The concept of major/minor drainage systems is used in a number of locations around the world where there is a tendency towards intense rainfall such as Canada, Malaysia and Australia. Under the concept urban, areas have two separate storm drainage systems:

- the **minor** system consists of the underground pipework which provide a system to rapidly carry away storm runoff from road surfaces for frequent (minor) rainfall events (around 1-in-5 annual chance); and
- the **major** system consists of above-ground overland flow routes such as open space channels, roads and other nominated flow paths, capable of conveying runoff rates and volumes for, say, a 1-in-100 annual chance rainfall event which exceed the capacity of the minor system. The water is often channelled to areas such as open land.

Here in England, it is also becoming increasingly apparent that it is not economic or sustainable to build the minor system to sufficient capacity to cope with extreme events. Therefore, there may need to be better use of above-ground urban pathways such as nominated roads, and open channels might need to be used to improve the management of exceedance.

6.77 Ofwat has informed the Review that, in the medium term, sewerage standards for new and renewal work should be risk-based and decided on by the level of protection that companies are aiming to provide to customers as a whole (not necessarily to individual properties). So far, Ofwat has concentrated on reducing flooding to the properties that most frequently flood. Ofwat reports that companies are starting to clear these problems, and each company now needs to outline the level of general protection that it should provide to customers. Ofwat expects that this level be set based on customers preferences, cost-benefit analysis and customers' willingness to pay.

RECOMMENDATION 21: Defra should work with Ofwat and the water industry to explore how appropriate risk-based standards for public sewerage systems can be achieved.

6.78 But it is equally important that such an approach does not wholly move to one where studies of consumers' preferences and willingness to pay determine standards. As discussed in Chapter 16, such studies are fraught with problems and do not tend to elicit the true value of the infrastructure either to customers or to wider society. For example, quantitative and qualitative research by the Consumer Council for Water strongly indicates that the vast majority of customers are not prepared to pay anything extra to ensure that flooding does not occur again, even though they do not want it to happen again. Somehow a decision on what is acceptable has to be made.

6.79 It is essential that investment is planned in a way which ensures that there is a sustainable approach which maximises value for money. In taking forward this risk-based approach, the Review expects companies to consider other options in addition to improving piped capacity including measures such as SUDs, and in the longer term the development of Surface Water Management Plans.

RECOMMENDATION 22: As part of the forthcoming and subsequent water industry pricing reviews, Ofwat should give appropriate priority to proposals for investment in the existing sewerage network to deal with increasing flood risk.

Drainage into public sewers

6.80 Urban areas were once rural areas that relied on natural land drainage and watercourse systems, but in many urban areas this has all but been removed and replaced by dependence on the public sewerage system. In some areas such as in Hull, much of the remaining land drainage and watercourses drain into the public sewerage system. Where there are significant land drainage discharges into sewerage systems, the Review sees merit in the land drainage authorities and water company working together to separate these flows consistent with a risk-based approach. Where there is no land drainage system in an urban area, one should be created wherever possible.

Incentivising greater surface water management

6.81 Water companies could also play a role in incentivising positive behaviour. However, in their report on flooding, the EFRA Select Committee found that the current charging system does not encourage householders, businesses and highway authorities to minimise surface water runoff at source and that as a result a lot of surface water is routed into public sewers, which themselves have limited drainage capacity.

6.82 Currently, charges for surface water drainage, highway drainage and foul sewage are often encompassed into the general charge for sewerage. Charges for sewerage services make up more than half of the average bill that householders pay to water companies.[10] The lack of transparency of the proportions of each of the three elements of the sewerage charge means there is no incentive for householders, businesses and highway authorities to minimise their runoff. The charging system is more transparent in several other European countries, thus offering an incentive to property owners and businesses to install property-level SUDS to reduce surface water drainage charges.

Transparency of charges drive change

In Germany, adoption of transparent surface water drainage charges and subsidies has encouraged a high amount of retrofitting of SUDS, particularly green roofs and water reuse systems. In North-Rhine Westphalia, for example, approximately six million square metres of surface area was disconnected from the sewer between 1996 and 2004.

In contrast, water companies in England offer rebates on the waste water charge for customers who can prove that they do not make any use of the public sewer to dispose of surface water, but uptake is limited, at typically 2 to 5 per cent of household customers, and the rebate is modest, typically less than £40. In England there is little uptake of property-level SUDS.

6.83 Currently only four water companies charge businesses for surface water runoff by property area. Ofwat has been consulting on its charging strategy. The Review believes that these charges should more transparently reflect the actual costs imposed on the system.

6.84 The Government also believes that charging for surface water drainage should become more transparent and, in its Water Strategy, the Government announced that it will *"consider whether funding for surface water drainage should be changed to better reflect the polluter pays principle" and may involve "strengthening requirements by Ofwat for water companies to vary their charges to reflect more accurately the true cost of surface water drainage"*.[11]

[10] Ofwat estimated that the average household bill for 2007/08 was £150 for water and £162 for sewerage, Ofwat water and sewerage charges 2007/08 report, May 2007

[11] *Future Water*, Defra, February 2008.

6.85 The Review believes that the Government will need to ensure that, in encouraging and incentivising householders and businesses to reduce (or even disconnect) their surface water drainage into the public sewers, clear guidance is given to ensure further problems are not created or simply transferred elsewhere.

6.86 In urban areas, most highway drainage is integrated into the public sewerage system. The Review has heard a weight of evidence that runoff from highways is a significant problem, as they tend to channel large volumes of water into public sewers. Currently, highway authorities are able to connect into a public sewer but only pay a connection charge (typically £250), and do not contribute to maintenance costs.[12] This means there is no incentive on highway authorities to minimise their discharge into the public sewers. Both the EFRA Select Committee and this Review sees this as an issue that needs to be addressed and believes the Government should explore how the runoff from highways can be minimised to reduce the effect it has on the public sewerage system.

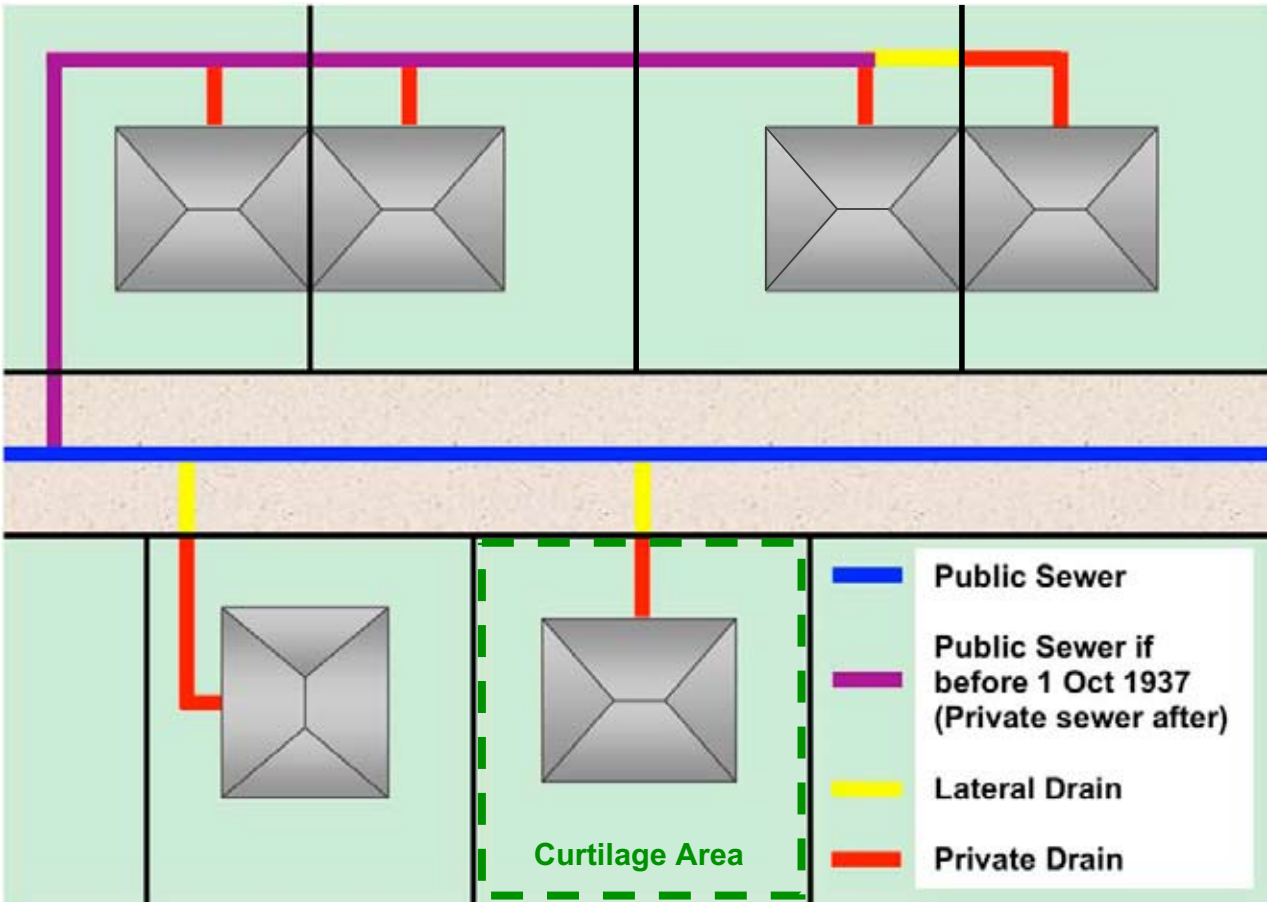
Private sewers

6.87 As well as public sewers, there are also a considerable number of private sewers. These have caused problems in the past, not least with maintenance. Some owners are not even aware of their responsibilities. The Government has announced that it intends to transfer to water companies the ownership of private sewers and lateral drains that connect to the public system. The Review welcomes this, as it will clarify institutional responsibilities. However, the transfer will not include drains within the property curtilage and these will remain the responsibility of the property owner.

6.88 The Review would welcome the Government taking this opportunity to issue guidance to property owners advising them of their responsibilities. The Review received a weight of evidence highlighting the importance of the role that the public can play in minimising the strain that is placed on the sewerage system, for instance Thatcham Town Council said: *"Guidance should be provided to householders, outlining essential maintenance, activities to avoid (e.g. tipping fat down drains) and other measures that will reduce the chance of drains becoming blocked or can reduce the quantity of surface water, such as soakaways and permeable drive ways"*. The Review has also heard expert evidence that there is a problem around property owners making the wrong connections to the piped drainage system, particularly from the flooding of foul sewers and causing the pollution of separate surface water sewers. Therefore the Review believes the guidance should also give advice to property owners on how to avoid making wrong connections to the piped drainage system.

[12] *Future Water*, Defra, February 2008.

Figure 5 – typical types of sewers and drains in a residential area



MARSTON'S

Flood defence

This chapter examines the range of methods that can be used to defend against the risk of flooding. It contains sections on:

- funding flood risk management;
- maintenance of defences and watercourses;
- temporary and demountable defences;
- the role of sandbags;
- working with natural processes; and
- land management measures.

Introduction

7.1 This chapter considers some of the more traditional approaches to mitigating flooding and some of the more common issues relating to river flooding that arose during the floods of summer 2007. While a substantial proportion of the damage in summer 2007 was caused by surface water flooding, flooding of rivers and minor watercourses also caused very significant problems. Many concerns following the floods related to adequate maintenance, in both urban and rural areas.

7.2 Investment in flood risk management has increased in recent years, but there are still questions about its adequacy and whether public money is being spent in a sustainable way. This chapter therefore also considers whether spending on flood risk management should be solely the preserve of national and local government.

Funding flood risk management

7.3 In the immediate aftermath of the summer floods, one of the first questions asked was: 'How much is being spent on managing flood risk and is it sufficient?'

7.4 Submissions to the Review on the issue of funding for flood risk management were mixed – some felt that funding was insufficient, others that it was heading in the right direction. Most felt that, regardless of how much was being spent, more would be needed in future. Many submissions queried whether the current level of national expenditure would be sufficient to deal with the projected impacts of climate change.

7.5 The Regional Flood Defence Committees (RFDCs) said

> *"In the case of investment to reduce flood risk the case is particularly compelling. We know the climate is changing. As a result the frequency of extreme weather events is increasing. At the same time sea levels are rising and will continue to do so. In short all the science tells us that the level of risk is increasing."*

7.6 The ABI also suggested that: *"more will be needed as the lessons learnt from the summer floods are incorporated into government policy."*

7.7 Government spending on flood and coastal erosion risk management in the year 2007–08 was approximately £600 million. This includes funding for operating authorities and local authority expenditure funded through CLG, some of which is channelled through local levies to RFDCs and some through levies to internal drainage boards.

7.8 In July 2007,[1] Defra announced that Government funding would rise to £800 million in 2010–11. Subsequent announcements[2] indicated progressive increases to that amount with a minimum increase in funding to £700 million in 2009–10. Table 3 below summarises the current funding split.

7.9 Aside from the clear benefits of protecting society, expenditure on flooding represents a sound investment for the Government. The Environment Agency noted in its report[3] into the 2007 summer flooding that:

> *"for every £1 spent on protecting homes and businesses and building in resistance and resilience, the cost of clean-up and repairs following a river flood can be reduced by up to £6 on average."*

7.10 This level of benefit is high and reflects well against Government expenditure on other types of capital schemes. In evidence to the Review, Defra noted that capital investment in flood risk management currently gives an average return of around 27 per cent per annum, compared with around 10–12 per cent per annum for road and rail capital schemes.[4]

7.11 The Foresight Future Flooding (2004) report is the most common reference point for estimates of the possible increase in funding needed for flood and coastal erosion risk management. This indicated that an increase in spending of £30 million a year in real terms would be needed just to contend with the best current predictions of the effects of climate change. However, this figure did not include the cost of tackling intra-urban (surface water) flooding, which it suggested would be in the order of £400,000 to £800,000 a year.

Table 3 – Funding for flood and coast erosion risk management in England

	£ millions				
			Allocated to Operating Authorities		Total
	LA Own Spend (Estimated)	Retained (for now) in Defra	Environment Agency Resource (maintenance & operational costs)	Capital Programme (new & improved defences & projects)	
2007/08 Baseline	86	0	247	259	592
2008/09	87	4	251	308	650
2009/10	87	20.5	258	334.5	700
2010/11	87	38	279	400	804
CSR 3 Year total	**261**	**62.5**	**788**	**1,042.5**	**2,154**

[1] 3rd July 2007 Flooding in England: Secretary of State statement to Parliament
[2] 4th February 2008 Budget allocations and Outcome Targets: Secretary of State Written Ministerial Statement
[3] Environment Agency, December 2007, Review of 2007 floods
[4] Defra ZBR Report, unpublished

7.12 The Review has commissioned a qualitative update of the Foresight report (see Chapter 3). This highlights that the risks from climate change are rising and that they are greater now than at the time of the Foresight report. It would therefore be logical to assume that any reassessment of funding needs is likely to be upwards rather than downwards. However, the Review notes from evidence submitted to it, and to the EFRA Select Committee, that many spending projections and assumptions are based on the original *Foresight Future Flooding* report. We believe that a quantitative update of Foresight would be prudent once the latest climate change scenarios are published.

7.13 The EFRA Select Committee also raised the issue of construction inflation. It suggested that construction inflation *"could be as high as 6.5 per cent"* and therefore well ahead of general inflation. Thus, in real terms, expenditure may not go as far as might be supposed by the headline figure. In its evidence to the Select Committee, the Environment Agency stated that some of the inflation was offset by efficiency savings within its flood risk management programme.

7.14 The Review welcomes the increase in funding announced by the Government in July 2007. The Review does not attempt to set a target figure for future funding of flood risk management. But in light of the evidence of rising risks from climate change and the additional challenges identified in this report, the Review does believe that it is sensible for the Government to plan on the basis of above inflation rate settlements in future Government spending rounds.

Certainty in the long term

7.15 In the interim report, the Review set out the importance of a long-term approach to expenditure on flood risk management. Our suggestion of a need to develop a long-term investment strategy at the national level was welcomed by a significant number of submissions to the Review. The Local Government Association recognised the need for such an approach at the local level as well.

7.16 The ABI said in its report[5] on the summer floods:

> "*The Government should also take this opportunity to set its policy in the context of a 25-year national strategic plan for flood defence and management. Britain is suffering from the fact that so much of the thinking about flood defences has been short-term, based on 3-year spending plans. What we actually need is sustained and planned investment over a far longer period, based on full and public assessment of the risks and costs.*"

7.17 A long-term investment strategy should set out the investment needs for flood risk management in England within a policy framework for delivering long-term, sustainable flood risk mitigation measures. It will need to give some indication of what investment will happen when, but with the understanding that more detail will be available for the years most immediately ahead.

7.18 Some of the key benefits for flood risk management are likely to be:

- greater certainty around which strategies will be delivered;
- greater development of long-term and flexible solutions;
- more efficient use of resources, including less stop-start approaches to the implementation of capital projects;
- greater certainty around resources and resource needs; and
- more consideration from local authorities and other partners of longer-term options and what further adaptation and resilience strategies are required for their communities.

7.19 A long-term investment strategy is not a new concept. For example, the Government's Building Schools for the Future programme[6] has committed to refurbishing a large number of schools in England over a period of 15 years.

[5] www.abi.org.uk/BookShop/ResearchReports/Flooding%20in%20the%20UK%20Full.pdf

The Department for Transport has a 10-year funding plan called the Long Term Guideline for Funding.[7] This sets out real-term growth in spending of 2.25 per cent per annum until 2018–19.

7.20 In their submissions to the Review, the Government and the Environment Agency supported our interim conclusion on the need for a long-term investment strategy and indicated that work had already begun to develop it. As part of this development work, the Environment Agency will consider long-term funding needs and sources of funding. We believe that, in doing so, the Environment Agency should consider all flood risk (coastal, river, groundwater and surface water flooding), consistent with its expected strategic overview role. Furthermore, as any long term programme will in effect set out the level of risk that Government is willing to bear, the Review believes that public consultation will be necessary and provide an oppportunity to debate what level of risk society is willing to tolerate and/or pay for.

7.21 We believe a move to a long term investment strategy would have cross-party support. The Treasury Select Committee report[8] on *Climate Change and the Stern Review: the implications for Treasury policy*, published in February 2008, said:

> "*We also believe that effective flood risk planning involves long-term investment, so requires long-term financing and advance warning of the funding that will be provided. We therefore recommend that the Government make a public commitment to the level of flood defence spending beyond 2010–11 in advance of the next spending review*."

RECOMMENDATION 23: The Government should commit to a strategic long-term approach to its investment in flood risk management, planning up to 25 years ahead.

Where the money is being spent

7.22 Many submissions suggested that the events of last summer might point towards a different prioritisation of current spending. There was general agreement with the Review's interim conclusion that funding should be spent on areas of highest risk, but this conclusion was interpreted in different ways. Some supported the interim conclusion, provided the funding was accompanied by a cost–benefit assessment; others supported the interim conclusion provided the funding accepted the notion of 'highest risk' in relation either to 'high probability' or to 'high consequence'.

Risk based framework

The development of a risk based framework is underpinned by the understanding that it will never be possible to prevent all flooding happening. It is therefore the impacts of and vulnerabilities to flooding that make interventions necessary. Risk is a function of both probability and consequence. As Figure 6 shows, measures to mitigate risk include the building of defences and maintenance of watercourses to reduce the probability of flooding happening, and land use planning and resilience measures to reduce the consequences. Measures such as flood warning and raising awareness of risks can build community resilience to flooding and make many of the measures above more effective. With a clear understanding of risk, the use and combination of these measures can help determine what level of risk is possible and/or desirable.

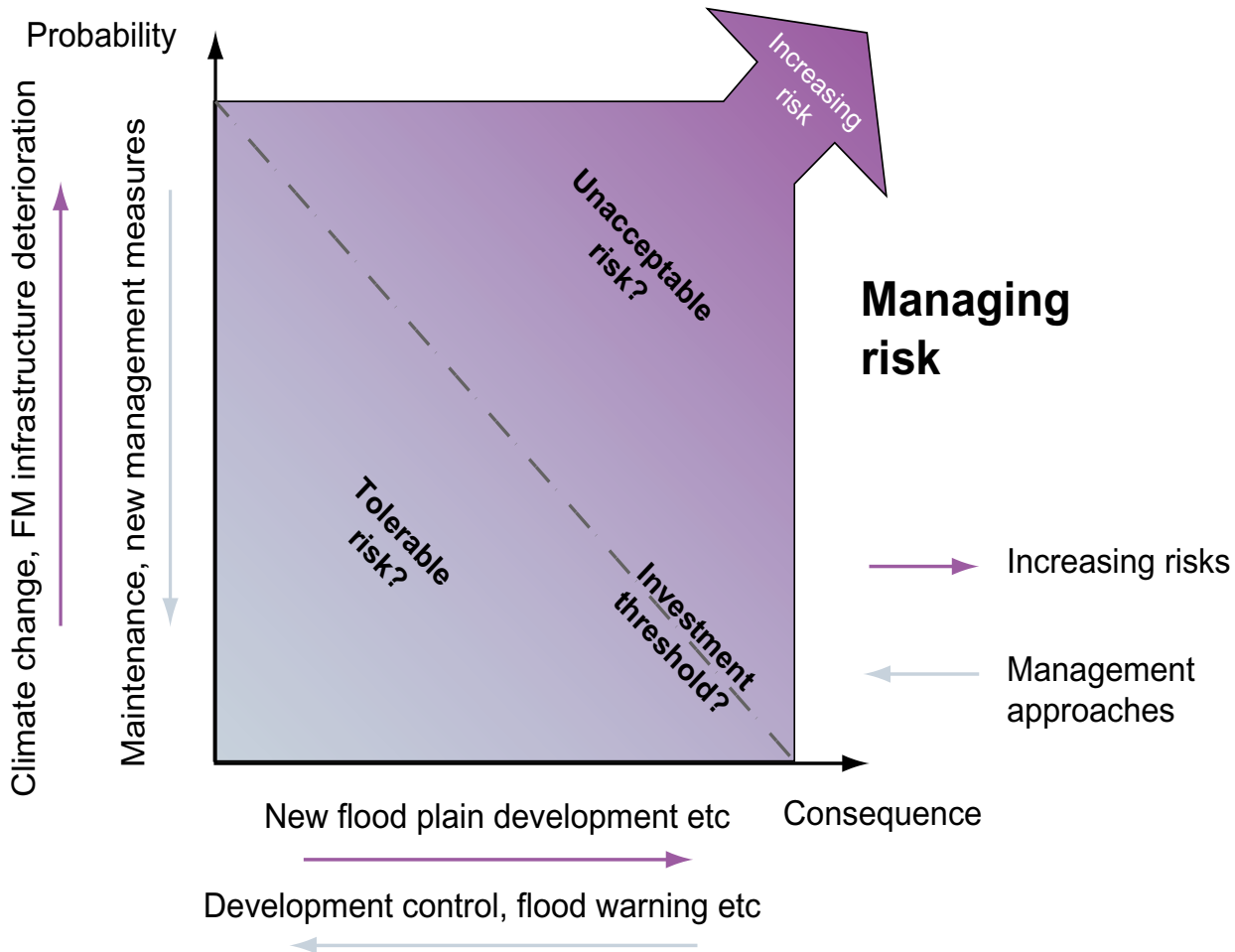
7.23 The Review is of the opinion that, because limited funds are available for flood risk management, the risk-based approach has to be accompanied by an assessment of costs and benefits. However, the full range of benefits – financial, social and environmental – should be considered when making that assessment.

[6] Partnership for schools: http://www.p4s.org.uk/
[7] http://www.dft.gov.uk/about/strategy/transportstrategy/hmtlsustaintranssys?page=17
[8] http://www.publications.parliament.uk/pa/cm200708/cmselect/cmtreasy/495/495.pdf

7.24 Figure 6 below sets out the challenge for the Government in dealing with flood risk and trying to decide where to focus investment. For example, does the Government focus its expenditure on high consequence events that rarely happen or, conversely, on those events that regularly happen but only affect a few properties? The current Government approach to national funding tends to be towards the higher consequence events because expenditure on these schemes will generally deliver the greatest value for money. However, it is important that low consequence events are not ignored as, if they occur frequently, the total may be comparable.

7.25 An approach that focuses national expenditure on the highest cost–benefit in this way may deliver the greatest value, but offers little hope to some communities that do not meet the cost benefit assessment. But new approaches are being developed which allow for broader consideration of the different types of risk, to allow consideration not only of high consequence, but also higher probability events.

Figure 6 – Considering risk for flood risk management



Prioritisation System and Outcome Measures

7.26 Flood defences that have been built or are in the process of being built in England will have been chosen using Defra's flood defence priority score system (see Table 4 below). This assesses the benefits of a scheme in relation to economics (cost–benefit ratio), people (number of households protected) and the environment. It delivers an overall score which is then ranked against all the other schemes coming forward. Finally, a cut-off point for funding is established. Many worthwhile schemes do not meet this level and it can be frustrating for communities which have developed schemes only to find they are not eligible for national funding.

7.27 A new system of outcome measures has been introduced that attempts to draw out a wider range of benefits and approaches to managing risk. These measures,[9] which were published in June 2007, allow the Government to target a broader range of outcomes. They cover households at risk, deprived households, nationally important wildlife sites, preventing inappropriate development, flood warning, contingency planning and the delivery of Catchment Flood Management Plans (CFMPs). A number of targets underpin these measures.

7.28 Defra also announced targets in relation to five outcome measures in February 2008[10] to cover the capital improvement (flood defence) programme for the current comprehensive spending review period:

- economic benefits – cost-benefit ratio (average target of 5 to 1);
- households protected – 145,000 households including 45,000 at significant or greater probability of flooding;
- households in the 20 per cent of most deprived areas – 9,000 of the 45,000 households in high probability areas; and
- environmental benefits – two measures addressing nationally important wildlife sites and biodiversity habitats.

7.29 Over the coming financial years Defra will roll out targets against the full set of outcome measures. **The Review welcomes this intention as it should ensure a broader consideration of risk management measures**. The Environment Agency will also be introducing a new prioritisation system to address the move to outcome measures. This new system will allow schemes to contribute to a number of targets and outcomes, rather than in the past where the focus of individual schemes has tended towards a single benefit, and as such should encourage the development of more diverse options. It will also introduce an element of moderation into the process as decisions about which mix of schemes to choose be made using a degree of judgement, rather than being based simply on the top scoring schemes. The Review notes that such an approach will also have its challenges and decision making will need to be transparent.

Table 4. Flood defence priority system in England

People (Max 12 points)	Environment (Max 12 points)	Economics (Max 20 points)
Number of residential properties protected – max 8 points Public safety – max 2 points Vulnerability – max 2 points	SSSI, BAP sites – up to 12 points Heritage sites – max 2 points Capped at 12 points	Cost – benefit ratio between 1:10.5 Capped at 20 points

[9] www.defra.gov.uk/environ/fcd/policy/strategy/sd4/default.htm
[10] www.defra.gov.uk/news/2008/080204a.htm

7.30 Defra has informed the Review that it intends to review the current range of outcome measures in the second half of 2008 to assess whether they cover all appropriate outcomes. **The Review welcomes this intention and would encourage Defra to consider whether, in light of the events of summer 2007, an outcome measure addressing surface water flooding is needed.**

Rural communities

7.31 A significant number of rural areas were flooded during summer 2007. Many submissions to the Review from rural areas stated that the current prioritisation and appraisal system, with its emphasis on cost–benefit analysis, favours urban over rural areas because of their higher property density levels. East Riding pointed out that:

> *"One of the major problems appears to be that despite a much greater number of individuals suffering or at risk from flooding, when they are dispersed they are given a low priority rating for investment... This means that the 6,200-plus properties flooded in our area will never attract funding as they are dispersed. This is hardly a balanced approach when all the individuals in East Riding are paying into Government for taxes and are paying their water bills for little or no return."*

7.32 The development of new outcome measures, described above, is an attempt to move away from a system of pure cost benefit. The Government could, if it felt rural communities were being disadvantaged, set an outcome measure to address this. Defra's target to reduce high probability flooding in 45,000 households could also encourage the use of property-level resilience and resistance measures or softer engineering schemes, which are more appropriate in sparsely-populated rural areas. This measure might work well linked to resilience grants schemes, covered in Chapter 5.

Social justice

The update commissioned by the Review of the Foresight Future Flooding report emphasised the importance of social justice issues in relation to flood risk management. It found that in many cases it was not which responses were used, but the way in which they were implemented, that led to perceptions of inequity. Recent research for Defra (projects FD2605 and FD2606) has looked at issues of inequity within flood risk management in England. The results have shown that the public, in general, is not overly concerned about demonstrable social inequities in provision for different groups (e.g. high standards in estuarine London; low standards in many areas flooded by intra-urban flooding). They are, however, more concerned about procedural inequity (i.e. how decisions are made, especially in rural areas). Many of the responses to the Review reflected this viewpoint.

Balance between new improvement schemes and maintenance

7.33 The Review also received representations about lack of maintenance, which are addressed more fully later in this chapter. Some were concerned that new schemes should not be progressed at the expense of maintaining existing schemes or watercourses. The Environment, Food and Rural Affairs Select Committee also cautioned against an approach that did not adequately balance existing and future maintenance needs against new capital schemes. We understand that Defra will be extending the outcome measures to maintenance during 2009 to ensure maintenance costs are considered alongside new capital schemes. **The Review welcomes this.**

The Environment Agency and the role of Regional Flood Defence Committees

7.34 The Environment Agency's programme of expenditure has to have the approval of RFDCs. RFDCs challenge the programmes brought forward by the Environment Agency for national expenditure to ensure that they are sustainable, deliver a range of outcomes and offer value for money.

7.35 RFDCs can raise local levies to supplement the national programme. This should enable the funding of schemes that do not get on to the national priority list but are considered to be of regional or local importance. While the RFDCs must demonstrate that the schemes are cost beneficial, they can often offer hope to communities who do not expect to receive support through the national system. However, the amount of funding that can be provided through this route is limited as it is linked to council tax levels and requires the majority agreement of local authority members on the committee. Last year RFDCs raised £29 million to spend on local schemes.

7.36 With their links to local communities, the RFDCs can often bring together a range of funding sources. Examples of the use of funds that were brought to our attention show that the RFDCs' involvement and the use of the local levy can often be the stimulus for further contributions.

Improving the defences at Kilnsea

The continuing erosion of coastal defences is creating a serious risk of flooding to houses in Kilnsea village in East Yorkshire.

The long-term economic case for realigning the defences at Kilnsea to protect the village is poor. Very expensive long-term engineering would have been required to protect relatively few properties and so the defences would probably have had to be abandoned.

However, when the Yorkshire Regional Flood Defence Committee and the Environment Agency looked at the situation in more detail, they concluded that, even though no money would be available from national budgets, they could use the resources from the levy to raise funds from other sources.

The offer of a £100,000 grant from the local levy stimulated the residents, who had formed the Kilnsea and Spurn Flood Defence Group, to raise funds and seek further grants; the levy also brought in a sizeable commitment from the East Riding of Yorkshire Council for infrastructure protection. These funds allowed the Environment Agency to build a new earth flood bank in time for the 2006-07 winter storms. The Group has taken on responsibility for managing the new defence, which will protect the village for a further 30 years and give the residents much-needed time to plan their future.

Local funding of flood risk mitigation measures

7.37 It is commonly accepted that, even with proposed increases in national flood risk management funds, there will never be enough national funding to address every need. Moreover, while there are national benefits from mitigating the impacts of flooding, there are also local and individual benefits. We know that aligning those who benefit with those who pay will bring greater efficiency and greater responsiveness from those carrying out the work. The Review does not believe that it is unreasonable, therefore, for funding to come from sources other than Government, such as a local authorities, business, environmental organisations or local community groups.

7.38 The Review has heard evidence from a range of sources, including local authorities and community groups, highlighting the value of local approaches to funding flood risk management measures.

7.39 Local authorities can use their own funds to tackle flood risk and many already do. Currently, they receive an allocation from central government through the Revenue Support Grant, but this is not ring-fenced and authorities do not have to spend it on flood risk. As local authorities move towards a greater leadership role in flood risk management and a better understanding of the level of flood risk in their area, it should become easier for them to prioritise spending on flood risk. Some may choose to follow the example of Gloucestershire County Council in raising additional council tax specifically to manage flood risk.

Gloucestershire County Council – extra investment in flooding

Following last summer's flooding, Gloucestershire County Council decided to commission a survey of options for a flood levy to council tax. The options were:

Option one	No levy
Option two	plus 1.1 per cent flood levy
Option three	plus 3.1 per cent flood levy

Option two would create a 'fighting fund' of £2.3 million to investigate and begin to tackle flood prevention and drainage works.

Option three would increase the 'fighting fund' to £4.5 million and provide for capital investment of £25 million to fund major investment in flood prevention and drainage works.

Nearly 3,000 people voted. Some 56.7 per cent voted for either option two or three – a flood levy. The results varied according to district. A relatively large number of Tewkesbury residents favoured option three and the Forest of Dean had a high proportion of votes for option one. This may reflect the fact that they were the most and least affected regions.

Gloucestershire County Council agreed a 1.1 per cent levy on 20 February 2008. This will support investment in flood prevention including better drainage.

Since announcing the decision on the levy, Gloucestershire County Council has taken forward work in a number of areas.

- the Council estimates there are some 450 'hot spots' on the highway network and Gloucestershire Highways has been given £2 million capital to start immediately on the 50 most serious sites. All 'hot spots' have been jointly reviewed by key partners such as the water (sewerage) authority, Environment Agency and the appropriate District Council;
- a flood guide has been sent to all householders in the county which was jointly funded by a major insurance company;
- a further £750,000 has also been released for some 135,000 drains, gullies etc to cleaned and cleared and this programme has started; and
- a Councillor-led team of members and officers developing a county-wide partnership with water authorities, the Environment Agency and other local authorities to support multi-agency projects.

7.40 Other local authorities have contributed funds and brought in business contributions to deliver flood mitigation measures. **The Review welcomes this proactive approach which recognises that local authorities and other beneficiaries can help to make schemes happen**.

Voluntary contributions to Environment Agency and local authority schemes

7.41 Contributing to the funding of flood risk management measures can offer real benefits for businesses. Most obviously, these will help protect their premises from flooding and reduce long-term costs. Where the contribution is to a community scheme, businesses are discharging their corporate social responsibility. For some businesses it makes sense to contribute to a wider scheme that benefits the whole community, rather than pay for a potentially less effective scheme that benefits only their business. However, while developers contribute to the mitigation of flood risk on new developments through section 106 agreements (see Chapter 5), the contribution arrangements from businesses to flood risk management schemes, and the benefits that businesses might gain for such a contribution, are currently carried out on an ad hoc basis. There is no clear guidance on how this should be done or what level of contribution is appropriate. Approaches can vary from region to region and between different local authorities.

7.42 A further complication with contributions is concern over the impact that they may have on scheme prioritisation. A business, or even a wealthy member of the community, could be seen as buying their way up the prioritisation table. The Review recognises that this would be undesirable. We have received welcome evidence that Defra and the Environment Agency are developing guidance on contributions. In its evidence to the Review, the RFDCs set out the dilemma:

> *"there is potential to draw in third party funding – both private sector and by public sector agencies other than the Environment Agency – to help with development of mainstream flood defence schemes. ... However the current funding system offers no incentives to potential third party funders. The Environment Agency and DEFRA are considering possible policy changes in this regard and these need to be brought forward quickly."*

7.43 The Review would welcome greater clarity on the role of contributions in flood risk management funding.

Business Improvement Districts

7.44 At the local level there may be opportunities for businesses to work in partnership to fund local flood mitigation measures, such as temporary defences or flood protection products. The Local Government Act (2003)[11] introduced Business Improvement Districts (BIDs) to the UK. As set out in the explanatory note for The Business Improvement Districts (England) Regulations 2004 (SI 2004 No.2443):

> *"Business Improvement Districts are provided for in Part 4 of the Local Government Act 2003 as areas within which projects specified in the BID arrangements are to be carried out for the benefit of that district or those who live, work or carry on any activity in the district. Those projects are to be financed (in whole or in part) by a BID levy imposed on the non-domestic ratepayers, or a class of such ratepayers in the district. A Business Improvement District may only be established where those entitled to vote approve the BID proposals."*

7.45 BIDs allow businesses in a defined area to work in partnership with local authorities to develop projects and services that will benefit the trading environment. More than 42 BIDs are already established in England and Wales covering a range of projects. Importantly, no agreement or raising of levies can be carried out unless voted for by the defined district. BIDs can fund services in addition to those provided by local authorities so, for example, some measures funded by existing BIDs have included additional cleaning of streets. Therefore, it is possible that BIDs may wish to fund additional clearance of gullies and highway drains.

Flood Alleviation Scheme at Banbury

Extensive rainfall during Easter 1998 on the Cherwell catchment caused flooding in Banbury to over 160 residential and 30 commercial properties. Banbury railway station was out of action for several days. The event was estimated to have a 1 in 100 annual chance of occurring. Upstream flood storage with online improvements in Banbury and a pumping station to take water away from properties during flood conditions were proposed, with the aim of providing a 1:200 year standard of defence and reducing the risk of flooding to 386 residential and 97 commercial properties.

The pumping station was completed in 2003, but it proved difficult to obtain the land for upstream storage. Eventually, Compulsory Purchase Order action became necessary. A Public Inquiry was called; but the priority score for the scheme was 16.9 at a time when the threshold for Grant-in-Aid funding had risen to the mid-20s, so funding could not be assured and the Public Inquiry had to be abandoned.

Alternative funding options have therefore been explored. Cherwell District Council has agreed to contribute £2 million and to seek a similar sum from businesses in the town. Seven key local businesses are currently in discussion with the council on their potential contributions to this scheme. Cherwell District Council recently wrote to these businesses to inform them of the potential scale of their contribution and included a draft of the legal agreement so they could see precisely how the scheme would work. On this basis, the RFDC has resolved to commit £9.7 million over four years from the local levy to enable the scheme to be built. This is almost a quarter of the expected levy over that period, showing very significant solidarity from the local authorities in the Thames region, which include the London Boroughs as well as upstream authorities out to the Cotswolds The Public Inquiry will restart in 2008–09. Banbury railway station and several commercial properties flooded again in summer 2007.

[11] www.opsi.gov.uk/Acts/acts2003/ukpga_20030026_en_1

Private Streetworks Code

7.46 The Highways Act 1980 (c66) includes the Private Streetworks Code. This allows the street authority, usually the county council, to make improvements to a private street in areas such as sewerage, channelling and levels where it views this to be necessary. The authority will draw up a plan and can charge an appropriate amount to premises that border the private street. The Code states that:

> *"A street works authority may include in street works to be executed under the private street works code with respect to a street any works which they think necessary for bringing the street, as regards sewerage, drainage, level, or other matters, into conformity with any other streets, whether maintainable at the public expense or not, including the provision of separate sewers for the reception of sewage and of surface water respectively."*

7.47 The cost of works is divided between those properties adjoining the street. As it is privately funded, work is usually taken forward only with the agreement of all or the majority of affected businesses or households and tends to be relatively low cost.

Communities

7.48 The Review has received submissions from community groups who have concerns that simple low-cost measures that could resolve their local flooding issues are not being prioritised at the national or local authority level. There are also examples where communities have contributed funds towards schemes (see Kilnsea example). Where local communities do decide to fund works privately, local authorities and the Environment Agency should be able to provide general and technical advice and the Review would encourage them to do so.

7.49 Care will need to be taken to ensure that works are technically sound and do not increase risk elsewhere. In certain circumstances, consent from local authorities and other organisations such as the Environment Agency and Natural England will be required.

7.50 We believe that voluntary contributions and actions to fund flood risk management measures locally, providing they are technically and environmentally sound and sustainable, should also be encouraged In order to facilitate voluntary contributions towards local flood risk management measures, the Government and the Environment Agency should develop guidance that sets out how this can be achieved including possible funding routes, consideration of flood risk assessments and options for managing risk. Surface Water Management Plans should reflect local flood risk concerns.

7.51 The Review has highlighted two schemes above (BIDS and the Private Streetworks code) that can facilitate joint action to tackle local issues. The Review believes that it should be possible to develop a scheme that encourages joint local contributions to resolve local flood issues. These schemes would be relatively low cost but would benefit local communities considerably and would take place only with majority agreement. Any scheme that was set up might require legislation and so consideration should be given to the inclusion of the necessary powers within the proposed Floods and Water Bill.

RECOMMENDATION 24: The Government should develop a scheme which allows and encourages local communities to invest in flood risk management measures.

Maintenance of defences and watercourses

7.52 Flood defences and the ability of channels to convey water play a significant part in flood risk management and their maintenance is crucial in protecting against future flooding. The Review received many submissions about maintenance.

Defence maintenance

Maintaining defences in target condition

7.53 The Environment Agency inspects and monitors the condition of all flood risk management assets that protect against flooding from main rivers and the sea. This is done both to ensure that the defences are in the appropriate condition and to target maintenance and repair. The Environment Agency has responsibility for some 24,000 miles of flood defences and 46,000 flood defence structures. Less than 0.2 per cent of the man-made defences and assets that were tested during the summer 2007 floods actually failed and the Environment Agency believe that in most cases this led to an earlier onset of flooding rather than causing flooding.

7.54 The Environment Agency has carried out a review to examine lessons that could be learned from the nine cases where it had been thought that assets failed.[12] Further analysis showed that some of these sites had not failed, but rather had been overtopped. Some other sites did not physically fail, but were unable to operate due to loss of power, with the majority being caused by a failure of utility service to the site. Its work has identified some lessons learned including, in relation to electrical equipment, design changes to maximise flood resilience, and preplanning the connection of temporary power. The Review believes that operators must do more to ensure there is appropriate resilience in flood risk management assets, including in any essential components of the supply chain such as power.

7.55 The Environment Agency also looked into a further five assets where there had been concern about near failure, with an initial conclusion that for the areas of England that were subject to the summer 2007 floods, geotechnical mechanisms (fissures and buried watercourses) were more likely to have caused defence breaches than overtopping. Since so many defences tested were classified as being overtopped, the Review believes it is essential that the Environment Agency should use these findings as a basis for gaining a better understanding of asset performance to optimise design and maintenance.

7.56 Only a relatively small proportion of assets that were tested during the summer 2007 events failed, but the House of Commons Public Accounts Committee (PAC), in its December 2007 report,[13] raised concerns about the Environment Agency failing to meet its own objective to maintain 63 per cent of its flood defence systems to target condition by March 2007. The National Audit Office (NAO) which undertook the analysis for the PAC, reported that an additional £150 million per year for ten years would be required to bring all flood defences up to their target condition.[14] Some witnesses giving evidence to the EFRA Committee Report into flooding,[15] believed this demonstrated that the Environment Agency's priority should be to maintain existing flood defences rather than build new schemes. A number of submissions to the Review were also concerned that there was insufficient focus on maintenance.

7.57 At the time of the audit, the Environment Agency was spending only around 55 per cent of available funding on maintenance of high-risk defences, but in the 2008–09 funding allocation round this has risen to around 75 per cent, with the remaining 25 per cent focused on sustaining operational equipment and channel maintenance (addressed later in this chapter). The Review recognises that it is important to get the right balance between building new schemes and maintaining existing ones. Given the importance of this matter, the NAO has also indicated that it may revisit this area in the near future.

[12] Environment Agency update on failed assets, May 2008 (not published)
[13] House of Commons Committee of Public Accounts, Fourth Report of Session 2007-08: Environment Agency, Building and maintaining river and coastal flood defences in England, 10 December 2007
[14] Report by the Comptroller and Auditor General, Session 2006-07: Building and maintaining river and coastal flood defences in England, HC (2006-07) 528
[15] House of Commons Environment, Food and Rural Affairs Committee, Fifth Report of Session 2007-08: Flooding

Asset database

7.58 Chapter 6 highlights the importance of developing a register of assets that sets out both condition and maintenance needs. The PAC also highlighted problems with the National Flood and Coastal Defence Database (NFCDD), including the fact that difficulties in extracting timely performance data were hindering efforts to keep the defences in their target condition. Local managers were unable to use the system to check whether identified faults had been remedied. In addition, the system could fail when users sought to extract large volumes of data and only 80 local authorities had used the system to monitor the state of their non-main river defences.

7.59 The Environment Agency is developing a new asset management system. It plans to complete piloting and training to enable implementation of a commercial off-the-shelf system in 2009, at a cost of around £10 million. **The Review welcomes this progress towards what will be a much more effective management tool**.

7.60 The Environment Agency has stated that it is consulting with local authorities and other third party operators to ensure the tool will provide reliable access. Given the proposed local leadership role for local authorities (see Chapter 6), the Review considers it essential that the new asset management tool is not only user-friendly but also provides the functions that are compatible with the local authorities' new role.

Maintenance of third party assets

7.61 While the Environment Agency maintain the majority of the flood risk management assets in England and Wales, some one-third of flood defences are the responsibility of third parties, so it is important there are systems in place to ensure these are maintained. Third party operators can include landowners and organisations such as Network Rail and the National Trust. The PAC raised concerns that the Environment Agency did not routinely notify third party owners of flood defences of any defects found. It recommended that, as well as formally notifying all third party owners of the remedial action needed, the Environment Agency should follow up to ensure necessary action has been taken. In the wake of the summer 2007 floods, the PAC also recommended that the Environment Agency consider whether there is a case for extending its powers to compel third parties to take action. **The Review has heard a weight of evidence raising this as an issue and welcomes the PAC's recommendation in this area**.

7.62 New guidance has been produced about the need to notify third party owners of defects and necessary remedial work. This requirement will be incorporated into the new Asset Management System, which is due to launch in April 2009. **The Review welcomes that this will include automatic prompting of re-inspection depending upon the degree of risk**. The Environment Agency is also working with Defra to identify whether the powers to compel works to be undertaken by third parties need to be extended.

Channel maintenance

7.63 Channel maintenance is the clearance of vegetation and debris from open watercourses including de-siltation and dredging. Many of the responses received by the Review have blamed the extent of the flooding in the summer 2007 floods on the fact that rivers are no longer dredged and vegetation and debris had been allowed to build up and cause the flow capacity to be significantly reduced. There were also concerns that this extra vegetation meant that flood waters did not recede as quickly as they might otherwise have done had watercourses been clearer.

> *"And the problem is that the maintenance of the dykes around the fields round the farms don't get maintained they have never been maintained at all." (Business, Toll Bar, Doncaster)*

7.64 Environment Agency has the powers to maintain and improve 'main rivers' to manage water levels and the passage of flood flow, but this is not an obligation. Local authorities have similar powers to carry out maintenance work on ordinary watercourses and where there is an internal drainage board in the region, it too has the same powers. The Environment Agency has

other duties and functions which extend to all watercourses, so it carries out work on those watercourses it believes pose a particularly high risk (for example in built-up areas where the impact is greatest and watercourses are confined to a single channel), including maintaining certain watercourses outside of the main river category on behalf of local authorities, IDBs and riparian owners.

7.65 In 2007/08, the Environment Agency spent around £3 million per year on dredging, £8 million per year on weed removal and £23 million on removing blockages, maintaining structures and carrying out preventative work to trees and bushes bordering rivers. Where it is the navigation authority, the Environment Agency also de-silts rivers in critical locations to allow passage for boats. The Environment Agency takes a risk-based approach to its maintenance regime and considers whether the work is technically feasible, economically viable and environmentally sustainable. Concerns were raised that environmental issues are put before the needs of those living with flood risk. The law currently requires that environmental impact assessments are carried out for all proposed weed cutting and channel work. However, the Environment Agency has indicated that work will be carried out despite the potential risk to the environment if it identifies an area as a significant flood risk.

7.66 The Environment Agency has been working to try to optimise its maintenance regime to gain the best value for money. To progress its understanding of how seasonal variation in vegetation affects the way in which watercourses behave, the Environment Agency has recently developed a tool called the Conveyance Estimation System (CES), which will help to deliver an improved maintenance programme. The costs and benefits of dredging are now also better understood and although widening and deepening a channel may seem like the obvious solution there are a number of constraints which need to be considered such as sustainability, waste material, environmental damage and cost.

Dredging

Dredging causes a physical change to the natural course of a river. The costs of maintaining the new channel dimensions can be extremely high because the watercourse will try to return to its natural state. The dredging can make the river banks prone to erosion, and hence stimulate a further build-up of silt, exacerbating rather than improving problems with water capacity. Disposal of dredged waste material also creates a problem: it cannot be left at the side of the river as this restricts the capacity of the flood plain and the transport/ disposal costs of the waste can be restrictively high. In the past, dredged material has been used to build flood defences but it has now been discovered that it is not suitable as it can become porous and unstable when wet. Dredging can also be harmful to natural habitats – and special areas of conservation are protected under the Habitats Directive.

Dredging is considered as an option for flood risk management, but it is limited to areas where it is most appropriate, with money that is saved being used for more effective methods of flood protection.

7.67 The effects of dredging and maintenance will be different for different watercourses; where a substantial part of the conveyance of water occurs on the flood plain, the effects will be less significant than if the conveyance of water generally remains within the banks of the watercourse. The statement from the Environment Agency that dredging and maintenance of watercourses would have had limited benefit during the summer 2007 floods relates to the fact that in extreme events the water will be conveyed by the flood plains. However, channel maintenance can have a significant impact on lesser flooding events.

7.68 The Review is of the opinion that the work carried out by the Environment Agency is not as transparent as it could be. Many responses quoted the fact that they never see the Environment Agency clearing rivers of vegetation or dredging. A reduction in maintenance to restore a channel to its natural equilibrium can often

be seen by the public as neglect rather than as a benefit. The Environment Agency has established a considered, risk-based approach to channel maintenance, based on the available budget, which needs to be available in the public domain to assure people that work is being carried out. The River Restoration Centre agrees with this approach to promote transparency and believes that it will increase the understanding of the benefits and disadvantages of different types of maintenance to some watercourses. The Review believes that this publication of schedules of work should also be extended to IDBs and local authorities to ensure that the maintenance work that they perform is recognised.

RECOMMENDATION 25: The Environment Agency should maintain its existing risk-based approach to the levels of maintenance and this should be supported by published schedules of works for each local authority area.

7.69 Although the Environment Agency only has powers to carry out flood defence works (including maintenance) on main rivers, it also carries out works on ordinary watercourses as explained above. A limited budget requires the Environment Agency to prioritise what maintenance is carried out using a risk-based approach. High-risk areas are maintained on an annual basis whereas medium-risk areas may only be carried out on a four-yearly basis. The consequence of this is that certain watercourses which may have been maintained by the Environment Agency in the past have had their maintenance reduced or, in some areas perceived to be of low risk, removed altogether. We emphasise above the need for transparency when doing this.

7.70 One of the Review's interim conclusions was that the Environment Agency should make sure that they inform landowners who are to be affected by a reduction or withdrawal of maintenance. The Environment Agency has since opened a dialogue with a number of organisations and individuals and has communicated its approach to maintenance on its website. However, concerns have been raised by the National Farmers' Union (NFU) that, although it has been asking for this dialogue in specific regions (such as the North West) for over two years, there has been little progress and that the Environment Agency needs to be more transparent about what work it intends to carry out. The Review also believes that this dialogue should include local authorities as part of their leadership role in relation to tackling local flood risk (see Chapter 6).

7.71 Preliminary guidance on the withdrawal of maintenance in coastal areas was issued in June 2007 and full national guidance is being developed to address inland areas. This guidance should explain options for landowners if maintenance is withdrawn or reduced and set out, together with national maintenance standards which are also currently in development, how to carry out maintenance works in a safe manner and in compliance with environmental legislation. The Review believes that the Environment Agency should continue to update this guidance, as well as providing advice and workshops to help riparian owners to manage their own flood risk through the maintenance of their watercourses.

Channel maintenance and desilting – making a difference

The Environment Agency has carried out maintenance work in and around Buckingham since July 2007 in collaboration with the local Internal Drainage Board. This has included removal of vegetation and overhanging branches and the removal of various obstructions upstream of the town and de-silting of the channel through part of the town by the Bedford Group of Drainage Boards. This will be supplemented in the coming months by further silt removal in and downstream of Buckingham. Together these works should help the flow of water through Buckingham and help alleviate some of the flooding problems experienced in the town.

Temporary and demountable defences

7.72 Temporary defences provide a quick and relatively easy way of defending long lengths against floodwater inundation from rivers. They can be transported to suitable sites, are re-usable, and offer many advantages over traditional sandbags, including speed and success rate. Demountable defences have fixed engineered foundations, with the demountable elements providing unrestricted access when not deployed. There is an increasing variety of these non-permanent defences and the flexibility they offer can have the potential to offer flood protection to locations that are not, or cannot be, protected by permanent flood defences.

7.73 During the summer 2007 floods, plans to deploy some of these temporary defences had mixed results, with defences not arriving at Worcester and Upton-on-Severn due to severe disruption to the road network. This highlighted a major risk with the temporary defences: the potential for operational failure due to the dependence on long enough flood forecast lead-times and the deployment of workforce, plant and materials.

7.74 The Review's interim report made the urgent recommendation that the Environment Agency should develop and implement a clear policy on the use of temporary and demountable defences. In response to this, the Environment Agency has used trials and its other experiences of the defences to inform a national policy which it published[16] earlier this year.

Temporary defences

7.75 Environment Agency policy states that it will stop using temporary defences as an alternative to permanent schemes. It will not use them to protect new locations on a routine basis. The Environment Agency believes experience has shown that temporary defences are labour intensive, have a significant increased risk of failure, raise public expectations and are uneconomic when considering whole life costs. Temporary defences will only be considered as a short-term measure where permanent defences are being repaired or installed, but should not be used where permanent schemes cannot be justified.

7.76 The Environment Agency makes clear that where it currently routinely uses temporary defences, but permanent defences cannot be justified, it will continue to provide temporary defences. Following the 2007 floods, the Environment Agency understands that they need to manage public expectations to make clear that these defences can only be provided on a best endeavour basis. Continuing management, liaison and dialogue must take place between the professional partners and the protected community to make sure that the right level of emergency preparedness is maintained. There must also be a full evacuation plan in the event of the defences not being deployed[17] or if they fail or are overtopped. In the longer term, the Environment Agency wants to move away from routine use of temporary defences, including perhaps through the building of a permanent defence (as is happening at Upton-on-Severn).

7.77 The policy also makes clear that, when the Environment Agency does provide temporary defences, the work will be carried out in conjunction with local partners as part of an incident response plan which gives details of responsibilities for storage, transport, operation and removal of the defences; and the provision of temporary pumping and other necessary measures. The Environment Agency wants to work closer with local authorities and other stakeholders to view the provision of temporary defences as a tactical response, as they do with sandbags.

7.78 The Environment Agency's review on temporary defences concluded that it will not provide a strategic stockpile of temporary defences. They found that the short-term benefits are considerably outweighed by the longer term organisational and financial costs. Strategic stockpiling could only be done on a best endeavour basis. The Environment Agency want to encourage other partners to hold stocks for tactical use in major events.

[16] Environment Agency, March 2008, Use of temporary flood barrier systems
[17] Environment Agency, May 2008. Outcome of Environment Agency review of deployment of temporary defences

The Review found that, in Sweden, temporary defences are used extensively as a key part of flood protection, both through provision from national strategic stockpiles and local municipal stockpiles. From late June to early August the national agency provided temporary defences to good effect for 17 municipalities in five areas of southern Sweden. **The Review would welcome the Environment Agency ensuring they look at any lessons from how other countries use temporary defences, both strategically and locally**.

7.79 The Environment Agency policy also states that it will, again on a best endeavour basis, also consider the use of temporary defences during flood events under the direction of Command Centres, where the Environment Agency has defences and resources available. In these circumstances, making the right decisions and being flexible about the best use of resources is essential. For instance, the inability to deploy the barriers to Upton-on-Severn to protect 30 properties allowed the defences to be used subsequently to prevent the risk of prolonged loss of power to 500,000 people (many of whom had already lost water) from Walham electricity substation. In the future it may be necessary to be flexible to make best tactical use of limited resources.

7.80 The Environment Agency believes that local authorities and the Fire and Rescue Service are potentially best placed to provide temporary defences as a strategic service, depending on the availability of additional funding. The Environment Agency suggests this might be coordinated by regional Government Offices through the resilience forums. Such an approach would need to be underpinned by regional risk assessments that identify critical flood risk sites, and each would need an effective contingency plan, with the Environment Agency playing a key role in advising and supporting this process.

7.81 Against these views, however, the Review found little evidence of local authorities providing temporary defences. Although the Environment Agency does have support from local authorities in helping get barriers to the deployment site, it has less success in getting local authorities to take on the lead role of erecting the barriers. The Review heard evidence that this can be, in part, due to local authorities relying heavily on a contracted workforce who generally require expensive retainers to provide a 24-hour call out service. In the East Midlands, there have been some discussions around the fire and rescue service taking on the role of erecting defences.

7.82 The Review has also heard evidence that, as a result of the summer 2007 events, a number of third parties have purchased temporary defences. For example, following the successful protection of Walham substation by temporary defences during the summer 2007 floods, some utility companies such as National Grid, Central Networks and Severn Trent Water have purchased their own temporary defences to defend their sites.

7.83 The Review understands that because deployment procedures come under the discretion of local management, reflecting catchment differences, there is no national guidance or formal route to share best practice from local reviews on deployment. **The Review would welcome the Environment Agency ensuring that systems are in place so that the key lessons learned in local areas are shared with other areas**.

Demountable defences

7.84 Environment Agency policy[18] states that demountable defences will undergo the same project appraisal and economic analysis as other flood alleviation schemes. The Environment Agency will limit the use of demountable defences to those locations where raised structures have been, or would be, rejected following formal planning procedures or to allow essential access. On-site storage will be considered in preference to off-site storage, thereby removing the need for transportation and reducing the risk of deployment failure. The Review supports this approach to demountable defences, which can offer a number of unique benefits and provide a useful option in certain circumstances.

[18] Environment Agency, March 2008, Envirnment Agency use of demountable flood defence systems

City of York Council

York's historic flood problem is well known, and a great deal work is already being done to alleviate it. City of York Council is involved in two further initiatives, one involving temporary defences and the other demountable defences.

In the first, the Council has taken over the storage and deployment responsibilities of some pallet barriers from the Environment Agency. The Council deploys these barriers across Tower Street to stop floodwater getting round the back of the Foss Barrier and rendering the pumping station ineffective. The Council stores the barriers in its own depot only half a mile from the deployment site. They have proved to be very effective and were last used in January 2008.

City of York Council are also involved in a pilot study to test the effectiveness of a new demountable barrier to prevent flooding of homes and buildings in an area of the city which is hard to defend because of the street layout and underground sewer. During the three-year pilot, the Council – who will be responsible for the deployment of the barriers – will act on flood warnings from the Environmental Agency. The Council is also responsible for maintenance.

Use by third parties

7.85 The Environment Agency has published guidance on the use of temporary and demountable flood protection[19], but from submissions to the Review, it appears third parties such as local authorities would welcome further advice on the potential of such defences. The Environment Agency has already stated that where other parties, such as local authorities, provide their own temporary defences, the Environment Agency will aim to provide a forecasting and warning service and assist, on a best endeavour basis, with any operational response.

7.86 The Review would encourage local authorities, utility companies and other third parties considering:

- the costs and benefit of using temporary and demountable defences both for specific vulnerable sites and having a strategic stockpile;
- liaising with the Environment Agency to take into account the effect of any forthcoming flood risk management measures; and
- understanding what advice and support they will receive.

Sweden's use of temporary defences

In Sweden, the municipal authorities play a key role in the deployment of temporary defences. In accordance with the Civil Protection Act, municipal authorities have to identify the risks within the municipality and have action programmes for the Fire and Rescue Services (who are part of the authority).

In Sweden temporary defences are a key part of the strategy to protect against floods and stocks are commonly stored locally at schools and deployed by the fire and rescue service. There is also a national stockpile of temporary defences which can be provided to the municipalities in the event of a major flood.

The role of sandbags

7.87 The most widely used form of temporary defence used during the summer floods was sandbags. Sandbags can also be successfully used alongside roads, for example, or by important buildings to prevent them from flooding. Nevertheless, the evidence we have had points to sandbags being relatively ineffective in helping householders mitigate the effects of flooding. In evidence, their use has been described as a 'sticking plaster' and the Local Government Association has said

[19] Defra and Environment Agency, Temporary and demountable flood protection, Interim guidance on use, R&D publication 130.

"sandbags are seen by the public and the media as a panacea in flooding events and their existence and deployment constitutes one of the most fraught parts of the emergency response to flooding."

The public's view

7.88 The public have mixed feelings about sandbags. While those who were unable to get hold of sandbags complained, others who did get hold of sandbags quickly became aware of their limitations, and commented that their time could have been better spent in, for example, moving valuables to safety rather than in fruitless efforts to keep the water out.

7.89 The immediate reaction of householders (or parish or other groups) who do not keep their own stocks of sandbags and plastic sheets and filler, or do not have other protection equipment such as kite-marked products, is to call on local authorities to provide sandbags for emergency protection. However, not only can this reaction give a misplaced sense of security, it can also be unnecessary. Evidence from Basildon District Council showed that in over 90 per cent of requests for sandbags, none were actually required.

What can sandbags do?

7.90 Sandbags are typically no more than sacks of a manageable size filled with sand or other dense material: in some cases householders filled carrier bags with garden soil. Research by the Environment Agency has suggested that at best sandbags offer a 40 per cent chance of success in keeping water out. In many cases, when sandbags are laid by householders, rather than skilled workforce, this rate will be much lower.

7.91 Any success sandbags do provide depends on their being laid in such a way as to exert pressure against a waterproof membrane in place against ingress routes. Given that many such routes do not provide surfaces level enough for an adequate seal, sandbags will at best provide a very short-lived 'holding' position. In addition, they will give adequate protection only where external water levels are low; and, like any external protection, they are powerless against flooding through internal sources such as sewers, sinks and baths.

Allocation to householders – local authorities

7.92 Allocation to householders is generally by local authorities from stocks they keep, many of which have to be filled by hand or mechanically at the time of use. Allocation is through a mix of delivery to individual households and availability at strategic points. The evidence the Review has had from local authorities is that most would welcome guidance from the Government on the use and usefulness of sandbags and alternatives. The Review looked in more detail at the policies and practices of a sample of local authorities.

7.93 Most of the councils concerned have no written policy but do have advice on sandbag provision. This may be because local authorities are caught in a dilemma – while householders are themselves responsible for protecting their own properties, in a flood emergency they turn, understandably, to the local authority for help at very short notice. Few local authorities wish to be seen as not being able to help, so the help is usually in the form of sandbags, even though maintaining stocks and brigading the council workforce to issue them is expensive and time-consuming with little real benefit to the people affected. Local authorities have commented on the diversion of resources from other, more useful, tasks, and the difficulty of supplying sandbags in time, particularly when there is little warning of flooding. In one case, although nearly 2,000 leaflets were issued giving advice about flood risk, public reaction at the time of potential flooding last autumn suggested that little notice had been taken.

7.94 The different practices for one county area comprising 12 district councils and 2 unitary authorities are summarised below:

- **stocks:** between 150 and 3,500 filled sandbags stored; between 1,000 and 7,000 unfilled;
- **storage:** mainly one storage depot for each council but in two cases a number of sandbags stored at parish councils for parish use;

- **allocation:** in three cases delivery is made routinely, although delivery is made in most cases during an emergency or to vulnerable people, in which case help will also be given in laying the sandbags. Few councils provide to businesses. Four councils do not issue sandbags except to vulnerable people in an emergency;
- **charging:** of the 14 councils none charges during an emergency although two charge at other times or refer to building supply merchants. Full cost is around £3.50–£4.00 per sandbag plus VAT;
- **need**: most councils assess need based on site visits or local knowledge and call vetting; and
- **disposal:** disposal is the responsibility of the householder. Sandbags are not collected except where they might cause a hazard or are dumped.

7.95 There will be a host of reasons why policy and practice differ so widely within one county; and from other evidence this picture of differential approach within county areas runs across the country. For example, the Review noted that, in its Scrutiny report, Gloucester City Council said that Cotswold District Council's policy is to provide sandbags at strategic points but not to provide them to individual households, the reason for this being the impossibility of supplying individuals across a relatively sparsely populated area. This approach is borne out in evidence from other local authorities. On the other hand, both Gloucester City and Cheltenham Borough Councils, because of their smaller, more densely populated geographical areas, are able to supply to individual properties.

7.96 We agree that, given the different circumstances, full equity of treatment between local authorities is unachievable in practice. In agreeing in part with our interim conclusion, Hull City Council think that while national guidance on the usefulness of sandbags might be helpful, sandbag policy (in terms of how and when used) should be determined locally. We also agree that where community groups exist, distribution of sandbags should be arranged through them so that they can arrange local supplies.

Alternatives for householders and community groups

7.97 The Review also received views that the general provision of sandbags should be phased out in favour of better products such as kite-marked flood boards and air brick covers targeted at the vulnerable, or other forms of temporary defence. The view is that such an approach would be more consistent with local authorities' responsibilities towards vulnerable people, while at the same time encouraging other people to make their own provision. Some local authorities take the view that they will not routinely supply sandbags, even with a charge, as this is counter to their policy to encourage self-reliance amongst people. Nevertheless, some local authorities acknowledge that it would be impossible for them simply to discontinue allocation of sandbags in emergencies and that realistically this could be done only as improved community resilience takes over this role. We agree with this assessment as sandbags can have a symbolic importance to the public as immediate help in an emergency.

7.98 There are a number of flood protection products available, many of which have received kitemarked approval. Defra has also recently concluded a pilot project to explore the potential of a grants scheme for these products and other property level resilience measures (see Chapter 5). While we consider that the use of flood protection products or temporary defences may provide another option, it is too early to say with confidence that sandbags will no longer have any useful role to play in the future. The Review agrees that householders should expect to protect their own properties. However, we do not think it is consistent with this responsibility to recommend the phasing out of sandbags because these are a relatively cheap and available, if unsatisfactory, option.

Advice to public and local authorities

7.99 The Review does, however, consider that advice to householders and local authorities should be improved. Many local authorities rely on advice in, for example, the Environment Agency's three leaflets 'Preparing for a flood', 'During a flood' and 'After a flood' in support of their own locally produced advice.

7.100 Other documents include *'Damage Limitation'* and *'Preparing for floods: interim guidance for improving the flood resistance of domestic and small business properties'*. Although these are worthwhile, the Review considers that the Government should work with the Environment Agency and insurers to replace these with one leaflet, which local authorities can also use to give additional advice tailored to local circumstances, including information about their own policies on provision during an emergency. This leaflet should give full advice about the use and availability of flood protection products – including sandbags – and make clear what assistance is available to vulnerable people.

RECOMMENDATION 26: The Government should develop a single set of guidance for local authorities and the public on the use and usefulness of sandbags and other alternatives, rather than leaving the matter wholly to local discretion.

Working with natural processes

7.101 It is now widely accepted that flood risk cannot be managed by simply building ever bigger hard defences. Softer approaches, such as flood storage and land management, can offer more sustainable ways of managing the risk, and can complement and extend the lifetime of more traditional defences.

7.102 The Review supports an approach to managing flood risk that incorporates a range of approaches and is sustainable. Working with natural processes and rural land use options form part of that package. The Foresight update report notes:

> *"Nothing has emerged to change our view that there is no single response to solve all problems. Our conclusion remains that a portfolio of structural and non-structural responses, implemented in a sustainable way, is needed to manage future flood risk."*

7.103 The Review received a large number of submissions supporting this conclusion, outlined in the interim report. Most of the more detailed submissions came from environmental and farming groups, which flagged up the benefits of these measures and the current obstacles to their wider implementation. Some submissions sounded a note of caution in that care needed to be taken not to suggest that certain measures would have prevented the summer 2007 floods or that specific farming practices were to blame. Other submissions highlighted the need to understand the catchment and its characteristics before determining which approaches might be effective. The latter point should be standard good practice.

7.104 There are three general types of rural catchment management solutions:

- water retention through management of infiltration, such as by protecting or enhancing soil condition;
- provision of storage, such as on-farm reservoirs or enhanced wetlands and washlands; and
- slowing flows by managing hillslope and river conveyance, such as planting cover crops or restoring smaller watercourses to a more natural alignment.

7.105 These measures are aimed at slowing water and keeping it in areas where it is less likely to be a problem. They often offer wider benefits than flood risk mitigation alone, such as amenity or biodiversity benefits. The Review has received examples of how these measures worked during the summer 2007 floods.

Potteric Carr Nature Reserve

Potteric Carr Nature Reserve lies within the Potteric Carr basin, an area of low-lying land to the south of Doncaster. Formerly largely fen and bog, it was drained in the mid-18th century for agriculture.

The wide range of species supported by the site includes:

- over 200 species of bird, including kingfisher and sedge warblers;
- marsh plants including great spearwort and greater tussock sedge; and
- 28 species of butterfly including comma and purple hairstreak.

The wetland site stores floodwaters at times of high water; the reserve's wetland plants filter incoming water so that, when it flows out, the quality is much improved.

During summer 2007, flood waters spilled safely over the banks onto the reserve, which has a flood storage capacity of approximately 200,000 cubic metres, and it is estimated that thousands of homes were saved from flooding. In addition, the wildlife was able to take refuge on the islands designed for it and did not suffer adversely from the extreme weather.

Catchment-based approach

7.106 Most responses to the Review supported measures being taken on a catchment-wide approach that was also part of a broader scope of measures. The National Trust said:

> *"Every parcel of land in a catchment, including that within major built developments, can make a contribution to reducing the probability and consequence of flooding, with the uplands and flood plains playing vital roles in retarding the flow of water and providing enhanced water storage at a landscape scale."*

7.107 Most submissions to the Review were of the view that there was already a framework in place to consider working with natural processes – CFMPs (and, on the coast, Shoreline Management Plans) – which allows consideration of rural land use options. The concern of some was that they may not necessarily deliver this role as well as might be required and also that once opportunities were identified, a system was not in place to actively encourage their further consideration against more traditional options. CFMPs are due to be completed by the end of 2008.

7.108 The Environment Agency has indicated that they will use these plans to work with partners to identify sites:

> *"Through Catchment Flood Management Plans and Shoreline Management Plans we will work together to identify appropriate sites, for example, wetland creation, restoration of natural course of rivers and green corridors, and the development of better incentives to deliver multiple benefits through flood management."*

7.109 In addition to the use of land management and local storage, there is potential for the increased use of flood plain storage in rural areas to reduce the transmission of flows downstream. The construction of engineered flood plain storage has been common for decades. Many submissions to the Review would like to see not only further encouragement of this more common technique but also other techniques such as restoring the natural functioning of rivers.

7.110 Like all flood risk management solutions, there is a premium on technical assessment of the area and of the appropriateness of the measures proposed. While there may be potential benefits for downstream flood risk, the effects of rural land use measures require careful, site specific assessment. Recommended solutions, also need to demonstrate clearly that flood risk will indeed be mitigated. In some instances the principal benefits may be environmental and the extent of flood risk management resources being

diverted to such a scheme will need to be carefully weighed. Conversely, where schemes deliver a range of benefits including clear flood risk mitigation, the funding and appraisal system needs to be sufficiently flexible to weigh up the relative benefits and costs of different proposals.

Links to spatial planning

7.111 Where there is a need to create flood storage in urban or rural areas, opportunities identified in CFMPs need to be linked with the appropriate spatial planning strategies. Planning Policy Statement 25 identifies active flood plains as a land-use category, making it easier to identify sites for flood storage. The accompanying practice guide says:

> *"The use of lowlying ground in waterside areas for recreation, amenity and environmental purposes can provide the most effective management of flood conveyance and storage as well as providing connected green spaces with consequent social and environmental benefits."*

Flood alleviation scheme: Centenary Riverside, Rotherham

Rotherham is situated on the River Don immediately downstream of the Rother confluence and has a history of flooding. A pre-feasibility study promoted by the Rotherham Investment Development Office in 2001 showed that the standard of defence is as low as 10 per cent risk of flooding in any year (1 in 10 years) in places, because no formal flood defences currently exist. Some 118 properties, five of which are residential, are at risk from flooding. Flood risk represents a major obstacle to regeneration of 14ha (33 acres) of urban centre land including proposals for 1,209 new homes, as this area is located within the 1 in 100 year (one per cent) flood plain.

A large area near to the River Don is gradually being redeveloped, placing the town's river at the heart of its renaissance and at the centre of a major social and economic regeneration programme. The regeneration zone, where most of the new development will be located, is at severe risk of flooding (and was inundated in summer 2007) so there was a need to defend it and increase the flood storage capacity of the river channel. A £12 million flood alleviation scheme is being put in place along the river, through a partnership led by Rotherham Metropolitan Borough Council, the Environment Agency and the Wildlife Trust for Sheffield and Rotherham, with funding from South Yorkshire Objective 1 and Yorkshire Forward.

It is anticipated that the full flood alleviation programme will prevent future serious flood events such as those that hit South Yorkshire in summer 2007, as well as enabling a wholesale shift in the town's attitude to the river, making it a highly-valued asset rather than an undervalued threat.

Central to the scheme is a new four-hectare urban wetland nature park in a loop in the river, on some of the land that had previously been earmarked for economic development – at Centenary Riverside, which will help to hold large flood events (protecting the surrounding area) while also improving the quality of the local environment for local businesses, providing recreational, educational, health and employment benefits to local people, and having a positive impact on wildlife. The new wetland at Centenary Riverside is being designed in partnership with the Wildlife Trust working in Rotherham, and will be managed and maintained by the Wildlife Trust for Sheffield and Rotherham once it is complete.

7.112 The PPS25 practice guide also supports the process of restoring rivers to their natural functioning:

> *"Perhaps most in the spirit of the Government's* Making Space for Water *strategy are proposals that seek to combine new development with measures to restore heavily-modified watercourses and their flood plains to a more natural state. Such measures can include removing culverts, restoring meanders and reconnecting river channels with areas of flood plain obstructed by artificial features. All of these measures can result in reductions in flood risk, as well as significant improvements in amenity, biodiversity and water quality."*

7.113 As the Centenary Riverside case study above illustrates, opportunities to use more natural solutions can arise in both urban and rural locations. Local authorities and the Environment Agency need to work with developers and other partners to ensure that these kinds of opportunities are explored. These developments will not only manage flood risk in a more sustainable way but also provide a more attractive place to live and deliver biodiversity and amenity benefits. These approaches, including setting back of defences alongside rivers or relocation of assets, may be particularly important if some of the more extreme scenarios set out in the Foresight update (see Chapter 3) arise, such as much higher river flows.

Barriers to uptake

7.114 In its interim report, the Review reflected concerns that progress on delivering more working with natural processes was too slow despite Government flood risk management policy supporting this approach in its strategy *Making Space for Water*:

The flood defence appraisal and prioritisation system

7.115 Some submissions to the Review felt that the current appraisal system favoured the construction of flood defence walls over softer engineering solutions. Many of the recommended softer solutions tend to be more integrated and deliver wider benefits than flood risk management ones alone. Natural England noted that:

> *"until now, driven by simple cost-benefit calculations, the system has had a tendency to deliver traditional concrete defences almost exclusively."*

7.116 The Royal Society for the Protection of Birds recommends that there is a:

> *"strong case for over-hauling the appraisal and prioritisation framework so that operating Authorities focus on the cost-effective delivery of strategic flood risk management plans through a whole range of measures rather than testing the cost benefit of individual warning or defence schemes."*

7.117 The EFRA Select Committee reflected evidence from Defra that stated that the Government was better at funding single outcomes from single sources of funding. However, the Committee rightly noted that many of the outcomes and funding sources are derived from the same government department, Defra. The Review is therefore of the opinion that there must be scope to develop a framework to consider the full range of benefits derived from catchment-based schemes.

7.118 In developing any programme to support greater delivery of these types of integrated schemes, Defra and its partners will need to explore whether the new appraisal and prioritisation system, described above, is helping bring forward more sustainable options and suggest appropriate remedies if it is not.

Lack of incentives

7.119 Many of the measures considered in this chapter take place in rural areas and require the active participation of landowners. Even where a scheme is appraised and a softer approach recommended, progression can be slow or even thwarted by a lack of appropriate incentives. Farmers and rural landowners have identified the lack of incentives as a major barrier to progress in this area. They are concerned that flooding of agricultural or rural land is not carried out in a planned or designed way, whereas it should be seen as part of a system that recognises the value of such a service.

7.120 The National Farmers' Union said:

> *"It is clear a debate is needed about protection of agricultural land vs. flooding of land, and more importantly, the need to flood by design rather than by default. Where flooding by design is needed, those landowners affected will need to understand their roles and responsibilities and should be provided with options and support to enable them to continue as viable businesses."*

7.121 In any programme the Government develops, the consideration of current incentives and opportunities will need to be explored. Current land management payments under such schemes as the Single Farm Payment Scheme and the Environmental Stewardship Scheme are limited, with flooding only a secondary consideration in the latter. Furthermore these schemes provide a limited amount of money for a limited duration. Where the Environment Agency decides to deliberately flood an area as part of a risk management scheme, flood easement payments are made. The Review recognises that as land values and agricultural commodity prices rise, any incentives may become less attractive to landowners.

7.122 The Review is of the opinion that if change of land use or land management options are identified as the right mechanism to manage flood risk in a given area which require sustained change of practice or use over a long period of time, incentives also need to be sustainable over longer periods. The move to a long-term investment strategy, covered earlier in this chapter, might in part help resolve this issue.

RECOMMENDATION 27: Defra, the Environment Agency and Natural England should work with partners to establish a programme through Catchment Flood Management Plans and Shoreline Management Plans to achieve greater working with natural processes.

Land management measures

7.123 The Review received a wide range of information about the benefits of good rural land management practices in reducing runoff and slowing down water. Some submissions disputed the conclusion in the interim report that changes to land management practices only benefited local flood risk and had no discernible effect at the catchment level.

7.124 Research clearly demonstrates the benefits of land management changes on local flood risk. A review of the impacts of rural land use and management on flood generation[20] in 2004 reached the conclusion that there is substantial evidence that changes in land use and management practices affect runoff generation at the local scale, but the relationship could not be distinguished at the catchment scale, especially during extreme precipitation events. This report also identified limitations in modelling

Rural land use impacts on local flooding

In rural areas soil infiltration is reduced by intense husbandry practices (caused by heavy machinery and high stocking densities), the long-term effects being soil degradation and compaction leading to overland flow and the non-use of moisture storage deeper in the soil profile. This situation is exacerbated if machinery and animals encroach onto waterlogged soils.

[20] Joint Defra/Environment Agency Flood and Costal Risk Management R&D Programme R&D Technical Report FD2114/TR (O'Connell et al., 2004, 2007)

Tillage regimes can reduce overland flow and increase storage. But, deeper long, term compaction of soils may still be increasing runoff.

There is also some debate as to how land drains and mole drains influence the balance of overland flow and subsurface flow (dependent on the age of the drains). Land drains can also introduce siltation problems in watercourses affecting the water quality and entire ecology of watercourses.

Loss of hedge and ditch features to enlarge field size can have a local impact by reducing storage in shallow inundations and creating fast overland flow paths to watercourses. Soil erosion is also enhanced when surface flow velocities are increased by such changes. In upland areas reduced stocking rates may show benefits by improving soil structure, infiltration, and storage and reducing erosion and pollution. Re-establishment of bogs, vegetation and certain types of woodland creation in uplands may also increase storage in these areas.

Soil treatments and cropping can have a noticeable effect during the early stages of severe events and in lower duration/more frequent events, particularly on the smaller catchments where a larger proportion of catchment area is cultivated. There are many examples where the threshold return period of localised flooding events has been reduced, or runoff increased, as a result of poor land management practices.

Taken from Wetlands, Land Use Change and Flood Management[21]

7.125 Current research in this area whilst not conclusive is also beginning to identify changes that may have an impact on the catchment scale, or at least within smaller catchments. For example, some methods such as woodland planting have been shown in some catchments to reduce peak flows.

River Skell catchment

Defra funded research based on the 120 km^2 catchment of the River Skell[22], a tributary of the Ripon catchment. Results indicated that if soil structural degradation (deterioration) were to occur across the whole catchment, together with additional maintenance of moorland grips (drains), peak flows (highest river flow levels) in the town of Ripon would increase by between 20 per cent for smaller scale floods and 10 per cent for more extreme floods.

A less extreme scenario (soil degradation over 30 per cent of the catchment) led to increased peak flows of 10 per cent for smaller scale floods and 3 per cent for more extreme events.

In contrast, the best case plausible improvement scenario (moorland grip blocking) led to a reduction of flood peak magnitudes in Ripon by up to about 8 per cent when compared to the baseline case.

7.126 Evidence from the National Trust also advocates the value of land management changes at both the local and smaller catchment scale. The National Trust commissioned Haycocks Associates to carry out a review[23] of evidence of land use/ management impact on catchment scale flood risk. A summary of the review's conclusions is provided below.

[21] A joint statement prepared by English Nature, the Environment Agency the Department for Environment, Food and Rural Affairs (Defra) and the Forestry Commission.(October 2003)
[22] Ripon Land Management Project (SLD2332) JBA (2007)
[23] www.haycock-associates.co.uk/Land-use%26Run-off.html

Review of land management impact on catchment scale flood risk

The review examined the evidence of the impact of land management upon different aspects of runoff at three different catchment scales:

- the experimental scale (less than 100km^2);
- the representative catchment scale (between 100 and 10,000km^2); and
- the large catchment scale (over 10,000km^2).

The review concluded that at a small catchment scale (less than 100 km^2) land management has a quantitative impact upon runoff and can be used as part of an integrated approach to flood management and defence. It also found that 97 per cent of the land mass of England and Wales has an upstream catchment area of less than 25 km^2: so the observations at an experimental scale, which show that land management does have an effect on runoff, are applicable to 97 per cent of England and Wales.

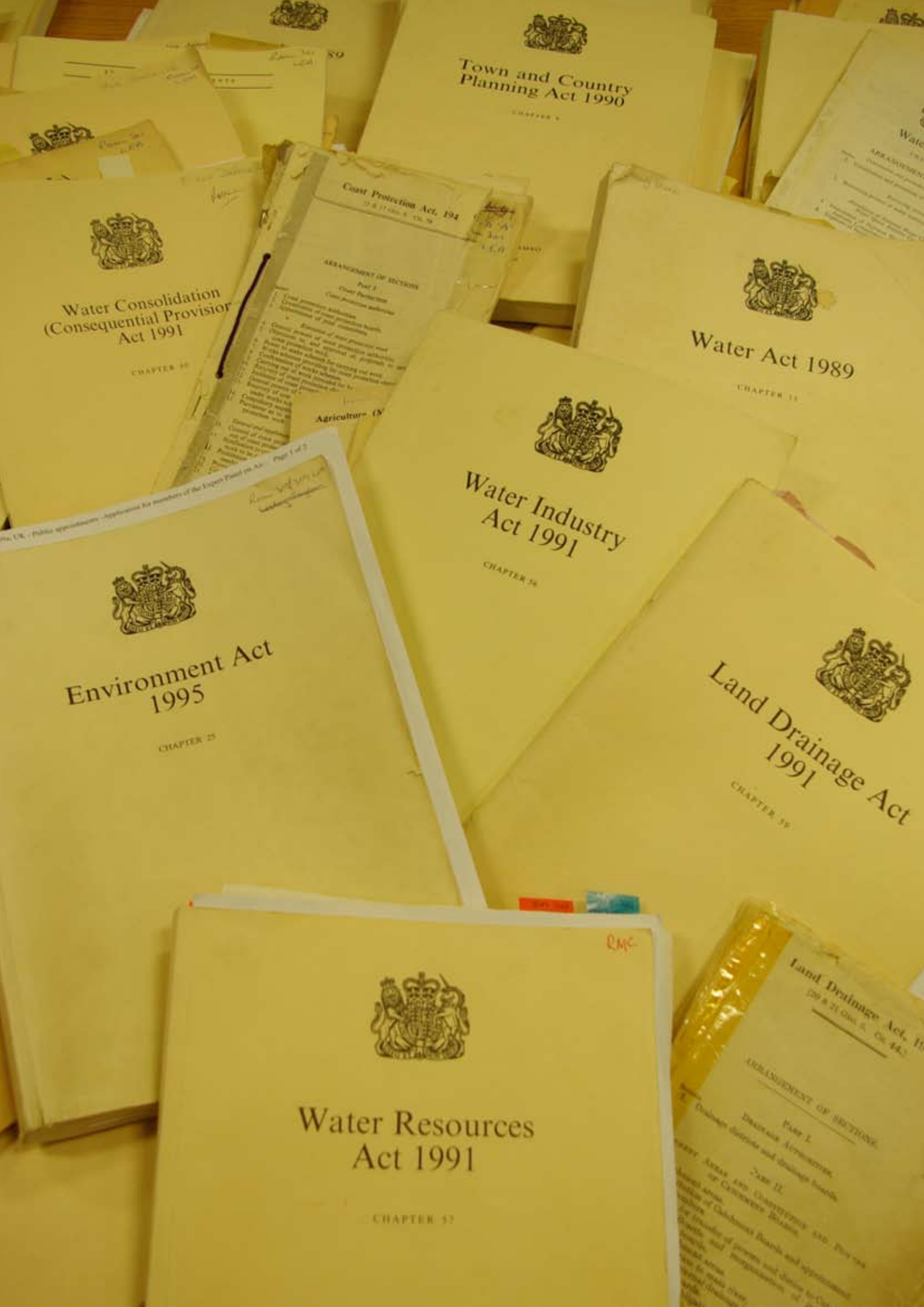
The review highlighted, for example, that there is consistent evidence at the representative catchment and experimental scale that afforestation (conversion of open land to forests) will lead to an overall reduction in runoff.

7.127 The update commissioned by the Review to the *Foresight Future Flooding* report supports the view that the evidence of land management impacts on a large scale catchment is unclear, but at the smaller catchment size or local scale they can have an effect.

> *"Some new work in England and Wales has been conducted in upland environments. A project at Pontbren (Wheater* et al.*, 2008) indicates that reduced stocking rates, farm woodlands and field boundary features in a small catchment can improve infiltration and reduce runoff and potential flood generation."*

7.128 The Review believes that rural land management approaches should be considered as part of the portfolio of measures to deal with flood risk and, where appropriate, as part of the programme to deliver more working with natural processes. Work is already taking place in Boscastle, for example, to manage risk through land management measures alongside more heavily engineered solutions. On the main river Jordan the Environment Agency is working with farmers on the upper catchment to implement a range of land management techniques to control the amount of surface water run-off, silt and stone debris that enters the watercourses. This includes looking at ploughing techniques, vegetation types and land drainage.

7.129 In addition, in the light of their benefits in managing local flood risk, appropriate land management changes should be considered as part of any Surface Water Management Plan and associated flood risk assessments where rural runoff or muddy floods are considered to be a problem. As with all measures, any land management changes will need to be considered as part of an overarching risk management framework with the recognition that the changes may not necessarily be the most appropriate solution. However, where land management measures are identified as a cause of or a solution to flood risk, the local authority and its partners will need to engage with the landowners to help deliver appropriate changes.


Town and Country Planning Act 1990
Water Consolidation (Consequential Provisions) Act 1991
Water Act 1989
Water Industry Act 1991
Environment Act 1995
Land Drainage Act 1991
Water Resources Act 1991

Modernising flood risk legislation

This chapter examines current inadequacies in flood risk legislation in the light of emerging policy and last summer's events. It contains sections on:

- present legislative framework;
- concerns about current legislation; and
- framework for the future.

Introduction

8.1 The legislative framework for flood risk management is fundamental in managing risk now and in the future. The modern management of flood risk requires concerted action by a number of public and private bodies. A number of elements must come together, including techniques, funding and expertise. However, although these are necessary if action is to be effective, they are not enough without powers in legislation to apply them, for example by spending on new works or controlling new development. The powers also have to be comprehensive. In this section we consider the current legislative arrangements for flood risk management and future needs.

8.2 We welcome the Government's commitment to consult on a proposed Floods and Water Bill in 2009. We urge the Government to make Parliamentary time available for its introduction at the earliest opportunity thereafter.

Present legislative framework

8.3 The statutory basis for flood risk management today is contained in several pieces of primary legislation:

- the Land Drainage Act 1991;
- the Water Resources Act 1991;
- the Environment Act 1995; and
- the Water Act 2003.

This legislation has developed over time, mainly in response to institutional change.

8.4 Other legislation is also relevant, for example:

- the Town and Country Planning Act 1990 is the main vehicle for development control in relation to flooding;
- the Building Act 1984 is the primary legislation under which changes to Building Regulations can be considered to improve property flood resilience;

- under the Highways Act 1980 the relevant highway authority – the Secretary of State for Transport or the local authority – is responsible for highway drainage; and
- the Civil Contingencies Act 2004 contains duties on Category 1 responders (including the Environment Agency and local authorities) relating to warning and informing the public in the event of emergencies, including flooding.

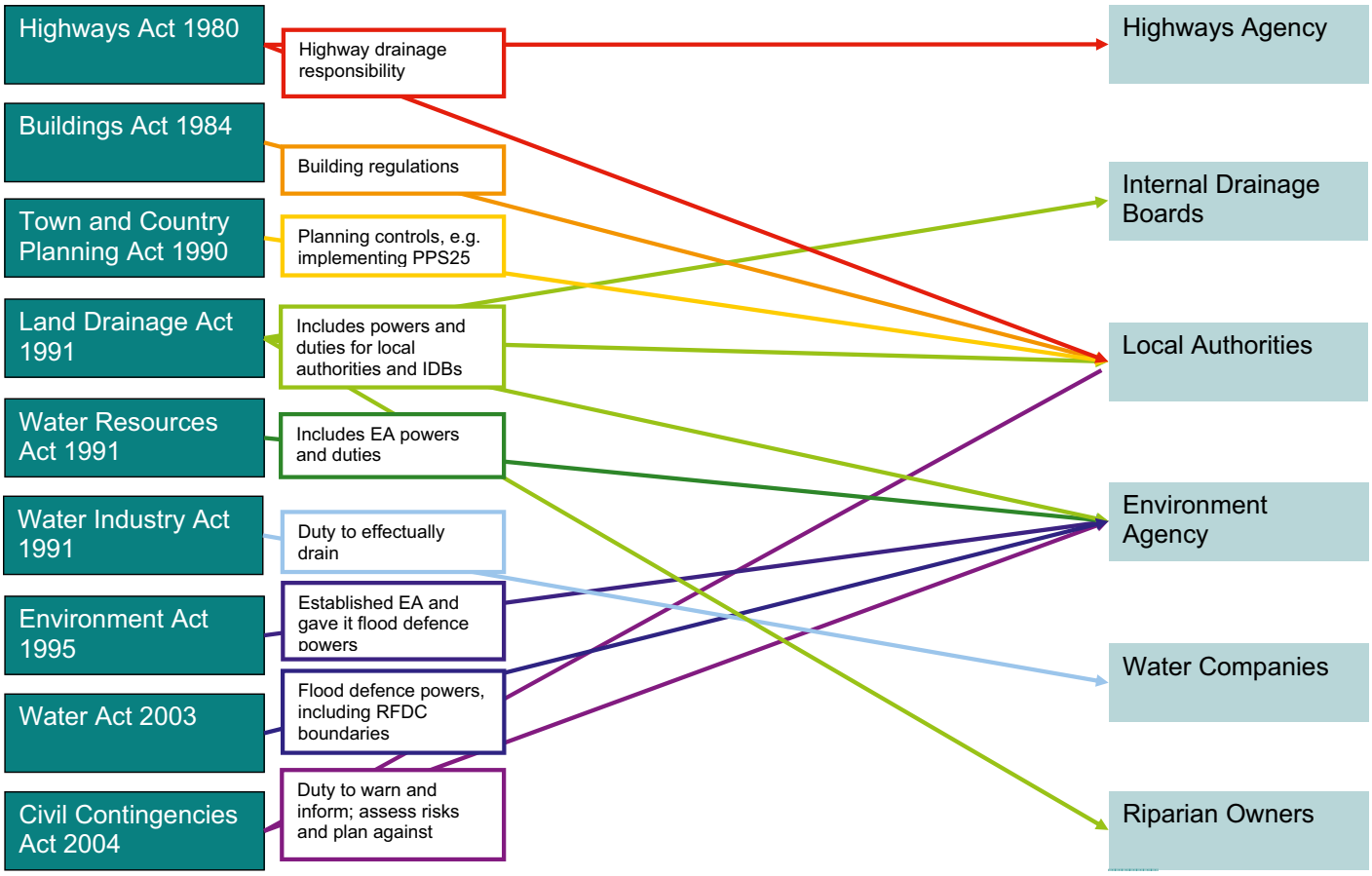
8.5 The result is a confusing landscape with related statutory provisions being spread over different Acts: a point that is reflected in comments the Review has received about the need for more clarity in flooding legislation. For example, the Land Drainage Act 1991 contains most of the powers available to local authorities and Internal Drainage Boards, while the Environment Agency's powers come to it through the Environment Act 1995, the Water Resources Act 1991 and the Land Drainage Act 1991. The summary diagram below sets out the main links for the above legislation and related Acts.

8.6 There are some constant features in the legislation:

a) powers are provided to the operating authorities (the Environment Agency, Internal Drainage Boards (IDBs) and local authorities) and are mostly permissive. There is no duty on any operating authority to carry out any works, and it is for those authorities to decide what works they should undertake;

b) the legislation gives the various authorities powers to deal with 'flood defence' (for example, land drainage and, in the case

Figure 7: Summary of legislative links



of the Environment Agency, flood warning systems);

c) the powers also relate to watercourses, whether a "main" river (in which case the responsibility is with the Environment Agency) or to "ordinary" watercourses (where the responsibility lies either with the local authority or the IDBs). However, the issues of groundwater or surface water drainage and flooding, for example, are not specifically addressed; and

d) the Environment Agency has a general supervisory duty in relation to all flood defence matters, including any practice which involves the management of water levels in a watercourse.

8.7 Regulations and guidance made under these and other Acts are important components of the framework for flood risk management and may need to be refined as policy develops. In other cases, amendment to primary legislation other than that listed above is needed to effect change such as reassessing the right to connect to the sewerage system which would involve amendment to the Water Industry Act 1991 (see 8.10 below).

8.8 The Review has considered whether this legislative framework is adequate for the country in the light of lessons identified from the summer 2007 floods and in particular the need for it to cover all sources of flooding.

Is the current legislation up to date?

8.9 Not surprisingly, evidence to the Review came principally from operating authorities because they are the bodies which need the right legislative framework. However, views expressed by others such as the Wildlife Trusts and the ABI also support the same point: that the legislation needs to provide clarity of responsibility about all sources of flooding and between the various bodies involved and that the current legislation does not do this.

8.10 From evidence we have received, legislative areas which seem inadequate to the challenges of flooding today include:

- The current legislative regime does not cater for operating authorities who may wish look at alternatives to building defences and maintaining them in perpetuity. Currently, payments can be made to landowners when areas are allocated for flood storage, for example. However, there is no financial provision available in other circumstances where defences to a property are, in effect, removed.
- At present there is no way to support other measures related to adaptation, for example where individual or community property resistance or resilience would be the only sustainable solution.
- A clear view from evidence to the Review was that there needs to be clear and effective arrangements to manage surface water flooding (including the relationships and responsibilities of all bodies and individuals concerned) including:
  - a clear definition of the relationships and responsibilities of the various bodies and individuals concerned;
  - providing a legal basis for surface water flood maps and SWMPs, including provisions for sharing data, for example to maintain local registers of flood risk management and drainage assets; and
  - removal of the automatic **right to connect** surface water drainage to the sewerage system.

Surface water flooding: evidence from Leeds City Council about effects of law on water companies

The Water Industry Act, 1991 (s.94) says: "It shall be the duty of every sewerage undertaker [i.e. water company] ... to provide, improve and extend such a system of public sewers (whether inside its area or elsewhere) and so to cleanse and maintain those sewers as to ensure that that area is and continues to be effectually drained" ... and yet the water companies refuse to see it as their responsibility when houses are knee-deep in water that has run off fields and highways.

The reason the water companies give is that the legislation only empowers them to provide sewers and 'sewers' are defined elsewhere as drains serving 'premises' (not open land). In many parts of Leeds, in common with other urban areas, there are no natural watercourses. Consequently, if the overland flows cannot soak away (due to clay-rich soil) or go into the sewers, there is no solution that any body or authority has a duty to implement. Section 94, which was originally a duty on local authorities in the Public Health Act 1936, has thus been rendered meaningless.

- The Environment Agency has pointed to the fact that there is no explicit legislative basis or legal powers to manage **groundwater levels** for the purposes of flood risk management (duties in relation to warnings are contained in the Civil Contingencies Act, 2004).
- **Third party assets**. There are no provisions on the maintenance of structures, for example factory walls or railway embankments that were not built as flood defences but have or have acquired a flood defence function.
- **Riparian owners**. The rights and responsibilities of riparian owners – those who own land or property adjacent to rivers or other watercourses – are a mix of common law rights and statutory responsibilities.

8.11 While some of the inadequacies currently identified can be addressed through the UK implementing the EU Floods Directive, a number cannot, including for example, the allocation of responsibilities for surface water management.

EU Floods Directive in UK law

The EU Floods Directive provides a framework to help member states reduce the risk to human health, the environment and economic activity associated with floods. Its main requirements from a UK perspective are:

a) to undertake a **preliminary flood risk assessment** for each river basin district, including associated coastal zones. This assessment includes mapping, descriptions of past floods, flooding processes and any development plans, an assessment of the likelihood of future floods and a forecast for the estimated consequences for human health, the environment and economic activity by December 2011;

b) to use this preliminary risk assessment to designate river basins (including associated coastal zones) or their constituent smaller parts as either liable to potential significant flood risk, or not. Significant flood risk is not defined. The preliminary risk assessments are to be completed by 22 December 2011;

c) to prepare flood risk maps for those areas designated as being at potential significant flood risk, showing extensive detail of expected flooding, and of potential damage to human health, the environment and economic activity. Flood risk maps should be prepared by 22 December 2013;

d) to prepare and implement **flood risk management plans**, establishing what they regard as appropriate levels of protection, and including measures aimed at achieving that level of protection. Flood risk management plans are to be published by 22 December 2015 at latest, and implemented from 23 December 2015;

e) to ensure the active involvement of all interested parties in developing and subsequently reviewing flood risk management plans, and to make the preliminary flood risk assessments, flood risk maps and flood risk management plans available to the public.

A proposed framework for the future

8.12 The current legislation is not fit for today's challenges. It does not deal with other sources of flooding such as surface water flooding, which came into such prominence last summer. We believe there is a need for a single unifying Act to clarify the present flood legislation. The future framework should, in our view, accommodate the extra provisions referred to above. In particular, it should designate the roles and responsibilities needed for the management of flood risks from all sources.

RECOMMENDATION 28: The forthcoming flooding legislation should be a single unifying Act that addresses all sources of flooding, clarifies responsibilities and facilitates flood risk management.

8.13 Flood risk management. As noted above, the current framework contains powers for operating authorities to spend money on flood defence measures. We believe that spending powers for a suite of measures should be included from flood defence, to individual property resilience and resistance, so that individuals and communities are encouraged to adapt to flooding in those cases where it is not sustainable to offer protection through defences.

8.14 Surface water management. Evidence to the Review indicates that there needs to be a clarification of powers and responsibilities. This is echoed in the EFRA Select Committee's report, which recommends that local authorities should have the main responsibility for surface water flooding, but that the Environment Agency should have a strategic overview role for all sources of flooding; and the relationship between the Environment Agency and local

authorities must be carefully articulated to make sure clear lines of accountability are in place. We note the Committee's recommendation that local authorities be given a duty to ensure effective drainage of their areas, including the ownership of SUDS, and to require cooperation from others involved, including information sharing to assist with SWMPs, drawing up asset registers and in carrying out works.

8.15 We deal with these subjects in more detail elsewhere. The main legislative implications are set out below:

a) We believe that upper tier local authorities should take the lead on surface water management and managing local flood risk (see Chapter 6). However, we recognise that the best fit will be determined by local circumstances and that upper tier councils may wish to delegate their powers to others, for example district councils or Internal Drainage Boards. Evidence to the Review indicated that the statutory duties should relate to cooperation, risk assessment, maintaining asset registers, gathering and sharing information on a common basis, communicating with and promoting flood risk measures to the public, and sharing expertise on flood risk. We conclude that duties on the different stakeholders are needed to cooperate and share information to enable effective management of surface water and local flood risk. We also recommend that the Government should urgently resolve the question of responsibility for ownership and maintenance of SUDS. Accordingly, we consider that the proposed draft Floods and Water Bill should provide appropriate powers to enable effective management of surface water flooding risks, including SUDS.

b) **Environment Agency Strategic Overview**. The Environment Agency's proposed overview of inland flooding is discussed in Chapter 3. We do not see a need for the Environment Agency to have any new regulatory role over local authorities. However, as a consequence of changes to the management of surface water flooding, change may be needed to the role and structure of RFDCs or to define clearly the role of the Environment Agency in that area. The Government's aim is to review the legislative basis and other arrangements to implement the overview progressively (see Chapter 3). We have considered whether existing legislation might be a suitable vehicle for expediting this. However, we conclude that this is not possible in the absence of explicit responsibilities for groundwater and surface water flooding. Nevertheless, depending on the timing of the proposed Floods and Water Bill, we consider that the scope of the Agency's overview role should be defined as far as possible ahead of a new legislative vehicle being available.

8.16 Similarly, we consider that the Government should define responsibilities for managing groundwater so that the right balance can be struck between abstractions and managing flood risks.

8.17 We note from the evidence to the Review that greater clarity is needed for riparian owners and owners of third party assets on their roles and responsibilities. We consider that legislation should provide for an explicit statement of their responsibilities for maintaining their watercourses and structures and seeking consents where these are part of the flood risk management suite of physical assets.

8.18 Flexibility. An important aspect of the future legislative framework will be its flexibility in meeting scientific, technological and policy developments over the coming years. We have noted above how the present framework has not kept pace with policy developments, and its inadequacy in dealing with such tests as surface water flooding risks. Climate change will need new policy initiatives. Accordingly, we consider that the Government and Parliament should provide for a framework which offers greater flexibility than is currently available, for example, through wider use of delegated powers.

Home insurance
Contents: household goods,
that belong to you, or are
your family who live
But not
a) motor vehicle
caravans, trail
or models)
b) any li
c) lan
d)
Heidi Smith

Insurance

This chapter examined the role of the insurance industry in responding to the events of summer 2007 and the public's experience of dealing with insurance companies. It contains sections on:

- the UK insurance system;
- low income households and insurance;
- insurers and flood risk information;
- the experience of policyholders following the floods;
- how the insurers responded to the summer 2007 floods; and
- raising service levels.

Introduction

9.1 The insurance industry played a major role in helping the country recover from last summer's floods. The floods presented the insurance industry with one of its biggest ever challenges, exceeding all events since flood cover became a standard policy feature.

9.2 As a consequence of the floods, there were at least 180,000 claims (130,000 home, 30,000 business and 20,000 motor) which is the equivalent of four years' normal claims totals. The total insured damage caused by the flooding in June and July 2007 is estimated at £3 billion.

9.3 As of June 2008, the ABI estimated that 90 per cent of all claims had resulted in some form of payment and 78 per cent of domestic claims and 70 per cent of business claims had been completed/paid in full. They also reported that virtually all motor claims had been settled. Approximately 17,000 households were put up in alternative accommodation by insurers. At the end of May 2008, local authorities estimated that 4,750 households were still not back in their homes. The ABI predict that 96 per cent of policy-holders will have been moved back into their homes by the first anniversary of the floods.

The UK Insurance System

9.4 Insurance is the system through which risk is shared. The UK is in an unusual position in that flood risk is typically covered as a standard part of business and household insurance and has been since 1961. Unlike many other countries, the UK Government is in the unusual position of not being the insurer of last resort for flood events. Continuing insurance provision in flood risk areas is based on a voluntary agreement, the Statement of Principles,[1] between members of the ABI (around 400 companies) and the Government.

[1] ABI Statement of Principles on the provision of insurance, ABI November 2005

9.5 Properties are currently assessed and insured against flood probability data in the following categories.

- significant: the chance of flooding in any year is greater than 1.3 per cent (1 in 75);
- moderate: the chance of flooding in any year is 1.3 per cent (1 in 75) or less, but greater than 0.5 per cent (1 in 200); and
- low: the chance of flooding in any year is 0.5 per cent (1 in 200) or less.

9.6 Under the Statement of Principles, ABI members continue to offer insurance cover to existing customers where the risk of households and small businesses being flooded in any single year is 1 in 75 or less; or for those properties where flood defences are planned in the next five years to bring the probability down to that level. Properties situated in areas that are classed as being at significant risk are subject to further scrutiny by insurers, for example for their topography, flood protection or resilience measures, to decide the cost of insurance or whether it is offered at all.

9.7 The Statement of Principles was brought in after the floods in 2000 and came into effect on 1 January 2003. It was revised in November 2005 with the new Statement being introduced from 1 January 2006. At a meeting in February 2008 the Government and the ABI confirmed a UK-wide review of the Statement of Principles which is currently underway: "*The Government and the ABI both want to ensure that flood cover remains as widely available as possible for the public*."

9.8 The approach to insuring flood risk differs from country to country. Many countries underwrite the risk to private insurers. It is noticeable that in countries where the Government or individual states provide insurance schemes, many have underestimated the costs and liabilities and found them oversubscribed and unaffordable. This can arise from the public sector using less sophisticated measures to understand risk than to the private market. The situation in the UK where free market private insurance is supported by the Statement of Principles appears generally effective to the Review. In a recent study carried out for the Review (see Insurance and health impacts survey later in this chapter), a large number of different insurers were providing insurance in flood risk areas and very few people appeared to suffer from excessive premiums or had been denied insurance.

9.9 The Review does not believe from the evidence of the 2007 summer floods that there is a need to change the current system of provision of flood insurance, and supports the Statement of Principles. It is therefore important that both sides of the arrangement (Government and the insurance industry) play their part in meeting their obligations under the agreement now and in the future. **The Review welcomes the discussions between Government and the insurance industry to review the Statement of Principles**.

Getting Insurance

9.10 The benefits of having insurance are strongly evident following the floods. The financial benefits of being able to replace damaged possessions and repair damaged homes are clear. The ABI estimate that the average payout in relation to the summer 2007 floods was between £15,000 and £45,000 against an average household insurance premium of £339. In some areas, the uninsured received some money from their local authority – however, this was usually limited to a few hundred pounds. The difference in payouts is, therefore, stark.

9.11 The impact on general well-being is also significant. A study into the health impacts of flooding on 30 different locations in England and Wales[2] since 1998 concluded that "*having adequate insurance cover reduced stress, and incurring uninsured losses added to the health effects at the worst time*."

9.12 Members of the public have raised concerns with the Review about potential difficulties in getting insurance following the floods. However, the ABI has reassured the Review that very few policy renewals have been refused, no existing cover withdrawn and no areas blacklisted. This does not necessarily mean that premiums will remain at the same

[2] The health effects of flooding: social research results from England and Wales. Tapsell. S *et al*. Journal of Water and Health, 04.3.2006

level, although, in a free market, premiums should retain a competitive element. In recent research[3] commissioned by the Review three-quarters of respondents' insurance policies had come up for renewal; of these 96 per cent had renewed and only 1 per cent had been turned down. If an ABI member offers a premium that appears excessive or refuses insurance then it is advisable to insist on speaking to the senior underwriter, who will be able to provide a more detailed assessment of the insurability of the property. If the situation is not resolved there is scope under the Statement of Principles for the insurer or customer to take the matter to the Financial Ombudsman for a ruling.

ABI survey 'Implementation of Statement of Principles': Analysis (2005, 2006, 2007)

Number of refusals to renew existing business on flood risk grounds:
4 cases for 2007, 1 for 2006 and 7 for 2005.
Reasons for refusal: prior non-disclosure of material facts, change of risk-information (Nafra), change of exposure assessment systems (for example: insurer is using better computer models/more detailed databases which allow them to specify individual flood risk, property now appears to be at worse than 1 in 75 flood risk).

Number of complaints related to flood cover:
2007 = 201, 2006 = 32, 2005 = 52
The complaints are not about issues relating to the Statement itself. Main reasons for complaints: perceived slow claims handling, increase in excess at renewal, premium increase at renewal. Almost all cases have been resolved, a handful of 2007 cases are still ongoing.

9.13 The British Insurance Brokers' Association (BIBA) operates an insurance flood scheme with Bureau Insurance Services. It underwrites non-standard household insurance including properties at greater risk of flooding where cover has been refused or subject to abnormal loading or excesses. Some 95 per cent of the enquiries it receives are from other insurers rejecting customers for cover. It receives around 1,000 enquiries per month. If it believes it can offer cover, a survey is conducted to identify the risks to that particular property costing £175. If, once assessed, insurance cannot be offered the amount is refunded except for £50 to cover administration costs. It offers insurance to 90 per cent of the properties it assesses with an average excess on policies issued of around £2,500.

9.14 While the Review has noted that risk in the UK is shared, it is not currently fully shared amongst those who are at risk. The ABI estimates that approximately 78 per cent of households nationwide have contents insurance. In some of the areas affected by the summer 2007 floods the figure is barely over a quarter, with vulnerable, low income households most likely to be uninsured.

9.15 A further issue is that many of those who do have insurance are often under-insured. A number of the major insurers have reported under-insurance of home contents in particular.[4] Some insurance companies now offer large standard sums to be insured to overcome this issue. To avoid the problem of under-insurance of buildings, the ABI has a tool on its website for the public to input their property details and get an indication of rebuilding costs to assess how much cover they should consider taking out.[5]

9.16 There are currently 2.8 million adults in the UK without access to reliable financial advice, bank accounts or affordable credit. The Financial Inclusion Taskforce commissioned the 'Now Let's Talk Money' campaign, launched by the Department for Work and Pensions (DWP), as part of its work to tackle financial exclusion. This campaign is designed to increase the amount of advice and support available to financially excluded people in their own communities from those they trust and has now been extended to include the uptake of insurance.

[3] GfK NOP Social Research; Flooding and the Insurance Industry May 2008

[4] Research by Zurich insurance company in 2005 revealed that one in five households was at risk of being under-insured because they were unsure of the value of their home contents (www.uk.biz.yahoo.com/moneyweekly/underinsurance.html 2 March 2005)

[5] http://abi.bcis.co.uk/

Business Insurance

9.17 Flooding insurance is an essential safety net for businesses who suffer the cost of loss of stock and physical damage caused by a flood combined with a severe impact on cashflow if trading premises cannot be used. There are various other types of insurance policy available to businesses which, depending on the business activity, can protect against the unexpected. The most important considerations in the event of flooding are buildings and contents cover and business interruption insurance.

9.18 During the summer 2007 floods, it became clear that many firms had inadequate or non-existent plans in place to protect them from an unexpected event.[6] A recent survey by AXA Insurance estimates that as many as 7 out of 10 small businesses would go under if they experienced a major emergency in their first year. The survey also revealed that 90 per cent of small businesses were under-insured for buildings cover and 41 per cent had no business continuity or loss of earnings insurance.

9.19 In April 2008, as part of its commitment to promote the importance of adequate business cover, the ABI launched the *Insurance Guide for Small Businesses* about managing risks and protecting small businesses.[7]

9.20 In calculating the premium for a policy, the insurer is likely to take into account any systems that the business has in place to control potential risks. A flood risk action plan can help businesses prepare and save on the cost of lost stock and moveable equipment. The action plan may include flood resistant measures in the building or flood protection barriers to hold waters back.

9.21 The Department for Business, Enterprise and Regulatory Reform (BERR) has worked with the ABI, the Environment Agency and Business Link to review the information available on how businesses should consider their risks, insurance needs and plan appropriately to deal with the effects of flooding. The revised guidance '*Protecting your business from flooding*' is available at the Business Link website www.businesslink.gov.uk and looks at how businesses can:

- assess the risk of flooding;
- draw up a flood plan;
- insure the business;
- train employees to deal with flooding;
- install flood protection measures; and
- do in the aftermath.

RECOMMENDATION 29: The Government and the insurance industry should work together to deliver a public education programme setting out the benefits of insurance in the context of flooding.

Low-Income Households and Insurance

Financial Inclusion

9.22 In 1999, home contents insurance, along with bank accounts, were identified as a key aspect of financial exclusion by the Social Exclusion Unit in its report *Access to Financial Services*, the principal focus of which was on promoting 'insurance-with-rent' schemes, usually for home contents.

9.23 In 2004, the Government launched a financial inclusion strategy backed by the £120 million Financial Inclusion Fund for 2005–08 designed to help people access a bank account, affordable credit and free money advice. However, there was no emphasis on the taking out of insurance. In December 2007, HM Treasury published *Financial Inclusion: An action plan for 2008–11* backed by a new Financial Inclusion Fund of £130 million.

9.24 As part of the new action plan, the Government will focus its policy response on home contents insurance for those living in rented accommodation, integrated with continued work on raising awareness among target groups on how to get a bank account, affordable credit and free money advice. **The Review welcomes this new focus on the uptake of insurance in the Government's financial inclusion policy.**

[6] *Preparing for climate change*. A practical guide for small business
[7] ABI *Access for all: Extending the reach of insurance protection*

9.25 As part of the action plan, the DWP has been allocated £12 million to establish 'financial inclusion champions' designed to integrate with the work of the 'Now Let's Talk Money' campaign. This initiative will include 20-2 person teams to assist in the uptake of home contents insurance and increase the accessibility of home contents insurance and affordable credit products by low-income households. This approach has been based on learning from a study carried out by Glasgow Caledonian University, which looked at the best ways to improve uptake of these insurance schemes.

9.26 Since the interim report, the Financial Inclusion Taskforce, along with members of the insurance industry and the ABI as part of the Insurance Working Group, have looked at areas for policy action. It identified various barriers to the uptake of home contents insurance.[8,9] These include:

- affordability;
- perceived lack of need;
- lack of trust;
- fear of the small print;

Glasgow Caledonian University report on 'Identification of barriers to tenants' take-up of low-cost, high-quality household contents insurance promoted by their landlord'. September 2006

The Cullen Centre for Risk and Governance (CRaG) at Glasgow Caledonian University were commissioned by the Scottish Federation of Housing Associations (SFHA) and Jardine Lloyd Thompson (JLT) to conduct a study to identify barriers to take-up rate of low-cost insurance schemes. JLT operate the SFHA Diamond contents insurance scheme for the benefit of SFHA members' tenants.

The study identified the importance housing association managers and front line staff place on access to these schemes, with 89 per cent of respondents rating them important or very important. It identified that they felt not enough time is dedicated to the promotion of the schemes due to a number of internal factors, for example adequate resources to administer and promote the scheme. It was also felt that the promotion of insurance schemes is generally perceived as poor.

The study notes that tenants viewed insurance per se as valuable and that they saw insurance as a product that offered peace of mind: however some did not perceive insurance as a priority, despite the fact that they may see its benefits. It was noted that tenants' knowledge of the insurance market and, in particular, the marketing and pricing of insurance products was limited.

The three most successful methods identified to raise awareness were promotional mailings, promotional leaflets and residents' newsletters in that order. In addition a minority of housing associations have successfully used incentives such as prize draws to improve take-up of low cost insurance with rent schemes.

The study suggests that there is a need for routine training and awareness-raising for staff to assist in reinforcing the message to tenants, as well as reinforcing the value of the insurance schemes to individual housing managers. The high turnover of front-line employees and many temporary posts means that frequency of training is relevant in order to maximise its value.

Innovative suggestions made by tenants in the focus group to improve uptake include the idea of Housing Associations surveying tenants and asking them to value their household contents, so helping to focus tenants' attention on the potential loss that they could face in a serious event. It was suggested that the insurance be made compulsory on taking up tenancy, or compulsory with an opt-out option for tenants.

[8] ABI Financial Inclusion and insurance: Meeting low-income consumers' needs 2007 report
[9] Ipsos Mori poll for the IWG in November 2007 to look at 'Financial Exclusion and Home Contents Insurance'

- effort involved in finding out about policies;
- banking and payment issues; and
- dislike of internet or phone communication.

9.27 A major influence on uptake of home contents insurance was that low-income consumers are less likely to own major insurable assets, such as a home or car, which reduces their need for and, therefore, exposure to insurance. It is the responsibility of the Financial Inclusion Taskforce to continue to work with the insurance industry to ensure that the right low-cost home contents insurance is available for people living on low incomes in social housing and privately-rented accommodation.

Low income households

9.28 Low-income households are least able to recover from the financial impact of flooding and are statistically the least likely to be insured. The lack of home contents insurance in low-income households is widespread. Of people in low and very low-income households, one-third of all UK households, 69 per cent are in social housing. Of this 29 per cent have no insurance at all and 50 per cent do not have home contents insurance as opposed to 1 in 5 of those on average income. See Table 5.

Social housing tenants

9.29 Helpfully, there are low-cost insurance schemes for social housing tenants designed for low income households. There is no legal requirement for local authorities or registered social landlords to put these schemes in place and there is currently only limited data on the number of schemes in operation. This lack of data is in part being addressed in a Treasury audit due to be completed this summer.

9.30 The tenants' contents insurance schemes that are in place ensure that cover is available to all tenants, even when mainstream contents insurers are unable to offer cover; at affordable premiums or on viable terms.

9.31 These schemes are run in two ways.

- **insurance-with-rent schemes**: are marketed and administered by the local authority or registered social landlords (RSLs) who collect the premiums, issue policy documents and act as first point of contact for tenants. The premium is either collected with rent as a single payment or at the same time and by the same method or the rent and premium are collected separately; or
- **arm's length or affinity schemes:** the administration and collection of premiums are handled either by a third party or directly by the insurer.

Table 5. Data from Family spending: 2006 edition, ONS

Respondents, %	Very low income, household earning under £10,000pa	Low income, household earning £10,000pa – £15,000pa	Average income, household earning £15,000pa – £30,000pa
UK Households	20%	10%	30%
Any insurance	35%	17%	5%
Home contents insurance	44%	61%	82%
Demand (quite/very important)	79%	83%	92%

9.32 Both schemes have policies that typically include low minimum cover levels of £6,000 for those over 60 and £9,000 for all other tenants. There is no excess on the policy, tenants do not even need a bank account and premiums can be paid weekly, fortnightly or monthly through a range of routes and outlets. Premiums can be very low, with some policies in certain areas charging as little as 60 pence per week.

Availability of schemes

9.33 There are around 1,900 housing associations in England, currently managing over two million homes for more than five million people. The National Housing Federation (NHF), the industry body, represents not-for-profit housing associations in England and has nearly 1,400 member associations. Housing associations are represented in Wales by Community Housing Cymru (CHC). In December 2006, the NHF and CHC launched the 'My Home' contents insurance policy[10] and currently have 351 RSLs participating in England and 14 RSLs in Wales.

9.34 The Northern Housing Consortium[11] (NHC) is a not-for-profit housing organisation which represents 86 per cent of social housing landlords in the North of England, with 260 members. In 1998 it launched a scheme called SIMPLE[12] (Simple Insurance Making Peoples Lives Easier), available to all members. This scheme is currently in operation through 65 of its members, providing contents insurance to 44,000 tenants.

Northern Housing Consortium in Toll Bar in Doncaster

Of the 166 Council properties in the area, approximately 150 of those were affected. It is unclear as to how many of those households were covered by Home Contents Insurance, but only 3 were covered by the 'Simple' scheme provided by the Royal & Sun Alliance.

One of those was Miss X of Askern Road, who had taken out her policy with effect from 12 February 2007. Damage to her property was extensive with water levels reaching waist height. As a result of having taken out the policy, Miss X was able to make a successful claim for damage to her goods to the value of £7,835.25.

Many have seen the benefits of taking out a home contents policy and the 'Simple' scheme has been heavily promoted in the area. As a result a further 27 households have taken up the scheme in that area alone since the flooding along with 567 others from across the Borough.

9.35 Many other insurers operate similar schemes. Royal Sun Alliance in total has 170 schemes (including its SIMPLE scheme) in operation providing approximately 250,000 customers with affordable weekly insurance. Norwich Union has over 100 in operation at present with 140,000 policyholders and Zurich entered the market with a tenants' contents scheme on 1 April 2008.

Uptake of schemes

9.36 In a recent study, the Financial Inclusion Taskforce commissioned the information services company, Experian, to conduct research to establish the availability of appropriate home contents insurance through social landlords. Experian surveyed housing associations to gauge take-up of insurance-with-rent and arm's length schemes. The

[10] Provided by the insurance broker, Jardine Lloyd Thompson and from the insurer Allianz plc
[11] http://www.northern-consortium.org.uk/Page/Index.aspx
[12] Provided in partnership with Marsh UK Ltd and Royal Sun Alliance

survey ran for five weeks and used a combination of telephone and electronic communication. Some 896 organisations responded to the survey, with 45.4 per cent of organisations having either insurance-with-rent or arm's length schemes. The Review is of the opinion that this proportion is far too low, especially considering the period of time that guidance has been available for these schemes to be set up. Experian are now undertaking work to identify and map the areas that are most likely to have a high need for insurance-with-rent schemes and overlay this onto the relative supply of insurance-with-rent schemes, which will enable mismatch analysis to be developed.

9.37 The Housing Corporation produced the guide *Insurance for all: A good practice guide* in 2001 to provide local authorities and RSLs with the necessary information to set up and run insurance-with-rent schemes. On 15 October 2007, it was announced that a new organisation, the Office for Tenants and Social Landlords, would be set up and replace the role currently played by the Housing Corporation, by December 2008. This new watchdog is the key recommendation accepted by the Government from the Cave Review of Social Housing, the most wide-ranging review of the regulation of social housing for 30 years, which took place in June 2007. One of the primary conclusions of the Cave Review is that the regulatory framework needs to focus more on tenants' needs through tenant empowerment.

RECOMMENDATION 30: The Government should review and update the guidance *Insurance for all: A good practice guide* for providers of social housing and disseminate it effectively to support the creation of insurance with rent schemes for low income households.

Insurers and flood risk information

9.38 In order to price flood risk accurately and provide coverage across the country, insurers need information about flood risk. Much of the data they use comes from the Environment Agency and many of the larger insurance companies supplement this with additional mapping of their own. More detailed information on property characteristics including kerb levels, for example, may be included as this could make the difference between a property being at risk or not of internal flooding.

9.39 The main source of information provided by the Environment Agency to the insurance industry is the National Flood Risk Assessment (NaFRA) and its flood risk maps, which are covered in detail in Chapter 3. A small charge is made to the industry for this information. Insurers have suggested that this information is neither as accurate nor as up to date as it could be. They have concerns that the data on flood defences and their condition is incomplete and in the case of condition, not accessible to them. They would also like more information on planned flood defences. The Review's suggestions for a long-term investment strategy and more transparency in relation to maintenance regimes (see Chapter 7), should in part help resolve these issues. However, the Review is of the opinion that future flood defence plans should be made available to the insurance sector as a matter of course.

9.40 Buying insurance is a key time when a household or business will think about risk. It is clear from the Review's work that flood risk is currently not considered or well understood by most people, unless they have direct experience of it. The Review received evidence from insurers that they were reluctant to provide additional information covering the issue of flood risk in renewal notices because of issues of cost and doubts over its effectiveness.

Insurance and Health Impacts Survey

Of some 582 people who had buildings insurance cover 14 people, (2 per cent) initially chose that particular policy because they provided good cover for flooding. The most important factor in people's decisions was price with 27 per cent choosing the cheapest premium. After the floods some 451 people, (77 per cent), had their insurance come up for renewal. Of these 433 people, (96 per cent) did renew their insurance. Interestingly 13 per cent now chose their insurer based on cost while 10 per cent chose their insurer in particular because they offered good cover for flooding.

9.41 The Review notes these views but believes that more could be done. Some insurance companies, such as Sterling, already provide a leaflet on flood risk. RBS Insurance said that "*a note on mitigation strategies in insurance renewal notices could potentially form part of a wider education campaign to raise awareness of measures that homeowners can take to better protect their property from flooding*."

9.42 The inclusion of a leaflet or a link to the main flood risk information website is another route to raise awareness of flood risk and will be an effective method for some.

9.43 Where insurance is provided through a broker there are clear opportunities to bring customers' attention to flood risk and the measures that they can take to mitigate that risk. BIBA has indicated to the Review that its members will be happy to help raise awareness of flood issues at renewal with customers: "*BIBA and our members will work together with the insurance industry to help disseminate the agreed information to clients at renewal*."

RECOMMENDATION 31: In flood risk areas, insurance notices should include information on flood risk and the simple steps that can be taken to mitigate the effects.

9.44 In the interim report the Review suggested that insurers could make signing up to Flood Warning Direct a condition of insurance for those living in flood risk areas. This suggestion received a mixed response. Some welcomed an approach that could lead to greater uptake of the service. Many others, including the insurance industry, queried how it could be monitored or enforced and felt that it might have the unintended result of invalidating insurance agreements where sign up did not occur.

9.45 The Review has considered the responses and has decided not to pursue this interim conclusion, but is instead pressing for a general opt-out system for Flood Warning Direct. However the Review would still like to see insurers and brokers encouraging sign-up to the system through the information provision above and more proactive steps such as links to online or phone registration.

Making a claim

9.46 When a policy-holder makes a claim following a flood, the handling of the claim has a significant impact on the policyholder's experience. Research[13] has demonstrated that "*the role of the insurance industry and the way that its personnel deal with flood victims are crucial in mitigating or exacerbating the trauma of a flood*." The Lancaster University study of 48 diaries of those who were flooded in Hull support this view. The study noted "*The stress of dealing with insurance companies and having to go through a cumbersome system of approval adds to people's discomfort and anxiety at a time when they are already in a very distressed condition."*

9.47 Many of the insurance companies and loss adjusters that the Review spoke to recognised the importance of their role in the claims process. The Chartered Institute of Loss Adjusters said:

> *"The first visit by an adjuster sets the tone for the progression of any claim. Good soft skills are essential and understanding the impact of the event on the household. Although the flooding may be the same in adjacent homes the effects are often very*

[13] The health effects of flooding: social research results from England and Wales, Journal of Water and Health, 04.3.2006

different – the needs of a young couple may be very different from those of an elderly or infirm couple. The adjuster must look for individual solutions whilst at the same time having regard to policy coverage and any issues arising."

The claims process

9.48 Dealing with the aftermath of a flood is likely to be an extremely stressful time. Depending on the amount of damage caused it could be weeks or months before the property is habitable again. There are a number of steps that the policy-holder and insurance company will go through in making and concluding a claim. When the claim relates to flood damage, the claim will often extend over a lengthy period of time (several months) and can often be split into two phases – drying out the property and then rebuilding or refurbishing.

9.49 Some insurance companies and loss adjusters provide a claims plan. This is a schedule of:

- what work will be done and when;
- how often the policy-holder will be contacted; and
- when money will be paid.

Claims process steps

Make the claim. Contact your insurer as soon as possible to inform them what happened. The insurer will advise you on arranging alternative accommodation if necessary, the evidence needed to support your claim and how to go ahead with the clean up and repair process.

Damage Assessment. A loss adjuster is appointed to assess the claim. An initial assessment of the damage will be made, the reinstatement process explained and the options for alternative accommodation considered.

Alternative accommodation. Alternative accommodation arrangements should be agreed with the loss adjuster before you commit to them. If the damage to the property is serious enough for there to be a large delay in moving back in, then a mobile home may be provided.

Stripping out and cleaning. All debris and damaged items are removed, damaged plaster hacked off, damaged woodwork removed and the house disinfected.

Decontaminating and dehumidification. Antibacterial and antifungal treatments are done. Drying equipment is installed to dry out the house before reinstatement can begin.

Reconstruction and repair. The cost of repairs is agreed with your loss adjuster and a contractor is appointed, either the insurers' own or one that has been agreed with them.

Moving back in. The reconstruction work is done. Some minor repair and redecoration work may still be necessary with you in your home before the claim is completed, all the outstanding work finished and payments made.

9.50 Many of the problems with insurance companies and loss adjusters stemmed from confused communication and expectations of how long the process would take. A claims plan helps to manage expectations, establish the likely length of time it will take for a claim to be settled and, in relation to properties, the length of time before a property will become habitable again. The Review was concerned to note that in evidence from its Insurance and Health Impacts survey that only 28 per cent of those who made a claim received a claims plan.

9.51 For private and social tenants the position is different in that their possessions are covered by a contents policy, and the building insurance is the responsibility of the landlord. The landlord's insurance may provide alternative accommodation for private tenants whereas the landlord should take steps to rehouse social tenants.

The experience of policy-holders following the floods

9.52 There is no doubt that an event of the magnitude of the summer 2007 floods represents a major challenge to the insured and insurers. The Review was encouraged to note that, of those who had insurance, many were very pleased with the service they received. This reflects well on the measures put in place by insurance companies and loss adjusters to deal with the event. However, the Review also heard numerous accounts of poor experiences with insurers, relating to a range of issues including information provision, the length of time it took to deal with claims and poor communication.

9.53 In the interim report the Review highlighted concerns arising at the beginning of the claims process: poor and conflicting evidence on disposal of flood damaged goods and levels of evidence required for a claim.

9.54 A number of research studies and surveys have been carried out following the summer floods. The ABI commissioned Populus to carry out a survey shortly after the floods, which indicated a satisfaction level with insurers that was comparable with local authorities.

Populus interviewed a random sample of 1,003 adults aged 18+ by telephone between November 16 and 21 2007 in areas particularly badly affected by the summer flooding in Yorkshire and Humberside, and Gloucestershire and Worcester. Respondents were asked to rate a number of bodies on a scale of 1-5 (where 1 was very poor and 5 was very good). Residents' average rating of their local authority was 3.28, their insurance company 3.26, the Environment Agency 3.13 and national government 2.64.

Populus updated their survey at the beginning of June 2008. The ABI is now rated 3.35 out of 5 and the Government's rating has fallen to 2.50.

Insurance response to flooding in Sedgeberrow, Wychavon

The river Isborne, fed by tributaries in the Cotswolds, runs through Sedgeberrow on its way into the Avon at Evesham. The Environment Agency's early warning system failed and due to the physical nature of the river (deep, narrow and winding), the area flooded very quickly, leaving little time for residents to move belongings. Within one hour river levels had risen by several metres and residents recount seeing a 4 foot 'tsunami' wave which swamped homes and moved parked cars, among other things, either washing them down river or up against homes or on top of garden walls. The July event saw almost 100 families in Sedgeberrow displaced, 65 people airlifted to safety and the whole of the Herefordshire and Worcestershire Fire and Rescue boat service deployed to rescue trapped residents.

Some insurance companies acted rapidly, effectively deploying loss adjusters to deal with the problems: however, many residents had to wait up to six weeks for a loss adjuster to arrive. Residents had problems making appointments while living elsewhere in temporary accommodation with no phone. Some residents had experiences of loss adjustors asking for excess monies up front to expedite claims, but had no way of confirming the amount or of making payment with their paperwork and chequebook lost to the floods.

Residents received differing information on what to do with damaged possessions. Some were told not to move anything until the assessor arrived, others were told just to take photographs to record their losses. Neighbours reported others receiving better, quicker or more sympathetic treatment than themselves.

Some residents had cleaners appointed to clean and strip out their homes but levels of service varied considerably with reports of inadequate staff, equipment and management. Again, when drying out began there are reports that some residents received proper dehumidifiers to dry their properties out, but others were just sent large fans.

Residents reported large differences in up front and subsistence payments, with some receiving £10,000 and £400 pcm accommodation costs and others receiving as little as £500 and £10 per day subsistence. There were also reports of delays in insurers making invoice payments and residents having to use savings to meet suppliers' demands.

Residents fear they will not be able to get insurance or that premiums will rise dramatically. There are reports that some businesses are having their premiums quadrupled, or insurers are refusing to insure them in the future. Some householders report that insurers are raising excess levels up to £30,000 extra, and in some instances surveyors are telling residents who live near streams or culverts that they must construct walls on their land to deflect flood water from their properties before they can be accepted for renewal premiums.

9.55 As outlined above, Lancaster University carried out a study of 48 diaries of households affected by flooding in Hull. In addition the Review circulated questionnaires to 1,500 households in Hull, covering people's general experiences with insurance companies, health impacts and the service received from different organisations.

Hull floods project – Flood, vulnerability and urban resilience: a real-time study of local recovery following the floods of June 2007 in Hull

This project was set up in response to the events of June 2007 in Hull and is funded by the Economic and Social Research Council, Engineering and Physical Sciences Research Council and the Environment Agency. An aim of the project is to undertake a real-time study of local recovery to identify all aspects of the long-term experience of flood impact and flood recovery. Parts of this research provide us with indicators of the insurance industry's performance.

To date, the study has completed 48 interviews: 43 of which are with residents, 31 with owner occupiers, 7 with council tenants, 2 with private tenants, 3 with housing association tenants. Of the 48 participants, 7 were uninsured.

Some participants in the study report having enjoyed good relationships with their insurance companies and loss adjustors: however, these were in the minority. The study highlights the stress respondents suffered as well as financial hardship through problems with their insurance claim.

I feel like a criminal trying to get blood out of a stone to get any money from building insurance. (Leanne, diary)

Each time we've had to go to them as though we are begging for something we are entitled to and I don't like that. (Barry, interview)

The study also highlighted residents' problems of communication with loss adjustors and insurers and the conflicting nature of information provided.

It was hell to get hold of her again; I just kept ringing her on her mobile. We had to try and keep this sort of level of not being a nuisance to everybody but not letting things go that we should be doing. (Emily, interview)

Left another message [with loss adjustor] – no response. If he would just call me back – it's so frustrating. This seems to be taking up my whole life – God, what did I do before the flood? (Rachel, diary)

We lost the fridge and the freezer and the cooker in the kitchen but the scary thing was we were actually still using them – nobody condemned them or even suggested that they were contaminated in any way, shape or form until we moved out. And then they said, "Oh you shouldn't have been using them"… The thing is as well, you find out different things from different people. Just by talking to your neighbours – they'd been told a completely different story to what you are getting told by their insurance company. (Julia, interview)

9.56 The Review also commissioned an insurance and health impacts study that covered 647 households across a sample of the affected areas. This survey examined some of the stages of the insurance claims process and the overall satisfaction with and perception of the industry. A summary of the study is provided in the box below.

Insurance and Health Impacts Survey

The Review commissioned a survey of 647 households affected by the floods: 88 per cent were owner occupiers and 12 per cent tenants. Some 96 per cent of the owner occupiers had buildings insurance. The survey, which was carried out by GfK, covered all the main flood affected areas. Full details of the survey can be found on the Review web site.

Of the owner occupied properties that were insured, 81 per cent had the same company for both contents and building insurance. Two companies accounted for a total of 20 per cent of households, with the remainder split between a large number of different insurers (none of which accounted for more than 5 per cent).

Impacts of flooding

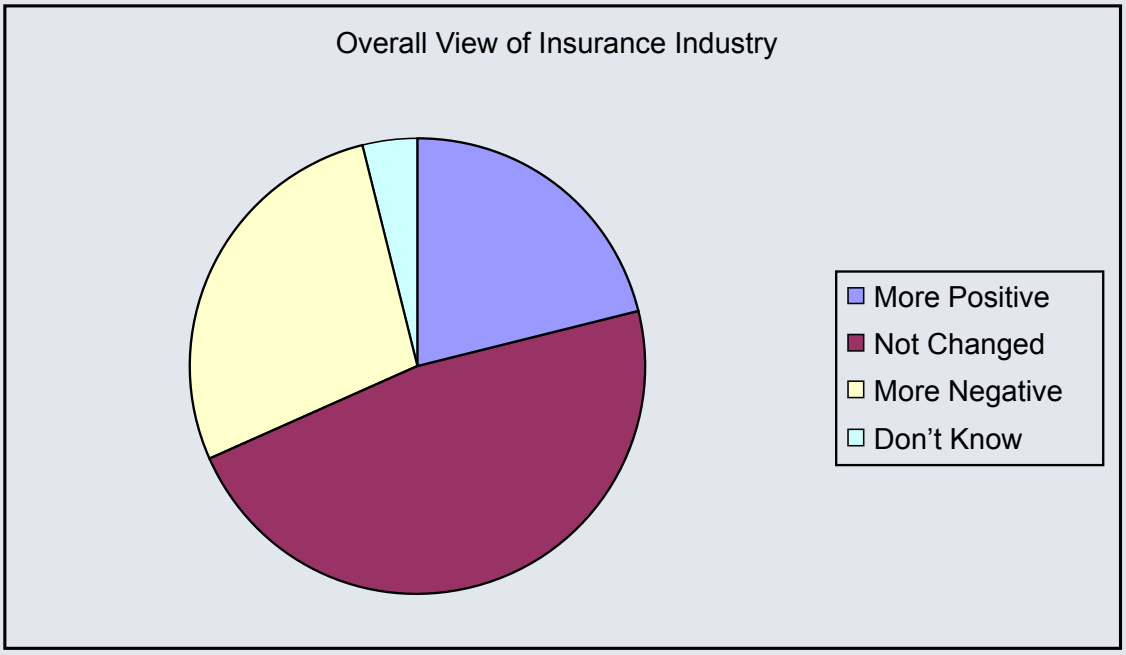
Most households saw damage to internal fixtures and fittings. Some 50 per cent saw damage to the external fabric (for example brickwork) of the building too.

Some 62 per cent had to move out of their homes.

The main additional costs to policy-holders came from extra heating (39 per cent), takeaway food (30 per cent) and temporary accommodation (23 per cent).

Satisfaction with insurers

Nearly half of respondents saw no change in their view of insurers following their experience with the floods. However, 21 per cent had a more positive view and 28 per cent had a less positive view.



There was a strong correlation between those who were dissatisfied with the handling of their claim and those whose view of their insurers was more negative.

Satisfaction with claim handling

The majority (72 per cent) were very or fairly satisfied with how their claim had been handled. However, 22 per cent (122) were very or fairly dissatisfied with how their claim had been handled.

For those who were dissatisfied, the three main issues were:

- time taken for home to be repaired (66 per cent);
- difficulty in getting information (66 per cent); and
- time taken to get advice/information (42 per cent).

Timings

Upon notification of a claim, insurers provided information quickly – 76 per cent within a week, but 8 per cent within 2 weeks and 7 per cent over 2 weeks.

Some 89 per cent were contacted by a loss adjuster after they had contacted their insurance company: 58 per cent were contacted within a week but for 21 per cent it took a fortnight: for 11 per cent it took a month and for 4 per cent it took over a month.

The loss adjuster visited homes after contacting the householder: 54 per cent were visited within a week, but 23 per cent within 2 weeks, 11 per cent within a month and for 8 per cent this took over a month.

Time from first contact with the insurer to when first work started on the property (stripping or drying out): 42 per cent saw work begin within 2 weeks, with a further 23 per cent within a month, 14 per cent within 2 months, 6 per cent within 3 months and for 8 per cent this took over 3 months.

There was a fairly even spread from when those who submitted a claim saw actual rebuilding work start, with 50 per cent having work start within 3 months: however, for 8 per cent it took over 6 months and 4 per cent have yet to have work start on their property.

Over half of the respondents, 56 per cent, have had their claim concluded and of these 66 per cent were concluded within 6 months of initially submitting their claim. For 10 per cent it took over 9 months.

9.57 The Review recognises that for some the element of dissatisfaction with insurers will be around policy conditions being enforced – for example, not having cover to deal with specific issues such as paying for vets bills or damage to growing crops. This flags up the importance of having clearly-written policy terms and making sure that those who buy insurance read the terms, conditions and exclusions.

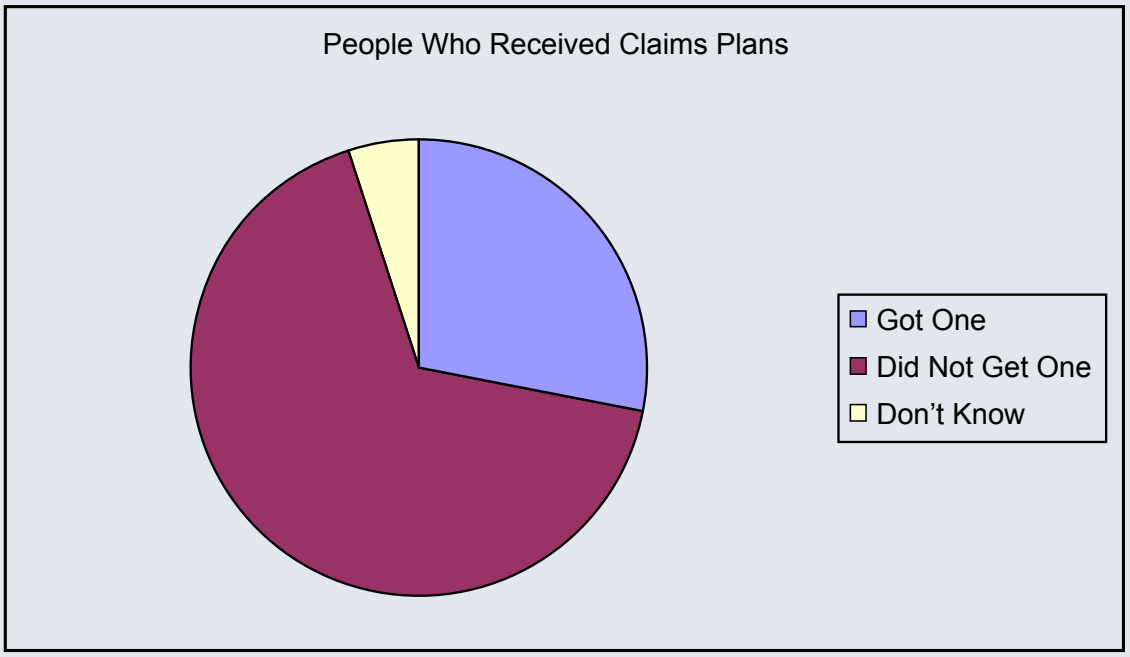
9.58 The scale of the summer 2007 floods were a challenge for insurers and loss adjusters, and many rose to that challenge. However, a small but significant number of households did not experience the good service received by many. Issues arose in the immediate aftermath, with conflicting information on clear-up and evidence levels for claims. Most insurance companies were in touch relatively quickly but there were delays for some in terms of contact and face-to-face visits from loss adjusters (some of over a month), which then led to delays in the onset of work. Those that were dissatisfied with their insurers raised concerns around information availability (difficulty in getting any information and length of time to get it), length of time to repair properties and issues around money.

Provision of information

Of the information provided by insurance companies about the claim and how it would be dealt with 66 per cent felt enough was provided: however, 31 per cent would have liked more.

The majority (80 per cent) of people found the information that they did receive very or fairly easy to understand: however, 15 per cent found it very or fairly difficult.

Only 28 per cent received a claims plan from the loss adjustor and of those that received a plan for 30 per cent the timings set out were not adhered to.



Claim Settlement and Payment of Money

Almost all have received full or part payment of their claim with 82 per cent having been paid in full and 16 per cent having received part.

Just over half (55 per cent) of people had received payment covering all of the additional costs incurred and 31 per cent had received only part.

In 59 per cent of cases builders were paid directly by the insurers and, in the majority of the rest, 34 per cent received the money up front from their insurer, with 7 per cent of respondents having to pay up front and claim the money back, which caused difficulty in half the cases.

In the cases where the insurer did not pay the builders directly 32 per cent of respondents received the money later than they were promised.

Renewal of insurance

Some 77 per cent of respondents have had their insurance come up for renewal since the floods and of these 96 per cent have either renewed with the same company or taken out insurance elsewhere. Only 1 per cent have not renewed because they have been turned down because of flooding.

Of those that renewed 33 per cent did so in particular because they were satisfied with their insurer. 10 per cent did so because the insurer offered good flood cover.

How the insurers responded to the summer 2007 floods

9.59 In general, the Review considers the insurance industry to have responded well to the summer 2007 floods, having been presented with one of its biggest ever challenges. As soon as the scale of the floods became apparent, insurers implemented their major event plans.

Insurers response

An elderly couple who took out two home contents insurance policies unknowingly (one with R&SA and one with AXA), when what they meant to do was take out one buildings policy and one contents policy. Their mistake only came to light after the flood.

R&SA contacted AXA and the two companies agreed that the couple's intention was clear, i.e. they intended to, and thought they had insured the building. On that basis both companies agreed to acknowledge the building and contents claims, so the customer did not lose out. The ABI will sort out the mechanics of how the overall repair cost is split between the two insurers.

9.60 Additional staff were brought in from outside the affected regions, and in some cases from overseas, to handle claim calls and visit premises. Many insurers established dedicated flood teams in their contact centres to deal with the influx of claims and extended their opening hours. There are examples of insurers' call centres making calls to check whether their customers in the affected postcodes needed assistance before they had even been notified of a claim. Some insurers installed mobile advice centres to handle claims in the especially hard hit areas. Some insurers identified vulnerable individuals to ensure they were given assistance quickly and efficiently. In certain areas, where looting became an issue, some insurers organised and paid for additional security.

9.61 Loss adjustors were generally rapidly deployed to assess damage and provide face-to-face assistance to customers, helping to arrange alternative accommodation and to plan the recovery process. Loss adjustors worked extended hours and weekends to cope with the demand.

9.62 Insurers instructed disaster recovery firms who contacted customers to start the recovery operation, stripping out and cleaning premises and beginning the decontamination and drying out process. Specialist additional drying equipment was brought in from across Europe and other parts of the world. Insurers' repair networks were mobilised and building firms were alerted in readiness for the work ahead.

9.63 Although the insurers' believe their response was very good, they have indicated that they could improve in certain areas, in particular through better communications, managing expectations and being clearer and more consistent about the claims process. The ABI have already taken steps to improve arrangements. They have indicated that they will work with the Government, local authorities and others such as the National Flood Forum to develop better information about what to do immediately after a flood. They have indicated to the Review that they are committed to preparing more generic information about the

flood claims process and to improving the understanding of why it takes so long to repair flooded homes and businesses.

Regulation of the industry

9.64 The Financial Services Authority (FSA) is the insurance industry regulator. The regulation follows a principles-based approach rather than a set of prescriptive rules. According to the FSA a principles-based approach should enable firms to compete and innovate more effectively in product design, quality of customer service and giving value for money.

9.65 The 11 Principles for Businesses have existed since the Financial Services and Markets Act (FSMA) 2001. Principle 6 says: "*A firm must pay due regard to the interests of its customers and treat them fairly*". 'Treat Customers Fairly' is at the forefront of the FSA's move to a principles-based approach to regulation. It is up to individual firms to decide what 'Treat Customers Fairly' means for their particular business. Under the regulations, insurers are required to:

- handle claims promptly and fairly;
- provide reasonable guidance to help a policyholder make a claim and appropriate information on its progress;
- not unreasonably reject a claim (including by terminating or avoiding a policy); and
- settle claims promptly once settlement terms are agreed.

9.66 The FSA will intervene when there it is considered that there is a market failure or when a particular insurer has a sustained under-performance compared to the rest of the industry. Much of the regulator's focus is on readily available information and fairness at point of sale.

9.67 Competitive pressures, combined with the regulation of the FSA and the redress provided by the independent Financial Ombudsman Service, are supposed to ensure that customers are well serviced by the UK insurance industry. However, the argument that competition alone will resolve service standard issues does not reflect the reality.

9.68 It may be difficult for some who have been flooded to find alternative insurers once they have been identified as being at risk and their choices are limited. Furthermore, regulation does not appear to cover the full claims process. Loss adjusters and appointed builders are in a contractual relationship with the insurance company and are not covered by the regulations.

9.69 Redress is provided by the independent Financial Ombudsman Service and it is their job to help settle disputes between consumers and businesses providing all financial services. Complaints are dealt with on the basis of individual merit. In its annual report[14] the Financial Ombudsman Service said:

> *"We kept a close eye on the consequences of the severe flooding that hit parts of the country during the summer of 2007 – to pick up on any early indications of problems that might result in insurance disputes being referred to us. Our experience in the past has been that the insurance sector's swift and professional response to large-scale emergencies has been complemented by a realistic and resilient attitude on the part of the consumers. So far, the number of complaints that we have seen resulting from the floods has been very low – although we are aware that many people are still unable to return home while waiting for properties to be repaired."*

9.70 In discussions with the Review, the FOS noted that they received only a small number of complaints from policyholders. But they also noted:

> *"it received only a small number of complaints from policyholders about insurers following major flooding events. In the Ombudsman's view the level of formal complaints was not necessarily a strong guide to actual performance or customer satisfaction. In particular it noted that flood related claims often were complex and lengthy customer concerns about poor performance or delays might not crystalise into a formal complaint as some customers*

[14] http://www.financial-ombudsman.org.uk/publications/ar08/ar08.pdf

were obviously concerned that a complaint might simply further delay the satisfactory completion of repairs."

9.71 The FSA looks at a spectrum of behaviour across the industry and, if there are constant lapses, checks whether the behaviour is reasonable compared to the general practice of other insurers. Where there is a significant market failure, it will act. The FSA sees the development of voluntary codes of practice and guidance as a useful method of highlighting good practice and making it easier to compare performance, both for customers and the regulatory regime. The insurance industry already uses voluntary codes of practice in other areas such as life insurance (see below).

Designed to be complementary to the FSA's Treat Customers Fairly Campaign, with a principles-based regulation approach, the ABI has developed codes of practice in a Customer Impact Scheme (CIS), launched in March 2006, with the objective of improving outcomes for customers of the UK's life, pensions and investment industry. The CIS is part of the industry's commitment to improve customers' experiences and for it to be accountable for its performance. This scheme has ten good practice guides including guides for handling claims and dealing with complaints. The CIS does not currently cover household or building insurance.

Raising service levels

9.72 The Review is clear that the impact on households from poor claims handling can be significant. Many insurance companies are aware of the impact and have good systems in place, as shown by the satisfaction ratings of the Review's survey. However, this survey, and other evidence submitted to the Review, shows that there are still real issues of concern. The current regulatory system places more of an emphasis on the point of sale and less on the claims handling element of the relationship between insurer and policyholder; nor does the existing regulatory system cover the insurers' agents such as loss adjusters or builders.

9.73 Evidence from insurance companies and others has highlighted that the industry could have better managed the expectations of customers. Many of the problems experienced by policy holders related to communication, information provision and issues over the recovery of their property. The FSA has indicated that voluntary codes and guidance have value in setting out expectations and general standards of service. The Review is, therefore, of the opinion that there would be great benefit in the ABI working with the industry to develop guidance to cover reasonable expectations of claims handling performance from insurers.

9.74 The Review is pleased to note that the ABI has been working with the insurance industry to develop industry guidance. The Review recognises that reasonable expectations may differ between small and large flood events and that the ABI's guidance distinguishes between the two. The Review also welcomes the ABIs commitment to develop a claims plan for flooding – this is an important document that sets out what a policyholder will reasonably expect to occur in relation to their own particular circumstances.

9.75 The Review believes that the development and implementation of this industry guidance will have a twofold impact – it will help raise standards of service among poor performers and improve the relationship between company and policyholder as each will know what to expect from each other.

RECOMMENDATION 32: The insurance industry should develop and implement industry guidance for flooding events, covering reasonable expectations of the performance of insurers and reasonable actions of customers.

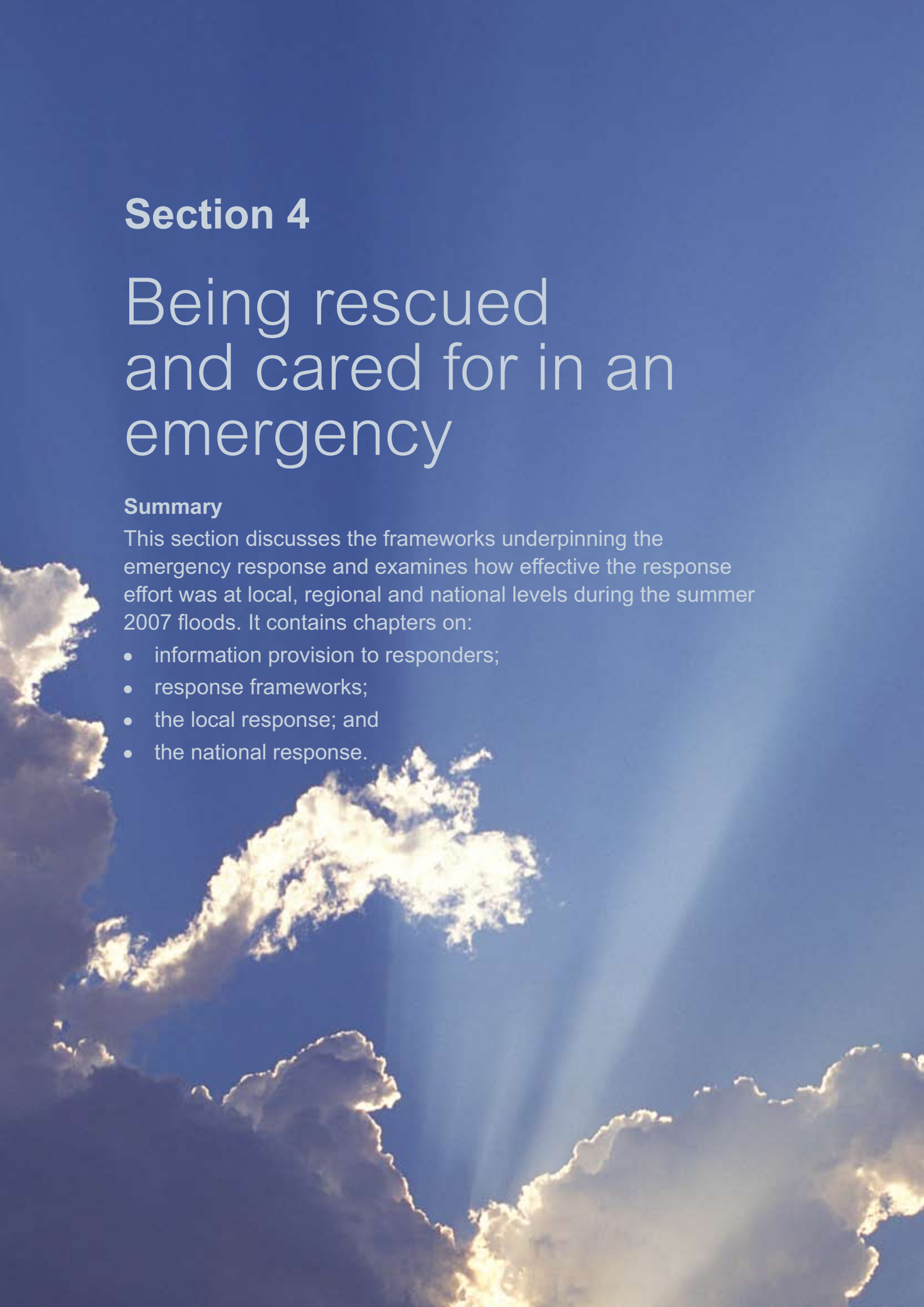
Section 4

Being rescued and cared for in an emergency

Summary

This section discusses the frameworks underpinning the emergency response and examines how effective the response effort was at local, regional and national levels during the summer 2007 floods. It contains chapters on:

- information provision to responders;
- response frameworks;
- the local response; and
- the national response.



Information provision to responders

This chapter examines the information provided to emergency responders, the assistance provided to interpret it, and the way that it is presented. It contains sections on:

- Met Office weather warnings;
- Environment Agency flood warnings;
- interpreting weather and flood information; and
- visualisation and real-time tools.

Introduction

10.1 Clear and accurate severe weather and flood warnings issued with sufficient lead time to allow emergency responders to act effectively are vital. Evidence to the Review shows that, during the summer 2007 floods, many emergency responders found warnings did not provide all the information they needed in a readily accessible format. Furthermore, the information needs of different responders varied according to the use to which they put the information, (for example standing personnel at the ready, or installing temporary flood defences), and the information provided did not always cater for these more tailored requirements. In the UK, the Met Office is responsible for issuing weather warnings, while the Environment Agency is responsible for issuing flood warnings, other than for surface water flooding, for which there is presently no official warning system in place. The issue of surface water flood warnings is discussed in more detail later in this chapter.

Met Office weather warnings

Multi-agency recipients

10.2 The Met Office has an improving understanding of how its warnings are used by different members of the multi-agency responder community. Its Public Weather Service (PWS) advisers played a significant role in the summer flooding events, including representing the Met Office at the Cabinet Office Briefing Rooms (COBR) and at Gold Commands in affected areas, as well as providing television, radio and newspaper briefings. Severe weather warnings were distributed in advance direct to emergency response organisations via email and fax, and PWS advisers located around the country helped responders to interpret the forecast information.

New weather alert system

10.3 The Met Office now issues colour-coded weather warnings against a lower threshold of probability than was previously the case. These are available to responders and direct

to the public from the Met Office website, and alerts of severe or extreme weather are carried in forecasts issued on television and radio. 'Yellow' and 'Amber' advisory alerts provide early warnings of disruption at lower levels of probability than was the case prior to the floods of summer 2007, flagging the need for vigilance rather than immediate action. Extreme and rare weather events such as those experienced in 2007 will be distinguished from the conditions commonly associated with UK weather.

10.4 As well as providing more information to the public, the alerts better inform the emergency services of any potential disruption associated with extreme weather, including heavy rainfall, snow and gale force winds. The Review encourages the Met Office to undertake activities to ensure that the public, its professional partners and the emergency responder community understand the new system, including precautions that they should take when warnings are issued.

Environment Agency flood warnings

Multi-agency recipients

10.5 A number of emergency responders told the Review that the Environment Agency's flood warnings can be difficult to interpret. They also noted that, in some areas, Environment Agency staff who engaged with Gold Commands during the 2007 floods had a limited understanding of their role and purpose, and in some cases were unable to present their assessments clearly.

10.6 The use and the interpretation of underlying data, which is covered later in this section, will clearly be aided by Environment Agency staff who are knowledgeable about their functions and able to explain scientific material to Gold Commands, and to Local Resilience Forums. The development of visualisation tools, which is covered later in this chapter, should help significantly in providing emergency responders with a rapid summary of the likely impact of imminent flooding.

10.7 The Review is aware of a recent survey by the Environment Agency of organisations receiving flood warnings, including Category 1 and 2 responders, which indicated that recipients prefer their information to come via multiple channels, such as fax, email, telephone and the Environment Agency's website, with fax and email being regarded as the most useful methods. In terms of the information provided in the warnings, the Review is pleased that in some areas more geographically-specific alerts are now being issued, as discussed in Chapter 21.

10.8 Research has found that local authorities and the police would welcome data indicating when flooding is most likely to recede, and whether or not there is any likelihood of immediate further flooding.[1] Such information would inform how an event is unfolding and the start of recovery activities, which involves decisions about the safety of re-deploying personnel back into a flooded area. **The Review would welcome the Environment Agency exploring with responders what level of information would be useful in this respect.**

Triggers for flood warnings

10.9 For each type of flood warning (Flood Watch, Flood Warning, Severe Flood Warning), the Environment Agency has a predetermined activation threshold, based for example on river depths and rainfall levels over a catchment area. Lower thresholds are used to initiate supporting actions, such as the staffing of incident rooms, increased monitoring of river gauges and enhanced flood forecasting activities.

10.10 The trigger for issuing a Flood Warning or Severe Flood Warning is based on the Environment Agency's assessment of whether any watercourse, or part of a watercourse, will reach a level at which the Agency judges that significant property flooding will take place. Since the trigger is usually calculated by the use of flood modelling studies or by looking at the behaviour of past floods, unexpected behaviour of rainfall or river water can diminish the accuracy of warnings. The Environment Agency found during the summer floods that, while the computer models generally proved

[1] S. McCarthy, S. Tunstall, D. Parker, H. Faulkner, J. Howe, 'Risk communication in emergency response to a simulated extreme flood', *Environmental Hazards* 7 (2007), 179–192.

satisfactory at predicting river levels, they were less accurate in predicting the timing of floods. The Environment Agency believes that this may have been due to the lack of historic data on such extreme summer floods, as many rivers rose far more quickly than during any previous flooding event.

The advance warning period

10.11 The Environment Agency's flood warning system has service standards that aim to issue warnings more than two hours ahead of potential river flooding in England – it delivers them to the public through its Floodline Warnings Direct system by a number of different media, in a range of languages. Warnings are also issued to the emergency responder community and to the broadcast media.

10.12 The lead time for warnings is almost entirely dependent on the type and behaviour of a river and the location of the flood warning area on that river; more time will be available to issue warnings of rainfall to downstream areas than those upstream near the headwaters of rivers. Thus, slower responding rivers with larger catchments can provide lead times longer than two hours.

10.13 Responders have told the Review that flood warnings are required that provide the maximum notice period possible, well in advance of those defined by the service standards. This is particularly true of utilities companies; in its submission to the Review, the Energy Networks Association (ENA) stated:

> *"Flood warnings are required that provide the maximum notice period possible, not simply a guaranteed minimum figure of two hours for river flooding and six hours for tidal flooding, as is generally the case at present, as it makes the use of temporary flood protection systems impractical."*

10.14 The ENA also described how a prediction of flood depth is important in determining substations at risk of flooding. Further research indicates that flood velocity and depth models would be potentially useful in informing assessments and decisions about the risks in deciding whether to deploy personnel and in making decisions on evacuation.[2]

10.15 The Review is encouraged that the Environment Agency has offered to share its 'National Flooding Outlook Statement' with energy infrastructure owners to provide an indication of potential flooding for the following three to four days based on Met Office forecasts. The usefulness of warnings would be extended further if the Outlook Statement was complemented by site-specific information for infrastructure operators, including greater levels of detail about the velocity and depth of flooding – we recommend that the Environment Agency takes this forward.

RECOMMENDATION 33: The Environment Agency should provide a specialised site-specific flood warning service for infrastructure operators, offering longer lead times and greater levels of detail about the velocity and depth of flooding.

10.16 We are aware that generally the Environment Agency's Flood Incident Management teams will provide notice as far in advance as possible, but only where they are confident in doing so. In this respect, as also discussed in Chapter 21, an interim conclusion of the Review was that the Met Office and the Environment Agency should produce an assessment of the options for issuing warnings against a lower threshold of probability.

10.17 The Met Office and the Environment Agency have recently established a joint working group to consider this in more detail. Initial work by the group suggests that emergency responders would benefit from such warnings and we are informed by the Environment Agency that longer lead times for all warnings will be possible when new, probabilistic warning services currently in development are implemented.

[2] ibid.

RECOMMENDATION 34: The Met Office and the Environment Agency should issue warnings against a lower threshold of probability to increase preparation lead times for emergency responders.

10.18 Until such systems are fully in place, the Review believes that the rationale for issuing warnings with particular lead times, and the confidence levels underlying them, should be more clearly communicated to professional partners. This consistent approach will allow recipients of the warnings to systematically interpret the warning, assess the likely consequences within their areas of responsibility, and to take action accordingly.

Case study – East Coast tidal surge, November 2007

An early warning the previous day predicting coastal flooding allowed EDF Energy Networks to put effective planning in place and prioritise its resources:

"The advance warning allowed us to escalate our emergency arrangements, make contact with the local Environment Agency incident centre and provide them with enough detail about our sites on the coastal and river flood plains to generate a more precise risk assessment based on the heights of our substations above the expected surge flood levels. This allowed us to focus our resources on key sites and to give Gold Commands much better information."

Surface water flood warnings

10.19 Issues surrounding surface water flooding are discussed in more detail in Chapter 4. Although there are presently no warning systems in place for surface water flooding, the Met Office, supported by the Environment Agency, is developing a system that will provide earlier flood-related weather alerts for partner agencies. This will use existing topographical data to identify locations considered susceptible to surface water flooding. It is hoped that upgraded Met Office computers will create the capability needed for this system in 2009.

10.20 In the meantime, the Environment Agency is working with the Met Office to develop an 'Extreme Rainfall Alert' service (ERA) for Category 1 and 2 responders to give an early indication of severe rainfall over defined areas that could lead to surface water flooding. The pilot ERA service has been launched on a UK-wide basis for six months. The service has been developed in consultation with the ENA and is designed to provide an early indication of extreme rainfall and the implied risk of surface water flooding. The potential value of this pilot will be enhanced with the release of the Environment Agency's indicative surface water 'hot spots', as discussed further in Chapter 4, which will assist emergency responders in prioritising their response efforts.

Interpreting weather and flood information

10.21 The Review notes that the Government's Chief Fire and Rescue Adviser's (CFRA) report[3] into the Fire and Rescue Service's role during the floods described how differences in interpretation, presentation and consistency of information between Environment Agency and Met Office information were experienced by some Fire and Rescue Authorities (FRA). One FRA reported that:

> *"…there was some initial difficulty in interpreting the different information sets provided by the Met Office and the Environment Agency. This was attributed to the different mapping system used by the Environment Agency when compared with that of the Met Office and that used by the Fire and Rescue Service. The effectiveness of the information was dependent on the end-user being able to collate and interpret the individual data sets correctly."*

[3] www.communities.gov.uk/publications/fire/floodingreview

10.22 In general, FRAs felt that they could have reacted to flood events more effectively if the information provided by the Met Office and the Environment Agency had been provided in a more consistent and understandable format. They also noted that the lack of information about tributaries made prediction of flooding events more difficult.

10.23 Following discussions with other stakeholders it became apparent to the CFRA that the interpretation of flood data went wider than evaluating Environment Agency and Met Office information only, and that it is necessary to evaluate flood risk information in a broader context. For example, some interviewees in the CFRA's report indicated that they needed to understand local drainage systems better in order to remove water effectively. Others reported that coordination with the various authorities with responsibilities for the drainage infrastructure was difficult. It was generally felt that closer liaison with local bodies with drainage responsibilities, the Met Office, Environment Agency and other Category 1 and 2 responders, would help to create more effective risk analysis for flooding. One FRA stated:

> *"This issue [the provision of information] was not as acute [here] as in other areas. As all agencies were located in the County Emergency Centre we could discuss the implication of predicted rainfall and drainage between the Environment Agency, the water [company] and internal drainage board, and local authority engineers. Having all key agencies in one room was vital in making sense of forecasts that cover broad areas to plan for effects on local rivers and drainage systems."*

10.24 The findings of the Environment Agency's review following the summer 2007 floods support responders' views that information provided by the Met Office and the Environment Agency on weather conditions and river levels was difficult to interpret unaided. Although interpretation assistance is often provided by the Met Office and the Environment Agency, this cannot be guaranteed in all cases and therefore information which can be readily interpreted by non-experts is desirable.

10.25 The Environment Agency's review indicated that the Agency would conduct a review of its professional partners' specific needs, so that the Agency and the Met Office can provide forecasts and warnings that mean action can be taken more easily. The Agency also stated that, together with the Met Office, it would look at the best way of presenting and explaining weather forecasts and flood warnings so that professional partners and the public better understand them.

10.26 The Review welcomes this commitment to closer working and cooperation and urges the Environment Agency and the Met Office to continue to develop these arrangements, so that consistent and joined-up weather and flood warnings and potential impacts can be provided to emergency responders in the event of future emergencies.

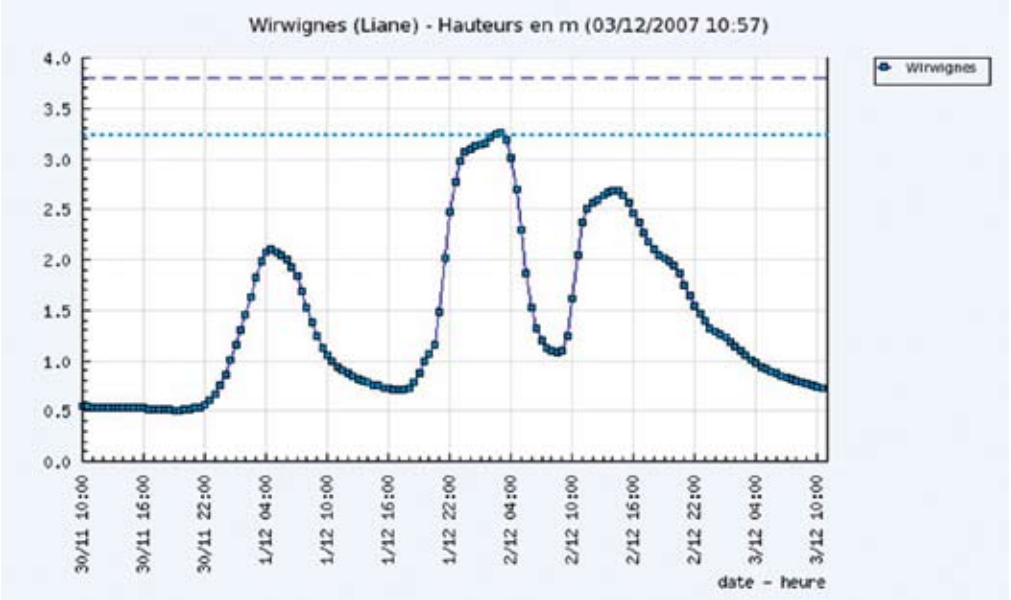
RECOMMENDATION 35: The Met Office and the Environment Agency should issue joint warnings and impact information on severe weather and flooding emergencies to responder organisations and the public.

Flood-risk visualisation in France[4]

A.

B.

C.



SCHAPI[5], France's National Hydrometeorological and Flood Forecasting service, publishes visual flood-risk information in the form of a national map (A) showing river systems colour-coded according to their status (green river systems signify that no particular vigilance is presently required, while an escalated warning level is signified by amber or red). Regions (B) can be viewed by clicking on the map and this also reveals the sites of automatic river level monitors, for which associated depth/flow data in the form of graphs is available (C). In this way, members of the public and emergency responders can actively observe trends in river levels as well as receiving warnings, leading to greater levels of awareness and confidence.

[4] www.vigicrues.ecologie.gouv.fr/

[5] Service Central d'Hydrométéorologie et d'Appui à la Prévision des Inondations (Central Service for Hydrometeorology and Flood Forecasting. Images reproduced with the kind permission of the French Ministry of Sustainable Development.

Visualisation and real-time tools

10.27 Local authorities and the police have to cope with large amounts of fast-moving and technical information relating to the scale of a flood during an emergency. In such dynamic environments, the timing, speed and method of communication is crucial and standard reporting formats assist in these respects. However, there is no consistent approach across the country to the way that this information is presented, which can depend on the facilities available, and this leads in some cases to a relatively 'low-tech', ad-hoc approach.

10.28 Flooding is a spatial phenomenon and can affect a number of areas concurrently. Continuous visual information (rather than table-based information received by fax or email) makes it much easier to get an understanding of how a flooding event is unfolding – especially when a large area is affected. In this respect, the Thames Regional Flood Defence Committee encouraged data provision that was less text-based and that used more model and map-based information:

> *"… much of the information that needs to be exchanged and used is naturally map-based (e.g. maps showing the distribution of key infrastructure and topography, vulnerable communities and assets, flood-risk areas, and a real distribution of rainfall and flood extent – both current and forecast) and therefore amenable to be displayed as layers on a GIS (Geographic Information System)."*

10.29 Further, a number of submissions to the Review, including those of local authorities and the police, highlighted the need to have real-time (or near real-time) flood visualisation tools available to enable emergency responders to react to and manage fast-moving events, and to target their limited resources at the highest-priority areas. In this respect, the Association of Drainage Authorities stated in their submission:

> *"An easy to use GIS that can be effectively updated with timings, levels and extent of flooding during a flood event would certainly be a useful system to keep Gold and Silver Commands informed."*

10.30 Modern technology, using electronic information and mapping that is already available at some control rooms operated by the Met Office and the Environment Agency, can provide some of this visual information and should be made more widely available to other responders.

10.31 A future means of sharing data from different organisations will be via the National Resilience Extranet (NRE) currently under development by the Cabinet Office and Communities and Local Government. The NRE will provide a resilient browser-based tool to enable efficient and secure exchange of information during both routine planning and emergency response. The Review has been informed that there will be a pilot of the NRE in selected local authorities during 2008, with the full roll-out expected in 2009. In the meantime, we believe that much of the current visual data held by the Environment Agency could be utilised in the short term by other responders if software were shared, or if the data could be exchanged via secure electronic links in a similar way to the Met Office's browser-based tool presently in development, as discussed below.

RECOMMENDATION 36: The Environment Agency should make relevant flood visualisation data, held in electronic map format, available online to Gold and Silver Commands.

10.32 One example of a visualisation tool that should be shared with responders is a map-based programme to record flooded locations, which is currently held in incident rooms in some Environment Agency regional offices. This information is built up from reports from on-the-ground staff and members of the public.

10.33 Another example of a visualisation tool used by the Environment Agency that would be useful to responders more widely is Light Detection and Ranging (LIDAR), an airborne mapping technique that uses a laser to measure the distance between an aircraft and the ground. This technique is usually used to produce a terrain map suitable for assessing flood risk. However, it can also be

used to show the extent of flooding in real time. Following limited use of LIDAR in the floods of 2007, the Review is encouraged to hear that the Environment Agency has now developed its capabilities and would be able to utilise this technique to a greater extent during future floods.

10.34 A further example of a visualisation tool is the GIS-based Flood Vulnerability Map (FVM), recently developed by the Environment Agency. This tool allows the possible social impacts of floods to be assessed, facilitating targeted warning by responders when flooding is likely. The system indicates vulnerability within an area, using Census information, and indicates graphically the type of land use in an area and the location of, for example, hospitals, schools, care homes, sites of hazardous materials, roads, camp sites, general practitioners and nurseries. Although static FVM maps can be shared with responders via fax or email, it would be useful if responders were able to interact with the system in their own command centres, displaying and overlaying different data points on screen and on demand. The Review believes the Environment Agency should do further work on the FVM to improve its accuracy and coverage and to enable the electronic maps to be shared.

The development of new visualisation tools

10.35 The Review welcomes a Met Office programme to provide a browser-based service to Gold Commands so that they are able to view the same information as the Met Office Public Weather Service Advisers, while receiving parallel interpretation advice. The system is planned to provide, amongst other data, rain forecasts, rainfall radar and real-time rain gauge data. Future upgrades may include GIS capability. Following user testing with the responder community, the new service is expected to be rolled-out towards the end of 2008.

10.36 In light of the evidence it has received, the Review believes that further flood visualisation tools should be developed to meet the needs of flood-risk managers, and emergency planners and responders. These tools should be developed in conjunction with those who will be using them and should be produced in a format that is compatible with the systems that are currently used by emergency responders. For example, the Local Government Association (LGA) has specified that these tools should ideally be developed in a GIS format, and should be able to link up with incident management systems, such as 'Atlas', which are used by many local authorities. However, the LGA highlighted the need to avoid using stand-alone computers where possible to avoid systems running in parallel.

RECOMMENDATION 37: The Environment Agency should work with its partners to progressively develop and bring into use flood visualisation tools that are designed to meet the needs of flood-risk managers, emergency planners and responders.

10.37 Advanced visualisation tools will, to some degree, be contingent on the Gold and Silver Commands' respective IT facilities, and the Review recommends in Chapter 12 that these facilities should be reviewed and upgraded as necessary.

RESCUE
RNLI A-04

Response frameworks

This chapter examines arrangements underpinning the response to wide-area emergencies. It contains sections on:

- the acquisition of emergency supplies;
- mutual aid;
- flood rescue; and
- emergency water provision.

The acquisition of emergency supplies

Introduction

11.1 Weaknesses in arrangements for the provision of emergency supplies by emergency responders were seen in the aftermath of the 2007 floods. While the arrangements put in place to carry out this task were broadly successful, their ad-hoc nature meant that supplies were often sourced later than was desirable. The scale and urgency of the situation in the South West led to a substantial contribution by the Armed Forces to the logistical operations and this is discussed in Chapter 12.

Emergency supplies in the 2007 floods

11.2 The most extreme example of supply problems involved the delivery of drinking water to 350,000 people in Gloucestershire who had lost their mains supply, generating an urgent demand for consumables such as bottled water, hygienic wipes and sanitation supplies, and means of distributing them. The urgency of the situation resulted in Gloucestershire Gold Command, central government departments and central crisis machinery – the Cabinet Office Briefing Rooms (COBR) – becoming involved in logistics sourcing and distribution, despite there being no established procedures for this.

11.3 Some private sector companies, including supermarkets, bridged this gap to a large degree through the provision of supplies for those affected, drawing on their established distribution networks. However, there is little reassurance that such methods could be relied upon in future incidents. In particular, the goodwill of suppliers in donating goods should not be taken for granted. The role of the private sector, including the key role played by voluntary organisations following the loss of the Mythe Water Treatment Works, is covered in more detail later in this chapter.

Opposite page: RNLI Arancia with woman and baby on board. By kind permission of Robin Goodlad, Natural Light Photography, member of RNLI Flood Rescue Team.

11.4 Evidence submitted to the Review included a number of comments from responders, primarily police, local authorities and central government, about the difficulties faced in sourcing essential supplies and equipment. For example, the Ministry of Defence (MoD) said that:

> *"Early in the crisis, it was apparent that Gloucester Gold Command was unable to resource critically important stocks (such as portable toilets and WAG bags [sanitation equipment]) from within the region and swiftly procured the national reserve of these stocks. Had the flooding caused more critical impact on other regions simultaneously, it was clear that these resources would then have been unavailable for a considerable time period."*

11.5 In addition, the Chief Constable of Gloucestershire Constabulary stated that:

> *"…there must be increased capacity to supply basic needs to communities in the event of an emergency…the county needs to increase its capacity to supply utilities, feed communities and supply other basic needs…there needs to be a strategic reserve of light, heat and sanitation across the country for use in the event of an emergency."*

11.6 A local authority also appeared to favour a central reserve:

> *"…a central supply system would be useful but we already have in place a number of on-call contracts for temporary mortuaries, transport, feeding, standby power, decontamination and water supply as well as clean-up after flooding contamination."*

11.7 However, a submission from a police constabulary stated there was no need for reserves:

> *"… [there is] no need for UK reserves of sanitation/food/water/fuel – supermarkets can supply via their distribution networks."*

Acquiring supplies: a range of solutions

11.8 To gain more information about sourcing emergency supplies, the interim report recommended that the Cabinet Office, with other departments, should urgently consider the costs, benefits and feasibility of establishing arrangements for the urgent acquisition of supplies during a major emergency, including the use of 'call-off contracts' or the creation of national or regional stockpiles of equipment and consumables.

11.9 The Review is aware that this recommendation is being taken forward by the Cabinet Office, who, as part of work to provide guidance, undertook a stand-alone survey of public, private and voluntary sector organisations to establish to what extent stockpiling, if at all, is used at present. The survey identified what essential supplies and equipment were needed and from whom, in what quantities, and how quickly they could be obtained.

11.10 The results of the survey showed that the range and quantities of existing supplies is extensive and comprises: sandbags; portable toilets; baby food and nappies; tents and temporary shelters; medical supplies and staff; food; cooking equipment; sterilising equipment for water and utensils; bottled water; water bowsers; blankets and warm clothing, including waterproofs; power generators; emergency lighting and power cables; diesel, petrol, LPG and oil; satellite phones; buses and public transport; inflatable dinghies and life jackets; buckets, shovels and flood barriers; 4x4 and specialist rescue vehicles; radios and batteries; and high-capacity water pumps.

11.11 However, the survey gave an aggregate picture and the work has also identified that within local authorities, as a general rule, stockpiles of essential supplies held ready for use during an emergency do not exist widely, particularly in large volumes. However, items can often be quickly sourced direct from suppliers at a local or regional level through existing distribution networks, and some local authorities are very well-organised for this eventuality, maintaining resource databases including the items needed, suppliers, quantities held and the time taken to supply them.

11.12 The Cabinet Office has since prepared draft guidance in response to the survey, which considers the possible options for acquiring supplies, including traditional stockpiling (that is, physically held stockpiles of particular items), call-off contracts and the use of supplies held in the community (see text box). This guidance is expected to be issued at both the regional and local level in the second half of 2008 after the National Capabilities Survey[1] has concluded.

11.13 Following submissions to the Review, we believe that how emergency supplies are acquired is dependent on the items in question, particularly whether they are consumable (and therefore not returned after use) or non-consumable. Some of the key factors to be considered in determining the most appropriate acquisition mechanisms appear to be:

- the extent to which the items are available on the open market from existing suppliers, including issues such as the availability of items at different times of year, over weekends and outside normal business hours;
- the extent to which items are available in large volumes within relevant timescales;
- the extent to which items can be distributed efficiently and quickly; and
- whether the market is able to supply 'surge capacity' to a number of recipients at short notice.

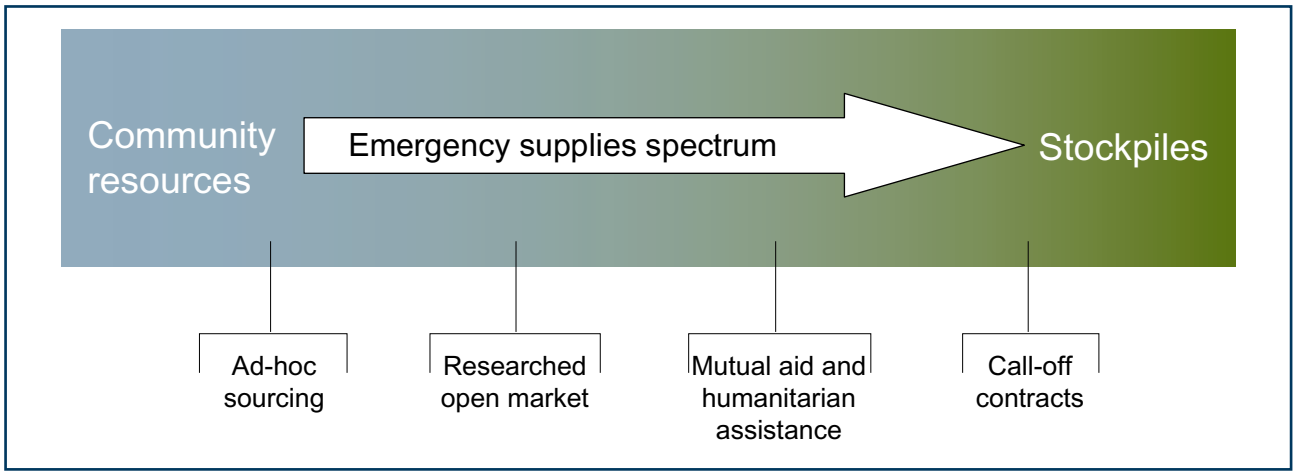
Spectrum of options for acquiring emergency supplies

A spectrum of options can be used to acquire emergency supplies or equipment including:

- **communities, individuals, businesses and schools**, which may have certain supplies and equipment, whether cached in personal stockpiles for use in an emergency or for everyday use – examples are tools, blankets, water, food and clothing;
- **ad-hoc sourcing from the open market**, as used during the floods of summer 2007 – however, this approach lacks certainty and should be the last resort;
- **planned sourcing from the open market** – where prior research gives reassurance that the items could be provided on demand using existing distribution networks;
- **mutual aid arrangements** at a local, regional or national level, including humanitarian aid provided by voluntary organisations;
- **'call-off contracts'** that typically either incorporate a commitment to purchase a particular volume or value of goods or services, or can set the terms and conditions that would apply if goods or services are purchased; and
- **stockpiles,** which can provide certainty of supply in an emergency but can be expensive once warehousing, maintenance, deterioration and transportation are taken into account.

[1] The National Capabilities Survey is part of the Government's programme to make the country more resilient to disruptive events, by providing an assessment of current levels of national resilience to inform national policies and prioritisation of investment in resilience. Conducted every other year, the Survey gathers information from a wide range of resilience stakeholders, in several different sectors and at all levels of resilience planning, to provide an up-to-date picture of preparedness, and to help plan improvements. www.ukresilience.gov.uk/preparedness/ukgovernment/survey.aspx

Figure 8: Emergency supplies spectrum



11.14 Stockpiles established before an emergency are one option for acquiring supplies. However, this option is not always appropriate. Supplies, such as food and bottled water, may have a limited shelf-life and would deteriorate in warehouses over time if not used. Therefore alternative options for acquiring supplies, such as community reserves, humanitarian assistance and contracts to supply goods on demand, should be considered.

11.15 The method used will depend on a number of factors, including the perishability of the item, ease of sourcing and the anticipated frequency of use, as outlined above. For example, storing large numbers of portable toilets for very occasional use would seem unrealistic, and mobilising and servicing them would also be extremely difficult. Established networks and systems to procure some items from different sources and hiring other items, complete with transportation and contracted service backup from large event organisers used to such challenges, would appear to be preferable.

11.16 In view of the forthcoming guidance from the Cabinet Office, the Review does not make a recommendation with respect to whether stockpiles should be established locally or nationally. However, it is clear that any decisions on making arrangements to acquire supplies in advance of or during an emergency should be risk-based, taking account of the likelihood and impacts of risks set out in the proposed National Risk Register and the respective local Community Risk Register.[2]

Mutual aid

Introduction

11.17 During the summer of 2007, mutual aid arrangements enabled organisations engaged in the emergency response to request urgent support from other parts of the country. Many examples of effective assistance were observed in the form of loans of equipment, such as pumps or boats, and personnel. Expertise was provided either on location or at a distance, for example when scarce expertise was required by a number of areas at once. Mutual aid is also discussed elsewhere in this chapter with respect to flood rescue and emergency water provision.

Examples of mutual aid arrangements

The emergency services

11.18 Well-established and effective arrangements already exist for the provision of mutual aid between police forces, with all requests for assistance routed through and coordinated by the Police National Information Coordination Centre in London. Arrangements also exist in the Fire and Rescue Service, administered through the combined efforts of its National Coordination Centre in West Yorkshire, the Communities and Local Government's Emergency Information Support Group in London,[3] and the Flood Support Team, based in Worcester.

[2] An assessment of the risks within a local resilience area agreed by the Local Resilience Forum as a basis for supporting the preparation of emergency plans.

[3] Now renamed the Communities and Local Government Emergency Room (Fire and Rescue).

11.19 The provision, mobilisation and effectiveness of high-volume water pumps under mutual aid during the 2007 floods were widely praised by local fire and rescue service officers. In his review[4] of the Fire and Rescue Service's (FRS) response to the floods, the Government's Chief Fire and Rescue Adviser (CFRA), explained how some Fire and Rescue Authorities (FRAs) expanded the scope of their work to include providing reassurance and general assistance to their communities. There were good examples of mutual aid between FRAs in this wider community engagement work and wherever this work was carried out it was highly praised by local politicians and the wider community. The Review agrees, however, with the CFRA's conclusion that it is necessary to clarify and communicate the role of the FRS's mutual aid bodies and the extent of their respective responsibilities. There is further discussion of the role of the FRS later in this chapter, with respect to flood rescue.

The Environment Agency

11.20 Mutual aid was also used by the Environment Agency, which lent staff inter-regionally to assist other offices. The widespread nature of the flooding meant that some adjacent Environment Agency regions were affected and arrangements were set up to bring staff in from across the country. The Review is aware that these procedures are now under review, to plan for future events with the intensity and duration of the unprecedented events of the summer. This review will examine individual roles and responsibilities, the need for further training and the exercising of the Environment Agency's response.

The British Red Cross

11.21 Another organisation with well-established mutual aid arrangements is the British Red Cross. The summer floods were the first instance where each of its 21 UK regional offices was involved in providing or receiving mutual aid. Their mutual aid arrangements proved particularly effective because all area emergency response managers were already aware of the capability that they could draw on from other parts of the country. As well as mutual aid between its UK offices, the British Red Cross can call on mutual aid from other Red Cross national societies in the European Union if it proves necessary. During summer 2007, aid was offered from elsewhere in the UK in the form of boats and trained crews as well as a water sanitation unit. In addition, support from the organisation's International Division was provided in the form of logistics capability and vehicles.

Uncoordinated mutual aid

11.22 Beyond the cited examples, however, there are few structured arrangements for mutual aid. Where it does happen, it is usually ad-hoc and inconsistent. Evidence submitted to the Review suggests that in a few cases ad-hoc mutual aid arrangements worked well during the floods of summer 2007. In these examples, good communication between those involved meant that resources were able to be loaned upon request and were received in a timely manner.

11.23 Others reported that when their agency had been called upon to help in the emergency, their personnel were poorly integrated into the response effort. People working in Silver Commands rotated frequently with little consistency or knowledge transfer and at times it seemed that the command structures did not know how to make best use of the additional personnel.

11.24 The Review considers it vitally important that Local Resilience Forums have clarity not just about local capabilities but about those available through mutual aid schemes at a regional and national level. We agree with a comment made by the Chair of the Chief Fire Officers' Association (CFOA) Inland Water Strategic Group in his submission to the Review:

> *"…uncoordinated mutual aid arrangements would quickly be exposed during an actual emergency, as water does not respect individual authority or regional boundaries. Different levels of response to different sections of the same flood event would rightly be deemed unacceptable."*

[4] www.communities.gov.uk/publications/fire/floodingreview

Local authorities and mutual aid

11.25 Local authorities have a proven track record of responding swiftly and effectively to incidents and emergencies that affect the communities they serve. All local authorities have plans in place that enable them to do this, and most will exercise and practise their response on a regular basis. The 2007 flooding incidents, however, demonstrated that even for the best-prepared of authorities, a point can be reached where it becomes difficult, if not impossible, for a local authority acting alone to sustain its emergency response effort.

11.26 Where pre-planned mutual aid arrangements are in place, local authorities generally rely on neighbouring authorities to provide support with equipment and personnel. However, the wide range of potential roles can make it difficult to identify the right people with the appropriate skills to assist during an emergency. Moreover, during summer 2007, many local authorities found that they could not rely on assistance from neighbouring authorities, either because they too were affected by floods or because they felt the need to retain the resources available to them in the event of the emergency situation escalating and affecting their area. Furthermore, shared inventories of equipment were not available, so local authorities were unaware what help neighbouring authorities might be able to provide. However, where mutual aid did occur, the help and support from other councils was singularly important to the affected areas.

11.27 It is inevitable that wide-area emergencies will occur in the future, especially in view of climate change predictions. Therefore, the importance of local authorities being prepared for such events by having more structured arrangements for mutual aid will become increasingly significant.

New guidance on mutual aid for local authorities

11.28 In its submission to the Review, and in subsequent discussions, the Local Government Association (LGA) acknowledged that national and cross-regional mutual aid arrangements between local authorities could be improved, for example by the development of a register of experts available to assist the response to a future wide-area emergency.

11.29 The Review welcomes the fact that the LGA and the Cabinet Office are taking forward work to develop guidance for local authorities on mutual aid. We understand that the guidance will recommend some basic principles of effective mutual aid and also seek to address some of the perceived and real difficulties which some contributors to the Review have seen as potential barriers to improved collaboration.

11.30 The Review is aware that research for this guidance has revealed examples of good practice in a number of local authorities, for example the arrangements in place in Northumberland, Norfolk, Cambridgeshire, Lincolnshire, Suffolk, Essex and Merseyside, as well as those between North London authorities and the adjoining counties of Essex, Cambridgeshire, Buckinghamshire and Bedfordshire. These arrangements provide that any assistance provided will be paid for by the requesting authority, which will also assume full responsibility for the health, safety and welfare needs of the staff deployed to assist. A number of local authorities have identified a lead officer responsible for dealing with mutual aid requests.

11.31 Without pre-empting the content of the forthcoming guidance, which is due for issue later this year, the Review has heard a number of suggestions for enhancing mutual aid arrangements. **The Review would welcome the LGA and the Cabinet Office considering these suggestions in developing the guidance to local authorities**. These are set out below:

i) During the floods, many local authorities found that they could not rely on assistance from neighbouring authorities either because they were also affected by floods or because they feared being affected. In the light of this, mutual aid should be considered not only from adjoining regions but also from regions further afield, perhaps including from Scotland, Wales and Northern Ireland, as appropriate.

ii) It should be an inevitable prerequisite of responding positively to a request for mutual aid that the responding authority does not believe that its own services will be diminished below an acceptable level. In addition, when setting up mutual aid arrangements, existing agreements entered into by all parties should be considered so that a level of excess capability (redundancy) exists, in case many mutual aid arrangements are enacted during large pan-regional incidents.

iii) Reimbursement arrangements for mutual aid should be agreed in advance of incidents occurring. However, where this is not the case, assistance should be provided straightaway and costs recovered later. A decision as to who would pay for the deployment of assets should also be agreed ahead of a likely incident.

iv) Where equipment is loaned to mutual aid partners, systems to record and track these assets will be required, even if the terms of the agreement allow for the equipment to be kept by the recipient upon payment or replacement on a like-for-like basis.

v) Mutual aid agreements might be based on the systematic consideration of different emergency scenarios, described in community or regional risk registers, for example a flood across three neighbouring regions affecting a defined number of people.

vi) Plans should consider mutual aid agreements between different types of organisation rather than remaining within a sector, for example between humanitarian organisations and local authorities.

RECOMMENDATION 38: Local authorities should establish mutual aid agreements in accordance with the guidance currently being prepared by the Local Government Association and the Cabinet Office.

Flood rescue

Introduction

11.32 The interim report praised the role of many organisations carrying out flood rescue in the summer, including the FRS, the Maritime and Coastguard Agency (MCA), the Royal National Lifeboat Institution (RNLI) and the Armed Forces. Subsequent evidence submitted to the Review also highlighted the valuable role of other voluntary search and rescue organisations such as Rapid UK, Severn Area Rescue Association and Avon and Somerset Search and Rescue. Voluntary organisations were sometimes first on the scene and added significantly to the response efforts. All of these organisations are highly valued by the public and were praised for their dedication and contribution.

11.33 However, a lack of clarity about who was responsible for carrying out and coordinating flood rescue placed both the public and responders at unnecessary risk. Timeliness and the effectiveness of the response were diminished since there were no common systems of work or understanding of command, control and risk. Further, a number of voluntary search and rescue organisations experienced difficulty in engaging with the response effort. As discussed further in Chapter 3, climate change is likely to lead to floods becoming both more frequent and more severe in the future – the response capability for major floods, including coordination arrangements and resources, needs to be enhanced to reflect this.

11.34 During the course of the Review, we have received a number of submissions from a wide range of organisations on the issue of flood rescue, including: the Association of Chief Police Officers; the MCA; the RNLI; the CFOA; the Fire Brigades Union (FBU); the British Red Cross; voluntary search and rescue organisations (including mountain and cave rescue teams); independent fire and marine consultants; and the Governments CFRA. These submissions, amongst other evidence, inform this section of the chapter.

Multi-agency search and rescue

11.35 The organisation of search and rescue activities in the UK is an amalgam of separate government departments, the emergency services and other organisations. A number of charities and voluntary organisations dedicated to search and rescue also play a significant role.[5] During the summer 2007 floods, rescue teams from these different organisations came together from across the UK.

Coordination of the Fire and Rescue Service

11.36 A large proportion of flood search and rescue activities were carried out by the FRS during the 2007 floods and the coordination of their resources mobilised to assist the affected areas was dealt with by the combined efforts of a range of organisations:

- the Communities and Local Government (CLG) Emergency Information Support Group in London;
- the FRS National Coordination Centre in West Yorkshire;
- the CFOA Flood Support Team in Worcester, an ad-hoc arrangement established during the initial floods; and
- CFOA lead officers.

11.37 There was widespread agreement among stakeholders that the arrangements had worked well in the circumstances. However, given the multiplicity of coordinating organisations, responders were often unclear about the role of each of the organisations and who was taking the strategic lead. This led to delays in the response and frustration on the ground in fast-moving and stressful circumstances.

11.38 Stakeholders agreed that it was necessary to clarify and communicate the role of each of these bodies and the extent of their respective responsibilities. In relation to the roles of these bodies, the report[6] by the Government's CFRA, which examined the FRS response to the summer 2007 floods, stated:

> *"Those involved [in the national coordination] have, however, acknowledged that there is room for improvement in the light of experience gained. The main issue requiring clarification is to confirm who determines the overall use of national assets and in what circumstances."*

And further:

> *"The apparent lack of clarity on the respective coordination functions means that stakeholders are unclear on which of the bodies has the lead in determining strategy."*

11.39 The Review believes that clarifying and communicating the role of each of these bodies, as recommended by the CFRA, would improve the response to flooding, however, we are concerned that the systems, structures and protocols developed to support national coordination of multi-agency flood rescue assets remain ad-hoc. Further, we believe that no cohesive national overview of flood rescue exists in the absence of an organisation having a lead role in major flooding events.

Engagement with other emergency response organisations

11.40 While the FRS carried out a large proportion of flood search and rescue during the summer, they formed only one part of the overall response. The MCA also contributed to the combined response, as did a number of voluntary organisations such as the RNLI, Rapid UK, Severn Area Rescue Association, Somerset and Avon Search and Rescue and the Royal Society for the Prevention of Cruelty to Animals (RSPCA).

11.41 Despite the contributions that they made, many of these organisations informed the Review that on occasions they struggled to become involved in the response. For example, despite numerous calls offering assistance, the MCA was not initially requested to join the multi-agency response to flooding in the

[5] Search and Rescue Framework for the United Kingdom of Great Britain and Northern Ireland (April 2008). www.mcga.gov.uk/c4mca/ukgov.pdf

[6] *Facing the Challenge* – the Chief Fire and Rescue Adviser's review of the operational response by the Fire and Rescue Service to the widespread flooding in England during 2007 (17 March 2008). www.communities.gov.uk/publications/fire/floodingreview

South West. Similarly, the RNLI's support in Hull and South Yorkshire was not requested until six days into the flooding, despite their attempts to become involved from the outset. Although lessons had been learned by the time of the flooding in July in the South West, and the RNLI was put on standby, a lack of clarity in giving them the formal instruction to attend meant that their ready-to-go resource sat waiting for 24 hours and as a consequence was delayed further in traffic congestion caused by the flooding. The RNLI has since written to all chief constables, chief fire officers and local authority principal emergency planning officers advising them of the extent of the RNLI's capability for flood rescue and the terms on which support can be provided.

11.42 The British Red Cross also commented to the Review on the issue of flood rescue:

> *"There was a particular issue around the absence of a clear lead for inland water rescue that may explain the absence of a request to utilise our swift water rescue service; it remains unclear which organisation has responsibility for tasking inland water rescue."*

11.43 Given the difficulty that these large national organisations experienced in engaging with co-responders, it is little wonder that smaller specialised, local voluntary organisations found it even harder to engage. A mountain rescue organisation described to the Review how they routinely undertake search and rescue incidents involving the search for missing persons, transporting casualties, and in many cases 'swift water' incidents. The wish to be involved, and the frustration in not being tasked, is clear:

> *"You have at your disposal a fantastically capable and dedicated resource that would cost you nothing to use, except the effort to engage with us at a national and local level."*

11.44 Even where volunteers were incorporated into the response effort, some felt that they were not properly supported and received little recognition afterwards. One such volunteer told us:

> *"We had all been swimming in the flood water for many hours, and all our equipment and vehicles were contaminated, and some people were feeling unwell as a consequence. We repeatedly called for 'post-incident help', including decontamination. We were told this assistance would be forthcoming. Unfortunately, we never received any help of this nature, and on being stood down from the incident, my team were dispatched back to their homes with no formal help, decontamination, or immediate incident review."*

11.45 The Review believes that the problems in engagement encountered by these organisations are partly symptomatic of a lack of awareness locally of the capabilities on offer. This view is backed up by responses to the urgent recommendation in the Review's interim report, which required all Local Resilience Forums (LRFs) to conduct a flood rescue capability review of their current local arrangements for flood rescue and to consider whether they were adequate in light of the 2007 floods and their local community risk registers. Responses to this exercise, and feedback during the process, indicated that the capabilities of organisations outside the FRS were often not considered.

11.46 The perceived reluctance to involve some volunteers in the combined response may also be due to the lack of a national, commonly recognised accreditation system, and the Review believes that this would be difficult to put in place without the coordination and control of flood rescue being clarified.

11.47 We strongly urge LRFs to ensure that they understand the range of expertise and capability that organisations (whether local or national) can provide in response to flood-related emergencies and build this provision into their emergency plans accordingly. Gold Commands should similarly utilise these valuable resources, where appropriate.

11.48 In this respect, the Review endorses the comment in the CFRA's report, which stated:

> *"It is incumbent on the LRFs to establish clearly, as part of their plans to meet the flood risk, the specific roles carried out by the various responders, recognising the expertise offered by the different organisations in their area. The Regional Resilience Forums should consider the plans of the LRFs in the context of a wider area flood and the coordination of an effective response."*

11.49 However, evidence to the Review shows that the ad-hoc nature of coordination and control arrangements and the absence of an organisation with a lead role with respect to flood rescue led to confusion on the ground. An illustration of this was provided by the Chair of the CFOA Inland Water Strategic Group in a submission to the Review, an extract of which stated:

> *"When the initial floods hit last year a number of volunteers working alongside fire fighters got into significant difficulty. [Subsequently] I discovered that the [volunteers] involved had assumed that the fire service had a duty and would know what they were doing. Equally, the fire service personnel had assumed that the [volunteers] would have been trained in 'water working' and so thought it was safe to continue working. In the event, neither set of staff were adequately trained or equipped for the job they were undertaking and did not recognise the inherent risks they were taking. This is just a single example of the current confusion."*

11.50 This confusion, along with difficulties around the strategic engagement of voluntary sector search and rescue organisations, leads the Review to believe that during future wide-area flooding events, there is a real risk that flood rescue will not be suitably coordinated and the voluntary sector could again become involved in the local response almost on a 'first come, first served' basis, leaving the wider regional or national response effort exposed.

Flood rescue capabilities

11.51 Flood rescue capabilities are the resources necessary to carry out flood rescue, and include trained personnel, boats and personal protective equipment (PPE). As such, they are vital components for effective flood rescue. These capabilities are held locally by the FRS and other search and rescue organisations.

Local capabilities

11.52 The flood rescue capabilities needed in a local area are determined by multi-agency responders at LRFs. These responders have a duty under the Civil Contingencies Act 2004 (CCA) to consider whether current flood rescue arrangements are adequate to address the risks in their community risk registers, and then to address them appropriately, for example by providing training and procuring boats and equipment. As a Category 1 responder, Fire and Rescue Authorities (FRAs) are actively involved in this capability assessment of the LRFs in their area.

11.53 In the interim report, the Review recommended that all LRFs conduct a flood rescue capability review, urgently reviewing their current local arrangements for flood rescue, to consider whether they were adequate in light of the 2007 floods and their local community risk registers. This recommendation required each LRF to assess its flooding risk and its response capability, including resources held by FRAs and voluntary organisations. One output of this process was a register of flood rescue boats and equipment in each area. In response to the Review's recommendation, one LRF wrote:

> *"It is the opinion of the group that it will not be possible to draw up a register [of flood rescue boats] until (a) the statutory responsibility for inland water rescue has been suitably allocated; and (b) central government provides clear guidance on the necessary training, competencies and experience of those boat operators that would be either expected to form or – in the case of volunteers – willing to become a part of, a structured inland water rescue capacity...to add a rescue craft to any register without an accredited*

level of capability, both in terms of the boat itself and the skills and experience of the crew, would clearly not be possible when considering the health, safety and welfare duties owed to that crew by the tasking agency."

11.54 A similar view was expressed at conferences held by the Review in each of the nine English regions and in submissions to the Review from a number of LRFs. The main concern raised was that to effectively assess widespread flooding risks in their own areas, multi-agency responders at LRFs must understand the operational challenges arising from flood rescues, and it is not clear in all cases that responders have the strategic knowledge and skills to carry out this role effectively. It was asserted that without the Government, or an organisation with a lead role for flood response, defining what capabilities would be necessary to respond to flood emergencies, the LRFs would not necessarily be able to tell if the capabilities that they had were suitable. In light of these concerns, some clarification was provided to LRFs by the CFRA, and the LRFs were then able to assess their capabilities in a more informed manner.

11.55 Responses to the recommendation in the interim report seen by the Review show that LRFs have been reviewing their current local arrangements for flood rescue and the flood rescue capability reviews have now been completed. Through this work, there is a real sense that LRFs are examining the strengths and limitations of local flood rescue capability, and are drawing up realistic plans accordingly. However, these plans are often limited, with differences in capability observed across areas of similar flood risk.

11.56 Representations to the Review cite a variety of reasons for the differences in capability: the lack of a statutory duty on any organisation to carry out flood rescue; the absence of definitive advice as to suitable capabilities to respond to a given flood risk; the considerable overlap of responsibilities in relation to flooding and the lack of clarity over who has a lead role in major flooding events; an absence of funding, or differences in funding structures, for equipment and training; and the absence of a formal national scheme for mutual aid in flood emergencies. Notably, there are no national standards for equipment and training or guidance for responders to work from.

National capabilities

11.57 It should be noted that LRFs are only required to consider risks in their local area and that there is no requirement to plan for any larger regional or national emergencies, including wide-area flooding. The exception to this is for emergencies utilising specialist equipment (known as 'New Dimension'[7] assets), for example high-volume pumps and decontamination equipment, for which the additional capability is provided centrally to respond to a wide range of emergencies.

11.58 Accordingly, the flood rescue capability review carried out by LRFs in response to the recommendation in the interim report showed that the current provision of boats, PPE and training is predominantly for local rescue, not for the greater scale of response required for multiple rescues in wide-area flooding events.

11.59 With regard to PPE, submissions to the Review appear to mirror those cited in the CFRA's report in recounting how FRS personnel worked in difficult conditions, often using PPE designed for routine fire-fighting duties, or for infrequent, short-duration incidents in rivers, lakes and canals rather than an interoperable response. We have heard first-hand how fire and rescue personnel deployed in normal fire fighting PPE rapidly became wet, cold and risked contamination by flood water.

11.60 It appears that, in the event of another wide-area flooding emergency, those responding would still not necessarily have the right resources or training to respond safely. Furthermore, any mutual aid enacted without a wider strategic overview could leave other areas exposed. In a wide-area flooding emergency, more resources would be needed than those

[7] The Government's New Dimension programme provides the FRS with supplies and equipment to enhance its capability to respond to a range of incidents, including: chemical, biological, radiological and nuclear incidents; industrial and domestic accidents; chemical spills and collapsed buildings; natural disasters; and floods and earthquakes.

currently held locally and these would need to be underpinned by effective strategic mutual aid arrangements, rather than the ad-hoc arrangements observed in summer 2007.

11.61 In a submission to the Review, the Chair of the CFOA Inland Water Strategic Group stated that:

> *"Floods are by their nature multi-agency, multi-jurisdictional events, hence need surety and mutual aid."* and:
>
> *"From a purely FRS perspective, it is vitally important that an LRF has clarity not just about local level FRS capabilities, but those available through mutual-aid schemes at a regional and national level. In addition to being unprofessional, uncoordinated mutual-aid arrangements would quickly be exposed during an actual emergency, as water does not respect individual authority or regional boundaries. Different levels of response to different sections of the same flood event would rightly be deemed unacceptable."* and further:
>
> *"We have a tremendous flood rescue capability, but it is inconsistent, and we lack the capacity to respond to major events."*

11.62 Further evidence of the need for increased capabilities in relation to the FRS is provided in the CFRA's report, which found

> *"…widespread agreement amongst respondents that the current capability of the FRS was inadequate to meet either national planning scenarios or events on the scale of summer 2007."*

11.63 The Review is aware that the Government accepts that more resources are needed to respond effectively to wide-area flooding. In light of this, Defra, the lead government department for flooding, is considering the degree to which the sum of local resources identified from the LRF flood rescue capability review fulfils the national requirements to cope with widespread flooding.

11.64 In submissions to the Review, stakeholders have cautioned that, in carrying out its assessment of the additional capabilities required, Defra should be mindful that if each area is equipped to deal with its own widespread flooding there could be overcapacity, and therefore there needs to be a careful balance between local and national capability and a fit-for-purpose mutual aid regime. The CFOA has also stated in a submission to the Review that capabilities should also be diverse, with an appropriate mix of specialised resources, for example powered rigid inflatable boats and simpler, non-powered ridged hulled boats and inflatable rafts for towing.

11.65 Further, when assessing the quantum of additional flood rescue capabilities needed, Defra should consider evidence to the Review from voluntary search and rescue organisations, one of which stated:

> *"Most people who were at risk in the flood waters, actually 'self rescued', or benefited from a minimum of outside, third-party, assistance. Most of the contact we had with people who were at risk, either in vehicles or in their homes, only required a minimum of assistance to gain a place of safety. We certainly 'rescued' many people whose lives were in immediate danger, but we also assisted many more, to a place of safety. To call this work 'rescue' is grossly overstating the case, yet many organisations have claimed to be undertaking 'rescues', many days later, when risk levels were much reduced."*

11.66 Early government estimates suggest that there are approximately 70 boats in England and Wales suitable for flood rescue currently held by various local responders, including the FRS, MCA and RNLI, and that an additional 80 boats located across England and Wales, with associated personnel and equipment, would be needed to respond to future wide-area floods (based on a 'worst case' scenario). **The Review would welcome the Government procuring the additional resources identified at the earliest possible opportunity, having regard to the need for a diversity of resources as well as issues relating to interoperability and national standards for equipment, which are discussed below**.

National standards for equipment and training

11.67 Many search and rescue organisations worked together during the floods and, once engaged, this interaction was usually effective. However, working together was hindered and time was wasted where equipment and ways of working were not readily interoperable.

11.68 Evidence of this is provided by a recent interview with Captain Hugh Fogarty, the RNLI's Head of Fleet Operations in *Monitor*, the publication of the Royal United Services Institute for Defence and Security Studies:

> *"The RNLI has a standard that applies whether you're in the Republic of Ireland, Scotland, the Isle of Man, the Channel Islands or anywhere else in the UK. We can take a man from Orkney, put him down in the Isles of Scilly and he'll find the same kit and the same training standards. But if you move from one county to another, the same is not always true of the fire service or police and this can have a huge impact on crew working under pressure…If they have to deal with a different engine type or a different control system, they could spend half their time trying to operate the gear rather than just doing the job."*

11.69 Further evidence of inconsistencies is provided by the flood rescue capability review conducted by LRFs, which, as discussed earlier, highlighted different approaches to training and different equipment. These inconsistencies arose not only between different categories of responder organisation, but also within categories, for instance between different FRAs.

11.70 With respect to flood rescue boats and equipment, evidence submitted to the Review illustrates the role of 'team typing' in facilitating mutual aid arrangements between teams from the FRS's across the country as well as other organisations involved in search and rescue activities. 'Team typing' is a system of categorising rescue teams, allowing them to be identified and selected based on the outcome they are able to achieve safely, rather than through a simple description of the organisation they represent or the equipment they carry. For example, in categorising a team with boats, considerations might include the numbers of people who can be safely carried in the craft, rather than its make or size. The team is further categorised depending on its capability to carry out search operations in particular conditions, such as in still or flowing water. Team typing is applied in the UK but only on an ad-hoc basis.

11.71 In this respect, the CFOA commented:

> *"Successful resolution of any major event would require the seamless coordination of the FRS and voluntary sector specialist water rescue assets at a local and national level. The CFOA-developed 'team typing' system has already proven itself in this regard and has been accepted in principle by the RNLI and all other major voluntary service providers."*

11.72 The CFRA's report also acknowledged the role of team typing:

> *"... in the longer term a more resilient and interoperable response is likely to be achieved using the team typing and training standards similar to those being developed by the CFOA."*

11.73 However, evidence to the Review shows that a national team typing arrangement for flood rescue assets would require a clear multi-agency management framework within which to operate. This framework would need to contain a clear set of criteria and definitions for classification, along with an accreditation system so that assets can be properly classified, rated and registered.

11.74 In terms of training, search and rescue organisations inform us that robust protocols for searching in flood water would need to be drawn up and included in any standards. One voluntary search and rescue organisation stated:

> *"We are accustomed to working under strict 'search' protocols, for missing people on dry land, and these have been built up over a number of years, calling on a vast pool of experience. However, nothing similar exists for searching in flood water."*

11.75 The Review would welcome the UK Search and Rescue Committee, chaired by the Department for Transport, examining the need for search protocols in flood water and providing guidance to responders as appropriate.

11.76 Based on the evidence, the Review believes that national standards for equipment and training and the national implementation of team typing would facilitate different local capabilities being 'plugged in' seamlessly to the regional or national response during wide-area flooding. Standards would also facilitate the accreditation of volunteers, thereby making their engagement easier. However, the Review believes that it would be difficult to agree and enforce national standards for equipment and training without the coordination and control of flood rescue being clarified.

Clarifying coordination and control

11.77 So far in this section, the Review has described the additional capabilities needed to enhance local resources to cope with a wide-area flooding event. We have also highlighted how, to fully utilise these resources, effective mutual aid, along with associated strategic coordination and control and interoperability of equipment, are necessary. However, it has become clear that in the absence of a lead organisation for flood rescue, such coordination and control on a national basis does not currently exist. Instead, in its place, there is uncertainty.

11.78 This issue was summarised in a letter to the Review by the Rt Hon Alan Johnson, Member of Parliament for Kingston West and Hessle, which stated:

> *"[one] of the most important observations that I believe my constituents would want me to make [is] the absence of any clear advice to the emergency services as to who should take command when flooding occurs inland…the emergency services have already made it very clear that they feel this ambiguity restricts their ability to deal with situations such as the floods in June."*

The current legal framework

11.79 Fire and rescue services invariably attend to flood situations and incidents requiring rescue from water, as personnel are trained to work safely near water and are provided with a range of equipment to assist people in difficulty in water. However, there is no statutory duty on FRAs in existing legislation[8] that requires the FRS to rescue people from water, irrespective of whether the cause of the emergency is flooding or other activities which lead to a water-related incident.

11.80 A range of other search and rescue agencies, for example the MCA and the RNLI, are also appropriately equipped for limited deployment for inland water and flood rescue. Although the MCA is a Category 1 responder under the Civil Contingencies Act 2004 for rescues at sea, on the coast and in estuaries, and the MCA and RNLI have a joint statutory duty on the River Thames, neither organisation has a legal responsibility for inland flood rescue. Similarly, no other voluntary search and rescue organisations have flood-specific duties.

11.81 There is no flood rescue duty on FRAs under the Fire and Rescue Services Act 2004, although each FRA has 'permissive' powers to take action it considers appropriate in the event of flooding. As a result, many FRAs use LRF assessments to make provision for boats, PPE and training in order to be able to respond to isolated water rescue incidents, such as people falling into rivers and canals, and local flooding incidents. This is facilitated by Integrated Risk Management Plans (IRMPs), which are developed by each FRA and set out the FRA's assessment of local risks to life. The FRA identifies how its resources should be deployed to tackle these risks and improve the safety of local people. However, as observed during the 2007 floods, the effectiveness of arrangements under IRMPs can vary locally between FRAs, and this inhibits areas working together effectively during wide-area emergencies.

11.82 In Scotland, where the legislative framework for flood rescue is different to that in England and Wales, an amendment to the Fire (Scotland) Act 2005 imposed a duty on fire and

[8] Fire and Rescue Services Act 2004; Civil Contingencies Act 2004.

rescue authorities to provide rescue in response to serious flooding events. The Review has been advised by the Scottish Executive that this duty has helped, to some extent, to clarify roles and set standards for training, kit and competency. However, it is currently subject to a review to define the roles that responders are increasingly being asked to undertake in respect of inland water rescues, many of which occur outside serious flood events.

A statutory duty for flood rescue

11.83 One frequently proposed method of providing certainty on flood rescue is the introduction of a statutory duty for flood rescue. It should be noted that, while the interim report did not ask explicitly whether a statutory duty was necessary, subsequent representations to the Review in favour of such a duty have been numerous and forthright. In contrast, representations against a duty have been scarce. At conferences held by the Review in each of the nine English regions, multi-agency attendees expressing a view were overwhelmingly in favour of a statutory duty for flood rescue. A similar view was expressed at Regional Resilience Forums attended by the Review team.

11.84 Furthermore, chief fire officers who have expressed an opinion told the Review that there was a clear need for a statutory duty on the FRS for flood rescue. In respect of a statutory duty, the CFOA commented:

> *"The way forward in delivering an efficient, resilient and cost-effective national response to major flooding events must surely be based on a clear statement of duties and specifically the duties of FRAs – as well as [Communities and Local Government] and other key Departments – in delivering agreed levels of service provision and standards of competence from within a robust quality and command and control framework. In particular, the CFOA needs to be assured that whatever arrangements might be put in place would be efficient, effective, safe and resilient, and would remain so for the foreseeable future."*

11.85 And similarly, in its submission to the Review, the FBU stated:

> *"After the experience of the summer 2007 floods, the FBU believes that the case for imposing a statutory duty for major floods is overwhelming. The public expects fire service personnel to respond in an emergency situation and fire service personnel, with our training and expertise, expect to participate in rescue efforts. Imposing a duty, as long as it is backed by the necessary resources, will help the fire and rescue service prepare for the next floods."*

11.86 There were, however, arguments against a statutory duty for flood rescue; the CFRA, stated in his report that a statutory duty was not the best means to solve the observed problems:

> *"A statutory duty does not, in itself, ensure interoperability and commonality of equipment, training and competence. After listening to a range of views from stakeholders I have considered the matter carefully and concluded that the issue is not one of legislative change but instead one that relies on making available the necessary capability (boats, equipment and training) to enable an effective national response from the FRS."*

11.87 In addition, three other submissions to the Review expressed concerns about a statutory duty: one search and rescue responder said that payment considerations during floods could delay the response, particularly on the part of non-FRS responders if such a duty was placed on FRAs (although the same person also said that a good argument for a duty was to provide clarity with regard to the lead organisation for flood rescue); and two other responders suggested that a duty might reduce the flexibility of the response that volunteer rescue organisations could provide.

11.88 While most of the representations we have received have been in favour of a statutory duty, the Review believes that the way forward should not be determined solely on a statistical basis, formed from the

weight of responses. It is equally a matter of the fundamental principles underpinning this Review (although in this instance the principles are mirrored by the evidence), which is to give clear and unambiguous direction – giving certainty where there is doubt – that the systems currently in place, or those otherwise proposed, will provide the desired outcome. We must be clear about who does what to ensure that people and organisations are held to account, structures are simple and outcomes are more certain.

RECOMMENDATION 39: The Government should urgently put in place a fully funded national capability for flood rescue, with Fire and Rescue Authorities playing a leading role, underpinned, as necessary, by a statutory duty.

11.89 The Review strongly believes that a statutory duty is the best means to achieve these outcomes. Whilst it is conceivable that non-statutory approaches, such as those proposed by the CFRA, might work, such approaches do not provide the certainty the public expect and the Review believes is needed. This is especially true when the evidence from the summer 2007 floods and the East Coast tidal surge of November 2007 have shown that, many lives may depend on an effective search and rescue response in future wide-area flooding, and when climate change is likely to lead to floods becoming both more frequent and more severe.

11.90 The Review agrees with the CFRA's view that a statutory duty does not, *in itself*, ensure interoperability and commonality of equipment, training and competence. However, a statutory duty would provide the foundation on which these factors could be built, based upon certainty of coordination and accountability. With a statutory duty, the FRS could nationally facilitate, and indeed direct, the development of standards and accreditation and could advise on suitable capabilities with authority. A duty-holding FRA would become the focal point for flood planning and response, disseminating and marshalling expertise from all multi-agency partners, including the voluntary sector. During a wide-area flooding emergency, coordinated strategic mutual aid underpinned by a duty will also allow best use to be made of national assets. Importantly, a statutory duty would also provide the public with clarity about roles and responsibilities during flood events.

11.91 The Review is aware that the CFRA perceives that one disadvantage of imposing a statutory duty on FRAs is the timeframe required for such a legislative change. We are sympathetic to this view. However the Review believes that certainty into the future should not be sacrificed for rapid solutions. If the duty were included in any amendments as part of the current review of the CCA, if appropriate, this could be a relatively quick procedure. In the meantime, immediate mitigating actions can be put in place to reduce the risk while a duty is framed, and in this respect we are reassured that a combination of the lessons learned from the floods of summer 2007, the East Coast tidal surge of November 2007, increased awareness, and the analysis from the LRFs flood rescue capability review, should provide increased confidence to emergency responders and communities alike.

11.92 The response to the flood events of summer 2007 suggests that FRAs are best placed to hold any statutory duty. However, the Review nonetheless examined the range of organisations that a statutory duty could be placed upon before deciding upon FRAs. We are convinced that FRAs are best suited to a statutory duty because of their already extensive experience of flood rescue and the scale of their coverage nationwide. This is a view backed up by the CFOA's submission to the Review, which stated:

> *"Although other search and rescue organisations all play a significant role in flood search and rescue, these agencies would not appear to have the scale or coverage to provide the command and coordination needed for a major event. If any of these bodies or agencies were to be given sole duties for inland response, they would need to create from scratch a local response infrastructure and a UK-wide planning and command element to contribute to each LRF. It is difficult to see how this could be achieved in a practical or cost effective way."*

11.93 Despite the Review strongly believing that any statutory duty for flood rescue should be placed upon FRAs, the Review's firm intention is that the police should continue to lead the multi-agency response at Gold Commands, as recommended in Chapter 12, with the organisation holding any statutory duty for flood rescue assuming the role of tactical adviser to Gold Commands.

Considerations in taking forward any statutory duty

11.94 The Review acknowledges that the detailed content of a statutory duty would need to be worked through carefully and a number of different and complex factors would need to be considered and addressed. In this regard, although the Review would not intend to be prescriptive, a number of issues raised by stakeholders are worthy of emphasising below, for consideration by the Government.

11.95 The Review does not make recommendations on whether any statutory duty should extend to incidents beyond flooding which may necessitate rescue from water, for example in response to inland boating incidents. However, the Review believes that responsibility for such incidents should be considered, drawing on experience from Scotland as appropriate.

11.96 Some stakeholders have informed the Review of a perceived risk that a statutory duty on FRAs would lead to a diminution of voluntary sector involvement and that other search and rescue organisations may face pressures to reduce their existing capabilities. However, on this matter, the CFOA stated in a submission to the Review:

> *"Our experience and evidence to date suggest the opposite. We believe that with an inclusive approach and clear leadership, the voluntary sector can be encouraged to maintain and develop their specialist rescue capabilities. The key advantages [include] voluntary agencies having certainty about how they will be utilised in the event of a major flood and a single point of contact for national coordination. With a single body providing community leadership in this area, smaller voluntary bodies will have access to professional advice and guidance on issues such as equipment, PPE and training standards."*

11.97 In implementing any duty, the Review strongly believes that the contribution of other search and rescue organisations to flood events should be maintained, with an expectation placed on FRAs to pay full regard to the services which already exist in LRF areas. Furthermore, particularly in light of the contributions of other organisations, FRAs should not unduly invest. Capabilities should be fit for purpose but should not be 'gold-plated'.

11.98 We have also heard the concern that other search and rescue organisations may choose to 'charge' any organisation holding a duty for their contributions to a rescue effort. We have no evidence to suggest that other organisations would charge in this way, and in fact one organisation told us categorically that it would not. However, this issue would need to be addressed during consultation with all search and rescue organisations ahead of any duty being drafted. Much care would also be needed in the drafting of any duty, to ensure that fair costs fell to appropriate parties under agreed rules of engagement during a flooding event. With these concerns in mind, we would urge the Government to consult fully with all search and rescue organisations.

Underwater rescue provision

11.99 On 25 June 2007, Michael Barnett became entrapped in a flooded drain and, despite the tireless efforts of emergency responders, he succumbed to hypothermia and died.

11.100 In a letter copied to the Review, HM Coroner for East Riding and Kingston upon Hull requested that the implications of this incident for underwater rescue were reviewed. The Review acknowledges this request and notes that the CFRA's report agreed to consider the coroner's comments in more detail in consultation with the other emergency services and to review what reasonable rescue methods and/or agencies might be appropriate in similar circumstances, and to report on the findings at a later stage.

11.101 Accordingly, the Review does not make recommendations in this respect. However, in arriving at this decision it has sought the opinion of a number of experts in emergency medical care and extrication to ensure that there are no immediate lessons to be learned that could mitigate in similar circumstances. We regret that we have not been made aware of any.

The coordination of search and rescue air assets

11.102 Major incidents can generate a nationwide need for air support across regional boundaries to move specialist personnel, equipment or the injured. Such requests for helicopter assistance, particularly in overland major incidents, can originate from multiple sources. Capabilities between regions and between each aircraft platform can differ significantly.

11.103 The safe and efficient employment of multiple air assets at a major incident therefore requires a high level of aviation expertise within the coordination authority. There is clear need for high-quality advice on safe routing, airspace restrictions, support requirements and weather. Such coordination requires expertise and a robust ground-to-air communications network.

11.104 In the interim report, the Review agreed to examine the advantages of establishing a single search and rescue emergency response coordinating authority for land-based emergencies, rather than the present system coordinated by the MoD, the MCA and the police.

11.105 The Royal Air Force submitted to the Review that a single search and rescue emergency response coordinating authority for land-based emergencies would be beneficial, and suggested that the current UK Aeronautical Rescue Coordination Centre should become the coordinating authority for a national air asset response to a major incident. However, evidence to the Review on this matter is insufficient to ascertain whether there is a problem, or the best way forward. **However, in any work in this area, the Review would welcome the Government considering the experiences of the summer 2007 floods**.

Emergency water provision

Introduction

11.106 The loss of Mythe water treatment works, when it was submerged by rising flood water on 22 July 2007, represented the most significant loss of essential services since the Second World War, leaving some 350,000 people without mains water for more than two weeks. This section details the substantial operation undertaken to provide alternative water supplies.

11.107 Mythe water treatment works, operated by Severn Trent Water, is located near to Tewkesbury in Gloucestershire, on the bank of the River Severn close to the confluence with the River Avon. It supplies approximately 160,000 properties in the towns of Cheltenham, Gloucester, Tewkesbury and in a large part of rural Gloucestershire.

11.108 On Sunday 22 July 2007, the facility at Mythe was submerged by rising flood water and a controlled shutdown commenced. Prior to this, Severn Trent Water was able to transfer some areas of Gloucester to an alternative source of supply, maintaining mains water to around 20,000 homes throughout the incident. However, by Monday 23 July, approximately 70,000 properties in the Tewkesbury and Gloucester areas had been affected and were without mains water. By Tuesday 24 July, the number of properties affected had increased to around 140,000 and included the Cheltenham area.

11.109 With support from a range of organisations, Severn Trent Water was able to provide emergency water supplies to those affected during the emergency. The restoration of mains water supply to customers was implemented in phases from 28 July, with supply to all 140,000 properties restored by 2 August and finally declared fit to drink on 7 August.

11.110 In considering this issue, the Review has had regard to the findings of other reviews and investigations, which have been conducted by a number of organisations following the loss of the Mythe water treatment works. These include:

- Severn Trent Water,[9] the privately owned water utility company that owns and operates the facility at Mythe;
- Water UK,[10] the industry association that represents UK water supply companies;
- the Consumer Council for Water[11] (CC Water), the industry watchdog, set up to represent customers of water and sewerage companies in England and Wales;
- The Drinking Water Inspectorate[12] (DWI), which regulates public water supplies in England and Wales and is responsible for assessing the quality of drinking water, taking enforcement action if standards are not being met, and appropriate action when water is unfit for human consumption;
- Ofwat,[13] the economic regulator of the water and sewerage sector; and
- local authority inquiry reports, for example that of Gloucestershire County Council.

The emergency response following the loss of Mythe water treatment works

11.111 From submissions to the Review it is clear that the loss of Mythe represented a very significant challenge to Severn Trent Water's capacity to cope with demand. Indeed, the scale of the supply and distribution challenge was far greater than had been planned for in the company's contingency plans. In their report following the incident, Severn Trent Water acknowledged:

> *"We have never experienced an incident of this magnitude. Our crisis management procedures were not designed to manage a civil contingency of this scale. It is fair to say that we found it extremely challenging to scale up our response to the extent required within the first 48 hours."*

11.112 The Review recognises that, after these initial challenges had been addressed, Severn Trent Water was able to deliver an alternative supply of drinking water (via bowsers, tankers and bottled water) to those affected. However, this was only possible with significant logistical and operational support from a range of organisations, including other water companies, the Armed Forces, the emergency services, the private sector, local authorities and the voluntary sector. Support provided was wide-ranging and included logistical operations and supply chain expertise, the use of personnel, vehicles, equipment, distribution centres and the provision of emergency supplies.

11.113 To ensure that affected customers were provided with an alternative water supply, Severn Trent Water, in addition to mobilising their own supply of bowsers, contacted other water companies and invoked established mutual aid arrangements to procure additional bowsers. These arrangements provide for the resources held by the water industry as a whole to be made available at any time to a specific water company in an emergency. The scheme was fully activated following the loss of Mythe water treatment works and involved both bowsers and tankers being supplied by other water companies as well as by a range of private sector organisations.

11.114 Using the expertise of an Armed Forces logistics team based within Gold Command in Gloucestershire, the deployment of bowsers was arranged to a number of pre-determined locations. Initially, this involved 100 bowsers being deployed in the first 24 hours, and 300 within 36 hours; it rose to over 900 on Wednesday 25 July. At the peak of the incident, in excess of 1,400 bowsers were deployed to over 1,100 locations. Armed Forces logistics expertise proved invaluable in advising on the siting and replenishing of bowsers, which was carried out up to three times a day by a series of tankers, including some tankers provided by the Armed Forces.

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[9] *The Impact of the July Floods on the Water Infrastructure and Customer Service.* Severn Trent Water, 2007, www.stwater.co.uk/redirect.php?dir=upload/&doc=The_Final_Gloucester_2007_Report.pdf&docType=pdf

[10] *Lessons Learned from Summer Floods 2007, Phase 1 report – Emergency Response, Water UK's Review Group on Flooding,* February 2008. www.floodforum.org.uk/waterukreviewgrouponfloodingphase1.pdf

[11] CC Water, Response to Loss of Water Supply, September 2007. www.ccwater.org.uk/upload/doc/Final.doc

[12] DWI Incident Assessment Letter to Severn Trent Water (14 March 2008). www.dwi.gov.uk/pressrel/2008/pr0108.shtm

[13] OFWAT, Water and sewerage services during the summer 2007 floods (December 2007). www.ofwat.gov.uk/aptrix/ofwat/publish.nsf/AttachmentsByTitle/flood07_review131207.pdf/$FILE/flood07_review131207.pdf

11.115 An extensive logistics operation for the sourcing and distribution of bottled water was also established. On the morning of Sunday 22 July (the day that mains water was lost), arrangements were put in place to deliver one million litres of bottled water each day to a logistics centre at Cheltenham racecourse, which had been set up by the Armed Forces logistics team operating within Gold Command. By Monday 23 July, 900,000 litres had been delivered to the racecourse, as well as direct to a number of distribution points established across the region. In response to high demand, additional supplies were sourced, peaking at six million litres on 27 July. Additional logistics centres were also established to service the high demand for bottled water.

11.116 In addition to the efforts of the Armed Forces following the loss of Mythe water treatment works, which is covered in more detail in Chapter 12, significant contributions to the emergency response effort were made by the private and voluntary sectors. Tesco, for example, worked very closely with Severn Trent Water and other responders to supply an average of 2.5 million litres of water per day across the region during the emergency. The company used its distribution centres and supply chain networks (both road and rail modes) to support the sourcing and distribution of bottled water during the emergency. In line with some other retailers, Tesco also distributed tens of thousands of litres of bottled water to local people direct from its stores.

11.117 The voluntary sector also played a key role in the response effort. For example, the British Red Cross supported the response through the procurement and distribution of water, food and hygiene packs to households in and around Gloucestershire. In total, the organisation assisted over 8,000 people, delivered over 335,000 litres of bottled water as well as thousands of food parcels, hygiene kits and dry toilet packs.

11.118 The reaction to the loss of Mythe highlighted the crucial role that private and voluntary sector organisations can play in providing the logistical expertise and capacity needed to support the response to emergency situations. The Review believes that this role should be adequately reflected in Cabinet Office guidance for local and regional responders, which is being prepared for issue in the second half of 2008, on options for acquiring emergency supplies, as discussed earlier in this chapter.

11.119 The Review pays tribute to the dedication, commitment and professionalism of all the people and organisations involved in the response following the loss of the facility at Mythe. It is, however, inevitable that in an event of this nature and magnitude, there will be lessons to be learned for building better contingency plans. The Review considers that there are valuable lessons to be learned in the areas of the deployment and security of bowsers; the provision of water to vulnerable people; the provision of information and advice (including health advice) to the public; and the amount of drinking-quality water that should be provided. These are covered in more detail in the rest of this chapter.

The deployment of bowsers

11.120 Severn Trent Water, like other water companies, already stored a supply of bowsers for use in emergencies throughout their region. However, bowsers tended not to be stored in a ready-to-use state and required cleaning, disinfecting and filling before they could be deployed. Water UK stated that *"it could take 24–48 hours to fully clean, drain and sample bowsers before use."* This resulted in an unnecessary delay in deploying bowsers to the areas where they were needed.

11.121 The DWI, in their Incident Assessment Letter to Severn Trent Water, suggested that the company *"worked with the rest of the water industry to ensure that it can achieve best practice relating to stocking of bowsers in a ready-to-use state."*

11.122 Water UK's report also reflected this view and recommended that *"water companies…should ensure that this equipment is kept in a roadworthy and clean condition at all times to ensure that response times to emergency events are kept to a minimum."*

11.123 The Review is aware that within the water industry, there are a number of

alternative approaches to facilitating the stocking of pre-cleaned bowsers, so that they can be rapidly deployed in an emergency. The Review urges the water industry to progress this matter without delay.

Mutual aid

11.124 Water UK's report highlighted a number of other areas where the industry's mutual aid scheme could be improved. In particular:

- **The compatibility of bowsers and other equipment** – as tankers and bowsers were brought in from across the UK, there were problems of incompatibility among the range of different makes, components and ages of the equipment supplied, particularly of bowsers. In particular, there is no standard specification for bowser and tanker couplings such as fittings, level indicators and security mechanisms. This resulted in problems with deploying and filling bowsers.
- **The provision of appropriately-sized tankers** – there was a shortage of appropriate tankers, particularly mid-sized tankers, available to the industry. Mid-sized tankers are particularly useful for filling smaller static bowsers in urban areas and for entering sites that can only be accessed by narrow or restricted roads. Bowser locations are planned by water companies based on distance from consumers. Water companies need to review their intended location for bowsers and ensure that suitable tankers are available to allow replenishment. Operational planning needs to ensure that only appropriately sized tankers are deployed to certain locations.
- **The provision of personnel** – the mutual aid scheme needs extending to include a protocol for enabling and managing the provision of personnel from supporting water companies, as well as equipment. This should cover operational staff and supervisors, call centre staff, communications and media staff, as well as technicians and tanker drivers. It should clarify chains of command, communication links, and to whom such staff report.

11.125 Water UK's report also recommended, in relation to the industry's mutual aid scheme, that:

> *"…a review of the state of preparedness of the industry for future events, in particular the industry's mutual aid scheme, should be undertaken…to ensure the technical compatibility of assets, the number and readiness of such assets, the means of deploying and managing staff and the resilience of the scheme to cater for such events",*
>
> *"…the standardisation of emergency supply equipment to ensure…equipment from other companies or organisations is compatible" and*
>
> *"water companies should rehearse emergency plans on a regular basis…"*

11.126 The Review notes that Ofwat's report also recommended that the industry's mutual aid scheme should be reviewed, with input from all stakeholders. **The Review welcomes these recommendations and urges the industry to progress these aspects urgently, incorporating them into contingency plans as appropriate.**

The location and filling of bowsers

11.127 The Review notes that Severn Trent Water acknowledged problems in refilling bowsers at the rate demanded by consumers during the initial 48 hours. While Severn Trent Water improved the supply of water throughout the first seven days – as highlighted in Ofwat's report – the research conducted by CC Water showed that, while the majority of customers felt that Severn Trent Water had done its best in the circumstances, 10 per cent thought that more bowsers should have been provided and the management of the location and filling of bowsers was not as effective as the provision of bottled water.

11.128 The Review welcomes therefore Severn Trent Water's commitment to explore the grouping and location of bowsers to improve the rate of refill. The Review also agrees with the company's view that there needs to be a balance between the distribution of locations and efficiency of refilling. While fewer bowser locations would

clearly enhance the logistics of refilling, as well as the supervision and security of supplies, it may also mean that people have to travel further to access supplies, potentially disadvantaging vulnerable people and those without private transport. The Review considers that the industry should have regard to this in its emergency plans.

Provision of water to vulnerable people

11.129 Issues regarding vulnerable people are discussed in more detail in Chapter 12. However, with regard to the emergency following the loss of Mythe water treatment works, the Review notes the findings in CC Water's report that *"vulnerable people appear to have generally been provided for, with organisations such as the British Red Cross, as well as other volunteer groups, helping to distribute bottled water and deliver water from bowsers to people's homes."*

11.130 CC Water's research also showed that there was evidence that people in affected areas had pulled together as a community to look out for neighbours who may have been 'vulnerable'. The research also highlighted that, under these exceptional circumstances, the word 'vulnerable' applied to a wide group of individuals, including babies who could not drink the standard bottled water, those who had no access to transport or were not strong enough to carry water, as well as the elderly, frail or chronically sick. It is vital that all of these groups are understood and catered for.

11.131 However, while water companies do currently maintain registers of vulnerable customers within their supply area that are intended to allow for the prioritisation of water provision in the event of an emergency, Water UK's report highlighted that questions had been raised as to the extent and suitability of these arrangements and recommended that *"water companies should ensure that they maintain a full and up-to-date register of… contact lists for organisations responsible for vulnerable consumers, and of any special communication requirements that they may have…"*

11.132 The Review welcomes this recommendation and urges water companies, in taking this forward, to have regard to guidance published by the Cabinet Office in March 2008 – '*Identifying People Who Are Vulnerable in a Crisis*', which is intended to help the development of local action plans for identifying groups of people who may be vulnerable in an emergency. Chapter 12 returns to this issue.

Security of bowsers

11.133 The Review received various submissions about the theft of bowsers and damage to them. Within 48 hours of bowsers being deployed, reports of damage were being received by Severn Trent Water's 'Bowser hotline'. An audit of bowsers, conducted by Severn Trent Water on 26 July 2007 to provide a snapshot of the situation, revealed that of 282 bowsers deployed, 38 were missing, 11 had been damaged and 125 were empty. The theft of bowsers is supported by evidence obtained by the DWI, which highlighted that bowsers clearly sourced from the water industry (and therefore believed to be stolen) were being advertised by members of the public for sale on eBay, the auction website, during the incident.

11.134 While the frequency of vandalism to bowsers was relatively minor in the circumstances, the Review notes that instances of bowser damage included damage to security seals (indicating possible contamination of the contents), broken taps, lids being removed and bowsers being left with the tap running. As Severn Trent Water's report highlighted, with over 1,400 bowsers deployed during the incident, it was not possible to provide permanent supervision to guard against theft or vandalism, and at the same time adequately police the distribution process to ensure that customers did not take excessive amounts.

11.135 Such anti-social behaviour is clearly unacceptable. **The Review therefore welcomes the proposal by Severn Trent Water that the water industry should examine the potential for using remote monitoring devices to track the location and**

water content of individual bowsers and tankers. Similarly, the Review also concurs with the DWI's suggestion that:

> *"Severn Trent Water works with the water industry and other agencies responsible for security and civil order to ensure that in any future similar incident, the risk of anti-social behaviour is promptly accepted and acted upon collectively by all relevant agencies to establish deterrent strategies within the affected communities from the outset."*

Severn Trent Water's provision of information and advice

11.136 Given the scale of the events, Severn Trent Water relied heavily on local radio and television broadcasts to convey information to the public. While information was also published on the company website, the website failed on 22 July 2007 due to the volume of people trying to access it. Although the service was returned later that day, the website continued to suffer from slow response times and limited capacity throughout the duration of the event. Severn Trent Water developed a simplified webpage on 23 July, which included details of bowser locations, maps of areas affected, copies of news releases and advice on coping without piped water. This information was also published on the BBC Radio Gloucestershire website. Despite this, CC Water's research highlighted the general dissatisfaction of the public about the quality and accessibility of information on Severn Trent Water's website. **The Review therefore welcomes the company's commitment to review the capacity and robustness of its website in light of the 2007 floods.**

11.137 In addition to information available via its website, Severn Trent Water established a customer information hotline, along with an additional customer contact centre, to deal with the high volume of telephone calls being received from the public about the incident. These additional services augmented the company's dedicated Customer Operations Service Centre. Severn Trent Water said that these centres received almost 50,000 calls from the Gloucestershire public between 20 July and 8 August 2007.

11.138 CC Water's report also highlighted the communication difficulties experienced by Severn Trent Water during the emergency. Difficulties included information about the location of bowsers, which the public generally thought was poor, and the fact that customers often found it difficult to get through by telephone to Severn Trent Water. Even when customers did get through, responses from the company's call centre staff were said to lack confidence and did not provide the necessary reassurance. There was also criticism of Severn Trent Water's low profile in media communications. In its report, Severn Trent Water acknowledged these difficulties.

11.139 Furthermore, a number of submissions to the Review commented on the lack of information displayed on bowsers about an individual's water entitlement. It was suggested that it was not widely known that people were expected to manage on 10 litres per person per day and as a result, many people took more than their entitlement in order to meet their total household requirement. This lack of awareness may have been a contributory factor in bowsers running dry more quickly than anticipated and added to the logistical problem in re-filling them. It was also suggested to the Review that, if local residents had been aware of the 10-litre per day limit, the majority of people in the community would have respected it. **It is clear that, in any future emergency, bowsers need to display clear information about an individual's entitlement. The Review would welcome the water industry considering this further and augmenting its emergency plans accordingly**.

The provision of public health information

Notices on bowsers

11.140 The Review notes the DWI's comments in their Incident Assessment Letter to Severn Trent Water that it is standard practice within the water industry for all bowsers to bear permanent fixed notices with appropriate clear advice to consumers to boil water drawn from bowsers before use. This standard precaution is aimed at informing consumers of the need to safeguard against contamination introduced inadvertently by them when drawing off

water into household containers and during subsequent storage and use in the home or workplace.

11.141 The Review received a number of comments that notices on bowsers in relation to the need to boil water before use were either missing or unclear. In its investigation, the DWI found that the need for notices was not understood by the other agencies involved in Gold Command. For example, the DWI obtained photographs showing how paper copies of Gloucestershire Primary Care Trust's (PCT) health advice leaflet had been attached to bowsers alongside, or obscuring, the permanent water industry notice. The DWI considered that this action was not conducive to maintaining public confidence in the alternative water supply.

Public information and the restoration of mains water

11.142 The mains water supply was not fully restored until 2 August. However, the DWI's investigation determined that the mains water supply could have been restored up to one to two days earlier if it had not been for the insistence of the Gloucestershire PCT that their health and safety leaflet be delivered to affected consumers before the water company operated valves to begin the process of reinstating mains water to affected households. This situation arose due to confusion around roles and responsibilities at the Scientific and Technical Advice Cell (STAC) set up to advise Gold Command in Gloucester. This and other issues around STACs are considered further in Chapter 13.

11.143 The DWI concluded that the action of the PCT acting through Gold Command was *"an interference with the statutory duty of a water company to provide a piped supply of water (along with any appropriate advice to consumers)."* The DWI's Chief Inspector, Professor Jeni Colbourne, commented:

> *"My inspectors were generally satisfied with the actions taken by Severn Trent Water to reinstate the Mythe Water Treatment Works but the piped water supply could have been reinstated more quickly…the delay of up to 48 hours was due to a decision to issue a health and safety notice prepared by the Gloucestershire PCT prior to the operation of valves to restore the water supply."*

11.144 Severn Trent Water undertook a rigorous testing programme of its piped water, approved by the DWI throughout the incident, and issued advice to consumers accordingly. The advice moved from 'Do Not Drink', when mains supply was first restored, to 'Boil Water' precautionary advice on 3 August, and subsequently to 'Safe To Drink' advice on 7 August. The DWI's investigation determined that there was no sound basis for the issuing of a 'Do Not Drink' notice in association with the restoration of the piped water supply and concluded that consumers would have benefited more from receiving the standard 'routine' notice provided by water companies whenever planned work occurs on the mains network. Such notices warn consumers to expect cloudy water (due to air) or discolouration (due to mains deposits) and advise that taps are flushed before use until the water runs clear.

11.145 The Review agrees with the DWI's suggestion that Severn Trent Water works with the rest of the water industry to ensure that all local health professionals have a full understanding of the standard hygiene precautions and practices of the water industry.

11.146 The Review is aware that national discussions between the DWI and the Health Protection Agency have led to an agreement to issue joint guidance on the subject of consumer warning notices in the autumn. The DWI has informed the Review that, following publication of the guidance, there will be a programme of training activities with water companies, health authorities and local authorities to raise awareness of the guidance among responders.

Minimum water provision

11.147 Under the Security and Emergency Measures Direction 1998, water companies are currently required to provide a minimum of 10 litres of drinking-quality water per person per day by alternative means when mains supplies fail.[14] Depending on the size of the water company concerned and the total population it supplies, the guidance sets in place minimum requirements for contingency planning purposes to ensure that in smaller incidents, 8,000 to 50,000 people receive this 10-litre provision for durations of up to three days. For major incidents, the requirement rises to 200,000 people for a week.

11.148 In contrast, the World Health Organization[15] recommends that a minimum of 15 to 20 litres per person per day be made available as soon as possible, and this figure rises greatly once sanitation is factored in; the generally quoted target is 50 litres. Even this figure does not take account of the increased needs of vulnerable people such as the elderly and those with small children.

11.149 The Review has received a number of submissions that the 10-litre limit was insufficient to meet the needs of the public following the loss of Mythe water treatment works. Severn Trent Water, for example, estimated that, while they delivered up to three times more than the minimum requirement at the peak of the emergency, this volume did not meet their customers' expectations, especially given that their normal daily usage amounts to an average of 138 litres. Given this, the Review agrees with Ofwat's suggestion in its report that *"it is not surprising that people found it difficult to adapt to the emergency supply volume."*

11.150 Water UK also concluded in their report that the 10-litre minimum amount was insufficient and stated that *"this amount does not in practice meet consumers' expectations."* The report recommended that:

> *"…water companies should review with drinking water regulators and public health organisations the likely scale of consumers' requirements for water during emergency events and how this requirement may change throughout an event. We recommend that plans for the provision of emergency drinking water supplies should take as their starting point that each person should be supplied with a minimum of 20 litres per day (i.e. twice the current assumption)."*

11.151 On the question of minimum water provision, OFWAT stated that:

> *"…whilst it might be desirable to increase the minimum quantity supplied, the logistics of increasing this especially during the initial response to an incident make this a difficult task. Severn Trent Water was able to exceed the 10 litres per person per day allocation once the operation was up to full speed, but only because of the unprecedented level of support it received…"* and further:
>
> *"Any review must consider carefully the definitions of short- and long-term loss of supply and in the initial response to an emergency at least, the focus should be on supplying water fairly and equally to all consumers whilst ensuring the most vulnerable have sufficient supply. This may mean that less than 10 litres is delivered in the first day, but the priority must be for everyone to have some, so that people gain confidence that the supply will be maintained and improved."*

11.152 The Review acknowledges that while the majority of submissions to the Review – from both organisations and the public – have suggested that the 10-litre limit was insufficient to meet people's needs during the loss of the Mythe facility, these views are not based on the outcome of any specific research on the issue. However, the Review believes that while

[14] www.ukresilience.gov.uk/~/media/assets/www.ukresilience.info/water_guidance%20pdf.ashx

[15] Technical Notes for Emergencies – Minimum water quantity needed for domestic use in emergencies, Technical Note No.9, WHO 07/01/05 – www.who.or.id/eng/contents/aceh/wsh/water-quantity.pdf

10 litres of water may have been acceptable in meeting the immediate and essential needs in the initial stages of the emergency, it was clearly felt by those responding to the Review to be insufficient to meet the needs of the public the longer the emergency went on.

11.153 The Review is aware that Defra, in conjunction with the water industry, is undertaking a review of the 10-litre requirement. In its response to the Review's interim report, the Government stated that:

> *"Defra has set up a working group to review the requirement for the minimum amount of water. The group will research and review other relevant guidance that indicates quantities of alternative drinking water, together with any sub-allocations. The review will also consider the logistics of distribution of alternative supplies and the adequacy and efficacy of the measures in place for vulnerable people."*

11.154 The Review understands that this work, which is being taken forward in conjunction with the DWI, the Health Protection Agency, CC Water, Water UK, water companies and devolved administrations, and will also look at practice in other European countries, expects to publish its findings later this summer.

11.155 The Review welcomes this work and considers that changes to the 10-litre requirement should consider the extent to which the amount of water required may change over the duration of an emergency, having particular regard to the needs of cultural and vulnerable groups (for example the chronically sick, those with young children and faith groups) whose water requirements are likely to be greater than others. In addition, this work should seek the DWI's views on the extent to which the provision of personal water purification devices could play a part in future emergencies in providing a potential alternative to bottled water, or as a supplement to providing water in bowsers (which could subsequently be purified without the need for boiling).

RECOMMENDATION 40: Defra should amend emergency regulations to increase the minimum amount of water to be provided in an emergency, in order to reflect reasonable needs during a longer-term loss of mains supply.

Water requirements of farms and farm animals

11.156 It is not just the needs of people that are important. The water requirements of farms and farm animals also need to be actively considered and in the case of dairy cattle these represent significant volumes, with a requirement of between 70 to 90 litres of water per head per day. The National Farmers' Union (NFU) told the Review that farmers affected by the loss of mains water felt their needs were not adequately provided for, often being left to source their own water supplies for animals removed from pastures and housed in barns to escape the floods. The NFU suggested that this may have been because water companies and emergency responders were unaware of the location of farms or the potential impact of flooding on farm animals, particularly livestock.

11.157 The Review has been informed by Defra that formal guidance to emergency planners in water companies was issued in October 2004 under the Security and Emergency Measures Direction 1998. The purpose of the guidance was to make clear to each water undertaker that, in an emergency, they should also give due regard to the needs of livestock and essential food industries.

11.158 The experience of farmers during the floods of summer 2007, as described by the NFU, was echoed by members of the farming community at some of the Review team's regional visits and meetings. As a result, the Review is concerned about the extent to which the water industry is aware of, and has regard to, the guidance issued by Defra, in planning for emergencies. **The Review would welcome water companies familiarising themselves with this guidance and ensuring that it is reflected in their emergency plans, so that the water requirements of farm animals in an emergency are adequately catered for.**

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The local response

This chapter examines issues relating to the emergency response at the local level and the role of the organisations involved. It contains sections on:

- planning, readiness and alerting;
- Gold Commands;
- humanitarian assistance and voluntary sector organisations;
- people stranded on road and rail networks; and
- the role of the Armed Forces.

Planning, readiness and alerting

Introduction

12.1 The scale of the 2007 floods stretched emergency response resources to the limit and beyond, and responders in some areas were not as ready as they might have been. In part, this can be explained by the unprecedented nature of the events, especially when set against a historic pattern of more localised, low-impact flooding. The absence of a warning system for surface water flooding contributed. The frequency and volume of severe weather warnings received by responders (including a number of false alarms) will also have played a part. But it is also clear that, in some areas, there were no agreed protocols between responders, setting out responsibilities for assessing the potential impact of a specific severe weather event and triggering an appropriate multi-agency response. This gap, crucial to the initiation of an effective emergency response, needs to be filled.

Membership of Local Resilience Forums

12.2 Under the Civil Contingencies Act 2004 (CCA), Category 1 and 2 responders come together in Local Resilience Forums (LRFs), usually based on a police force area, to share information, carry out risk assessments and for emergency planning. The concern has been voiced to the Review that because LRF members "also have day jobs", demands on their time can leave them stretched and sometimes this leads to a lack of continuity of membership at the LRFs. Indeed some LRFs may have only one 'permanent' member. This may lead to planning at the LRF being tactical rather than strategic as intended.

12.3 There may also be a reduction in the effectiveness of the LRF in cases where an organisation spans a wide geographical area, leading to the same member sitting on a number of LRFs. In the most extreme scenario, this could mean a small number of people in a national organisation (such as a power company or transport operator) representing their organisation at all 43 LRFs in England

(or 47 if Wales is included). This is a tall order considering that LRFs generally meet every three months, excluding meetings of specialist subgroups. Pressure would be eased if Category 2 organisations employed more staff able to attend LRFs, or if staff could in some instances attend Regional Resilience Forums instead of LRFs. Chapter 18 explores this in more detail.

12.4 It is clear from the events of summer 2007 that a crucial element to the success of the local response is that attendees at Gold and Silver Commands 'know each other in a crisis', having worked together ahead of the emergency. The Review urges all responder organisations to ensure that emphasis is placed on developing and maintaining effective working relationships through the LRF network to ensure that in an emergency, as far as possible, Gold and Silver Commands can operate as an established, cohesive unit.

12.5 Submissions to the Review also point out that LRFs are based on police force areas and may not be coterminous with the operational areas of other responders. This can lead to some areas being left unrepresented.

12.6 A number of submissions to the Review drew attention to inconsistencies in the level of engagement of Category 2 responders, particularly utilities companies, in the work of LRFs. This contributed to a lack of preparedness in some aspects of the response and irregular levels of engagement of Category 2 responders in Gold Commands. Moreover, some Category 2 responders who attended Gold Command meetings were clearly unfamiliar with emergency response procedures and were unable to engage effectively.

12.7 The Review takes these concerns seriously. Category 1 and 2 responder agencies need to ensure that they are suitably represented on all LRFs. For Category 1 responders this is a duty under the CCA. We strongly urge Category 2 responder organisations to ensure they are appropriately represented at both the emergency planning and response stages, including exercises. Chapter 18 returns to these issues.

12.8 LRFs should monitor their membership and where representation is patchy, appropriate actions should be taken as laid down in the CCA. The Review would welcome the current review of the Act considering these concerns closely.

Triggering a multi-agency response

12.9 The Met Office is the primary source for severe weather warnings that may trigger a multi-agency response. Met Office advisers are the natural starting point for improving arrangements for assessing the potential impact of a specific severe weather event. The Review believes that LRFs should designate the police and local authorities as the primary points of contact for Met Office advisers before and during an emergency, in order to ensure effective use of this resource at a critical time.

12.10 In some areas, there was a degree of confusion between responders about whose responsibility it was to consult with partners and to advise whether multi-agency response arrangements should be triggered in light of severe weather and flood warnings. While most LRFs have generic plans in place to respond to emergencies, and some key responders in flood-prone areas have specific flood plans in place, few set out collectively agreed arrangements for assessing the impact of an emergency such as flooding, where the effects can be felt over a wide area and take many forms.

12.11 Upper tier[1] local authorities are well placed to assess the potential impact of floods across their area, liaising with neighbouring local authorities, as appropriate, to gather input on the basis of local visual assessments and previous experience. In light of this, the interim report suggested that upper tier local authorities were best placed to be given 'lead responder' status for planning, with a duty to advise partners on whether multi-agency response arrangements should be triggered, perhaps initially on a precautionary basis.

[1] 'Upper tier' local authority: county councils, London boroughs, metropolitan boroughs and unitary authorities.

12.12 The majority of submissions to the Review on this subject agreed that upper tier local authorities were best placed to **lead the planning** for flooding emergencies. Many responders, including approximately half of all local authorities responding to the Review, also agreed that upper tier local authorities should **lead the triggering** of multi-agency response arrangements in response to severe weather and the likelihood of flooding based on local impact assessments. However, the remaining local authorities which responded to the Review disagreed that upper tier local authorities should also be **solely** responsible for triggering multi-agency response arrangements. A comment from one responder, indicative of many the Review received, said:

> *"Any one of the agencies can and should trigger emergencies. If this responsibility was placed only on local authorities, people may be looking and waiting to them to trigger multi-agency arrangements whereas at the time it could be affecting another agency more."*

12.13 It was stated further that while local authorities receive severe weather and flood warnings directly, they do not have a large workforce on the ground on a 24/7 basis. As a result, their capability for local visual assessments would be reduced outside office hours, while police forces and fire and rescue services do have a 24/7 presence across an area and either could potentially trigger the multi-agency response.

12.14 Some submissions to the Review also stated that the organisation responsible for triggering the arrangements should be left to local determination on the day, although in practice this would most likely fall to the police, who would do so in close consultation with multi-agency partners, including local authorities.

12.15 However, the Review is concerned that these views propose no more than what is effectively the current default position for triggering the multi-agency response, which was shown during the summer 2007 floods not always to work effectively. Furthermore, the Review believes that views stating that local authorities are not 24/7 organisations and should not therefore lead multi-agency triggering arrangements may be misjudged, or are at least based on a misunderstanding of the reasoning for the interim conclusion.

12.16 As Category 1 responders under the CCA, upper tier local authorities must be able to respond to emergencies whenever they occur – and this is observed to be the case in practice. The Review appreciates that local authorities will have reduced staffing outside office hours, including fewer staff 'on the ground' who are able to give local visual assessments of the impacts of severe weather. However, upper tier local authorities will always have staff available, 'on call' in some cases, to liaise with other emergency responders in case of an emergency. Indeed, submissions received by the Review against upper tier local authorities leading the triggering arrangements acknowledge this as they agree that the locally-determined triggering arrangements should be set in train *"in close consultation with multi-agency partners, including local authorities"*.

12.17 The Review also understands that the police and the fire and rescue services are likely to have personnel out working in neighbourhoods observing the impacts of severe weather, including flooding, and 'calling in' this information to their control rooms. These local observations and information on severe weather are then assessed in dialogue with other emergency responders, including the upper tier local authority. Current arrangements then allow for any responder agency to trigger multi-agency response arrangements and this is where confusion and inconsistencies were observed to arise during summer 2007, since no one agency had the clearly defined lead responsibility.

12.18 Based on the evidence, the Review reiterates that upper tier local authorities are well placed to assess the potential impact of floods across their area, based on previous experience and the local visual assessments of their own staff and/or those of other emergency responders where necessary. Upper tier local authorities are similarly well placed to take the lead for triggering multi-agency arrangements.

RECOMMENDATION 41: Upper tier local authorities should be the lead responders in relation to multi-agency planning for severe weather emergencies at the local level and for triggering multi-agency arrangements in response to severe weather warnings and local impact assessments.

Communication between multi-agency partners

12.19 Some responders told the Review that there was a degree of uncertainty across responder agencies when they heard that other agencies, such as the police and ambulance service, had declared a 'major incident'. Responders wondered why their own organisation had not also declared a major incident and this led to confusion.

12.20 Each area has a similar definition of a 'major incident', which generally describes an emergency that requires the implementation of special arrangements by one or all of the emergency services, the National Health Service (NHS) or the local authority. In London, for example, guidance from the London Emergency Services Liaison Panel[2] defines a major incident as:

> *"…any emergency that requires the implementation of special arrangements by one or more of the emergency services and will generally include the involvement, either directly or indirectly, of large numbers of people. For example:*
>
> - *the rescue and transportation of a large number of casualties;*
> - *the large-scale combined resources of the police, London Fire Brigade and London Ambulance Service;*
> - *the mobilisation and organisation of the emergency services and support services; for example, local authority, to cater for the threat of death, serious injury or homelessness to a large number of people; and*
> - *the handling of a large number of enquiries likely to be generated both from the public and the news media usually made to the police."*

12.21 A major incident can be declared by any member of the emergency services who considers that any of the criteria outlined above has been satisfied. In certain circumstances, such as flooding, the local authority may declare a major incident.

12.22 While realising that some types of emergency will apply to one responder more than others, in the case of widespread flooding all responders are likely to be involved to a large degree. The Review believes that communication procedures between responder agencies ahead of formal multi-agency arrangements being in place (Gold Commands) should be clarified so that if a 'major incident' is declared in one, the other agencies are notified as soon as possible and understand the basis for the 'major incident' status. In accordance with the triggering arrangements described above, in flooding emergencies the communication of major incident status between agencies should be carried out in close consultation with the local authority.

12.23 The Review is aware that the Association of Chief Police Officers (ACPO) is in the process of updating its guidance to police forces on emergency procedures, which will also be of interest to other agencies involved in emergency response. This revised guidance is due for issue by the end of 2008.

Leading the multi-agency response

12.24 The vast majority of relevant submissions to the Review agreed with the interim conclusion that, unless otherwise agreed locally, where a Gold Command is established, the police should convene and lead the multi-agency response. ACPO were keen to stress that 'lead' in this respect should

[2] www.leslp.gov.uk/docs/Major_incident_procedure_manual_7th_ed.pdf

not imply primacy; however, they were content with the interim conclusion, which we now restate as a recommendation.

RECOMMENDATION 42: Where a Gold Command is established for severe weather events, the police, unless agreed otherwise locally, should convene and lead the multi-agency response.

Gold Commands

Introduction

12.25 Gold Commands activated in the summer were effective in coordinating the local response, often with reassuring and high-level visible leadership.

Early activation of Gold Command

12.26 In some areas, responder organisations had difficulty in engaging effectively with the local response effort, possibly because Silver Commands were activated instead of Gold. This also hindered the involvement of the media, which meant that essential public information messages did not necessarily get through, with less helpful news items being broadcast instead. Although these areas coped, the strategic perspective brought by Gold Command would have allowed more effective engagement by the full range of potential responders and hence the easier procurement of external resources, including involvement of the Armed Forces where this was appropriate.

12.27 Evidence submitted to the Review shows that there is a clear benefit in Gold Commands being activated at an early stage on a precautionary basis when assessments indicate that significant disruption from flooding is likely. This assessment should be based on the likely impact locally, as well as rainfall and weather data from the Met Office and flood data from the Environment Agency. Precautionary Gold Commands need not physically convene at the outset: conference telephone calls or other appropriate means of multi-agency communication, could be used to share and assess information on the extent of the emergency.

12.28 Since early precautionary Golds were first proposed in the interim report, the UK has experienced the East Coast surge event of November 2007 and instances of 'usual' winter flooding in south-west England. In these cases, early, precautionary Gold Commands were established and were found to work well. While responders warned against being overly cautious and calling Gold Commands "every time it rained", they agreed that, with experience, the optimum point to convene Gold would become established locally over time.

RECOMMENDATION 43: Gold Commands should be established at an early stage on a precautionary basis where there is a risk of serious flooding.

Emergency response facilities

12.29 The Review has received positive feedback from responder organisations on the emergency facilities at Gloucestershire Constabulary's purpose-built headquarters in Gloucester, which can accommodate a Gold Command at short notice in the event of a major incident. The Gold Command suite's IT and communications systems, including immediate Gold e-mail addresses for all responders, were said to work well. The Gold suite was also complemented by an adjacent flexible open-plan space to accommodate agencies and Gold support services.

12.30 The Review believes that the response to major incidents would be more effective if a similar level of facilities were the norm. Incorporating IT to support flood visualisation tools, as they become available to multi-agency responders, would enhance facilities yet further and these tools are discussed in Chapter 10.

12.31 In reviewing facilities, responders should ensure that control rooms support multi-agency use, and should bear in mind the way different responders work and the different equipment required. In addition, all organisations that will be part of the multi-agency response to emergencies should ensure that their representatives are familiar with the emergency response facilities ahead of an emergency. A similar approach in Silver Command facilities would also pay dividends.

RECOMMENDATION 44: Category 1 and 2 responders should assess the effectiveness of their emergency response facilities, including flexible accommodation, IT and communications systems, and undertake any necessary improvement works.

Humanitarian assistance and voluntary sector organisations

Introduction

12.32 The Review pays tribute to the many humanitarian organisations whose contributions were, and indeed still are, invaluable following the floods. The emergency response to the floods of summer 2007 would not have been as successful without the committed contribution of the voluntary sector in a variety of roles. Similarly, continuing recovery operations continue to rely heavily on their contribution. This section of the report gives illustrative examples of the tasks undertaken by the voluntary sector, cites problems encountered and suggests possible future activities. More detail on the specific roles played by voluntary sector organisations during the response to and recovery (including fundraising) from the floods of summer 2007, is provided in Chapters 11 and 28.

Activities of voluntary organisations during and after the floods

12.33 The Review is aware that a wide range of voluntary organisations was involved in the response and recovery activities following the floods, including the British Red Cross, the WRVS, Salvation Army, Women's Institute, Help the Aged, Rotary International in Great Britain and Ireland, Fair Shares and Timebank. Indeed, the number of voluntary organisations involved in the response to and recovery from the floods of summer 2007 was so great that they are too numerous to mention individually here. However, the Review pays tribute to all these organisations and their dedicated personnel, whose contributions, whether large or small scale, were important to the effectiveness of the overall response and recovery effort.

12.34 The assistance provided by voluntary organisations was hugely varied. The list below outlines some examples of the activities the voluntary sector carried out and serves to highlight to the wider emergency response community how they might utilise the skills available through this sector. Activities included:

- procuring and distributing water, food, beds and hygiene packs;[3]
- coordinating and assessing needs via telephone support lines;
- transferring non-urgent casualties in four-wheel drive vehicles;
- assisting evacuation;
- identifying vulnerable people and referring them to social services;
- staffing rest centres, including providing practical and emotional support;
- warehousing, transportation and distribution of donated goods;
- fundraising;
- recovery support, including providing cleaning materials for homes; and
- assessing and tasking spontaneous volunteers.

Engagement of voluntary organisations in emergency response

12.35 Engagement of the humanitarian organisations with Category 1 and 2 responders was generally good during the floods of summer 2007. There were, however, examples where emergency responders lacked understanding of the roles that voluntary sector organisations could play in the response, the supporting legislation and how to engage with the sector. This meant that the response to the emergency was not as effective as it might have been.

[3] In response to the loss of mains water supplies in Gloucestershire, 8,378 beneficiaries were assisted, 335,577 litres of bottled water were delivered and 2,260 food parcels, 1,769 hygiene kits and 8,466 dry toilet packs were distributed by the British Red Cross alone.

12.36 There was also frustration that, despite clear unmet needs, it sometimes proved necessary for the voluntary sector to approach some local authorities to ask them to utilise their resources. For example, one organisation explained to the Review how, four days into the floods, they had to offer their services as no formal request had been received. This may have been partly because responders were busy coordinating their own efforts but there are also instances where it appears that local authorities might have chosen not to use voluntary organisations. On some occasions when specific help, including equipment, was offered, it was refused without an explanation.

12.37 Some of these difficulties could be a result of local relationships not having been established before the floods. However, it has also been suggested to the Review that local authorities may have feared negative perceptions in the minds of the public about their ability to cope if voluntary sector assistance was called in. Non-involvement or delayed involvement of the voluntary sector in the response phase also increased the challenge for organisations in becoming involved in the recovery phase. This meant that in some cases vulnerable people did not receive access to the humanitarian assistance they needed as early as they could have if the full and active engagement of the voluntary sector had been established from the outset.

Voluntary sector organisations and civil contingencies legislation

12.38 It is felt by some that the patchy integration of the voluntary sector into wider emergency plans may, in part, be due to lack of clarity in the CCA and associated guidance underpinning arrangements for the coordination of emergency planning and response. To paraphrase, the CCA states that Category 1 responders, in carrying out their duties, should 'have regard to' voluntary organisations. The guidance then discusses the intent of this section.

12.39 The Review was told by one voluntary sector organisation that it would like to see, within the guidance to the CCA, a clearer explanation of what is intended by the expression 'have regard to' and how the approach of individual Category 1 responders may be assessed. In essence, this view suggests that a lack of clarity in the guidance results in Category 1 responders not utilising the voluntary sector as much as they might. **While the Review does not come to a conclusion on this point, it would welcome the Cabinet Office considering further the involvement of the voluntary sector in emergency planning in the current review of the CCA**.

Coordinating the response from voluntary sector organisations

12.40 The contribution of individual voluntary organisations can be substantial, especially where they provide a specialist capability. However, the voluntary sector should not be considered as an array of unlinked organisations acting independently.

12.41 The voluntary sector can be expected to deliver a coordinated response both locally and nationally via the Voluntary Sector Civil Protection Forum, chaired by the British Red Cross and supported by the Cabinet Office. This is a single platform for voluntary sector communication with government and professional institutions. In a major or widespread emergency, it would be possible to use the chair of the Forum to engage with other voluntary sector emergency response organisations. Any gaps in provision could then be filled by the membership if they have the capacity and capability, or via 'advocacy' – identifying the relevant agency and passing on the information.

12.42 Where gaps are identified and individual needs are not being met, which other organisations could address, advocacy can play an important role. This was demonstrated after the floods when voluntary sector personnel working in schools in Doncaster identified that the schoolchildren were frightened of crossing local roads because of heavy traffic involved in the recovery work. This information was passed on to the local authorities, who then provided a 'lollipop lady'. Another example could involve passing on to the authorities the location of vulnerable people who have not been identified by other means. The voluntary sector has stressed to us that in passing on such information, there is no

intention to be critical and it is left to the experts to work out how to deal with the situation. The Review endorses advocacy as a means to ensure that people's needs are met and urges responders to accept this constructive interaction in the spirit intended.

Memoranda of understanding

12.43 During the floods, volunteers coordinated by a recognised voluntary organisation contributed highly effectively to the response and recovery effort. This is the voluntary sector's forte and the Review positively encourages them to continue their recruitment campaigns. As well as this well-recognised role, the voluntary sector is involved in a range of innovative support activities which are often less familiar to the emergency response community. The Review believes that such activities would be more widely implemented if they were recognised and understood more extensively at the planning stage.

12.44 One such input to emergency planning is the drawing up of agreements ('Memoranda of Understanding', or 'MoUs') with organisations to provide humanitarian assistance in times of need. Examples the Review is aware of are MoUs between the British Red Cross and a local authority to supply substantial numbers of beds in an emergency; between the British Red Cross and an electricity company to provide households with assistance in the event of power cuts; and between the British Red Cross, the WRVS, the Royal Society for the Prevention of Cruelty to Animals (RSPCA) and the Highways Agency to provide emergency welfare in the event of large numbers of people, including domestic pets and livestock, being stranded in vehicles on motorways and major trunk roads. The voluntary sector is keen to extend these arrangements and we see great value in this approach.

12.45 The Review has also heard enthusiastic support from a number of voluntary sector organisations towards becoming involved in the task of door-to-door knocking to warn households of flooding, which is discussed in more detail in Chapter 21. The Review acknowledges that this task may be well suited for voluntary organisations to carry out and one which they could (and should) become involved in. The voluntary sector's knowledge of vulnerable people would also be particularly useful in this regard.

12.46 The voluntary sector wants to be more widely utilised. Indeed, one voluntary organisation in its submission went so far as to ask the Review to task it specifically in our recommendations. The clear message is that voluntary sector organisations should be viewed as key professional partners to be integrated in all stages of emergencies including planning, response, recovery and, importantly, lessons-learned reviews after emergencies and exercises. **Much of this engagement at the planning stage will be via voluntary sector representation in LRFs and their voluntary sector subgroups and the Review would welcome LRFs and the voluntary sector ensuring they have mutual, effective, cohesive links in place**.

The use of volunteers

12.47 It is clear that the public are keen to volunteer: in Gloucestershire during the 2007 floods, offers of help compiled by the Police Casualty Bureau ran to a list 38 pages long. More widely, organisations such as the Red Cross, St John Ambulance, the WRVS and the Salvation Army have thousands of volunteer members. People also volunteer to become Special Constables, Neighbourhood Watch members and Flood Wardens. The role of volunteers in the flood rescue effort is discussed in Chapter 11.

Spontaneous volunteers

12.48 A number of submissions to the Review have discussed how spontaneous, or walk-in, volunteers had difficulty engaging in the response and recovery effort. The high volume of offers to help left the authorities struggling to cope. Their difficulties included collating the different types of help offered (from personal befriending and staffing rest centres through to offers by the owners of four-wheel drive vehicles to help move people from flooded areas and transport water), and, importantly, the need to carry out checks before a volunteer could work with vulnerable people.

12.49 Because responders were unable to establish volunteers' fitness for the role in some cases, offers of help were not taken up or people were turned away for safety and liability reasons. However, where they could engage, unaccredited volunteers played an important role, for example in comforting members of the community. The Review heard how, in one area, responders asked all unaccredited members of the local community to leave the affected area and this meant that victims who had been comforted by local residents were left alone. With this in mind, one voluntary organisation, in its submission to the Review, saw the need for a less stringent set of rules, or at least the relaxing of some rules, during emergencies and urged the response community to accept that members of the local community may not be accredited but can still be of beneficial use.

12.50 Responders should have plans in place for occasions where spontaneous volunteers do offer their help in an emergency; the Review is aware of work on this matter outside the UK, including the guide '*Spontaneous Volunteer Management Planning*'[4] from the Government of New Zealand and a Red Cross project in Austria, 'Team Österreich',[5] which relies on prior expressions of interest from potential volunteers. **The Review is also aware of a project being led by Skills for Justice to develop National Occupational Standards in planning for and responding to emergencies, including how to manage and develop volunteers;[6] we believe that experiences from the 2007 floods might be usefully incorporated and would welcome Skills for Justice drawing on the present report.**

Spontaneous volunteers, Austria

Team Österreich is a joint project between the Austrian Red Cross and Hitradio Ö3, Austria's largest radio station. The project was launched through a well-publicised campaign in the summer of 2007. The public were asked to indicate their interest in helping in the response to a future emergency or disaster by contacting the Austrian Red Cross and agreeing to have their details entered onto a database of spontaneous volunteers.

Each volunteer receives a two-hour familiarisation session to raise their awareness of the response activities and structures and to establish the nature of their potential contribution. By December 2007, more than 23,000 volunteers had registered, providing contact information and potential areas of activity, for example sorting and packing relief goods, filling sand bags and administration. In an emergency, available volunteers are brought in and briefed and are then regarded as Red Cross volunteers, covered by insurance for the duration of their deployment.

Insurance for volunteers

12.51 Where spontaneous volunteers were used, it was generally at the request of a recognised organisation, such as the police or the British Red Cross, who were able to assess the volunteer's skills and training. Volunteers working in an emergency under the direction of responders and recognised voluntary organisations, such as the British Red Cross and the WRVS, are usually covered by the organisation's insurance for liabilities, in the case of damage to property or injury to themselves or other people. This follows assessment of the volunteer's fitness and abilities, and may include training. To utilise fully all those wishing to contribute to the response effort, it was suggested to the Review that spontaneous volunteers working

[4] www.civildefence.govt.nz/memwebsite.nsf/Files/SpontaneousVolBPG306/$file/SpontaneousVolBPG306.pdf
[5] http://translate.google.co.uk/translate?u=http%3A%2F%2Foe3.orf.at%2Fteamoesterreich&sl=de&tl=en&hl=en&ie=UTF-8
[6] www.skillsforjustice.com/template01.asp?pageid=458

independently and not under the direction of an organisation should have access to insurance for liabilities.

12.52 The Review pursued this with insurers and their industry body, the Association of British Insurers. However, we were advised that liabilities insurance for independent volunteers is not possible due to the lack of prior assessment of the volunteer's suitability to carry out the task and also the large range of tasks that they might undertake, which would be impossible to define. In the case of injury, death or damage to property, insurance claims could be very large and it would not be commercially viable for companies to bear this risk.

12.53 The Review still encourages individuals to offer their assistance during emergencies, and to contribute to less risky activities such as checking on neighbours and lending equipment, however, it is more helpful if an individual can join a voluntary organisation, where skills can be assessed in advance and training provided. In this way, voluntary organisations can become invaluable repositories of skills available to the community, including first aid qualifications and language skills.

The provision of support to vulnerable people

12.54 During the summer 2007 floods, local authorities and voluntary sector organisations were very active in providing social care support for vulnerable people. However, evidence to the Review shows that there were sometimes difficulties identifying who was vulnerable and there was occasionally reluctance to share personal information due to misconceptions over data protection rules.

Identifying vulnerable people

12.55 The definition of who is vulnerable can be particularly wide in flooding events. In addition to elderly, sick and disabled people, families with small dependent children, who may have the added problem of collecting their children from school or nursery, as well as foreign language speakers who might not understand or be aware of flood warnings, and people who have recently moved to an area, may also be potentially vulnerable. A person's vulnerability can also change with time as flooding progresses, with warnings perhaps needing to change accordingly, and this is discussed in Chapter 21.

12.56 Research conducted by CC Water following the extended loss of mains water supplies in and around Gloucestershire in July 2007 highlighted that, in the prevailing circumstances, vulnerability extended to babies who could not drink the standard bottled water as well as people who either had no access to transport or were not strong enough to carry water back to their homes. Even then, an individual's particular needs may necessitate further consideration, for example, an elderly woman had bottled water delivered to her door by emergency responders, only for responders to find some time later that she had not been able to open the bottles due to arthritis.

12.57 Prompted by the particular problems faced by vulnerable people during the summer 2007 floods, and the problems which some local responders had in delivering a consistent and effective approach, the Review recommended in its interim report that:

> *"…the guidance currently under preparation by the Cabinet Office to provide local responders with advice on the definition and identification of vulnerable people and on planning to support them in an emergency should be issued urgently."*

12.58 The Cabinet Office subsequently published guidance in March 2008, *'Identifying People Who Are Vulnerable in a Crisis*',[7] which centres around four stages of establishing an emergency plan for identifying people who are vulnerable in a crisis, namely:

[7] Identifying People Who Are Vulnerable in a Crisis – Guidance for Emergency Planners and Responders. www.ukr.gov.uk/news/vulnerable.aspx

- *building networks* – identifying and working with those organisations best placed to have current information of the location and particular needs of individuals, for example residential care homes and the hotel industry;
- *creating 'lists of lists'* – instead of creating a list of vulnerable people, which would be difficult to maintain and keep up to date, the guidance suggests that emergency responders prepare lists and contact details of those organisations who can provide relevant information quickly in the event of an emergency;
- *agreeing data sharing protocols and activation triggers* – which should be flexible to adjust to changing circumstances; and
- *determining the scale and requirements* – estimating the number of vulnerable people and their range of needs in advance of an emergency and building this information into emergency plans.

12.59 The Review welcomes this guidance and is aware that LRFs are now using it to further develop their humanitarian assistance arrangements. This guidance fits well with a wider effort which local responders are making to improve the way they meet the needs of vulnerable people during emergencies. This work, informed by the guidance, and other tools, such as the Environment Agency's Flood Vulnerability Map, which is covered in more detail in Chapters 10 and 21, should prove helpful during future emergencies.

Sharing data about vulnerable people

12.60 The Review considers that issues relating to one aspect of the guidance, the sharing of data, is worthy of particular reference. The interim report highlighted that during the response to the floods of summer 2007, some responders were reluctant to share personal information with each other for fear of contravening duties of confidence or the Data Protection or Human Rights Acts, resulting potentially in disciplinary action being taken against them.

12.61 Existing Cabinet Office guidance, 'Data Protection and Sharing'[8] has sought to address some of the myths surrounding data protection as an aid to emergency planning, response and recovery. This guidance is intended to provide a framework within which personal information can be used with the confidence that individuals' rights to privacy are respected. One of the key principles in it is that **data protection legislation is not a barrier to appropriate information sharing**. The Review considers that this is a key point worthy of re-emphasising.

12.62 The recent Cabinet Office guidance, 'Identifying People Who Are Vulnerable in a Crisis', sought to clarify further these principles in relation to vulnerable people and provided some key points for emergency planners to consider in developing agreed data sharing protocols and triggers. These included that:

- while the Data Protection Act 1998, the key law governing the use of personal data, does not empower the sharing of data, it does not prevent legitimate sharing either: instead, it puts in place a framework within which any sharing should take place;
- local authorities are likely to have legal powers to share information on vulnerable people in the circumstances and context described within the guidance;
- for the purposes of risk assessment and emergency planning, clear legal power to share information is found in secondary legislation made under the Civil Contingencies Act 2004;
- local and regional responders need to balance the potential damage to the individual (and where appropriate to the public interest) in keeping the information confidential against the public interest in sharing the information as part of the response to an emergency (including the humanitarian response). A key question to ask is, 'what would I want done if I were the data subject?';

[8] Data Protection and Sharing – Guidance for Emergency Planners and Responders. www.ukresilience.info/dataprotection.pdf

- under the Data Protection Act, consent of the data subject is not always a necessary precondition for lawful data sharing; and
- if personal data is collected by one organisation for a particular purpose, it does not mean that it can *only* be used by another organisation if the purpose is the same. The legal requirement is to ensure that the new purpose is *not incompatible* with the original purpose.

12.63 The Review urges emergency responder organisations to ensure that personnel are familiar with this guidance and that appropriate relationships are established between the range of organisations that hold relevant data on vulnerable people, such as social care departments, faith groups and voluntary organisations. In particular, in the planning stage, organisations are encouraged to implement the two important steps outlined in '*Identifying People Who Are Vulnerable in a Crisis*'. These are to:

- *share less detailed information* – such as an indication of the type and indicative numbers of vulnerabilities that may exist in certain geographic areas, instead of detailed data on individuals. For instance, it may be enough for planning purposes to know the numbers of people within a certain geographic area that require prescription medicine. This can allow preliminary allocation of GP resource (or equivalent). The detail of who those people are (and possibly the type of prescription medicine required) may only need to be shared when an incident is imminent; and
- *agree the method and format* in which information will be shared in the event of an incident occurring.

12.64 Furthermore, the Review encourages the Cabinet Office to continue actively promoting the guidance at a local and regional level.

Rest Centres

12.65 Rest centres are premises used for the temporary evacuation of people from the scene of an incident. These centres are intended to provide a place of safety where evacuees can be cared for immediately after an event has occurred, either until it is safe to return home, or until suitable longer term accommodation can be found. As a Category 1 responder under the Civil Contingencies Act 2004, local authorities are responsible for the coordination of rest centre accommodation, as well as arrangements to get people to rest centres.

12.66 During the flood events of summer 2007, many people were forced to evacuate their homes, often at short notice, when their properties were affected by rising flood water, while others away from their homes when the floods struck found it impossible to get home due to flood waters. The majority of people affected were able to make their own arrangements to stay with family and friends, which is clearly preferable if it is an available option, as pre-existing support networks will generally offer more social, emotional and practical support than can be provided in a rest centre. However, for those people who did not have support from family or friends readily available – as was the case for a number of people stranded mid-journey on the road network – local authorities had to implement emergency plans to establish rest centres. These were set up, for example, in church halls, universities, schools and leisure complexes. In some cases, rooms in hotels and guest houses were used for small numbers of people with no specific welfare needs, where it was considered more cost-effective than opening up rest centre accommodation.

12.67 The Review considers that rest centre arrangements generally worked well during the floods, largely due to the combined efforts of a range of organisations, including local authorities, the emergency services and the voluntary sector, who worked tirelessly to provide a wide range of humanitarian assistance to people made temporarily homeless by the events. The assistance provided included shelter, warmth, food and water and emotional support in the form of reassurance or simply a friendly face to talk to. For example, in Hull, the Salvation Army provided practical and pastoral care to pensioners staying at the University of Hull following evacuation from their homes and also provided assistance to those sheltering at the City Hall by providing blankets. In Evesham, they assisted the local authority in providing support to those evacuated to the rest centre set up at the local leisure centre.

12.68 Inevitably in a large-scale emergency like the one experienced in summer 2007, a number of issues came to light to illustrate where local rest centre emergency plans could be improved. One of these related to the location of designated rest centres, some of which could not be used because they became inundated with flood water, as were other important sites including police headquarters, county council offices holding data on vulnerable people, and depots holding stocks of sand for sandbags. As a result, the Review recommended in its interim report that:

> *"…all LRFs should undertake an urgent review of the resilience of designated rest centres and other major facilities to ensure either that they can be used in the response to flooding and other major emergencies, or that alternative arrangements are put in place."*

12.69 The Review notes that such a review has subsequently been carried out by LRFs and contingency arrangements are being made where there are rest centres which are at risk of flooding. The number of rest centres available has also been considered by LRFs. For example, in some cases, smaller, more localised rest centres have been identified to be used if the emergency causes problems with travelling (one of the lessons learned from the summer floods). Other major facilities have also been checked and, where there are vulnerabilities, these have been highlighted to the appropriate organisations for them to set up business continuity plans. A number of LRFs have also carried out analysis against consequential risks such as loss of power.

Other centres for assistance

12.70 Beyond rest centres, there are other types of centre which may be set up by local responders, generally the police and local authorities, to provide assistance in response to emergencies and incidents. These include: family and friends reception centres; survivor reception centres; humanitarian assistance centres (HACs); and casualty bureaux. HACs are normally established by the local authority, following a decision by Gold Command, within two to three days of an emergency or major incident, to provide a one-stop-shop for all those affected by an emergency (including survivors, family and friends), through which they can access support, care, information and advice from a range of agencies.

12.71 The Review heard from some responders that the range of centres that may be established in response to an emergency or incident has the potential to cause confusion among emergency responders and the public, especially if inconsistent terminology is used to describe the nature of assistance provided by the centre in question.

12.72 While the Review is not aware of evidence to indicate that this caused a major issue in response to the floods of summer 2007, the Review encourages local authorities and the police, working through LRFs, to ensure that the purpose of each of these centres (including rest centres) is clearly defined in emergency plans, along with the arrangements and triggers for how each one links into the wider incident response framework. In doing so, organisations should have regard to the Government's *Evacuation and Shelter Guidance*[9] as well as guidance from the Department for Culture, Media and Sport on establishing humanitarian assistance centres in emergencies,[10] which is currently being updated for issue in late 2008 or early 2009.

12.73 In addition, the Review encourages organisations to draw on the experience of the Emergency Planning Beacon Authorities,[11] who have a great deal of experience and

[9] HM Government – Evacuation and Shelter Guidance – non-statutory guidance to complement *Emergency Preparedness and Emergency Response and Recovery* (2006). www.ukresilience.info/evac_shelter_guidance%20pdf.ashx

[10] Humanitarian assistance in emergencies – non statutory guidance on establishing humanitarian assistance centres – Department for Culture, Media and Sport (May 2007). www.ukresilience.info/hac_guidance%20pdf.ashx

[11] The Beacon Scheme identifies excellence and innovation in local government. In 2006-07 emergency planning featured as a beacon theme and seven local authorities and emergency planning units were awarded beacon status for emergency planning. www.ukresilience.info/preparedness/ccact/goodpractice/beaconscheme.aspx

best practice to share with other responder organisations, not just about rest centre and humanitarian assistance centre planning but concerning emergency response planning across the board.

People stranded on road and rail networks

Introduction

12.74 There were many instances of motorists and rail passengers being stranded in transit due to disruption to road and rail networks as a result of the flooding events of June and July 2007. Evidence to the Review shows that there is some good practice in place to provide welfare for stranded people. However, this is sometimes patchy and it is not clear that people's needs would be adequately catered for across the board in a future wide-area emergency.

The road network – the provision of emergency welfare

12.75 By far the most serious incident on the roads occurred on Friday 20 July, when an estimated 10,000 motorists in south-west England were stranded overnight between junctions 10 and 12 of the M5 and surrounding roads. While emergency responders were able to cope, accommodating a number of people in rest centres overnight, the immediate impacts were lessened considerably by the fact that the incident occurred in the summer.

12.76 Had the M5 event occurred during the winter, the consequences could have been much more serious, as was the case in January 2003, when snow and ice caused widespread and severe disruption on the motorway and trunk road network across south-east and eastern England and parts of Scotland. In the most severe cases, people were trapped on the M11, near junction 7, and the A90 near Aberdeen, for up to 24 hours.

12.77 Following the January 2003 incident, which became known as 'White Friday', the Highways Agency commissioned an internal review of the provision of welfare assistance to stranded motorists in the event of any future emergencies of this nature. This subsequently led to a framework agreement, developed in consultation with the Department for Transport (DfT), Cabinet Office and Category 1 responders, setting out the roles and responsibilities of responder organisations in the event that emergency welfare provision was needed. Under the framework agreement, in essence, the Highways Agency, through partnerships with voluntary sector organisations, would be responsible for providing basic and essential welfare to motorists on the strategic road network[12] (motorways and trunk roads), evacuating and transporting people to rest centres in extreme circumstances as necessary, while local authorities would be responsible for setting up appropriate rest centres and then providing emergency welfare support to people evacuated from vehicles.

12.78 At the time of the M5 incident last July, the Highways Agency was still in the process of agreeing MoUs with voluntary sector organisations to provide the welfare support to motorists on its behalf, and the guidance setting out how the arrangements would work in practice had not been finalised. Despite this, the Highways Agency was able to call on the British Red Cross to respond to the M5 incident, due to interim arrangements which had been established pending the formalising of the guidance and MoUs.

12.79 The Highways Agency subsequently published guidance[13] in October 2007, which set out arrangements for triggering emergency welfare support and the nature of support to be provided in response to future incidents on the strategic road network. The Highways Agency also signed a MoU with two voluntary sector organisations – the British Red Cross and the

[12] The Highways Agency is responsible for managing, maintaining and improving the strategic road network in England on behalf of the Secretary of State for Transport.The network represents two per cent of England's roads (more than 5,000 miles) and comprises motorways, dual carriageways and single carriageways in both urban and rural areas. It carries approximately one-third of all road traffic in England and nearly two-thirds of all heavy freight traffic. Other roads in England are managed by local authorities.

[13] Highways Agency – Provision of Emergency Customer Welfare on Motorways and All Purpose Trunk Roads – National Policy Guidance – 2007. www.highways.gov.uk/business/17026.aspx

WRVS – to provide this emergency welfare support on the Agency's behalf. A separate MoU was also established between the Highways Agency and the RSPCA to provide emergency welfare assistance to domestic pets and livestock.

12.80 The Highways Agency informed the Review that, while it has no legal duty to provide welfare support to stranded motorists, it recognises that severe weather can have a dramatic impact on the reliability of the road network (the flooding events of July 2007 created a substantial 'spike' in delays on the strategic road network, with flooding on the 20 July alone responsible for an estimated 2 per cent of the delays for the whole year). With this in mind, the Highways Agency's intention is to provide, where circumstances allow, a consistent standard of basic emergency welfare to motorists stranded on the strategic road network and this provision forms an integral part of its response capability, in line with one of its key performance indicators[14] to "*deliver a high level of road-user satisfaction*."

12.81 The Agency's emergency welfare arrangements are intended to be activated only under exceptional and extreme circumstances, with evacuation from the scene of the disruption generally considered only as a last resort. In the event of support arrangements being triggered, every effort would be made to provide support in or close to motorists' vehicles to address their very basic welfare needs – for example water, emergency food rations, survival blankets and hygiene needs, including in-car or roadside toilet facilities.[15] The first priority of responders would be to identify those persons and/or animals deemed most vulnerable, for example sick or injured people, babies and young children, elderly people, and people with disabilities, and to establish the extent of their needs. Consideration would also be given to the diversity of people's needs, such as their faith, cultural background and beliefs, ensuring that communication and any emergency welfare items provided have regard to these needs.

12.82 The Highways Agency also encourages motorists, as far as circumstances allow, to take responsibility for their own welfare and that of their passengers. In conjunction with the DfT, the Agency promotes a 'Travel Prepared' message, which urges motorists to always carry their own personal welfare items when travelling on the roads. In addition, the Agency's website[16] and its summer and winter service leaflets provide checklists and advice on items that motorists may wish to consider taking with them when they travel (such as a basic emergency kit in their vehicle: water; food; warm clothes and a blanket; first-aid kit; mobile phone and in-car charger; torch; battery jump leads) to help ensure that they are adequately prepared for an emergency.

12.83 The Review commends the Highways Agency for their initiative in developing these measures to provide emergency welfare support to motorists stranded on the road network. It is clear that, while these arrangements are still relatively new and need time to bed in, they provide welcome support to motorists, passengers and animals stranded for extended periods in long queues of stationery traffic. The Highways Agency informed the Review that it intends to undertake an *Emergency Customer Welfare Aware and Prepare* campaign, which will run for six months from June 2008, to help raise awareness further. This campaign will also advise drivers how to be prepared in the event of their being stranded on the road network.

The provision of information on the road network

12.84 The Highways Agency told the Review that, from lessons learned following previous incidents, by far the most common request from motorists stranded on the road network is for information. As a result, the primary focus

[14] Helping you with your journey – Highways Agency Business Plan 2008-09. www.highways.gov.uk/aboutus/documents/HA_Business_Plan_07-08_WFV.pdf

[15] The Highways Agency informed the Review that the provision of hygiene needs present particular challenges. While the Agency are looking at ways of addressing this, for example using in-car hygiene packs, this provision is said to be still some way off.

[16] www.highways.gov.uk/

of the Agency's support to people stranded is aimed at keeping motorists informed, for example on the anticipated length of the delay and the reason for it.

12.85 A number of submissions to the Review support the view that the provision of regular, accurate and timely information is vital. For example, a member of the public stranded on the M5 in July 2007 told the Review that:

> *"Safety information needs to be put out much earlier, on a national level. Had I known on the M1 further north the real extent of any problems in the [South West] … I could have stopped the journey and found a hotel in the daylight and continued on the Saturday ... It transpired that many people had set off without being aware of the very real problems ahead and that is simply unforgivable. Many also had small children with them and narrowly averted a real crisis. Floods are one thing… but surely we really could do better to prevent people getting stranded, like many people did (M5 etc)…"*

12.86 In addition, in its submission to the Review, the Automobile Association said:

> *"… when motorways or trunk roads are closed or disrupted, particularly for long periods, the travelling public demand accurate and timely information. The Highways Agency has significantly improved the extent and reliability of information to drivers who are en-route, through use of variable message signing. We welcome this enhancement. However, there are two aspects that need further consideration, the distance beyond which such messages are considered unnecessary and also the situation for those much closer to motorway closures. The AA still receives complaints from motorists who are trapped in congestion caused by long-term closures who are concerned for their welfare. Some say that not enough is being done to quickly gauge the severity of an incident and prevent further drivers from ending up in the same situation. More needs to be done to ensure motorway access points can be quickly closed and diversions put in place. The AA notes that official diversion signing between motorway junctions exists on only a fraction of the English motorway network."*

12.87 The Highways Agency has contingency plans in place which enable it to respond in the event of serious unavoidable blockages on motorways and trunk roads, for example through the use of demountable central barriers to enable traffic to be cleared by utilising adjacent carriageways. However, as the Review's interim report highlighted, it is clearly preferable wherever possible to prevent people from becoming stranded on the road network in the first place.

12.88 Through its National Traffic Control Centre in the West Midlands and seven regional control centres, the Highways Agency monitors the road network on a continuous basis for early warning signs of impending disruption, using a range of measures such as an extensive network of CCTV cameras and patrols by about 1,500 traffic officers. Any available information that can be provided to give an early warning of potential incidents is considered and may include: alerts when bad weather is expected; local incident black spots and pinch points on the network; planned and emergency maintenance and repair works; and high demand periods when incidents are more likely to occur. This 'horizon scanning' will be augmented in July 2008 by the introduction of an Advanced Command Cell, which aims to provide a focus for any developing information and impact assessment of potential disruption to the network, supporting the implementation of the Agency's contingency plans for the most serious events, not just flooding.

12.89 Other measures introduced by the Highways Agency to tackle congestion on the strategic road network include:

- establishing agreed 'off-network diversion routes' (pre-identified and in some cases pre-signed routes that by-pass sections of the strategic road network) with local authorities;
- the use of strategic variable message signs to direct longer-distance traffic via an alternative route on the strategic road network at decision points;

- the extension of existing Met Office support arrangements to include access to Met Office weather forecasters on a 24/7 basis, along with information focused on expected weather conditions on the strategic road network which will incorporate an assessment of the likely impact of severe weather;
- improvements to the capacity and the resilience of the Agency's telephony system and TrafficEngland[17] website to deal with peak demand during incidents; and
- enhancements to information made available to road users through real-time traffic information channels such as the TransportDirect[18] and TrafficEngland websites, Traffic Radio[19] and via commercial travel information service providers.

12.90 Furthermore, the Review is aware that the MoU between the Highways Agency and the Environment Agency, aimed at better understanding and reducing the vulnerability of the strategic road network to flooding, is in the process of being updated in light of the events of summer 2007. The amended MoU, once finalised, will formalise the contact arrangements between the two organisations at local and national levels. Quarterly meetings are also being held to identify where both organisations can work together more effectively.

12.91 The Review welcomes the positive and pro-active steps taken by the Highways Agency to develop its contingency plans for events, not just flooding, which can lead to severe congestion on the strategic road network and leave large numbers of people stranded. The Review urges the Agency to continue to develop its plans further, especially in relation to the potential for the use of even earlier, stronger and more specific warnings and strategic road clearance and closures, perhaps beginning a long way from the actual flooded areas, to help mitigate wherever possible the extent of potential disruption on the road network and prevent the risk of motorists becoming stranded in the first place.

RECOMMENDATION 45: The Highways Agency, working through Local Resilience Forums, should further consider the vulnerability of motorways and trunk roads to flooding, the potential for better warnings, strategic road clearance to avoid people becoming stranded and plans to support people who become stranded.

The rail network

12.92 The disruption to the travelling public was not limited to motorists. The Review is aware of a number of incidents that led to the disruption of the rail network as a result of the floods during summer 2007, leaving the public stranded either on trains or at railway stations. The most notable of these was at Gloucester railway station on Friday 20 July when about 500 people were stranded after part of the rail network was suspended due to flooding.

12.93 Network Rail maintains contingency plans to provide for potential disruption to rail services. As the organisation responsible for national rail infrastructure, it also assumes lead responsibility in managing any major incident on the rail network, working with other responders, such as train operating companies,[20] British Transport Police and the emergency services. Network Rail is also working with the Environment Agency to enhance the flood warning services it receives and to improve its understanding of the risks and potential impact of flooding on the rail infrastructure. Similar arrangements exist with the Met Office for warnings of adverse weather which may affect the rail network.

[17] www.trafficengland.com
[18] www.transportdirect.info/web2/
[19] The Highways Agency launched its Traffic Radio channel in June 2007. The service is now available on DAB (Digital Audio Broadcasting) and on the internet at www.trafficradio.org.uk and provides traffic information to listeners about traffic conditions on the strategic road network, updated every 10 minutes in peak hours and every 20 minutes outside peak times.
[20] As at 1 January 2008, there were 20 franchised train operating companies operating passenger rail services in Great Britain.

12.94 In its submission to the Review, Network Rail advised that:

> *"[Network Rail] has procedures in place, developed in partnership with relevant agencies, to respond both to flooding and to other extreme weather events to ensure the safety of the network and maintain as much service continuity as possible ... For example, restrictions may be imposed on rail traffic when heavy rainfall and flooding is forecast and experienced. Lines may be closed or diversions and service curtailments introduced. Speed restrictions can be imposed to mitigate landslip risk and routes over river bridges may be closed because of the risk of water undermining the foundations."*

12.95 Train operating companies also have contingency plans in place in the event of disruption to rail services and generally take responsibility for their passengers in the event of incidents. At the 18 major 'hub' railway stations run by Network Rail, (for example the main London stations, Manchester Piccadilly, Birmingham New Street and Leeds) this responsibility is undertaken in conjunction with Network Rail. In developing their contingency arrangements, train operating companies draw, as appropriate, on non-mandatory good-practice guidance issued by the Association of Train Operating Companies (ATOC). Previous ATOC guidance addresses situations including those where passengers are stranded on trains in periods of extreme heat, or where on-board air conditioning units have failed.

Passengers stranded on the rail network

12.96 The Review was advised that, in the event of passengers being stranded on a train between stations, Network Rail would work with the relevant train operating company to get the train to a station before off-loading passengers. Only in extreme circumstances would plans to remove passengers from trains between stations be considered. This may involve using a level crossing or other suitable location to remove passengers from the rail network to a place of safety.

12.97 For incidents specific to the railway, such as mechanical or signalling faults, train operating companies would then seek to ensure that affected passengers reach their destination by alternative transport means if necessary, exceptionally arranging and paying for overnight accommodation in the event that the journey cannot be completed on the same day.

12.98 However, for passengers stranded by events beyond the rail industry's control, such as severe weather or wide area flooding, while the industry would endeavour to assist passengers in reaching their destinations, this may not always be possible for the industry to achieve alone, especially when the emergency has disrupted transport networks more widely. In this instance, the rail industry's role would generally not currently extend beyond getting passengers safely off the rail network; whereupon local authorities, as a Category 1 responder under the Civil Contingencies Act 2004, would assume responsibility. This would involve establishing and transporting people to rest centres, prioritising their needs and directing the response effort accordingly, in conjunction with the emergency services.

12.99 The rail industry informed the Review that, during the floods of summer 2007, the majority of rail passengers affected by disruption to their journey went on to make their own arrangements, often with the assistance of friends or relatives. Only a minority of passengers required further assistance from local authority rest centres. The Review considers, however, that the mechanisms between the rail industry and local authorities for triggering and implementing arrangements for collecting, transporting, dispersing and accommodating rail passengers stranded by the events of summer 2007 were not always clearly understood by responders.

12.100 The Review is aware that train operating companies are generally not obliged to offer compensation as a result of delays outside the control of the rail industry, such as exceptionally severe weather conditions or flooding. The DfT is currently looking to simplify compensation schemes through the progressive introduction of 'Delay/Repay' arrangements as part of the new round of franchise agreements being negotiated with train operating companies. Under these arrangements, all train operating companies will offer the same compensation terms which will apply for all delays, regardless of cause.

12.101 The Review welcomes this initiative, especially for people who may be vulnerable such as the elderly, people with disabilities or those travelling with particularly young children. Such an approach would help to provide reassurance to passengers that, in the event of being inadvertently stranded on the rail network during their journey, their needs would be considered and some level of support provided. Some train operating companies already operate such a scheme. For example, National Express East Coast, which now operates the Intercity East Coast franchise, gives some important commitments in its Passenger Charter.

National Express East Coast – Extract from its Passenger Charter[21]

"Where we believe that because of a delay or cancellation of a National Express East Coast train it will be impossible to get you to your destination at a reasonable time either by train or alternative transport, we will:

- either arrange for you to return to where your journey started, or another appropriate location, and ensure that you can travel again the next day, all at no additional charge; or
- arrange overnight accommodation and ensure that you can travel the next day, all at no additional charge.

In these circumstances if you decide not to travel the following day, i.e. you abandon your journey entirely, we will give you a full refund on the price of your ticket, whether single or return.

If you are delayed by over 60 minutes on any National Express East Coast train, or you are delayed by over 60 minutes at any National Express East Coast station because of a problem with National Express East Coast services, we will offer you a choice of tea, coffee, mineral water or fruit juice with our compliments, while stocks last. If the delay extends to 120 minutes, we will then offer you a choice of a sandwich or a piece of cake with our compliments, while stocks last."

The provision of emergency welfare on the rail network

12.102 The Review was advised by the rail industry that its plans were geared more to removing passengers from trains in the event of a *"protracted delay"*, rather than have passengers stranded for such extended periods that provision of emergency supplies was required. It was considered conceivable, however, that the industry could arrange the delivery of emergency supplies, such as food, water or blankets, to passengers stranded on a train in exceptional circumstances. For example, Network Rail has had a contractual arrangement in place with the WRVS for a number of years to provide humanitarian assistance, such as refreshments and shelter, in response to incidents on the rail network. However, this arrangement is primarily intended to provide assistance to personnel involved in the response to an incident, as seen in 2007 when WRVS volunteers were deployed to support emergency responders after a train derailment in Cumbria, rather than direct to stranded passengers.

12.103 The rail industry has also established Rail Incident Care Teams – a cadre of volunteers drawn from most train operating companies – who have been specially trained to provide humanitarian assistance to passengers on a 24/7 basis in the event of a major incident on the rail network. However, this assistance is generally only provided to passengers and their families as a result of a serious incident (physical or psychological injury, or death) in the immediate aftermath of an incident and away from the scene of an incident. The Review was advised that such teams would not be used to provide emergency welfare needs to stranded passengers.

12.104 As such, there is no system of providing emergency humanitarian support to rail passengers analogous to that provided by the Highways Agency to motorists stranded on the strategic road network, as described earlier in this chapter.

[21] www.nationalexpresseastcoast.com/Documents/PDFs/Passenger's%20Charter.pdf

12.105 In the interim report, we proposed that local emergency plans should specifically include incidents which leave large numbers of people stranded on motorways and trunk roads. A submission by Passenger Focus, a statutory body which represents the interests of rail passengers, commented that this approach should apply equally to rail passengers:

> *"…we wonder whether reference to rail passengers, who have the added disadvantage of not having a vehicle in which they can divert or return home, could be added here … in exceptional emergency situations, it is not in passengers' interests if this is just assumed to be a matter for the train operator – and nor is it very equitable if the interests of road users attract greater efforts from public authorities."*

12.106 The Review agrees with this view. While acknowledging that some trains, especially inter-city services, may be equipped with supplies of food and water for its immediate journey, such supplies are likely to be limited and insufficient to service the diverse needs of passengers stranded for an extended period. Other local services may have no such supplies on board. In addition, passengers are less likely to be properly equipped or clothed to deal with the impact of becoming stranded, a situation which could be exacerbated in the height of summer or during winter months.

12.107 The Review considers therefore that the rail industry should ensure that the needs of passengers, who may be stranded on the rail network as a result of disruption to services, are factored into emergency plans. In particular, the rail industry, working through LRFs, should develop plans to identify the nature of emergency welfare support – such as water, emergency food rations and survival blankets – that rail passengers may require in the event of becoming stranded and establish the mechanisms for providing such assistance in an emergency. The particular needs of passengers who may be vulnerable in such circumstances should also be considered.

RECOMMENDATION 46: The rail industry, working through Local Resilience Forums, should develop plans to provide emergency welfare support to passengers stranded on the rail network.

The provision of information on the rail network

12.108 Not surprisingly, the need for early information on the extent and duration of disruption, expressed by motorists affected by the disruption on the road network, has also been communicated to the Review by passengers stranded on the rail network. For example, a member of the public stranded at Bristol railway station following last summer's floods commented:

> *"I, like many others, live in Gloucestershire but work in Bristol. When I left for work on the morning of the 20th, I was aware that severe heavy rain was forecast but was not aware of its likely severity – thus like many others, I was stranded at Bristol railway station when the rail services collapsed. During the several hours spent at the rail station, no information of any type was available at all."*

12.109 The Review is aware that the ATOC has previously published good practice guidelines for train operating companies to provide improved information, including announcements at stations and on trains, within set time periods following a train delay incident. An ATOC Approved *Code of Practice – Provision of Passenger Information*,[22] was also issued in February 2008, which while not mandatory on the rail industry, provides best practice on providing information to travelling passengers during service disruptions, whether on a train, at or away from a station. Subsequently, a report by the National Audit Office (NAO)[23] published in March 2008, made a number of recommendations aimed at improving the provision of information to rail passengers. In particular, the NAO recommended that:

[22] ATOC Approved Code of Practice ATOC/ACOP014 Issue 1, February 2008.
[23] National Audit Office – Reducing passenger rail delays by better management of incidents – March 2008. www.nao.org.uk/publications/nao_reports/07-08/0708308.pdf

"Train Operating Companies should implement the good practice guidelines issued by the Association of Train Operating Companies for the provision of accurate and useful initial information to passengers and the frequency with which passengers should be updated." And:

"Train Operating Companies and Network Rail should identify and use other means of communicating information, for example through visual displays onboard trains (where technically feasible) and at stations … and highlight in contingency plans for incidents the need to provide information to passengers."

12.110 Given that the provision of information to rail passengers during incidents has been extensively considered by the NAO, the Review does not propose to re-visit this issue further here. However, the Review believes that the implementation of the NAO recommendations would assist in reducing the significant difficulties that rail passengers can experience at times of severe disruption, not just from flooding. Furthermore, Passenger Focus told the Review that a major weather problem affecting the rail network, for example in Swindon, had the potential to result in hundreds of people with disrupted plans, perhaps even being stranded distant from the incident in Bristol or at Paddington. **The Review therefore welcomes the NAO's findings and encourages the rail industry to implement its recommendations urgently, particularly the two recommendations highlighted above on useful information and the means of providing it.**

The role of the Armed Forces

Introduction

12.111 The contribution of the Armed Forces to the emergency response during the floods was welcomed by emergency responders and members of the public, who praised their efficiency and effectiveness. The interim report described how the Armed Forces provided support to the very substantial logistics operation that was needed in order to ensure emergency water provision when the Mythe water treatment works was shut down. This is covered in more detail in Chapter 11. However, assistance from the Armed Forces went much further than this and this section outlines the role they took and the principles laid down regarding their engagement. Media coverage of the Armed Forces is examined in Chapter 23.

Military Aid to the Civil Authorities

12.112 The CCA provides the framework for the response to civil crises. It defines how organisations, particularly local responders, prepare for emergencies. CCA places a statutory duty on Category 1 responders (emergency services including the police, fire and rescue authorities, the ambulance service and the Maritime and Coastguard Agency, local authorities, NHS primary care trusts and the Environment Agency) and Category 2 responders (utility companies, transport operators, strategic health authorities in the NHS and the Highways Agency) to respond to a disruptive challenge should one arise.

12.113 The Armed Forces' involvement in civil operations in the UK falls under the umbrella of Military Aid to the Civil Authorities (MACA), and there is no statutory duty placed on the Armed Forces at any level (central, local, or regional) to respond to civil crises. The principles underlying MACA mean that it should only be available on request as a last resort when the civil authorities have exhausted all alternative sources of capability and there are not sufficient resources to cope immediately with an emergency situation. MACA is always subject to the defence commitments of the Armed Forces, who maintain no standing forces for MACA tasks, other than for specialist capabilities, including bomb disposal and search and rescue activities. Thus, a commitment cannot be made that guarantees assistance to meet specific emergencies. During the flooding, assistance from the Armed Forces was administered centrally and also at the request of Gold and Silver Commands.

12.114 Members of the public, noting the effectiveness of the Armed Forces' involvement during the floods, have suggested to the Review a formal, pre-planned role for the Armed Forces in such operations. However, as MACA makes clear, specific involvement

of the Armed Forces should not be included in plans to fill gaps in civil capability or capacity; where a gap in civil capability can be identified in advance, it is for resilience planners to fill that gap. However, it is recognised that during a disruptive challenge, unforeseen failures of the resilience plan or events in excess of planning assumptions, may generate requests for aid from the Armed Forces.

The funding of Armed Forces assistance

12.115 The provision of assistance from the Armed Forces where there is an immediate threat to life is paid from the central Ministry of Defence (MoD) budget. As such, the cost of rescue work undertaken by the Armed Forces in Yorkshire and Humberside during the summer of 2007 was absorbed by the MoD.

12.116 However, according to HM Treasury (HMT) rules, government departments must charge for services that do not form part of their funded tasks. No matter how valid a request for assistance may appear, defence funds are granted for defence purposes only and where work is done by the Armed Forces for other purposes, the MoD is required by HMT rules to secure reimbursement for the costs incurred. Therefore, unless the work undertaken provides training opportunities in defence-related tasks, costs must be reimbursed by the recipient of the service, for example the local authority or the utility company.

12.117 The majority of the work undertaken by the Armed Forces in south-west England was of a general nature, not offering training opportunities, and was connected to securing electricity infrastructure at Walham and Castle Meads electricity substations and helping to re-establish mains water at Mythe water treatments works, as well as distributing water to those affected and assisting communities by filling sandbags. As such, costs of Armed Forces assistance in the South West fell to a number of organisations, some of whom could claim back the costs under the Bellwin scheme.[24] This scheme, funded by central government via Communities and Local Government, may be activated where local authorities have spent money taking immediate action to safeguard life or property or to prevent suffering or severe inconvenience in the response phase of the emergency. The Bellwin scheme is discussed further in Chapter 28.

12.118 To allocate the costs properly to the appropriate party, accurate records of the number of Armed Forces personnel and how long they were engaged in each task are necessary and the Armed Forces' detailed records were praised by government officials facilitating this process. Although calculating the relative costs falling to each organisation can be a complex accounting process, the existing procedure was thought to work well after the floods.

12.119 Evidence to the Review shows that an early Ministerial statement that Armed Forces assistance would be centrally funded (as was appropriate during the search and rescue phase) was helpful and provided reassurance to responders that costs would not be incurred, which, although not the prime concern during an emergency, can ease apprehension and reduce administrative burdens on the ground.

Activities of the Armed Forces during the floods

12.120 The Armed Forces undertook a wide range of activities during the floods. In the north of England, hundreds of personnel were involved and in Gloucestershire over 1,000 personnel across all Forces took part in the response over an 11-day period, comprising 311 members of the Royal Navy, 444 of the Army and 272 Royal Air Force personnel.

12.121 To coordinate actions agreed by Gold and Silver Commands, Armed Forces representatives, known as Joint Regional Liaison Officers (JRLOs), sat on these coordination groups across the affected areas. Given the large deployment, and the overriding Armed Forces commitment to defence tasks, the Review was asked whether the Armed Forces would be able to field JRLOs in a widespread, perhaps national, incident with many more coordination groups involved. On this matter, the Armed Forces reassured us that

[24] www.communities.gov.uk/fire/resilienceresponse/floodrecovery/faqs/localauthorities/bellwin/?id=645866#question

commanding officers of units in their Brigade areas were trained in the JRLO role and could therefore easily be provided in sufficient numbers if required.

Search and rescue

12.122 Search and rescue was the first activity carried out by the Armed Forces using both helicopters and assault boats. Across the north of England, assault boats were used to rescue people and at Thorpe Marsh Power Station in Doncaster they were used to provide access for fire and rescue service and National Grid personnel and equipment. In Leconfield, the Armed Forces helped to evacuate vulnerable people from their homes. Aside from emergency rescues, assault boats manned by the Armed Forces and fire and rescue personnel also provided reassurance patrols to ensure communities were safe.

12.123 In the South West, up to eight helicopters were operating at a single time, including those of the MCA. All the helicopters were coordinated by the Aeronautical Rescue Coordination Centre at RAF Kinloss in Scotland. The scale of the airborne activities was substantial, and included rescuing over 193 people in 68 separate incidents in the first six days. Helicopters were crucial in rescuing people from roofs and areas inaccessible to ground-based rescue services.

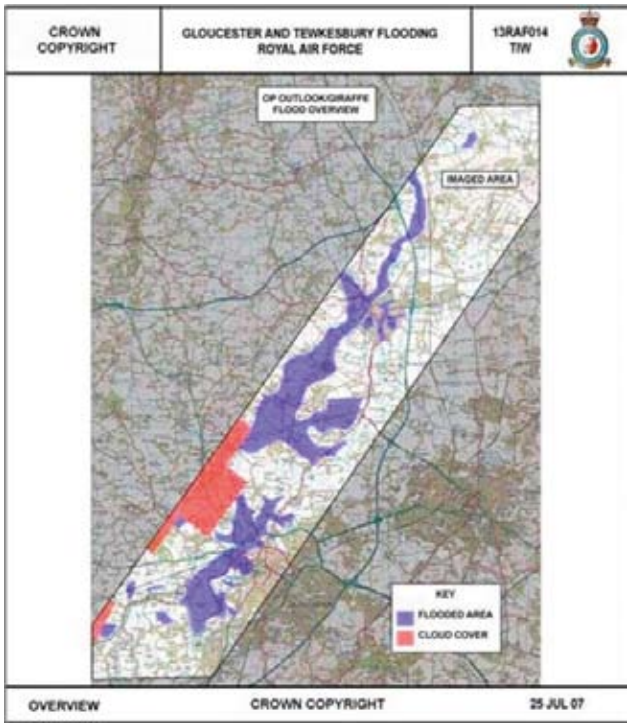
12.124 The Signals Regiment played a useful role providing communications to ensure that the Armed Forces could work in a civilian-led operational situation and providing, where required, both Armed Forces communications and Airwave (a digital communications network) to some civil agencies.

Air assets

12.125 As well as utilising Armed Forces helicopters for search and rescue, air assets were used widely to great effect during the floods. At Ulley Dam in South Yorkshire, a Chinook helicopter was used to transport high volume pumps to assist in lowering the level of the water when a dam breach appeared imminent. In Bentley near Doncaster, the Chinook was again used to lift aggregate to shore up the banks of the River Don.

12.126 In the South West, a Tornado aircraft on exercise in the area flew over the region and provided aerial imagery (see Figure 9) to Gold Command to assist responders, helping to inform the assessment of the scale of impact of the floods. The Review has been informed that this valuable service was offered rather than being requested and this suggests that responders should be made aware that this facility exists, although, as outlined above, any Armed Forces contribution cannot be guaranteed in a particular situation.

Figure 9 – RAF photo by Tornado flyover superimposed on 1:50,000 map



Building flood defences

12.127 Emergency flood defence work carried out by the Armed Forces ranged from the extensive filling of sandbags to help protect people's homes through to the building of large semi-permanent barriers around utilities infrastructure at Mythe water treatment works and Walham electricity substation. The value of the flood defences built at Walham on 22 July was enormous since they averted its inundation, which could have caused a large-scale power outage across the region.

12.128 Once the flooded Mythe water treatment works had drained on 26 July, the military assisted in building 1,000 metres of stone-filled semi-permanent flood barrier to avoid further flooding of the facility.

12.129 Armed Forces engagement continued until 30 July when the situation was sufficiently improved for them to be stood down.

Distribution of bottled water

12.130 When Mythe water treatment works flooded, Severn Trent Water was faced with a water distribution problem far greater than they had planned for; 350,000 people required alternative water supplies from bottles or bowsers. The provision of emergency water supplies is discussed further in Chapter 11.

12.131 Given the requirement to provide 10 litres of water per person each day, the scale of the supply and distribution challenge was clear. An Armed Forces logistics team at Gold Command set up bottled water storage at Cheltenham racecourse; photographs of the area demonstrate the size of the operation, with a substantial portion of the race track covered with pallets of bottled water. The logistics team also advised on the setting up of 24 distribution points across the region, mainly in supermarket car parks where the public could easily access their provision. As well as bottled water, 1,400 bowsers were used and Armed Forces logistics provided invaluable advice on their replenishment, which was carried out up to three times a day by a series of tankers, including some military tankers.

12.132 The Armed Forces have articulated to the Review that the "*flat management structure*" in Severn Trent Water, and probably in the utilities generally, meant that the organisation had a limited ability to plan and understand how to get the resources needed once the emergency had begun. This led to the onus falling on the Armed Forces to employ lateral thought, for example suggesting the use of an alternative bowser filling point near Bristol to minimise the distance that needed to be travelled to replenish supplies.

12.133 The Armed Forces have highlighted to the Review that considerable reliance was placed on them to act in the place of a Category 2 responder (the water company) under the Civil Contingencies Act 2004. On this occasion the Armed Forces coped well. However, fulfilling this role in future crises covering wider areas or multiple locations could severely stretch defence resources. Accordingly, the Review believes that the water industry should develop its logistics expertise to effectively cope with future wide-area emergencies.

12.134 Although the MoD is neither a Category 1 or 2 responder, nor the nominated lead government department for responding to civil emergencies, it is clear that Armed Forces personnel possess a wide range of logistics experience, expertise and knowledge which may be useful to Gold commanders during wide area emergencies, as well as to local and regional resilience forums and lead government departments in the emergency planning stage.

12.135 Inevitability, despite careful planning, some emergencies will stretch established capabilities to their limits. In case of such scenarios, the Cabinet Office and the MoD should identify how the experience and expertise of Armed Forces personnel could be utilised and made available to emergency responders, for example by identifying a small number of trained logistics personnel, who would be available to Gold Commands in an advisory capacity during a wide-area civil emergency. The Review stresses however, that the MoD and the Armed Forces should never be assumed as the lead for responding to civil emergencies. It is for emergency responders to plan for and respond to civil emergencies.

RECOMMENDATION 47: The Ministry of Defence should identify a small number of trained Armed Forces personnel who can be deployed to advise Gold Commands on logistics during wide-area civil emergencies and, working with the Cabinet Office, identify a suitable mechanism for deployment.

The Civil Contingencies Reaction Forces

12.136 The Review has been asked why the Civil Contingencies Reaction Forces (CCRF), thirteen 500-strong groups of volunteers from the Territorial Army capable of being mobilised at short notice to assist in dealing with a major civil emergency such as the floods, were not mobilised. Behind the question was the suggestion that help was not brought in as quickly as it might have been if the CCRF had been used.

12.137 The Review has been advised by the MoD that the use of CCRFs was considered but that it would have taken longer to mobilise the CCRFs than it would to deploy regular forces to the scene. Since time was of the essence, regular Armed Forces personnel were used. Further, after the first 24 hours the majority of the work undertaken by the Armed Forces required specialist skills which the CCRFs did not have – for example engineering skills to construct semi-permanent flood defences and logistics specialists for the distribution of water supplies. Finally, any reserve personnel in the local area may have had other responsibilities in the community which would have been lost if they had been called up.

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The national response

This chapter examines the role of central and regional government in preparing for and responding to the emergencies. It contains sections on:

- central government crisis machinery;
- information management;
- Defra – the role of the lead government department;
- exercising; and
- regional leadership.

Introduction

13.1 Although flooding is predominantly a local emergency, larger-scale events, such as those witnessed during summer 2007, often require support at regional and national levels. The exceptionally large scale and variety of the summer 2007 floods, coupled with the consequent widespread disruption of essential services, made the regional and national efforts integral to the response.

13.2 Central government's response to each of the string of major emergencies that occurred followed the guidance laid down in *Central Government Arrangements for Responding to an Emergency*.[1] This distinguishes between incidents which are primarily managed locally, with little or no central government engagement, and those that require closer working with central government, either primarily through the lead government department or, where there is a need for wider government involvement, through the activation of central crisis arrangements and facilities such as the Cabinet Office Briefing Rooms (COBR).

13.3 The Review considers that overall there was strong collaborative working and cooperation between government departments and agencies during the 2007 floods and that the central response was effective and coordinated. Certain departments played a particularly prominent role, notably Defra as the central government department with lead responsibility for flooding, Communities and Local Government (CLG) as lead government department for the recovery phase, and the Cabinet Office.[2]

[1] http://www.ukresilience.info/~/media/assets/www.ukresilience.info/conops%20pdf.ashx

[2] The Civil Contingencies Secretariat sits within the Cabinet Office and works in partnership with government departments, the devolved administrations and key stakeholders to enhance the UK's ability to prepare for, respond to and recover from emergencies.

Central government crisis machinery

13.4 The flooding in June 2007, although undoubtedly serious, was judged on the basis of initial reporting from the Environment Agency to be within the capacity of local responders to manage. COBR was not therefore formally activated, although consolidated briefing on the situation was produced and circulated by the Cabinet Office to all government departments, and Defra (with the Environment Agency) provided a continued oversight of the response. There was, however, recognition, based on experience from the flooding in Carlisle in 2005, that the major challenge was likely to be during the recovery phase. The central government focus was therefore placed on confirming CLG's leadership of cross-government activity to support recovery efforts in the affected areas, and on ensuring that financial and other support was made rapidly available.

13.5 COBR was activated during the July 2007 floods. The trigger was a forecast by the Environment Agency – which turned out to be broadly accurate – that the scale of the flooding would be severe and on a par with that in 1947. As well as the direct flooding emergency, COBR was used for the succeeding civil emergencies, including the prolonged interruption to water supplies following the loss of the Mythe water treatment works and the threat to Walham electricity substation, as well as later flooding events in the Thames Valley. Each of these events was expected to require significant central government support from a number of departments to the local multi-agency response. This proved to be the case.

13.6 The activation of COBR in July 2007 was welcomed by Gold Commands, and played an important role in the achievement of improved performance. Departments felt that the response was better coordinated and more focused than had been the case in June 2007. While it would be wrong to say that the non-activation of COBR in June was a failure, it is certainly right to say that its activation in July enhanced the overall response. This experience points to the desirability of earlier activation of COBR on a precautionary basis in the future in the event of serious flooding. This would facilitate access by local responders to central government and would ensure a better understanding of the evolving situation.

13.7 Stakeholders, including Defra and the Environment Agency, agree with this analysis: however, because central crisis machinery is very resource intensive, they also add that any response needs to be proportionate and should not be escalated beyond the requirements of the event – activation of central crisis machinery should add value. The Review considers therefore that Defra's Lead Government Department Plan should be amended to reflect the activation of central government crisis machinery in response to high-impact flooding, with the provision of supporting guidance on the definition of the term 'high impact', as the trigger for activation of central government crisis machinery.

RECOMMENDATION 48: Central government crisis machinery should always be activated if significant wide-area and high-impact flooding is expected or occurs.

Information management

13.8 After the summer 2007 floods, although local responders generally appreciated central government's need for local information, the Review has learned that they were frustrated by the volume of information requested and the time it took to collate. On the other hand, central government was concerned by the lack of agreement on the extent of the flooding and the scale of the damage. This matter is discussed in greater depth in Chapter 27.

13.9 Discrepancies in information can be partly explained by the different locations and timings of reporting and the widespread nature of the flooding. They may also reflect instances where Gold Commands were not established to provide the strategic dimension. However, they do raise questions over the extent to which there was a coherent understanding on the scale and extent of the problems faced. While accurate figures will inevitably take time to collect and data collection must take a lower priority to saving life, rough estimates of the scale of damage need to be made available to allow scarce resources to be effectively prioritised. This data also needs to be sufficient to meet central government's immediate needs.

13.10 The confusion experienced in June 2007 suggests that for surface water flooding events, central government should seek information via Government Offices from local authorities in the first instance. Data from the Environment Agency and the ABI should be used as supplementary evidence to gauge the extent of potential damage.

13.11 It would also be helpful to be clearer about what data is needed, who is responsible for providing it and when. Evidence to the Review shows that some protocols were in place for information gathering and reporting during the response and then in the recovery phase, including an agreed template which was completed via the Government Offices in the affected regions. However, there was limited awareness that this system was in place.

13.12 A further issue is the handling of information once it reaches central government's crisis machinery. Information presented to ministers through the Common Recognised Information Picture (CRIP) – the mechanism used in the COBR for providing an up-to-date situation report of the emergency – was on occasions inaccurate during the summer 2007 floods. The Review believes that closer working between Defra and the Environment Agency, as discussed below, will remedy this and urges both parties to address this matter.

Defra – the role of the lead government department

Defra's performance

13.13 As the designated lead government department for flooding, Defra was at the heart of the Government's response to the summer 2007 flooding. It discharged this role with commitment, working with other departments and the Environment Agency.

13.14 However, Defra's response took time to settle into an effective pattern. This was essentially due to the unprecedented nature of the floods and the way in which the July 2007 flooding events rapidly led on to a much more serious emergency, affecting essential services and critical infrastructure (and thus going well beyond Defra's day-to-day responsibilities).

13.15 The careful and effective response to the possibility of East Coast flooding in November 2007 shows that both Defra and the Environment Agency had already learnt lessons and improved their level of performance.

Sharing best practice

13.16 As well as having lead government department responsibilities for flooding emergencies, Defra has important emergency responsibilities in relation to animal disease and other significant risks and there is now a significant body of expertise and experience within the department which should be captured and shared.

13.17 An interim conclusion of the Review was that Defra extends its current departmental programme to share best practice and provide training in emergency response across the organisation. The Government agrees with this conclusion and the Review is pleased that Defra will now take this forward as part of their ongoing programme of work. This will ensure that Defra has the ability to learn lessons from emergency exercises and real events; it will spread good practice and help retain knowledge; and it will ensure a consistent approach across Defra to the response to emergencies where applicable. Defra will also hold an internal cross-departmental learning event during 2008 on responding to emergencies.

Working relationships between Defra and the Environment Agency

13.18 Defra's position was further complicated by the operational–policy split of responsibilities between it and the Environment Agency. However, the relationship was generally productive and there is no evidence to support a need to draw the Environment Agency more closely into the department following the summer 2007 events.

13.19 Nevertheless, experience from other emergencies shows the efficiency benefits that come from single site coordination of key information gathering and decision-making. Despite their close working relationships, a separate Environment Agency control room and individual policy teams in Defra had to work harder than necessary in order to deliver coherence.

13.20 In the interim report we suggested that coherence could in future be better achieved if staff representing key divisions in Defra and the Environment Agency were co-located together to support decision-making and to work with ministers in their representative role. Our interim conclusion was that Defra and the Environment Agency should work together to establish a single London situation room to coordinate flooding information, to act as a focal point for cross-Defra efforts and to support Defra ministers. We also stated that to succeed, this enhanced coordination and communication effort would need to be supported directly by the top management teams of both organisations. Analogous and effective arrangements to bring together Defra and its Animal Health agency in the response to major animal diseases were cited.

13.21 Defra and the Environment Agency agreed with this interim conclusion, with modification, agreeing to work together to deliver the conclusion's intention. As part of this work, and in support of its cross-government lead department role for flooding, Defra will develop plans for using its Emergency Operations Room. However, the Government considers it can meet the intention of this recommendation without necessarily establishing a single London situation room. It is proposed by Defra that this can be achieved by closer joint working and information sharing, while allowing both organisations to continue to manage the flooding situation to meet their differing operational requirements, and within their own managerial space. To this end, the Environment Agency has offered to provide a Strategic Liaison Officer to support Defra's work in a major flood. If the intention of our conclusion is delivered by this arrangement, the Review is content. **However, we would welcome the Government continuing to review the effectiveness of this arrangement over time and if it is not delivering the intention of our conclusion, co-location in a single London situation room should be reconsidered.**

Planning for emergencies: a national framework

13.22 The split of responsibilities for flooding between Defra and the Environment Agency, along with the very local nature of flooding impact, means that direct comparisons with other national emergencies such as foot-and-mouth disease or pandemic influenza need to be made cautiously. Nevertheless, there are some national-level planning and response techniques used in other areas which could have obvious benefits for the response to flooding events.

13.23 The fragmented, locally-focused nature of planning for the response to the 2007 floods is one such issue. While this did not materially affect the quality and effectiveness of the local response, time was spent dealing with issues which could have been pre-determined centrally. In other areas (such as pandemic influenza), such issues are addressed within a single national framework – a model in which the lead government department brings together information, guidance and key policies in a single strand of planning, thus providing a resource for all tiers of government and key external partners. It is not an emergency plan, but it does bring coherence and identify key prior decisions. The Review believes that capturing work across government in this way would be equally sensible in relation to flooding.

13.24 In this respect, the interim report recommended that, in order to effectively fulfil its lead government department role for flood risk management and emergency response, Defra needed to urgently develop and share a national flood emergency framework. In an open letter in April 2008 to the Secretaries of State on progress of the urgent recommendations in the interim report, the Review acknowledged that Defra had completed a review of its Lead Government Department Plan in December 2007 and issued new guidance on producing multi-agency flood plans in early 2008, which provided a sound basis for developing a national flood emergency framework. Defra explained that an outline national framework was at an advanced stage of preparation, and should be in a position to be finalised in the autumn.

13.25 However, the Review now notes, with regret, that the framework will not be ready in the stated timeframe. The Review has since been advised that, while central

government accepts that such a framework for flooding is essential, it believes that written guidance alone will not bring about the long-term, cultural change that is required and the full implementation of a programme to develop information, guidance and key policies in a single strand of planning, may take until 2010 to fully implement. The Review acknowledges this, with regret, and suggests that Defra, with support from the Cabinet Office, should urgently develop a project plan with a view to implementing a national flooding emergency framework, incrementally if necessary, within clearly defined timescales.

Exercising

National exercises

13.26 The improvements which Defra was able to institute before the July 2007 floods reflect the learning experiences of many of those involved in the June events. This demonstrates the benefit of experience when framing any response. This experience can come in two ways – through dealing with actual emergencies or through exercises. Because relying on experience of actual emergencies alone may risk dissipation of experience and expertise, the Government has a wide-ranging exercise programme to ensure that experience gained is sustained.

13.27 The last national flooding exercise was Exercise Triton in 2004. The exercise scenario covered an extreme event with extensive coastal flooding affecting nearly half of England and Wales. The Review notes that, as of June 2008, another national flooding exercise is not due until 2010 and in the interim report we suggested that this exercise might be brought forward. Evidence subsequently received strongly suggests that Category 2 responders and the voluntary sector should be included in the exercise and that 'consequence management', or the recovery phase of an emergency, is exercised as well as the emergency response. Evidence also strongly suggests the inclusion of the regional and local levels in the exercise. Further, submissions request that extreme or 'worst case scenarios' should be exercised, perhaps including flooding at night or at a weekend, or concurrent emergencies. **We welcome all of these suggestions being considered, noting that they should be driven by the risks identified in the national risk register and local assessments**.

13.28 We have received evidence that some national exercises are not as well coordinated, planned, and inclusive as they could be and that quality differs between the lead government departments taking them forward. In part, this could be a matter of resources. It could also indicate different levels of knowledge and expertise in exercising across government. **This situation might benefit from central guidance and the Review would welcome the Cabinet Office, which oversees preparedness activity across government, considering this proposal further**.

13.29 In response to the Review's interim conclusion, the Government has informed us that there is a substantial lead time for a national exercise, especially if national crisis machinery, including COBR, is to be used. Defra has informed the Review that a plan for a flooding exercise which will set out when it will be conducted will be formulated by the end of October 2008. Work will then begin on planning a national exercise that will test key components of the arrangements which will be set out in the national flood emergency framework in due course, and the Defra Lead Government Department Plan.

RECOMMENDATION 49: A national flooding exercise should take place at the earliest opportunity in order to test the new arrangements which central government departments are putting into place to deal with flooding and infrastructure emergencies.

Local and regional exercises

13.30 While national exercises are coordinated by lead government departments with support from the Cabinet Office, there are no structured arrangements in place at the regional and local level to compare the scheduling of exercises and to ensure that experience and learning is shared more widely, including with other regions. This can lead to exercises taking place with similar responders at the same time. Similar scenarios may also be held in isolation in different regions, having been planned and

carried out without incorporating the lessons learnt elsewhere. Exercises are, in effect, being duplicated. While there is an argument for responders learning their own lessons in exercises, we also believe that exercises should build on those held previously in other areas.

13.31 It has been suggested to the Review that to avoid exercises 'clashing', CLG, with the support of the Government Offices, could share exercise diaries across regions and localities and with central government departments. This would also allow exercises to be scheduled at appropriate times to incorporate lessons from previous exercises. **The Review would welcome this suggestion being considered by CLG**.

13.32 Further, to draw on lessons learnt, **the Review would welcome consideration of the proposal that organisers of exercises publish a 'lessons identified' report and circulate it to all players as well as posting it on their website.** Since the published report might be unable to contain sensitive details that would be helpful to responders, lessons could also be shared between LRFs in a region and the Government Office or Regional Resilience Forums might be able to facilitate this process. A further suggestion is that the Emergency Planning College's library might act as a repository for exercise information, including lessons learnt. **As the potential remit of these proposals goes much further than just flood emergencies, the Review has not explored this in detail, however, we would welcome CLG and the Cabinet Office examining the proposals.**

13.33 Based on submissions received by the Review, we would welcome planners of local and regional exercises considering including Category 2 responders and the voluntary sector to a greater degree as an integral part of exercise programmes. Subject to reflecting local risk assessments, planners of exercises should also consider testing extreme scenarios, as described above in relation to national exercises. Community exercises might also include volunteer members of the public to test this aspect of resilience. This would include working through the planning stages with key members of the community involved.

Scientific and Technical Advice Cells

13.34 Scientific and Technical Advice Cells (STACs) are the provision for Gold Commanders of a single point of advice on matters of public health – and their value was reinforced by the events of summer 2007. Local STACs were established to support Gold Commands in Yorkshire and Humber, the West Midlands and Gloucestershire. A national STAC was also set up during the floods to advise central Government, especially the debate in COBR.

13.35 The concept of STACs worked well, but a number of issues were raised, not least in the area of public health protection where there was confusion over the respective roles and accountabilities in law of staff of the Health Protection Agency, primary care trusts, strategic health authorities and, following the loss of mains water supplies in and around Gloucestershire, the Drinking Water Inspectorate (DWI) and their interface with Gold Command.

13.36 Furthermore, some experts were asked to attend both local and national STACs, which led to competing demands on their time and stretched resources. It was unclear to some whether the role of the national STAC was to provide advice on the same issues being considered by the local STACs, or to provide support in areas that could not be handled by the local STACs. Similarly, it was unclear whether decisions made at the local level had to be signed off by the national STAC.

13.37 Confusion at the STAC in Gloucester centred on roles and responsibilities in deciding when the mains water supply could be restored. The DWI was not initially invited to advise the work of the STAC and became involved only when it requested participation. Subsequently the DWI also participated in the national STAC and provided authoritative technical water supply advice. However it was unclear how the national advice was being applied at the regional level. The DWI's investigation into the

incident estimated that the delay in the return of a piped water supply was approximately one to two days.

13.38 The interim report noted that STAC guidance was not sufficiently clear about how roles within the STAC should be discharged and stated the urgent need for a clearer definition of these roles to be provided.

13.39 In this respect, the Review is pleased to note that guidance[3] to the National Health Service (NHS) in England on providing strategic command arrangements across the healthcare sector was released in December 2007, updating roles and responsibilities for NHS organisations during major incidents. The guidance specifically clarifies the role of the strategic health authority as the principal healthcare system manager during a crisis. Local responders have already begun incorporating the new advice into their planning activities, which should lead to greater consistency and improved awareness of the role which health service organisations can play.

13.40 The Review has been advised that the Department of Health is continuing to work closely with the Cabinet Office to further develop STAC guidance at the local, regional and national levels, including clarifying the roles of central advice and that of other health agencies. This guidance is due to be published later in 2008. **Stakeholders have urged that, once this advice is published, responders at all levels, including potential Gold Commanders, should familiarise themselves with the advice and in due course take part in exercises involving a STAC, as appropriate – the Review would welcome this approach.**

Regional leadership

13.41 Regional Civil Contingencies Committees (RCCC) were activated in the South West region on 23 and 24 July as a precaution against the potential wide-area impacts of power loss that would have occurred had Walham electricity substation been flooded or closed down. These were the first RCCCs activated since the Civil Contingencies Act 2004 came into force.

13.42 The Review has heard evidence that, regionally, the reasons for activating the RCCC were not widely appreciated and there was some uncertainty in responders' minds over the RCCC's authority and relationship with COBR. Some people wrongly believed that the RCCC had a command and control function above Gold Command, rather than being a structure for coordinating the regional picture and liaising with central government. It appears to have been sensible for the RCCC to meet when it did and to step it down once it was clear that widespread power loss had been avoided.

13.43 The Review welcomes work by the Cabinet Office and CLG to explain the situation to local responders, drawing on the events of the summer and the role and purpose of RCCCs.

[3] www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_081507

Section 5

Maintaining power and water supplies and protecting essential services

This section looks at the effect of the floods on our critical infrastructure and considers ways in which the resilience of such systems can be enhanced.

It contains chapters which cover:

- taking a systematic approach to reducing disruption to our essential services;
- understanding the level of risk that is tolerable;
- delivering greater resilience in critical infrastructure;
- minimising the loss of essential services;
- enabling better emergency planning through information sharing and engagement; and
- effective management of dams and reservoirs.

Taking a systematic approach to reducing disruption to our essential services

This chapter examines the events of summer 2007 in relation to essential services and explores the issues that need to be tackled to improve the protection and resilience of our critical infrastructure. It contains sections on:

- the 2007 floods – highlighting the vulnerabilities of critical infrastructure;
- lessons learned from summer 2007 floods; and
- taking a more systematic approach to building resilience in critical infrastructure.

The 2007 floods – highlighting the vulnerabilities of critical infrastructure

Introduction

14.1 The summer floods of 2007 had a dramatic effect on electricity power substations, water and sewage treatment works, and the road and rail network. As a consequence of the events there was a strong possibility of the loss of power to 750,000 people leading to discussions about evacuation. Drinking water was lost to 350,000 people for up to 17 days. Tens of thousands of people lost power, some for more than two days, and tens of thousands of people were stranded as the road and rail networks ground to a halt.

14.2 The consequence of the loss of these assets extended beyond the areas that were flooded. This was not an isolated problem but a consistent and significant feature of the emergency. The loss of essential services made everyone affected feel vulnerable. People spoke of feeling isolated, and of 'a return to the dark ages'. In some cases, the loss of supplies sparked panic as people were scared of being left without water. A nation that has become accustomed to, and ever more reliant on, a reliable supply of water and energy was left feeling exposed and underprepared.

14.3 The water industry had previously been considered a fairly resilient sector, but the flooding of the Mythe water treatment works in Gloucestershire demonstrated that there are 'single points of failure' in the water network that, in the event of failure, have massive consequences for whole regions. The loss of Mythe cut off water to 350,000 people for up to 17 days. In total, five water treatment works and 322 sewage treatment works were affected by the floods.

14.4 Similarly, several electricity transmission and distribution assets were affected, with 40,000 customers in Gloucestershire being cut off for up to 24 hours and 9,000 customers on rota disconnection for several days in south Yorkshire and Humberside. However, it

was the 'near-misses' at Walham substation (serving 500,000 people in Gloucestershire and south Wales) and a number of electricity substations around Sheffield (servicing 750,000 people) that brought home the vulnerabilities of infrastructure assets. The failure of supply on that scale in either region would have caused chaos and, almost certainly, loss of life.

14.5 Another potentially catastrophic near-miss occurred at Ulley Reservoir, near Rotherham. The dam was at high risk of breaching, putting in danger life and a number of other infrastructure assets, including the M1 motorway, a major electricity substation and the gas network connection for Sheffield. Although the highest profile incident, it was not alone. Many other dams were also affected.

14.6 Other infrastructure was also disrupted by flooding. There were 148 flooding or bank-slip incidents on the rail network as a consequence of the rainfall and several 'pinch-points' became blocked, destroying the continuity of the network. This in turn caused delays in the bulk supply of fuel products to terminals and other storage facilities, while rail-replacement alternatives were hampered by flooded roads and traffic congestion. Closures affected the motorway network (M1, M4, M5, M18, M25, M40, M50, and M54) and many local and trunk roads were also disrupted with repair costs estimated at £40–60 million.

14.7 Thus, the events of last summer have shown that the vulnerability of infrastructure to flooding can have significant and cascading impacts on the delivery of essential services. The increased frequency and scale of flooding likely as a result of climate change will inevitably introduce greater risks for more infrastructure assets.

14.8 It is clear from the feedback we have received that the public need to be reassured that essential services are resilient to flooding and other civil emergencies. The Government needs to respond by taking action to enable infrastructure operators and local responders to mitigate these risks, especially for single points of failure.

The national infrastructure and the critical national infrastructure

14.9 At the simplest level, infrastructure consists of the basic facilities and installations needed to provide services for the functioning of an advanced, industrialised society. There are many different definitions, developed for different purposes.

National infrastructure

The national infrastructure comprises those facilities, systems, sites and networks necessary for the functioning of the country and the delivery of the essential services upon which daily life in the UK depends. These services fall with the sectors of energy, water, communications, transport, finance, government, health, food and emergency services. Within these sectors there are certain 'critical' elements of infrastructure, the loss or compromise of which would have a major impact on the availability or integrity of essential services leading to severe economic or social consequences or to loss of life. These critical elements make up the nation's critical national infrastructure (CNI).

Centre for Protection of National Infrastructure

14.10 The most important sectors for this Review encompass organisations which the Civil Contingencies Act (2004) defines as Category 2 responders. This includes organisations that provide utilities (water, energy and telecommunications) and transport (where the focus is on the national road and rail networks, which are vulnerable to flooding and natural hazards and vital for delivering an effective response). These figured prominently in last summer's flood and it is on these, in combination, that other essential services depend. Other sectors were excluded as follows:

- the main vulnerability of the **finance** and **government** sectors to natural hazards would be loss of the infrastructure providers that underpin their systems, such as telecommunications and electricity, and therefore the sectors are not considered to be a primary concern for this Review;

- similarly, the diversity, complexity and competitiveness of the **food** sector makes it very resilient as a network to natural hazards and means it is most vulnerable through the loss of other infrastructure providers, such as the transport network; and
- the geographically widespread nature of both the **emergency services** and **health sector** also provides a high level of resilience and redundancy to natural hazards.

14.11 References in the analysis below to critical infrastructure cover the utilities and transport sectors outlined above. These sectors will have facilities, systems and networks that are so important that they have been categorised by government as being part of the National Infrastructure and Critical National Infrastructure.

14.12 Reservoir dams represent another key part of UK national infrastructure albeit less for their role in delivery of essential services than for the potential for catastrophic failure and the risk that they pose to life when situated in or near populated areas.

Lessons learned from summer 2007

14.13 Analysis of the evidence submitted to the Review has highlighted fundamental gaps and weaknesses in a number of areas. These gaps and weaknesses have had an impact on the ability of those concerned to anticipate and reduce the vulnerability of infrastructure in advance of events, to ensure that adequate contingency and local emergency plans are in place and that there was an effective response as events unfolded. Evidence indicates the reasons for these failures is:

- the approach taken by the Government to mitigating the risk to the delivery of essential services from natural hazards has largely been uncoordinated and reactive. There is no central understanding of the level of vulnerability or risk to which infrastructure, and hence wider society, is exposed; and there is no centrally defined standard against which to drive action;
- emergency planning for failures has been patchy and inconsistent;
- the amount of information made available at the local level for emergency response planning is insufficient. The emergency response last summer was hampered as a result of an inadequate understanding of:
  - the location of critical sites;
  - the mapping of vulnerability to flooding;
  - the consequences of their loss; and
  - their dependencies on other critical infrastructure assets.
- in addition, the involvement of Category 2 responders in multi-agency response exercises has been poor and their integration into Gold Commands during last summer's emergencies was slow.

14.14 In light of these findings, the interim report proposed a number of interim conclusions that would help minimise disruption to the delivery of essential services if similar events were to happen in the future. The goal of the Review has been to develop an approach that anticipates and manages risks in advance and enables more effective responses to emergencies as they arise.

Taking a more systematic approach to building resilience in critical infrastructure

14.15 The proposals in the interim report relating to critical infrastructure generated a very positive response. This included strong support for a systematic programme to reduce the disruption caused by natural hazards to critical infrastructure and essential services. There was also strong support for improved information sharing and engagement at the local level to enable more effective emergency planning and response.

14.16 The Government agreed with the need to introduce a systematic programme to reduce disruption based on centrally defined standards.

14.17 The Review welcomes the positive feedback from all respondents and, in particular, welcomes the recognition and commitment shown by the Government.

14.18 We strongly believe there is a need for a more systematic insight into the vulnerability of our critical infrastructure and a coordinated approach to driving up its resilience. We welcome the Government's commitment to take this forward and propose that they create a framework to help reduce the risks resulting from natural hazards with the goal of minimising disruption to the delivery of essential services.

Defining protection and resilience

The historic approach to reducing risks to essential services has concentrated on the protection of infrastructure from harm, typically security threats. While this is a useful approach, a focus on protection alone has limitations. Complete protection can never be guaranteed – it is impossible to anticipate all hazards, nor is it practicable on economic or any other grounds to completely protect all elements of the critical infrastructure.

In recognition of this, the protection component has been translated into a broader and more flexible concept of resilience. Resilience is the ability of a system or organisation to withstand and recover from adversity. As such, a resilient organisation is one that is still able to achieve its core objectives in the face of adversity through a combination of measures.

Protection may make up an important part of resilience, but it is not the only factor. Resilience is also underpinned by an effective emergency response to help reduce the impacts of failure.

National infrastructure, security threats and the National Security Strategy

14.19 Protecting critical infrastructure from security threats and maintaining essential services is a high priority for the Government and a comprehensive and well-established programme of protection is already in place. The Government recognises that without these essential services "*the UK could suffer serious consequences, including severe economic damage, grave social disruption, or even large scale loss of life*".[1] The Review shares these concerns and the overall aim.

14.20 However, the Government's programme of work to reduce the vulnerability of critical infrastructure to terrorism and national security threats is fundamentally about increasing protective security – it does not address natural hazards or include measures to increase the resilience of critical infrastructure or emergency preparedness.

14.21 The Civil Contingencies Secretariat, which sits within the Cabinet Office, looks at both security threats and natural hazards but its remit is to enhance the UK's ability to prepare for, respond to and recover from emergencies, rather than protect against threats or hazards arising. There is therefore a gap in the Government's policy and delivery related to the protection of critical infrastructure from natural hazards.

[1] www.cpni.gov.uk

Protecting national infrastructure against terrorism and other national security threats

Sector sponsor departments are responsible for deciding the appropriate security approach to be taken in their sectors. This involves identifying and monitoring priorities for security activity in their sector in consultation with industry and relevant security specialists such as the Centre for the Protection of National Infrastructure (CPNI).

CPNI is the Government authority on protective security in relation to national security threats. It comprises teams of expert advisers who conduct security reviews and provide advice across the national infrastructure aimed at reducing vulnerability to these threats. CPNI works closely with businesses and industries to identify risks and vulnerabilities.

Within each sector key steps include identifying and categorising infrastructure, setting security goals and priorities taking account of risk, delivering security advice, implementing advice and monitoring and reviewing progress.

14.22 Since our interim report, the Government has published its new National Security Strategy. This takes a holistic approach, covering crime, pandemics and natural hazards, such as flooding, in addition to traditional security threats. Natural hazards are a security issue on the basis that they can affect large numbers of UK citizens and *"demand some of the same responses as more traditional security threats, including terrorism".* We welcome the inclusion of flooding within the National Security Strategy, and the recognition that risks to individuals and communities are as important as risks to the State.

14.23 In order to deal with these risks the Strategy states that the Government needs *"to understand them better, act early to prevent them where we can, and ensure that we minimise and manage any harm they might cause".* It is clear from the evidence gathered from last summer's widespread events that more must be done to anticipate risks as well as effectively tackle the potential impacts arising from natural hazards to critical infrastructure.

14.24 The Strategy also indicates that the Government is considering how to strengthen its capacity for horizon scanning, forward planning and early warning to identify, measure and monitor risks and threats. It acknowledges that the challenges to our security cannot be delivered by Government alone but demand *"broader partnerships...with owners or operators to protect critical sites and essential services"*.

14.25 The Review believes that these principles – acting to the benefit of the individual citizen and planning and acting in advance of an emergency through tripartite cooperation – should also form the guiding principles for a systematic programme to reduce the vulnerability of national infrastructure to flooding and other natural hazards. The recommendations set out in this report will go a long way to helping achieve the outcomes set out in the National Security Strategy.

The National Security Strategy

The National Security Strategy, published in March 2008, sets out how the Government will address and manage security challenges and their underlying drivers in order to safeguard the nation, its citizens, our prosperity and our way of life. This is the first time the Government has published a single, overarching strategy, and represents a new approach to national security.

The Strategy covers not only 'traditional' security threats, such as terrorism, but includes transnational crime, pandemics and flooding. It is also person-centric, considering not just the protection of the integrity and interests of the State but also threats to individual citizens. Notably, the Strategy recognises climate change as potentially the greatest challenge to global stability and security, in part caused by an increase in the frequency and intensity of extreme weather events. Another important development in thinking is the commitment to focus on the underlying drivers of security and insecurity in order to allow prompt action and improved prevention where possible, and to achieve this through partnership between the public and private sectors.

The Strategy sets out the Government's intention to publish a national-level risk register setting out its assessment of the likelihood and potential impact of the range of different risks that may directly affect the United Kingdom and the safety and well-being of its citizens.

An outline for the systematic programme

14.26 Ensuring safe, secure communities that are at the heart of a robust, growing economy requires resilient essential services. This will require a thorough, infrastructure-wide risk assessment, targeted investment to improve resilience and an effective emergency response capability. The effectiveness of this activity can only be assured through strong co-operative relationships between private and public sector at the national and local level. Government represents the public interest but does not possess the experience or expertise to identify measures to reduce risk. Sectors have much better knowledge about their capability and the measures necessary to make improvements and respond to the interests of their shareholders. **We would welcome the Government and industry working together to foster a collective responsibility for enhancing resilience in line with the values in the National Security Strategy.**

14.27 In order to achieve the level of ambition set out in the National Security Strategy and to minimise potential future disruption of the kind we saw last summer, the Review believes that the Government should develop an enduring programme to take on the challenge of driving up resilience through a coherent national plan that balances risks and costs within and across sectors. The systematic programme should aim to:

- **reduce the most substantial known risks** to critical infrastructure resulting from natural hazards through careful assessment of vulnerability and prudent action based on new centrally defined standards;
- **provide appropriate economic incentives** to increase the resilience of critical infrastructure;
- **enhance the capacity to absorb shock and act quickly** when faced with unexpected events through the introduction of mandatory business continuity planning; and
- **ensure an effective emergency response** at the local level through improved information sharing and engagement before, during and after emergencies.

14.28 Such a programme would need to encourage coordination and integration within and between sectors. It should consist of an overarching plan and sector specific plans that are based on a comprehensive and objectively measurable programme. It should include levels of protection and resilience for individual sectors. At the national level, Government, economic regulators and utilities companies should work together to understand vulnerabilities and develop workable solutions that provide value for money. At the local level,

emergency planners and utilities companies should exchange information and ensure engagement for effective emergency response.

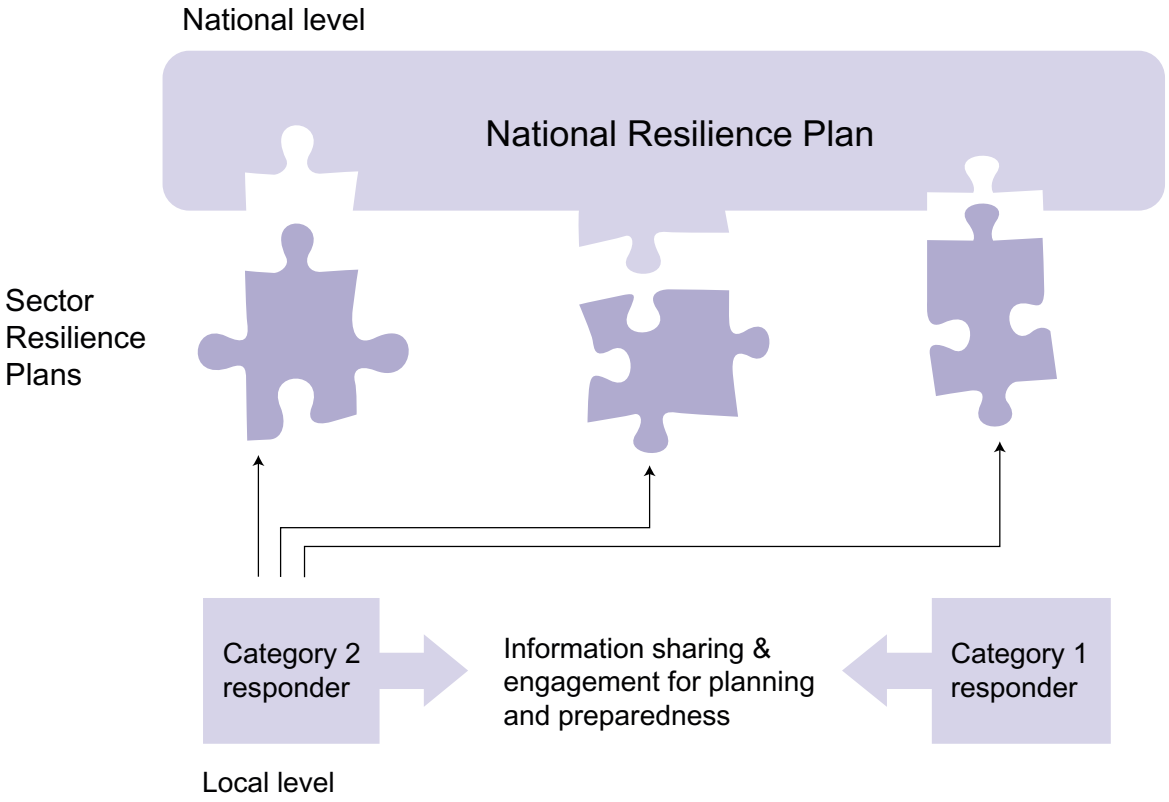
14.29 We feel that this is an appropriate compromise between the needs of national coordination to drive up resilience and improvements in emergency response capability at the local level. While risk and vulnerability information is gathered at the local level, we do not believe it is best placed to derive or drive plans to improve the protection and resilience of nationally critical infrastructure. The systematic programme should comprise:

- a coordinated, coherent **National Resilience Plan** for critical infrastructure, based on a partnership between the public and private sector, which enables coordination between multiple sectors, organisations and localities. The National Resilience Plan should be formed from Sector Resilience Plans; and
- **Sector Resilience Plans**, developed jointly through a tripartite relationship between the relevant government department, economic regulator and industry sector, should be public documents with controlled sections where necessary for sensitive information. The plans should set out:
  - the levels of ambition for resilience across the critical infrastructure (based on standards of protection, economic incentives and business continuity planning for all risks);
  - a picture of risk and vulnerability for the entire sector developed by bottom up aggregation of risk and vulnerability analysis on a periodic basis;
  - a programme of measures for achieving the appropriate level of ambition for resilience, along with the timescales for delivery;
  - a mechanism for reporting progress on the implementation of the programme of measures and updating the plan on an annual basis; and
  - a process for benchmarking and reporting of business continuity plans.

14.30 The national programme would be complemented by a range of measures at the local level:

- 'bottom-up' aggregation of risk/vulnerability analyses through sectors to inform Sector Resilience Plans;
- Local authorities (upper tier) being free to undertake 'ad hoc' scrutiny of infrastructure operators' business continuity plans; and
- getting the right balance between 'need to know' and 'need to share' to enable local emergency responders and infrastructure operators more effectively to plan and prepare for emergency response.

Figure 10 – National and sector-level resilience plans



14.31 Although we advocate a consistent approach across the critical infrastructure, we recognise that there are differences between sectors. Working on a sectoral basis will respect existing sectoral definitions and methodologies, and complement other existing measures and policies.

14.32 The Government should develop guidance and a national policy statement that sets out the national process, timescales and expectations. This would also provide additional guidance on information sharing protocols at the local level.

RECOMMENDATION 50: The Government should urgently begin its systematic programme to reduce the disruption of essential services resulting from natural hazards by publishing a national framework and policy statement setting out the process, timescales and expectations.

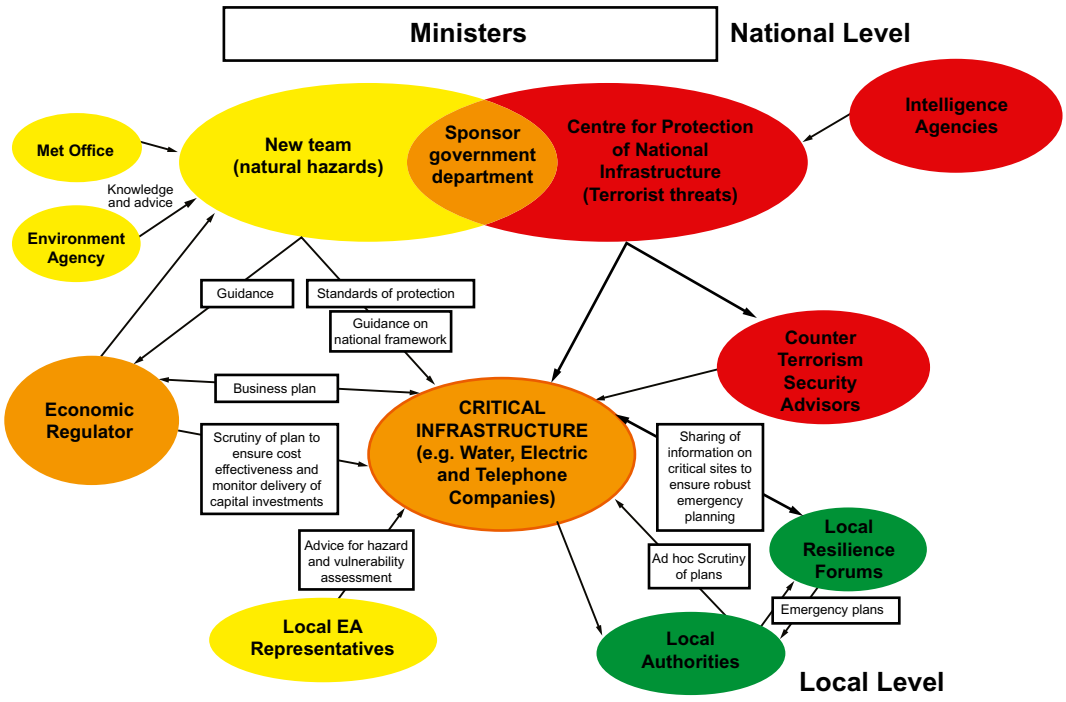
14.33 The relevant Sector Resilience Plans, and the standards that underpin them, should be the basis for work to improve the resilience of existing critical infrastructure and inform the resilience of future infrastructure developments. We recognise that the Government has proposed to introduce a system of National Policy Statements that will establish the national case for 'major infrastructure' development and set the policy framework for Infrastructure Planning Commission decisions. **The Review would welcome the Government considering how Sector Resilience Plans and the relevant National Policy Statements can be aligned.**

14.34 We also call for the appropriate structures and resources within government to manage and coordinate the cross-government effort. Our discussions have revealed that there is currently no single body responsible for driving and coordinating activity to anticipate and mitigate risks from natural hazards to critical infrastructure. The Review therefore believes that the national framework should be driven and coordinated at the national level by a new Natural Hazards Team within Government.

14.35 Past and present approaches to critical infrastructure protection in the UK are driven

by security threats. However, other countries, including the United States and European Union countries that we visited, are starting to take a broader 'all-hazards' approach in response to the conclusion that comparative analyses clearly show that large-scale natural events are more probable and have higher consequences than terrorism. In the short term, the approach set out above should be closely aligned to the Government's approach to tackling security threats to the delivery of essential services. **In the longer term, the Review would welcome the Government pursuing a more integrated approach to critical infrastructure that considers security threats and natural hazards together in a single plan.**

Figure 11 – Natural Hazards Team illustration



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Understanding the level of risk that is tolerable

This chapter examines how risks to critical infrastructure can be assessed and discusses how government should reduce those risks by setting proportionate standards within and across critical infrastructure sectors. It contains sections on:

- the risk assessment and risk management context;
- the complexity of risk assessment;
- coordination of risk reduction across sectors;
- understanding flood risk to critical infrastructure; and
- setting standards as part of a national campaign.

Introduction

15.1 The strategy that we propose in Chapter 14 is two fold: to reduce the most substantial known risks to critical infrastructure in order to prevent emergencies; and to enhance the capacity to absorb shock and respond quickly when faced with unexpected events.

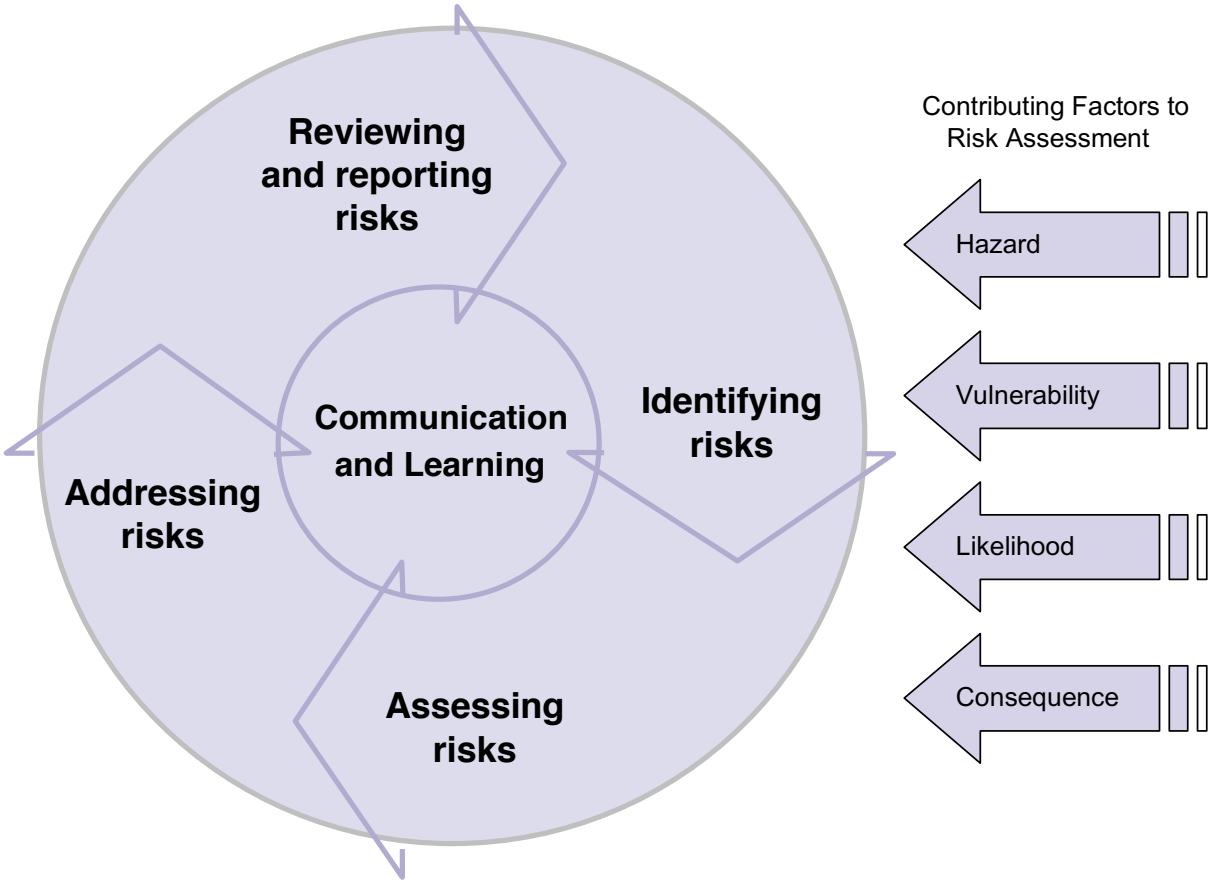
15.2 Our aim of minimising disruption to the delivery of essential services cannot be achieved unless there is a good understanding of what elements of critical infrastructure are vulnerable to the impact of flooding and the potential consequences of their loss. This, in conjunction with standards, will enable the appropriate measures to be developed by critical infrastructure operators to allow them to manage flood risk. This Chapter sets out how the Government and infrastructure operators can cooperate to deliver consistent risk assessment and target action based on proportionate standards.

The risk assessment and risk management context

15.3 There is a large amount of literature on risk, risk assessment and risk management. It is not the purpose of this Review to appraise the subject in detail but some key issues stand out.

15.4 Broadly, understanding risks to infrastructure involves assessment of the hazard, vulnerability of assets and the consequences of their loss. Each hazard has specific characteristics in terms of probability, frequency, intensity, coverage and duration. Failures of infrastructure associated with these hazards reflect the ability of assets and systems to absorb the impact and recover. It is not just the presence of a hazard that leads to a risk but also whether the asset is vulnerable. For example, a critical site might be in the flood plain but if it has a flood defence then the risk is reduced. The principles of the risk assessment cycle are set out in Figure 12.

Figure 12 – The risk assessment cycle and the contributing factors to risk.



15.5 Once a detailed picture of risk has been established, the next step is to work out which risks need to be tackled as a priority and take decisions about preventative action. This is necessary because of the virtually unlimited number of risks and the finite resources available to reduce those risks.

15.6 In policy terms, taking action to reduce any of the elements of risk – hazard exposure, vulnerability to the hazard or the consequence of loss – can help reduce the overall risk: relocating an asset away from the flood plain will reduce the hazard; providing flood defences will reduce the vulnerability; creating additional capacity in networks will reduce the consequences of loss.

What is currently known about risks to critical infrastructure?

15.7 At present, there is an incomplete national picture of the vulnerability of critical infrastructure to flooding. The focus of the existing Government approach is to minimise the impacts of loss of essential services through emergency preparedness and contingency, rather than through reducing vulnerability. In addition, the national flood defence programme is focused primarily on people and properties so while some infrastructure may be protected through community based schemes, it is expected that site owners and operators should assess and address risks themselves. Thus, while there is a core programme of reducing the overall consequences aimed at failure of critical infrastructure in an emergency, this does not enable the Government to understand the overall level of risk and make informed judgements about the level of preventative action that may be necessary.

15.8 The Government does consider natural hazards, including flooding, in its national risk assessment (NRA) process, which aims to identify risks to the UK as a whole and assess their likelihood and impact over a five-year period. Information gathered through the

NRA process is used to improve emergency preparedness for both security threats and natural hazards under the Civil Contingencies Act.

15.9 The Government has also set out its intention in the National Security Strategy to publish a National Risk Register (see previous chapter). This will describe the Government's assessment of the likelihood and potential impact of a range of different risks that may directly affect the UK with the goal of helping local authorities, people and communities, businesses and others prepare for emergencies. Flooding is explicitly recognised in the National Security Strategy and is expected to feature in the National Risk Register when it is published later this year.

15.10 We welcome the National Risk Register approach and believe that the National and Sector Resilience Plans, described in Chapter 14, for critical infrastructure could, if synchronised appropriately, provide the appropriate vehicle to inform the National Risk Register of the risks that natural hazards pose to critical infrastructure and the delivery of essential services.

15.11 It is difficult to say in any objective way whether critical infrastructure is any better prepared for flooding than a year ago. In the areas that were affected last year, critical infrastructure assets now have temporary defences in place and there is improved engagement between stakeholders, which has led to more developed response strategies for emergencies. Nationally there is greater awareness of the risk of flooding and this was highlighted in the level of preparedness demonstrated by critical infrastructure owners in response to the tidal surge risk in autumn 2007. However, while there are some sector specific programmes to assess the vulnerability of critical infrastructure to flooding, it is clear that there is no concerted programme of action to reduce risk nationally across all sectors.

The complexity of risk assessment

15.12 Understanding and taking action to mitigate flood risks is complicated by the tendency for the hazard, vulnerabilities and consequences to change over time. The result is that risk is dynamic. Our evidence shows a number of trends that are of importance to the debate on risk and risk reduction for critical infrastructure. Although these trends are not quantified, they suggest that risk is growing overall and that targeted action is needed in response.

15.13 Chapter 3 sets out some of the changes that are occurring in the frequency and severity of natural hazards as a consequence of climate change. In general, natural hazards, including floods, are set to increase with climate change. Climate change will result in two different effects. The first is gradually increasing mean temperature, which will eventually affect a wide range of infrastructure. The other relates to the effect on extreme weather events, including precipitation and floods, and is especially relevant to the functioning of infrastructure and the delivery of essential services. Climate change will introduce greater challenges for which we need to be prepared.

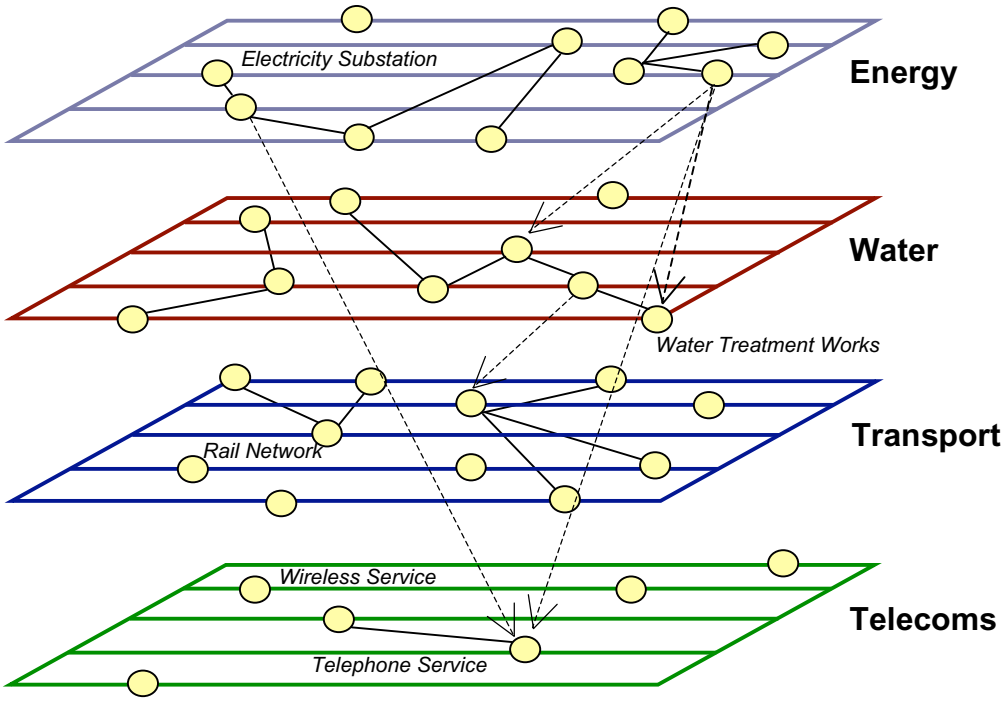
15.14 These changes are magnified by societies' increasing dependency on essential services. Few activities in society function without access to drinking water, electricity and telecommunications. Industry and households have overconfidence in infrastructure's 'always-on' availability, and have little preparedness for outages in the power network.[1,2,3] Increases in population also make it harder to provide emergency supplies in the event of loss of essential services such as drinking water. Consequently, the loss of an essential service has the potential to cause greater disruption, economic and social, than might have occurred in the past.

[1] Amin (2002) Towards secure and resilient infrastructure, Journal of Infrastructure Systems, 8, 67–75.
[2] Little (2002) Controlling cascading failure: Understanding the vulnerabilities of interconnected infrastructures, Journal of Urban Technology, 9, 109-123.
[3] Blostrom (2006) Third International Conference on Critical Infrastructure.

15.15 Economically, infrastructure operators, in particular the utilities, are striving for efficiency. This is a consequence of the need to be more competitive, which has been supported through the process of economic regulation and the successful Government policy of driving for improved efficiency.[4] However, while this makes good business sense and provides better value for utility bill payers, it drives out any spare capacity within networks that is assessed to be unnecessary, with the unintended consequence that redundancy can be lost. Several asset owners and regulators suggested that this loss of spare capacity means that, in the event of failure, there are fewer options for providing a continuation of service.

15.16 The issue of reduced redundancy has been exacerbated by the increasing interconnections between sectors, creating a complex system of interlinked networks: if one part of the system fails, it is likely to affect another part of the system.[5] Power, transport, communications and water for example, could all be badly affected by a loss of electricity supply, the latter causing a cascading effect into each of the others. This 'domino effect' was seen during the summer floods where loss of power caused water discharge pumping stations to fail resulting in further flooding, for example at Longlevens in Gloucestershire. The Cabinet Office Report "Risk: Improving Government's capability to handle risk and uncertainty" said "…….*interconnected infrastructure brings with it increased exposure to catastrophic events*….". The box on the following page describes these complex interactions and Figure 13 shows an example of just some of the interdependencies between elements of the critical infrastructure.

Figure 13 – A schematic outline of some of the interdependencies between critical infrastructure sectors. The direction of the arrow indicates the dependence[6]



[4] Kearns and Gude (2008) The New Front Line: Security in a Changing World, Institute for Public Policy Research.
[5] Auerswald (2006) eds. Seeds of Disaster, Roots of Response: How Private Action Can Reduce Public Vulnerability. *Cambridge University Press*.
[6] Adapted from Pederson, Dudenhoeffer, Hartley and Permann (2006) Critical Infrastructure Interdependency Modelling: A Survey of U.S. and International Research. Idaho National Laboratory Critical Infrastructure Protection Division. www.pcsforum.org/library/files/1159904563-TSWG_INL_CIP_Tool_Survey_final.pdf

What is the critical infrastructure system?

Critical infrastructure is often described as a 'system of systems', which functions with the support of large, complex, widely distributed and mutually supportive supply chains and networks. Such systems are intimately linked with the economic and social wellbeing and security of the communities they serve. They include not just infrastructure but also networks and supply chains that support the delivery of an essential product or service.

A 'system of systems' is most commonly described at national level, but they also operate locally. For example, the interdependencies of an oil refinery extend equally to the services that support the well-being and social cohesion of its local workforce, such as health, education and transport, which in turn employ local people, as they do to the shipping lanes that bring in the crude oil, the roads that take the fuel away or the telecommunications that link all these elements together. They are not bounded by the immediate geography of the refinery itself or necessarily linked directly to its operational role.

As a complex, interdependent 'system of systems', the challenges faced by critical infrastructure, whether from natural or man-made hazards, are shared across the entire system and its organisational structure and cannot be viewed in isolation.

15.17 While interdependencies between sectors can create vulnerabilities, we also recognise that interconnectivity within a sector can have benefits: for example, in their response to the EFRA Select Committee, Yorkshire Water outlined how the high levels of interconnectivity developed in response to the 1996 drought means that for around 95 per cent of their customers they can switch to an alternative water supply should their usual supply be lost. However, evidence from other water companies indicates that greater interconnectivity may also reduce resilience if the networks allow companies to use a small number of very large treatment works in the search for efficiencies. The appropriate balance needs to be achieved between efficiency and resilience.

15.18 Planning is also complicated because infrastructure assets are typically long-lived. Critical infrastructure resilience must consider risks that might arise over a long time, including hazards that occur infrequently, and which take account of dynamic factors such as climate change, population growth and socio-economic change. Increasingly the risks that we have to be prepared for in relation to disruption to essential services are becoming more complex and interrelated. The challenge is not only to develop a better understanding of the known natural hazards but also the changing and newly emerging vulnerabilities and consequences of loss as well as their interrelationships.

Coordination of risk reduction across sectors

15.19 The ownership of infrastructure is complicated. There is a mixture of privately owned companies, overseen by various economic regulators and government departments. This has created a patchy programme of hazard assessments, regulation and protection strategies within sectors.

15.20 The current Government approach to protecting critical infrastructure focuses on minimising the impacts of the loss of essential services through emergency preparedness and contingency planning. Government does not prescribe standards of protection or measures of resilience to reduce the vulnerability of critical infrastructure to flooding.

15.21 The legislative framework in place for risk mitigation, preparedness and emergency planning and response by Category 2 responders is created by the Civil Contingencies Act and sector-specific legislation. The utilities considered in this chapter are all designated Category 2 responders under the Civil Contingencies Act, 2004 and this places general duties on them to cooperate and to share information with Category 1 responders – emergency services and local authorities – to support the latter's risk assessment and contingency planning duties at the local level.

15.22 Sector specific legislation contains similar, complementary, provisions to plan for, prevent and respond to particular sector specific eventualities. The individual legal obligations are not consistent and there is a degree of uncertainty about the level of risk reduction required. A key issue is whether operators are able to identify and reduce vulnerabilities to an acceptable level themselves or whether a degree of Government advice and intervention is required.[7] Evidence that we have received from Category 2 responders indicates that the priority given to natural hazard risk mitigation varies within and between sectors. As a result, access to funding for resilience work can be variable.

15.23 While most sectors appear to have a national, government-led group to discuss emergency planning issues there is no targeted, consistent programme or forum that acts as a focal point to reduce vulnerabilities and increase resilience across all sectors. Our discussions with critical infrastructure operators have indicated that some companies and sectors have thought more about robustness and resilience than others, depending on the nature of the sector, market conditions, legislative requirements and past incidents.

15.24 The case study below is an example from last summer where two infrastructure assets in different sectors were exposed to exactly the same hazard but had very different outcomes. This resulted from the current approach to dealing with natural hazards, whereby individual sectors and asset owners are responsible for making their own judgements about the degree of risk mitigation.

15.25 These problems point to the need for a cross-sector programme to provide consistent approaches to understand and manage risks and also reduce the likelihood of knock-on failures between sectors. There are already some positive industry-led cross-sector coordination activities, such as the CNI Shared Capability Advisory Network (CNI Scan) and, since last summer's floods, the water and electricity industries have started a process of assessing the vulnerability of their assets to flooding. However, these sectors have highlighted that more central guidance is needed to assist this work and deliver consistency between sectors as well as within them.

CNI Scan

CNI Scan (Shared Capability Advisory Network) is a collaborative programme between public and private sectors that aims to build upon best practice security, risk and resilience planning in the CNI.

The programme objectives are achieved through a series of collaborative projects across the nine CNI sectors. The projects aim to capture and analyse good practice approaches of individual stakeholders through activities including horizon scanning and war games supported by scenario planning, visualisation and experimentation.

The learning generated from these projects feed development of system level best practice approaches spanning the complex web of people, processes, systems, technology and governance of the CNI.

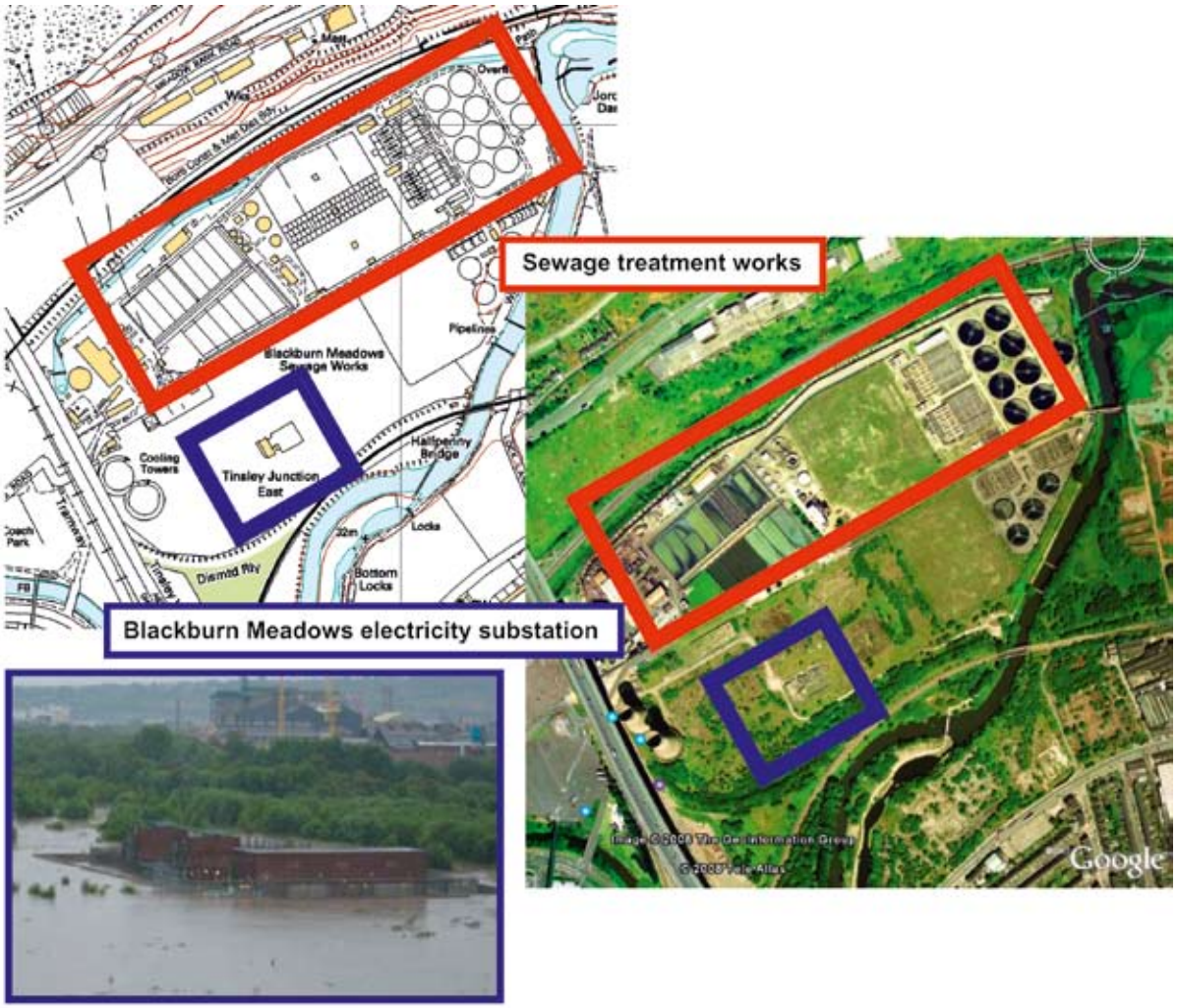
15.26 Thus there is no consistent and targeted focus for flood risk reduction across all the relevant infrastructure sectors. Within each sector the nature of risks and the degree of uncertainty differ. There is no objective process to understand risks and vulnerabilities and there are no specific standards of resilience to flooding. As a result, the Government does not understand the level of vulnerability and risk of infrastructure failure resulting from flooding.

[7] Walker (2008) The governance of the Critical National Infrastructure, Public Law, 323-352

An aerial view of Blackburn Meadows electricity substation in Sheffield, which was defended by a flood defence wall, unlike the neighbouring sewage treatment works

Blackburn Meadows is situated next to the River Don in Sheffield and was heavily flooded last summer. Two infrastructure assets are located on the site: a sewage treatment works and electricity substation.

The operator of the substation had undertaken an audit of its assets following the flooding of 2000 and invested in defences at a number of the highest risk sites. The effectiveness of the defences at Blackburn Meadows substation meant that flood water was largely kept out. However, the neighbouring sewage treatment works had not been defended. The result was that the sewage treatment works, which serves 500,000 people, flooded. Sewage flowed into the river for 5 days following the event. Repair costs are estimated at £17 million.



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International cross-sector risk assessments

The uncoordinated approach to the assessment and response to natural hazards in relation to critical infrastructure in England contrasts with the approaches taken in some other countries, which have recognised the importance of critical infrastructure to society and the potential issues related to widespread failure, and have therefore introduced a more coordinated approach to mitigating risks. The two examples described below take a structured approach to dealing with risk. By taking an explicit, systematic approach they have been able to improve their decisions and delivery on a rational and analytical basis. Improvements have been made in: providing systematic assurance that key risks are being managed effectively; identifying and coordinating handling of risks across departmental boundaries; assessing the risk landscape as a whole; and judging capacity for additional risk.

United States

The United States' interest in critical infrastructure protection dates back to the Oklahoma City bombing in 1995 and has developed over time. The current strategy, in the form of a National Infrastructure Protection Plan (NIPP), was launched in 2006 and tackles both security threats and other manmade and natural disasters.

The NIPP provides a coordinated approach to critical infrastructure protection, setting out national priorities, goals and requirements for effective distribution of funding and resources to help ensure that the US government, economy and public services continue in the event of a terrorist attack or other disaster. Protection includes a wide range of activities such as hardening facilities, building resiliency and redundancy, incorporating hazard resistance into initial facility design and initiating active or passive countermeasures.

The Netherlands

The Dutch have also chosen to take a more systematic and coordinated approach to tackling potential disruption to critical infrastructure. They have established a project, Protection of Vital Infrastructure ('Bescherming Vitale Infrastructuur'), which aims to develop an integrated package of measures to protect infrastructure in both the private and public sectors from security threats, accidents and extreme natural phenomena.

The project consists of several steps: a quick-scan analysis of the Dutch critical infrastructure, stimulation of a public-private partnership, threat and vulnerability analysis, and a gap analysis of protection measures. These measures, intended to be embedded in the regular operation of business and government, aim to reduce the occurrence of large-scale disruption and prepare for the consequences of failure or disruption.

Understanding flood risk to critical infrastructure

15.27 Reducing flood risk to critical infrastructure must be about prioritisation. The probable result of trying to protect everything is that nothing will be protected adequately. Efforts related to risk reduction must be based on an assessment of the risk situation.

15.28 The failure of elements of our critical infrastructure has potential consequences for 100,000s or millions of people across the country. Given the scale of the risks, the Review believes that it is vital that the Government should have an understanding of the risks that society is exposed to as a result of failure of critical infrastructure from flooding. This will enable Government and the relevant sector to: understand the baseline vulnerability; allow an assessment of progress and whether further action is needed; and facilitate coordination of risk assessment and management across sectoral and Departmental boundaries. It will also fit with the aim of the National Security Strategy to "…*understand risks better, and act early to prevent them where we can*…".

15.29 The new systematic programme for reducing risk across critical infrastructure,

as agreed by Government in response to our interim report, should be based on an understanding of the flood hazards and vulnerabilities to those hazards. Vulnerability occurs at the local level and needs to be understood and mitigated at the local level. It is therefore appropriate for critical infrastructure operators to undertake the process. However, it is essential that this is carried out consistently within and across sectors, which will require central guidance from Government.

15.30 In the short-term, exposure to flood hazard can be assessed by infrastructure operators by mapping their assets onto Environment Agency coastal and fluvial flood maps. This mapping exercise should also take into account surface water flooding using the surface water "hot spots" map recommended in Chapter 4. This assessment of risk can then be further refined by establishing the consequence of a particular asset failing, that is, the 'criticality' of the asset. The ranking of criticality is already being undertaken by the Government using a system that is based on the principle that 'criticality' is defined in terms of the extent to which its loss will affect the delivery and/or integrity of essential services. This approach is as equally applicable to natural hazards as it is to national security threats.

15.31 The Review recognises that most risks cannot be eliminated altogether. Risk management will require judgements to be made about what level of residual risk is acceptable. These judgements should consider not just the asset providing the service but also the consequence of the loss of that service, and this principle should be taken into account in the appraisal of flood defence projects undertaken by the Environment Agency.

15.32 As a result of last summer's floods, the water and electricity sectors have already started a process of assessing the vulnerability of their assets to flooding. The goal is to be able to identify priorities and propose measures for risk reduction. The Review welcomes the proactive approach taken by both sectors.

Asset Resilience to Flood Hazards: Ofwat's development of an analytical framework

Since the water industry's experience of the 2007 floods, Ofwat have taken the opportunity to review current industry practice for assessing the resilience of assets to flood risks. The report develops an analytical framework for assessing the risk from flooding of critical assets and identifying cost-beneficial resilience options. The intention is that the framework will enable water companies to establish the risks from extreme rainfall events under current and changing climate conditions and consider adaptation options for critical assets in a consistent manner, in order to rank the value of potential investments. Finally, flood hazard specific guidance on the application of cost benefit analysis for justifying potential asset investments is provided.

The framework supports:

- quantification of asset criticality in relation to service criticality;
- assessment of risks resulting from flooding of critical assets; and
- cost benefit analysis of related investment proposals.

The framework considers flooding events that have relatively low probability (< 1 per cent per year) and relatively high consequence of failure, in terms of service disruption. As such, the priority is large, discrete assets (treatment works, pumping stations, communication centres, major pipelines), because the failure consequences could be severe. The effects considered are those that result in loss of service to the customer and environment such as water supply interruption caused by shutdown of a water treatment plant, pollution of a watercourse due to inundation of wastewater treatment processes, contamination of the water supply due to pipeline damage and ingress of flood water.

Energy Networks Association (ENA) Substation Resilience to Flooding report

ENA is the trade association for UK energy transmission and distribution licence holders and operators, acting in the interest of its members in the energy 'wires and pipes' sectors.

The electricity network comprises a mixture of overhead lines and underground cables that generally are not susceptible to flooding. However, substations on the ground can be susceptible and it was the flooding of substations in Yorkshire and Gloucester that caused the power failures experienced in 2007.

After the 2007 floods, in recognition of the vulnerability of electricity substations to such incidents, the Energy Minister requested ENA to lead a comprehensive assessment of electricity substations' resilience to flooding and identify steps that could be taken to mitigate current and future risks. The Task Group included representatives from all the Electricity Networks companies, Department for Business Enterprise and Regulatory Reform, Ofgem, and the Environment Agency.

The ENA report considers primary and higher voltage substations, as distribution substations serve a very small geographic area, and if flooded, the customers they supply are also normally flooded and unable to take supply of electricity

The report describes a number of steps in a cross-sector systematic approach to vulnerability and risk assessment, which will be used to inform investment decisions to ensure the resilience of existing substations against such risk. They include:

- identifying all substations (within scope) in the flood plain;
- establishing flood risk assessment for each substation to identify predicted flood depth and other key factors to establish which substations are 'at risk';
- for all those 'at risk' sites, the identification of the flood impact for that particular site, including potential societal impacts;
- establishing if the site is, or will be, protected by a flood protection scheme sponsored by the relevant local authority;
- if not, establishing the most appropriate protection solutions and the cost of protection works for each substation;
- proposing an appropriate solution based on the levels of flood risk to be considered and the implications for investment;
- reviewing information from the Environment Agency and Scottish Environment Protection Agency on flash flooding as it becomes available.

15.33 The challenges involved in developing the baseline information necessary to undertake the hazard vulnerability analysis should not be underestimated. For example, following the Carlisle floods of 2005, the then Department of Trade Industry and electricity industry started a process to assess the vulnerability of the electricity transmission and distribution network to flooding. However, the Review understands that the process of mapping vulnerability was hampered by the lack of flood depth information. Although more and better quality information is increasingly available, there is still a need for improved flood depth data for the current work. This is expected to be achieved through the Environment Agency's new topography data and modelling work, being undertaken as part of its commitment to the European Floods Directive.

15.34 The Review recognises that gaps in the information available need to be filled, particularly in relation to the most critical assets. The current availability of up-to-date information on both flood hazards (likelihood) and critical infrastructure criticality (consequence) make the approach described above, combined with site-by-site consideration of vulnerability, an ideal short-term strategy for prioritising action to reduce vulnerability to flooding.

RECOMMENDATION 51: Relevant government departments and the Environment Agency should work with infrastructure operators to identify the vulnerability and risk of assets to flooding and a summary of the analysis should be published in Sector Resilience Plans.

Setting standards as part of a national campaign

15.35 The approach proposed above will allow some rapid progress to be made in identifying and prioritising the most significant risks. However, in order to ensure a consistent approach to risk reduction within and across sectors, the Government needs to be able to articulate a maximum level of risk which is acceptable on behalf of society.

15.36 The Review believes that Government should set clear, unambiguous standards to reduce the vulnerability of infrastructure and essential services. The Review does not feel that mandatory, inflexible standards would be appropriate at this stage, as these could hinder fast-paced industries and may simply become obsolete by the speed of change. Instead, we feel the Government should be seeking to develop strong relationships with industry and regulators and to introduce sector-specific plans that are based on non-mandatory standards. Of course, if non-mandatory standards are not embraced, consideration will need to be given to the option of a regulatory approach.

15.37 Responses to the interim report strongly supported the establishment of standards by government in order to provide certainty over the level of protection required within and between sectors.

15.38 The Review believes that in the short term the Government should use the 'reasonable worst-case' scenarios derived from the NRA process to determine the level of flood hazard to drive risk reduction. The worst case scenarios for flooding are based on flooding events of the scale experienced in 2007, and the Review believes that a new standard of protection should ensure continuation of supply of essential services during such an event.

15.39 While the precise scale and nature of these events varies, and extreme flows can be difficult to measure accurately,[8] the Review considers that for the purposes of building resilience in the critical infrastructure, a minimum standard of 1 in 200 annual probability would be a proportionate starting point.

15.40 However, the Review notes that Planning Policy Statement 25 (PPS25), which sets out the Government's national policy on land use planning development in relation to flood risk, allows new 'essential infrastructure' assets to be built in 1 in 100 fluvial flood zones or 1 in 200 coastal flood zones if an 'Exception Test' is passed and the asset is '*designed and constructed to remain operational and safe for users in times of flood*'.[9]

15.41 The Review would welcome Government aligning the standards of resilience across both existing and new critical infrastructure by updating the Practice Guide Companion to PPS25. This should state that essential service assets within PPS25 designated flood risk zones 2, 3a and 3b (see Table 6) need to be designed and constructed to remain operational and safe for use (including any necessary access and egress) in at least a 1 in 200 annual probability flood event.

[8] Marsh and Hannaford (2008) The summer 2007 floods in England and Wales, National Hydrological Monitoring Programme, Centre for Ecology and Hydrology

[9] www.communities.gov.uk/planningandbuilding/planning/planningpolicyguidance/planningpolicystatements/planningpolicystatements/pps25/

Table 6: PPS25 Classification of land according to flood risk

Zone Name	Flood Risk Classification	Annual probability of River Flooding	Annual probability of Coastal Flooding
Zone 1	Low Probability	less than 1 in 1000	less than 1 in 1000
Zone 2	Medium Probability	between 1 in 100 and 1 in 1000	between 1 in 200 and 1 in 1000
Zone 3a	High Probability	1 in 100 or greater	1 in 200 or greater
Zone 3b	The Functional Floodplain	1 in 20 or greater (land where water has to flow or be stored in times of flood)	

15.42 The Review also notes that PPS25 currently considers water treatment and sewage treatment assets separately from other essential services, classifying them as 'Less Vulnerable'. Based on the evidence of last summer, this would appear to be inappropriate. **The Review would welcome all utilities and transport being classified as essential services within PPS25, and therefore being subject to the same planning conditions in terms of flood risk assessment.**

15.43 Priority action for applying these standards to existing critical infrastructure should be focused on those assets defined by Government as critical for the purposes of protective security. The Review understands that the process of re-assessing criticality is ongoing but believes the total number of critical assets across the utilities (water, electricity, gas, and telecommunications) and transport (road and rail) sectors will be in the low hundreds.

15.44 In addition, priority should be given to single points of failure. The interim report considered the importance of single points of failure, based on the example of Mythe water treatment works, which is one of five in Severn Trent Water's region that represent a single point of failure resulting in a complete loss of supply to a significant number of customers; and that in only one case had a specific scheme been developed to ensure supplies in the event of failure. The interim conclusion was that single points of failure and complete loss of assets should be explicitly considered in risk assessment and contingency planning. We would now go further: we consider that, in taking this work forward, the Government should provide particular weighting for such single points of failure and identify them for priority action to increase resilience.

RECOMMENDATION 52: In the short-term, the Government and infrastructure operators should work together to build a level of resilience into critical infrastructure assets that ensures continuity during a worst-case flood event.

15.45 Action at the local level may vary in order to achieve this resilience standard, taking into account the particular vulnerability of assets and the most cost-beneficial option to minimise disruption. For example, in the interim report we pointed to three ways in which resilience might be improved:

- **relocation of the asset.** This would involve moving high-criticality assets out of the floodplain altogether and into a low-risk area;
- **improving the robustness of flood defences.** This could include permanent defences for high-risk sites through to demountable or temporary defences for sites at medium risk; and
- **increasing resilience of the service or asset.** This may involve making the service more resilient by building additional network connections and/or making the asset more

resistant to flooding through waterproofing key components or raising them out of harm's way.

15.46 While action should be progressively extended to other sectors of the critical infrastructure, we would expect standards to be proportionate to criticality, with the less important sites being subjected to only business continuity requirements (discussed in Chapter 17). Crucially, the same standards should be applied across all sectors at the same level of criticality.

15.47 In the longer term, the Review sees merit in a more holistic approach to standard setting, which would be service focused, rather than hazard focused. We see value in a measurable index of resilience being developed that may comprise several vulnerability and resilience parameters such as level of interconnectivity, redundancy and consequence of loss. This approach would be intended to inform how resilience can be improved across critical infrastructure networks, rather than focusing on a particular hazard and individual assets. Such resilience standards should be embedded into the planning procedures for future critical infrastructure.[10,11]

15.48 In order to ensure that the long-term approach is well informed, a systems approach to building resilience should be adopted, including research, analysis and policy development of risk determination, risk communication and economic regulation and incentives. To achieve this, it will be essential to engage with a wide range of government departments, industry sectors, economic regulators and academics to achieve a forward-look approach to risk assessment beyond the five year scope of the NRA process.

15.49 The Review considers the activities in the longer term could include:

- expanding the range of hazards considered beyond flooding;
- identifying all sources of long-term natural hazard information in order to inform decision making;
- reviewing economic framework and associated incentives;
- setting out expectations for business continuity service levels;
- considering options for 'designing in' resilience to new assets;
- other key considerations such as appropriate application of cost-benefit analysis (to include the impact of loss of service) and issues of planning permission.

[10] Garbin and Shortle (2007) Measuring resilience in network-based infrastructure. Critical thinking: Moving from infrastructure protection to infrastructure resilience, CIP Program Discussion Paper Series, George Mason University.

[11] Moody (2007) The need for resiliency at the corporate level. Critical thinking: Moving from infrastructure protection to infrastructure resilience, CIP Program Discussion Paper Series, George Mason University.

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Delivering greater resilience in critical infrastructure

This chapter explores issues related to the delivery of greater resilience in critical infrastructure. It contains sections on:

- economic regulation;
- incorporating resilience into regulators' and utilities' activities;
- funding additional resilience in the privatised utilities;
- incentivising greater resilience;
- better co-ordination across sectors; and
- enhancing the resilience of the road transport network.

Economic Regulation

Introduction

16.1 Our analysis of essential services has focussed on the facilities, systems and networks that are provided by Category 2 responders under the Civil Contingencies Act 2004. These include the privately owned assets of utilities companies and the state owned road network.

16.2 The privatised utility companies' obligations, investments and prices are overseen by the economic regulators due to their position as industries with vital monopoly networks or network elements. This is true of electricity and gas (overseen by Ofgem), water (overseen by Ofwat), telecommunications (overseen by Ofcom) and railways (overseen by ORR). The strategic road network is publicly owned and not subject to the same economic regulation. For this reason, roads are dealt with separately later in this chapter.

16.3 The interim report concluded that the economic regulatory frameworks provide an obvious route for funding work to reduce the vulnerability of infrastructure assets owned by the private sector. They also provide a framework within which standards can be set, incentives provided and progress monitored.

Economic regulation in practice

The main responsibility of the economic regulators is to ensure that customers are provided with a secure supply of acceptable quality, at the minimum price. This includes a rate of return to shareholders that allows privately owned and financed companies to meet their investment needs.

In the UK, companies agree 'overall revenue allowances' in advance with their economic regulators over five-year planning periods. This may be for total investment (as with the water companies) or just for all or some part of network investments in pipes, wires and similar (as with electricity, gas and telecoms). The companies' investment plans take account of expected demand, likely efficiency improvements, quality standards and other factors, including changes in UK government or EU-mandated standards. If companies can meet their obligations with lower investment or operating costs, they can keep the revenue savings for up to five years; if their expenditures exceed the projected expenditures, they earn a lower rate of return than projected.

The investment plans of the regulated utilities – and of roads – include the costs of environmental requirements agreed with the Environment Agency and of health and safety regulations as agreed with the Health and Safety Executive. These costs, which are subject to prior cost-benefit appraisal, are treated as an allowable cost by the economic regulators in setting revenue targets and projected capital and operating costs at the five-yearly regulatory reviews.

In contrast, there are no *explicit* standards for the resilience of infrastructure to flooding and similar events. The resilience of infrastructure assets is usually an *implied* item in the projections for operating and capital expenditure, for example, as a guaranteed service standard in the water supply industry.[1]

16.4 In response to the interim report, the Review received a number of submissions from utility companies supporting the principle that improvements in resilience should be considered more explicitly as part of the existing regulatory process. Views were also expressed by the Government, regulators, consumer bodies and a number of utilities who agreed with the principle but set out the need for effective analysis to ensure that the benefits of any future improvements were balanced against the costs.

16.5 The Review explored a number of issues related to how economic regulation could help improve resilience, including holding discussions with a wide range of people including utility companies, regulators, financial specialists, academics and other experts, as well as reviewing the literature.

Efficiency at the expense of resilience

16.6 Utility regulation has focused primarily on monopoly issues and their implications for prices and quality. The general objective of economic regulation has been to promote competition where possible and to regulate where it is not. The evidence is clear that the Government's policy on economic regulation has successfully delivered by driving up efficiencies and reducing costs to customers. It has also facilitated billions of pounds of investment in improving customer service and, in the case of the water and energy industries, on improved environmental outcomes. In addition, regulators have acted with the regulated companies, where economically justified, to maintain and improve quality standards and day-to-day reliability. This will have contributed indirectly to resilience.

16.7 The events of summer 2007 have focused attention on other aspects of the operation of these utilities – their resilience to flooding events. Some commentators have suggested, that while efficiency and underlying performance have been improved, it may have been at some loss of resilience to low probability, high consequence events such as flooding.[1,2] For example Helm states: *'…that*

[1] Helm, D., February 2008, Utility Regulation and Critical National Infrastructure, www.dieterhelm.co.uk
[2] de Bruijne, et al., 2006, Assuring high reliability of service provision in critical infrastructure, Internation Journal of Critical Infrasstructure, Volume 2, Number 2/3

critical national infrastructure has not received much attention and this comparative neglect has begun to be reflected in the responses to a series of events – from terrorist threats [to]...the impacts of flooding'.

16.8 Discussions with a number of utility companies in the water and electricity sector during the course of the Review has suggested that the drive for efficiency may have removed some of the redundant capacity in the networks, which would make them more vulnerable than otherwise. For example, utilities companies have replaced large numbers of small assets with fewer, larger assets in order to become more efficient. While there are clear benefits for consumers and the wider economy in the form of reduced costs, a number of commentators believe that this step has increased public vulnerability as the consequences of failure will be much more significant.[3]

16.9 The Review found no clear quantitative evidence that overall resilience has declined under the current regulatory approach. Nevertheless, the events of summer 2007, and other events such as the Carlisle flooding in 2005 and the November 2007 near miss coastal surge show, firstly, that there is a clear need for improvement in the resilience of utilities to low probability, high consequence events where this can be demonstrated to be necessary; and, secondly, that stronger incentives should be placed on the utilities to achieve this. The predicted trend of increasing likelihood of high consequence events such as flooding[4] mean that current levels of resilience are likely to be insufficient for the future.

16.10 We agree with the ENA's assessment that whilst weather and flooding together accounted for around the same level of outages as aging equipment, the summer 2007 floods demonstrated the potentially catastrophic one-off loss that people affected found so difficult to accept.

Taking account of low likelihood, high consequence shocks

The Energy Networks Association (ENA) report that during the period April 2004 to December 2007, which included the exceptional level of flooding in 2007, losses of supply due to flooding accounted for approximately 4 per cent of the total customer minutes lost at high voltage and above. By comparison other weather events such as lightning strikes and high winds accounted for some 22 per cent and ageing equipment accounted for about 25 per cent of the total customer minutes lost.

The ENA have said that *'In view of this, expenditure to reducing the overall level of customer minutes lost is unlikely to be targeted at flood risk. However, the societal impact of electricity supply loss during a flooding incident, in particular the possibility of a large concentration of consumers being disconnected in a single incident will provide a substantive focus for any additional investment to improve resilience to flooding'* .

This shows that, since flooding is a relatively rare event, it also is a relatively low cause of average annual disruptions in supply. However, as the summer 2007 floods demonstrated, while these events are low likelihood, when they do occur they can be potentially catastrophic to a large population of people. We need to have the right framework in place to ensure the utilities make sufficient provision to protect against such events.

16.11 In economic terms resilience to flooding or other extreme weather is an 'externality'. While utility companies are concerned with resilience for longer term reputational commercial effects as well as for short term supply consequences, it is doubtful that they will take into account the full social costs and benefits of resilience to low probability, high

[3] Egan, M., 2007, Anticipating future vulnerability: Defining characteristics of increasingly critical Infrastructure-like systems, Journal of Contingencies and Crisis, Volume 15, Number 1

[4] Foresight Future Flooding, 2004, Office of Science and Technology

impact events. For example, given the low overall impact of flooding on annual average outages, there is not likely to be a strong enough incentive to ensure sufficient provision and investment in response without explicit Government intervention. Defra Ministers said, when giving evidence to the House of Lords Select Committee on Regulators, that:

> *"if you have economic regulation that is focused narrowly on the economics you miss all the important externalities, such as the impact on the environment ..."*

16.12 As for other externalities, such as the environment and health and safety, we are proposing that the Government set out explicit standards against which investments should be planned and appraised (see previous chapter).

What is an externality?

An externality occurs when a decision by people involved in an activity causes a cost or benefit to a 'third party' who were not involved in the original decision and whose interests were not taken fully into account. Because the 'third party' costs and benefits do not form part of the calculations of the people deciding to go ahead with the activity, they are not fully reflected in the price and are a form of market failure.

For example, air pollution may be generated by some manufacturing processes which has adverse consequences on others who live down-wind and whose interests were probably not taken into account.

In general, the best way of correcting for externalities is to require the costs and benefits to the third parties to be included (internalised) into the calculations of those engaged in the economic activity. This can be done in many ways including: the use of classic regulatory controls, by economic instruments and by voluntary agreements between the parties. An example where internalising costs has been used to good effect has been the regulatory induced reductions in sulphur dioxide emissions from power stations over the last 20 years

Incorporating resilience into regulators and utilities activities

16.13 Utility regulators are 'independent' of government with each having a series of primary and secondary duties in legislation. Primary duties tend to be general and focus on promoting customers' interests and ensuring that efficient utilities can finance their functions. Secondary duties cover a range of considerations that regulators must have regard to, such as sustainable development. Balancing the tensions between these objectives is part of the regulators' role. The post-privatisation focus on monopoly issues has led a number of commentators to conclude that resilience for critical infrastructure will not be provided for without intervention.[5,6]

16.14 In the opinion of the Review the resilience of critical infrastructure to low probability, high consequence events is a fundamental point of public interest. The statutory framework within which the economic regulators work includes a range of terms including 'consumer interest', 'public interest', and 'citizen interest'. The recent House of Lords Select Committee Report provides a detailed examination of what this means in practice. The Report concluded that the *"regulators can therefore be given specific duties that are considered by Government and Parliament to represent the public interest ..."* . In its response to the Report, Government agreed that it was for *"Government and Parliament collectively to define the public interest and the specific duties which flow from it, and for regulators to decide how best to satisfy ... those duties in accordance with its statutory framework".*

16.15 In line with the House of Lords Report[7] and the Government's response on 'public interest' and duties that flow from it, the Review believes that regulators should be given an explicit duty to take resilience into account, along with guidance to ensure clarity and that it is given appropriate regard. This would ensure that the issue was incorporated into price reviews and providing allowances in the operating and capital expenditure plans

[5] Helm, D., February 2008, Utility Regulation and Critical National Infrastructure, www.dieterhelm.co.uk
[6] Lewis, J.A., 2005, Cyber security regulation in the United States, Telecommunications Policy, Volume 29, Number 11
[7] House of Lords Select Committee on Regulators, First Report of Session 2006-07: UK Economic Regulators

of the utilities on a sustainable basis. Indeed regulators may in turn consider agreeing with the companies a specific licence modification to improve the resilience of critical assets and networks. The House of Commons Environment, Food and Rural Affairs Committee report into the floods[8] included a recommendation that a specific duty be placed on utilities companies to ensure the resilience of the supply system. However, it is also essential that, in making changes to improve the level of provision for resilience, regulators ensure that companies are not incentivised or allowed to make enhancements that do not represent good value for money.

16.16 The Review recognises that it may take some time to legislate for a new duty, but would welcome the Government issuing interim guidance to the regulators in the form of resilience obligations to be met by utilities companies that are based on the Government set standards to ensure essential services are appropriately protected against low likelihood, high consequence events. These could then be implemented via existing licence procedures. This should happen in time to inform the next price review processes.

RECOMMENDATION 53: A specific duty should be placed on economic regulators to build resilience in critical infrastructure.

Funding additional resilience in the privatised utilities

16.17 Action will be required in order to meet the standards for resilience, including protection. The expectation would be for companies to develop options for a programme of measures and submit this to the economic regulator for approval. In particular, we would expect companies to prepare plans specifying how in practice they intend meeting the standards for their defined criticality band.

16.18 It would not be for the economic regulators to construct these plans; it is for the companies to do so. The role of the regulators is to discuss and eventually approve both the plans and then, subsequently, the agreed capital and operating expenditures necessary to implement them. This will:

- maximise the use of specialist knowledge that companies have to target investment, developing efficient solutions to resilience problems;
- give companies strong incentives to devise improvements in technology, management and organisation to meet the standards more efficiently; and
- define the risks that the regulated companies must manage but where the regulator supervises and approves the risk approaches and models adopted by the regulated companies and then monitors and enforces their operational use by the companies.

16.19 As indicated earlier, this approach builds on current models of how utility regulators such as Ofwat and Ofgem handle environmental rules that are set by the Environment Agency. The agreed obligations (justified by cost-benefit analysis and other information) become part of companies' licence conditions which provides monitoring and enforcement powers. They are also included in the appraisal and approvals of companies operating and capital expenditure proposals.

16.20 The Review believes that the goal should be to try and optimise investment to get the greatest value for money. Cost-benefit analysis will be an important element in assessing what is acceptable to both private and public sectors. The first important test is whether the benefits of action outweigh the costs. Not all measures identified to improve the resilience of infrastructure or services will pass such a test. Hence, in some cases, it may be more appropriate to take lower cost options or simply prepare for unexpected events through business continuity and emergency planning. Even if the cost-benefit test is passed, questions of affordability and prioritisation will still arise.

[8] House of Commons Environment, Food and Rural Affairs Committee, Fifth Report of Session 2007-08: Flooding

16.21 The Review recognises that investment in resilience will need to take a phased approach over a number of periodic reviews. This will ensure that investments in improvement are both affordable and realise an optimal return by taking account of priorities, cost-benefit analysis and asset replacement strategies.

Incentivising greater resilience

16.22 By creating incentives, the Government and regulators can encourage certain types of behaviour. Ofgem have developed a set of incentives on quality of performance by all regulated companies (e.g on number and duration of supply interruptions). This included rewards for out-performance as well as penalties for under-performance. Figures indicate that there has been significant improvement in underlying performance since the introduction of the incentive scheme. Ofwat also has standards for water quality as well as leakages.

16.23 The Review believes that operational targets could be delivered for flooding and/or natural hazard resilience that allow out-performance to be financially rewarded and under-performance to be penalised. This would be analogous to current treatment of other quality standards e.g. by Ofgem.It may be that rewards or penalties could be attached to performance in business continuity or emergency exercises.

16.24 We suggest that these and other methods of incentivising resilience improvements are best considered by the economic regulators in discussion with the companies, consumer panels and other relevant parties.

Severe weather clauses

16.25 Regulators impose economic sanctions on utilities for prolonged disruptions to service. For example, in the water industry the Guaranteed Service Scheme requires water companies to pay compensation to customers for failure to supply. However, the regulations also contain a severe weather clause, which allows companies to claim exemption from paying compensation in the case of an event such as last summer's floods.

16.26 The rationale for this exemption is to provide a 'safety valve', so that companies are not liable to pay compensation in circumstances that are beyond their reasonable control. Other exemptions include unforeseen circumstances and industrial action. Interestingly, water companies do have to pay compensation where essential household water supplies are interrupted as a result of restrictions authorised by emergency drought orders. However, because of the lead-time, problems can be foreseen and planned for.

16.27 In the water industry, there are no formal criteria setting out what constitutes 'severe weather', leaving it to the discretion of the regulator whether or not to allow the exception. This means that there is no clear signal about the level of performance expected in relation to severe weather events. Had the severe weather exemption not been applied, Severn Trent Water would have been liable for approximately £35 million in compensation. The result of a lack of robust economic sanctions during severe weather events may have had a perverse effect on resilience. Thus, when water companies are considering the risks to their business and/or undertaking cost-benefit analysis for enhancements, there is no clear incentive to improve the resilience of assets to low probability, high consequence events.

16.28 The electricity regulator Ofgem has taken action in this area. Following wind storms in 2002, Ofgem realised that it needed to improve resilience by taking steps to restore the supply of electricity to customers cut off by bad weather more quickly. Following an industry review, Ofgem decided to increase the incentives to restore supply quickly and make distribution companies liable to compensate customers for prolonged loss of service for all but the severest of storms. Unlike water, the electricity sector does have defined service thresholds for what constitutes severe weather payments. This provides clarity on the rights of customers and the obligations on companies, sending stronger signals as to the level of service required.

16.29 The Review did not have sufficient time to come to a conclusion on a definitive solution to this issue, but the Review would welcome Ofwat examining whether stronger signals can be provided by setting out what constitutes severe weather for the water industry.

Defining an agreed set of expectations

EDF Energy told the Review that the strengthened Guaranteed Service Standards that came in following the severe storms in 2002 to improve compensation arrangements for loss of supply due to severe weather, has had a number of impacts which have acted to improve resilience.

The standards define restoration times for given sizes of event and a common framework and standards for customers across all regions. The company said: *'this has focused our management of events on meeting these expectations' and that 'much of this has come from there being an agreed set of expectations about what level of service should be delivered and what the customer can expect if this is not achieved.'*

Valuing the benefits of greater resilience

16.30 The events of summer 2007 underlined the severe impact on society of a prolonged loss of supply of essential services to a large population. This can be potentially catastrophic, particularly where the loss is combined with the failure of other infrastructure or other aspects of the emergency response. For example, in the summer 2007 events, the loss of electricity supply to large concentration of people who had already lost mains water was only just narrowly averted – if it had happened it could have extended the emergency caused by the flooding to something much bigger, the evacuation of hundreds of thousands of people and, in turn, to potential social unrest and risks to public health.

16.31 However, although cost benefit tests are the appropriate method of ex ante appraisal, they may well currently underestimate not only the full impacts on customers but fail to take proper account of the costs to the wider economy and society resulting from large-scale emergencies. Valuing the benefits of more protection to large scale emergencies and the catastrophic losses that they cause can be very difficult and great care must be taken if it is to be done adequately.

16.32 The economic regulators and utilities companies' use of 'willingness to pay' measures seems appropriate for relatively minor and/or short duration interruptions to supply. This is, not least, because consumers are likely to have experienced such interruptions. However, we have doubts about whether this tool can incorporate the impact of large-scale events where 100,000s of people are without essential services for extended periods. They cannot be readily scaled up – a week long interruption to water or electricity supply that causes a major civil emergency, puts major industrial facilities out of commission, or which ruins all the food stored in household deep freezers has a far greater cost than a simple multiple of the cost of a six-hour interruption that has little impact beyond inconvenience.

16.33 More significantly, because very few people have any experience (let alone recent experience) of the consequences of extreme weather events, it is very difficult for most people to set a value of the cost of avoidance.

16.34 Standard 'willingness to pay' and similar techniques deal badly with unusual and extreme risks, particularly when difficult ethical issues such as the value of peoples' lives are involved. Hence, it would seem sensible for 'willingness to pay' methods as currently used in cost-benefit analyses of utilities' proposed expenditures to be supplemented by additional and better-suited information so that the actual costs of the worst case credible scenario can be properly accounted for.

Case study: Risks from major electricity supply interruptions

The impact of the loss of electrical power extends well beyond the immediately obvious consequences. For example, loss of traffic lights can lead to traffic chaos and motorway gridlock, which will have a knock-on effect on peoples ability to go about their daily lives as well as on the emergency services' ability to respond. The mobile telephone system will become overloaded and probably fail completely within eight hours. Domestic central heating – even gas fired – will fail as boilers and central heating pumps require power.

Water supplies and sewerage will be affected to varying levels. Petrol pumps, tills and ATMs fail, radio and TV broadcasts would stop. There is an increased risk of fires as people resort to using candles and cooking over fires. Only those sectors equipped with stand-by generators and fuel supplies would be able to continue for a time.

In summer 2007, flooding at Walham substation in Gloucestershire – which would have led to power loss to 500,000 people – was only averted by the deployment of 250 military personnel and temporary defences which were only available because they had not been used at Upton-upon-Severn.

16.35 Other possibilities for measuring the benefits of resilience include more sophisticated survey methods that include attempts to take account of the consequences for whole areas, the wider economy and society as well as the costs on individuals and specific firms. Simple questionnaire approaches are not likely to be as useful as 'citizen jury' and other expert-led focus group techniques. Participants are exposed to a variety of different approaches and views; they can pose questions to the experts and debate amongst themselves; and the final verdict can be compared with the initial position. When these work well and the issues (and trade-offs) are clearly spelled out, such techniques can provide useful, informed guidance on 'willingness to pay'. The Review has heard of an example of where one utility company are developing new techniques to take better account of the value of avoiding large-scale service failure and consequential civil emergency. Economic experimental approaches may also be potentially useful.

Deliberative approaches to understanding consumers' views

Deliberative approaches to understanding consumers' views have been used by the Consumer Council for Water (CCWater), particularly where it has been important to get behind consumers' views of issues, or where there are difficult trade offs involved.

For example, in its work on fair charging for water, CCWater has involved participants by first meeting in small groups at the start of the process. They were presented with a range of informative material to guide them in self-deliberation over the next one or two weeks. Groups were then reconvened in workshops across England and Wales where participants engaged in group-deliberation around the key themes. The research provided real insight into consumers' perspectives, for example revealing little understanding of how water bills are calculated and what they are actually paying for; concerns over perceived excessive water industry profits and its monopolistic position; strong and swift rejection of social tariffs; little appetite for alternative metered tariffs, and rejection of private subsidy for those who are vulnerable.

16.36 The Review would welcome economic regulators working with companies to develop new tools to improve and complement the 'willingness to pay' studies to incorporate the costs of large-scale disruption into the decision-making process.

Better co-ordination across sectors

16.37 The problems that can arise as a result of vulnerabilities at interfaces between networks and the gaps that can occur between boundaries of organisational responsibilities are well known. Recent studies and reports emphasise how, since the 1980s, critical infrastructure in the industrialised world has become increasingly interrelated and dependent on each other's 'always on' availability. Commentators have expressed alarm at the ability of these complex systems to be managed under stress and their increasing vulnerability to large-scale cascading events across sectoral boundaries.[9,10] The summer 2007 events come close to realising these fears.

16.38 The critical infrastructure must be viewed as an interdependent system, where resilience improvements within one sector could be completely negated by the vulnerability of a key supply component in another. Even if that vulnerability has been identified in a business continuity plan (see Chapter 17), the question will still arise of who bears the costs, since improving resilience in one sector such as electricity will also bring benefits to customers in others.

16.39 Such issues will need to be considered in cross-sectoral discussions to exchange information and ensure coverage of potential gaps and minimise overlaps. They can consider how best to target investment across networks in order to optimise the benefits to the critical infrastructure system as a whole and identify appropriate funding mechanisms. This approach is in agreement with the House of Lords Select Committee conclusion that *"action is necessary to improve regulators' joint working. There needs to be a more structured and formal cooperation between the regulators if it is going to be meaningful."*

16.40 The Review would welcome, that the issues related to better coordination across sectors, be tackled at a joint regulators group. This would help to support the implementation of measures flowing from the proposed National Resilience Plan where issues of cross-subsidies between sectors are raised.

Enhancing the resilience of the road transport network

16.41 The road transport network presents different issues in relation to improving resilience to flooding and severe weather events. In broad terms, for trunk roads and motorways – the strategic network, which is the focus of this section – the levers to improving resilience are with the Department for Transport (DfT) through its funding of the Highways Agency. For local transport the levers are with the local authorities and, for London, the Greater London Assembly.

Roads network: funding mechanisms

DfT funds trunk roads and motorways through the following broad channels, subject to the DfT's or the Highways Agency's project appraisal requirements:

- Local Network Management Schemes. Programmes of small schemes making better use of the existing network;
- Targeted Programme of Improvements – major schemes funded by DfT or public-private partnership; and
- Capital and Routine Maintenance funding.

16.42 The Highways Agency's current activities to improve reliability of the strategic network fall under its PSA target for journey time reliability, within which severe weather is an important factor. For 2007, flooding on one day alone – 20 July – caused 2 per cent of the delays for the whole year. The flooding of what was a small part of the road network last summer led to up to 10,000 people being stranded. As part of its mapping of high risk weather sites under this target, the Highways Agency is identifying those parts of the strategic network liable to flooding.

[9] Little, R. G., Controlling Cascading Failur: Understanding the vulnerabilities of interconnected infrastructure, Journal of Urban Technology, Volume 9, Number 1

[10] Amin, M., 2002, Towards secure and resilient infrastructure, Journal of infrastructure systems, volume 8, Number 3

16.43 The Highways Agency has a number of measures to improve resilience including establishing "Off Network Diversion Routes" (pre-identified routes that by-pass sections of the strategic network) and improved response procedures. We note that the Highways Agency has also taken a number of measures to provide priority access to emergency related services, localised flood protection, sand bays (for storage and filling of sand bags) and drinking water contingency supply to ensure road users health and safety in the event of disruption due not only to flooding, but also accidents or high summer temperatures.

Responding to climate change

16.44 The 2004 Foresight Future Flooding Study identified that carriageway flooding incidents were expected to increase substantially by 2085 due to a 20 to 30 per cent increase in predicted rainfall. In anticipation of climate change and more frequent and heavier rainfall, drainage standards were reviewed following the severe flooding events of autumn 2000. Since then standards for new works and drainage maintenance renewals have been raised to provide increased capacity for the 20% to 30% increase in rainfall intensities expected up to 2085. Also, a programme of work is in its early stages to identify those structures, such as culverts, which may not function as intended within the frequency and higher levels of rainfall now predicted and experienced.

16.45 We consider that, in relation to trunk roads and motorways, there are enough levers available through funding and other mechanisms for a programme of improvements to the resilience of these networks. We note the work that is currently under way to address resilience to today's events and to cope with the effects of climate change.

16.46 The Review would welcome the Highways Agency looking at the vulnerability of the most significant elements of the road network to flooding. The Government should specify for the Highways Agency those standards of performance that the strategic network should aim to meet in relation to its resilience to flooding.

Minimising the loss of services

This chapter proposes a way in which organisations' abilities to absorb the effects of emergencies can be enhanced. It contains sections on:

- summer 2007;
- business continuity management and its benefits;
- British Standard 25999;
- the current framework: business continuity and the law
- proposals for enhancing capabilities;
- accountability and governance; and
- planning assumptions: expecting the unexpected.

Introduction

17.1 It is not possible to anticipate all hazards, nor is it practical on economic or any other grounds to protect all assets against all risks. Exceptional events have the potential to overwhelm defences; so an essential element of minimising disruption should be to plan to withstand and recover from such events. However, the events of summer 2007 suggest that planning for failures has been patchy and inconsistent.

17.2 The Government's national approach to civil emergencies seeks to minimise the impact of events through planning and preparedness. Improved business continuity management (BCM) has an important part to play in attaining that goal by minimising the potential for disruption to essential services in the event of a flood or any other disruptive event.

Summer 2007

17.3 Last summer, Gloucester Gold Command anticipated that if Walham electricity substation had been inundated, electricity would have been lost for up to three weeks. The flooding of Mythe Water Treatment works left people without water for 17 days. We believe greater uptake of effective BCM could minimise the potential for such lengthy disruption occurring in the future.

17.4 That is why our interim report proposed Government introduce a duty on national infrastructure operators to undertake business continuity planning to more closely reflect that on Category 1 responders. We also suggested that the British Standard on BCM, BS 25999 should be prescribed.

17.5 Our proposed recommendations generated a positive response. For example, evidence from Water UK emergency planners' group pointed out that a significant number of water companies support the adoption of BS25999 for their business continuity planning and are adopting the standard to protect against disruption to their businesses. A number of other Category 1 and 2 responders also agreed with this proposal. The Review welcomes this feedback.

17.6 However, some responders believed that the intention of the interim conclusion was to replace current sector-specific operational emergency planning duties placed on them through sector-specific legislation. The intention was not that BS 25999 should replace current approaches to risk management, emergency planning or mandatory contingency requirements such as the Security and Emergency Measures Direction (SEMD) in the water industry. The Review takes the view that, though they are complementary disciplines, sharing similar ideologies, the focus and methods of business continuity differ from those of emergency or risk management.

17.7 We note and endorse the work being undertaken by some Category 2 responders since summer 2007 to update and improve their business continuity arrangements. Severn Trent Water has acknowledged that the floods led it to question the appropriateness of accepting such widespread interruptions to service. The company is now taking the opportunity to review and update its plans.

17.8 There is still scope for improvement. The Chartered Management Institute's (CMI's) 2008 review of BCM reports that, of the 17 utility companies that responded to their survey, a third had not exercised or tested their business continuity plans (BCPs) at all.[1] This, along with evidence from consultation responses and our discussions, indicates that organisations are taking forward business continuity initiatives at different speeds and to different standards. Some were not motivated to act at all; especially those that were not affected by the 2007 floods.

Business continuity management and its benefits

17.9 A resilient organisation is one that is still able to achieve its core objectives in the face of adversity. This means not only reducing the size and frequency of crises (by identifying and managing vulnerabilities in advance), but also improving the ability and speed of the organisation to manage crises effectively when they occur.[2] BCM is a process which increases organisational resilience by helping manage risks to the smooth running of an organisation or delivery of a service and ensuring that it can either continue to operate and deliver critical functions in the event of a disruption or that, in the event of loss, it is reinstated as quickly as possible.

Defining business continuity management

The British Standards Institution defines BCM as: "*A holistic management process that identifies potential threats to an organisation and the impacts to business operations that those threats, if realised, might cause, and which provides a framework for building organisational resilience with the capability for an effective response that safeguards the interests of its key stakeholders, reputation, brand and value-creating activities*."[3]

17.10 Evidence suggests that some Category 2 responders do not understand what BCM is and how it differs from emergency management. For the purpose of the Review, emergency management is defined as the process that deals with the initial or acute phase of an incident. BCM has a wider focus, providing a wider strategic and operational framework for reviewing how an organisation delivers its products and services and increasing its resilience to disruption, interruption or loss. As such, BCM would not replace emergency management but would complement and work alongside such systems.

[1] CMI 2008 report, utilities-only data.
[2] E. Seville, *Organisational resilience: Researching the reality of New Zealand organisations*, Journal of Business Continuity and Emergency Planning. Vol.2, No.3 p.258.
[3] BS25999-1 British Standards Institution's Code of Practice for Business Continuity Management.

17.11 Defining what is within the BCM system is influenced by the environment and context within which the particular organisation delivers its services. Decisions on which products, services or locations are included within the scope of BCM may be prompted by regulatory or statutory requirements or by perceived high-risk locations due to physical threats such as flooding. This may mean that an individual business continuity manager sees security, IT availability or risk management as the key issue with other areas taking a less prominent role. This is why it is so difficult to reach a consensus on precise BCM responsibilities.

Benefits of BCM

17.12 The insurance broker Marsh surveyed BCM and identified the following benefits of its adoption: a better understanding of the business; faster recovery and reduction of negative impacts after incidents; improved risk-intelligent decision-making; and reduced insurance premiums.[4] The report concluded that such benefits yield rewards for businesses. Such findings are supported by the Chartered Management Institute's survey on BCM in which 76 per cent of managers' questioned reported that they regarded BCM as important to their organisation.

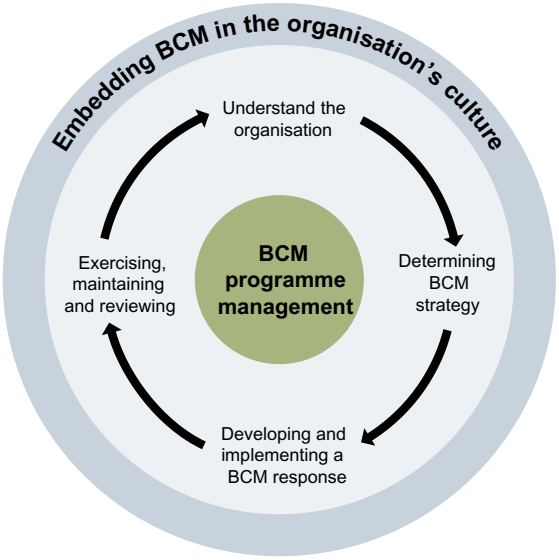
17.13 Within the wider business community, acceptance of the need for BCM is now almost unanimous. Many organisations view it as a good practice tool which they can use to manage their overall operational risk management challenges and help them protect their reputations as well as recovering critical business processes.

17.14 The CMI's 2008 report found that many organisations, including infrastructure companies, across the UK are failing to provide adequate protection for their key assets and, therefore, for the public. The report concluded that, while many companies appear to be failing to carry out BCM, 93 per cent of respondents with plans in place agreed that such plans had reduced disruption to the delivery of their services.

The BCM lifecycle

BCM is an iterative process which aims to ensure that organisations monitor and manage business continuity on an ongoing basis. There are five stages in the process:

- **Understanding the organisation**: identifying key products and services and the critical activities and resources that support them.
- **Determining the BCM strategy**: this will depend on a range of factors, including the maximum tolerable period of disruption of the critical activity, implementation costs and the consequences of failing to act.
- **Developing and implementing a BCM response**: plans and arrangements should cover incident management and continuity of key services.
- **Practising, maintaining and reviewing the BCP**: a BCP cannot be considered reliable until it has been thoroughly tested and proved workable.
- **Embedding BCM in the organisation's culture**: creating understanding and acceptance of BCM within the organisation is essential.



[4] M Caddick, *The upside to business continuity*, 2008. www.continuitycentral.com/BCMbenchmarkfindings.pdf

17.15 The Review believes that identifying risks and making plans for managing disruption in advance can reduce the costs to an organisation in terms of both financial expenditure and management time. As such, the benefits of implementation far outweigh the potential costs of not acting.

Identifying interdependencies

17.16 The Review takes a systems view of critical infrastructure, recognising that there are multiple interdependencies within and between different organisations that influence their ability to respond and recover. This means that effective organisational resilience for any one organisation must look beyond that single organisation and consider the resilience of other organisations on which it depends.[5]

17.17 The events of summer 2007 saw infrastructure fail as a result of flooding and due to interdependencies which had not been recognised ahead of time. Subsequent discussions with utility companies have revealed that, before the summer, electricity companies were unaware they were supplying other elements of critical infrastructure, such as large water treatment works, in their distribution area.

17.18 BCM requires that organisations look not only at the resilience of internal structures, but also at the resilience of the structures they rely on – their supply chains. They should then look at ways of ensuring the plans of those they rely on are resilient as BCP is only as strong as its weakest link. We give a specific example of this in Chapter 18.

British Standard 25999

17.19 The British Standard on business continuity, BS 25999, aims to promote greater consistency in organisations' approaches to BCM and reassurance to all stakeholders of conformity to best practice. Our dependence on essential services such as electricity and water means that society itself is a stakeholder in this context.

17.20 The Standard, is intended for use by all organisations in the public, private or voluntary sector with responsibility for business operations or the provision of services. However, levels of awareness and adoption vary widely. Discussions with Category 2 respondents show that some Category 2 responders are completely unaware of the standard, some have drawn on it to maintain business continuity for their office-based businesses and others have applied it to their whole operation. Of the 17 gas or electricity companies that responded to the CMI's 2008 survey, 20 per cent had evaluated their plans against BS 25999. This is a good foundation on which to build. But the Review is concerned that the same data suggests that a third of Category 2 responders do not evaluate their BCM capability against anything at all.

17.21 A number of responses to the interim report have asserted that BS 25999 is not applicable to asset-based services. The Review recognises that BCM has historically been associated with financial services but does not believe such claims are substantiated by evidence. As mentioned above, the scope of BCM is influenced by the environment and context in which the organisation delivers its services. There are pre-existing examples of infrastructure operating companies applying the standard to the critical elements of their business, and Category 2 responders were involved in the Standard's development. Some Category 2 responders who were not already using the standard were positive about how it could benefit their operations. For example, in its response to the interim report, Anglian Water stated: '*we have already begun to explore what will be required for Anglian Water to achieve BS 25999. We support this approach and believe that it will complement our current Quality Management Systems and Environmental Management Systems*.' Ultimately BS 25999 is a flexible management standard that can be adapted to take into account the individual needs of businesses of all shapes and sizes.

[5] E. Seville, Organisational resilience: researching the reality of New Zealand organisations, Journal of Business Continuity and Emergency Planning, Vol.2, No,3 p.258.

17.22 The Review believes that BCM undertaken in conjunction with additional investment for protection will go a long way to decreasing disruption to essential services resulting from flooding and other natural hazards. The use of a standard will make the desired outcome – more resilient critical infrastructure – consistent and certain for all stakeholders, public and government included.

PAS 55 Asset Management Specification

17.23 Evidence from the electricity industry indicated that they were positive about the use of BSI Publicly Available Specification (PAS 55) as a possible alternative to BS 25999. PAS 55 lays out a process for the optimised management of physical infrastructure assets. The specification is intended to apply in cases where an organisation is primarily dependent on the function of its assets in the delivery of services or products, the objective being to ensure that the assets deliver required function and level of performance in terms of service or production (output). The Review notes that electricity network owners were asked by Ofgem to adhere to the specification as part 7 of an Asset Risk Management Project – (which has now been discontinued). All major gas and electricity companies had been certified by February 2008.

17.24 We commend the use of the specification as an asset-specific approach to risk management. However, we do not believe the specification is as applicable to overall organisational resilience. BS 25999 is focused on all the factors surrounding and associated with disruptive events and can be applied to a far wider range of organisations. The focus of PAS 55 is not applicable to the task of broader event management and limits its use in connecting with the planning of others. The focus of PAS 55 does provide it with value as a component in the establishment of BCM within organisations, but the Review believes that alone it would not be as strong as the BCM planning required by BS 25999.

The current framework: business continuity and the law

17.25 There are no clear obligations in law on utility companies to undertake BCM in a consistent way. Contingency and preparedness for extreme weather events exist in some sectors, and some may have a strong financial incentive to recover as quickly as possible from an event. Even when there are such requirements, plans and policies are often found in a number of different documents relating to a number of different obligations.

Scottish Power

As a diverse company, involved in trading, generation, transmission and supply, Scottish Power recognises that implementing a meaningful and enduring BCM System can present a considerable challenge. The company decided to utilise Part 2 of BS25999, on the grounds that it provides a common framework for identifying key services and the measures needed to restore or maintain these services should they suffer interruption.

Along with the rest of the electricity industry, Scottish Power has well-rehearsed emergency plans for dealing with the consequences of severe weather and the safe restoration of supply; these are complemented by robust BCPs. The company recognises that alignment, or indeed certification, to the Standard does not guarantee that, when major events such as floods occur, there will be no problems. However, the application of the Standard does demonstrate that there is a quality management system in place to identify, monitor and continually improve continuity of key services.

The company's business continuity arrangements focus on protecting and resuming critical activities that support key services, including fault and emergency management.

Managing business continuity within a quality management system has enabled Scottish Power to effectively and demonstrably manage the risk to key service disruption, ensuring that the company has arrangements in place to recover key services, their critical activities and enabling resources.

Scottish Power have on several occasions utilised their plans and recovered the business within the expected timescale, or better. They believe the financial and non-financial impact mitigation has more than justified their initial investment in BCM.

Sector-specific legislation

Water and sewerage

Section 208 of the Water Industry Act 1991 and the existing direction of 1998 requires an undertaker "to make, keep under review and revise such plans as it considers necessary to ensure the provision of essential water supply or sewerage services, at all times, including a civil emergency". The Act also contains provisions about the assumptions on which plans should be based, and sets out specific requirements, for example for personnel to receive appropriate training and essential equipment to be stockpiled. Plans are presented to the Secretary of State and revised annually.

Electricity and gas

Under the terms of the operating licences issued by Ofgem, electricity and gas companies are under a general legal duty to ensure adequate levels of security of supply. This may include introducing some form of preventative, risk-assessment control.

For electricity providers, regulation 3 of the Electricity Safety, Quality and Continuity Regulations 2002 is the key provision, requiring generators, distributors and meter operators to construct, install, protect, use and maintain their equipment to prevent interruption of supply so far as reasonably practicable.

Gas companies are obliged to comply with the Gas Safety (Management) Regulations 1996. These are primarily aimed at safety rather than security of supply and set out a number of specific areas to be covered by continuity plans, including: dealing with gas escapes and averting danger; arrangements for minimising the risk of a supply emergency; and arrangements for dealing with supply emergencies or other incidents that could endanger persons.

Telecommunications

The Communications Act 2003 gives Ofcom the power to impose conditions requiring or regulating the provision, availability and use, in the event of a disaster, of electronic communications networks, electronic communications services and associated facilities on providers of electronic communications networks and electronic communications services.

Roads

The relevant highway authority for most roads will be the local authority, a Category 1 responder under the Civil Contingencies Act 2004. Beyond this, there are preventative planning obligations on the relevant highway authority such as the Highways Act 1980, although these fall short of requiring the preparation of statutory plans.

Rail

Rail operators are licensed by the Office of Rail Regulation. Licences require operators to provide a service which an efficient rail operator would be expected to provide. They are also under a statutory duty to operate in a manner which does not endanger the public under the Health and Safety at Work Act 1974. The Railways Act 1993 allows the Secretary of State to make directions in relation to railways in the event of a great national emergency.

The Civil Contingencies Act 2004

17.26 The Civil Contingencies Act 2004 (CCA) places very few direct legal obligations on Category 2 responders relating to BCM. Instead, it puts the emphasis on cooperation with Category 1 responders.

17.27 The CCA takes a principle-based approach, requiring Category 1 responders to maintain BCPs in order to ensure that they can continue to exercise their functions in the event of an emergency so far as is reasonably practicable. This duty relates to all their functions, not just their emergency functions. The CCA does not mandate a framework: rather, it allows Category 1 responders to choose their own model for meeting the legal requirement. However, the statutory Guidance issued under the CCA does provide a common approach for Category 1 responders to follow. This Guidance is based on PAS 56, the forerunner of BS 25999. This means that, unlike Category 2 responders, Category 1 responders have a more systematic and consistent approach to BCM.

Proposals for enhancing capabilities

17.28 The driver for business continuity and wider organisational resilience should be the long-term interests of stakeholders and all those who depend on the organisation in some way.[6] In the case of essential services delivered by critical infrastructure, these interdependencies are even more significant. Given the importance of this relationship, the Review believes the Government should act to increase the overall capacity of critical infrastructure operators to resist failure for as long as possible and recover quickly when faced with unexpected challenges. While we recognise that risk cannot be totally eliminated, the likelihood of an event threatening the business can be anticipated and the potential impact reduced.

17.29 The scale and complexity of critical infrastructure, coupled with the uncertain nature of natural hazards, means that effective cross-sector preparedness is a real challenge. Inconsistencies between required levels of preparedness for distinct sectors add to that complexity. Although there is a foundation of business continuity planning on which to build, coverage is patchy and approaches are inconsistent.

17.30 The events of summer 2007 serve as a reminder that this is an issue to be tackled. To shy away from it would leave society open to the possibility of a more serious loss of essential services – particularly as vulnerability to risk appears to be growing with time. As a society, we must deal with risks effectively. Ensuring that the essential services delivered by Category 2 responders are resilient to a consistent standard is a key aspect of this. The Review believes that this resilience is vital and that consistency of approach should be promoted by introducing BCP on a statutory basis.

Recommendation 54: The Government should extend the duty to undertake business continuity planning to infrastructure operating Category 2 responders to a standard equivalent to BS 25999, and that accountability is ensured through an annual benchmarking exercise within each sector.

[6] Business Continuity Institute, *The good Practice Guide 2008*, www.thebci.org

Case study: Business continuity law in France

In France, business continuity is seen as a key part of the resilience framework. In 2006, a law was passed on the Security of Vital Infrastructure Activities in response to growing awareness of the risk posed to infrastructure operators by both natural hazards and security threats. The law obliges operators to include business continuity in their emergency plans.

It has been implemented sector by sector since 2006, with the energy, transport and water sectors being the fastest to comply. The state provides a framework for business continuity planning, and individual operators form their own security plan (with the help of government).

Accountability and governance

17.31 Nevertheless progress must be monitored. The Review has consulted stakeholders on a mechanism that could be used in order to hold companies to account. This involved the use of local scrutiny committees. Such committees have an important part to play, but also present a number of security issues. Concern was also expressed about the level of technical capability in local authorities (see Chapter 30 for a full discussion of making scrutiny work).

17.32 Each organisation needs to assess how to apply BS25999 or equivalent to their own organisation *'ensuring that their BCM competence and capability is appropriate to the nature, scale and complexity of their business, and that it reflects their individual culture and operating environment'*.[7]

Case study: Severn Trent Water and Gloucestershire Scrutiny Committee into the summer 2007 floods

As a result of exceptionally heavy rainfall in July 2007, Gloucestershire experienced two major emergencies and narrowly avoided a third.

Following the emergency, Gloucestershire County Council undertook a scrutiny exercise in order to build up a picture of the event, the response and what lessons could be learnt.

The committee was modelled on Select Committee proceedings. Approximately 35 organisations provided written evidence to the Inquiry, and of these 22 were selected to attend hearings to answer questions from the panel. These included Severn Trent Water, National Grid and Central Networks. Both Severn Trent and National Grid agreed to take part in the scrutiny process, but Central Networks declined on the basis that they were already working with the Local Resilience Forum. Questioning of companies focused on the events of July 2007 and how both organisations reacted to them. It covered areas such as each organisation's emergency plans for dealing with flooding, contingency arrangements and plans to improve future resilience.

The concept of attending a scrutiny committee was new to Severn Trent Water. However, in their experience the approach has facilitated:

- engagement with community leaders;
- enhanced working relationships with the community;
- assurance to the community that they are concerned with increasing resilience in their area and have contingency arrangements in place to respond and recover from an incident; and

[7] Business Continuity Institute, *The good Practice Guide 2008*, www.thebci.org

Case study *(continued)*

- increasing the awareness in the community of what the company does as an organisation

Although unfamiliar at first, Severn Trent Water conclude that the experience of the enquiry was valuable in rebuilding trust with the community and developing good working relationships.

The committee's final report, along with copies of the uncorrected transcrpits from hearings, can be downloaded from the Glousester County Council website: www.glousestershire.gov.uk/inquiry

17.33 However, we believe that the Government must ensure business continuity provisions are technically robust and deliverable. **We would welcome Government utilising a light-touch, benchmarking approach, ensuring accountability for BCM by obliging regulators or sponsor sector departments to conduct sector-wide benchmarking exercises through which companies can assess whether their level of business continuity is average, or significantly above or below average.** This approach will have the added benefit of allowing the Government to assess the level of resilience within each sector and would form part of the proposed Sector Resilience Plans. The output of the benchmarking exercise could be made public as part of the annual reporting process. This could act as a powerful incentive for companies, as a good reputation is often important for companies who would rather change their behaviour than lose their good reputation.

Case study: accountability and BCM in the financial sector

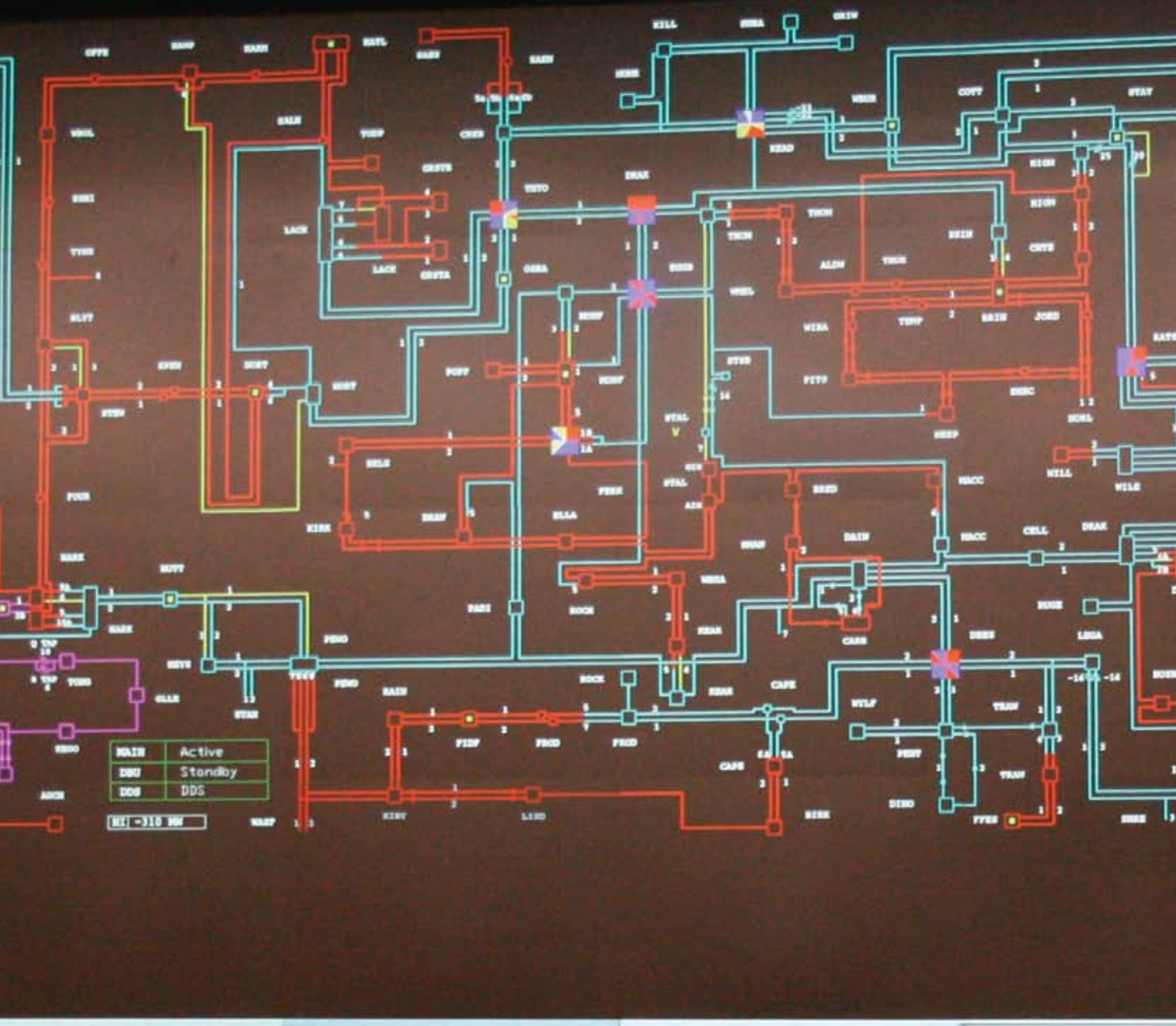
Resilience in the financial sector is crucial to the operation of the economy. For this reason, financial services, like utilities, are part of the CNI. The Financial Services Authority (FSA) takes a principle based approach to BCM. It stipulates that a firm must have in place appropriate arrangements, having regard to the nature, scale and complexity of its business, to ensure that it can continue to function in the event of an unforeseen interruption. It goes on to say that "a firm must take reasonable care to organise and control its affairs responsibly and effectively, with adequate risk management systems".

To ensure compliance, the FSA runs a benchmarking exercise which firms pay to take part in. It consists of a detailed online questionnaire, where participants answer around 1,000 questions relating to their business continuity and crisis management arrangements. This allows the FSA to assess the overall business continuity preparedness of the UK financial sector, as well as seeing how individual firms perform against a benchmark and how they compare with their peers. Participants are those institutions which are critical to the well-being of the UK financial system in the first vital hours or days following a major operational disruption. Participants have responded well to this approach, with 76 per cent of those consulted by the FSA saying that the exercise has heightened business continuity awareness in their firms and 81 per cent agreeing that it had raised awareness in the sector as a whole.

Planning assumptions: expecting the unexpected

17.34 The work done by companies needs to be measured against clear outcomes. But business continuity and other forms of contingency planning are only as good as the assumptions that they are based on. In the UK, these take the form of National Resilience Planning Assumptions (NRPAs), published by the Cabinet Office and based on the Government's national risk assessment process. They are designed to inform emergency planning and policy formulation at all levels, and include estimates of the most significant consequences of various risks – including extreme weather events such as flooding – facing the UK over the next five years were to materialise. As such, they are intended to set the bar for resilience planning and capability building at national, regional and local levels.

17.35 The Review is concerned that because events such as floods are perceived as rare, they – along with other high-impact, low probability risks – may not be accounted for sufficiently in planning. The 2008 CMI report noted that only 31 per cent of respondents considered extreme weather as a threat in their BCM plans. We would like to see national infrastructure operators enhance their planning thresholds for flooding in the same way as they have done for recent high-profile risks such as human influenza. To this end, **we welcome the use by Category 2 responders of the NRPAs to inform the vulnerability assessment of critical infrastructure and develop measures to mitigate the risk**.


MAIN Active
DBU Standby
DDS DDS

Enabling better emergency planning through information sharing and engagement

This chapter explores issues around increasing preparedness through information sharing and enhancing response capabilities through early engagement.
It contains section on:

- information sharing in summer 2007; and
- local-level engagement for more effective emergency response.

Introduction

18.1 If local emergency planners (Category 1 responders) are to mitigate potential harm and respond effectively to events, they must first understand the scale and nature of the risks. The infrastructure sectors of interest in terms of the Review are all Category 2 responders under the Civil Contingencies Act 2004. Comprehensive community risk and vulnerability assessment cannot be done by any single organisation acting in isolation. Information is the lifeblood of effective emergency planning, and, as such, the sharing of information across the Category 1 and 2 divide and among all bodies involved in dealing with natural hazards such as flooding is essential. Effective working should also be based on wider engagement and cooperation with Category 2 responders. In particular, multi-agency response is likely to be more effective where all responders are well practiced and versed in the relevant protocols.

Information sharing in summer 2007

18.2 The events of summer 2007 exposed the fact that emergency responders had an inadequate understanding of the location of critical sites, their vulnerability to flooding, the likely consequences of their loss and interdependencies between sectors. The information local emergency planners needed in advance of events to enable emergency planning for loss of essential services was at best inconsistent, and at times completely unavailable.

18.3 As a result, agencies were severely hampered in their ability to respond quickly as events unfolded. For example, evidence to the Review indicates that the Gloucester Gold Command was initially unaware of the vulnerability and criticality of Mythe water treatment works and Walham electricity substation. As the EFRA Select Committee report notes, Gloucestershire County Council was unaware until the summer floods that

there was only one source of water supply and electricity supply in the area.[1] Discussions with other local authorities and Local Resilience Forums (LRFs) across the country indicate that many are similarly unaware of the risks associated with the loss of national infrastructure.

18.4 Had Gold Command been aware in advance that the loss of Walham would threaten the supply of electricity to half a million people in England and Wales, it would have been in a position to make contingencies accordingly. As it was, a huge effort by the military, fire services and others combined with the availability of temporary barriers, narrowly prevented the loss of Walham. Questions remain as to why information about such assets, their vulnerability and the potential consequences of their loss are not shared routinely with local responders in advance.

18.5 In light of these observations, the interim review report recommended that LRFs should ensure that Community Risk Registers reflect risks to critical infrastructure from flooding and other hazards. It also recommended that single points of failure and the complete loss of an asset were explicitly considered in the risk assessment and contingency planning undertaken by operators, emergency planners and responders. The success of both of those conclusions is dependent on an effective exchange of information.

Implementing recommendation 10

18.6 As a first step, the interim report recommended that *"Category 1 responders should be urgently provided with a detailed assessment of critical infrastructure in their areas to enable them to assess its vulnerability to flooding".* The Government agreed to the urgent recommendation and the Cabinet Office wrote to LRF chairs in mid-March 2008 setting out a standardised procedure for the secure sharing of such information (see Annex F). The Government's response to the review, which set out how each urgent recommendation had been fulfilled, highlighted the difficulty of overcoming security concerns but also stated that significant progress had been made in response to this recommendation.

18.7 The Review welcomes the spirit of the procedure but is not convinced that adequate progress has been made in attaining the level of sharing envisaged by the interim report. Feedback from stakeholders has been mixed with some LRFs displaying uncertainty and confusion over the process. At least two LRFs we heard from had received no briefing as yet, due to security sensitivities. Others had received their briefing but were advised not to cascade this information down to their risk and planning sub-group, again due to security concerns. As such, many planners are still taking an ad hoc (and possibly inefficient) approach to obtaining the information that they need.

18.8 LRFs in the south west of England reported that the briefing had been a step in the right direction as they were now in a position to map impacts of loss and consider single points of failure. Those who had found the process successful tended to be those who had recognised the validity of security concerns and acted to deal with them by ensuring all risk and planning group members had been security cleared to Security Cleared (SC) level. Others were concerned about the level of detail that they were given, which they deemed too high-level to assist planning for loss of services such as those witnessed last summer. Overall the view appears to be that, while oral briefings have been a basic introduction, what is really required is an ongoing dialogue with the utilities themselves.

18.9 More than one piece of feedback from LRFs mentioned problems with accessing the Environment Agency's Receptors Vulnerable to Flooding (RVF) data. On further consultation with the Environment Agency, it appears that there are legal issues around the sharing of RVF data. The data is composed of information from Ordnance Survey and the Centre for Ecology and Hydrology and is subject to an Environment Agency approved-access procedure. This deals with issues around third-party intellectual property and contractual rights and as such, the Environment Agency cannot license it for access by others.

[1] EFRA Committee, Fifth Report of Session 2007–08, Flooding, pp.36, 94

18.10 We understand that the Environment Agency has managed to reach agreement with certain data providers to release sections of the study to Category 1 and 2 responders for Civil Contingencies Act 2004 purposes, but only on a case-by-case basis. This position is unacceptable. **The Review would welcome greater effort by all parties concerned to overcome the problem in order that such information can be used effectively for contingency planning purposes.**

Gloucestershire LRF – work since summer 2007

Following the summer flooding and water supply failure, Gloucestershire LRF realised that it was not fully aware of vulnerabilities and single points of failure within the Critical National Infrastructure (CNI) supplying their county. It was concerned that without information on impact of loss emergency planners were not in a position to successfully plan for contingency.

As a result of their experience, the LRF infrastructure sub-group was tasked with gathering information to indicate the potential consequences if other components in Gloucestershire's infrastructure were to fail. To achieve this, five focus group meetings (highways, water, energy, telecoms and waterways) were convened with representatives of infrastructure operators in the county.

The aim of these meetings was to bring to light any resilience issues that may be known within the relevant industry, but which the emergency responders were unaware of, and also highlight the possible knock-on effects to other parts of the infrastructure. The groups also discussed mitigation options to deal with these issues.

The information from the focus group meetings has been passed to the LRF risk sub-group to challenge the Community Risk Register and where necessary to change local risk assessments, mitigation measures and planning priorities.

Why is information sharing important?

18.11 Sharing information at all levels has numerous benefits: sound risk assessment at the national or local level relies on obtaining accurate information about the nature of hazards and their potential impacts; effective business continuity planning involves understanding links and dependencies on suppliers; and joined-up emergency planning relies on understanding partners' priorities and plans. Without information, responders will be unable to make the right judgments, from what risks to plan for to how responses might be coordinated. Sharing information will also ensure that Category 2 responders' own arrangements are fully linked with those of the wider emergency management community.

18.12 Responses to the interim review on this issue were resoundingly positive and included very strong support for a shift in the direction of sharing information. For example, in light of the floods, Water UK reported that information sharing between Category 1 responders and the industry had been an issue. It recommended that water companies *"… review the data and information available within the sector that can be securely shared amongst key stakeholders to better aid the planning and response process. Areas where data may not be available should be identified and solutions proposed to redress these gaps*."

Information sharing in law

18.13 Local authorities involved in the floods state that duties imposed on Category 2 responders under the CCA have enabled them to opt out and avoid making an appropriate contribution to the development of emergency response arrangements.

18.14 Central government guidance, as set out in *Emergency Preparedness,* states that Category 2 responders are required to share information about the performance of functions related to emergencies with Category 1 responders and other responders. It recognises that information sharing is a crucial element of civil protection work, underpinning all forms of cooperation, and goes on to state that responders should share information both formally and as part of a culture of cooperation.

18.15 Under the current framework, Category 2 responders are supposed to work on the presumption that non-disclosure is the exception rather than the norm. Evidence from the response to the 2007 floods indicates that Category 2 responders have not been putting this principle into practice effectively.

18.16 The CCA recognises that the release of some information, and of information to some audiences, may need to be controlled. We believe that this balance is not being effectively achieved. Exceptions to the disclosure of information can be made where the release of the information to the requesting responder would be prejudicial to national security or public safety, or where the information is commercially sensitive or personal. However, the regulations do make provision to protect sensitive information. As such, the receiver cannot pass on commercially sensitive or personal data without consent, even where there is a strong public interest in doing so.

18.17 Importantly, if there are repeated instances of apparent failure to comply with obligations by sharing information, ministers may use powers under Section 9 of the CCA to ask for information and explanations. **The Review would welcome, in the short term, further use of these provisions to redress the balance and drive change.**

Regulatory uncertainty

18.18 Sir Ken Knight's review of the operational response to the floods points out that providing an effective, joined-up response to major incidents that affect Category 2 assets and resources is difficult if Category 2 responders are not fully involved in the heart of planning. As things currently stand under the CCA, Category 2 responders are obliged to 'cooperate and share', a phrase which, Sir Ken Knight argues, is open to interpretation, leading to variations in the levels of engagement of Category 2 responders during both the planning and response phases. He notes that it is hard to see how responders can be 'heavily involved' in a response if they have been 'less likely to be involved' in planning and exercising.

18.19 Category 2 responders indicated that they feel they face a myriad of conflicting requirements, and that this is leading to uncertainty about what they can and cannot share. This in turn increases anxiety about the disclosure of material and discourages positive action.

18.20 Evidence to the Review identified various legal impediments to transparency. These included the common law of confidence, Competition Law, the Data Protection Act, and the Official Secrets Act. Stakeholders were aware of the existence of a multitude of legislation restricting information sharing, but did not necessarily understand the precise implications. Sectors are also subject to tailored advice, via sponsor departments and CPNI, on what constitutes a designated site and what information can be released externally. As a result, Category 2 responders tended to avoid discussing even the most minor issues for fear of breaching some part of the law.

Competing interests

18.21 In their response to the interim conclusions, Category 2 responders noted that it was not only the lack of a formalised process that led to their reluctance to share information. Security concerns were also a major issue. Western Power Distribution's submission states: *"When previously asked by local government to advise where loss of more than 100,000 customers might occur, WDP sought advice from the then DTI…[they] were advised to provide a 'footprint' showing an area affected but not to provide site location detail… the provision of such information is currently… against written advice."*

18.22 The Review recognises the legitimacy of such concerns. The potential damage that could result from releasing sensitive information too widely must be balanced against the need for Category 1 responders to get planning right. However, we believe that the events of summer 2007 highlighted that, for individuals and communities at risk from flooding and the resulting loss of essential services, the balance is currently tipped too far in favour of security

concerns. A fresh look must be taken at current provisions to enable greater transparency.

18.23 The tension between greater transparency and control of information is common in countries that share a similar risk profile to the UK. The USA, Australia and the Netherlands are three countries that have developed strategies for dealing with that tension.

National Infrastructure Protection Plan – Network approach to information sharing

In 2006, the US Department of Homeland Security (DHS) released the final version of the National Infrastructure Protection Plan (NIPP), which defines roles and responsibilities for all levels of U.S. government and private industry that must work together to secure the nation's critical infrastructure and key resources. One of the NIPP's unique features is its network approach to information sharing, which represents a fundamental shift in how security partners share and protect critical infrastructure/key resources (CI/KR) information.

Prior to the creation of the NIPP, private-sector critical infrastructure security partners used information sharing and analysis centers (ISAC) that served as mechanisms for collecting, analysing and sharing information on CI/KR threats and vulnerabilities within private infrastructure sectors and the US government.[2] However, the US government itself did not possess any comprehensive unifying networks or systems that could facilitate this kind of real-time information sharing within and between all levels of government and private sector partners for all 17 sectors.

The NIPP's network approach builds on the basic concept of these ISACs to enable secure and cross-directional information sharing between and across the US government and private sector, in order to protect key assets. It provides improved and more centralised mechanisms that support a real-time relay of strategic and tactical threat assessments, vulnerability assessments, threat warnings, situational or incident reports, lessons learned and best practices for CI/KR protection.

The network approach has been gradually gaining traction, however much work still needs to be done. Its effectiveness varies significantly across each sector. For instance, the public health and health care sector's diverse nature has made collaboration difficult, while the commercial nuclear reactors, materials and waste sectors have been successful because the grouping itself is relatively homogenous and has a long history of collaboration.

A lack of an effective relationship and trust between the DHS, other federal agencies and the private sector is another challenge to the NIPP's networked information-sharing strategy. Stakeholders frequently cite prior working relationships with federal partners as well as access to contractor resources and technical assistance through the DHS as key ingredients to establishing effective information-sharing councils within each sector.

[2] *Critical Infrastructure Protection: Progress Coordinating Government and Private Sector Efforts Varies by Sector's Characteristics*. GAO, GAO-07-39 (www.gao.gov/cgi-bin/getrpt?GAO-07-39).

Australia's Trusted Information Sharing Network for Critical Infrastructure Protection

Critical-infrastructure protection has become a general label for a range of activities undertaken jointly by government and the operators of key locations, facilities and systems to ensure that they are adequately managing risk. In recognition of this, the Australian government has set up the Trusted Information Sharing Network for Critical Infrastructure Protection (TISN). The network allows members (who include national and state ambulance, police and fire services) to share security-related information in a protected environment. The TISN is not an operational network but is concerned with policy issues in a medium-to-long timeframe. Through its peak committee, TISN members have a direct line of communication to the Attorney-General and the National Counter-Terrorism Committee.

Information sharing in the Netherlands

In Holland, the private sector manages 70-80 per cent of critical infrastructure. In 2002 the Dutch government set up the Critical Infrastructure Protection project in order to prevent disruption against technical failings, overloading, extreme natural phenomena and intentional or unintentional human action.

As part of that project, the Dutch have held workshops where representatives of three or four critical infrastructure sectors met with emergency planners from regional authorities. Two scenarios were developed (pandemic flu and coastal flooding) and participants were asked to describe sector and cross-sector effects if such scenarios were to occur. To make sharing of sensitive information possible, they recognised that there were three types of information: information that could be shared with everybody (green); information that could be shared in a previously defined professional group (orange); and information that would only be shared with the participants of the meeting (red). All participants were asked to sign a confidentiality agreement in which they promised to keep red information confidential. The classification of information was also used to ensure that the reports of the workshops were produced in such a way that confidentiality was respected. The reports are now available to other critical infrastructure operators and government.

Another initiative used in the Netherlands has been the National Advisory Centre for Critical Infrastructure (NAVI), which is a public–private network between government and critical-infrastructure operators who are able to share information on threats, risks and vulnerabilities. They use a similar colour-coding system for defining the level of confidentiality. Information can be shared via face-to-face contact, but also through closed websites.

One of the major gains of the operation has been decompartmentalisation, as sectors have begun entering into dialogues among themselves and are better informed about each other's possibilities and needs. Consequently, they are even more aware of their own vulnerabilities and those in the sectors that are dependent on them. As a result, preparedness measures have been aligned more effectively. The Minister of the Interior in the Netherlands believes that the benefit of the project has been that *"a network has emerged where individuals from the public as well as the private sector know where to find each other".* Everyone involved in it regards this informal network as highly valuable.[3]

[3] Remkes, Report on critical infrastructure, 2005.

The public domain

18.24 Many Category 2 responders see the sharing of information with their Category 1 counterparts as analogous with putting it in the public domain. In the water sector, for example, companies are restrained by a Security Service Advisory Note that aims to ensure that information placed in the public domain does not compromise the security of the water company. Such information includes emergency plans. Legal advice to the Review indicates that, unless such advice is withdrawn or amended, water companies will be very wary of going against it.

18.25 Submissions to the Review point out that local responders are not widely security-cleared. Local authorities do not receive sensitive information from Government and local authority emergency planning officers do not generally have security clearance. Although this is changing, particularly in London, this privilege still does not apply to all officers or to local authority chief executives.[4]

18.26 All of this raises the question of why Category 1 responders, who have been entrusted with responsibility for leading civil protection work, are not equally trusted when it comes to accessing information that will allow them to perform that role effectively. **We would welcome Government driving change, moving away from 'need to know' towards 'need to share'.** If necessary, this could include putting all emergency planners in local authorities through security clearance. Some LRFs we spoke to had chosen to take this path, security clearing all of their emergency planning staff, and found that this avoided such serious problems in terms of being trusted with sensitive information. However, this process had been both time consuming and costly.

The risks of relying on generic assumptions

18.27 Evidence from Category 2 responders indicates that there are times when they fail to see the benefit of giving responders prior knowledge of risks that affect their infrastructure. They argue that generic planning assumptions are sufficient, and should encompass all the scenarios that local responders need to plan for.

18.28 However, Cabinet Office advice is clear that while generic assumptions are designed to inform emergency planning and policy formulation, they do not remove the need for LRFs to make judgements about area-specific key hazards and their consequences. These judgements will then form the basis for their Community Risk Registers.

18.29 Before the events of summer 2007, Category 1 responders were not aware that Mythe water treatment works was a potential single point of failure and that the consequences of losing it would be so significant and far-reaching. Generic assumptions would not have allowed responders to sufficiently plan for such an event.

18.30 While providing information on which assets are susceptible to flooding goes some of the way, it does not go far enough. Planners will be unable to prioritise sites and identify appropriate, adequate contingencies without an understanding of which sites are considered to be critical and which are not.

Developing national guidance

18.31 We believe that, without such information, it will not be possible to ensure an adequate emergency response to any civil emergency. At present, there are too many obstacles to sharing information. What is more, there appears to be little consistency both in terms of the type of information which Category 2 responders will and will not share and within individual organisations, where different actors seem to apply variable degrees of stringency on sharing. This leads the Review to conclude that companies are free to share (or not to share) pretty much as they choose.

[4] C Walker and J Broderick, *The Civil Contingencies Act: Risk, Resilience and Law in the UK*, p. 258

Information sharing in Yorkshire and the Humber

Following the 2007 floods, the Government Office for Yorkshire and the Humber (GOYH) undertook a study to gauge how effectively Category 1 and 2 responders in the region were liaising with each other. Findings highlighted the reluctance of Category 2 responders to share information with other responders due to both commercial and security concerns.

Levels of transparency varied greatly between organisations, as did expectations regarding information sharing. The study also showed that LRFs operated differently across the region and, by extension, across the country, suggesting that responders have varied expectations in terms of interaction and cooperation. This is a cause of confusion and concern for Category 2 responders dealing with multiple LRFs.

Some Category 2 responders are working to identify the risks they face and find ways of sharing that information. The GOYH believes that more should be done to work out how this information can best be integrated into emergency planning and risk assessment processes and how sensitive information can be given adequate protection. The study concludes that more work is required at all levels to build relationships between partners, including the security services and central government, with a view to developing robust protocols for information sharing.

18.32 While we recognise that there will always be security concerns over making information on critical infrastructure sites too readily available, the experiences of summer 2007 suggest that a better balance needs to be struck between security and information sharing in order to improve preparedness and, therefore, ability to protect the public at all levels. The Review believes there is no reason why information relating to the vulnerability and risks to infrastructure should not be shared with emergency planners as quickly as possible. This should be an ongoing process as risks are dynamic and assets change over time.

18.33 In the short term, the Review would welcome clearer guidance at the national level to raise awareness of this issue and set out what Category 2 responders are expected to do under the CCA. Such guidance should, as far as reasonably practicable, define exactly what should and should not be shared and what information Category 1 responders can reasonably ask for. In the longer term, we believe the CCA needs to be revisited and information sharing obligations strengthened to ensure compliance.

From 'need to know' to 'need to share'

18.34 Experience shows that the impact of natural disasters (such as floods) on critical infrastructure can be as big – or even bigger – than that of a security threat. In summer 2007, many tens of thousands of people were left without water and electricity, and hundreds of assets were flooded. Forward planning for such an event is impossible without information. Responders cannot legitimately be expected to identify what is critical without improved input from Category 2 responders. Greater willingness to share will also lead to greater cooperation, as individuals and agencies start to form effective working relationships and learn more about each others' roles.

18.35 The CCA states that: *'In most instances, information will pass freely between Category 1 and 2 responders, as part of a more general process of dialogue and cooperation. This is the means by which the overwhelming majority of information sharing should happen…if this is not the case, it is probably evidence of a wider systematic failing in the way the Act is operating.'*[5] The events of summer 2007 show that, in practice, neither the culture of cooperation nor the obligation to formally contribute information has flourished.

18.36 The interim report argued that the Civil Contingencies Act should be extended

[5] CCA, Emergency Preparedness Guidance, p.25, 3.7

to require Category 2 responders to engage more fully by formally contributing information on critical sites, their vulnerability and the impact of their loss. **Where problems are being experienced, we would welcome an increase in the use of the protection of information provisions within the CCA.**

18.37 We recognise that changes to the CCA will not improve the sharing of information by themselves. The problem is as much cultural as it is legal. The challenge for government is to reconcile legitimate but competing objectives: the need for security and the need for information sharing to enable planning and preparation. Government must rethink, with the public interest at heart, the balance between security restrictions on information sharing and the need for access to such information.

18.38 In order to develop clear and consistent guidelines, lead government departments should work together to develop guidance that clearly specifies what information can and cannot be released about critical infrastructure sites. Such guidance will also help to ensure that responders across the country have access to similar levels of information, that Community Risk Registers better reflect risks to critical infrastructure from flooding and other hazards and that the implications of both single points of failure and the complete loss of an asset are explicitly considered in all risk assessment and contingency planning undertaken by responders. Clearly defined information sharing protocols must be developed and new information sharing networks established as necessary to enable the level of sharing intended by the CCA.

RECOMMENDATION 55: The Government should strengthen and enforce the duty on Category 2 responders to share information on the risks to their infrastructure assets, enabling more effective emergency planning within Local Resilience Forums.

Local-level engagement for more effective emergency response

18.39 Category 2 responders are the experts when it comes to their assets, and the risks those assets face in both day-to-day and exceptional circumstances but Category 1 responders are the experts when it comes to managing wider civil emergencies. It is in the interests of those who suffered a loss of essential services during the summer and everyone who may be at risk from such events in the future for these areas of expertise to be combined effectively. Experience has shown that preventing and preparing for civil emergencies requires the active participation of appropriate responders. This in turn requires meaningful engagement between Category 1 and 2 responders. The CCA recognises the role both Category 1 and 2 responders have to play in the planning, preparation and response to an emergency and requires organisations to work together towards greater system resilience.

Multi-agency working in summer 2007

18.40 Evidence from the summer suggests that Category 2 involvement in multi-agency emergency response exercises has been patchy. As a result, the integration of Category 2 responders into Gold Commands set up over the summer was initially slow. Feedback from Category 2 responders who attended Gold Commands indicated that they were often unfamiliar with the Gold Command structure, and as a result arrived without any clear idea of what to expect.

18.41 The EFRA Select Committee found that councils were critical of the performance of Category 2 responders during the floods. Sheffield City Council claimed that the floods highlighted significant issues in relation to the engagement of Category 2 electricity and gas utilities in planned exercises, stating that the utilities had ‘not been round the table’ and were not even ‘entirely equipped to be round the table.’[6]

[6] EFRA Committee, Fifth Report of Session 2007-08, Volume 1, 94.

18.42 Severn Trent Water admitted that it had not previously taken part in a multi-agency exercise simulating an event of the summer's floods. As such, they were initially unaware of the dynamics of the team, which had been running for the previous day and a half. Severn Trent Water may have been able to cope better in the early stages of the loss of Mythe water treatment works had they been more actively involved in multi-agency planning and had both the company and its partners been better informed about local circumstances and infrastructure. The company has responded positively to its experience by ensuring that all relevant staff receive appropriate training to allow them to integrate successfully into the structure.

18.43 The experiences of Gold Command in Gloucester proved that giving team members the opportunity to get to know each other before an emergency arises speeds up multi-agency working when an incident does occur. Stakeholder evidence has supported such diagnoses, Water UK concludes that water companies should rehearse emergency plans on a regular basis and that such rehearsals should include the local emergency response organisations. In addition, training such as the 'Gold Standard' course provided by the Government's Emergency Planning College can help ensure that responders know what to expect before attending an actual Command.

Current approach to planning and response

18.44 The Civil Contingencies Act places the primary duties for response planning for events in the local domain. The intention of the Act was that Category 2 responders, defined as entities that perform 'functions vital to the life of the community' or are 'key parts of the local infrastructure which maintain the life of the community', play a part in civil protection at local level by responding to reasonable requests and adhering to principles of effective representation.

Anglian Water and Lincolnshire LRF

Lincolnshire's LRF welcomes Category 2 attendees to its meetings and consistently aims to reinforce its links with the emergency planning community.

Being part of numerous LRF sub-groups and exercises has enabled key Anglian Water staff to build relationships and work effectively with other agencies' representatives. As a result, those agencies now have a greater awareness of the water company and its role, something which proved to be of great benefit during the floods when Anglian Water was able to provide technical advice on aspects of the incident relating to sewage flooding. Often, a representative from Anglian Water was the only Category 2 attendee; those staff attending Silver Command reported significant benefits in terms of their ability to respond.

As a result, Anglian Water now attends other multi-agency commands in person, wherever they are established. Although this can seem costly in terms of time, allocating the resources to regularly attend LRF meetings and build up working relationships can pay huge dividends in the event of an emergency event. Key Anglian Water staff are now being put through training to enable them to represent the company more effectively.

18.45 The events of summer 2007 have led people to question whether this is happening successfully in practice. Sir Ken Knight's report states: *"An initial survey of five of the worst affected areas, and subsequent wider consultation showed that the problem of Category 2 engagement in both planning and response was experienced at different levels in many areas."*[7] It goes on to say: *"of thirteen organisations that responded to CFRA's Emerging Issues Report, 12 agreed that the involvement of Category 2 responders needed to improve. One response said that their local arrangements were working well."*[8]

[7] K Knight, *Facing the Challenge*, p.86.
[8] Ibid.

EDF Energy and the North Sea tidal surge

In November 2007 a tidal surge coincided with high tides along the Norfolk and Suffolk coasts, giving rise to an early warning of coastal flooding. EDF Energy sent senior management to both the Norfolk and Suffolk Gold Commands. Contact was also made with Kent and Essex, but the lower level of risk meant there was no need for the company to attend in person although it was important to keep the channels of communication open.

Based on the importance of one site in Great Yarmouth, Norfolk Gold Command decided to ask the Environment Agency to send temporary flood barriers to the site to supplement existing measures. Effective Silver and Bronze coordination between EDF staff, the Agency and fire service ensured the barriers were successfully deployed before the morning high tide. Thankfully, severe flooding was avoided and the defences were not put to the test, but the event demonstrated that an effective response can be mounted when proactive multi-agency working is initiated in good time.

18.46 When the CCA was devised, Category 2 responders, and in particular utilities which are often nationally based, feared the practical and financial difficulties associated with the obligation to undertake planning and response on a local level. They would have preferred a greater emphasis on regional and national planning forums.[9]

18.47 This preference persists, as highlighted in a report by the Electricity Networks Association. *'Electricity Network Owners are fully engaged with Resilience Forums although, because Network Owners span many LRFs, this engagement is necessarily with Regional Resilience and Utilities Sub Groups who can respond to requests from Category 1 responders.'*

18.48 The interim report concluded that Category 2 responders should be required to participate fully at Gold and Silver Commands and that this should be delivered through a revision to the CCA or other regulatory regimes. Numerous submissions indicated that, due to the size and scope of some Category 2 responders, a mandatory requirement for all such responders to attend all exercises would be impossible. For example, the electricity sector includes transmission and distribution, water includes waste and clean water, and in both sectors communications are provided by numerous actors. Responders also noted that providing an appropriate officer, that is one who both understands fully the utility's obligations and capabilities and is empowered to interact with the Command and take binding decisions, is a challenge given that such skills will also be in high demand for the direct management of the incident. By extension, having to find more than one such officer to resource multiple events across the utility's area could well prove beyond many organisations' capabilities.

18.49 Whilst recognising the validity of such concerns, the Review agrees in principle with the idea that emergency response should be managed at the local level and sees merit in LRFs acting to consider how best to accommodate and communicate with numerous providers. We note that some regions have managed to streamline engagement in planning by setting up regional utilities engagement forums, enabling generic issues to be dealt with at a higher level. While such groups are invaluable for the reasons described below, responders felt that they were just one half of the picture, almost unanimously stating that relationships and information sharing which the latter engender could not be developed via a Utilities Group alone.

[9] C Walker and J Broderick, *The Civil Contingencies Act: Risk, Resilience and Law in the UK*, p.89

North West Regional Utilities Resilience Forum

The North West Regional Utilities Resilience Forum was created in September 2004. It meets 3-4 times a year to improve understanding, cooperation and coordination between regional Category 2 Utility responders themselves and between that group and LRF/Regional Category 1 responders. Representation includes electricity and gas suppliers and distributors, telecommunications companies (mobile, cable and landline) and the regional multi-utility companies (electricity, water and sewerage services). Representatives of four of the six LRF attend regularly. The Government Office participates and provides the secretariat.

Benefits of the forum include:

- networks of trusted relationships between Category 1 & 2 responders;
- Category 1 awareness of national, regional & sub-regional utility roles and boundaries;
- publication of lay guide to Category 2 Responders' duties & roles;
- presentations and discussions on infrastructure issues and interdependencies;
- verbal briefings on sensitive exposures (e.g. single points of failure);
- joint awareness of contingency plans, resources and sector mutual aid schemes;
- 24/7 contact arrangements between members; and
- development of members' resources to support needs.

The London model was mentioned by more than one responder as providing a good framework which could be adopted nationally.

The London model

In London, utilities companies engage with responders at a regional level. Representatives from the telecommunications, energy and water sectors and the London Resilience Team meet quarterly as the Utilities Sectors Panel.

Through this mechanism, utilities are involved in planning, exercising and awareness raising events. Meetings also serve to enhance communication between utilities, ensuring greater understanding of interdependencies and familiarity with each other's emergency planning and response mechanisms.

'The strength of the arrangement was evident to me on 7.7.05. When the crisis started, the group rapidly came together to support each other whilst our representatives convened at Gold. The benefits of a well developed working relationship were quickly evident in the mutual support and joined up working and information sharing.' EDF Energy, Emergency Planning and BC Manager

Lack of consistency

18.50 Evidence to the Review highlighted large inconsistencies in the approaches taken by LRFs to engaging Category 2 staff. In their submissions, Category 1 responders pointed out that individuals in some Category 2 responder organisations had been given emergency planning as an add-on to their core role. They felt that inadequate resources were being assigned to local engagement by national infrastructure operators. A number of Category 2 responders agreed that attendance at meetings should be mandatory, acknowledging that civil contingency planning would otherwise not get the level of attention or resource necessary from their organisations.

18.51 The Review considers that LRFs, if necessary acting together at regional level, should consider and agree with their Category 2 responders how they should engage with each other for planning and response purposes. Government should not leave this entirely to local discretion but facilitate debate. We also believe that there is a need for a national focal point for each sector and that this should support discussions around the development of the Sector Resilience Plans (as set out in Chapter 14).

Lack of awareness of capabilities and dependencies

18.52 The Business Continuity Institute's submission to the review indicates that a number of businesses acknowledged that their plans had not taken into account reliance on other service providers. This appears to be due to a lack of awareness and understanding of what they could expect in terms of reconnection from energy companies. These findings, along with other stakeholder evidence, lead the Review to conclude that it was not only responders who had a limited understanding of the vulnerabilities of the utilities and their own dependency on supply.

18.53 The Review believes that greater engagement at local level will lead to better understanding of what utilities can and cannot provide. This will in turn lead to greater clarity as to what communities and businesses should be planning for. It is impossible for communities and local businesses to prepare themselves if they are kept in the dark over the potential for failures.

National guidance

18.54 Civil protection is a multi-agency activity. Responders must work together and develop a good understanding of each other's capabilities and vulnerabilities if they are to be effective. Submissions to the Review almost unanimously recognise that the events of summer 2007 highlighted shortcomings in the current arrangements.

18.55 The Water UK review states: *'The experiences during summer 2007 showed a patchy and inconsistent picture in the level and timing of involvement…the degree of participation of water companies ranged from none to full. The points at which water companies were invited to attend also varied…once a water company was directly incorporated into the emergency command structure and reported to the command leader then both communications, understanding of needs, and decision-making improved rapidly… participation in and training with LRFs will allow the development of working relationships...that will have benefits in the event of an emergency.'* It concludes that: '*Water companies should ensure they are appropriately involved with key agencies in planning, training and rehearsing for critical incidents.'*

18.56 Evidence has shown that, as things stand, the quality and extent of engagement in a local area is too dependent on the individual character of the LRF and the awareness level of the Category 2 responder. Some Category 2 responders are not even aware of their own status. It is reassuring to hear that a number of Category 2 responders are reviewing how they interact with LRFs and Gold Commands and putting their senior management through training in civil emergency planning and response. This approach must now be adopted across the board.

18.57 The Review would welcome an awareness raising exercise, conducted by government, to increase understanding of responsibilities under the CCA, remove the uncertainties around engagement and deliver a clear message on expectations of engagement.

18.58 Sectors have begun entering into dialogues amongst themselves, and are consequently better informed about each other's vulnerabilities and dependencies. The next step must be to adopt this approach both between sectors and across the public/private sector divide. While recognising the difficulties this presents, especially for organisations with a national footprint, we believe such engagement is essential.

18.59 There are good models of how this engagement can be streamlined to work effectively. However, the Government should provide additional guidance on the expected levels of engagement, increase awareness of these duties and also carry out enforcement actions to ensure the Act is complied with.

RECOMMENDATION 56: The Government should issue clear guidance on expected levels of Category 2 responders' engagement in planning, exercising and response and consider the case for strengthening enforcement arrangements.

18.60 The Government should issue this guidance and distribute it to the regulators, who should then act to inform every organisation within their sectors of their duties under the CCA. As the level of engagement increases, enforcement action should be considered more seriously where responders are failing to comply with engagement obligations.

Effective management of dams and reservoirs

This chapter considers dam and reservoir safety and makes recommendations as to how it could be improved. It contains sections on:

- balancing the needs of security and safety;
- the nature of the risks of dam failure;
- reservoir flood plans;
- achieving a risk-based approach;
- a new legislative framework for reservoir safety; and
- succession in the civil engineering profession.

Introduction

19.1 The events which occurred at Ulley reservoir, Rotherham, in summer 2007 highlight the potential risks facing communities living in dam inundation areas. While emergency responders were repairing damage to the reservoir caused by excessive flows down its spillway, around 1,000 people were evacuated and main roads (including the M1) were closed. In the absence of contingency plans because of the restrictions on the sharing of information, responders had to improvise during the event by drawing flood maps and making evacuation plans on the spot. The evacuation took place in the early hours of the morning and people who were evacuated at short notice had no knowledge of the risks. Had the incident happened in a more densely populated area or with less time, it is doubtful if this improvised approach would have been adequate. Although the incident at Ulley reservoir gives cause for concern, other reservoirs overtopped during the course of the summer, albeit without such serious damage.

Balancing the needs of security and safety

19.2 There is an unresolved dilemma in our current attitude to reservoir safety. This arises from the vulnerability of reservoirs to both malicious attack and to natural failure. The former has resulted in an insistence on secrecy about the area that would be flooded from a dam breach, so as not to give information to would-be attackers; but this has meant that we cannot be as ready to respond as we should be, whether a breach occurs because of attack or natural failure and this puts lives unnecessarily at risk. Emergency planners and responders do not have the information they need and the public are not aware of the risks to plan effectively.

19.3 Thus, while we try to reduce the risk of one cause of dam breach, the trade off in doing so is that we increase the risks to life and property arising from all causes. The balance between security concerns to reduce risks of attack and planning to save lives in the

Ariel view of Ulley Reservoir after heavy rain © Empics

event of a dam breach has not been properly addressed. Secrecy leaves us in the curious position that there is a strong chance that we now defeat our own ends. This contrasts with the situation in other countries which also face a similar threat of malicious attack. France and the USA for example are more open about providing information to the public to help save lives in the event of a breach. Below we give a best practice example of the kind of information made available in another country, Switzerland (Lake Sihl).

19.4 The Government needs to urgently resolve the dilemma in its attitude to reservoir safety. We believe that the current approach to security concerns is misguided: we explain below that the issue is about security of the reservoir site, not having knowledge of where flooding would occur if a reservoir were to breach, since anyone with an Ordnance Survey map and purpose can work that out. There is good work going on to improve reservoir safety and emergency planning but it is, worryingly, hampered by security restrictions on sharing of information on impacts and flood zones.

The nature of the risks of dam failure

19.5 The likelihood of breaches is remote: there has been no dam failure in this country since the 1920s. But the consequences are potentially catastrophic. We do have large reservoirs near to built up areas. “Near” does not mean within view: the area in which buildings would be destroyed can be several kilometres from the dam itself. By “destroyed” we mean just that. The best way to describe it is as similar to the Boscastle flood of 2004, when the power of the deluge destroyed

Boscastle, 2004.

buildings and cars without, miraculously on that occasion, killing anyone. That is the force that we could expect to see unleashed if a dam were to breach. But in an urban area, below a very large reservoir, the consequences would be very much greater.

19.6 The conditions following a major dam breach are much more severe than normal flood flows. The effect of catastrophic dam failure is to create a high speed wall of water that sweeps along debris and rubble, killing people and with the energy to destroy buildings and other infrastructure in its path.

19.7 The photograph below is taken from an incident in Sweden a few years ago, which is included to show the potential impact of a dam breach.

19.8 People are at risk if they are within the inundation zone. The impacts are greatest for people and property immediately downstream. The speed of flow and extent of the immediate area will depend on a number of factors including topography. For example, if a downstream valley is confined and narrow for great distances the area of immediate impact will be some distance from the reservoir. Although there may be cases where some notice is possible, this may not always be the case. A quick and effective warning and emergency response is necessary to save lives in the event of a dam breach. However, this is not enough; people also need to know in advance how to respond to warnings for example by knowing what evacuation routes to take. The importance of this was dramatically underlined for us during a site visit, where we saw from the inundation map that a school lay directly downstream of the reservoir, in the path of what would be the inundation flow.

Scale of the risk

19.9 In the last 200 years there have been 14 dam failures that resulted in the deaths of 465 people across the UK. However, there were 10 dam failures that did not cause loss of life between 1960 and 1971. Various serious incidents have occurred since then but fortunately these have not resulted in dam failures.

Breach of Noppikoski Dam, Sweden, 1985

19.10 In England and Wales there are over 2000 reservoirs (Large Raised Reservoirs – LRRs) covered by the Reservoirs Act, of which 956 are currently categorised as posing a risk to life if they breach. Figures from the Environment Agency reveal that in England and Wales there are at least six emergency draw downs of reservoirs each year. These are instances where draining a reservoir is the last resort to prevent dam failure.

19.11 The Chair of the British Dam Society (BDS) has provided the Review with a statistical comparison using data on Large Dams from across the world. This suggests a catastrophic failure leading to loss of life at a rate of around one every 45 years on average in the UK. Whilst this figure must be treated with caution – it does not reflect differences in construction standards or dam size – the Chair of BDS concludes that *"there is no obvious reason to assume that UK dams are significantly safer than [Large Dams worldwide]".* A report to the Government *("Climate Change Impacts on the Safety of British Reservoirs"* Defra 2002) indicates that risks of failure will increase as a result of climate change reducing safety factors by 20 per cent because of increased subsidence of embankments in summer droughts, stronger winds causing more wave activity and more severe rainfall events leading to greater overspills. At the same time, climate change will create a need for new reservoirs particularly in the densely populated South East, where there are also strong pressures to develop.

19.12 We have been able to obtain a limited number of inundation maps to try and understand the scale of risk that we face from potential dam breach. This data is not currently publicly available and covers less than 10 per cent of the England and Wales stock of LRRs. Our analysis has focused on reservoirs whose inundation areas include major urban centres. The analysis suggests that the overall risks are extremely serious.

19.13 The analysis included some reservoirs with overlapping inundation zones. This shows that, within the total combined inundation zones, the night time populations at risk total nearly 350,000 people (day time populations are higher at over 430,000 people). In addition, although available information on infrastructure is incomplete, there are for example over 40 sites belonging to the emergency services, nearly 80 educational establishments, including schools and three items of Critical National Infrastructure. It is clear from this that the consequences of reservoir breaches present significant risks to people and property. These figures can be scaled up by a factor of 10 to gain an indication of the total risks in England and Wales alone.

19.14 While we have not been able to do this analysis for inundation maps for Small Raised Reservoirs (SRRs), those maps we have seen indicate that people, property and infrastructure could be at risk. As such, we support the proposal of the Environment Agency in its biennial report that the Reservoirs Act should be amended to provide better, risk-based, criteria for inclusion in its controls. The implications of this are discussed further below.

Reservoir flood plans

19.15 The Government is making progress towards introducing flood plans for LRRs. The Water Act 2003 amended the Reservoirs Act allowing ministers to direct reservoir undertakers to prepare a flood plan setting out how they would control or mitigate the effects of flooding likely to result from the escape of water from a reservoir. The aim, to ensure that the correct emergency procedures are in place to deal with any breach, is clear and correct. A flood plan comprises three components, which are currently under development by Defra:

- an **on-site plan** detailing the response to a potential breach to reduce the risk or extent of any uncontrolled escape of water;
- a reservoir **inundation map**, showing the area that would be affected by any escape of water; and
- a **communications plan** setting out how the undertaker and local emergency services should communicate with each other.

19.16 Local Resilience Forums (LRF) would draw up an off-site contingency plan based on the reservoir inundation map.

19.17 Some of this work is already in place: a number of water companies have drawn up reservoir inundation maps, and some LRFs have prepared off-site plans. In 2007, Defra asked water companies to be ready to share their plans with LRFs. Defra also plans to hold a public consultation on the direction under the Water Act 2003. Finally, Defra is working with contractors on a pilot methodology for producing inundation maps to meet LRFs' contingency planning needs, including evacuation. The aim is to provide a generic methodology for identification of any raised body of water and the possible inundation areas in the event of a breach. But restrictions still control the extent to which detailed information is released to emergency planners and, in particular, to organisations such as other utility companies.

LRF planning

19.18 In our view, the LRF is best placed to assess the risks, as it is the only body with access to information on populations and property, including that which may be at risk underground, in the inundation area. We therefore consider that LRFs should have access to inundation maps for all LRRs. They should then carry out risk assessments and inform the Environment Agency and the undertaker of the result. This will enable the inspecting engineer to judge the priority that should be attached to any works recommended in the interests of safety.

19.19 The importance of good inundation maps was brought out in the post-incident report on the Ulley incident which said: *"estimates of downstream areas likely to be affected had to be assessed fairly crudely by those on site and then passed to Gold Command in case evacuation had to be called for. In the absence of definitive mapping, estimates had to be conservative."*

19.20 Inundation maps should also be made available to development planners. We have seen evidence of one case (Benfield Hazard Research Centre Technical Paper 1 "The Dams and Reservoirs Problem") where residential development had been allowed in the inundation zone of a reservoir without any inundation map or contingency plan being available at the time. This cannot be an isolated case. We consider that PPS 25 should be made explicit on the need to take into account risks from reservoirs. In particular, any developments leading to a change in a reservoir's risk category must be communicated to the undertaker, who may in turn need to carry out an inspection to assess whether work, such as the enlarging of spillways, is needed to ensure the future safety of the reservoir. The Government should make clear how such works should be funded.

19.21 Responses from water companies suggest that they broadly agree with the approach set out above, subject to concerns about putting information on critical assets into the public domain and sharing it with other Category 2 responders. Similarly, infrastructure operators such as the National Grid support the introduction of inundation maps and are keen to have access to them. The LGA is concerned about funding for off-site planning, the adequacy of some undertakers' resources and the need for good practice guidance (preferably with statutory force). The Association is also concerned about access to inundation maps and, in particular, about Defra's timescale for making them nationally available.

19.22 Defra's inundation map pilot should also bring another benefit if extended to include the identification of SRRs. Although the full range of controls under the Reservoirs Act cannot be applied to these reservoirs, there is no reason why LRFs should not carry out risk assessments on them based on inundation maps. LRFs can then assess the risks across the spectrum and put in place contingency planning as necessary. Ahead of the proposed Floods and Water Bill, we consider that the Government should also explore whether a suitable legislative vehicle is already available

to introduce legislation to require undertakers of all SRRs to cooperate with LRFs in preparing contingency plans.

Engaging the public

19.23 The Review considers it essential that LRFs engage fully with downstream communities in relevant emergency planning. This would bring the UK into line with other parts of the world, where evidence suggests that involving the community in local planning increases awareness and lessens the risk of fatalities and damage. This should include identification for the public of evacuation routes and procedures for the public to follow, particularly where the main impacts of potential destruction of buildings and loss of life would be felt. See Figure 14.

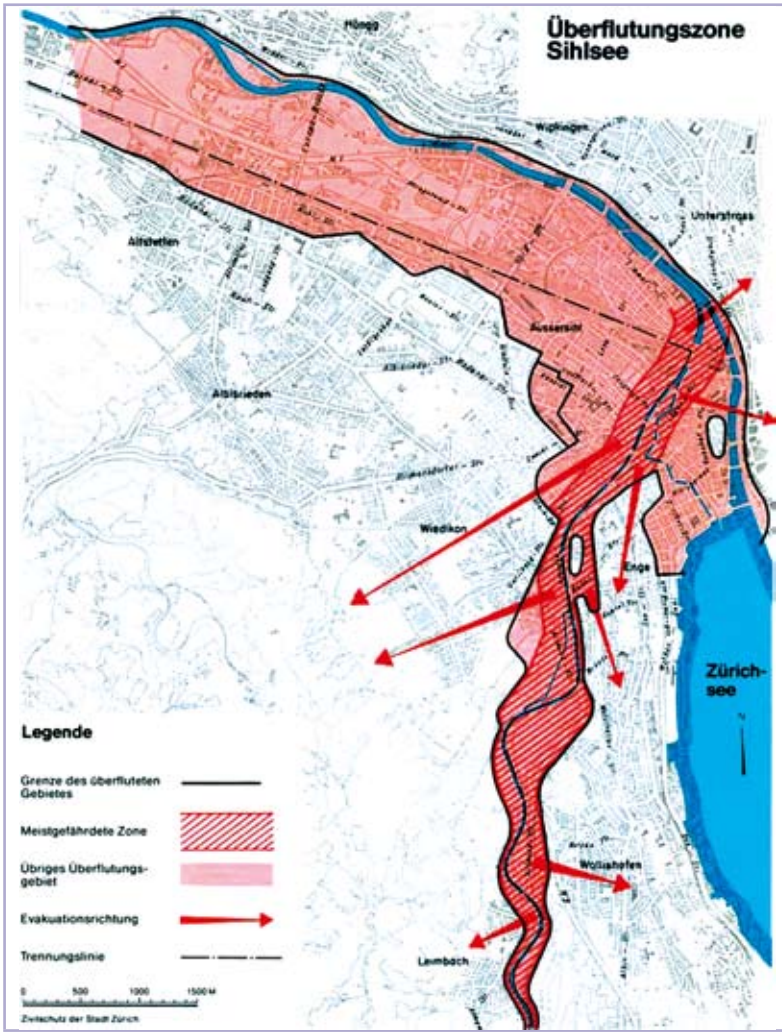
19.24 The main weakness of current restrictions on the release of information is illustrated by the fact that anyone can prepare this information for themselves with just an OS map. This is not to dismiss security concerns, but to place them in their proper context. In our view, risks arise not from knowing the location of reservoirs but from having access to sites and, more importantly, knowledge of how to cause sufficient damage to create a breach. We agree with Professor Hughes' evidence to the Review that *"it is quite obvious just by looking at a map which dams have the highest consequence of failure. Keeping information from people will cost lives rather than save lives and the Government could be criticised in this event."* We also note that the Floods Directive will require the preparation and publication of flood risk maps and plans.

19.25 Evidence to the Review is that the key to stopping any potential threat would be to make tunnels and galleries, valve houses and gate areas secure and limit vehicular access to the crest and spillway areas of dams. Frequent surveillance with associated CCTV coverage would be an essential element of maintaining security. We believe that more emphasis should be placed on on-site security measures and preparedness instead of restrictions on inundation maps.

RECOMMENDATION 57: The Government should provide Local Resilience Forums with the inundation maps for both large and small reservoirs to enable them to assess risks and plan for contingency, warning and evacuation and the outline maps be made available to the public online as part of wider flood risk information.

19.26 For both LRRs and SRRs, the aim should be to identify those where any breach would have the most serious consequences, supporting a risk-based approach to reservoir management and contingency planning. We consider this to be the only feasible approach. Nevertheless, we consider that the Government should look at whether the current categorisation is adequate and, in particular, at whether more detailed mapping is needed in some cases.

Figure 14 – Lake Sihl flood alert system



Lake Sihl flood alert system

If the dams across Lake Sihl failed, the areas of the city shown pink on the map could end up under 8 metres of water in some areas within 2 hours.

Alert signal – a wailing siren sounding for 1 minute; plus local radio broadcast. **Practice alert** each year to test sirens

Immediate evacuation from the red hatched area in directions indicated by arrows

People in the **pink (unhatched)** zone to move to higher floors.

Other measures: check that no-one has been left behind when evacuating; close shutters and turn off gas and water taps and electrical appliances; help elderly and infirm and those who are unwell.

Follow instructions from the police and the authorities closely.

Achieving a risk-based approach

19.27 The Environment Agency has also proposed a number of other changes to the Reservoirs Act. These are summarised here.

Funded powers to act at reservoirs with no owner

19.28 This refers for example to those cases where ownership cannot be determined or no undertaker identified (the latter being anyone who has an undertaking at and actively uses the reservoir). Although the Reservoirs Act grants the Environment Agency reserve and emergency powers, these do not enable it to act as an undertaker in all respects, for example in operating the reservoir. Also, the question of funding is obviously important if the Agency is to be able to use these powers effectively in the event that works in the interests of safety cannot wait until ownership issues are resolved. We consider that Defra should address this issue urgently.

Mandatory post-incident reporting

19.29 The Environment Agency has instituted a voluntary post-incident reporting system, with mixed results. The aim is to ensure that undertakers and engineers can benefit from the experiences of others and to enable the Agency to identify problem areas. For example, the Ulley incident and other earlier incidents highlighted the importance of remedial works to limit damage to masonry spillways which may otherwise be undermined by high, turbulent flows, leading to the erosion of dam embankments. We consider that anonymous reporting and information sharing is an important component in risk awareness. A voluntary system does not provide for this comprehensively and a mandatory route should be instituted.

Better quality of inspection reports

19.30 The Reservoirs Act calls for reports to be written by inspecting engineers, but is silent on the subject of how the quality of those reports might be assured. Inspecting engineers are appointed for a period of five years, subject to advice from the Institution of Civil Engineers (ICE). The role of inspecting engineers does require them to assess the need for new work, for example on spillways, and to supervise that work. We therefore consider that ICE should look to introduce a system of quality assurance for reservoir inspections, although we do not consider this should necessarily be mandatory within any amending legislation.

Better regulation of canals and disused mine and quarry tips

19.31 The Environment Agency's biennial report also called for extension of controls to canals and disused mine and quarry tips. Although these are not always the same types of structures, there is potential for them to create risks. However, we note that progress is already being made towards putting safety concerns on a firmer statutory footing and we do not therefore think that these sectors need to be brought within the Reservoirs Act.

Canals and other inland waterways

19.32 British Waterways (BW) has statutory responsibility for the canal network and maintains a risk-based system of asset management. This has recently been updated in accordance with its Asset Inspection Procedure (AIP) 2008, a comprehensive asset inspection and prioritised improvement programme. A recent review by BW, the Agency, plus an independent engineer concluded that BW's current regime is a satisfactory risk-based asset management system. **We would welcome moves to recommend to ministers that the regime should be placed on a statutory footing to ensure that it is a duty on BW.** We also consider that the Government should assist BW in sharing its assessments with LRFs so that appropriate off-site planning is in place

19.33 The basis of BW's approach is to concentrate monitoring and maintenance priorities on principal (ie high consequence) embankments (those over six metres high; or 3-6 metres high for a length of 200 metres or more) and culverts, which historically have been the main source of failure. We agree with this approach. While canals are unlikely to cause flooding on the same scale as dams, they can nevertheless pose risks: on average, there are several canal breaches every year. These occur mainly in rural, sparsely populated areas. In what was an unusual and extreme recent breach on the Monmouth and Brecon canal, a flow of debris-laden water caused considerable (albeit very localised) damage.

Mine and quarry tips

19.34 'Tailings' lagoons are used for settling water-borne waste from mine and quarry workings. Here, new rules introduced at European level following an incident in Spain a few years ago provide for waste sites to be categorised according to risk and managed in accordance with statutory rules. These are discussed further below.

A new legislative framework for reservoir safety

19.35 As the evidence above shows, good progress is being made in the area of reservoir safety. There remain, however, two key areas for discussion, relating to the Environment Agency's proposal for a fully risk-based approach. One is the nature of the controls that currently apply to LRRs; the other is the lack of statutory controls on SRRs. It should be noted that, due to the lack of controls, there is no requirement for a register to be kept. Hence there is very little information available about SRRs and even their numbers are an informed guess at best.

19.36 Under current legislation, LRRs are subject to a regime of construction, supervision and inspection by engineers appointed for five-year terms by ministers. At least once every 10 years, these inspecting engineers may make recommendations for works in the interests of safety to the undertaker; in England and Wales, these recommendations will be enforced by the Environment Agency. While in many cases this system has been effective in avoiding loss of life from reservoir breaches, there is scope for improvement in a number of areas, in addition to those already mentioned above:

- inspecting engineers' reports are not made available to the Agency unless they recommend works in the interests of safety. Any report which does make such recommendations can in effect be overturned by a further inspection, thus delaying any works;
- although the legislation is not itself risk-based, as noted above inspecting engineers do categorise reservoirs according to risks to people and property and may make recommendations in the interests of safety on that basis. Nevertheless, inspections can be as long as 10 years apart in all cases. Also, again as noted above, SRRs are outside the scope of the legislation, regardless of the potential impact of any breach;
- there are no provisions relating to the competence and financial soundness of undertakers to perform safety-related duties. At the moment, anyone can own and operate a reservoir; and
- the definition of 'reservoir' is problematic. In one recent case, a blocked culvert in a causeway effectively made it a reservoir, caused it to fill with water and overtop. This led to emergency action including the evacuation of people in properties downstream. It is not clear, however, whether such a structure falls within the Act; a situation which, in the light of the possible consequences, is clearly undesirable.

19.37 We consider that all these issues should be addressed legislatively. Existing laws provide useful models. For example, the Control of Major Accident Hazards (COMAH) Regulations require sites that pose significant risks to have on-site and off-site contingency plans for any incident. The steps being taken by the Government now to develop reservoir flood plans reflect this approach. However, we consider that more should be done to minimise the risk of incidents taking place. Another possible model, the Mining Waste Directive, provides for measures, procedures and guidance to prevent or reduce as far as possible any adverse effects on the environment, and any resultant risks to human health, brought about as a result of the management of waste from the extractive industries. It requires:

Monmouth and Brecon Canal breach

- a waste management plan to be provided by operators to the satisfaction of the regulatory authority (the 'competent authority' for the purposes of the Directive) for the minimisation, treatment, recovery and disposal of extractive waste;
- a major accident prevention policy, including a safety management system and internal emergency plan, to be drawn up by the operator for those waste facilities classified as Category A under the Directive (that is, facilities containing hazardous waste or dangerous substances) or those where failure or incorrect operation could give rise to a major accident. The 'competent authority' is also required to draw up, with public participation, an external emergency plan;
- a permit to operate a waste facility for extractive waste;
- waste facilities to be managed by a competent person, and sets out requirements for the construction and management of waste facilities;
- closure and after-closure procedures to be put in place for waste facilities; and
- a financial guarantee (or equivalent) prior to commencement of operations involving the deposit/accumulation of waste in a waste facility.

19.38 Clearly, not all of these requirements are appropriate to reservoir safety; but they do provide a comprehensive system of legislative controls which, in our view, should be considered for application to reservoirs.

RECOMMENDATION 58: The Government should implement the legislative changes proposed in the Environment Agency biennial report on dam and reservoir safety through the forthcoming flooding legislation.

Succession in the civil engineering profession

19.39 Professor Hughes, in his evidence to the Review, notes a serious decline in the number of appointed supervising and inspecting engineers. At the same time, the average age of those remaining has increased and is now in the 50s. This is not to suggest any lessening in competence; but we consider that the Institution of Civil Engineers should provide leadership at this time of change, taking action to encourage more people to enter the profession in order to ensure an adequate succession.

Dams and reservoirs – a technical overview

Dams and reservoirs form an important part of our national infrastructure providing valuable functions which include water supply, hydro power generation, irrigation, navigation, canal supply, flood control and protection and amenity use. Some dams are constructed to serve one purpose whilst others are built to serve several.

Historically the main purpose of dams has been to enable people to collect and store water when it is plentiful and then use it during dry periods – and this function is likely to become more important in years to come.

The types of dams found in the UK include earthfill dams, rockfill dams and concrete dams (gravity, buttress, arch) but the most common type is earthfill which often have a central clay core, a wall of clay which forms the watertight element within the body of the dam. We have around 2,800 dams subject to reservoir legislation in the UK and perhaps as many as another 2,000 small dams not subject to reservoir legislation

The most common type of dam found in the UK is the embankment dam, some 88% are earthfill dams. The average age of dams in the UK is now over 110 years. We obviously know a lot less about the construction of our dams which were built over a 100 years ago when compared with dams built in the last 20 years. Dams must meet certain technical requirements to ensure safe, effective and economical operation and the design and construction of all dams must comply with those requirements.

Embankment dams are the most common because they are constructed of materials, either earth or rock, or a combination of both, which are plentiful in the area where the dam is to be built.

Most dams have a number of features associated with them including a spillway, outlet works and control facilities.

The outlet works and control facilities often involve a drawoff tower within the reservoir with valves and pipes which allow water to be taken for example to supply water, to draw the reservoir down to provide flood storage or to release water to the stream/river for river regulation.

The spillway is the overflow facility at the dam to prevent the reservoir becoming too full. At a concrete dam the water can be passed over part of the concrete dam but at an embankment dam it must be safely passed around the dam in a spillway, usually made of reinforced concrete.

A scour facility is often provided at the bottom of the reservoir controlled by valves which allow the reservoir to be emptied, particularly if there is an emergency.

Although the likelihood of failure is very small the consequence of the failure of some dams can be large. As a result, after failures in the 1800s and in 1925, reservoir safety legislation was developed and our current legislation is the Reservoirs Act 1975, which ensures that all dams with a capacity greater than 25,000m³ are inspected and examined frequently. All dams subject to the Act will be very carefully inspected by an Inspecting Engineer at least once every 10 years, and examined by a Supervising Engineer at least once a year. It is best practice for owners of dams, certainly in public ownership or used for water supply and where the consequence of failure is high, to provide members of their staff who would visit the dam, usually at least 3 times per week to look for signs of distress.

The likelihood of the failure of a dam is very low but as part of an emergency preparedness scheme techniques are now available to mathematically model the way in which a dam might fail and also to study how the water released would then flow down a valley below the dam. Analyses carried out to date have illustrated that the effects of the failure of a dam may stretch for many kilometres, in certain instances as many as 30-40 kilometres from a dam.

Information from inundation mapping, as it is known, enables emergency planners to see how quickly the water will move, and what damage is done. This allows the development of plans to evacuate and take people to safety. Obviously when the population is some way from a dam then that population can be warned and evacuated before the effects of the dam breach are felt.

In many countries throughout the world these inundation plans are made available to the public living in the vicinity of dams and used to develop emergency and evacuation plans, which are then given to those who might be affected. They are often rehearsed for high consequence dams – dams where the consequence of failure is high.

When inspecting a dam an Inspecting Engineer is required to assess the dam's condition and also its safety against a number of engineering 'guidance notes' and standards. An engineer will make a visual assessment of the dam and its associated features (its spillway, valve tower, tunnel, pipework etc) and look for signs of distress which might include leakages or seepages, cracking of both the dam and its associated features, evidence of movement (i.e. bulges, depressions or slips in the face of the dam), and perhaps deterioration of materials – softening, spalling, cracking, crazing etc. In addition he would carry out technical assessments of the dam's ability to withstand seismic events and flood events.

The seismic assessment is based on the type of dam and the consequence of failure and enables an engineer to decide an appropriate level of seismic analysis to adopt to be able to demonstrate the dam is safe under seismic loading. Because the UK is not a highly seismic region, very little or (more often than not) no seismic analysis is deemed necessary.

In the case of floods, an Engineering Guide suggests the 'design flood' that a dam must be able to safely withstand based on the consequence of failure. For a dam where loss of life can be foreseen the design standard becomes the 10,000 year event or the PMF, the Probable Maximum Flood, where the return period might be of the order of 30,000 or even a million years – the worst storm that could be imagined.

The system of reservoir safety in the UK has developed from the late 1800s and continues to develop. The great benefit of the UK system compared with others around the world is that it places responsibility for safety on the owner of the structure and the assessment of safety on the shoulders of an individual, the Inspecting Engineer. The UK has not followed a highly prescriptive assessment of safety based on codes of practice which would be inappropriate in some areas, but recent events have highlighted a need to move our legislation to a risk/consequence based approach.

It is considered that the UK continues to be one of the best safety regimes in the world by allowing appropriately qualified engineers, who take individual responsibility, to use their judgement and supporting information to assess reservoir safety.

Section 6

Better advice and helping people to protect their families and homes

Summary

This section looks at the importance of public engagement before, during and after floods. It contains chapters on:

- raising awareness before the emergency;
- weather and flood warnings;
- providing advice during an emergency;
- the role of the media; and
- personal and community resilience.

Raising awareness before the emergency

This chapter examines how members of the public can make themselves aware of flood risk and how this process can be facilitated. It contains sections on:

- risk education;
- awareness and action;
- Floodline Warnings Direct; and
- awareness of properties at risk of flooding.

Introduction

20.1 The public needs to be aware of a flooding risk before they can take action to minimise it. But even being aware of risk may not be enough – of those we talked to who actually knew prior to the floods that they were at risk, relatively few had done anything to prepare. This finding is backed up by the Environment Agency's 2008 flood awareness campaign tracking survey[1], which confirmed a widespread apathy and tendency for people to deny the risk and assume it will never happen to them. Of respondents living in flood risk areas, only half (52 per cent) were aware that their property was at risk of flooding and of those, only 57 per cent had taken any measures to prepare in advance, for flooding.

Risk education

20.2 We need to educate the public about flood risk. Evidence to the Review as well as research shows that some communities at risk of flooding are in a state of denial and choose to ignore the warnings.[2] The Environment Agency estimates around 75 per cent of people who receive a flood warning currently take some form of action. While this is encouraging, it also indicates that one in every four people aware of a flood warning does not take effective action to limit the impact on themselves and their families. With climate change likely to lead to more varied weather patterns and a greater risk of flooding, householders and businesses need to take greater ownership of the risks and take precautionary action in the same way as they do against other hazards, for example fire.

> *"Flooding is seen as a complex issue that is difficult to deal with and to control. That is why people choose to ignore it. We receive numerous warnings in everyday life, yet we only have the capacity to deal with some of those. Psychologically we hope that by*

[1] Ipsos MORI. Face-to-face survey of 1,129 'at risk' respondents; 21 February -1 April 2008.
[2] Improving community and citizen engagement in flood risk management decision making, delivery and flood response, R&D Technical Report SC040033/SR3: http://publications.environment-agency.gov.uk/pdf/SCHO1005BJTC-e-e.pdf.

> *ignoring the issue it will go away – but that simply doesn't happen."* Philip Hodson, Psychotherapist

20.3 There is a balance to be struck so that people are reminded, and remind themselves, of the risks they face and how best they can contribute. However, this needs to be done without people living in fear. We need an *o*pen debate about how our society should handle risk. The Review thinks there could be merit in an education programme on the risks that communities face and that the Government should take this forward, working with the Risk and Regulation Advisory Council.[3]

RECOMMENDATION 59: The Risk and Regulation Advisory Council should explore how the public can improve their understanding of community risks, including those associated with flooding, and that the Government should then implement the findings as appropriate.

20.4 In terms of facilitating people to be more aware of risk, the Review notes that the Government's National Security Strategy, published in March 2008, announced that a national-level risk register will be published in summer 2008. This will set out the Government's assessment of the likelihood and potential impact of a range of different risks, including from climate change, that may affect the safety and well being of its citizens. The proposed National Risk Register will be updated annually to help local authorities, communities, businesses, and others in preparing for emergencies. Risk is discussed in more detail in Chapter 15.

20.5 Community Risk Registers are available publicly on the websites of most local, borough and county councils. It is open to the public and local businesses to consult these websites and in doing so to raise their awareness of the risks they face and to make resilience plans accordingly. Seeing the risks assessed and set out by the authorities in this way would also serve to assure the public that good systems were in place by the authorities to prepare for risks. **However, not many people outside the emergency planning community are aware of these Registers and we would therefore welcome the Government considering how to raise awareness of their existence**.

Children

20.6 Raising risk awareness more widely across society is likely to take many years, and should ideally begin in childhood. Research submitted to the Review indicates that children are not only aware of the dangers within their environment but are full of ideas for preparing for them.[4] [5] Children have the capacity to perceive high-risk, low-probability disasters, such as flooding, and that they are able to communicate those risks in a way that can influence the actions of those around them.[6] The United Nations' International Strategy for Disaster Reduction states:

> *"we know from past experience that children who are taught about natural hazard risks play an important role in saving lives and protecting the community in times of crisis."*

20.7 During the evidence gathering process, the Review has been made aware of a range of interesting initiatives to inform children of natural hazards and how to respond in an emergency. We feel it is worthwhile signposting some of these, such as those of 'edu4hazards'[7]

[3] The Risk and Regulation Advisory Council is a new advisory group, charged by the Prime Minister to develop a better understanding of public risk, and how best to respond to it, and to foster a more considered approach to public risk and policy making. http://www.berr.gov.uk/about/economics-statistics/rrac/index.html

[4] J. Twigg, 'Disaster risk reduction: Mitigation and preparedness in development and emergency programming', 2004, Overseas Development Institute, Humanitarian Practice Network.

[5] http://www.coe.int/t/dg4/majorhazards/Source/Paphos/UK_Sharpe_presentation.pdf

[6] K.R. Ronan, D.M. Johnston, 'Hazards Education for Youth: A Quasi-Experimental Investigation', Risk Analysis, Volume 23, Number 5, October 2003 , pp.1009-1020(12)

[7] www.edu4hazards.org

and the United States' Federal Emergency Management Agency.[8] The United Nations' publication, 'Disaster Risk Reduction Begins at School'[9] showcases good practice in this area. Flood specific websites include those of the BBC,[10] the Met Office[11] and the Qualifications and Curriculum Authority,[12] which has units for web-based study on floods, including pages on:

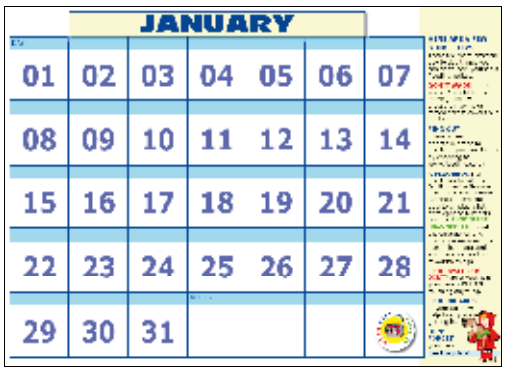
- the problem of flooding;
- understanding flood symbols;
- rivers that flood;
- investigating flooding in your area;
- flood defences; and
- flooding in the future.

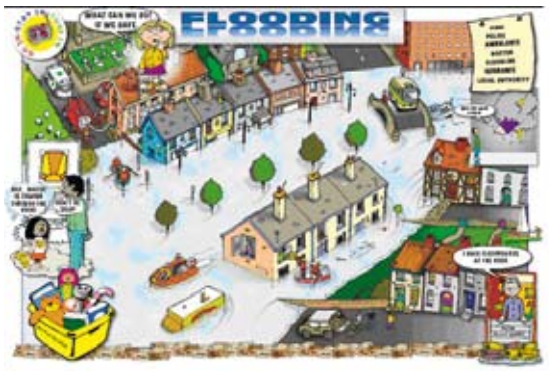
20.8 One particularly commendable piece of work is a schools pilot project, which was designed to teach children the importance of being prepared for emergencies, and was developed by Essex County Council's emergency planning unit. One pilot of this project involved working with a primary school and teaching the children about the dangers of flooding through a week of fun activities spread across the whole curriculum. The second pilot was conducted in a secondary school and involved a day of learning about the role of different agencies in emergencies and ways of preparing. These pilots were well received and crucially, when tested a year after the events, the children had retained much of the information.

20.9 Essex County Council has also been leading a European project to produce a calendar to create discussion with children about how to cope with, and be a good citizen in, a range of emergency situations, including flooding. The 'What If? Calendar'[13] is available in a number of different languages and can therefore be used in different communities. Images from the calendar are shown below. **The Review welcomes this work and encourages similar initiatives**.

20.10 Increased risk awareness is important but it must co-exist with advice on effective actions to limit the impact of flooding, otherwise all that may be achieved is a heightened sense of anxiety and helplessness. The Review has received a body of evidence that during the

Figure 15: Illustrations from Essex County Council's 'What If?..' calendar





[8] www.fema.gov/kids
[9] http://www.unisdr.org/eng/about_isdr/isdr-publications/11-education-good-practices/education-good-practices.pdf
[10] http://news.bbc.co.uk/cbbcnews/hi/newsid_1610000/newsid_1613800/1613858.stm
[11] http://www.metoffice.gov.uk/education/
[12] www.qca.org.uk/geography/innovating/geography_matters/cpd_activities/key2_rivers.htm
[13] Contact Rosanna Briggs, Essex County Council Deputy County Emergency Planning Officer at Rosanna.Briggs@essex.gov.uk for details of availability.

summer 2007 floods, the public was confused by the numerous sources of information relating to flood mitigation measures, health advice, and actions to take before and during flooding. Not only did the multiple sources mean that people did not know where to look for advice, but the information given was often inconsistent. Chapter 22 discusses the provision of advice during an emergency, including via the telephone and the internet across all sectors. Chapter 23 examines the role of the media in disseminating public information.

20.11 Advice considered important by one organisation will not address matters pertinent to another's interests – utilities companies are unlikely to be interested in promulgating wellbeing advice and business groups will be likely to focus on continuity planning rather than issuing guidance on drinking water. However, some interests will overlap and this is where inconsistencies may arise. This leads to a multitude of sources of mixed information, from which somehow the public, authorities and the media are expected to hit upon the right advice.

20.12 Thus, the number of organisations responsible for providing advice to the public makes the compilation of a set of definitive advice a complex operation which no one organisation outside of government will contemplate. Therefore, the Review believes that the Government should decide which flood prevention and mitigation advice is essential and it should brand this as the definitive advice via a public information campaign.

RECOMMENDATION 60. The Government should implement a public information campaign which draws on a single definitive set of flood prevention and mitigation advice for householders and businesses, and which can be used by media and the authorities locally and nationally.

Awareness and action

20.13 Flood forecasting and warning services are not just about event-specific warnings, but also about year-round awareness raising and information provision. To improve awareness, the Environment Agency has a public awareness campaign; each year events are organised to reinforce the key message of preparing for floods, using a combination of national media and local events. Full page adverts are placed in national and local newspapers and publications. Local radio stations are sent pre-recorded adverts and Environment Agency staff provide interviews for radio and TV bulletins. Targeted awareness campaigns aim to get householders and businesses to sign up to the Agency's Floodline Warnings Direct service and, in high risk areas, to develop flood plans and business continuity plans.

20.14 Other initiatives have included video packs with celebrity presenters talking about preparing for flooding, advertising on buses and bus shelters, as well as prominent poster sites in the floodplain. New guides 'Preparing for a flood', 'During a flood' and 'After a flood' have recently been published.[14] Following the 2007 floods, an event was held in the House of Commons for Members of Parliament to find out more about preparing for floods and it is hoped that this will filter into wider community awareness.

20.15 But 'awareness' does not necessarily lead to action. Evidence suggests that:

> *"attitudes rarely translate neatly into action…providing information does not necessarily change attitudes, and changing attitudes does not necessarily cause a change in behaviour."*[15]

[14] www.environmentagency.gov.uk/subjects/flood/826674/882909/483622/?version=1&lang=_e

[15] Demos/Green Alliance. Carrots, *sticks and sermons: influencing public behaviour for environmental goals* Defra, 2003: http://www.green-alliance.org.uk/uploadedFiles/Publications/CarrotsSticksSermons.pdf

20.16 In its submission to the Review, BTCV, an environmental volunteering charity, describes how volunteering leads to increased understanding and awareness ("*learning by doing*") and that, in their opinion, flood awareness marketing should be aiming to achieve different patterns of action rather than just awareness. The Environment Agency is now looking at alternative marketing approaches, including psychological profiling as a basis for segmenting customers so that communication can be tailored. This technique is being assessed at flood awareness events to measure its effectiveness in getting people to act on flood messages.

20.17 Research[16] [17] has shown that more people become involved in community activities and their satisfaction with the process is greatest when:

- they attribute the consequences of their actions to their personal efforts;
- they assume responsibility for their situation;
- they feel their physical and social surroundings to be important; and
- they identify with their neighbourhood and with other residents.

20.18 A genuine public participation exercise can facilitate these conditions. In this vein, the Environment Agency has, over the past few years, examined how best to achieve these conditions through a number of research projects, reports and initiatives engaging local communities in flood risk management. In some areas, their work has been successful but it is often difficult to involve the public, particularly in areas that have not been flooded but are at risk of doing so. One participatory method of engaging the community has been to promote community memory of flooding by encouraging a community group to compile a diary of flood events over the past 150 years; this 'picture of the past' is helping to raise local flood awareness.

RECOMMENDATION 61: The Environment Agency should work with local responders to raise awareness in flood risk areas and identify a range of mechanisms to warn the public, particularly the vulnerable, in response to flooding.

20.19 This section has dealt with the need to raise awareness about flooding, and has not considered the need to raise awareness about bad weather. That is not to say that everyone understands the weather, follows weather forecasts and takes precautionary actions when severe weather is predicted, but people tend to be more aware of weather than floods via bulletins in the media and direct observation. Indeed, it is often said that as a nation we are obsessed by the weather. **There may be a case for increased public understanding of the links between severe weather and floods and the Review would welcome the Met Office and the Environment Agency working together to examine this issue,** which is covered below.

Floodline Warnings Direct

20.20 Public uptake of Floodline Warnings Direct, the Environment Agency's flood warning system, is limited. Along with awareness campaigns, the Environment Agency has a pilot scheme to register automatically eligible households and premises for the service unless they opt out. In the regions affected by the summer 2007 floods, only around 20 per cent of people invited had joined the service. The level of take-up varies significantly: for the Midlands and Thames regions, only 35 per cent and 28 per cent respectively of the people invited to sign up to the service did so, while for the North East (including Yorkshire) and Anglian regions, the figures are 17 per cent and nine per cent. In addition, the Agency's analysis shows that around 27 per cent of telephone calls made under the Floodline Warnings Direct system were not picked up by recipients. In England and Wales overall, only around 41

[16] L. Horelli, 'A methodology of participatory planning', In: Handbook of Environmental Psychology (ed. R.B. Bechtel and A. Churchman), 2002, pp. 629–646. New York: John Wiley & Sons.

[17] E. Wiesenfeld and E. Sánchez, 'Sustained participation: a community based approach to addressing environmental problems'. In Handbook of Environmental Psychology (ed. R.B. Bechtel and A. Churchman), 2002, pp. 629–646. New York: John Wiley & Sons.

per cent of people for whom the Floodline Warnings Direct service is available, take it up – approximately 276,000 properties. Take-up matters; research[18] has shown that, of those surveyed, 84 per cent of people who received a warning in summer 2007 went on to take some form of action, however of these respondents only 39 per cent had prior knowledge that their property was at risk and only 17 per cent had made any preparations prior to the floods.

20.21 From January to the end of March 2008, 37,500 homes were newly registered on the Environment Agency's Floodline Warnings Direct system. This is a result of both a recruitment campaign and of the Agency automatically registering over 15,000 customers using publicly available names and telephone numbers. Of these, 175 customers de-registered from the service, which equates to an approximate overall retention rate of 99 per cent. This reflects a step change in the level of take-up and interest, and is to be commended.

20.22 In the interim report, the Review recommended that the Environment Agency should work urgently with telecommunications companies, consulting the Information Commissioner as necessary, to facilitate the roll-out of 'opt-out' telephone flood warning schemes to all homes and businesses liable to flooding, including homes with ex-directory numbers. The Review has been informed that legislative and regulatory changes may be required to facilitate the registration of ex-directory numbers and the Environment Agency is actively pursuing this issue with the Information Commissioner, British Telecom (BT), and Ofcom, the independent regulator and competition authority for the UK communications industries. Ofcom has also agreed to raise the issue with the other emergency call handling companies informing them of the issues since it is likely that the solution will require access to databases held by Cable & Wireless, Global Crossing and Kingston Communications, as well as those of BT. **The Review welcomes this work and reiterates the importance of implementing an opt-out scheme. We urge all parties to work urgently towards overcoming the current legal and regulatory obstacles, and restate this once again as a recommendation.**

RECOMMENDATION 62: The Environment Agency should work urgently with telecommunications companies to facilitate the roll-out of opt-out telephone flood warning schemes to all homes and businesses liable to flooding, including those with ex-directory numbers.

20.23 Until an opt-out scheme is implemented, the good progress made on automatically registering publicly available names and telephone numbers should continue alongside work encouraging people to sign up themselves. This could include educational activities to help people understand the warnings, and to dispel some of the myths that prevent people signing up, such as the fear that opting in will affect insurance.

Awareness of properties at risk of flooding

20.24 A large proportion of property owners and tenants do not know if their property is on a floodplain and there is currently no requirement for people purchasing a property to be informed about flood risk by estate agents, lawyers or the previous owner.

"When we bought the house in '99, the solicitor didn't tell me it was on a floodplain, but then you speak to people that lived here years, and know Catcliffe, and the worst thing they say to you is "oh, I could have told you that". *(Householder, Rotherham) GfK NOP survey*

"The problem is that they are building on flood plains. There is nothing in law to say that you have to be told about this. That is disgusting." *(Householder, West Oxfordshire) GfK NOP survey*

[18] Environment Agency survey of 576 respondents, 2007.

Buying property

20.25 Currently, unless informed by an open and honest vendor, by a knowledgeable estate agent or by a thorough lawyer, a potential purchaser is not actively made aware of flood risk or a history of flooding at all in the transaction. The first time they become aware might be when they come to exchange contracts and, on organising insurance, they find their application is refused or is subject to loading or abnormal excesses. Flood risk or flood history discovered at an advanced stage of the purchase process can be costly if transactions are aborted after money has been spent by the potential purchasers.

20.26 Estate agents play a key role in the sales process and are responsible for the overwhelming majority of property sales in the UK, with only six per cent of those selling not using an agent. Estate agents are regulated by The Estate Agents Act 1979 and the Property Misdescriptions Act 1991. This legislation imposes a general duty not to mislead the public and, where information is given for it to be accurate, however the agent is under no obligation to disclose information that may be detrimental to the sale unless specifically asked. An estate agent therefore is under no legal obligation to inform a purchaser about flood history or flood risk unless asked specifically by the purchaser. Additionally, if the estate agent is asked about flood history or flood risk by the purchaser and is unaware of a problem, then they have not committed an offence in not providing the correct information.

Home Information Packs

20.27 Home Information Packs (HIPs) were introduced in August 2007 and provide house buyers with some of the information they need to make an informed choice about a property they wish to buy. One of the overriding aims of HIPs is to reform the house-buying process to give consumers a better deal by creating a more transparent and efficient market. Compulsory elements include an Energy Performance Certificate, evidence of title, drainage and water enquiries and standard searches of, for example, records held by the local authority on planning decisions. Optional documents can include non-standard searches covering rights of way and environmental hazards such as flooding and contaminated land.

20.28 Flood risk from groundwater, rivers and the coast is not a mandatory search element of the HIP. The only question asked on flooding in the HIP relates to surface water (pluvial) flooding and arises in the mandatory drainage and water search, which covers the risk of flooding or an incident of flooding due to an overloaded public sewer. This information is obtained from the local water company. 'At Risk' properties in this respect are defined as properties that have suffered or are likely to suffer internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years), as determined by the water company's reporting procedure. Flooding which occurs as a result of storm events proven to be exceptional and beyond the reference period are not included on the 'At Risk' register. In addition, properties may be at risk of flooding but not included on the register where flooding incidents have not been reported to the company.

20.29 Last year, the Government decided not to include flood risk as a mandatory search in HIPs. This decision has been challenged by several submissions to the Review on the basis that including it as a mandatory search could help boost awareness. The Government has agreed to look again at this decision later in 2008 once the system has been in operation for 12 months.

20.30 As well as flood risk searches currently not being a mandatory requirement in HIPs, vendors, unless asked, do not have to disclose whether they are aware of the property ever having flooded. This is because a question on flood history does not feature as a standard question in the Law Society's 'Sellers Information Form' or in the optional HIPs 'Home Use/Contents' forms. **The Review has discussed this with the industry and we welcome the National Association of Estate Agents, the Association of Home Information Pack Providers, the Royal**

Institution of Chartered Surveyors and the Law Society agreeing to consider how to take this forward, with one option being that flood history is a mandatory question in the 'Sellers Information Form'.

Information in flood risk searches

20.31 The basic level of information in an optional flood risk search comprises Environment Agency data freely available to the public on its website, and gives a general overview by postcode of the likelihood of coastal and river flooding based on the presence of flood defences, predicted flood levels and ground levels. A greater degree of detail can be provided if requested and this is becoming more common; in response to an increasing level of demand, both market leaders for carrying out the searches, Groundsure and Landmark, produce a more detailed and specific flood risk search. These include information from the Environment Agency as well as British Geological Survey groundwater data and information from insurers' flood maps. Information on insurance claims in a particular postcode area based on data from loss adjustors can also be included.

20.32 In light of concerns raised in submissions to the Review, we have discussed with the industry how flood risk information is best presented so as not to alarm consumers – the same facts can be presented in potentially different ways and the perception of flood risk can differ accordingly. Reassurance on this has been provided by the Council of Property Search Organisations (CoPSO) whose Search Code sets out minimum standards, based on the Government's prescribed standards for searches in the HIP regulations 2007, which member organisations have to meet. In a sample of flood risk searches, the Review found the information presented clearly and accurately in line with the Search Code.

20.33 There is a question about the validity of information included in the HIP based on its age. Guidance from the Council of Mortgage Lenders and the Law Society recommends that mandatory searches, for example covering drainage and local authority planning decisions, should be no more than six months old at the point of exchange. Many property purchases can take longer than this to complete, meaning that these searches may be out of date by the time contracts come to be exchanged and need to be renewed either by the vendor or purchaser. However, it is unlikely that flood risk information would go out of date within six months and therefore flood risk will probably be valid until any flood search is renewed.

20.34 As we have discussed, a flood risk search informs the potential purchaser of essential flood risk information. However, a search presently provides no advice on flood protection measures if it reveals a risk. **The Review would welcome a minimum prescribed standard of information on flood risk protection measures and advice on personal flood resilience to be included with flood risk searches. There might also be merit in providing a number of indicative insurance quotes on the search report.** We have discussed with the industry whether flood risk protection measures and advice on personal flood resilience could be included in the industry code of practice (the 'Search Code') **and would welcome the CoPSO considering this further, in discussion with the Environment Agency and other organisations as appropriate.**

Mandatory flood risk searches

20.35 In the interim report, the Review suggested that flood risk should be made part of the mandatory search requirements when people buy property, and should form part of HIPs. Submissions to the Review in response to this interim conclusion were overwhelmingly in favour of this approach, with those in agreement including the Local Government Association and most responding local authorities. The Environment Agency strongly agreed. The National Association of Estate Agents agreed that this matter should be considered in any Government review to streamline the HIPs process. A few of these respondents, however, raised matters that would need to be considered before implementation and we discuss these in the following paragraphs. Insurance is discussed separately in Chapter 9.

20.36 One concern raised about the mandatory inclusion of flood risk information in HIPs is the possibility of blight, or a reduction in value, for those properties at risk of flooding. Blight may occur because some potential buyers are discouraged from purchasing, firstly through a fear of the risk itself (which may be grossly overemphasised in relation to the statistical probability), and secondly through the perception that the risk may discourage other future buyers, and therefore the property will be a poor investment and may prove difficult to sell. It has been suggested that even properties not at risk of flooding could be affected by blight due to people's perception of risk and the way in which this information is presented to them.

20.37 However, a study for the Royal Institution of Chartered Surveyors (RICS) in 2004[19] showed that the value of properties at risk of flooding but which have not previously flooded is only 'marginally adversely affected', although such properties in local markets where flooding awareness is greater may experience a greater discount. Following a flood event within the last five years, the study found that a property may lose an average of 12 per cent of its value, although there were wide variations around this figure. This was mainly because there is little consistent information on flooding and flood risk available to valuers to inform their opinions, and consequently they rely predominantly on their own personal experiences and local knowledge when assessing market value. The study indicates that affected properties experience a progressive yet variable recovery in value over several years (a 'broadly indicative' median of three to four years is stated) helped by property resilience measures and neighbourhood flood defences, provided there is no reoccurrence of flooding.

20.38 A more recent study[20] shows that, for the vast majority of floodplain properties, flood impacts on property prices are small and temporary and imply that the natural concern experienced by property owners about long term equity in their home is largely unfounded. The recent study further stated that, even for the most at risk properties in the areas with the most frequent flood history, property price impacts are small, at an average of nine per cent. The 2004 RICS study summary concluded:

> *"The study highlights the need for more accurate and finely-tuned information to be publicly available to aid in the realistic assessment of flood risk to a particular property. The consequent reduction in uncertainty would permit insurance cover to be negotiated, albeit subject to premiums and exclusions to the most at-risk properties, and would focus the property owner's attention on the necessity of flood contingency planning and flood defence measures, both at the neighbourhood level and to the property itself."*

20.39 The concern has also been raised that the discovery of flood risk might result in the collapse of a property sale. However, it should be noted that residential property sales of any type may collapse for various reasons and the 2004 RICS study found no evidence that the incidence of collapsed sales due to flooding or flood risk is any greater or less than due to other reasons such as subsidence, security risk, or nearby developments. On this issue, the RICS study stated:

> *"…collapsed sales as a result of flooding and flood risk are very rare in view of the length of experience and the level of valuation activity of the respondents, many of whom have been carrying out over 200 surveys a year for over 10 years. Most have never experienced such a collapse. Of the ones who have, only a few have experienced more than one."*

20.40 It is worth bearing in mind that flood risk is only one consideration when deciding to buy a property and other factors include location, transport network, number of bedrooms and school catchment area. A property at risk of flooding does not necessarily make it an undesirable place to live and in many cases a river running by a property or a sea view can add value.

[19] http://www.rics.org/NR/rdonlyres/DFDBBBEB-7F01-42FA-B338-2860945C4DAE/0/Effect_of_flooding_report.pdf

[20] J. Lamond, D. Proverbs, F. Hamond (2008), 'A transactional analysis of the impact of flood events on the price of residential property', *RICS research report*, In review, Royal Institute of Chartered Surveyors.

20.41 The question has been asked whether mandatory flood risk searches would and should apply to every property transaction – why would a house on a hill need a flood search and would requiring this not create a substantial burden? Yet even houses on raised land can and do flood for a variety of reasons. Further, the industry pointed out that a process to decide which properties did and did not require a search would be complex and burdensome.

20.42 In fact, we believe that making flood risk searches mandatory in the HIP would not create a substantial net new burden since, as part of solicitors' due diligence procedures before the exchange of contracts, 80 per cent of property transactions have an environmental search carried out, primarily to check for contaminated land.[21] Law Society best practice guidance recommends that this environmental search also comprises at least a basic level flood search and therefore it is likely that many property transactions already include such a flood search. However, it should be remembered that this search is not currently mandatory and many properties remain unchecked with the purchaser remaining uninformed.

20.43 Another concern is that the cost of HIPs would increase considerably with a mandatory flood search. As stated above, many property transactions are likely to already include a flood search. Of those properties remaining, a separate flood search costs on average £15 depending on the company and the extent of search information they provide; competition in the market for searches would probably bring this figure down further. Given the costs of flooding, the Review believes that this sum is minimal in the circumstances.

RECOMMENDATION 63: Flood risk should be made part of the mandatory search requirements when people buy property, and should form part of Home Information Packs.

20.44 Given the range of sources of flood risk information, the industry has urged that, in taking forward the recommendation for mandatory flood risk searches, the Government gives full consideration to the prescribed sets of data in the searches to ensure that there is competition in the market for its provision. This should ensure that the searches can be delivered quickly and at a reasonable price for the consumer. In this respect, one search company has stated to the Review:

> *"In order to provide consumers with the most comprehensive information to inform their risk assessment, it is necessary to combine numerous data sources, for example Environment Agency official data, insurance claims data and information from the British Geological Survey on groundwater flooding and geological indicators of flooding. The private sector does this, and it will be important that it continues to do so. It can only do so, however, through a competitive market driving innovation."*

20.45 Since flood risk searches do not currently form a mandatory requirement of HIPs, the Review advises prospective buyers to establish whether the property is at risk of river or coastal flooding by obtaining a flood risk search and by asking the vendor if the property has flooded before. As comprehensive surface water flood risk data increasingly becomes available, the flood risk search is likely to also report on this risk. If a survey is being carried out on a property, the surveyor should ask whether it has ever been flooded, especially if the property is near a river or in a known flood risk area. With this information, purchasers can ask more informed questions – not only of the property owner, but also of the Environment Agency or local authority – such as what flood defences exist locally and whether flood warnings are available.

[21] Figure provided to the Review by the Council of Property Search Organisations

Renting

20.46 There is currently no requirement in either social housing or private rental accommodation for information on flood risk to be provided, yet tenants occupy 30 per cent of properties and concerns have been raised that many of them are unaware of their exposure to flood risk.

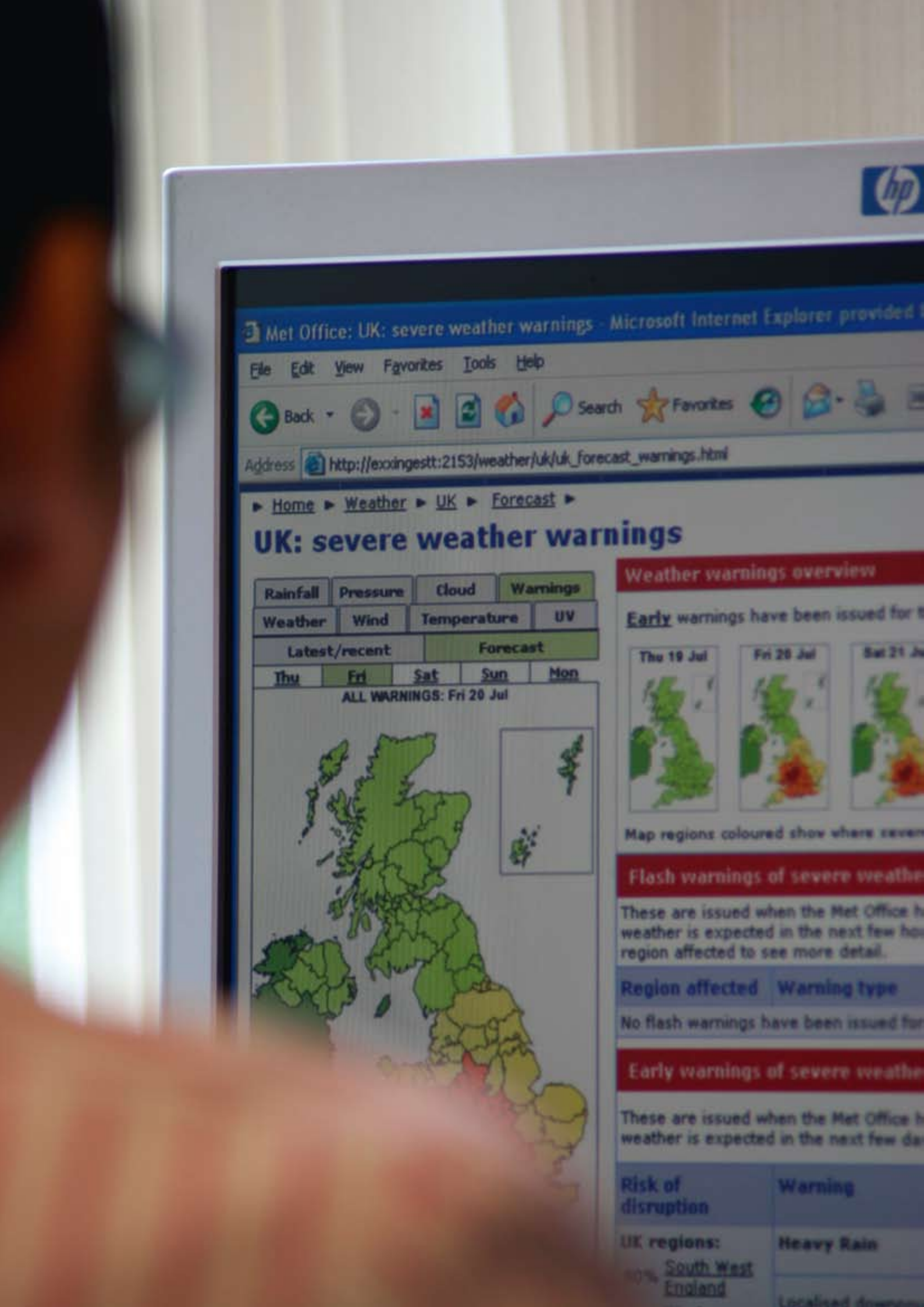
> "My house was newly built after the last floods and my letting agents said it wouldn't flood and everyone said you know it flooded before so I've no idea how that was allowed to be built." *(Householder, Wychavon) GfK NOP survey*

20.47 In some cases tenants, aware of the risk of flooding and the fact that they are uninsured, will make the decision to not have contents insurance, perhaps because other financial commitments take priority. However, in others they are unaware of their lack of cover or might not know of the risks, including that of flooding.

20.48 The Review has discussed with the industry ways in which private tenants could be informed of flood risk. However, there would appear to be no existing legal vehicle to impose such a duty on landlords and letting agents. **In light of this, as well as encouraging tenants to check their postcode on the Environment Agency's website, the Review would welcome moves by the letting industry to introduce a voluntary code of practice to inform tenants of flood risk**. At one end of the scale this could involve obtaining a flood risk search. For properties recently purchased, any flood risk search carried out could be shared with prospective tenants. At the other end of the scale, information could be provided along with the rental contract giving details of the Environment Agency website, Floodline Warnings Direct telephone number and highlighting that contents insurance is not provided and encouraging tenants to obtain insurance.

20.49 With respect to social housing owned and rented out by local authorities and housing associations, Communities and Local Government has informed the Review that the majority of tenants are offered an induction which seeks to clarify the terms of their tenancy agreement. **The Review would welcome local authorities and housing associations informing tenants of flood risk at this induction by providing Environment Agency data based on the postcode of the property and flood history where appropriate.** Information could also be provided with the rental contract giving details of the Environment Agency website, Floodline Warnings Direct telephone number and personal resilience advice. Further, it could be pointed out that contents insurance is not automatically provided. On this latter point, many councils offer tenants comprehensive insurance cover within their own Home Contents Insurance Scheme, as discussed further in Chapter 9.[22]

[22] http://www.direct.gov.uk/en/HomeAndCommunity/SocialHousingAndCareHomes/CouncilRentAndOtherCharges/DG_10029761


Met Office: UK: severe weather warnings - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://exxingestt:2153/weather/uk/uk_forecast_warnings.html
Home ▸ Weather ▸ UK ▸ Forecast ▸
UK: severe weather warnings
Rainfall Pressure Cloud Warnings
Weather Wind Temperature UV
Latest/recent Forecast
Thu Fri Sat Sun Mon
ALL WARNINGS: Fri 20 Jul
Weather warnings overview
Early warnings have been issued for
Thu 19 Jul
Fri 20 Jul
Map regions coloured show where severe
Flash warnings of severe weather
These are issued when the Met Office
weather is expected in the next few hou
region affected to see more detail.
Region affected
Warning type
No flash warnings have been issued for
Early warnings of severe weather
These are issued when the Met Office
weather is expected in the next few da
Risk of disruption
Warning
UK regions:
Heavy Rain
South West England

Weather and flood warnings

This chapter examines weather and flood warnings and how their content and method of dissemination can be optimised to provide clear information to the maximum number of people, including the vulnerable. It contains sections on:

- weather warnings; and
- flood warnings.

Introduction

21.1 Warnings are issued when severe weather and flooding are judged by the experts to reach certain levels of likelihood. Ideally, warning content and methods of communication should be such that all members of the community receive the warning and understand the action they should take, informed by awareness before the emergency. The events of summer 2007 generated an almost continuous stream of warnings throughout June and July.

Weather warnings

21.2 The Review has received largely positive evidence from the public on the accuracy and timeliness of the Met Office's Severe Weather Warnings. As described in Chapter 1, weather forecasts preceding the events of June and July 2007 were generally detailed and accurate within the limitations of current technology. The public were kept informed, receiving warnings via the media and the Met Office's website and Customer Centre. The Met Office also held regular briefings with its key customers, including the BBC, to share the most up to date information.

21.3 An interim conclusion of the Review was that the Met Office and the Environment Agency should produce an assessment of the options for issuing warnings against a lower threshold of probability, including costs, benefits and feasibility. In this respect, the Review is aware that the Met Office and the Environment Agency have recently established a joint working group to consider this work in more detail.

21.4 Initial work by the group suggests that emergency responders would benefit from earlier warnings issued against a lower threshold of probability and a recommendation is made with regard to this in Chapter 10. However, a concern has been expressed by

the Environment Agency that similar warnings issued to the public could lead to confusion and may actually decrease vigilance due to a higher incidence of 'false alarms'. **The Review would welcome further work by the Environment Agency to see if this is the case, particularly in light of new Met Office alerts based on lower thresholds of probability, as discussed below.**

21.5 The Review welcomes the establishment of a new permanent joint communications team between the Met Office and the Environment Agency, whose priority is alerting the public to severe weather to improve their personal state of readiness. The Review also welcomes improved Met Office alerts based on a traffic light system for severe and extreme weather. The colour-coded warnings are available direct to the public from the Met Office website and alerts of severe or extreme weather are carried in forecasts issued on TV and the radio. 'Yellow' and 'Amber' advisory alerts provide early warnings of disruption at lower levels of probability than is currently the case, flagging the need for vigilance rather than immediate action. Extreme and rare weather events such as those experienced in 2007 will be distinguished from the types of severe conditions commonly associated with UK weather. The new criteria are in the table below.

21.6 As well as providing more information to the public, the new alerts better inform emergency services of any potential disruption associated with extreme weather including heavy rainfall, snow and gale force winds. There are two tiers of weather events based on potential impact:

- **SEVERE** – these events are not uncommon particularly during winter months; and
- **EXTREME** – these are rare events, of which there are usually fewer than six per year.

21.7 The Review welcomes these developments and encourages the Met Office to undertake activities to ensure that the public and responders understand the new system, including precautions they should take when warnings are issued. Additionally, the Environment Agency and the Met Office are urged to expedite the work of their joint working group.

Flood warnings

21.8 The Environment Agency's Flood Warnings generally worked well in summer 2007 for river flooding. Likewise, effective and timely coastal flood warnings were issued during the East Coast surge in November. However, many of the summer's emergencies were caused by groundwater and surface water flooding and therefore many people affected were unaware of the situation even as it unfolded. The types of floods that are forecast to increase with climate change are those which have rapid onset and are unexpected; these are the types of flood that are not at the heart of the current service.

Table 7: New Met Office weather alert system

Colour and risk levels for SEVERE weather events (can often occur, particularly in winter)					
	Green		Yellow	Amber	
Warning	None		Advisory	Early	Flash
Risk	Very low <20 %	Low ≥20 % <40 %	Moderate ≥40 % <60 %	High ≥60 % <80 %	Very high >80 %

Colour and risk levels for EXTREME weather events (these events are rare events)					
	Green	Yellow	Amber	Red	
Warning	None	Advisory	Advisory	Early	Flash
Risk	Very low < 20 per cent	Low ≥20 per cent <40 per cent	Moderate ≥40 per cent <60 per cent	High ≥60 per cent <80 per cent	Very high >80 per cent

21.9 Chapter 4 discusses work to monitor groundwater and surface water flooding and the requirement for the Met Office and Environment Agency to work more closely together so that we are better prepared for all types of flooding. The need to consider a single flood forecasting and warning centre is also raised.

21.10 Predicting floods more effectively should allow people to be warned and therefore better prepared. However, it is not just a matter of issuing warnings; they must be received, understood and – crucially – acted upon. The Review, and the range of experts we have consulted, believe that warnings should explicitly describe the type of flooding scenario, rather than the present codification, which can be confusing.

21.11 Research[1] has shown that the main benefits from flood warnings are in reducing risk to life and human health and that the benefits from reduction in damage of property contents, although not to be disregarded, are actually lower than assumed. Yet in the UK, investment in flood forecasting, warning and response systems must be justified through cost-benefit analysis which does not take into account loss of life and/or the effects of flooding on health. The research paper argues that risk communication designed to increase response should not be based solely on economic perspectives but that research findings in the social and behavioural sciences should be factored in. **The research suggests that the benefits from warnings are actually greater than currently assessed. They include the benefits from the ensuing operation of flood barriers, temporary defences and other measures. The Review would welcome these benefits also being included in future benefit assessments.**

21.12 In addition, the trust and credibility of the sources of warnings needs to be attended to or attempts to improve methods and messages will be undermined. Evidence to the Review shows that there is often a lack of understanding about warnings and, when false alarms are issued, the public feels that there is not always adequate explanation afterwards. There is some evidence that the public is more tolerant of uncertainty which has been honestly admitted than is often believed, and acknowledging uncertainty often carries fewer dangers.[2]

> "*It wasn't even raining*"
> Reported comment from an elderly resident sick of receiving telephone alerts (for coastal flooding)

Methods of warning

21.13 Flooding in summer 2007 disrupted electricity supplies and led to power outages, disabling mains-powered radios, televisions and computers. Fixed line telephones also failed. As a result, a diverse range of warning methods was employed to ensure warnings reached their intended audience. Warning methods used included:

- door-to-door knocking, cross-referenced with records of vulnerable people;
- electronic message boards on major arterial roads and motorways;
- mobile loudhailer announcements;
- public address announcements in public buildings;
- sirens;
- automated telephone, fax, email and text message services (Floodline Warnings Direct); and
- broadcast media announcements on television and radio.

21.14 The reported lack of public awareness of the floods in many areas could be an indication that the full suite of warning methods was not used everywhere. Indeed, this might not

[1] D. Parker, S. Tapsell, S. McCarthy, 'Enhancing the human benefits of flood warnings', Nat Hazards, (2007), 43:397-414.
[2] L.J. Frewer, C. Howard, D. Hedderley and R. Shepherd, 'What Determines Trust in Information about Food-related Risks?', Risk Analysis, (1996), 16 (4) pp 473-486.

have been practicable. Although some people might have received a number of overlapping warnings by different methods, in other cases, individuals might have been missed altogether. Even where warnings were given in good time in an area, someone who was not tuned in to the media and who had not signed up to receive direct flood warnings might have been unprepared when the floods hit. Raising awareness in non-emergency situations and systematically assessing the appropriateness of all warning methods in each area could help prevent such situations arising.

21.15 Research[3] has shown that people at risk may obtain much of their flood related information from unofficial sources, such as personal networks and direct observation. In this way the warning message is delivered as a dialogue, providing personal and specific advice. There could be advantages to integrating informal information with official warnings. This would improve the timeliness of issuing warnings and their receipt, the numbers of people warned within a given time-frame, the quality and quantity of information exchanged and the degree of belief in the warning by the recipient. Face-to-face warnings are preferred by a great many people as they allow a dialogue to take place and follow up questions to be answered.

Door-knocking

21.16 Door-to-door calls were viewed as particularly effective and were welcomed by residents, as also witnessed during the flooding on the East Coast in November 2007. This is a simple but effective method which can be put into effect quickly while additional warning methods are explored. Door-knocking is also effective once flooding has receded to provide information and as a means of assessing the welfare needs of the community. Reflecting best practice during the summer floods, the interim report recommended that Local Resilience Forums (LRFs) urgently develop plans to enhance flood warnings through door-knocking by local authorities based on an assessment of the post code areas likely to flood. A progress report to the Review in March 2008 shows that LRFs have carefully considered their plans for warning the public, taking into account local needs, the practicality of door-knocking in their area, the resources of the local authorities and the other options available to them to enhance flood warnings.

21.17 However, during the regional multi-agency consultation events carried out by the Review, it became clear that a substantial number of local authorities felt that door-knocking was highly resource intensive and that they would have difficulty carrying it out. Some believed that responsibility for door-knocking fell to the police. The perceived ability to offer door-knocking also differed between urban and rural areas, where the numbers of households and the distances between them vary greatly.

21.18 However, the method is already used in a number of areas, where its effectiveness as a method of disseminating information before flooding and once flooding has receded is well understood. Some LRFs have plans which utilise the resources of the police, other local community groups and Environment Agency staff where appropriate. Subject to training and addressing health and safety requirements, some staff are able to be moved from office roles, as happened in Hull where 750 council staff took part. As outlined in Chapter 12, voluntary organisations consulted by the Review enthusiastically offered to be involved in door-knocking and we recommend that the use of this resource is explored. Where resources are stretched, prioritisation of door-knocking based upon lists of vulnerable people and areas at highest risk can be carried out. It should be remembered that for warning, door-knocking is only one method and as such it should be used simultaneously with a suite of other methods, as described in the literature.[4]

[3] D. Parker and J. Handmer, 'The role of unofficial flood warning systems', J*ournal of Contingencies and Crisis Management*, (1997), 6(1)45-60.

[4] http://ies.jrc.cec.eu.int/fileadmin/Documentation/Reports/Land_Management/EUR_2006-2007/EUR_22760_EN.pdf

RECOMMENDATION 64: Local Resilience Forums should continue to develop plans for door-knocking, coordinated by local authorities, to enhance flood warnings before flooding and to provide information and assess welfare needs once flooding has receded.

21.19 Other personal warnings include those given by the Environment Agency's flood wardens. These are volunteers from the community, who are contacted directly by the Agency, and pass information on to neighbours. Flood wardens are favoured in some areas as they supplement official warnings with local knowledge and provide community support. The Review encourages communities to consider setting up volunteer flood wardens, for example by extending the role of Neighbourhood Watches, with advice from the Environment Agency. Environment Agency staff known as Flood Ambassadors are in place in some areas and, as well as issuing flood warnings, reassure people sometimes that floods will not happen in given rainfall scenarios.

Flood codes

21.20 The Environment Agency currently issues warnings based on Flood Codes: Flood Watch; Flood Warning; Severe Flood Warning; and All Clear and are described in the table below:

Table 8: Environment Agency Flood Codes

Code	Flood Watch	Flood Warning	Severe Flood Warning	All Clear
What it means	Flooding of low lying land and roads is expected	Flooding of homes and businesses is expected. Act now!	Act now! Severe flooding is expected with extreme danger to life and property.	No further flooding is expected. Water levels will start to go down.
What to do	• Monitor local news and weather forecasts • Be aware of water levels near you • Be prepared to act on your flood plan • Check on the safety of pets and livestock • Charge your mobile phone	• Move cars, pets, food, valuables and important documents to safety • Get flood protection equipment in place • Turn off gas, electricity and water supplies if safe to do so • Be prepared to evacuate your home • Protect yourself, your family and help others • Act on your flood plan.	• Collect things you need for evacuation • Turn off gas, electricity and water supplies if safe to do so • Stay in a high place with a means of escape • Avoid electricity sources • Avoid walking or driving through flood water • In danger call 999 immediately • Listen to emergency services • Act on your flood plan.	• Keep listening to weather reports • Only return to evacuated buildings if you are told it is safe • Beware sharp objects and pollution in flood water • If your property or belongings are damaged, contact your insurance company • Ask their advice before starting to clean up.

21.21 Submissions to the Review and discussions with members of the public make it clear that a large proportion of the public does not understand the Environment Agency's Flood Codes. This is also true for a number of responders the Review has spoken to, including fire fighters, infrastructure owners and transport operators. Further, academic research also indicates that the meanings of the Codes are not always understood.[5]

21.22 This lack of understanding may be based on a number of factors inherent to the Flood Codes and their presentation. For example, the warning system is not sequential, but, the perception is that each warning indicates an incremental increase in risk, or the probability of flooding, from 'Flood Watch' up to 'Severe Flood Warning'. This misunderstanding may be due, in part, to the Flood Codes always being listed in the order of severity, thus possibly implying a sequence, as opposed to a stand-alone warning. Understanding may also be hindered by the terms used in the Flood Codes and our evidence suggests that sometimes 'Flood Watch' is completely misunderstood and is thought to mean that "*monitoring is probably increased in an Environment Agency office somewhere but it won't really affect the public on the ground at this stage.*" As such, 'Flood Watch' is sometimes disregarded as it seems "*benign.*" The National Farmers' Union commented:

> *"It is not clear at what levels the flood warnings are set. We understand that flood warnings and severe warnings apply to properties and 'flood watch' applies to land. We consider this is potentially misleading as a 'flood watch' sounds relatively benign and may not motivate people in less densely populated areas to act as it may be them and their livelihoods that are affected. We need clarity of language in any communications."*

21.23 If the basic Flood Code is not understood, the associated guidance provided in the telephone warning or available on the Environment Agency's website provides only limited clarification: for 'Flood Watch' this states "*Flooding of low lying land and roads is expected*", without mentioning possible impacts such as railway lines and low lying houses also being flooded. Furthermore, the flooding of 'low lying land and roads' could include those used to access areas and properties which would not themselves flood and recipients of the warning would not necessarily appreciate this. For the 'All Clear' Flood Code, the associated guidance is "*No further flooding is expected. Water levels will start to go down*", however a farmer with fields under water or a person whose home is flooded is unlikely to describe the situation as 'all clear' even if they are told the water will recede.

21.24 The Review believes the Flood Codes system is too complicated and should be looked at afresh, starting with a 'blank sheet of paper' if needed. The warnings should say what they mean, with a reduced reliance on separate guidance. They should, as far as practicable, comprise the elements of an ideal warning:[6]

- a brief description of the hazard – what is happening;
- the location – where the hazard is and where it is likely to go/impact;
- the severity of the impact – what is likely to happen and the consequences;
- what action should be taken and the time window in which to act; and
- when and how the next warning and other information will be available.

21.25 Furthermore, instead of a one-size-fits-all approach, the warnings should be tailored to different types of people and places, particularly addressing vulnerabilities, and possibly different types of flooding, as discussed below.

People references

21.26 Not all people can respond to warnings: not all those receiving a warning will be able to understand it and be physically able to take action in response. Post-event surveys

[5] H.L. Molyneux, 'Flood Warning for Schools: Effective Risk Communication?', MSc Dissertation, University of Leicester, February 2005.

[6] J. Salter, J. Bally, J. Elliott, D. Packham, 'Vulnerability and warnings', Natural Disasters, Thomas Telford, London, 1993.

show that English (the principal language in warnings) is not the first language of about one per cent of the population at risk of flooding, and that between 15 to 23 per cent of residents have some form of disability.[7] Warnings therefore need to take account of the needs of people living in an area and some of this information might be held in official health or social records. But, much of the information on people's particular needs might be held intangibly within the community and the best way of harnessing this information will be by dialogue with the community.

21.27 Vulnerability in terms of flooding can be defined as the capacity of a person to anticipate, cope with, resist and recover from the impact. As such, it is not confined to those who may be considered as 'traditionally' vulnerable, such as the elderly and disabled. Other groups can include: people living alone; families with young children and babies; non-English speakers; different socio-economic groups; people with difficulties with sight, hearing or mobility; and temporary residents such as tenants, homeless people and tourists. A person's vulnerability can also change with time as flooding progresses, with warnings perhaps needing to change accordingly. For example, a telephone warning or media broadcast might be suitable when vulnerability is assessed to be low, while face-to-face methods such as door knocking are more appropriate as vulnerability rises. Of course, assumptions about vulnerability are just that – assumptions – which members of some groups might confound. For example some elderly people might be better connected with the community, more experienced in dealing with challenging situations and therefore more resilient as a result.

21.28 The Review has seen good progress in mapping vulnerability in the Environment Agency's Flood Vulnerability Map, as discussed in more detail in Chapter 10. The Flood Vulnerability Map allows the possible social impacts of floods to be assessed, facilitating targeted awareness-raising before floods and warning when flooding is likely.

Personalised health-related weather warnings

The impact of weather on health is increasingly well-understood and a service has been developed by the Met Office to provide early warning of conditions that can lead to increased risk for people with Chronic Obstructive Pulmonary Disease (COPD).[8] The service includes:

- winter COPD forecast, delivered by email twice per week between October and the end of March;
- summer COPD forecast issued once per week by email;
- automated telephone calls to patients, from October to the end of March, when forecast risk is 'Elevated'; and
- information for patients and training courses for healthcare professionals.

A comparable personalised warning system, perhaps based on Floodline Warnings Direct, for people particularly vulnerable to floods, and their carers or healthcare professionals, may be an option worth considering by the Met Office and the Environment Agency.

Place references

21.29 The Review heard that, during the 2007 floods, warnings based on named stretches of watercourse – for example, "between 'x' brook and 'y' stream" – were considered unhelpful, both to emergency responders and the public. Most people do not use watercourses as a reference point and struggle to understand information issued on that basis.

20.30 Our research reveals that many people felt that a reliable alert was required that directly applied to their street or neighbourhood. The Review is aware that the Environment Agency has work underway to tailor information to individual communities and is pleased that in some areas more geographically-specific warnings have started being issued. An example of this is in Hertfordshire, where a

[7] D. Parker, S. Tapsell, S. McCarthy, 'Enhancing the human benefits of flood warnings', *Nat Hazards*, (2007), 43:397-414.
[8] http://www.metoffice.gov.uk/health/features/copd/COPD_service.pdf

warning under the old system; "Upper River Colne from North Mymms to Maple Cross" now states "Radlett Brook at Radlett." Of course, this is not the same as giving standardised warnings directed at an individual property, street or postcode area, but such accuracy can probably only be aspirational in some cases due to the uncertainty and complexity of natural systems such as rainfall and water flow. However, local warning methods such as sirens, loudhailers and door-knocking can ensure that messages are more focussed on an area.

Types of flood

21.31 Floodline Warnings Direct works best for a 'typical' flood of a slow-rising river but may not be appropriate for the other types of floods witnessed in summer 2007. The Environment Agency aims to provide a minimum of two hours notice of river flooding; this period is thought to provide sufficient warning to take some mitigating actions to avoid damage without being so far in advance that the sense of urgency, and the need to take immediate action, is not conveyed. The advance warning period is also discussed in Chapter 10.

21.32 In many areas this two-hour lead time is achievable, as slower-responding rivers can take several hours to reach maximum levels during an event. However, this early notification is impractical for other areas as many rivers can rise from normal to maximum levels in just half an hour. In these instances, the provision of warnings based on Met Office forecasts rather than Environment Agency river level monitoring is often required.

21.33 In contrast to slow onset floods, shorter lead times for surface water floods might be desirable to give greater certainty when the forecasts are more focused geographically.[9] However, regardless of the type of flooding, longer lead times allow people to put protective measures in place.

21.34 Chapter 10 discusses longer lead times with respect to responders and utilities providers. In a submission to the Review, the National Farmers' Union also stated the need for farmers to be issued warnings with as much lead time as possible:

> *"We need to ensure that flood risk modelling is able to provide the resolution and sufficient for farmers to be able to move their livestock. This does not mean more flood warnings as there is a danger that people will suffer from warning fatigue and become complacent but simply more targeted warnings."*

21.35 The cited literature provides some evidence that a longer warning lead time also has a beneficial effect on the mental health of flood victims both at the time of the flood and later. Indeed warning lead time, rather than receiving a warning or not, appears to be the crucial factor in reducing the adverse psychological impacts of flooding.[10] The Review acknowledges that generally the Environment Agency tries to issue warnings with as much lead time as possible.

21.36 Clearly there is a balance to be struck between waiting for greater certainty that flooding will occur and giving the maximum time to prepare. The Review therefore encourages the Environment Agency to research this further in dialogue with the communities affected. The types of floods that are forecast to increase with climate change are those which have rapid onset and are unexpected; unfortunately, they are not at the heart of the current service. Future warning systems will need to reflect rapid onset flooding both in the warning methods used, actions to take and the timeframe in which to take them.

RECOMMENDATION 65: The Met Office and the Environment Agency should urgently complete the production of a sliding scale of options for greater personalisation of public warning information, including costs, benefits and feasibility.

[9] S.D. Drobot and D. Parker, 'Advances and challenges in flash flood warnings', *Environmental Hazards*, 7 (2007) 173 -178.

[10] D. Parker, S. Tapsell, S. McCarthy, 'Enhancing the human benefits of flood warnings', *Nat Hazards*, (2007), 43:397-414.

Providing advice during an emergency

This chapter examines methods of providing advice to the public during and after flooding. It contains sections on:

- telephone information lines; and
- internet advice.

Introduction

22.1 Once flooding had occurred and essential services were lost, the public needed advice on what to do. In most instances, they turned to the authorities. People needed basic information on the extent of flooding, the implications for health and welfare and advice on issues such as transport options and whether to switch off their electricity.

Telephone information lines

22.2 Telephone contact with the authorities was a key source of information for a lot of people during the flooding emergencies of 2007, particularly those directly affected. But many people commented that they were passed from organisation to organisation when seeking advice. In some instances, the publicising of several different telephone lines left people confused about which one to ring.

22.3 In addition, there were instances of 999 calls being made when, for example, a garden or unoccupied vehicle had been affected by flooding. Although clearly distressing to the individuals affected, these kinds of events are not considered emergency situations by the police and fire and rescue services, and this contributed to the pressure on emergency call centres during the events of June and July 2007. The Review is aware of work underway between the Home Office and Communities and Local Government to raise public awareness of the difference between emergency and non-emergency situations. Fire and Rescue Authorities are pursuing similar work through Local Resilience Forums (LRFs). **The Review would welcome these initiatives drawing on experiences from the 2007 summer floods and the final output including information on Floodline or details of local authority call centre numbers if appropriate**.

22.4 Nevertheless, there were also success stories. Members of the public were able to get information on flooding via the telephone from a variety of sources. In addition to Floodline – (0845 988 1188), the Environment Agency helpline which provides advice on flooding to

the general public – there were a number of other organisations such as Hull and Barnsley councils which set up flood information lines for the local community. These services made use of local authority contact centres, which are now a regular part of service delivery for most local authorities. In practice, information requests generally fell into two distinct areas:

- advice on the likelihood or scale of flooding; and
- details of local response and recovery services, including how to deal with the loss of essential services.

Non-emergency telephone advice

22.5 An interim conclusion of the Review was that non-emergency advice by telephone during a flood emergency should come from just two sources – the Environment Agency for flooding information and local authority contact centres for local advice.

22.6 In response to this, the Review received a volume of evidence suggesting that, when essential services were lost, people generally contacted the utility companies concerned or, if in doubt, the local council. We also heard that well established telephone services run by voluntary organisations and police casualty bureaux were extensively used, and in one instance played a useful role fielding many calls from the public volunteering their services. It was felt that defining only two telephone lines was restrictive and did not reflect other useful sources of information. Submissions to the Review argued for a telephone line providing general information that could also redirect people to other organisations. The Review has therefore adjusted its final recommendation to reflect this.

RECOMMENDATION 66: Local authority contact centres should take the lead in dealing with general enquiries from the public during and after major flooding, redirecting calls to other organisations when appropriate.

22.7 The Review understands that, in some areas, both county and district local authorities will have separate contact centres. Where this is the case, the Review expects the authorities to work together to ensure suitable, unambiguous provision of advice. In addition, the Review is aware that inevitably in stressful situations people ring the wrong organisation for the information they are seeking and will not necessarily telephone the local authority contact centre. **In such cases, we would welcome the local authority contact centre's details being passed on to the public by the recipient agency, including Environment Agency local offices and utilities companies. In cases where an organisation other than the local authority contact centre is required, the agency receiving the call should pass on the correct organisation's details to the public instead**.

22.8 In terms of transferring telephone calls, the Review welcomes a pilot study by the Environment Agency to provide this service as an extension of Floodline Warnings Direct. In this pilot, Floodline agents are able to provide a response to local authority related enquiries from the public by drawing on material provided by the local authority, and, if necessary, transferring callers to the relevant local authority. This system is currently being tested and, subject to a successful outcome, may be implemented later in 2008.

Internet advice

22.9 Many people were frustrated at having to access a number of websites to find information on different flood-related issues such as the disconnection or restoration of electricity and water supplies, health notices and flood warnings. Many websites were poorly constructed or crashed under the volume of information requests. Some were not updated quickly enough, including one rail website which said cancelled trains were still running – this might have exacerbated the situation on the ground as people may have acted on incorrect information. Furthermore, some people could not find the information they needed as they did not know where to start looking.

22.10 The Review has also received evidence about the public's concern over a perceived lack of information about the the provision of emergency supplies. This came through both our discussions with the public and through social research carried out for the Consumer Council for Water, and is discussed in more detail in Chapter 11. Good engagement with the public helps to allay anxieties in an already stressful environment. The Review believes that essential service providers should maintain continuous provision of public information during an emergency, through a website preferably linked to other responders and local authority contact centres.

22.11 In submissions to the Review, LRFs have expressed concern that public information provision presently overemphasises the use of the internet. In conversations with the Review, social scientists have described how the proportion of people who have access and the knowledge to navigate the internet may be much lower than generally thought and even people who have the internet might not be proficient at finding the information they need, particularly if websites are difficult to navigate. Further, the internet is not available when mains power fails – a common scenario when properties flood. The Review appreciates these concerns and reminds organisations that a suite of other methods should be used to provide information.

The Environment Agency's website

22.12 Some criticism has been levelled at the Environment Agency's website in terms of its ability to cope with high demand, its navigability and the information provided. In light of this, the Environment Agency is working to improve the functionality of its website, following user testing and feedback on the way flood risk information is displayed. These improvements are designed to make it easier for people to navigate and understand their personal flood risk as well as the action they are required to take. New features will include automated online updates ('RSS feeds') for flood warnings live to computer desktops and templates to allow access via mobile phones via Wireless Application Protocol (WAP). The new website will also be more resilient to high traffic. By bringing in a new technical platform, the Environment Agency informed the Review that the website will be capable of serving one million pages per hour (peak traffic during the summer 2007 floods was 250,000 pages per hour). The Environment Agency will also be able to syndicate flood warning content to other websites. This will enable other organisations' websites to display Environment Agency flood warnings live on their websites. Reciprocal links will raise awareness of the Environment Agency's Flood Warnings service and flood-related advice. The new site will be launched towards the end of 2008.

Local resilience forum websites

22.13 It would be of great value if a single website provided links to all the websites needed for a comprehensive set of advice on flood-related matters, including where to go for more specific information and what to do in the emergency. This could be the area's LRF website, with all Category 1 responders also linking back to this 'hub' website. Other useful information could also be linked, for example the guidance from the Electrical Safety Council on actions to take once floodwater has subsided.[1]

22.14 Some LRFs already have websites like this. Others have commented that it would be difficult to keep the website updated, particularly in real time during an emergency, and that keeping data and messages consistent would be problematic. Given the range of responses on this matter, the Review believes that the Cabinet Office, working with the National Steering Committee for Warning and Informing the Public, needs to take the lead in providing advice so that LRFs are equipped to set up effective public information websites. **Awareness of LRF websites also needs to be raised via the Government's public information campaign** as discussed in Chapter 20.

RECOMMENDATION 67: The Cabinet Office should provide advice to ensure that all Local Resilience Forums have effective and linked websites providing public information before, during and after an emergency.

[1] http://www.esc.org.uk/pdf/flood_advice.pdf

The role of the media

This chapter examines how media organisations communicate news, including public information messages, before, during and after an emergency, how effective this is, and the media's interaction with multi-agency responders. It contains sections on:

- local media;
- national media;
- the multi-agency response and the media; and
- media coverage of the Armed Forces.

Introduction

23.1 Although media organisations have no statutory responsibility under the Civil Contingencies Act 2004 (CCA) to communicate with the public, they do have a widely recognised role in providing information before, during and after an emergency. Radio and television broadcasters have a longstanding agreement with the government to interrupt programming with public safety advice and information in the event of a major emergency. They also support the sharing of information. Journalists and news crews often arrive early at an emergency scene, and the rolling news which follows is a valuable resource for the public and responders alike. Every emergency control centre facility, from the Cabinet Office Briefing Rooms (COBR) outwards, watched live news feeds closely during the floods of summer 2007.

A guide to working with the BBC in an emergency

(www.bbc.co.uk/connectinginacrisis)

The BBC has a well established initiative to help ensure the public has the information it needs during an emergency. Although the title 'Connecting in a Crisis' might suggest that it relates only to events during an incident, it is underpinned by connections *before* a crisis and ensures that BBC local radio station producers have established appropriate contacts with emergency planners, the police and other key organisations in their local area. The online guide explains how to access the range of communication outlets offered by the BBC at local, regional and national level. Examples of information provided can include updates from the Environment Agency on river levels, from the police on roads and flooded areas and from local authorities on school closures.

Opposite page: photographer: Tim Aston

Local media

23.2 The media, particularly local radio, has a pivotal role in passing important information to the large numbers of people affected by flooding or loss of essential services. After the 2007 floods, the information broadcast was often important local news, such as road and school closures. In Gloucestershire, for example, the local BBC radio station received a large number of calls from the public giving live accounts of flooding on their streets and transmitting messages to concerned friends and relatives whom they were otherwise unable to contact. In many cases, the media acted as a 'friendly voice', listening to public concerns and providing a sense of reassurance, especially to people isolated by the floods and those living alone.

23.3 The local media's interest continued well after the 2007 floods had receded. For example, BBC Radio Gloucestershire broadcast a memorial service, organised by local media, from Tewkesbury Abbey for those who died in the floods. In addition, when the A46 road reopened after being closed for a number of months due to flood damage, the BBC transmitted live broadcasts to publicise the reopening of the village of Painswick, thus helping the economic recovery of the area. The media also performed a scrutiny role, 'chasing up' and asking questions of those responsible for utilities and services to ensure suitable outcomes. A series of media reports and documentaries since the 2007 floods have helped keep flooding in people's consciousness and high on the national agenda.

Engaging the local media proactively

23.4 However, the events of summer 2007 highlighted inconsistencies and limitations in the way in which the media fulfil this public information role. Evidence to the Review from media organisations described them struggling at times to engage with emergency responders during the floods. In particular, they cited their desire for Environment Agency representatives to come to radio and television stations to give advice, but found that often, due to the scale of the events, they were not available. While the media acknowledged the enormous strain on responders caused by the unprecedented scale of the events, they were often unable to get the information they felt they needed to meet the public's concerns.

23.5 The Review believes that in any realistic analysis of local media engagement during emergencies, the benefits far outweigh the costs if the engagement is properly organised and structured. Only involving the media after an event can result in broadcasts being focused on 'news' only rather than planned public information messages. Local media should be supported in developing their public information role at all stages of an emergency. While there was effective engagement with the media in many areas, it needs to be replicated throughout England as do the opportunities such engagement offers for stronger public leadership.

23.6 In recognition of the importance of consistent engagement with the media, in the interim report the Review recommended that Local Resilience Forums (LRFs) urgently make arrangements to involve local media representatives in local preparedness and response planning to support their public information role. The Review was pleased to note that this recommendation was received with enthusiasm by LRFs. Their feedback suggests that arrangements throughout the country are well underway with local media representatives being involved in various ways depending on the local need. Effective engagement with the media at early planning stages will help this relationship run smoothly during an emergency and throughout the recovery phase.

23.7 And lessons are being learnt; news editors and local newspapers have told the Review that, at the beginning of the 2007 floods, they were not informed that a major incident had been declared, leading to a hurried need to catch up with the situation. However, in the East Coast winter floods, the local Chief Constable had called the news organisations direct, which bears testament to the stronger relationships that are being developed.

23.8 Although, understandably, media presence decreases once the immediate emergency is over, coverage during the recovery phase is just as important. Communication strategies therefore need to be agreed at the outset by all recovery coordinating groups and should focus on reassurance, advice and progress. This idea formed the basis of one of the Review's interim conclusions. **The Review would welcome a common approach being considered further by both Local and Regional Resilience Forums. It is clear that the local authority lead role in the recovery phase should extend to an overview of communications, ensuring clear, consistent messages across all partnership organisations**.

Local engagement with the media

In Hertfordshire, the LRF media group already enjoys strong relationships with local media and engages with them on a regular basis. For example, they have an active relationship with BBC Three Counties who have provided airspace to promote feature items including preparedness for flooding and severe weather incidents. The group has devised a series of monthly features for local media and included flooding in the spring around a wider county campaign about preparedness. This included working with BBC Three Counties and local press to reinforce messages and targeted work with different groups, particularly the elderly. In December 2007, the group hosted a junior reporters' training session in which young journalists were briefed about the work of Hertfordshire LRF and asked to support the group's warning and informing work. This was well received.

23.9 Members of the Review team attended a conference, "*Beyond the Floods*" to discuss lessons learned after the 2007 floods. The conference was organised by BBC Nations and Regions for local and national journalists, presenters and editors as well as members of the emergency response community. We heard how media websites are often the most resilient to sudden heavy demand and this was true during the floods when many millions of 'hits' were received from members of the public seeking information. The Review was also interested to hear of innovative thinking and new technologies being used to provide public information and education, including:

- the development of new websites allowing the user to access video footage and local information – the BBC website alone received nearly 11,000 photos and 200 video clips submitted by the public;
- different programmes being broadcast on FM and MW frequencies in a local area to maximise information output; and
- the use of the 'red button' on television remote controls to provide extra information including bespoke weather reports; and broadcasts of Gold press conferences.

Media profile of local leaders

23.10 Local media activity also worked well in other respects during the 2007 events. The Review notes the value of a high media profile for local leaders, as achieved by council leaders and Gold Commanders in a number of areas affected by the floods. For example, in Doncaster, the elected Mayor's high visibility provided reassurance to the public during the severe flooding which affected the city in June 2007. In Gloucestershire, the Gold Commander adopted a similarly successful high profile, using the media as a way of communicating advice to the public and providing visible leadership at the local level.

23.11 In light of this, an interim conclusion of the Review suggested that council leaders and chief executives should play a prominent role in public reassurance and advice through the local media during a flooding emergency as part of a coordinated effort overseen by Gold Commanders. All respondents to the Review agreed with this stance, although the need for flexibility was also stressed. The most suitable person should be used depending on the information to be given and sometimes important messages are more readily received and acted on if they come from a recognisable figure of authority – a "person in uniform".

Submissions also highlighted that in some cases media training would be necessary, although the majority of local authority chief executives already have experience in this area.

RECOMMENDATION 68: Council leaders and chief executives should play a prominent role in public reassurance and advice through the local media during a flooding emergency, as part of a coordinated effort overseen by Gold Commanders.

National media

23.12 National television coverage, especially the rolling news channels, was regarded more cautiously than local media by the responder community and the public. The public felt that reports tended to move away from the local level too quickly, focusing instead on the regional or national picture and sometimes coming across as sensationalist. A number of affected people were dismayed by footage of reporters in Wellington boots standing up to their knees in flood water and regarded such reports as unhelpful unless supported by local facts and practical advice. But where that advice was forthcoming, television was a powerful medium. **The Review is reassured to learn that editorial controls in place at some media organisations do not countenance reporters putting themselves and emergency responders at risk by standing in dangerous flowing flood water. The Review welcomes this approach and encourages other media organisations to adopt a similar policy where one is not already in place**.

23.13 Since the 2007 floods there have been further instances of less severe flooding, for example on Friday 11 January 2008, when the Environment Agency installed temporary flood barriers along the riverfront in Upton-upon-Severn. The next day the river rose and over the weekend, a road was closed briefly, reopening again on the Monday. However, on the following day, television breakfast news showed a reporter standing by the barriers saying that the Environment Agency had erected the barriers and the River Severn was overflowing its banks, creating the impression that the town was newly in danger. During the day journalists from other television stations all reported what might be classed a 'non-event'. Submissions to the Review stated that the media appeared intent on making the story into a drama, consequently causing substantial unnecessary worry for local people. Although later the same day reporters said that Upton-upon-Severn was open for business, the Review is aware of businesses that reported cancellations and lost business because customers had seen the news reports. Businesses still struggling following the July floods found the nature of this reporting unhelpful and damaging.

23.14 Even in genuine flooding events, care needs to be taken in reports on flooding to accurately portray the impact on a location, while not inappropriately giving the impression that the wider area is closed for business from customers and tourists. News reports of winter flooding in Leeds city centre included the ubiquitous reporter standing in flood water and, using narrow camera angles, gave the impression that substantial urban areas were flooded, when in fact flooding was limited to a small number of streets adjacent to the River Aire. Aerial film footage of inundated floodplains heightened this perception without setting in context that this is what flood plains are 'designed' for.

23.15 The impacts of media reports on an area are difficult to quantify. However, the perception of adverse impacts is real: a survey of 81 local authorities affected by the summer 2007 floods, carried out for the Review by the Local Government Association, showed that, as of February 2008, 20 of these local authorities were still experiencing adverse impacts to their leisure and tourism industries and in some cases this was attributed to the media. One local authority stated:

> *"Hotel bookings were down 40 per cent because of the negative media in some areas, which has continued".* Another said:
>
> *"[There was] a £150 million loss to tourism business by loss of bookings and people viewing the area as closed for business".*

The multi-agency response and the media

23.16 Evidence to the Review shows that good relationships generally exist between the media and emergency responders, with examples of organisations working well together, ensuring sufficient access to unfolding events is provided and valuing each others' role. In some areas broadcasting direct from Silver Command as well as Gold allowed a dialogue to take place, with questions being asked and answered on air. This arrangement also meant that representatives from the emergency services had no need to be present at both the radio station and at Silver or Gold Command, thus freeing them for use elsewhere.

23.17 The GfK NOP study published alongside the Review's interim report showed that, whereas the public had clear, usually positive, views on the role of 'blue light' emergency responders during the floods, the public were less clear where local authority staff were involved and this often led to a critical assessment of their role. Local authorities, as a Category 1 responder under the CCA, play a central role in emergency planning and response and the prominent media profile of local authority chief executives would also help to raise awareness of the authority's role.

23.18 A small number of submissions to the Review from media organisations have argued for the media sitting on Gold Commands in place of the present arrangement of having a Media Liaison Officer who then reports back decisions made at Gold to assembled representatives of each organisation. This, the proponents suggest, would give quicker access to the full set of discussions at Gold, rather than 'filtered' snapshots. Given the important role of the media in providing public information, clearly there is an argument for media access to the decisions made at Gold. However, based on the evidence, the Review does not see the need for media organisations to actually sit on Gold Commands, as key decisions by emergency responders might be made differently if carried out under the eyes of the potentially critical media. Furthermore, if each media organisation were to sit on Gold Commands, the numbers of people present would be too large and unwieldy for the facilities and for effective decision-making. Additionally, if the media were involved in decision making, it could compromise editorial independence. Information coming out of Gold Commands should be shared between news organisations and not held exclusively by one. The BBC has informed the Review that information-sharing arrangements are in place and are adhered to during incidents.

23.19 A few media representatives have suggested that a 'local media only' Gold liaison officer, running in parallel with the usual media liaison officer, would be useful to ensure adequate contact time for the local media. Contact time can otherwise get usurped by the national media which has more prominence and sometimes runs to tighter editorial deadlines. **The Review does not make a recommendation in this respect, however, it would welcome Gold Commanders considering individually the needs of local and national media when appointing media liaison officers to Gold Command, especially given their different roles in public information provision**.

23.20 Clear communications and consistent terminology between responders are crucial to public information messages. For example, some confusion arose in the South West when the BBC broadcast information given to them by Severn Trent Water that the 'Gloucester region' had flooded. In fact the city of Gloucester at that stage had not been affected whereas Stroud, a town some 10 miles from Gloucester, had been affected. The confusion stemmed from the terminology for respective BBC and Severn Trent Water operational regions not being strictly geographically defined, and therefore not tallying, which was not understood at the time. **The Review would welcome responders discussing and understanding at the planning stage each others' geographical area of operation and the terminology used for these areas.**

Media coverage of the Armed Forces

23.21 The Armed Forces played an indispensable role during the floods. As well as the practical tasks they completed, their involvement reassured the public that everything possible was being done to protect their communities and utilities supplies. This reassurance was heightened by positive media coverage of their role. However, while the positive coverage was welcomed by the Armed Forces in their submissions to the Review, they also expressed the need for care in balancing the messages so as not to over-expose their role, which could imply in the minds of the public that the civil response was failing. Overexposure in the media, and then the sudden absence of coverage when the Armed Forces' role was complete, could also leave members of the public uneasy as the visible reassurance of the Armed Forces was no longer there.

23.22 Moreover, the public's view of flood response might be largely formed by the news images they receive. In a submission to the Review, an emergency planner told us:

> "*The public's indifference to putting in place their own basic resilience measures may be due to a reliance on the "authorities" coming to their aid with soldiers and sandbags. This view of flood response is largely formed by the news images they receive every day demonstrating what a flood response should look like, which…suggest that the "authorities" are responsible for dealing with flood risk by drafting in and deploying additional resources and that individual householders do not bear any responsibility to make their own flood preparations. Promotion of flood resilience cannot be discussed as though it happens in a vacuum, these messages are constantly fighting against news reporting clichés and historical images of how flooding is to be dealt with*."

23.23 The Review has sympathy with this viewpoint and recognises the important role of the media in promoting effective actions by the public during an emergency and in promoting public resilience by education *before* an emergency occurs.

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Personal and community resilience

This chapter discusses the role of individuals and communities in withstanding the consequences of flooding by being aware of risks, acting to mitigate them and responding effectively when the risks materialise. It contains sections on:

- the concept of resilience;
- personal resilience; and
- community resilience.

Introduction

24.1 Much of this report has been about the roles of public and private bodies in emergencies. However, evidence to the Review shows that the public play just as important a role – and in some aspects a greater one – in coping effectively with emergencies like those of summer 2007. On visits to the affected areas, the Review team collected many stories which illustrate how active local leadership and positive action, by both individuals and local organisations, helped to minimise the extent of the damage to communities. Temporary facilities, such as reception centres staffed predominantly by volunteers, were widely utilised. Those with the equipment to help others – for example farmers in Upton-upon-Severn – did work for those in greater need. Post-flood, individual and collective involvement has helped to engender a sense of enhanced community spirit and cooperation.

The concept of resilience

24.2 'Resilience' is generally defined as 'the ability to recover readily'. Applied to individuals and communities, the term relates to withstanding the consequences of an incident; being aware of risks; acting to mitigate them; and responding effectively when the risks materialise. The Review has received many illustrations of personal and community resilience – in every area affected, the extent to which communities came together to respond to the flooding events was both heart-warming and commendable.

24.3 There is no reason why, as a society, we should accept flooding as simply a fact of life. But responsibility does not lie with Government or other authorities and organisations alone – they cannot protect people from all the consequences of natural disasters. The response to a major emergency is stronger if

all parties work together, including communities and individuals. In major emergencies where responders are severely stretched, community resilience has an important part to play, both before, during and after the event and can complement the response of the emergency services.

24.4 Experts involved in emergency response should not ignore the skills, energy and ingenuity that are latent in most communities; in preparing for an emergency, communities have important shared local knowledge and can harness local resources and expertise – for example, the location of doctors, vulnerable people and temporary shelter and where useful equipment is stored. After an emergency, working in partnership with all who have a role to play, including members of the public, communities, businesses and voluntary organisations, can help return a community to normality as soon as possible.

Community action in a Berkshire village

Bucklebury is an old rural village on the River Pang in Berkshire, which flooded in July 2007, inundating 24 out of 26 houses as well as the Grade 1 listed Norman Church and the village hall. After the floods, Bucklebury villagers took a community-driven proactive and collaborative approach that has brought praise and delivered results. Not only did the villagers help each other on the day of the deluge, they also worked together over several days to clear out the River Pang of weed and silt – it was only when this job was complete that the river stopped overflowing. This teamwork created a determined community spirit which was harnessed in the formation of an action plan to develop projects to alleviate future flooding.

"In our village it has brought us closer together; but we have worked hard, kept focused and stayed calm and it has (hopefully) brought long term dry results."
Bucklebury resident

Personal resilience

24.5 Individuals and families need to be more personally resilient. There are a number of practical measures which members of the public, including business owners, can and should consider taking to prepare for a possible flood. All of these require only minimal action yet can make a real difference to the impact of a flood event.

24.6 One practical measure that members of the public can take to increase their resilience is to create a personal stockpile of supplies that might be useful in an emergency. During the floods of 2007, equipment and supplies were brought in by the emergency services and humanitarian organisations, often using the supply network of the major supermarkets. Donations from individuals also played a significant role in supplying those in need. However, supplies do not always need to be transported in and it was helpful that communities, individuals, businesses and schools already held, as a matter of course, certain supplies and equipment, whether cached in personal stockpiles for use in an emergency or in every day use – examples are tools, blankets, water, food and clothing. There was no lack of willing communal cooperation in the floods and capable and well-motivated individuals relied largely on common sense and utilised household equipment. Thinking about the possible need, quantity and accessibility of these 'reserves' in advance of an emergency can enhance the resilience of individuals and communities. Chapter 11 looks at this matter in more detail.

24.7 The Review recommended in its interim report that members of the public make up a flood kit. However, disappointingly, informal surveys suggest that few people have assembled a flood kit since then, although it is recognised that only six months have elapsed since the recommendation was first published. The Review considers however that the point is worthy of restating as a recommendation in its final report. The Review is encouraged by the fact that flood kits are highlighted on many local authority websites, indicating that this key message is being delivered to the public by

organisations. The Review is also aware that as part of its Flood Awareness Campaign in 2008/09, the Environment Agency will produce and market a flood kit. **This is a welcome move which the Review supports.**

RECOMMENDATION 69: The public should make up a flood kit – including personal documents, insurance policy, emergency contact numbers (including local council, emergency services and Floodline), torch, battery or wind-up radio, mobile phone, rubber gloves, wet wipes or antibacterial hand gel, first aid kit and blankets.

24.8 In the interim report, the Review also recommended that members of the public in flood risk areas increase their personal state of readiness and resilience to floods by following the Environment Agency's practical advice, as summarised below.

24.9 Progress on this recommendation is encouraging; as of May 2008 over 20,000 people had visited the Environment Agency's website pages on '*Simple ways to protect your home from flooding*',[1] in comparison to the same timeframe last year when there were only 7,500 visits. In addition, as of May 2008, over 11,000 people had viewed advice on producing an emergency flood plan[2] in comparison to fewer than 1,500 for the period from January to May 2007.

"Since the floods, we have worked hard on supporting a Flood Warden Network in Lewes. This has proved very difficult to sustain in the face of public apathy. Most people want to put the distressing experience of flooding behind them, rather than get involved in community support networks to improve emergency response."
Lewes District Council

Environment Agency website: Simple ways to protect your home from flooding

- Make sure you have adequate insurance. Flood damage is included in most buildings insurance policies, but do check your home and contents are covered.
- Access the Environment Agency's website to check flood risks to property (this can be followed up by advice from the Agency, for example whether the property in question is protected to some degree by physical defences).
- Contact the Environment Agency to be registered on their Floodline Warnings Direct scheme (however, this does not apply to surface water or sewerage flooding and people should also make sure they remain alert to weather forecasts).
- Keep vital possessions, such as financial and legal documents and items of sentimental value, upstairs or stored as high as possible in waterproof containers and have plans in place to move items at short notice.
- Make a list of other useful numbers you may need – your local council, the emergency services and your Floodline quick dial number.
- Make sure you know where to turn off your gas, electricity and water. If you are not sure, ask the person who checks your meter when they next visit. Mark the tap or switch with a sticker to help you remember.

Property resilience

24.10 Property owners need to take responsibility for protecting their homes and businesses. As set out in Chapter 5, improving the resilience of property at risk from flooding would help reduce the impact of future flooding events. Immediate examples of steps that

[1] www.environment-agency.gov.uk/subjects/flood/826674/830330/876970/?version=1&lang=_e
[2] http://www.environment-agency.gov.uk/subjects/flood/826674/830330/927042/927049/927084/927259/?version=1&lang=_e

members of the public could take to increase property resilience include purchasing products such as door guards, air brick covers and toilet non-return valves.

Flood Resilience – Well worth it!

"We live near Oxford and were flooded in 2000, 2003 and 2007. After the 2000 flood we put things back as before, thinking we would not flood again for 50 years. Three years and one flood later, we knew differently. We decided to restore our house in a way that would minimise the damage caused by any future flood – so-called flood resilience. Being flooded will never be fun, but being more or less flood resilient makes it less stressful and one's much more quickly back to normal.

We decided to have stone floors which only need mopping to return to normal and our insurers assessed our claim on the basis of replacing like with like, they did not mind how we spent the money. At the same time, we had a sump dug in one corner of the kitchen, and in which sits a submersible electric pump. Water coming into the house runs across the floor and down through the grating into the sump below. It's then pumped back out into the garden. We are on the edge of the flood plain so we get plenty of warning and (so far!) the flooding outside has not been more than about 30 cm deep. We also had flood boards fitted to our door frames, electrical points fitted well up off the floor and our fridge, freezer and washing machine are up on platforms with storage space below.

Cost is an issue for almost everybody. As far as I know, insurance companies will not pay extra to help with these measures (though you could always ask!). However, many things don't cost much more (if at all) to do in a flood-resilient way. Stopping the water ever getting in is the best thing, but if that isn't possible, flood resilience measures are very well worthwhile." Peter Rawcliffe

Business resilience

24.11 Many businesses we met were very proactive in recovery after the 2007 floods and set about getting back on their feet as soon as possible; indeed this was to be expected given that people's livelihoods depended on it. However, with regard to resilience before a flood, many businesses were less resilient to deal with flooding before it occurred. In submissions to the Review, local authorities have told us how they have difficulty engaging with businesses and one stated:

> *"Engaging with the business community is very difficult because they don't want to know (in terms of resilience) and get involved in business continuity. This is particularly true of SMEs [small and medium enterprises]."*

24.12 Businesses are more likely to be flooded than burned down, resulting in devastating financial loss, yet fire safety is often considered more important. Resilience measures should be a part of every business' continuity planning in flood risk areas; by taking action to prepare in advance for flooding, most businesses can save 20 to 90 per cent on the cost of lost stock and moveable equipment, as well as a lot of trouble and stress.[3]

24.13 To ensure business continuity when flooding occurs it is vital that businesses have a flood plan which examines possible flooding scenarios, how the business would react, and steps possible to protect property and ensure the safety of staff. Consolidation of this information in a written document can make the information easy to access during a flood, easy to communicate to staff and easy to remember. The Environment Agency's website provides a template for creating a personalised flood plan.[4]

Physical measures

24.14 Many of the measures used to make homes more resilient can also be used to protect business premises, although the Review has heard that the comparative take-up of these measures is lower, perhaps because buildings have features such as large roll-doors

[3] http://www.environment-agency.gov.uk/subjects/flood/826674/830330/927042/
[4] http://www.environment-agency.gov.uk/commondata/103599/flood_form_6.1_936714.doc

or shop frontages that people perceive cannot be protected. In addition, many business owners do not live on site, and the home may take precedence during a flood.

24.15 However, where appropriate, flood boards on the doors of businesses and air brick covers can be used. In addition, business owners can register their premises as well as their homes on Floodline Warnings Direct to have telephone warnings sent to their mobile phone or home address. As well as allowing people to evacuate if necessary, these warnings allow businesses with moveable stock, such as car dealers and small goods retailers, to move stock to a place of safety. Physical resilience measures for properties are discussed further in Chapter 5.

Resilience advice

24.16 Most Regional Development Agencies report that flood resilience workshops they and Chambers of Commerce have held for businesses have had disappointing attendances. This could be because small and medium-sized enterprises do not always have the time to attend events.

24.17 But some areas have reported successful engagement; in September 2007, London First, a business membership organisation, with the Environment Agency, carried out an online exercise that aimed to assess business continuity plans against the effects of severe weather.[5] More than 300 businesses signed up. It offered a platform for debate between the private and public sectors as well as providing the opportunity for businesses to network with emergency planning officers. The exercise also allowed good practice to be shared and current guidance to be signposted. **In another interesting initiative, Business Link, the government service to provide business advice, runs free workshops to inform rural businesses of the impacts of climate change and possible changes to business practices in light of these.[6] This approach is encouraging and the Review would welcome it being trialled more widely**.

Community resilience

24.18 There is no doubt that, when caught up in an emergency, the majority of people do help themselves and their community. Although resilience begins with the individual, greater dividends can be achieved if activities are organised at the community level. There are areas where community preparedness work is already under way, and evidence to the Review suggests that it works best when kept to a focused local level – the village; the town ward; the business; or the housing estate. In part, successful community resilience requires people to know who, and what, is where. It also requires the scope of the job to be kept within what can be managed by people in their spare time.

24.19 A local level focus to activities does not preclude the involvement of national organisations. Formalised structures in which local groups have links to a national organisation, such as voluntary organisations, can help to prevent remote communities from feeling forgotten or left out, provide a focus for the community in times of emergency and can be an obvious point of contact for the emergency services when they arrive. Building relationships within the community through local branches of national organisations could help in local recruitment and in the delivery of messages to vulnerable groups.

24.20 Leadership is an issue that needs to be explored further; in some areas, people look to formal leaders, such as Ward Members, to have a role. In other areas, leadership is provided by more informal networks, such as existing community groups, especially in rural areas. Submissions to the Review show that emergency preparedness activities are already well organised in many parishes and villages. They are often arranged individually in villages and may sometimes be taken forward by umbrella organisations, such as the Hampshire Flood Steering Group, which represents over 100 parishes at risk of flooding. A number of local areas were enthusiastic about the National Flood Forum's Flood Fairs, which

[5] Businesses can take part in online continuity testing by contacting London First at www.londonfirst.co.uk.
[6] http://www.iod.com/intershoproot/eCS/Store/en/pdfs/mk_climate_change.pdf

are aimed at communities and individuals who have been flooded or are at risk of flooding. Flood Fairs are designed to offer the support, knowledge and help communities and individuals who need to organise themselves, to manage the effects of flooding, to promote self-help and to campaign for flood alleviation.

24.21 Much good advice about community resilience is also available, both to members of the public and local authorities. Examples include West Berkshire's 'Guide to Developing a Community Emergency Self Help Plan' and Gloucester County Council's 'Your Essential Flood Guide',[7] which provides helpful information, including essential telephone numbers, flood defence measures and health and safety advice as well as recovery guidance on cleaning and drying property. **The Review endorses the collaborative approach widely observed and would welcome the sharing of good practice in this area**.

Flood resilience advice in Filey

The town of Filey in North Yorkshire has flooded a number of times in the last few years. After the floods in 2002, in partnership with community organisations and responders, the local council issued a ring-binder to every household containing useful information, including contact numbers of all agencies, pamphlets on property resilience measures and recovery as well as a list of all the local radio wavelengths. The folder also contains a red 'H' for residents to place in their window to summon priority assistance from neighbours or emergency services if other methods for summoning help are unavailable. The folders were in such demand after the 2007 floods that extra supplies were produced, which were sponsored by Yorkshire Water and Scarborough Borough Council.

Engaging the public to promote resilience

"We have our strategy to incorporate promotion and support to building and sustaining resilience in communities. Using some of the government's flood relief grant, we are now engaged in rolling out tangible community assets, including storage facilities containing basic equipment and personal protective equipment to high flood risk communities. As our involvement and engagement has grown, we note that those communities are also more receptive to investing in individual property protection. We have also facilitated local flood fairs and will assist communities with training for volunteer teams. Where there are flood warden groups already in place we will support the development of their roles."
Newark & Sherwood District Council

24.22 Employers also have a role in leading community resilience. **An idea put to the Review, which we would welcome being developed further, suggests that businesses could allow staff time to gain skills in, for example, first aid, personal safety management and befriending – this could lead to a more resilient workforce year round and one that could contribute to the collaborative community effort during an emergency**.

24.23 Community resilience, and its leadership, has a role at all stages of an emergency from emergency preparedness to response and into the recovery phase. Chapter 26 looks more closely at the role of local authorities in coordinating the recovery phase.

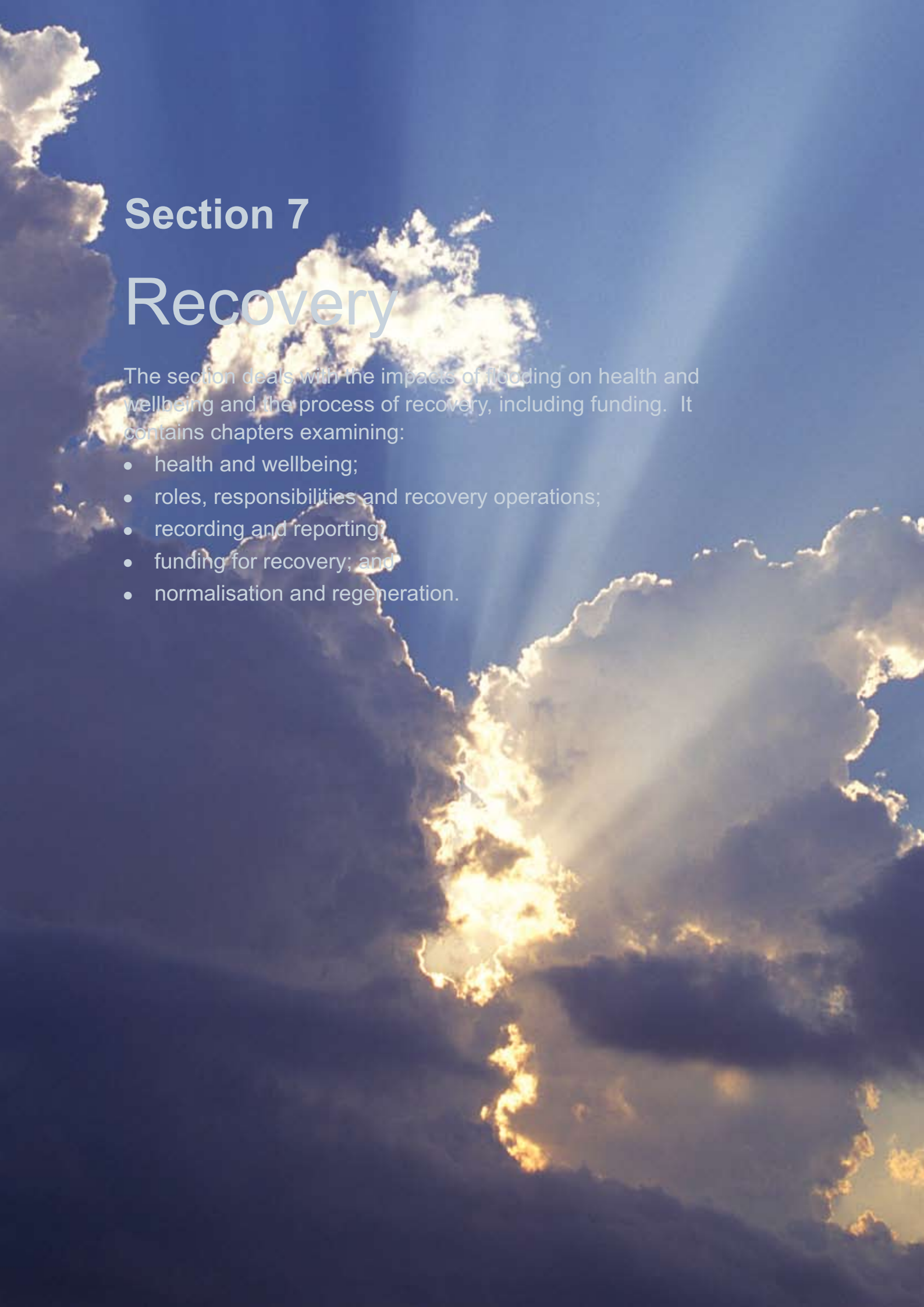
24.24 In this section of the report, the Review has outlined a range of different ways in which individuals, businesses and communities can increase their resilience, including planning for emergencies, taking mitigating actions when flooding occurs and putting physical resilience measures in place in homes and businesses.

[7] http://www.gloucestershire.gov.uk/index.cfm?articleid=17465

We have also explained how resilience can be promoted at local, regional and national levels by public and private bodies, including the voluntary sector.

24.25 However, in this chapter we have only been able to give a snapshot of existing arrangements and a few suggestions of resilience measures that people can adopt. The Review believes that individuals and communities would benefit from more comprehensive, targeted advice from the Government and we make a recommendation accordingly. This also reflects the Government's commitment to the principle of community resilience in the National Security Strategy.

RECOMMENDATION 70: The Government should establish a programme to support and encourage individuals and communities to be better prepared and more self-reliant during emergencies, allowing the authorities to focus on those areas and people in greatest need.



Section 7

Recovery

The section deals with the impacts of flooding on health and wellbeing and the process of recovery, including funding. It contains chapters examining:

- health and wellbeing;
- roles, responsibilities and recovery operations;
- recording and reporting;
- funding for recovery; and
- normalisation and regeneration.

Health and wellbeing

This chapter explores the impact the floods have had on individuals' health and wellbeing. It contains sections on:

- provision of health advice;
- health and psychosocial impacts;
- wider community impacts;
- social research studies; and
- monitoring and mitigating actions.

Introduction

25.1 The summer 2007 floods had a significant impact on people's health and wellbeing. Many people suffered from illnesses including stomach upsets, anxiety and depression and this affected family life and relationships. Some individuals have likened their flooding experience to bereavement, going through similar emotions such as shock and disbelief, anger, blame and finally acceptance.

25.2 Definitive statistics on the health impacts of the floods are scarce for a number of possible reasons as discussed later in this chapter. However, one, perhaps indicative, study[1] by the Farm Crisis Network, an organisation which provides pastoral and practical support to farming people during periods of anxiety and stress, showed a significant increase in the number of calls to its helpline, which received up to five times more calls than in the same period the previous year, most probably due to the combination of the floods and restrictions imposed as a result of last summer's animal disease outbreaks. Impacts reported included physical and psychological health conditions, potentially over extended periods.

Definitions used in this chapter:

Good health:

A state of complete physical, mental and social wellbeing, and not merely the absence of disease and infirmity

Psychosocial:

The mind's ability to, consciously or unconsciously, adjust and relate to the social environment

Psychological:

Pertaining to the mind, its mental processes, and its emotional makeup

[1] http://www.farmcrisisnetwork.co.uk/file_download/28

25.3 A number of organisations are responsible for providing general and specific health advice, including the Health Protection Agency (HPA), the Department of Health (DH) and Strategic Health Authorities (SHAs). As described in Chapter 12, there is also a large role for the voluntary and community sectors in all aspects of recovery and they can be particularly effective in supporting local communities in addressing the psychosocial impacts of flooding.

25.4 However, during the response and early recovery phases of the summer flooding, the Review found that there were many instances of individuals, businesses and the voluntary and community sector receiving inconsistent health information. In some cases, health advisors said it was safe to stay in flooded properties, yet in others families were told to leave their homes immediately due to health risks from fungal spores. Television images of children playing in floodwater suggest that the dangers of contaminated water had not been widely understood by the public.

25.5 In the recovery phase, builders were unable to find advice as to whether renovating damp properties posed health risks. As noted in Chapter 9, confusion was caused by conflicting advice from public authorities and the insurance industry on the removal and disposal of water-damaged items from houses and businesses. There was also uncertainty about any continuing health risks from interior brickwork and building fabric that had absorbed flood water and furniture that was water-damaged. Schools and householders were not confident about using playing fields and gardens once the floodwater had receded.

25.6 Difficulties in finding consistent health information for the provision of emergency water supply from bowsers are highlighted in Chapter 11, which describes how water bowsers deployed during the emergency response should have had permanent notices advising consumers to boil water before use. The Review received a number of comments that notices on bowsers were either missing or unclear.

25.7 Evidence submitted to the Review shows that information was particularly lacking or inconsistent on the sources of support available and possible longer-term health impacts. Furthermore, there was only limited guidance for relevant public authorities on actions they could take to improve health and wellbeing in the community.

25.8 The HPA now provides advice through a number of factsheets focusing specifically on health in flooding emergencies, including 'Health advice following flooding', 'Cleaning up after a flood – health advice' and 'Advice on flooded sports playing fields'.[2] The Review is pleased to learn that the HPA has set up a working group to examine all flood advice made available to the public by public authorities to ensure consistency.

25.9 Clear and consistent health advice needs to be widely available to all people affected, both during the response and throughout recovery. The advice should cover hazards to both physical and mental health. To ensure accessibility, it should be widely available across a range of media, such as the internet and in leaflets available at health centres. Consideration should also be given to raising health awareness in advance of an emergency. This is discussed further in Chapter 20.

RECOMMENDATION 71: The Department of Health and relevant bodies should develop a single set of flood-related health advice for householders and businesses which should be used by all organisations nationally and locally and made available through a wide range of sources.

[2] http://www.hpa.org.uk/webw/HPAweb&Page&HPAwebAutoListName/Page/1158934608011?p=1158934608011

Organisational responsibilities in the healthcare sector

The Department of Health (DH) is responsible for the overall performance of the NHS in England. Its work includes setting national standards and shaping the direction of the NHS and social care services, and promoting healthier living. In the event of an emergency, the Department provides strategic co-ordination of the NHS response in England. DH has produced emergency planning guidance which explains the requirements of the Civil Contingencies Act for NHS organisations. It includes guidance on the Scientific and Technical Advice Cell which recognises two distinct 'health' roles at Gold command level: the coordination of health service resources and the provision of health advice to the public.

The Health Protection Agency is responsible for providing advice and information on health protection issues to the public, communities, professionals and to government.

Strategic Health Authorities are responsible for managing and setting the strategic direction of the NHS locally. They support Primary Care Trusts and other NHS organisations that deliver primary health services at the local population and ensure that they are performing well.

Regional Directors of Public Health are responsible for ensuring that NHS arrangements in their region are appropriate and safe. They also have responsibility for emergency planning and work closely with the Health Protection Agency, the NHS and Regional Resilience Teams in Government Offices.

Local Authority Chief Executives are responsible for recovery co-ordination groups in their areas.

Organisational responsibilities in the healthcare sector *(continued)*

Social Services are responsible for providing support, care and protection to vulnerable groups, and providing services for children and their families, older people, and those with a physical, mental or learning disability.

The health and psychosocial impacts

25.10 Submissions to the Review and anecdotal evidence gathered during our visits around the country highlight various health impacts believed to result from the flooding. Physical health problems attributed to the floods ranged from coughs and colds to bronchitis and heart attacks. Psychological and psychosocial impacts included increased levels of anxiety during periods of rainfall, distress as a result of temporary living arrangements and stress from dealing with insurers and builders or caused by people experiencing financial difficulties.

25.11 The emerging findings from a real-time study of local recovery in Hull (see case study) suggest that participants are:

- experiencing increased levels of stress, anxiety and depression and a loss of interest in everyday activities;
- experiencing strain on family relationships, especially increased arguments;
- having more difficulty in managing long-term health problems such as angina and arthritis;
- drinking more alcohol as a coping strategy; and
- finding it harder to adhere to usual practices of healthy eating and exercise.

Flood vulnerability and urban resilience: a real-time study of local recovery following the floods of June 2007 in Hull[3]

This project is funded by the Economic and Social Research Council, Engineering and Physical Sciences Research Council and the Environment Agency. An aim of the project is to identify all aspects of the long-term experience of flood impact and flood recovery. To date, 48 interviews of people affected have been completed, including owner-occupiers, and private, council and housing association tenants. The emphasis of the study is on understanding flood recovery from the perspective of those involved in the process. Extracts from interviews and diaries of householders include the following:

"Some days I just felt like jumping off Humber Bridge. It's been that low, it's been that bad, except I'm not brave enough to do it. But the state of mind I've been in – some days I've just sat in here and just sobbed and sobbed and sobbed."

"When I go home, the first thing I do if it's been raining or is raining, is stop and check the level of the drain. The last thing I do before I leave is check the level of the drain just to make sure that I'm aware of its current state… There is a lot of anxiety if the weather is going to be bad. As we move more into winter… the anxiety, I think, will rise and it's affecting people. I think the main problem is sleep patterns because a lot of us have said we are not sleeping through it and a lot of us are waking up and we've dreamt it's been raining through the night because that's on our mind all the time."

"You get very fraught marriage-wise. We've had lots of arguments and lots of discussions and lots of "I'm leaving you when this is all done!" and "That's it, the house is going up for sale!". Because there's nobody to help you – if my husband is working away during the week and he comes home on a weekend and we are in here, and it's like all the stress I've had in the week goes straight on him, and all the stress he's had in the week goes onto me…"

"When we told our son it would be six more weeks and then we could move back home he started to pack his toys away! I don't think anybody realised how much the floods and the move affected him. He still gets upset and very protective of me every time it rains. He has just started cubs so it means he can see his friends more, like he used to. Because before we lived so close to all his friends he is now isolated in the rented house and spends a lot of time on his computers or watching the TV."

25.12 DH has reported no significant increase in the number of people reporting to healthcare professionals with physical health problems caused by flooding. Anecdotal evidence from discussions the Review has had with local healthcare professionals suggests however, that the DH's reporting mechanisms are not necessarily a good indicator of all the health impacts of flooding as they monitor only specific health conditions (such as diabetes and chronic heart disease) and they also rely on individuals presenting to healthcare professionals. Anecdotal evidence suggests that many victims of flooding will not go to their GPs and therefore health affects may go unreported. This seems to be for a variety of reasons, including concern by affected people that they will not be treated sympathetically and the perception of a stigma attached to admitting such problems.

25.13 DH has also reported no significant increase in the number of people requesting psychosocial help and mental healthcare support. The DH has, however, indicated that there could still be an upsurge in those experiencing psychological problems, given the long period over which symptoms may appear.

[3] http://www.lec.lancs.ac.uk/cswm/Hull%20Floods%20Project/HFP_home.php

Insurance and Health Impacts Survey

A survey of 647 households affected by the floods across England, carried out by GfK NOP UK for the Review, showed the health and relationship effects to include:

- 39 per cent of respondents stated that the flooding had had an effect on their (or their partner's) physical health. Those who were forced to move out of their property were twice as likely to have physical health problems as those who did not (50 per cent versus 24 per cent).
- 15 per cent of respondents reported that the flooding had had an effect on their children's physical health; this figure did not differ between those who moved or did not move out of their home.
- 67 per cent of respondents stated that the flooding had had an effect on their (or their partner's) emotional health. Those who were forced to move out of their property were more likely to have emotional health problems (78 per cent versus 50 per cent).
- 35 per cent of respondents stated that the flooding had had an effect on their children's emotional health. Those who were forced to move out of their property were twice as likely to have emotional health problems as those that did not (42 per cent versus 20 per cent).
- 31 per cent of people with health problems took time off work, and over half of these were off work for more than 10 days.
- 39 per cent of those who reported health problems had been to see a doctor.
- Of those married or living with a partner, 22 per cent reported that the flooding had an effect on their relationship. Those who were forced to move out were twice as likely to have had relationship problems as those who did not (28 per cent versus 14 per cent).
- Of the whole sample, 15 per cent said the flooding had affected their relationship with family members. Those who moved out were nearly twice as likely to have problems as opposed to those who did not (18 per cent versus 10 per cent).

25.14 Health and wellbeing problems related to stress and anxiety may also arise due to flood-related debt. In this respect, evidence submitted to the Review by Hull Citizens Advice Bureau (CAB) shows increases in the numbers of priority debt enquiries for January and February 2008 compared with the same period in 2007, as follows:

- Mortgage and secured loan arrears up from 58 to 136 (+134%)
- Fuel arrears from 74 to 138 (+86%)
- Water arrears from 41 to 87 (+112%)
- Council tax arrears from 82 to 176 (+115%)
- Rent arrears from 44 to 91 (+107%)

25.15 Whilst these increases in priority debt enquiries cannot be attributed directly or wholly to the flooding, especially in light of the current market situation, the CAB suggests that there is likely to be a correlation.

25.16 Data gathered through a questionnaire distributed to households by Hull City Council, however, provides stark evidence of the wide-scale nature of the health impacts of the summer 2007 floods (see case study). Of the 890 individuals who responded to the health questionnaire, 64 per cent said their health had been adversely affected. Stress, anxiety and depression were the most commonly reported conditions, but a range of symptoms was

also reported including dermatitis, worsening asthma, arthritis and chest infections, which individuals have attributed to being flooded.

25.17 Negative health impacts amongst children appear to stem from a variety of causes including the use of temporary facilities, extended travel times to school and the need to re-do destroyed school work, in addition to heightened anxiety levels during rainfall. It is notable from GfK NOP's Insurance & Health Impacts Survey that children were twice as likely to suffer emotional health problems if they had to move out of their homes.

25.18 Evidence to the Review suggests that health impacts are also being felt by people at work. Individuals and trade associations have described to the Review the difficulties people faced trying to keep working whilst dealing with their recovery and that of their family, and the distress that this caused them. Some companies reported increased sickness absences as a result. Health impacts extend beyond people directly affected by the floods and evidence to the Review shows that organisations responsible for response and recovery have also reported increased levels of stress amongst staff. Many attribute this to prolonged additional duties in response to the floods.

Hull recovery questionnaire

The recovery questionnaire was distributed via Hull City Council to 1500 households in Hull during March 2008. Householders were asked to provide feedback on a number of recovery-related issues including health impacts and the service received from different organisations. 890 survey responses were collated and assessed.

Of the 890 respondents, 869 had been flooded. Of these 869 people, 862 indicated whether they had to move out of their home or not. The figures show that 66 per cent (568) had to move out of their homes and of those 70 per cent (396) reported health problems.

Comments included:

"I have lost a stone in weight due to the stress of sorting our home out and coping with a 3 year old and an 8 month old baby whilst in very small temporary accommodation. It has also put a strain on our marriage." (Householder now back in her home)

"My 2 year old daughter's facial eczema has got worse and flares up a lot, my two sons (aged 6 & 10) have had colds constantly, we have all had bad chests, sickness and diarrhoea lots of times, coughs, sleepless nights. I have mild IBS but it has been worse recently. I have also come out in a rash all over my hands. We are at the doctor's a lot more than normal and my daughter has also had to visit the hospital due to a very bad bout of sickness & diarrhoea. It is all extremely worrying." (Householder not back in her home and currently in alternative accommodation)

"I have had to take sick leave due to stress and insurance problems. The children's behaviour has deteriorated as their friends have left the area and there has been a lack of space for a long period of time – we have not returned to normal as yet." (Householder temporarily in a caravan on her driveway, now back in her home)

"I am having panic attacks due to living conditions. Having a disabled child in a caravan isn't easy, I only hope these attacks improve once back in my home. I also have mood swings and depression" (Householder in a caravan on her drive – not yet back in her home)

Wider community impacts

25.19 Anecdotal evidence to the Review suggests that the effects of the summer 2007 floods are likely to extend beyond the individual households which were flooded. The Review has heard accounts of the negative impact on extended families both as a result of accommodating displaced family members and concern for their progress in recovery. Community impacts range from damage and disruption to community facilities to changes in traditional support networks because of displaced families or because of the unavailability of community facilities.

25.20 So far we have discussed the negative impacts of flooding. Positive effects may be few, but one which has been widely recognised is a heightened sense of community. Householders often had to rely on neighbours for help and support both during the flood and during the clean-up phase. This support took many forms, from the provision of refreshments to the loan of equipment, as well as emotional support. The Review has heard accounts from people praising much greater community awareness and the emergence of new friends and support networks. **The Review considers that often such community networks are effective tools in reducing the psychosocial impact and they should be supported and capitalised on by local Recovery Coordinating Groups.**

Research studies

25.21 Social science studies consulted by the Review reinforce the significance of the psychosocial and health impacts of the summer 2007 floods and the need to consider these issues when planning for and recovering from serious emergencies.

25.22 One such study was carried out by the Health Protection Agency into the health impacts of the flooding in Lewes in 2002.[5] This found that having been flooded was associated with a significant increase in gastroenteritis and a four-times higher risk of psychological distress in adults. The study concluded that policies for the recovery period must include both practical support for flood victims and the provision of appropriate psychological support. The incidence of physical illness pointed to the need for advice and assistance about hygiene and access to medical services.

25.23 Likewise, research[6, 7] funded by the Department for the Environment, Food and Rural Affairs described the impacts of flooding on the mental health of flood victims in both the short and long term and stressed the need to improve the services available to flood victims at the time of the flood and during the recovery period.

25.24 In summary, evidence to the Review and existing studies show that the impact of flooding on psychosocial health is significant. The Review therefore believes that those charged with leading recovery locally should consider actions they can take to minimise the distress people feel during the recovery from emergencies.

RECOMMENDATION 72: Local response and recovery coordinating groups should ensure that health and wellbeing support is readily available to those affected by flooding based on the advice developed by the Department of Health.

Health impacts of damp properties

25.25 A number of people the Review consulted around the country wanted advice on the health impacts of living in damp, flood-affected properties. This was true both of people living upstairs in houses where the lower floors were still flooded and residents who had moved back into their damp homes once the floods had receded. However, the advice given to householders was often inconsistent and people were frequently confused.

> *"I've been told by [company A] that it's alright to live in a damp house with children with asthma, and I've been told by [company B] that it's dangerous, so who do you trust?"* (Business owner, Hull)

[5] http://www.hpa.org.uk/cdph/issues/CDPHvol7/No1/7(1)p56-63.pdf
[6] The Appraisal of Human related Intangible Impacts of Flooding: www.defra.gov.uk/science/project_data/DocumentLibrary/FD2005/FD2005_1855_TRP.pdf
[7] Flood Risks to People Phase 1: www.rpaltd.co.uk/documents/J429-RiskstoPeoplePh1-Report.pdf

25.26 The Review is aware of some advice on this matter (albeit limited), for example that of CIRIA[8], which states:

> *"Do not occupy a house that still contains standing water. Do not move into the building until it is structurally safe, sufficiently clean and, preferably, reasonably dry. Damp surfaces are good breeding grounds for mould and other fungi, so it is best to minimise the potential for fungal growth by drying them as quickly as possible. If you do re-occupy the building prior to this, ensure that the building is well ventilated and that an effective heating system is running at all times, preferably with a de-humidifier."* And from the HPA:[9]

> *"It is recommended that you only fully reoccupy your home once it has been thoroughly cleaned and disinfected and allowed to dry out."*

25.27 Clearly, people wish to move back into their homes as soon as possible, but this is not just a matter of comfort; evidence shows that there is continuing and significant detrimental effect on families' mental and physical health when they have to stay out of their homes for months at a time. The Review's Health & Insurance Impacts Study saw a marked link between those households who had to move out of their home and both physical and mental problems. Those who moved out were twice as likely to have physical health problems as those who did not (50 per cent to 24 per cent). Therefore, the results of the study suggest that action to improve the speed at which individuals can return to their homes and 'normality', for example carrying out property assessments and repairs quickly, will pay significant dividends.

25.28 However, the Review is not aware of appropriate advice on the potential health impacts of living in a damp property, which will affect the speed with which residents move back into their homes (although it is noted that, in many cases in summer 2007, it was impractical to wait until properties were fully dry before re-occupation). Although the local council's environmental health department may be able to assess whether the building is dry enough for re-occupation, it is the opinion of the Review that publicly available advice on factors to consider when deciding whether to re-occupy a damp property, is neither extensive nor definitive and it is found in a confusing variety of locations. The Review judges the wider HPA advice to be particularly good at highlighting the risks of germs and chemical hazards when cleaning a flooded property, however, it appears to be silent on the potential hazards arising from fungal spores and the longer-term health impacts of damp properties, both in terms of carrying out structural repairs and living in the property. Again, the Review found that the public, in the absence of advice, was often confused:

> *"We don't know what the spores are… what is in a spore? What are they? In ten years time we could all pay the price for not wearing masks."* (Business owner, Hull)

25.29 The Review would welcome the HPA providing guidance on the impacts on health of damp flood-affected properties; this should be aimed at people repairing the properties and householders and should also comprise advice on mitigating measures. The material prepared should then feature in the single set of flood-related health advice for householders and businesses recommended earlier in this chapter.

Drying out damp properties

25.30 We have been made aware of significant dissatisfaction about the time it took to dry out and stabilise some properties after the summer 2007 floods and the Review believes that cases of undue delay may be due to the absence of definitive guidance about drying methods.

25.31 With respect to existing guidance, following the summer 2007 floods, Hull City Council prepared a range of material for its contractors to advise on the drying process. The Review is also aware of guidance on a variety of different methods and technologies for drying properties, for example that of CIRIA[10], which advises pumping out the flood

[8] http://www.ciria.org.uk/flooding/drying_out.htm
[9] http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1194947420817
[10] http://www.ciria.org.uk/flooding/

water at a defined rate to avoid structural damage, followed by the use of central heating or industrial heaters, fans, wet/dry vacuum cleaners and dehumidifiers. As well as these conventional drying methods, the Review is also aware of a variety of more innovative approaches, including the use of bags of absorbent gel and trailer-mounted dry-air systems. However, the Review is not aware of any definitive guidance as to best practice in this area.

25.32 In light of the evidence about the impact on displaced communities, insurance costs, alternative accommodation costs and long-term health and wellbeing problems, the Review recommends that Government, the ABI and other relevant organisations work together to explore any technological or process improvements that can be made to speed up the drying out and stabilising process of building recovery.

RECOMMENDATION 73: The Government, the Association of British Insurers and other relevant organisations should work together to explore any technological or process improvements that can be made to speed up the drying out and stabilising process of building recovery after a flood.

Monitoring and Mitigating Actions

25.33 Although DH has reported no increase in people presenting to healthcare professionals, this is likely to be a consequence of the method of monitoring used, as discussed above. To promote continued vigilance by healthcare professionals in spotting flood-related symptoms, and to ensure the provision of effective health services, national guidance on recovery from emergencies recommends that local services undertake a range of actions, including:

- continuing to monitor closely the numbers of people who are coming forward for psychosocial help and mental healthcare;
- facilitating access to primary and secondary mental health services;
- making the necessary capacity available to meet any upsurge in demand; and
- expecting to see an increase in anxiety, particularly in children, during heavy rain.

25.34 The Review endorses these recommendations. Whilst the benefits to individuals and communities cannot necessarily be measured on a quantitative basis, anecdotal evidence suggests they are likely to reduce the burden on medical services, reduce the need for people to take sickness absence from work and positively aid recovery.

Observed examples of mitigating actions to aid recovery from flooding

- Partnership working to provide advice to appropriate organisations such as the insurance industry and the voluntary and charitable sectors.
- The distribution of leaflets giving specific advice such as coping with stress, keeping physically and mentally well, dealing with property repair (builders and insurers) and health and safety advice to those living in temporary accommodation.
- Primary Care Trusts working collaboratively with the local authority to provide health and wellbeing events at which individuals are able to access advice and support.
- The provision of on-site counselling services in schools.
- The provision of funding to community resilience and support networks which enable flood victims to share their experiences and seek support from others with similar experiences.
- On-site and mobile advice centres provided by local authorities to enable individuals to access a range of services and support available to them.
- Flood fairs organised by local flood forums and residents groups.
- Organised social activities, such as day trips and coffee mornings, to maintain community camaraderie and support networks built up during the flooding.

RECOMMENDATION 74: The monitoring of the impact of flooding on the health and wellbeing of people, and actions to mitigate and manage the effects, should form a systematic part of the work of Recovery Coordinating Groups.

Roles and responsibilities for recovery operations

This chapter examines the roles and responsibilities of those involved in the recovery operation. It contains sections on:

- central government's recovery machinery;
- local and regional recovery operations;
- aims and objectives of recovery coordination groups; and
- current guidance.

Introduction

26.1 As with the response phase, clarity over roles and responsibilities is crucial to the effective management of the recovery phase. Evidence to the Review shows that recovery arrangements following the floods in summer 2007 generally worked well, with strong collaborative working between key government departments and agencies, and between regional and local bodies. Successful outcomes were seen especially where there was clear leadership and where roles and responsibilities were well understood. However, there were inconsistencies in the approaches taken, and in some cases this reduced the effectiveness of the recovery phase. The public also perceived differences in treatment within communities which led in some cases to annoyance and frustration.

Central government's recovery machinery

26.2 All emergencies are local, especially to those who suffer. So work at the local level is the building block of preparedness planning. Local planning and decision-making allows local knowledge to be factored into preparedness plans, leading to a more effective outcome. This reasoning lies behind government's approach to planning for the response and recovery phases, which prescribes that operations should be managed and decisions should be made at the lowest appropriate level. Accordingly, response and recovery operations are usually managed by local agencies with limited input from regional or national levels. However in some instances, such as wide-area flooding, the scale or complexity of the emergency is such that some degree of central government support or coordination becomes necessary.

The Lead Government Department

26.3 The 2007 summer floods were one such case where the breadth of the impact meant that central government support and coordination was indeed required. During the emergency response phase, the Department for Environment, Food and Rural Affairs (Defra) (the Lead Government Department for flooding) led the coordination of the Government's response, and the crisis management facilities at the Cabinet Office Briefing Rooms (COBR) were activated. The response aspects of both the June and the July emergencies are dealt with in greater detail in Chapters 11-13.

26.4 When the situation tranferred formally from the emergency response phase to the recovery phase, the lead department role was transferred to Communites and Local Government (CLG) on an ad-hoc basis. CLG thus became responsible for cross-government delivery of the flood recovery programme.

26.5 CLG's role was to ensure that government departments and other national and regional bodies had a shared understanding of policies and priorities, and that they contributed fully and effectively to the recovery effort. The rapid establishment of a central Flood Recovery team within CLG was key to the provision of this coordinated response, providing a national, centralised focus for flood recovery issues, driving progress and enabling responses to requests for information from multiple sources.

26.6 Guidance on identifying the responsible lead department in the case of an emergency can be found in '*The Lead Government Department and its role – Guidance and Best Practice*' along with the '*Lead Government Department List*', maintained by the Cabinet Office. These documents enable lead departments to carry out effectively the responsibilities and functions associated with their role. However, at the time of the summer 2007 floods, the formal lead department for recovery from flooding had not been allocated. In light of this, in the interim report the Review recommended that CLG should have formal responsibility within government for coordinating recovery from all future flooding emergencies.

26.7 The Review has now received, and welcomes, formal confirmation from the Government that CLG will be lead department for flood recovery, as well as for other recovery situations either where they involve local communities, such as some categories of severe weather events or where the primary impact is on the built environment such as dam failures, earthquakes and some categories of structural failures. **The Review now encourages CLG to set out clearly the duties and responsibilities of its lead department role in the recovery phase, and to explain how it will work in partnership with other government departments and regional and local bodies.**

The Inter-Ministerial Group for Flood Recovery

26.8 Following the summer 2007 floods, the CLG Minister of State put in place and then chaired a Cabinet Committee - the Inter-Ministerial Group for Flood Recovery (IMG) - which brought together ministers from relevant departments across Government. The IMG acted as the key mechanism for decision-making and currently remains responsible for driving the progress of the Flood Recovery Programme. The terms of reference for the IMG captured the key aspirations of the Flood Recovery Programme, which were:

- to engender public confidence in the recovery process at all levels;
- to ensure effective, coordinated support by central government departments and other national and regional bodies to the work of local agencies in helping communities affected by the June and July floods to return to normality as soon as possible; and

[1] http://www.ukresilience.gov.uk/response/ukgovernment/~/media/assets/www.ukresilience.info/lgds%20pdf.ashx
[2] http://www.ukresilience.gov.uk/sitecore/content/Sites/www.ukresilience.info/response/ukgovernment/responsibilities.aspx

- to ensure that local authorities and other recovery agencies fulfil their role and that, where necessary, local issues are considered and resolved at the national level.

26.9 The IMG was supported by a Flood Recovery Officials Group (FROG), chaired by CLG, whose members included officials from all relevant departments and a representative from the Local Government Association (LGA).

Local and regional recovery operations

26.10 Multi-agency Local Resilience Forums (LRFs) and Regional Resilience Forums (RRFs) lead local and regional planning activities for the response phase of emergencies, and recovery is planned for in subgroups of these bodies.

Local Resilience Forums

26.11 Evidence to the Review shows that LRF recovery subgroups worked well in relation to the floods. However, some responders have pointed out that, since LRFs are based on police areas rather than local authority areas, and therefore because the footprint of an LRF can cover more than one local authority, plans need to be consistent between adjacent areas as far as possible. To aid consistency between areas, LRFs should develop recovery plans that are generic, wherever possible.

Government Offices

26.12 Government Offices (GOs) represent central government in the nine English regions. During the 2007 floods, they were the principal means for gathering information from affected local authorities and relaying this to central government. Likewise, local responders used the GOs as the first port of call for requests for advice or assistance from central government.

26.13 Each of the GOs has a Regional Resilience Team (RRT) to coordinate the response during emergencies in their regions. During the response to the floods, the GOs provided an information conduit between the central government response structures in COBR and local responders. This role continued into the recovery phase, however, there were not previously-established structures in place to undertake this work, which caused difficulties in some GOs.

RECOMMENDATION 75: For emergencies spanning more than a single local authority area, Government Offices should ensure coherence and coordination, if necessary, between recovery operations.

Regional Development Agencies

26.14 There are nine Regional Development Agencies (RDAs) in England. They provide a crucial link between the needs of business and the policies of Government. RDAs can also put businesses in touch with business support and advice. As covered Chapter 28, following the summer 2007 floods the RDAs provided support and reassurance to businesses affected in their regions, making over £11 million available to support business recovery in the affected areas.

Local Government Association and Local Authorities

26.15 For the affected regions last summer, as the flood waters receded recovery operations became just as pressing as the initial emergency response. Local authorities are ideally placed to understand the varied flood recovery needs of different neighbourhoods within their areas and in summer 2007 local authorities naturally understood that they would be looked upon to play a key leadership role in recovery efforts. Indeed, the Local Government Act 2007 provides local authorities with the 'leadership of place' role and, as such, local authority leadership of the recovery phase is well placed.

26.16 Just as central government recovery coordinating groups were quickly established nationally, local Recovery Coordinating Groups were, on the whole, established rapidly. Recovery activities were frequently carried out with partner groups and organisations, with the local authority having ultimate responsibility for ensuring progress. The Review has seen

considerable evidence of good work by many local agencies, starting with their determination to begin the process of recovery, underpinned by dedication and hard work at all levels within local government and a willingness to go above and beyond established roles to help those most severely affected. Such efforts have, disappointingly, been little recognised so far.

26.17 The Review did however receive evidence which indicated that not all local authorities had well-rehearsed plans for recovery. The Review is of the strong opinion that the need to exercise recovery plans is as important as the need to rehearse plans for the response phase and this is discussed further in Chapter 13.

The voluntary and community sector

26.18 Evidence to the Review demonstrated the integral role of the voluntary sector and wider communities in the recovery phase. Local knowledge held by volunteers has been shown to be invaluable when considering how to engage effectively with the community during the recovery phase.

26.19 We have been encouraged to hear many excellent examples of good practice on community engagement during both the response and recovery phases following the summer's flooding, including in Hull where a 'flood bus' took council staff into communities to give one-to-one advice, in West Berkshire where mobile multi-agency advice centres were set up, and in Gloucester where the PCT ran a health and wellbeing event in Tewkesbury. In Toll Bar, Doncaster Council located 14 staff in temporary prefabricated accommodation in the village, initially on a 24 hours per day basis, to listen, solve problems and provide reassurance. In Catliffe, Rotherham Council set up a Flood Assistance Centre in the Memorial Hall to provide residents with a one-stop-shop for raising their concerns, also providing transport for those who could not get there by their own means.

26.20 From talking to members of the public affected by the 2007 floods, it is clear that people who had access to the types of projects highlighted above found them to be extremely helpful. Community-based activities allowed people to access important information and guidance on dealing with the aftermath of the floods and also provided them with the opportunity to meet other people who had been affected in the same way. Having someone to talk to, has for many people, been key to enabling them to accept what has happened to them and their home, and to begin to move on with their lives.

RECOMMENDATION 76: Local authorities should coordinate a systematic programme of community engagement in their area during the recovery phase.

Recovery Coordinating Groups

26.21 Recovery Coordinating Groups (RCG) provide multi-agency strategic decision-making structure for the recovery phase. Their composition is typically decided by the lead local authority depending on the nature of the emergency. Activation of the RCG is carried out by the local authority, usually following the request of or by agreement with Gold Command. Subgroups support the RCG allowing a focus on a range of operational issues.

26.22 RCGs decide the overall recovery strategy, including communications, clean-up, health, welfare, and economic and business recovery plans. Furthermore, and most crucially, RCGs also ensure that relevant stakeholders, especially the communities affected, are involved in the development and implementation of the strategy.

26.23 During last summer's flooding, RCGs were not routinely activated at an early stage across the country. Evidence to the Review shows that, where they were set up from the outset of the emergency, plans were more coherent. And formal handover from Gold Command to the RCG (locally, to the Chief

Executive of the affected local authority and nationally to the minister of the lead government department for recovery) clarified the lead at each stage of the emergency and made negotiations simpler and smoother. Evidence to the Review shows that delays in setting up RCGs usually arose from the absence of national guidance. **The Review welcomes the fact that this has now been published**[3]. Shortly after the floods hit, Gloucestershire County Council, for example, were able to make use of the then draft National Recovery Guidance to help set up their RCG and subgroups quickly and effectively. They have subsequently noted that they found the guidance useful, although they remarked that its direction may be more suited to unitary authorities than upper tier local authorities.

RECOMMENDATION 77: National and local Recovery Coordinating Groups should be established from the outset of major emergencies and in due course there should be formal handover from the crisis machinery.

Aims and objectives of recovery coordination groups

26.24 Evidence to the Review from local authorities suggests that, when RCGs are established, aims and objectives for the recovery phase should be agreed and a programme of actions captured in a Recovery Plan. Furthermore, that Plan should set out timescales for action and provide for regular review of progress to check that proposed actions are still needed. RCGs should coordinate, drive and facilitate recovery until there is no longer the need for regular multi-agency coordination and the remaining issues can be dealt with by individual organisations as a part of their mainstream programmes and business. The need for care in doing so is, however, provided by substantial evidence to the Review of staff within local organisations struggling to cope with additional burdens placed upon them by having to handle new tasks associated with recovery from flooding whilst at the same time discharging their previous responsibilities.

26.25 National Recovery Guidance describes the functions of RCGs against which it is suggested that recovery aims, objectives and plans are based. The Review welcomes this. Thus, the Guidance suggests that the local RCG:

- is the strategic decision-making body for the recovery phase, able to provide a broad overview and represent each agency's interests and statutory responsibilities;
- provides visible and strong leadership during the recovery phase;
- takes advice from subgroups, decides the strategy and ensures implementation of the strategy and the rebuilding of public confidence; and
- ensures the coordination and delivery of consistent messages to the public and media.

These functions allow flexibility to meet differing local circumstances.

RECOMMENDATION 78: Aims and objectives for the recovery phase should be agreed at the outset by Recovery Coordinating Groups to provide focus and enable orderly transition into mainstream programmes when multi-agency coordination of recovery is no longer required.

Mutual aid and coordination

26.26 Experience last summer highlighted the benefits to be gained from local areas working together and sharing best practice on the management of recovery work. The Review has received reports of the significant benefits to RCGs of advice from authorities who had dealt with recovery from previous similar flood emergencies. The Review therefore welcomes the development of mutual aid plans, including those addressing the recovery phase, and guidance on mutual aid is discussed further in Chapter 11.

[3] http://www.ukresilience.gov.uk/response/recovery_guidance.aspx

26.27 The Review considers that responders' experience is valuable and should be captured and shared with others in the immediate aftermath of an emergency. The National Recovery Guidance is a key source of information; however, it could be enhanced by GOs also taking on a role, in cooperation with organisations such as the LGA, to facilitate the provision of expert advice in the aftermath of a severe flooding emergency

RECOMMENDATION 79: Government Offices, in conjunction with the Local Government Association, should develop arrangements to provide advice and support from experienced organisations to areas dealing with recovery from severe flooding emergencies.

Current guidance

26.28 Accurate, up-to-date guidance is vital to the efficient management of emergencies. Central government has produced considerable guidance material on the management of the response phase. However, recovery is often addressed separately and in much less detail. While there are some advantages to having separate 'stand-alone' and focused guidance for responders, in the Review's opinion, and that of stakeholders we have spoken to, it is important that the recovery phase is both seen as integral to the overall management of the emergency and that its importance is viewed as equal to that of the response phase.

26.29 The Review therefore concludes that central government guidance should be reviewed and the roles and objectives of those responsible for the recovery phase should be developed and formalised on the basis of the model employed during the recovery from last summer's floods and as set out in the National Recovery Guidance. As such, the recovery phase needs to be included within a number of guidance documents and papers, especially:

- **Central Government Arrangements for Responding to an Emergency: Concept of Operations (CONOPS)**[4], central government's generic emergency plan which sets out arrangements for the response to an emergency, irrespective of the originating cause. At present the management of the recovery phase is not spelt out;
- **Emergency Response and Recovery**[5], which provides the generic framework for multi-agency emergency response and recovery in the UK, including crisis management structures at central government, devolved administration, regional and local level. At present the document does not have the latest material on the management of the recovery phase.
- **The Lead Government Department and its role – Guidance and Best Practice**[6] along with the **Lead Government Department List**[7], which provide guidance on designated lead departments for the various types of emergency that might arise and which set out the responsibilities and functions associated with being designated lead department. These documents describe the key processes and disciplines necessary in planning for and responding to emergencies, and describe how these processes will be monitored and audited in order to achieve a uniformly high standard of planning and preparation. They do not yet, however, make reference to the recovery phase or to how the formal transfer of leadership from the response to the recovery phase should be executed.

RECOMMENDATION 80: All central government guidance should be updated to reflect the new arrangements for recovery and Local Resilience Forums should plan, train and exercise on this basis.

[4] http://www.ukresilience.gov.uk/response/~/media/assets/www.ukresilience.info/conops%20pdf.ashx
[5] http://www.ukresilience.gov.uk/preparedness/ccact/~/media/assets/www.ukresilience.info/emergresponse%20pdf.ashx
[6] http://www.ukresilience.gov.uk/response/ukgovernment/~/media/assets/www.ukresilience.info/lgds%20pdf.ashx
[7] http://www.ukresilience.gov.uk/sitecore/content/Sites/www.ukresilience.info/response/ukgovernment/responsibilities.aspx

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Recording and reporting

This chapter examines information needs and the recording and reporting of data during the recovery phase. It contains sections on:

- gathering and collating information;
- the accuracy of data collected;
- protocols and mechanisms for reporting; and
- the publication of information.

Introduction

27.1 As in any wide-area emergency with central government involvement, the floods of summer 2007 led to the need for effective information flows during the response and recovery phases. Those seeking information included members of the public, the media, those charged with leading response and recovery actions at the local, regional and national levels, and businesses and industry associations.

27.2 Local authority leadership of the recovery phase meant that they were tasked with providing information to central government via the Government Offices (GOs). Central government, in turn, provided information on the position on recovery overall.

27.3 Chapter 13 sets out the difficulties experienced in obtaining accurate and up-to-date information the response to the flooding. Whilst the situation improved significantly during the transition to and through the recovery phase, there are lessons to be learned in terms of pre-planning to ensure that there is clarity at the beginning of the process about:

- who is responsible for collecting data;
- the information that is needed;
- when it is needed;
- the purposes is needed for; and
- where it will be published.

Gathering and collating information

27.4 The Review has received evidence from the Government which explains the protocols and mechanisms in place for information-gathering and reporting during the response and recovery phases. It would appear that local authorities used a variety of approaches to gather and collate information (for example on which properties had flooded, what repairs might be necessary and any special needs of the occupants). Some authorities used a home visits process, whilst others chose to record

only those who came forward for support. The former may have fuelled the perception which we have heard from some members of the public that some authorities prioritised the needs of their own tenants – by visiting those in social housing – above the needs of other flood victims in private accommodation.

27.5 Although home visits by local authorities and the voluntary and community sector were resource-intensive, the evidence shows they were beneficial and worth the investment. They enabled authorities to identify quickly those who were vulnerable and in need of particular support. Although there are data protection issues to be considered, those authorities who did undertake home visits found they were then able to use data gathered in this way to feed into the information needs of central government and other agencies, ensuring that the vulnerable received the support they needed.

The accuracy of the data

27.6 Evidence to the Review has been critical of the accuracy of the data produced. This has been particularly noticeable in relation to estimates of the number of households affected by the floods. The numbers used differed between agencies and government departments. Indeed, different organisations used different definitions of the term 'households affected'. For example:

- the Environment Agency initially reported that there were 20,238 houses affected, although it later became clear that this estimate included only properties affected by fluvial (main river) flooding;
- the Cabinet Office initially reported that 55,357 houses had been affected but it would seem that this estimate included properties which did not have flood water entering living quarters; and
- many central government departments reported a figure of 48,000 households affected, an estimate which covered households where flood water had entered living premises but which did not cover properties which had outbuildings and gardens flooded.

27.7 In addition, there have been many references to over 7,000 businesses having been 'affected' (a figure that we have used in this report). However the Review has found it difficult to clarify how this figure was derived – for example, whether it is based on flood water having entered business premises or whether it includes businesses that experienced secondary effects, such as loss due to the non-delivery of goods and services or the absence of staff.

Protocols and mechanisms for reporting

27.8 Submissions to the Review have indicated the frustration with the information gathering process.

> *"There are multiple requests for information which seem fragmented and replicated. Information is being requested that is not possible to give. A clearer outline and understanding of what is required would be useful."*
> **– LGA Survey**

27.9 The agreed protocols and mechanisms for reporting included a template which was completed at the regional level by GOs, in an attempt not to overburden and divert those dealing with recovery at the local level. The intention was to have an agreed set of reporting information which produced accurate data and reduced the need for ad hoc requests. Submissions to the Review show this approach was welcomed by the GOs.

27.10 However, the Review has also heard from local authorities that, while the handling of requests for information and the deadlines set did improve throughout the recovery phase, there are instances even today where information is being requested:

- with unreasonably tight deadlines;
- directly from local authorities by government departments and other agencies without going through the mechanisms established by CLG and the relevant GO; and
- which is novel or not readily available.

27.11 While the actions taken by the Government described above did ease the bureaucratic burden associated with information reporting, the Review believes that more attention and forethought should be given to agreeing the criteria, definitions and mechanisms for reporting in advance. Thought should be given to who needs information, what information they need and the format they need it in. In this respect, the Review is pleased to learn that the Cabinet Office is currently working with the GOs and other Departments to agree an improved, standard GO situation report template.

27.12 In taking forward this work, the Cabinet Office should consider not only the immediate needs of the various organisations involved but also the need for key indicators to allow the measurement of wider impacts or trends, for example on business recovery. Thus, for example, the Department for Children Schools and Families will want indicators on the impact on local schools or the disruption caused to school education, while Regional Development Agencies (RDAs) will want indicators of the impact on businesses, perhaps by sector, and the wider impact on the local economy. Key indicators should be agreed with the main stakeholders, including:

- lead departments;
- the GOs;
- the RDAs;
- upper tier local authorities; and
- public and private sector associations (such as the ABI and LGA).

RECOMMENDATION 81: There should be an agreed framework, including definitions and timescales, for local-central recovery reporting.

Publication of information

27.13 One of the main indicators used during both the response and recovery phases to measure the scale of damage and speed of recovery was that of 'households affected' – replaced later by the indicator on 'households who are still displaced'. Data in this area was also used to support the targeting of resources and the direction of actions to maximise their impact. The figure for households still displaced was used most recently in January 2008 by the Government to make further payments of the Flood Recovery Grant, discussed in Chapter 28.

27.14 Perhaps most importantly for those affected, such information is a very clear signal of progress and of the effectiveness of the efforts being made by all those engaged in the recovery phase. When published, it has attracted wide interest and allowed both government and the insurance industry to be called to account. This is extremely beneficial – as we say elsewhere in this Report, the number of people out of their homes has remained unacceptably high and every pressure which focuses effort on bringing down numbers more quickly is to be strongly welcomed.

27.15 However, the Review has not found any evidence of a specific pre-agreed timeframe or method for publishing such information. Rather, we have identified a variety of publication channels used such as:

- the House of Commons, either during debate, via written updates or as a response to questions posed by elected members;
- in the media, through government press releases and as a result of investigations by media organisations, at national and local levels; and
- via a host of other channels such as local publications and debates.

27.16 The Review believes that the methods and timescales of publication of data should be pre-planned, perhaps in parallel with producing wider information templates. The Review believes that this would enable those seeking information to be clear in advance about what will be reported and when, which may help reduce the number of ad hoc and time-pressured requests.

RECOMMENDATION 82: Following major flooding events, the Government should publish monthly summaries of the progress of the recovery phase, including the numbers of households still displaced from all or part of their homes.

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Funding for recovery

This chapter examines the costs of recovery and funding support. It contains sections on:

- individuals and communities;
- businesses;
- local authorities; and
- new funding arrangements.

Introduction

28.1 The total costs of the summer 2007 floods to public and private sectors and to businesses and individuals are estimated to run into billions of pounds. They ranked as the most costly floods in the world last year.

28.2 Damage caused by the floods affected individuals, homeowners, farmers and businesses as well as public buildings and infrastructure such as schools and roads. Funds to cover the repair and replacement of goods and property, and to compensate for loss of business, came from a number of sources and via an assortment of funding mechanisms. In some cases people were happy with the speed of payment and the amounts given. However, in many cases there were concerns that advice on funding was inconsistent and the procedures for obtaining funds were complex and inflexible.

28.3 Evidence to the Review shows that different people and organisations have different opinions about who should fund the costs of recovery from flooding and the sums required. Many look to the various layers of government for support and have expectations that do not necessarily match the finite funds available, leading to disappointment and criticism.

28.4 The Review has also received a range of evidence which indicates that, although the schemes and payments were broadly welcomed, there remains room for improvement in respect of:

- the length of time it took to receive funds;
- clarity over processes;
- certainty about the sums that could be expected; and
- the allocation of funds to provide the greatest benefit.

Individuals and communities

Costs

28.5 The largest expenses for individuals were the costs of replacing vehicles and the moveable contents in their homes, for example furniture, televisions and washing machines, and the costs of repair to buildings, fixtures and fittings. People also had to fund additional equipment to dry their homes, to buy cleaning products, as well as unexpected costs such as take-away food or increased mobile phone usage where land-lines were disrupted.

Support

28.6 Building and contents insurance funded the vast majority of costs to individuals and homeowners. In information submitted to the Review, the Association of British Insurers (ABI) has estimated the average domestic claim for the June and July 2007 floods at between £30,000 and £40,000. Costs for those without insurance were covered through public funds such as grants from local authorities and the Department for Work and Pensions, as well as support from the voluntary and community sector, as discussed below.

Flood Recovery Grant

28.7 The Flood Recovery Grant (FRG) was a new grant scheme established in June 2007 and administered by Communities and Local Government (CLG) for local authorities. FRG was intended to support local flood recovery work, particularly for people in greatest and most immediate need. The grant was paid to lower-tier local authorities on the basis of the number of households affected by flooding (those where water entered the property, not just the grounds). As of June 2008, the total amount of money paid out to local authorities under FRG had reached £18.39 million: £10 million in June 2007, £7.39 million in July 2007, and a further £1 million in January 2008 to the nine local authorities who had the greatest number of households still displaced on 17 January 2008.

28.8 FRG was a non-ring fenced grant for local authorities, who could decide locally how to use it. In practice, this included:

- support payments to flood-affected households based on a range of criteria;
- provision to flood-affected households of new household items (for example fridges, cookers, washing machines);
- provision of temporary caravans to allow people to remain within their communities while their houses were repaired; and
- other priorities set through consultation with flood-affected householders and communities, including resilience projects.

28.9 A number of submissions to the Review praised the flexible nature of FRG payments, which ensured that money was provided to local authorities quickly. Central government was also able to meet continuing needs, which led to the welcome payment in January to those areas still with the greatest need in respect of displaced households.

28.10 There has been some criticism that the amounts allocated in FRGs did not necessarily give compensation commensurate with losses incurred within a local authority's area. The Review notes this concern, although, it also appreciates that the intended purpose of the FRG was to support local flood recovery work, not to compensate for all losses. However, many local authorities reported that because the FRG funding was new and unexpected (though much appreciated) without well established triggering criteria, it is not possible for them to factor this assistance into their contingency plans for future emergencies. In response to this, the Government has argued that such funds should not be seen as setting a precedent and each and every emergency should be seen as different and requiring a tailored solution.

28.11 Some people felt that the distribution of FRG payments to individual households was a 'postcode lottery' and that the allocation rewarded the uninsured. While the Review acknowledges this strength of feeling, it is our opinion that the uninsured remain those who have ultimately suffered most from the 2007 floods. For example, many uninsured owner occupiers had little option but to remain living

inside homes that were barely habitable and were unable to replace items essential to everyday life. In many cases they were forced to rely upon support from charitable donations or on the generosity of friends and family.

28.12 There were also problems with the mechanisms used to pay the FRG. In some cases, the FRG was paid to lower-tier local authorities, although upper-tier local authorities had the lead on social responsibilities. Evidence has been submitted that certain county councils (upper-tier) wished to carry out work in response to their social duties but lacked funding, the funds having been provided direct to the district council (lower-tier). The Review is of the opinion that, whilst in the majority of occasions the lower-tier is the correct level for funding, the principle behind the FRG is that funding should be provided to aid those most in need. In addition, because the mechanisms of allocating FRG did not allow the Government to spend the money directly there was no guarantee that funds went to those with the greatest need. In this respect, the Review is of the opinion that greater consideration needs to be given to the possible role of the voluntary and community sector in using its local knowledge to help to indicate areas of greatest need to aid allocation. Finally, there is a question over the funds allocated to the FRG which have remained unspent. As has been mentioned previously, money available from the FRG remains limited and is intended to help those most in need. **It is the strong belief of the Review, particularly in light of the number of people still living in temporary or flood-damaged accommodation, that money provided for recovery purposes should be used without further delay.**

Crisis Loans and Community Care Grants

28.13 The Department for Work and Pensions (DWP) gave funds using two existing payment mechanisms from the Social Fund: Crisis Loans and Community Care Grants. Crisis Loans are intended for people on benefits or a low income, and Community Care Grants are for people on income-related benefits with little or no access to capital or other resources to meet need. Crisis Loans are repayable with amounts taken weekly from existing benefits, whereas Community Care Grants are non-repayable.

28.14 A contingency reserve of £1 million was available to meet the extra call on grants as a result of the flooding, to help with the replacement of essential household items. As at the end of February 2008, a total of 1,791 Social Fund Payments had been made with respect to flooding (see table 9).

28.15 Evidence provided to the Review suggests that the availability of the two schemes was not widely publicised. It is noteworthy that over 96 per cent of Community Care Grants were paid within the Yorkshire and the Humber region, while the Government's latest figures (May 2008) on those claiming income support (and therefore eligible to receive a Community Care Grant), are broadly similar between the affected regions: Yorkshire and the Humber constituted 9.59 per cent of the national total while the South-East and South-West regions constituted 9.52 per cent and 6.97 per cent of the national total of income support claimants respectively.

Table 9 – Payment mechanisms from the Social Fund

Crisis Loans		**Total**
Living expenses	347 awards	£20,000
Items	158 awards	£58,000
Community Care Grants	1,286 awards	£732,900

28.16 The Review is aware of factors within the Yorkshire and the Humber region (such as the low take-up of insurance and the large proportion of cities affected, with associated socio-economic factors, compared with other affected areas) that may explain the apparent discrepancy. Nevertheless, the Review believes that questions around these figures, and the effectiveness of methods of publicising the schemes which could underlie them, may be mirrored in other areas. **We would welcome further studies to explore how effective publicity of the schemes was elsewhere. Lessons from such studies should ensure that appropriate uptake of the schemes is optimised in future.**

28.17 In supporting local flood recovery work, particularly for people in greatest and most immediate need, the FRG and DWP's Crisis Loans and Community Care Grants can be seen to have overlapping targets. **To avoid confusion and to remove the inconsistencies observed within these funding schemes, the Review would welcome a more joined up approach from CLG and DWP.**

Voluntary and community sector

28.18 The Review would like to draw attention to the excellent work of the voluntary and community sector during the recovery phase. In all of the affected regions, local voluntary organisations played a crucial role along with national voluntary organisations such as the Salvation Army, OXFAM, RSCPA, St John Ambulance, the WRVS and the Women's Institute. The money provided by local funds, such as the Gloucestershire Relief Fund (which raised over £1.8 million), helped meet uninsured financial losses, as well as costs relating to damaged possessions, equipment and, for businesses, machinery.

28.19 The British Red Cross is worthy of separate mention. Its National Floods Appeal was launched on 24 July 2007 to support those affected by the floods. As of June 2008, the appeal had raised more than £3.8 million. The British Red Cross invited organisations in affected areas to apply for grants to help those most in need, such as the elderly, disabled or those on low incomes. It began making grants on 5 October 2007 to local authorities and charities to support people affected by the floods. Funds were allocated on the basis of the scale and severity of the flooding suffered in a particular area, and based on the number of homes that were affected.

Businesses

Costs

28.20 The costs of the floods to businesses resulted from stock and equipment loss, damage to premises and business interruption. In some cases, stock was still usable but was marked down in quality, while in others the stock write-off was serious enough to halt operations for a considerable time. The loss of business often resulted in cash-flow problems and many businesses had to reduce staffing levels.

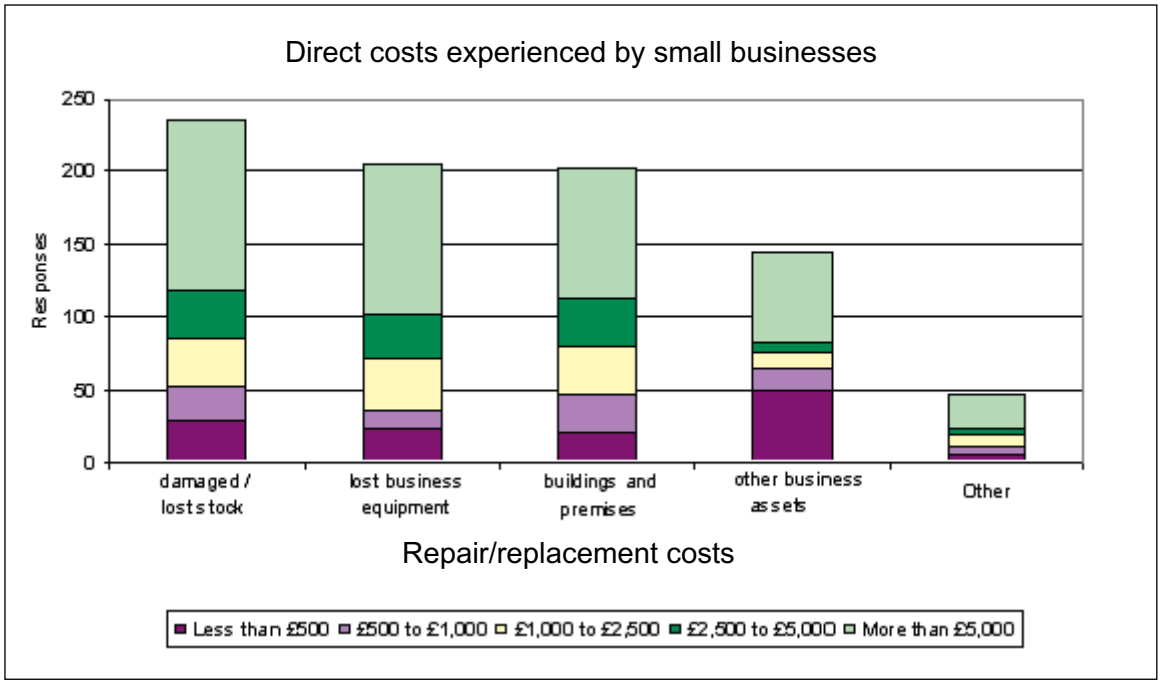
28.21 A survey of 81 local authorities affected by the flooding, carried out for the Review by the Local Government Association (LGA), showed that, as of February 2008, 20 of these local authorities were still experiencing adverse impacts to their local economy, with the same number citing adverse impacts to their leisure and tourism industries. And impacts are substantial; one local authority said hotel bookings were down 40 per cent and another said the losses to tourism amounted to £150m.

Costs to businesses in Yorkshire

A study was undertaken by EKOS Consulting Ltd to assess the impact of Yorkshire Forward's response to the 2007 floods and the interim report has been shared with the Review. For the study, 303 small businesses and 23 larger companies who received RDA grants were surveyed.

Replacing and repairing damaged/lost items (stock, machinery and assets) was one of the biggest immediate costs affecting both large and small businesses. Many large businesses experienced direct losses of over £25,000 (the chart illustrates that the comparative figure for small business was over £5,000). Of those small business which experienced lost sales, approximately 40 per cent incurred an indirect cost of over £10,000 and a further 25 per cent judged this to be over £25,000. Many large businesses experienced indirect losses of over £100,000.

The consultants believe the cost estimates are conservative and are undertaking further work to obtain more detailed figures for those large businesses with direct losses of over £25,000.



Agricultural businesses

28.22 Agricultural businesses suffered all of the above expenses as homeowners and businesses, as well as incurring secondary impacts - for example, poorer yields and lost crops caused by the floods resulted in a significant loss of income for arable farmers. Farmers were also facing animal disease restrictions associated with successive outbreaks of foot-and-mouth disease, Blue Tongue and avian influenza. These restrictions meant that animals could not be sold at the most lucrative time and farmers incurred additional costs when purchasing higher priced replacement forage. Some arable farmers had forward supply contracts in place, notably for potatoes and milk, and were required to source the products from other places, typically at a loss, to avoid breaching the terms of the contract.

28.23 Case studies have shown that irrespective of the type of farm, farmers faced considerable losses resulting from the flooding, ranging from around £18,000 to approximately £150,000. With the exception of damage to equipment and to dwellings, insurance is not available to cover losses for farmers and they therefore had to meet the costs from their own funds.

28.24 The submission to the Review from the National Farmers' Union (NFU) highlighted the costs incurred by farmers in clearing up waste and debris brought down by the floods and deposited on their land from properties and towns upstream. During a visit by the Review to a farm in Upton-upon-Severn, the farmer told us how this waste comprised tonnes of household rubbish, as well as larger items such as gas canisters and telegraph poles, sufficient to fill tens of skips. Disposal costs included the time and manpower needed to collect the rubbish as well as landfill fees. The NFU stated to the Review that farmers would like some immediate support to undertake this work in the aftermath of a major flood, as well as waiving of the landfill fees associated with disposing of this waste, or some arrangement for the waste to be collected free of charge, since they are not the originator of the waste but are left to deal with it. **The Review would welcome the Environment Agency examining this matter further in discussion with the NFU.**

Support

28.25 As with individuals, insurance was the main source of reimbursement for businesses, particularly business continuity insurance. In information submitted to the Review, the ABI has estimated the average commercial claim for the June and July floods at £90,000. However, a number of businesses also had existing contingency plans as well as reserve funds that they were able to use following the summer floods.

Regional Development Agencies

28.26 As well as drawing upon their own reserves and seeking reimbursement through insurance, many businesses also received support from the Regional Development Agency (RDA) for their area. RDAs are government bodies that support economic development in the regions and are financed through the Single Budget, a fund which pools money from all the contributing government departments (BERR, CLG, DIUS, Defra, DCMS and UKTI). The RDAs made over £11 million available to support business recovery in the affected areas. However, their packages of support to businesses affected by the flooding differed significantly from region to region.

28.27 RDA grants were paid under *de minimis* State Aid rules, which are the means by which the European Union ensures that individual member states do not distort the principle of 'fair and open competition' through the use of financial assistance. While the overwhelming majority of evidence to the Review from businesses was positive with regard to RDA funding, particularly with regard to the speed at which the funds were established and the percentage of businesses that benefited from the relief funds, there were questions raised over the use of *de minimis* State Aid rules, provision of information as to what could be claimed, the value for money of the funds and differences in awards and advice between regions. In this respect, comments from businesses' submissions to the Review included:

> *"If a friend hadn't told us we wouldn't have known about it"*

> *"There needs to be improved clarity about what can be claimed for, particularly relating to uninsured losses."*

> *"Grants are not always the answer – some form of low interest loan or something like the Small Business Loan Guarantee Fund might be better."*

> *"The grants on offer to farmers are too small to make any impact."*

28.28 The NFU queried the use of *de minimis* State Aid rules. They make the case that farmers are in the unique position of having substantial uninsurable losses (largely in crops) and that the payment under the rules is far from sufficient. The NFU argue that the RDAs did not consider a further option which is to apply

to the European Commission for permission to use one of the other methods of calculating financial assistance, such as Agricultural Exemption Regulations (which pay 80 to 90 per cent compensation) or the Fully Notified Scheme Under Agricultural State Aid Guidelines (which pays 100 per cent compensation).

28.29 There remains disagreement over the advice that Defra provided the RDAs in relation to the options available to them, with the RDAs maintaining that they were unaware of options beyond the *de minimis* State Aid rules, whereas Defra is of the opinion that the RDAs merely clarified whether *de minimis* rules could be applied and that the RDAs already had complete knowledge of the alternative arrangements. It is the opinion of the Review that this is an example of how the lack of pre-planned arrangements has resulted in a less than fully considered approach.

28.30 In addition, there have been some criticisms about whether the variety of schemes between regions offered the best value for money. This disparity was brought to the attention of the Review on a number of occasions. For example, interest-free loans were commonly requested by both businesses and farmers, and the West Midlands provided such loans, while the other RDAs did not. In the regions where loans were not available, the provision of grants to cover the costs of business planning advisers only served more to anger than to aid. Those affected argued powerfully that they needed money, not advice.

28.31 There have been a number of suggestions that a national long-term low-cost loan system be established, similar to the Small Firms Loans Guarantee scheme currently offered by the Department for Business, Enterprise and Regulatory Reform (BERR), to assist businesses and farmers after an exceptional emergency. The Review believes that such a scheme could potentially be of great benefit, however, we are also of the opinion that there is considerable work yet to be carried out before it is known whether this is a viable option. **The Review would welcome Defra and BERR considering such a scheme**.

Local authorities

Costs

28.32 The LGA survey of 81 local authorities affected by the summer 2007 floods showed that, as of February 2008, 57 local authorities (70 per cent) were struggling to find the resources to carry out recovery work. Comments from the survey included:

"Some areas have produced a large piece of work that has had an impact on workload and budgets."

"[We] spent one year's worth of budget on the floods so none of the programme of maintenance can be actioned in this year's budget."

"Ideally, one officer would work with town and parish councils to prepare for an emergency, run training days and act as a go between. There isn't the money to do this."

Table 10 – Total flooding costs to local authorities

Local Authority Service costs*	£ million	£ million	£ million
	Revenue	Capital	Total
Emergency action	31.288	0	31.288
Highways	0	81.755	80.755
Schools	26.305	11.371	37.676
Housing	31.809	0	31.809
Social Services	0.734	0	0.734
Other	26.621	24.134	50.754
		Total	**233.016**

*Data taken from Audit Commission publication – 'Staying Afloat – financing emergencies', December 2007, which sets out the service costs of flooding to 18 severely affected local authorities that took part in the study

Support

28.33 The Prime Minister, in his announcement of 14 July 2007, acknowledged that the summer 2007 floods constituted an exceptional emergency and therefore committed the Government to make available additional resources to support communities affected.

28.34 However, the evidence shows that before this announcement there was considerable uncertainty among both local authorities and central government during the flooding over the definition of 'an exceptional emergency'.

Funding schemes

28.35 Many submissions to the Review from local authorities stated that funding the costs of the recovery phase, including humanitarian assistance, was as vital as funding the costs of the emergency response. However, many people perceived that recovery did not receive the same priority.

28.36 The majority of payments made to support the communities affected by the flooding were made via central government departments, using a combination of existing mechanisms and new schemes. By June 2008, the Government had made available a package of up to £118 million. The range of mechanisms available to fund recovery from the floods is outlined below in detail.

Insurance and reserves

28.37 Under the current funding models, costs to local authorities for non-exceptional emergencies and insurable costs must be met by the local authorities themselves. Councils have a long-accepted responsibility to prepare themselves for unforeseen events using insurance, self-insurance and reserve funds, as appropriate locally. Guidance[1] issued by the Chartered Institute of Public Finance and Accountancy on local authority reserves and balances lists *"the adequacy of the authority's insurance arrangements to cover major unforeseen risks"* as one of the factors authorities should consider in deciding the level of their general reserves.

28.38 The Review has considered evidence from local authorities about their insurance decisions. We do not take a view on whether decisions were appropriate or not as we consider that insurance, self-insurance and the use of reserves remain a question for the relevant local authorities. The Review maintains that local authorities must take responsibility

[1] http://www.cipfa.org.uk/pt/laap.cfm

for the consequences of their decisions – central government will not fund costs for non-exceptional emergencies or insurable costs.

28.39 Nevertheless, the Review considers that further work by government is required around this model. The Government should support local authorities by commissioning work to review whether it constitutes value for money for local authorities to use commercial and self-insurance, and whether they have sufficient and appropriate information against which they can make risk-based decisions.

Recommendation 83: Local authorities should continue to make arrangements to bear the cost of recovery for all but the most exceptional emergencies, and should revisit their reserves and insurance arrangements in light of last summer's floods.

28.40 As well as funds from insurance, self-insurance and reserves, the exceptional nature of the emergency meant that, following the 2007 floods, many local authorities were also eligible for payments from funding schemes.

Response

28.41 The Bellwin scheme, administered by CLG, is a well-established method for compensating local authorities. The scheme is designed to fund the non-insurable, immediate response efforts and would, for example, cover: the costs of providing sandbags; evacuating people from dangerous structures and works to make them safe; temporary re-housing; and the costs of initial repairs to highways, pavements and footpaths and work to clear debris causing obstruction or damage to them. However, money from the Bellwin scheme cannot be used for post-emergency costs of recovery such as capital expenditure.

28.42 A Bellwin scheme is only set up at the discretion of Ministers, as was the case following the floods of 2007. Given that the events were of an unprecedented scale and severity, the following amendments to the scheme were announced for both the June and July floods:

- extension of the period for which local authorities are eligible to claim – from two to six months – meaning they could claim for more of the costs they incurred; and
- an increase in the proportion of costs that local authorities could claim to 100 per cent (instead of the current 85 per cent), once the costs rose past the given threshold (0.2 per cent of their revenue budget). The threshold has been a feature of the Bellwin scheme since its inception and represented the minimum amount which Ministers in successive administrations decided was reasonable for authorities to pay from their own resources.

28.43 Fifty local authorities registered for assistance from the June scheme and fifty-two registered for the July scheme. Twenty of these local authorities registered for both schemes. As of June 2008 around £18 million has been paid out through the Bellwin Scheme. The majority of responses to the interim report praised the scheme and it was felt, particularly amongst the emergency services, that it met the needs of the situation. People were also grateful for the increase in funding (up to 100 per cent from 85 per cent of eligible costs incurred).

28.44 However, the Review received suggestions that the scheme should be reviewed in light of the 2007 floods. Affected local authorities suggested that some of the Bellwin provisions were felt to be arbitrary or unclear, such the provision allowing for roads to be cleared but not public rights of way, such as rural footpaths and bridleways (for which we understand there have been no funds made available from the lead department, Defra). Furthermore, submissions to the Review suggested that consideration needed to be given to the funding of related costs incurred by organisations responsible for managing the recovery processes, such as increased staff costs.

28.45 There was particular concern around local authorities' expectation that government would fund 100 per cent of the costs of responding to and recovering from the 2007 floods. Local authorities have reported to

the Review that this was their understanding arising from promises made by the Prime Minister during visits to flood-affected areas and during debates in Parliament. Having explored this issue, the Review considers that this misunderstanding was generated by the explanation of the Bellwin limit being extended to 100 per cent. This meant eligible Bellwin costs, not all costs and not costs associated with the recovery phase.

Schools

28.46 There are no centrally held figures on the total costs to schools damaged by the June and July 2007 floods. However the Audit Commission report '*Staying Afloat – financing emergencies*', published in December 2007, noted that 858 schools had been reported as damaged, of which the 500 schools who took part in the Audit Commission study incurred damage costing almost £38 million.

28.47 The LGA survey showed that as of February 2008, 15 per cent of local authorities continued to see an impact on schools, mainly because of continuing repair works, with some pupils still being taught in temporary accommodation.

28.48 The Department for Children, Schools and Families (DCSF) made a £14 million grant available for schools and children's services affected by the June and July 2007 floods.

28.49 Nearly all of the funding was allocated on the basis of a formula worked out in discussion with the affected areas. The same formula was used for the areas hit by the June floods and those affected by the July floods and allowed a set sum per school 'severely damaged', 'significantly damaged' and 'slightly damaged' respectively. A sum was also allowed per pupil in flood-hit schools and per home damaged, these sums acting as a proxy measure for disruption to services for children and families. As well as these formula-based allocations, DCSF gave an additional payment to Gloucestershire of £350,000 for the loss of water supplies, as this caused severe disruption to services for children, young people and families in addition to the flood damage.

28.50 The general DCSF grant could only be spent on the provision of education or education services, childcare or services related to childcare, and the promotion of welfare of children and their parents. In practice, this included:

- the provision of temporary accommodation for schools and 'early years' and childcare services, including Sure Start children's centres;
- the provision of additional summer activities for children and young people from communities affected by flooding; or
- family support workers to help parents, children and young people handle the pressures and demands resulting from the flooding, including counselling.

28.51 Because the DCSF scheme was based on the level of damage and number of pupils affected, it did not take account of whether the costs for repair (and other related areas) were already being met by insurance or other sources. In the opinion of the Review, this approach does not guarantee value-for-money.

Tourism

28.52 On 14 August 2007, the Department for Culture, Media and Sport (DCMS) announced a £1 million cash injection to promote tourism, rural destinations and visitor attractions. Of the £1 million, £750,000 came from DCMS, while £250,000 was provided by Visit Britain. A number of DCMS-sponsored museums were offered short-term curatorial and conservation support, for example where documents needed urgent treatment.

Roads

28.53 The Department for Transport (DfT) announced in July 2007, as part of the Government relief package, that funding would be made available to help local authorities repair flood-damaged roads through its emergency capital highway maintenance funding scheme, which helps local authorities address urgent capital resources and works needs arising from serious unforeseeable events.

28.54 The broad principle adopted by DfT over a range of differing emergencies in recent years has been that claims for emergency funding will be considered where the cost of works needed to restore infrastructure to the level of provision applying before the emergency exceeds 15 per cent of an authority's formulaic Local Transport Plan (LTP) capital allocation for highway maintenance for the relevant year. As of June 2008, first stage allocations of £23 million for repairs to the local highway had been confirmed in writing to local authorities and the majority of the funding had been paid. DfT issued guidance for emergency funding on 8 August 2007 and appointed a specialist to help local authorities obtain a clear assessment of the costs and to submit their claims.

28.55 A similar DfT scheme had been operational in earlier emergencies. However, like many of the other funding schemes described, this scheme, while welcome, was also an ad-hoc solution to the issue of funding. The guidance issued in August 2007 provided advice, which previously was not available, on the circumstances under which a claim for financial assistance could be made.

European Union Solidarity Fund

28.56 The European Union Solidarity Fund (EUSF) is intended to contribute towards the costs of damages incurred where no other funding is available, including emergency relief and reconstruction operations. As such, it can be used to support the costs of emergency services, cleaning up after an emergency and putting infrastructure back into working order. The Government submitted an application to the EUSF on 20 August 2007, requesting help in meeting the uninsurable costs of the floods.

28.57 The European Commission announced on 10 December 2007 that they proposed aid totalling €162.388 million (which equates to around £110 million) to help deal with the damage caused by floods in England, Northern Ireland and Wales in June and July 2007. This aid payment of £110 million was approved by the European Commission in April 2008 as a contribution to the costs of recovery. However, due to the UK abatement mechanism agreed between Government and the EU, in place since 1984, the net value to the UK of this allocation is £31 million.

28.58 The Government has used the money offset by the EUSF funding to set up a Restoration Fund to provide additional funding to local authorities affected by the 2007 floods. The Government has reported that detailed decisions on how the money will be spent have yet to be made but it is anticipated that the grant will go towards reimbursing part of the cost of emergency measures such as rescue services, cleaning up after flood damage, and restoring basic infrastructure.

New funding arrangements

28.59 Problems with existing funding systems for local authorities were thus twofold: some organisations at the local level had not made proper arrangements to cope with significant financial shocks, and there was no coherent pre-agreed system for funding at the national level.

28.60 To improve future funding arrangements, a number of submissions made to the Review suggested that funding for recovery must be flexible in order to allow for local needs and that national funding must not distort local decision-making nor provide disincentives for local authorities to properly insure and maintain necessary reserve funds. The Review agrees with these principles. But we also believe that the benefits of regional and local decision-making and transparent processes being implemented nationally are not mutually exclusive.

28.61 While the Review accepts that there are valid reasons for funding schemes not being identical across the country, the reasoning for the disparity of funding across areas and regions following the summer 2007 floods was not always transparent and justifiable. There was certainly a need for greater consistency.

28.62 The Review believes that the problems observed are likely to be due to the speed with which schemes were put together and distributed. In contrast, pre-planned schemes, established in non-emergency situations, give the opportunity for the difficulties identified

to be considered. Calls by the Review for consistency do not imply advocacy of a generic approach to decision making. Pre-agreed parameters and principles may lead to different approaches or schemes at local and regional levels. But, they also ensure a coherent rationale and provide transparency around the differences.

28.63 Local organisations must also prepare themselves better. Most of the losses incurred during the summer were insurable, either through commercial insurance or through self-insurance and use of reserves. Local authorities in particular already have clear direction to build contingency into their financial arrangements, and this must continue. As with all other aspects of the response to emergencies, local organisations must expect to manage their own problems in the first instance and only seek support in the most difficult situations.

28.64 Nevertheless, the effects of the most significant emergencies can cause very serious financial problems. Individual authorities can face problems for which insurance is unavailable or its cost unreasonable. In the past, just as during the summer floods, central government has recognised this through generous ad-hoc funding schemes. But the temporary and uncertain nature of this approach undermines efficiency, and encourages local authorities to over or under-provide for disasters.

28.65 Having reviewed all of the existing means by which recovery work is funded, the Review therefore continues to believe that there are core principles upon which recovery funding should be based. These principles should be developed with advance planning and forethought. The opinion of the Review is that, although there is a clear need for local decision-making based upon specific local needs, the current variety of funding to local authorities, individuals and businesses is detrimental to the recovery process following from a national emergency. In addition, the Review considers that the ad-hoc nature of the schemes used to support recovery from the 2007 floods was not necessarily the best use of taxpayers' money and improved planning would enable significant targeting and therefore better use of limited funds. The Review believes that financial assistance can be revised to improve speed, simplicity and certainty.

28.66 The Review considers that that any future model for financial assistance should be designed to minimise unnecessary expenditure and maximise value for money for public finances collectively, rather than singularly for central or local government, and that arrangements for distributing any financial assistance during the recovery phase should be transparent and equitable.

28.67 The Review believes that there is a strong argument for a scheme to be created specifically to fund the capital costs of recovery from exceptional emergencies such as the floods of 2007. The new scheme would receive funding from relevant central government departments, be delivered through a single funding gateway and supported by the work of Government Offices. Such an arrangement would end the current piecemeal approach and allow for more accurate financial planning by local authorities. Effectively, it would be a kind of public sector self-insurance for the most serious events.

RECOMMENDATION 84: Central government should have pre-planned rather than ad-hoc arrangements to contribute towards the financial burden of recovery from the most exceptional emergencies, on a formula basis.

Normalisation and regeneration

This chapter examines the transition from the recovery phase to normalisation or regeneration. It contains sections on:

- normalisation versus regeneration; and
- examples of regeneration programmes following emergencies.

Normalisation versus regeneration?

29.1 Recovering from a major event, such as the 2007 summer floods, is a long-term process taking many months if not years. Determining when an area has 'recovered' very much depends on the definition of the aims and objectives of the recovery phase made by those involved at its outset. In some cases, this will involve returning affected areas to their previous condition - 'normalisation'. In other cases, the recovery phase will be seen as the opportunity for long-term regeneration and economic development.

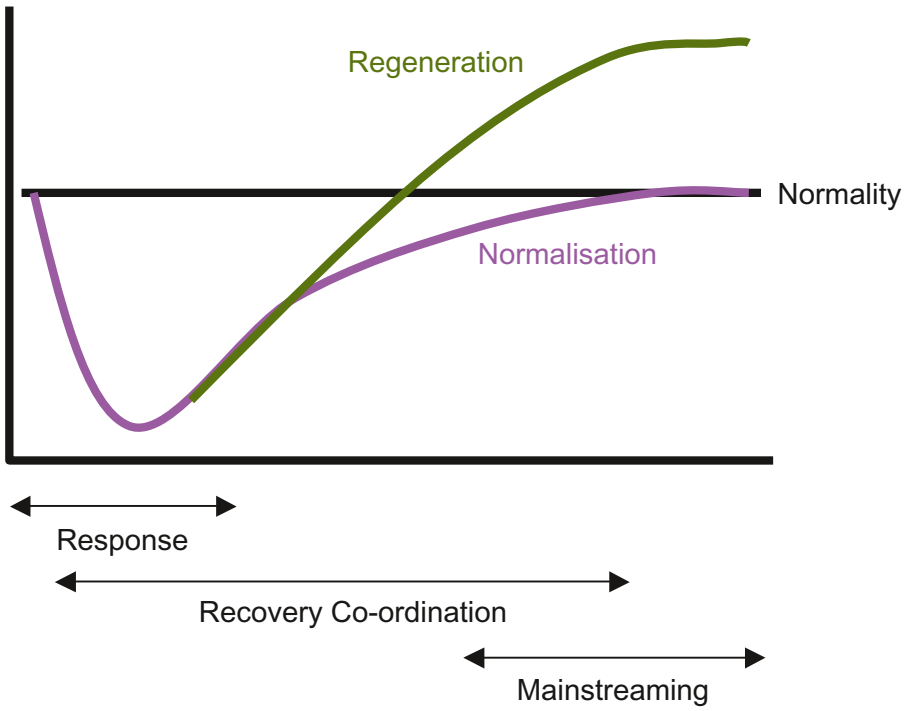
29.2 The Review believes that there is thus an important role for Recovery Co-ordination Groups (RCGs), in establishing the aims and objectives for the recovery phase, in considering the strategic choice between normalisation and regeneration of an affected area.

Recovery – the process of rebuilding, restoring and rehabilitating the community following an emergency. This may be driven by RCGs until such time as recovery work can be delivered by an organisation's mainstream programmes.

Normalisation – local multi-agency RCGs can concentrate their efforts on action designed to restore the affected area to its previous condition.

Regeneration – local multi-agency RCGs can consider whether, in light of the damage caused and costs to recover, there is the opportunity to aspire to transformation and revitalisation. Transformation can be physical, social and economic. It can be achieved through building new homes or commercial buildings as well as through raising aspirations, improving skills and improving the environment whilst introducing new people and dynamism to an area.

Figure 16 – Recovering from an emergency



29.3 Evidence to the Review has shown that most local authorities agree that longer-term regeneration and economic development should be considered at an early stage of the recovery process, although many query where funding will come from. But evidence also shows that most authorities have opted for normalisation rather than regeneration. There are often very good reasons for this, not least a strong desire to return to a state of normality as soon as possible, including getting residents back into their homes quickly and restoring everyday services.

"The opportunity for 'betterment' is often overlooked in the rush to return the community to normality… the allocation of 'betterment' in financial terms will need to be worked through on a case by case basis"
– Havant Borough Council

"The long term recovery of the flooded areas is as integral as the physical recovery of the affected premises… Economic recovery and regeneration need to be considered and planned for on a priority basis as early in the recovery phase as possible"
– Dartford Borough Council

Examples of regeneration programmes following emergencies

29.4 The Review has found a number of regeneration programmes which followed emergencies in the UK and overseas, including the Carlisle floods of 2005, the hurricane and subsequent flooding in New Orleans and the explosion and fire at the Buncefield oil storage depot, Hemel Hempstead.

Carlisle

In January 2005, severe storms and associated heavy rain falling on already saturated ground led to the worst flooding in over 100 years in the Carlisle area, resulting in:

- 3 deaths;
- over 2,000 homes and business flooded up to 2 metres;
- more than 3,000 people homeless for up to 12 months or more;
- 40,000 addresses without power, and
- 3,000 jobs put at risk.

Left to Right: The Civic Centre flooded, and an artist's impression of what a redevelopment could look like. Reproduced with permission from Carlisle City Council

Carlisle City Council decided that the aftermath of the floods presented an opportunity to regenerate the city. A task group was formed, which included Cumbria County Council, English Partnerships and Cumbria Vision, to assess the strengths and weaknesses of Carlisle and, importantly, any opportunities that the city might explore as part of the vision for the future of Carlisle. As part of the delivery of the regeneration programme, it was important for the Council to consult the general public as well as the private sector.

Under the banner 'Carlisle Renaissance', the vision was designed to lay the foundations for the city's future prosperity and growth within the following aims:

- to develop sites within the city centre, revitalise local communities and promote the city;
- to reduce worklessness, improve workforce skills and support businesses; and
- to build an accessible city, develop Carlisle's infrastructure and establish a sustainable community.

The authorities in Carlisle recognised the potential that the floods had afforded them:

> *"In the immediate aftermath of the floods in January 2005, Carlisle City Council… knew that it just wasn't enough to get the city back to normal, we had to do much better than that – so our mantra in the early days became 'Let's get Carlisle back to normal – but better.'*
> *"Our key task was to oversee the flood recovery process, but we took the opportunity at that early stage to use our multi-agency group in developing a vision for the physical, social and economic regeneration in Carlisle and make the case for Carlisle Renaissance."*
> – Maggie Mooney, Town Clerk & Chief Executive, Carlisle City Council

Buncefield

On 11 December 2005, a number of explosions and a subsequent fire at the Buncefield oil storage depot, Hemel Hempstead resulted in:

- 40 people being injured;
- 2000 people being evacuated;
- between 300 and 325 properties being damaged;
- over 16,000 employees within the adjacent Maylands Industrial Area unable to access work;
- 92 businesses being temporarily relocated; and
- business recovery costs of £2.2 million with long-term costs in the region of £100 million over 10 years.

During the recovery phase, it became clear to the RCG that the impact on the local economy was important in terms of the longer term recovery of the community. Maylands Business Park, central to the area's economy, had over many years been losing ground to competing business parks around London. Office and employment growth had fallen significantly behind the regional norm. It was evident that Maylands had entered a slow spiral of decline prior to the explosion.

The RCG's business subgroup made the decision early during the recovery phase that its aspirations needed to be changed from recovery into one of regeneration. Work with local businesses prior to the explosion, captured in an existing 'Hemel 2020 Vision' regeneration package, part of which was a £400m 'Maylands Masterplan', could be used to support the economic and business recovery of the area.

Delivery of the Masterplan, which was adopted in September 2007, is the lynchpin of the Maylands regeneration strategy and focuses on actions to retain existing business and attract inward investment.

> *"Recovery is unambitious – use any disaster to think afresh, in a planned way, about the renewal aspirations"* – Executive Director, Maylands Partnership

New Orleans

On 29 August 2005, the centre of Hurricane Katrina passed to the east of New Orleans causing catastrophic damage. The impact on New Orleans included:

- 1,836 deaths;
- 50 breaches in drainage canal levees and also in navigational canal levees;
- flooding to 80 per cent of the city, with some parts under 15 feet of water;
- evacuation of 90 per cent of the residents of southeast Louisiana;
- loss of electricity supply for 3 million people; and
- $81 billion worth of damage.

In addition to their programmes for repair and rebuild, the City of New Orleans decided that the aftermath of the hurricane was an opportunity to regenerate the city. A significant proportion of the population has yet to return to the city, and the authorities recognise that they are unlikely to return until much of the infrastructure has been built, such as schools, hospitals and housing. The Unified New Orleans Plan (also known as the Citywide Strategic Recovery and Rebuilding Plan) enabled the City of New Orleans authorities to address some of the chronic problems that plagued the city before the hurricane and set a clear vision for the future of the city. The plan helps to prioritise those projects which should be undertaken first. It uses population spread as the basis for assessments of the need for a better distribution of services, such as schools and hospitals, across the city. There are also plans to replace damaged social housing with mixed community and tenure housing, in an attempt to regenerate deprived areas.

29.5 None of these examples of regeneration has been without its difficulties and critics. But the barriers and complexities are similar to those inherent in any change programme, and should not deter local RCGs from considering regeneration at an early stage.

RECOMMENDATION 85: Local Recovery Coordination Groups should make early recommendations to elected local authority members about longer-term regeneration and economic development opportunities.

Section 8

Oversight, delivery and next steps

This section examines how the improvements recommended in this report can be delivered and contains a full list of all the recommendations. It contains chapters on:

- Oversight and delivery; and
- Next steps

Oversight and delivery

This chapter considers how the improvements recommended in this report can be delivered, and who should take responsibility for making sure that change is swift and successful. It contains sections on:

- leadership in central government;
- oversight at the national level; and
- scrutiny at the regional and local level.

30.1 The preceding chapters of this Report make a large number of recommendations about how we can improve the way the UK deals with the risks posed by flooding. If implemented, we believe they will deliver a step change improvement in our capacity to handle events of the kind experienced last summer and which we will experience more frequently in the future. To achieve that, there must be a clear framework for delivery, with proper ownership of actions and oversight of progress.

30.2 Many organisations have raised this issue in their submissions. The widely shared fear is that important recommendations may be forgotten or ignored if they are too challenging. However, we know from our own analysis that the precedents are positive. The changes proposed in previous flooding reviews have generally been implemented. Indeed, some of the most significant changes in the way we handle flooding have resulted from independent reviews or reports. We regard that as encouraging, but recognise that we must still be specific about delivery. So this chapter deals with the issues of leadership and oversight.

Leadership in central government

Defra

30.3 The recommendations in this Report are directed towards a range of government departments and agencies. Lead amongst these is Defra, as department with responsibility for flood risk management.

30.4 Defra has a Departmental Strategic Objective to make the economy and society more resilient to environmental risk and encourage adaptation to the impacts of climate change. This is underpinned by measures of performance including the number of households at risk from flooding. Flood risk management is one of Defra's main departmental programmes, and is monitored closely by the Defra board. In addition, Defra sponsors the Environment Agency, which has six-monthly performance meetings with Ministers and continuous discussions with Defra at official level.

30.5 Defra has already shown itself willing to take on a leadership role, and we understand that it will coordinate both the response to this Review and the wider programme of change.

30.6 But a positive approach and administrative structures are not enough alone. This programme of work must have teeth and Defra should set out publicly how the government can be held to account and how progress can be monitored. Defra has already agreed to deliver a National Framework for flood emergency preparedness, following the recommendation in our interim report. They must also produce a clear plan of action for implementing our other recommendations.

30.7 This work must be overseen by a top official, with regular reporting to Defra Ministers and the Board. Defra must recognise that flood risk management is a central issue for the department, and treat it accordingly. Reducing flood risk, handling major flood incidents more effectively and communicating properly with the public need to be priorities for the whole department, from the Secretary of State downwards. **We welcome the positive approach Defra has taken to our work, and we hope it will continue**.

RECOMMENDATION 86: The Government should publish an action plan to implement the recommendations of this Review, with a Director in Defra overseeing the programme of delivery and issuing regular progress updates.

A Cabinet Committee for flooding

30.8 Defra cannot tackle this job alone. The issues considered in this report are many and varied, and go far beyond Defra's direct interests. In order to support Defra, there should be a new Cabinet Committee to deal with flooding, much as we have already for terrorism and pandemic influenza.

30.9 Cabinet Committees provide a framework for collective consideration and decisions on major policy issues, and questions of significant public interest. They ensure that issues that are of interest to more then one department are properly discussed and that the views of all relevant Ministers are considered. Cabinet and Cabinet Committees are the only bodies formally empowered to take binding decisions.

30.10 A Cabinet Committee will provide clear ministerial leadership across government, and ensure that other important departments such as CLG, the Cabinet Office and BERR play their part. As a Cabinet Committee, its business will take precedence within government over other matters. It is a step which raises the status of flooding to bring it alongside the other most serious risks we face. A status which the Government signalled in its own National Security Strategy.

30.11 We are aware that government has generally been seeking to reduce the number of Cabinet Committees. It is certainly true that we cannot have a Committee dedicated to every subject. But we believe the case for a dedicated flood committee is strong, and perhaps best articulated in the government's own explanation of the rationale for Committees. The example of the Committee established to improve pandemic influenza planning amplifies the point:

> *"At best, a Cabinet or Cabinet Committee decision is more than the sum of its parts. Bringing the different knowledge and perspectives of departments, and the varying judgement and experience of Ministers, together enables Ministers to arrive at a much better outcome than would be possible for any one Secretary of State[1]."*

[1]'A Guide to Cabinet Committee Business', Cabinet Office, 2008

MISC 32 – a cabinet committee for pandemic flu planning

A Cabinet Committee on pandemic influenza (called 'MISC 32') was established in 2005 to guide the preparations for a potential influenza pandemic. The Committee is chaired by the Secretary of State for Health, and around 20 ministers are members. The Permanent Secretary Government Communications, the Chief Medical Officer, the Government Chief Scientific Adviser and the Chief Veterinary Officer are also invited to attend as required. Other Ministers and officials, the Devolved Administrations, and representatives of the Association of Chief Police Officers and the Local Government Association attend as necessary. Able to focus on a single issue, the Committee has provided drive and focus to the work to deliver a step change in UK planning, and overseen the production and publication of a national framework for preparedness.

30.12 The process of establishing the Cabinet Committee could be completed quickly to drive and support progress. Its creation would be a strong signal that the Government intends to take flooding and this Review seriously.

RECOMMENDATION 87: The Government should establish a Cabinet Committee with a remit to improve the country's ability to deal with flooding and implement the recommendations of this Review.

Oversight at the national level

National multi-agency planning

30.13 The work carried out in government has to be done together with external organisations. Just as at the local level, the multi-agency approach has to be the cornerstone of improving our ability to deal with flooding emergencies. However, at present there is no single body at the centre of government to make this happen. Local and Regional Resilience Forums provide a strong focus, but the absence of a national equivalent means that the Government relies on a mixture of subject-specific or lower level working groups to give non-government organisations a voice.

30.14 Key decisions must still sit with government itself, but local responders and the private sector need influence and to be more closely involved. Submissions to the Review from key external organisations, notably local government and critical infrastructure operators, have made this clear.

30.15 The creation of a National Resilience Forum (NRF), with representatives of local response organisations and Government, would give the kind of multi-agency strategic oversight that we believe is necessary to make the recommendations in this report work.

30.16 The NRF would deliver four things:

- high level buy-in and strong affirmation of the government's commitment to a multi-agency, consensual approach;
- a clear signal that the centre of government attaches great importance to the work, prompting action and interest of external bodies;
- a public statement of intent through published minutes and collective endorsement of key decisions; and
- a focus for national, regional and local stakeholder groups which do not have a direct link in to Cabinet Committees.

How a National Resilience Forum (NRF) might work

The NRF would not be a decision making body. Government would continue to make decisions and the NRF would help to advise and encourage multi-agency working.

The NRF would have a direct relationship with regional and local resilience forums. Regional and local resilience forums would be briefed on debate in the NRF, and the NRF would review progress in resilience at regional and local level. The NRF would also have a direct relationship with stakeholder groups on specific issues, such as the Business Advisory Group on Civil Protection and the Media Emergency Forum. Groups might pass issues up to the NRF, either formally or through their representatives.

The NRF should have a Cabinet Minister in the chair and external representation would be at the highest level. The group would meet approximately every six months, and focus on strategy, delivery policy aims and key government decisions relating to resilience.

The membership of the NRF could include:

- Cabinet Office
- CLG
- Home Office
- Department of Health
- Defra
- Environment Agency
- BERR
- Department for Transport
- HM Treasury
- Local Government Association
- ACPO
- Chief Fire Officers' Association
- Ambulance Service Association
- Confederation of British Industry
- Energy Networks Association
- Water UK
- National Voluntary Aid Societies Emergencies Committee
- Media Emergency Forum representative

30.17 The Review has considered other options to deliver the same outcome. In particular, we considered the new National Security Forum (NSF) described in broad terms in the Government's National Security Strategy. However, the strong focus of the Strategy on external threats and the likely focus of the NSF on security issues leads us to believe that a different body is necessary. The government may, of course, consider this proposal and decide that a broadening of the role and membership of the NSF would be a more efficient way to achieve the same effect, but our view is that the NRF model should be pursued in its own right.

RECOMMENDATION 88: The Government should establish a National Resilience Forum to facilitate national level multi-agency planning for flooding and other emergencies.

EFRA Committee

30.18 We have also considered how delivery should be monitored at a national level once the Review is shut down.

30.19 The Environment, Food and Rural Affairs (EFRA) Select Committee has followed the progress of our Review and there has been a sharing of ideas. We believe the EFRA Select Committee should build on its own longstanding interests in flood risk management by reviewing progress against our recommendations at key stages. The Committee will have a particular interest when the Government's response and Action Plan are published in late summer or early autumn, and Defra might most helpfully meet with members of the Committee to explain their approach at that stage.

30.20 In addition, we would encourage the Committee to make an assessment of progress once departments have had time to undertake some of the more substantial policy and operational changes. We expect even the most significant programmes of work to be up and running within a year, and so next summer seems an appropriate time for an assessment of progress.

RECOMMENDATION 89: The EFRA Select Committee should review the country's readiness for dealing with flooding emergencies and produce an assessment of progress in implementation of the Review's recommendations after 12 months.

Scrutiny at the local level

30.21 National oversight must be matched locally and we consider that there is a role for scrutiny committees of local councillors. Overview and scrutiny is a function of local authorities in England and Wales. It was introduced by the Local Government Act 2000, which created separate Executive (decision making) and Overview and Scrutiny (reviewing) functions within councils. The Local Government and Public Involvement in Health Act 2007 enabled enhanced overview and scrutiny functions – allowing all Members to refer any matter affecting the local authority area or its inhabitants to the oversight and scrutiny process.

30.22 Overview and Scrutiny Committees (OSCs) have a number of specific functions including:

- holding the Executive accountable, by questioning Executive Members and council employees about their decisions; and
- scrutinising services delivered by external organisations to local communities.

30.23 OSCs are now a well-established feature of local government. They provide a strong focus for public interest in key areas of local service delivery, and ensure that organisations are held to account publicly. As one step removed from the service providers, they can consider the position across the piece. The model is already used successfully on a national basis to improve local oversight of NHS services.

30.24 The wide range of organisations which have a part to play in reducing the impacts of future flooding in local areas means that the scrutiny model is particularly well-suited. Scrutiny committees have successfully examined the events of last summer in areas such as the East Riding of Yorkshire, Gloucestershire, Doncaster and Berkshire, taking evidence from public and private sector bodies. These have been most effective where a public report has been produced, and specific actions identified. Indeed, the lessons they have identified have provided useful information for this Review.

Local scrutiny of the NHS

For some time, the Government has encouraged councils to take a stronger role in scrutinising services outside their own organisation. The Health and Social Care Act 2001 provided the Overview and Scrutiny functions of unitary authorities and county councils with statutory powers to call in witnesses from local NHS bodies, and make recommendations that NHS organisations must consider as part of their decision-making processes. The 2001 Act also places requirements on NHS organisations to consult health overview and scrutiny committees when considering substantial developments or variations in the services which they provide.

Overview and Scrutiny Committees are playing an increasingly important role in publicising, scrutinising and questioning key issues in local and national health policy. Health scrutiny has developed well in a challenging and changing environment with OSCs providing democratic accountability for health matters through:

- collaboration (bringing people together to solve common problems);
- corporate support (recognising councils' role in health improvement);
- campaigning (tackling service redesign and reconfiguration); and
- challenge (holding decision makers to account).

Given the constitutional and resource constraints within which health scrutiny operates, evidence suggests outcomes have been promising with scrutiny contributing to changes in both service provision and the attitudes of individuals and organisations involved. Impacts identified by a Centre for Public Scrutiny report include, an improved level of debate about health; greater collaboration amongst service providers; closer working with neighbouring authorities; increased public and patient voice; changes in plans, services or resource allocation; and improved performance.[2]

Gloucestershire's scrutiny enquiry

Gloucestershire County Council held an in-depth inquiry during October 2007 to discover exactly what happened during the flooding events of the summer and how the county could prepare for the future. Witnesses from various county council departments and other external agencies were asked to provide both written and verbal evidence. The final scrutiny inquiry report was published. It makes a number of recommendations and calls for action plans to be produced. These commit key organisations to actions in response to lessons learned.

Hull's independent review

The Hull Independent Review identified a number of serious issues with the design, maintenance and operation of the pumped drainage system in Hull. These issues had been recognised and raised as long ago as 1996, but were apparently never acted upon. Had there been effective information exchange, coupled with local scrutiny, it would have provided a better understanding of the risks and would have promoted earlier action and the development of contingency plans. The people of Hull would undoubtedly have benefited.

[2] Centre for Public Scrutiny, Health Scrutiny – Evaluative Research Project, June 2007

Southwark Council and Thames Water

A review was initiated in response to a mains water burst in Linden Grove in September 2003 which resulted in large numbers of Southwark residents being without water for up to five days. OSC members were keen to find out: the cause of the water burst and the impact it had on local people; how Thames Water and the Council responded to the emergency; and what practical lessons could be drawn from it. Southwark council remarked that although they initially had trouble making contact and agreeing terms of engagement, the experience itself was positive for those concerned.

30.25 The Review considers that holding scrutiny meetings in flood risk areas would send a powerful leadership message. Such an approach would give locally elected members the opportunity to ask questions about decisions concerning the management of local flood risk, based upon actions within a number of public documents such as SWMPs, Local Development Frameworks and Community Risk Registers.

30.26 If all those with responsibilities were required to attend, including representatives from water companies, local authority drainage officers and Environment Agency, scrutiny meetings would also provide local authority members with the opportunity to engage with relevant parties and monitor progress. Local authority scrutiny has the benefit of giving greater impetus to ensuring that risk-based actions, once decided, actually take place. It should also ensure a greater understanding of both local issues and the national context. Scrutiny should lead to greater transparency for the public, including better understanding of local maintenance regimes, risk and options for managing risk.

Scrutiny in practice

30.27 Our interim report proposed two conclusions in relation to local scrutiny, suggesting a role for OSCs in relation to flood risk management and critical infrastructure. Reactions were generally positive. Most councils recognised scrutiny as an increasingly important part of local governance and could see its benefits to managing local flood risk. Nevertheless, some issues have led those who would have to implement these proposals to be cautious.

Resourcing and timing

30.28 Some submissions to the Review raised concerns about the scale and frequency of the scrutiny process. Local authorities regard the scrutiny process as generally resource-intensive. Certainly, the experience of those authorities which have carried out scrutiny suggests a review of all matters relating to flooding and infrastructure is a significant one.

> *"there are many subjects which the 'beam of scrutiny' has yet to touch on and scrutiny must also fulfil its statutory duty to examine health issues… I am not sure there is the capacity to keep the issue of flooding permanently under local authority review year on year."*

30.29 Many authorities take a 'task-and-finish' approach to scrutiny, choosing topics of particular local importance and producing a one-off report. In practice, we believe that most authorities would not chose to review flood risk management every year through a full-scale scrutiny exercise. Areas of particularly high risk might opt to do so, but for many a large initial exercise followed by a light annual review would suffice. In either case, it is clear that greater scrutiny activity in this area will have resource implications for local government which will need to be resolved.

30.30 There is a separate issue for infrastructure providers, who have concerns about managing relationships with large numbers of local committees.

> *"We are concerned about any proposal to duplicate ownership or reporting responsibility by the introduction of linkage to local authorities. We believe that if there is a case to add or change to emergency planning obligations then the correct route for that is for BERR to do so, and Ofgem to agree any consequential impact on financing. It could be a recipe for confusion*

and conflict if Local Authorities each believed they had oversight of plans which will overlap a number of Local Authority areas."

30.31 We believe this point is finely balanced. Infrastructure providers do often cover large areas, and taking part in a scrutiny process can be demanding. But as we say earlier in the Report, infrastructure providers now need to make sure they are resourced to manage more complex relationships with the local level. And the pressure on local government to keep its scrutiny activity at an efficient level should mean that all those involved have the right incentives to avoid unnecessary work.

Technical, commercial and security issues

30.32 Submissions from both Category 2 responders and local authorities themselves pointed out that there is a shortage of specialist expertise in councils. This, they claim, makes the idea of meaningful, detailed scrutiny of emergency and business continuity plans more difficult.

"the drainage infrastructure is very complicated from a technical and historical perspective and it would be advisable if some form of readily comprehensible guidance were produced by Government to enable members to grasp the complexities and subtleties of this and what the key issues to focus on are"

30.33 The Review recognises that a level of background knowledge would be required to examine the detail of such plans. But one of the great strengths of OSCs is that they are able ask the questions a layman would ask, representing the public's concerns and providing a reality check for the 'experts'. Gloucestershire's positive experience in the summer demonstrates that technical expertise is not a pre-requisite for meaningful scrutiny.

30.34 We also recognise some of the sensitivities around critical infrastructure. The contents of emergency and business continuity plans may have implications for security, and critical infrastructure issues can touch on matters of commercial confidence. As such, Category 2 responders would be reluctant for this information to be public.

30.35 As outlined in earlier chapters, we believe the balance between public good and security threats should be redressed. While recognising the legitimacy of security and commercial concerns, we note that such plans have been successfully discussed at OSCs in the past. Scrutiny committees can take evidence in private if necessary, and final reports do not need to contain the detail of specific sites or assets.

Expectation management

30.36 A point of concern raised in some of the evidence is the management of the expectations of the public and councillors. If scrutiny reports identify areas of concern organisations will come under considerable pressure to resolve problems. Although this pressure is positive, it may not allow for the realities of limited resources and existing priorities or statutory commitments.

30.37 This is not a concern supported by evidence. The scrutiny enquiries which followed the summer floods asked hard questions of key organisations, but accepted practical programmes of work rather than pushing for unrealistic improvements. Guidance from the Government on how the process should work would be appropriate.

"In order to be able to rebut excessive demands for routine maintenance through public forums there must be very clear acceptable standards set by central government, for watercourse condition. Detailed guidance would also need to cover such issues as dispute resolution, the level of control the public sector would have over the private sectors plans etc."

Information sharing and co-operation

30.38 The Review notes that Central Networks refused to participate in Gloucester review and recognises that external organisations may at times not want to fully engage or share information. Again, this issue is surmountable. We believe Government should oblige external organisations to cooperate, as requested, with such exercises.

In its submission to the Review, Severn Trent Water commented on the company's experience of attending the Scrutiny Inquiry conducted by Gloucestershire County Council following the floods of summer 2007:

"Severn Trent Water has experienced the benefits [that] attending the Gloucester Scrutiny enquiry can bring. We have been able to inform and reassure the communities we serve by demonstrating what we as an organisation are doing to make our networks more resilient and what contingency arrangements we have in place to respond to an emergency in their community."

30.39 Taken together, these issues are significant but manageable. Making the scrutiny process work will require proper guidance, but there are strong precedents and real benefits. Scrutiny enables authorities to ensure that national policy is complied with at the local level. It holds companies who deliver essential public services to account – helping to ensure vital services are correctly maintained for the good of the local community and that robust plans are put in place for potential failure. The Review believes an effective exchange of information, coupled with local scrutiny can act to promote earlier action and the development of better contingency plans.

RECOMMENDATION 90: All upper tier local authorities should establish Oversight and Scrutiny Committees to review work by public sector bodies and essential service providers in order to manage flood risk, underpinned by a legal requirement to cooperate and share information.

RECOMMENDATION 91: Each Oversight and Scrutiny Committee should prepare an annual summary of actions taken locally to manage flood risk and implement this Review, and these reports should be public and reviewed by Government Offices and the Environment Agency.

Learning lessons

30.40 Oversight and Scrutiny Committees will be the major route through which effective change in the management of flood-risk by public sector bodies and essential service providers will be monitored and driven. Through the improved contingency plans engendered by this committee process, the organisations subject to scrutiny will be better prepared to cope with flood-risk and this will lead to greater resilience at both the local and national levels.

30.41 However, the other element of work at the local level to achieve improvement following flooding events is internal analysis to learn and share lessons. In this respect, there will be a need for responders to evaluate and share lessons in the response and recovery phases and some of the areas under discussion will be particularly sensitive for security and commercial reasons. The specialist and operational nature of this work means that Local Resilience Forums should play a leading role in its discussion and development.

RECOMMENDATION 92: Local Resilience Forums should evaluate and share lessons from both the response and recovery phases to inform their planning for future emergencies.

Next steps and summary of recommendations

This chapter marks the end of the Review process.
It contains sections on:

- the end of the Review process, and immediate next steps; and
- a full list of all the recommendations.

Next steps

31.1 The Review was initiated in August 2007 and has now, after some 10 months, reached its conclusions. The Review was given clear terms of reference at the outset of the work and has delivered against those. The Review process now comes to an end and the Review team disbanded.

Access to evidence

31.2 Ongoing work and remaining evidence will be dealt with by the Government. The Review mailbox and postal address will continue to be monitored, but enquiries will be passed on to the relevant government department.

31.3 We want to ensure that the evidence submitted to the Review will be available to those who wish to use it for research purposes. The material will be held at the Library of the Emergency Planning College, and be supplied in full on request. The Library can be contacted by email at Epc.library@cabinet-office.x.gsi.gov.uk or by telephone on 01347 825 007. In due course, the evidence will be transferred to The National Archives.

Views and comment

31.4 The Review Team is not seeking any public comment on this Report or its recommendations. However, we are conscious that many people may have views on what we have said. These should, in the first instance, be directed to Defra as lead government department for flooding. Defra Flood Risk Management Division can be contacted at:

Defra Flood Risk Management Division
Ergon House
Horseferry Road.
London
SW1P 2AL
08459 33 55 77

Government response

31.5 The Government has indicated to us that it will want to reflect on the recommendations in this Report, and publish a considered response in due course. We recognise that the recommendations touch on a wide range of issues and organisations, and it will take time to reach decisions within government and beyond. Nevertheless, we expect the Government to respond formally to our recommendations by the end of September 2008 at the latest.

Recommendations in full

A full list of the final recommendations which appear in the earlier chapters of this document follows below.

RECOMMENDATION 1:
Given the predicted increase in the range of future extremes of weather, the Government should give priority to both adaptation and mitigation in its programmes to help society cope with climate change.

RECOMMENDATION 2:
The Environment Agency should progressively take on a national overview of all flood risk, including surface water and groundwater flood risk, with immediate effect.

RECOMMENDATION 3:
The Met Office should continue to improve its forecasting and predicting methods to a level which meets the needs of emergency responders.

RECOMMENDATION 4:
The Environment Agency should further develop its tools and techniques for predicting and modelling river flooding, taking account of extreme and multiple events and depths and velocities of water.

RECOMMENDATION 5:
The Environment Agency should work with partners to urgently take forward work to develop tools and techniques to model surface water flooding.

RECOMMENDATION 6:
The Environment Agency and the Met Office should work together, through a joint centre, to improve their technical capability to forecast, model and warn against all sources of flooding.

RECOMMENDATION 7:
There should be a presumption against building in high flood risk areas, in accordance with PPS25, including giving consideration to all sources of flood risk, and ensuring that developers make a full contribution to the costs both of building and maintaining any necessary defences.

RECOMMENDATION 8:
The operation and effectiveness of PPS25 and the Environment Agency's powers to challenge development should be kept under review and strengthened if and when necessary.

RECOMMENDATION 9:
Householders should no longer be able to lay impermeable surfaces as of right on front gardens and the Government should consult on extending this to back gardens and business premises.

RECOMMENDATION 10:
The automatic right to connect surface water drainage of new developments to the sewerage system should be removed.

RECOMMENDATION 11:
Building Regulations should be revised to ensure that all new or refurbished buildings in high flood-risk areas are flood-resistant or resilient.

RECOMMENDATION 12:
All local authorities should extend eligibility for home improvement grants and loans to include flood resistance and resilience products for properties in high flood-risk areas.

RECOMMENDATION 13:
Local authorities, in discharging their responsibilities under the Civil Contingencies Act 2004 to promote business continuity, should encourage the take-up of property flood resistance and resilience by businesses.

RECOMMENDATION 14:
Local authorities should lead on the management of local flood risk, with the support of the relevant organisations.

RECOMMENDATION 15:
Local authorities should positively tackle local problems of flooding by working with all relevant parties, establishing ownership and legal responsibility.

RECOMMENDATION 16:
Local authorities should collate and map the main flood risk management and drainage assets (over and underground), including a record of their ownership and condition.

RECOMMENDATION 17:
All relevant organisations should have a duty to share information and cooperate with local authorities and the Environment Agency to facilitate the management of flood risk.

RECOMMENDATION 18:
Local Surface Water Management Plans, as set out under PPS25 and coordinated by local authorities, should provide the basis for managing all local flood risk.

RECOMMENDATION 19:
Local authorities should assess and, if appropriate, enhance their technical capabilities to deliver a wide range of responsibilities in relation to local flood risk management.

RECOMMENDATION 20:
The Government should resolve the issue of which organisations should be responsible for the ownership and maintenance of sustainable drainage systems.

RECOMMENDATION 21:
Defra should work with Ofwat and the water industry to explore how appropriate risk-based standards for public sewerage systems can be achieved.

RECOMMENDATION 22:
As part of the forthcoming and subsequent water industry pricing reviews, Ofwat should give appropriate priority to proposals for investment in the existing sewerage network to deal with increasing flood risk.

RECOMMENDATION 23:
The Government should commit to a strategic long-term approach to its investment in flood risk management, planning up to 25 years ahead.

RECOMMENDATION 24:
The Government should develop a scheme which allows and encourages local communities to invest in flood risk management measures.

RECOMMENDATION 25:
The Environment Agency should maintain its existing risk-based approach to levels of maintenance and this should be supported by published schedules of works for each local authority area.

RECOMMENDATION 26:
The Government should develop a single set of guidance for local authorities and the public on the use and usefulness of sandbags and other alternatives, rather than leaving the matter wholly to local discretion.

RECOMMENDATION 27:
Defra, the Environment Agency and Natural England should work with partners to establish a programme through Catchment Flood Management Plans and Shoreline Management Plans to achieve greater working with natural processes.

RECOMMENDATION 28:
The forthcoming flooding legislation should be a single unifying Act that addresses all sources of flooding, clarifies responsibilities and facilitates flood risk management.

RECOMMENDATION 29:
The Government and the insurance industry should work together to deliver a public education programme setting out the benefits of insurance in the context of flooding.

RECOMMENDATION 30:
The Government should review and update the guidance *Insurance for all: A good practice guide* for providers of social housing and disseminate it effectively to support the creation of insurance with rent schemes for low income households.

RECOMMENDATION 31:
In flood risk areas, insurance notices should include information on flood risk and the simple steps that can be taken to mitigate the effects.

RECOMMENDATION 32:
The insurance industry should develop and implement industry guidance for flooding events, covering reasonable expectations of the performance of insurers and reasonable actions by customers.

RECOMMENDATION 33:
The Environment Agency should provide a specialised site-specific flood warning service for infrastructure operators, offering longer lead times and greater levels of detail about the velocity and depth of flooding.

RECOMMENDATION 34:
The Met Office and the Environment Agency should issue warnings against a lower threshold of probability to increase preparation lead times for emergency responders.

RECOMMENDATION 35:
The Met Office and the Environment Agency should issue joint warnings and impact information on severe weather and flooding emergencies to responder organisations and the public.

RECOMMENDATION 36:
The Environment Agency should make relevant flood visualisation data, held in electronic map format, available online to Gold and Silver Commands.

RECOMMENDATION 37:
The Environment Agency should work with its partners to progressively develop and bring into use flood visualisation tools that are designed to meet the needs of flood-risk managers, emergency planners and responders.

RECOMMENDATION 38:
Local authorities should establish mutual aid agreements in accordance with the guidance currently being prepared by the Local Government Association and the Cabinet Office.

RECOMMENDATION 39:
The Government should urgently put in place a fully funded national capability for flood rescue, with Fire and Rescue Authorities playing a leading role, underpinned as necessary by a statutory duty.

RECOMMENDATION 40:
Defra should amend emergency regulations to increase the minimum amount of water to be provided in an emergency, in order to reflect reasonable needs during a longer-term loss of mains supply.

RECOMMENDATION 41:
Upper tier local authorities should be the lead responders in relation to multi-agency planning for severe weather emergencies at the local level and for triggering multi-agency arrangements in response to severe weather warnings and local impact assessments.

RECOMMENDATION 42:
Where a Gold Command is established for severe weather events, the police, unless agreed otherwise locally, should convene and lead the multi-agency response.

RECOMMENDATION 43:
Gold Commands should be established at an early stage on a precautionary basis where there is a risk of serious flooding.

RECOMMENDATION 44:
Category 1 and 2 responders should assess the effectiveness of their emergency response facilities, including flexible accommodation, IT and communications systems, and undertake any necessary improvement works.

RECOMMENDATION 45:
The Highways Agency, working through Local Resilience Forums, should further consider the vulnerability of motorways and trunk roads to flooding, the potential for better warnings, strategic road clearance to avoid people becoming stranded and plans to support people who become stranded.

RECOMMENDATION 46:
The rail industry, working through Local Resilience Forums, should develop plans to provide emergency welfare support to passengers stranded on the rail network.

RECOMMENDATION 47:
The Ministry of Defence should identify a small number of trained Armed Forces personnel who can be deployed to advise Gold Commands on logistics during wide-area civil emergencies and, working with Cabinet Office, identify a suitable mechanism for deployment.

RECOMMENDATION 48:
Central government crisis machinery should always be activated if significant wide-area and high-impact flooding is expected or occurs.

RECOMMENDATION 49:
A national flooding exercise should take place at the earliest opportunity in order to test the new arrangements which central government departments are putting into place to deal with flooding and infrastructure emergencies.

RECOMMENDATION 50:
The Government should urgently begin its systematic programme to reduce the disruption of essential services resulting from natural hazards by publishing a national framework and policy statement setting out the process, timescales and expectations.

RECOMMENDATION 51:
Relevant government departments and the Environment Agency should work with infrastructure operators to identify the vulnerability and risk of assets to flooding and a summary of the analysis should be published in Sector Resilience Plans.

RECOMMENDATION 52:
In the short-term, the Government and infrastructure operators should work together to build a level resilience into critical infrastructure assets that ensures continuity during a worst-case flood event.

RECOMMENDATION 53:
A specific duty should be placed on economic regulators to build resilience in the critical Infrastructure.

RECOMMENDATION 54:
The Government should extend the duty to undertake business continuity planning to infrastructure operating Category 2 responders to a standard equivalent to BS 25999, and that accountability is ensured through an annual benchmarking exercise within each sector.

RECOMMENDATION 55:
The Government should strengthen and enforce the duty on Category 2 responders to share information on the risks to their infrastructure assets, enabling more effective emergency planning within Local Resilience Forums.

RECOMMENDATION 56:
The Government should issue clear guidance on expected levels of Category 2 responders' engagement in planning, exercising and response and consider the case for strengthening enforcement arrangements.

RECOMMENDATION 57:
The Government should provide Local Resilience Forums with the inundation maps for both large and small reservoirs to enable them to assess risks and plan for contingency, warning and evacuation and the outline maps be made available to the public online as part of wider flood risk information.

RECOMMENDATION 58:
The Government should implement the legislative changes proposed in the Environment Agency biennial report on dam and reservoir safety through the forthcoming flooding legislation.

RECOMMENDATION 59:
The Risk and Regulation Advisory Council should explore how the public can improve their understanding of community risks, including those associated with flooding, and that the Government should then implement the findings as appropriate.

RECOMMENDATION 60:
The Government should implement a public information campaign which draws on a single definitive set of flood prevention and mitigation advice for householders and businesses, and which can be used by media and the authorities locally and nationally.

RECOMMENDATION 61:
The Environment Agency should work with local responders to raise awareness in flood risk areas and identify a range of mechanisms to warn the public, particularly the vulnerable, in response to flooding.

RECOMMENDATION 62:
The Environment Agency should work urgently with telecommunications companies to facilitate the roll-out of opt-out telephone flood warning schemes to all homes and businesses liable to flooding, including those with ex-directory numbers.

RECOMMENDATION 63:
Flood risk should be made part of the mandatory search requirements when people buy property, and should form part of Home Information Packs.

RECOMMENDATION 64:
Local Resilience Forums should continue to develop plans for door-knocking, coordinated by local authorities, to enhance flood warnings before flooding and to provide information and assess welfare needs once flooding has receded.

RECOMMENDATION 65:
The Met Office and the Environment Agency should urgently complete the production of a sliding scale of options for greater personalisation of public warning information, including costs, benefits and feasibility.

RECOMMENDATION 66:
Local authority contact centres should take the lead in dealing with general enquiries from the public during and after major flooding, redirecting calls to other organisations when appropriate.

RECOMMENDATION 67:
The Cabinet Office should provide advice to ensure that all Local Resilience Forums have effective and linked websites providing public information before, during and after an emergency.

RECOMMENDATION 68:
Council leaders and chief executives should play a prominent role in public reassurance and advice through the local media during a flooding emergency, as part of a coordinated effort overseen by Gold Commanders.

RECOMMENDATION 69:
The public should make up a flood kit – including personal documents, insurance policy, emergency contact numbers (including local council, emergency services and Floodline), torch, battery or wind-up radio, mobile phone, rubber gloves, wet wipes or antibacterial hand gel, first aid kit and blankets.

RECOMMENDATION 70:
The Government should establish a programme to support and encourage individuals and communities to be better prepared and more self-reliant during emergencies, allowing the authorities to focus on those areas and people in greatest need.

RECOMMENDATION 71:
The Department of Health and relevant bodies should develop a single set of flood-related health advice for householders and businesses which should be used by all organisations nationally and locally and made available through a wide range of sources.

RECOMMENDATION 72:
Local response and recovery coordinating groups should ensure that health and wellbeing support is readily available to those affected by flooding based on the advice developed by the Department of Health.

RECOMMENDATION 73:
The Government, the Association of British Insurers and other relevant organisations should work together to explore any technological or process improvements that can be made to speed up the drying out and stabilising process of building recovery after a flood.

RECOMMENDATION 74:
The monitoring of the impact of flooding on the health and wellbeing of people, and actions to mitigate and manage the effects, should form a systematic part of the work of Recovery Coordinating Groups.

RECOMMENDATION 75:
For emergencies spanning more than a single local authority area, Government Offices should ensure coherence and coordination, if necessary, between recovery operations.

RECOMMENDATION 76:
Local authorities should coordinate a systematic programme of community engagement in their area during the recovery phase.

RECOMMENDATION 77:
National and local Recovery Coordinating Groups should be established from the outset of major emergencies and in due course there should be formal handover from the crisis machinery.

RECOMMENDATION 78:
Aims and objectives for the recovery phase should be agreed at the outset by Recovery Coordinating Groups to provide focus and enable orderly transition into mainstream programmes when multi-agency coordination of recovery is no longer required.

RECOMMENDATION 79:
Government Offices, in conjunction with the Local Government Association, should develop arrangements to provide advice and support from experienced organisations to areas dealing with recovery from severe flooding emergencies.

RECOMMENDATION 80:
All central government guidance should be updated to reflect the new arrangements for recovery and Local Resilience Forums should plan, train and exercise on this basis.

RECOMMENDATION 81:
There should be an agreed framework, including definitions and timescales, for local-central recovery reporting.

RECOMMENDATION 82:
Following major flooding events, the Government should publish monthly summaries of the progress of the recovery phase, including the numbers of households still displaced from all or part of their homes.

RECOMMENDATION 83:
Local authorities should continue to make arrangements to bear the cost of recovery for all but the most exceptional emergencies, and should revisit their reserves and insurance arrangements in light of last summer's floods.

RECOMMENDATION 84:
Central government should have pre-planned rather than ad-hoc arrangements to contribute towards the financial burden of recovery from the most exceptional emergencies, on a formula basis.

RECOMMENDATION 85:
Local Recovery Coordination Groups should make early recommendations to elected local authority members about longer-term regeneration and economic development opportunities.

RECOMMENDATION 86:
The Government should publish an action plan to implement the recommendations of this Review, with a Director in Defra overseeing the programme of delivery and issuing regular progress updates.

RECOMMENDATION 87:
The Government should establish a Cabinet Committee with a remit to improve the country's ability to deal with flooding and implement the recommendations of this Review.

RECOMMENDATION 88:
The Government should establish a National Resilience Forum to facilitate national level multi-agency planning for flooding and other emergencies.

RECOMMENDATION 89:
The EFRA Select Committee should review the country's readiness for dealing with flooding emergencies and produce an assessment of progress in implementation of the Review's recommendations after 12 months.

RECOMMENDATION 90:
All upper tier local authorities should establish Oversight and Scrutiny Committees to review work by public sector bodies and essential service providers in order to manage flood risk, underpinned by a legal requirement to cooperate and share information.

RECOMMENDATION 91:
Each Oversight and Scrutiny Committee should prepare an annual summary of actions taken locally to manage flood risk and implement this Review, and these reports should be public and reviewed by Government Offices and the Environment Agency.

RECOMMENDATION 92:
Local Resilience Forums should evaluate and share lessons from both the response and recovery phases to inform their planning for future emergencies.

Annexes

Annex A: Biography of Sir Michael Pitt

Sir Michael Pitt is the current Chair of NHS South West, the strategic health authority for the South-West region. He holds a range of other appointments, including chairing two companies (Solace Enterprises Ltd and Swindon Commercial Services) and providing consultancy advice to a variety of organisations. He was formerly the National President of the Society of Local Authority Chief Executives and Senior Managers.

Sir Michael graduated from University College London in 1970 with a first-class honours degree in civil engineering. He is a Fellow of the Institution of Civil Engineers. He has worked for the Civil Service, in the private sector and for local government, with the majority of his career being spent in county council technical departments. He was appointed Chief Executive of Cheshire County Council in 1990 and of Kent County Council in 1997. He was knighted in the Queen's Birthday Honours in 2005.

Sir Michael lives near Malmesbury in Wiltshire, and is married with two daughters.

Annex B: Pitt Review revised terms of reference

The terms of reference were revised at the end of 2007 in light of the scope of the Review extending to include the recovery phase.

Scope

The Review should be wide-ranging and consider all available evidence on the flooding that occurred in England during June and July 2007, its impacts and what this means for the future. It should hear from those involved at the local, regional and national level, including the public, their elected representatives, public organisations, businesses, the farming community and professional associations. The Review should focus specifically on issues around:

a. Flood risk management, including the risk posed by surface water flooding and the way in which the public and private sectors might adapt to future risks.

b. The vulnerability of critical infrastructure, including:

   i. The ability of critical infrastructure to withstand flooding, and what improvements might be made.

   ii. The resilience of dams and associated structures, and what improvements might be made.

c. The emergency response to the flooding, including social and welfare issues.

d. Issues for wider emergency planning arising from the actual or potential loss of essential infrastructure.

e. Issues arising during the transition period from the response to recovery phases.

f. Issues arising during the recovery phase.

The Review should build on previous reviews of the response to serious flooding events, other relevant reports and policy developments including making best use of resources and maximising value for money.

Objectives

Specific objectives for the Review are:

i. To understand why the flooding was so extensive.

ii. To learn lessons on how in future we can best predict, prevent or mitigate the scale and impact of flooding incidents in a potentially changing environment.

iii. To look at how best to coordinate the response to flooding in future, including the significant social implications for communities.

iv. To establish what access to support, equipment, facilities and information is needed by those involved in the response at local, regional and national levels.

v. To ensure the public has as much access as possible to information on the risk of flooding to allow them to take appropriate precautions, be adequately informed on developments as an emergency unfolds, and be looked after properly in the immediate aftermath.

vi. To establish how the transition from response to recovery is best managed.

vii. To identify those aspects of the response that worked well and should be promoted and reinforced.

viii. To look at how best to coordinate the recovery phase in the future.

ix. To establish what support and information is needed by those involved in the recovery phase at local, regional and national levels.

x. To identify those aspects of the recovery phase that worked well and should be promoted and reinforced.

xi. To make recommendations in each of these areas to improve the UK's preparedness for flooding events in the future.

xii. To make recommendations, drawing on the experience of the flooding incidents, to improve the UK's broader ability to manage the loss of essential services in any future emergencies.

Composition

The Review will be overseen by an independent chairperson, Sir Michael Pitt.

The Review team will be led by the Cabinet Office with support from the Departments for Environment, Food and Rural Affairs, and Communities and Local Government, drawing on experts from other bodies as necessary.

Governance

The independent chairperson, Sir Michael Pitt, will report to the Secretary of State for Environment, Food and Rural Affairs; the Secretary of State for Communities and Local Government; and the Chancellor of the Duchy of Lancaster.

Annex C: Science and Engineering Panel terms of reference

Chair:

Dr Stephen Huntington

Members:

Prof Richard Ashley
Dr David Balmforth
Prof Edward Evans
Prof Jim Hall
Prof Paul Mason
Mr Steve Noyes
Prof Edmund Penning-Rowsell
Prof David Potts
Dr Nick Reynard
Mr Jonathan Simm
Ms Sue Tapsell
Prof Colin Thorne
Prof Howard Wheater

Purpose of group

Taking into account the overall Terms of Reference of the Pitt Review, the group shall have the following roles:

i) Provide advice to the Review on science or engineering related aspects including:

   a. what science or engineering focused research might be required and be possible within the timeframe of the Review that would assist the Review in reaching its conclusions;

   b. how likely the scale of flooding experienced in June/July will be repeated in the future and at what frequency, taking into account the potential impacts of climate change

ii) Provide a challenge function to the Review on the following:

   a. the report outlining the reasons why the flooding occurred;

   b. research produced in support of the review;

c. emerging ideas from the Review; and

d. draft recommendations of the Review, with a particular focus on whether any flood risk management/infrastructure proposals are technically feasible.

Frequency and mode of engaging with panel

The group will meet at key milestones during the Pitt Review. In between these meetings a virtual panel may operate enabling members to comment on specific proposals or papers via e-mail. The secretariat function for this panel will be provided by the Pitt Review Team.

Disclosure of information

In discharging their role under the terms of reference, members of the Science Panel agree not to disclose to others any information that they receive in relation to the Review and its ongoing proposals and recommendations.

Expenses

The Pitt Review will cover reasonable costs for the attendance to the Science and Engineering Panel meetings.

Annex D: List of organisations and members of the public who have contributed to this Review

The Review Team

Dr Matthew Barber
Emily Bliss
Dr Simon Bryars
Jonathan Chan
Dr Matthew Clarke
Rosy Day
Paul Ditchfield
David Gledhill
Roger Hargreaves
Lucy Isotta
Paul Johnson
Penelope Kanssen
Marcia King
Kirsty Lord-Smith
Philippa Makepeace
Gregory Parker
Eve Shuttleworth
Nicholas Smith
Yasmin Sonde
Craig Trevor
Richard Willock
Aram Wood

Organisations

1. Central Government

British Waterways
Department for Business, Enterprise and Regulatory Reform
Cabinet Office
Centre for Protection of National Infrastructure
Chief Fire and Rescue Adviser's Unit
Communities and Local Government
Defence, Science and Technology Laboratory
Department for Children, Schools and Families
Department for Culture, Media and Sport
Department for Environment, Food and Rural Affairs
Department for Innovation, Universities and Skills
Department for Transport
Department for Work and Pensions
Department of Health
Drinking Water Inspectorate
Emergency Planning College
Environment Agency
Government Communications Headquarters
Health Protection Agency
Highways Agency

HM Coroner
HM Treasury
Home Office
Maritime and Coastguard Agency
Met Office
Ministry of Defence
National Health Service
Ordnance Survey
Risk and Regulation Advisory Council
Scottish Executive
10 Downing Street
UK Climate Impacts Programme
Welsh Assembly Government

2. Government Offices

GO East of England
GO East Midlands
GO London
GO North East
GO North West
GO Science
GO South East
GO South West
GO West Midlands
GO Yorkshire and the Humber

3. Local Government

Abingdon Town Council
Albrighton Parish Council
Aylesbury Vale District Council
Bedford County Council
Bleasby Parish Council
Bradford Metropolitan District Council
Bristol City Council
Bromley Council
Buckinghamshire County Council
Bulcote Parish Council
Calderdale Metropolitan Borough Council
Cambridgshire County Council
Cheshire County Council
Colchester Borough Council
Darlington Borough Council
Dartford Borough Council
Devon County Council
Dorset County Council
Dudley Metropolitan Borough Council
East of England Regional Assembly
East Lindsey District Council
East Riding of Yorkshire Council
Epping Forest District Council
Essex County Council
Filey Town Council
Flintshire County Council
Gloucestershire County Council
Gunthorpe Parish Council
Hampshire Association of Local Councils
Hart District Council
Havant Borough Council
Hertfordshire County Council
Hoveringham Parish Council
Hull City Council
Kent County Council
Kirk Ella Parish Council
Lancashire County Council
Land Drainage Working Partnership
Leeds City Council
Lewes District Council
Local Government Association
London Borough of Bexley
London Borough of Hounslow
London Borough of Redbridge
Lowdhan Parish Council
Mablethorpe and Sutton Town Council
Maidstone Borough Council
Malvern Hills District Council
Mid Beds District Council
Newark and Sherwood District Council
Norfolk County Council
North East Lincolnshire District Council
North Lincolnshire Council
North Norfolk District Council
North Yorkshire County Council
Nottinghamshire County Council
Oxford City Council
Redditch Borough Council
Rhondda Cynon Taff CBC
Royal Borough of Windsor and Maidenhead
Runnymede Borough Council
Ryedale District Council
Salford City Council
Scarborough Borough Council
Sefton Metropolitan Borough Council
Sheffield City Council
Slough Borough Council
South Hams District Council

South Tyneside Council
Stanwix Rural Parish Council
Suffolk Joint Emergency Planning Unit
Swindon Borough Council
Tendring District Council
Tewkesbury Borough Council
Thatcham Town Council
Torridge District Council
Tunbridge Wells Borough Council
Vale of White Horse District Council
West Berkshire Council
West Devon Borough Council
West Midlands Regional Assembly
West Oxfordshire District Council
West Sussex County Council
Wiltshire County Council
Worcestershire County Council
Wychavon District Council

4. Local Resilience Forums

Avon and Somerset LRF
Bedfordshire and Luton LRF
Cambridgeshire and Peterborough LRF
Central London LRF
Cheshire LRF
Cleveland LRF
County Durham and Darlington LRF
Cumbria LRF
Derbyshire LRF
Devon, Cornwall and Isles of Scilly LRF
Dorset LRF
Durham LRF
Essex Resilience Forum
Gloucestershire LRF
Greater Manchester LRF
Hertfordshire LRF
Humber LRF
Kent Resilience Forum
Lancashire LRF
Leicester, Leicestershire and Rutland LRF
Lincolnshire LRF
Merseyside LRF
Norfolk LRF
Northamptonshire LRF
Northumbria LRF
North Central London LRF
North East London LRF
North West London LRF
North Yorkshire LRF
Nottingham and Nottinghamshire LRF
South East London LRF
South West London LRF
South Yorkshire LRF
Staffordshire Resilience Forum
Suffolk LRF
Surrey LRF
Thames Valley LRF
Wales Resilience Forum
Warwickshire LRF
West Yorkshire LRF
West Mercia LRF
West Midlands LRF
Wiltshire and Swindon LRF

5. Internal Drainage Boards

Bedford Group of Drainage Boards
Beverley and North Holderness Internal Drainage Board
Black Sluice Internal Drainage Board
Market Weighton Drainage Boards
Powysland Internal Drainage Board
Upper Brue and Upper Axe Internal Drainage Board

6. Community Groups

Anglian Regional Flood Defence Committee
Bucklebury Flood Alleviation Committee
Burton Joyce Residents Association
Chertsey Society
Crosby on Eden Emergency Committee
Derringham and Boothferry Community
Essex Flood Forum
Farnham River Watch
Flood Prevention Society
Holy Trinity Church, Tewkesbury
Hull Citizens Advice Bureau
Keswick Flood Action Group
Luckley Wood Neighbourhood Watch & Residents Committee
Much Wenlock Referendum Group
National Flood Forum
North Curry Flood Group
North West Regional Flood Defence Committee
Northumbria Regional Flood Defence Committee

Park View Residents Association
Pickering & District Civic Society
Regional Flood Defence Committees
Severn & Avon Valley Combined Flood Group
South Farnham Residents Association
South Yorkshire Federation of Women's Institutes
Thames Regional Flood Defence Committee
Wiltshire Federation of Women's Institutes
Wolvercote Commoners Committee
Yorkshire Regional Flood Defence Committee

7. Businesses

A & F Consulting Engineers
Analox Environmental Technology Ltd
Association of British Insurers
Atkins
British Chambers of Commerce
British Insurance Brokers' Association
British Property Federation
Business Continuity Institute
Chartered Institute of Loss Adjusters
Chartered Management Institute
City and Financial
Engineering Support Practice Ltd
Experto Crede
Financial Ombudsman Scheme
Financial Services Authority
Groundsure
Halcrow Group Limited
Home Builders Federation Ltd
Hull and Humber Chamber of Commerce
Indepen
Jardine Lloyd Thompson
KPMG
Lane, Jeffries & Associates Ltd – Fire and Marine Safety Consultants
Lippke, Cartwright & Roberts Inc
National Housing Federation
NGM Sustainable Development
Northern Housing Consortium
Norwich Union Insurance
RBS Insurance
Reynolds Partners
Risk Management Solution
Royal Haskoning
Royal & Sun Alliance UK
Sheffield Chamber of Commerce
Sterling Insurance
Stormwater Control
Tesco
WeatherAction
Weather Intelligence
WPS4 International
Zurich Insurance

8. Emergency Services

Association of Chief Police Officers
Avon & Somerset Constabulary
Avon & Somerset Search & Rescue
Bedfordshire & Luton Fire and Rescue Service
Bristol Primary Care Trust
Chief Fire Officers' Association
Dumfries & Galloway Fire & Rescue Service
Fire Brigades Union
Gloucestershire Constabulary
Gloucestershire Primary Care Trust
Hereford & Worcester Fire and Rescue Service
Humber Emergency Planning Service
Lincolnshire Fire and Rescue Service
London Fire Brigade
Metropolitan Police
Midshires Search and Rescue
National Policy Improvement Agency
NHS Resilience Project
NHS Yorkshire & Humber
Northamptonshire Police
Rescue and Preparedness in Disasters (RAPID UK)
Royal National Lifeboat Institution
Search And Rescue Assistance In Disasters (SARAID)
Severn Area rescue Association
Surrey Police
Swaledale Mountain Rescue Team
West Midlands Ambulance Service
Wiltshire Police

9. Media

BBC News
BBC Radio Humberside
BBC TV Look North
Cotswolds Observer Newspaper
East Riding Mail
Environment UK Magazine
Gloucestershire Echo
Hull Daily Mail

ITN
ITV West
ITV Yorkshire
KC FM
Sheffield Star
Sky News
Society of Editors
Sunday Telegraph
Surveyor Magazine
The Citizen (Gloucester)
Viking FM
Yorkshire Post

10. Science and Engineering

Association of Drainage Authorities
Chartered Institution of Water and Environmental Management
Flood Protection Association
Hadley Centre
HR Wallingford
Institution of Civil Engineers
Risk Management Solution
Royal Academy of Engineering
Royal Institution of Chartered Surveyors

11. Universities and Research Organisations

Centre for Ecology and Hydrology
City University
Coventry University
Cranfield University
Demos
Imperial College London
Institute for Public Policy Research
London School of Economics
Lancaster University
National Hydrological Monitoring Programme
New College – Oxford University
River Path
Royal United Services Institute
Swansea University
Tyndall Centre
University of Birmingham
University of Bristol
University of Dundee
University of East Anglia
University of Gloucestershire
University of Hertfordshire
University of Hull
University of Leeds
University of Manchester
University of Middlesex
University of Newcastle upon Tyne
University of Northumbria
University of Nottingham
University of Sheffield
University of Southampton
University of Strathclyde
University of Wolverhampton

12. Utilities and Critical Infrastructure

Airwave Solutions
Anglian Water
Association of Electricity Providers
British Dam Society
British Energy
British Standards Institution
British Telecom
BSI Management Systems UK
CE Electric
CNI SCAN
Consumer Council for Water
EDF Energy
Electricity North West Ltd
Energy Networks Association
Energy Watch
E:ON Central Networks
National Grid
Network Rail
Northumberland Water
Ofcom
Ofgem
Ofwat
Scottish Power
Scottish & Southern Power Distribution
Severn Trent Water
Thames Water
Water UK
Western Power Distribution
Wessex Water
Yorkshire Water
UK PIA
United Utilities

13. Voluntary Organisations

British Red Cross
De Montfort Housing Society
Help the Aged
National 4x4 Response Network
Powys 4x4 Response
Rotary International in Great Britain and Ireland
RSPCA
Salvation Army
Shelter
St John Ambulance
Wessex 4x4 Response
WRVS
Women's Institute:

- Filkins & Broughton Poggs
- Hampton Bishop (Herefordshire)
- Hundelby, Lincs
- Sandhurst
- Sinnington
- South Elkington
- South Yorkshire
- Thorpe St. Peter
- Washingborough
- Worcestershire Federation

14. Cross-cutting organisations and Interest Groups

All Party Parliamentary Water Group
Association of Directors of Adult Social Services
Association of Drainage Authorities
Association of Home Information Pack Providers
Association of Inland Navigation Authorities
Association of Train Operating Companies
Audit Commission
Automobile Association
British Continuity Institute
British Red Cross
British Hydrological Society
Centre for Public Scrutiny
Chatham House
Commission for Rural Communities
Continuity Forum
Country, Land and Business Association
Emergency Planning Society
English Heritage
Forestry Commission
Institute of Asset Management
International Association of Emergency Managers EUROPA
National Association of Estate Agents
National Farmers' Union
National Flood Forum
National Planning Forum for England
National Trust
Natural England
Office of Rail Regulation
Ombudsman of Estate Agents
Passenger Focus
Public Weather Service Customer Group
Riding Safely
Royal Institute of British Architects
Royal Institute of Chartered Surveyors
Road Haulage Association
Royal Meteorological Society
Royal Society for the Protection of Birds
Royal United Services Institute
Skills for Justice
Soil Association
Social Care Institute for Excellence
Town & Country Planning Association
United Kingdom IT Association
Water Research Council
Wildlife and Countryside Link
Wildlife Trust
World Wildlife Fund

Individuals from the general public

Christine Adamson
P A Allen-Jones
Ray Armishaw
Eric Armstrong
Dorothy Arnett
Sue Badger
Charles Bagnall
Thomas Bailey
Michael Baker
Julie Bardsley
Joss Barnard
Steven Bateman
Derrick Bates
Robert Beckett
Malcolm Beer
David Bell
R J Berkeley

J Bennett
R M Bennett
E J Birt
Roger Black
James R Blake
Gillie Bolton
Jess Bouse
Robert E Bridges
Howard Brier
M R Broadman
Leon Brocard
S J Brooks
John and Dr Clare Broome Saunders
Linda Brown
Linda and Steve Brown-Pike
Maria Bryant
H M Buckland
Richard Burke
Jane Burrett
Chris Callaghan
L Cannon
Kevin Ceaser
Jeremy Chamberlayne
Natalie Clark
Richard Clark
David Crichton
Tom Crossett
Thomas Coulthard
Donna Cowley
Robert Dale, MBE
Martin Davidson
Bev Day
Stuart Derwent
Jill Dewsbury
Barbara Donovan
Kevin Duma
Iain B Dunn
Roy H Eardley
David Edge
Chris Elkington
Brian Ellis
Henry Elwell
Sidney Joseph England
Tim Fairhead
Peter Farley
Tony Ferguson
Jaap-Jeroen Flikweert
Derek Foot
Lisa Frost
David Girtchen
Alan Gordon
David Gosling
Beatrice Greenfield
Mick Gudgeon
Simon Haddrell
Phil Hall
Karl Hardy
Adam Hart-Davis
Rod Heard
Dieter Helm
Paul and Ron Higgins
Sally Hilliar
Gerry Hobbs
Simon Hogfress
John Hopf
Anne and Colin Howes
Geoff Howes
Paul Howes
Emma Hughes
Cath Humphris
James Hunt
Steve Hutchins
C H Hutchinson
Neil Hyder
Mary Jackson
Emma Jayne-Beaumont
Jacquiline Jenkins
Dilys Jones
John Jones
Wendy Jones
John Kane
Ruth Keens
Keith Kennils
Stephen King
F E and A Langcaster
Ewan Larcombe
Arthur Lawrence
Jennifer E Leeman
S M Lodge
Rev Raymond Lunt
Caroline Mackin
Rachael Maher
K Malone
Eileen Marshall

John Martin, CBE
Jeff Martin
Peter Martin
Neil McCart
Michael McEllin
Chris Meehan
Edwin Miller
David J Mills
Bev Milner Simonds
Patrick and Jennifer Morrissey
David Munn
Anil Nair
David Noble
Christine O'Luby
R K Owen
C W Parker
P Parker
Kim Parkinson
Andrew Parris
Brendan L Payne
Jan Pendrigh
K E Petch
Gill Pillar
G Pinkney
Andrew Plane
Adrian Porter
Ann-Marie Powell
Kevin Powell
Peter Power-Hynes
Ken Pratt
Linda Preston
Carolyn Price
Graham Price
Reg Purnell
Arthur Rabjohn
Leanne Raper
Peter Rawcliffe
Dan Raymond
J E Read
Michael Reade
David G Reed
Andy Reeley
P S Reid
Athee Reiss
Mary Riley
Brian Rodges
Anne Robinson
Michael Robinson
Nicholas Robinson
Steve Robson
Sarah Rogers
Tom Rollins
David Royffe
Mary Russell
Lesley Russell
Peter Russell
R E Rust
Jayne Salt
Clive Savage
Gerald Savage
Francis Shaxson
David Sheldon
Jane Sircombe
Ronald Skene
Chrysa Skouloudi
R Smailes
Lisa Smoult
Howard Smith
Kath Smith
Patrick Smith
Peter Smith
Philip Smith
Gary Sone
Gillian Stellman
David Steven
Susan Stuckey
Peter Styles
David Sullivan
Jackie Surtess
Linda Swann
Roy Taylor
Bob Thacker
David Thomas
Gareth Thomas
Richard Thomas
Richard Tilbrook
Petr Tomes
John Michael Tonks
Richard Trimmer
Vincent Tully
Mr and Mrs D S Turner
Jack Turton
Clair Twigger-Ross
Tim Twomey

Mr and Mrs Wakefield
Edward Walker
Jeremy Walker
Rosemary Walker
Timothy Walker
Mark Wallace
Christopher Waller
Mike Walton
Richard Ward
Pauline Washington
J Wassell
Ron Watson
Jonathan Weaden
E Webber
Paul Weeden
Sara Wells
R Weston
Sharon Wheeler
Sue Wherrett
John Whitehead
Paul Whittle
Sandra Wickenden
David Wilkinson
Mike Williams
Albert Williamson
David Wilson
R M Wilson
V Wilson
Rory Witham
S Woolley
Nigel Wroe
Wren Wroe
George Yarrow

Members of Parliament

Norman Baker MP
Rt. Hon. Hilary Benn MP
Rt. Hon. Hazel Blears MP
Rt. Hon. David Blunkett MP
Tim Boswell MP
Colin Burgon MP
Rt. Hon David Cameron MP
Parmjit Dhanda MP
Philip Dunne MP
Environment, Food and Rural Affairs Committee
Rt. Hon. Caroline Flint MP
Paul Goodman MP
John Healey MP
Martin Horwood MP
Rt. Hon. Adam Ingram MP
Rt. Hon. Michael Jack
Rt. Hon. Alan Johnson MP
Diana Johnson MP
Rt. Hon. Charles Kennedy MP
David Kidney MP
Peter Luff MP
John Mann MP
Eric Martlew MP
Rt. Hon. Ian McCartney MP
Anne McIntosh MP
Shona McIsaac MP
Rt. Hon. Ed Milliband MP
Anne Milton MP
Owen Paterson MP
Rt. Hon. John Redwood MP
Laurence Robertson MP
Prof. Steve Webb MP

International Organisations

France
French High Committee for Civil Defence
Ministry of the Interior
Ministry of Sustainable Development

The Netherlands
Ministry of the Interior and Kingdom Relations
Rijkswaterstaat Centre for Water Management

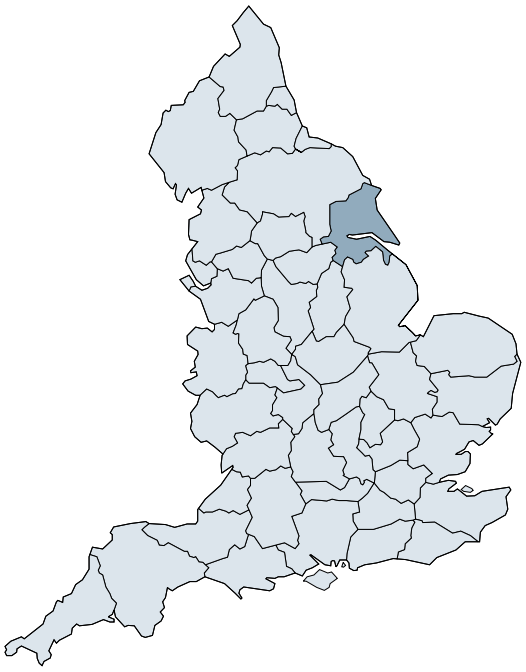
Sweden
Ministry of Defence
National Food Administration
Stockholm Vatten
Swedish Commission on Climate Change and Vulnerability
Swedish Emergency Management Agency
Swedish Meteorological and Hydrological Institute
Swedish rescue Services Agency
Swedish Civil Defence League

United States
Association of State Flood Plain Managers
City of New Orleans
Federal Emergency Management Agency
Office of Homeland Security
US Army Corps of Engineers

Annex E: Regional summaries

East Riding of Yorkshire and Kingston upon Hull

Key affected police areas	Humberside
Key affected local authorities	East Riding Hull CC
Area	2,479 km^2
Population	587,100
Houses flooded	Approx. 15,500
Businesses flooded	Approx. 650



The area sits on a chalk formation that extends from the Humber Estuary to the Yorkshire Wolds. Erosion from the North Sea is a major concern for the region, and the coastline is continually changing as a result. Much of the area is low-lying (90 per cent of Hull is below high-tide level) and the drainage system for Hull is entirely pumped, which means it is particularly vulnerable to flooding. The higher ground surrounding Hull causes a 'basin effect', as the region mostly drains into the Humber. Other key rivers in the region are the River Hull and the River Ouse.

Weather conditions and flooding

Between 14 and 25 June 2007, a large amount of rain fell across Humberside, causing widespread surface water flooding. Intense rainfall on 14–15 June saturated the area, and another bout of intense rainfall on 24–25 June then quickly overwhelmed the drainage systems. Between these two periods, there were a number of other localised floods. June 2007 was the wettest month on record in Yorkshire since 1882.

Impact on communities

The sheer scale and speed of the floods caught many local residents and businesses by surprise. Almost 15,500 properties were affected in the Humber area, including an estimated 2,336 council properties. There were also a significant number – over 3,000 – of uninsured properties. About 400 households required alternative accommodation for up to a week – and over 200 households needed alternative accommodation for more than six months.

The emergency response

The Environment Agency used advanced technology to monitor rainfall, river levels and sea conditions and collated the data to issue flood warnings through its flood warning system. It issued an early warning on 22 June

and repeat warnings over the following few days. A Flood Watch was issued on 24 June followed by a Flood Warning, but this was not escalated to a Severe Flood Warning. By 25 June, a major incident was declared by Hull City Council, and later that day the police set up Silver Command.

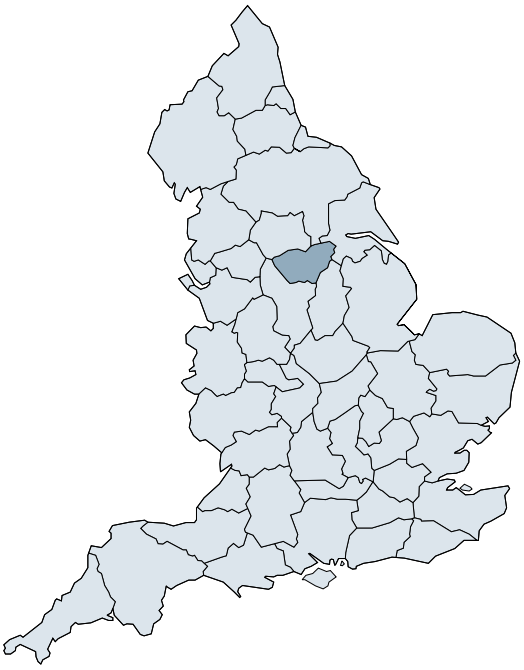
The effect on critical infrastructure and essential services

The area experienced extensive surface water flooding that caused widespread disruption to roads and essential services. The estimated cost of damage to regional roads stands at £28 million and there are further costs associated with damage to bridges (£4–5 million) and street lighting (£500,000).

More than 90 schools were damaged and over 650 businesses were affected, disrupting food supplies and other aspects of daily life for many residents.

South Yorkshire

Key affected police areas	South Yorkshire
Key affected local authorities	Barnsley MBC Doncaster MBC Rotherham MBC Sheffield CC
Area	1,552 km^2
Population	1,292,000
Houses flooded	Approx. 4,000
Businesses flooded	Approx. 1,800



South Yorkshire is a region with a major industrial history, from the coal industry to the steel industry concentrated in Sheffield. The region's principal towns and cities are Barnsley, Doncaster, Rotherham and Sheffield, and its two main rivers are the Don and the Dearne. There is also an extensive network of canals, which were built to help navigate and transport goods between the major cities.

Weather conditions and flooding

Intense rainfall between 14–16 June and between 24–25 June resulted in two serious floods in the region. Two people died and approximately 6,000 homes and businesses were flooded.

The first flood was due to heavy rain falling over a period of three days. Many locations received one to two months' rainfall in the space of just 48 hours.

The rainfall that caused the second flood was less widespread than the first and mainly affected South and West Yorkshire, Hull and East Yorkshire. Although 48-hour rainfall totals were similar to the first flood, the majority of the rain in the second flood fell in one particularly intense 12-hour period on 25 June.

In addition to the two major floods, there were a number of localised storm floods between 14 June and 23 July across North Yorkshire and North East England. Together, these events made June the wettest month on record in Yorkshire since 1882. Surface drains and sewers became overwhelmed and rivers rose to record levels, overtopping their banks and flood defences.

Impact on communities

In Doncaster, 50 caravans were sited at Toll Bar caravan park, where many residents are still living a year on from the floods. Some authorities offered to waive social housing rents and council taxes for those affected by the floods. In Barnsley, Doncaster and Rotherham,

the authorities waived both rents and council tax. In Sheffield, council tax was waived, and a £100 payment given to affected households for social housing rents.

The emergency response

Two Silver Commands were established in Sheffield and Rotherham in the first floods on 14 June. During the second flood, Silver Commands were set up in Doncaster and Barnsley, and Gold Commands in South Yorkshire and Sheffield.

The effect on critical infrastructure and essential services

The effects of the second flood were compounded by the fact that the first flood had not drained sufficiently, causing saturated ground and high water levels.

During the evening of 25 June, concerns grew about the condition of the Ulley Reservoir after reports of problems with the dam wall. The spillway, through which water escapes from the dam, had been damaged and the dam wall was eroding. This could have led to a catastrophic failure of the dam wall and put lives, property and other infrastructure assets at risk. A major effort by the emergency services and others was mounted to reduce the water levels in the reservoir and shore up the dam wall.

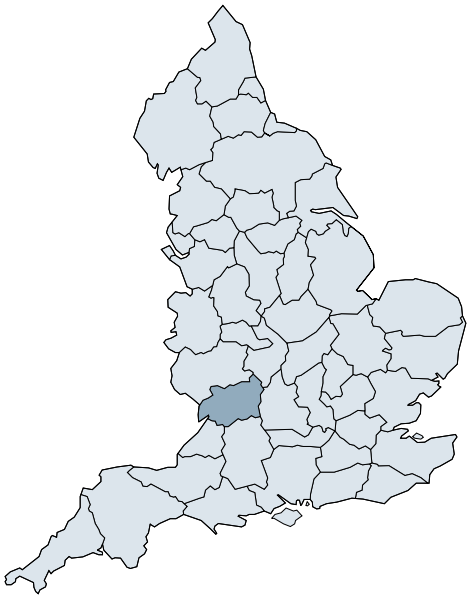
Elsewhere, Neepsend electricity substation was shut down with a loss of power to 40,000 people and there were further power failures in Hillsborough.

The floods caused significant damage to the local highway infrastructure. Several arterial roads to Sheffield were closed due to flooding, several bridges were washed away.

Rotherham train station was closed on 25 June for almost a month, and a replacement bus service was provided.

Gloucestershire

Key affected police areas	Gloucestershire
Key affected local authorities	Cheltenham BC Gloucester CC Tewkesbury BC
Area	3,150 km^2
Population	833,100
Houses flooded	Approx. 6,000
Businesses flooded	Approx. 1,000



The county of Gloucestershire lies between the Cotswold Hills, the Severn Valley and the Forest of Dean. The county is largely rural – the principal towns are Cheltenham, Cirencester, Gloucester, Stroud and Tewkesbury. The region has an extensive network of rivers, the principal waterways being the Severn, the Frome, the Teme and the Avon.

Weather conditions and flooding

Between 24–25 June there was heavy, persistent and frequent thundery rain in Gloucestershire, with almost a whole month's rainfall in two days. Flooding was predominantly caused by smaller watercourses that reacted quickly to local runoff – flooding from the River Severn was not significant at this stage.

A deluge of heavy and persistent rain on 20 July caused extensive flooding across the lower Severn catchment – in many places, river levels were the highest ever recorded. Gloucester experienced record flood levels as a result of the exceptional flows in the Teme and Avon rivers and heavy rainfall across Worcestershire and Gloucestershire. River levels at the Gloucester Docks gauge reached a peak of 4.92 m on 23 July. This was only 1 cm lower than the highest recorded level in 1947. Normal summer levels are around 0.6 m.

Impact on communities

Over 6,000 properties were affected by the July floods, many of which were first flooded by surface water or by watercourses that reacted quickly to local runoff. The same properties were then flooded by the River Severn a few days later. Roads and transport links were affected by the floods and seriously hampered people's travel plans. The M5 flooded and left some 10,000 vehicles and their occupants stranded. In Gloucester, the flooded rail network left 500 rail communities stranded. Over 30 schools were damaged.

The emergency response

Gold Command was set up in Gloucester to coordinate the emergency response. Some local authorities offered to waive social housing rents and council taxes for those affected by the floods.

The Environment Agency monitored rainfall, river levels and sea conditions and collated the data to issue flood warnings.

There was some criticism of the Environment Agency's warning system. In particular, there was concern that warning of flooding at the Mythe water treatment works was very late.

The effect on critical infrastructure and essential services

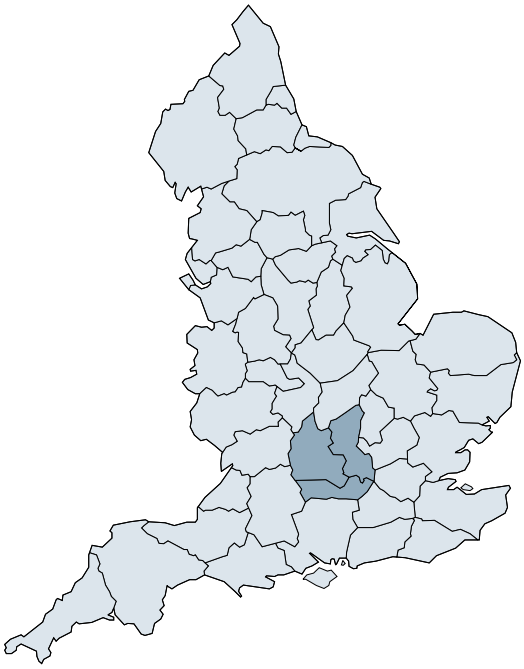
Mythe water treatment works near Tewkesbury was flooded and had to be shut down on 22 July. Mythe represented a single point of failure, as the households supplied by the works could not receive a piped water supply from any other source. This left 350,000 people across Gloucestershire without drinking water for over 20 weeks – the largest loss of essential services since the Second World War. Severn Trent Water, assisted by the Armed Forces, responded with a massive effort to provide water through bottles and bowsers to numerous locations across the county.

Electricity supplies were also threatened, as Walham and Castle Meads electricity sub stations became vulnerable to rising floodwater. The Environment Agency worked with the Armed Forces, fire and rescue services and the police to protect Walham substation. Castle Meads was shut down before it flooded, leaving over 40,000 people without electricity. The joint response from emergency responders and the Environment Agency meant that many tens of thousands of people across Gloucestershire and South Wales did not suffer from loss of power supplies.

Rough estimates suggest about one per cent of the road infrastructure was damaged costing £25 million to repair.

Thames Valley

Key affected police areas	Thames Valley Warwickshire Wiltshire Surrey
Key affected local authorities	Oxford CC West Oxfordshire DC Vale of White Horse DC West Berkshire Council Royal Borough of Windsor and Maidenhead Wokingham BC
Area	12,800 km^2
Population	4,300,000
Houses flooded	Approx. 5,700
Businesses flooded	Approx. 80



The Thames Valley covers the counties surrounding the River Thames, including parts of Berkshire, Buckinghamshire, Oxfordshire and beyond. The Cotswold hills typically mark the general landscape of the region, with steep escarpments down to the Severn Valley and Warwickshire Avon. The principal towns affected by the summer floods are Reading, Oxford and Abingdon, and the region's principal rivers include the Thames, the Cherwell and the Avon.

Weather conditions and flooding

The Thames region experienced greater than average rainfall for most of May and June, but the majority of the rain fell on 19 and 20 July. Extremely high rainfall and already saturated ground meant that drains were overwhelmed, which led to a large amount of surface water flooding. There was also fluvial flooding along the River Thames and its tributaries, which affected Wiltshire, Oxfordshire, Berkshire and Surrey.

Impact on communities

Flooding occurred across the Thames Valley. However, the impacts were less severe than in other parts of the country. Approximately 5,700 properties were flooded – more than half of these were due to surface water flooding rather than river flooding, with the majority of affected houses to be found in the Oxfordshire and West Berkshire areas.

The emergency response

Silver Commands were put in place in several locations including Windsor, Abingdon and Reading. A Gold Command operated for the Thames Valley region. The authorities in West Berkshire used a leaflet campaign to provide advice to the public.

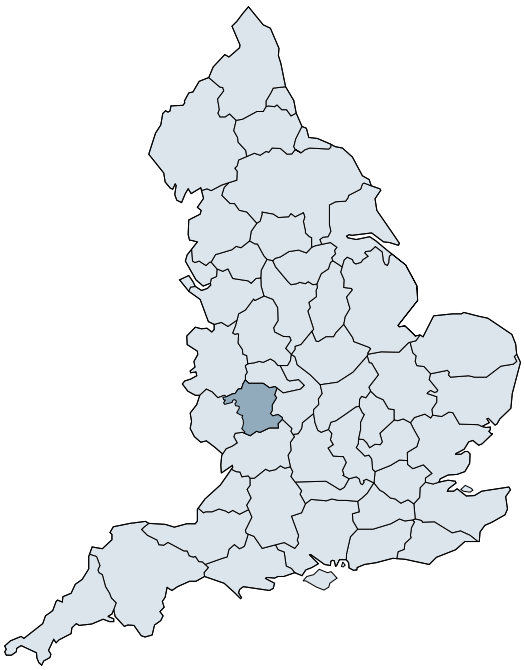
The effect on critical infrastructure and essential services

Many arterial roads into major towns were affected, including a number of A-roads leading into Oxford. Rail lines were closed as a result of flooding or the risk of flooding, and the major route between Didcot and Oxford was suspended.

Utilities infrastructure was also affected, including an electricity sub station in Oxford, and a sewage treatment works and several sewage pumping stations in or near Oxford and Abingdon.

Worcestershire

Key affected police areas	West Mercia
Key affected local authorities	Worcestershire CC Wychavon DC Wyre Forest DC Malvern Hills DC Worcester City
Area	1,735 km^2
Population	552,900
Houses flooded	Approx. 3,366
Businesses flooded	Approx. 747



The county of Worcestershire is located in the West Midlands of central England, towards the north of Gloucestershire and the Cotswold Hills. The region's principal towns include Redditch, Pershore and Malvern. Among the main rivers that flow through the county include the rivers Severn, Stour and Teme.

Weather conditions and flooding

Heavy rainfall in the region during May and June resulted in the first major pluvial flooding on 19 June in the Wyre Forest and Malvern Hills areas, damaging over 150 properties.

Flash flooding in July resulted in 18 cm of rain to fall in Worcestershire – over four times the normal average. The small market town of Tenbury Well, for example, suffered extensive flash flooding on 17 July causing extensive damage to properties and infrastructure in the town. The most significant flooding event of summer 2007 occurred as a result of exceptionally heavy rainfall across the Midlands on 20 July, leading to fluvial flooding of the Severn, Teme and Avon and their tributaries and extensive flash flooding due to an already high water table.

Impact on communities

Approximately 6,000 buildings were affected by the flooding, including approximately 3,500 residential properties. Roads and transport links were severe affected on local roads that connect the county to some of the neighbouring major cities in the Midlands and in the South West. The economic cost to the County was estimated at £6.4 million per week during the height of the flooding.

The emergency response

A declaration of a Major Incident was made on 20 July. Strategic Gold and Silver commands were set-up in Hindlip Police HQ and Worcester Police station. Worcestershire County Council set up an emergency response centre to coordinate the response of local authorities, and a public emergency helpline was also set up.

The effect on critical infrastructure and essential services

Many of the most critical areas affected were located around the River Severn, such as Upton-upon-Severn and Kempsey. Care homes and hospitals were among the first to be evacuated. Over 90 long-term care patients were moved to temporary alternative accommodation.

Elsewhere, some of the county's key road infrastructure were made impassable by the severe flooding. The closure of the M5 due to flooding resulted in heavy traffic backing up into Worcestershire. Rail services were severely disrupted. Many of the county's roads and public rights of way were affected months after the flooding event, such as the B4084 near Cropthorne which did not re-open until December 2007.

Tourism was also severely affected across the region. The Severn Valley Railway was closed due to major landslips. It has only just recently re-opened. Regional Development Agency assistance was important towards the repair of the railway attraction, as well as helping to promote the region and to attract visitors back to Worcestershire.

Annex F: Open letter on progress of urgent recommendations 16 April 2008

16 April 2008

Dear Secretaries of State,

During December of last year we published the Interim Report on lessons learned from the 2007 floods. It highlighted 15 urgent recommendations which I believed to be necessary in order to prevent or mitigate flooding which might occur before the final report is published. These recommendations were not just for government, they also called for urgent action by local organisations, the private sector and the public.

Hilary Benn, on behalf of the Government, accepted all of the urgent recommendations on the day of publication and undertook to work with all organisations involved to deliver changes as quickly as possible. In the Interim Report, I promised to monitor work against the urgent recommendations and committed to publish a commentary on what had been achieved by the end of March of this year.

This letter, and supporting annex, sets out my views on progress. The Review Team have assessed progress against each recommendation on the basis of contributions from government departments and agencies, structured feedback from Local Resilience Forums (LRFs) and direct evidence received from organisations through the consultation process and a series of regional conferences.

We have judged each recommendation to fall into one of three categories: 'complete', for those which have been carried out as we intended; 'acceptable progress', for those which have been the subject of considerable activity and are nearing completion; and 'insufficient progress', for those which we believe to be taking significantly longer than seems reasonable.

In all our assessments, we are informed by a consideration of what those people directly affected by last summer's floods would consider to be fair. We are also mindful that our deadline for progress was demanding,

though we recognise that the time elapsed since the publication and acceptance of the recommendations will be regarded by many as generous and that of the 107 actions identified we chose to prioritise only 15.

Overall, I am pleased to report that strong progress has been made against the majority of the recommendations, particularly recommendations 1 to 9, 12, 13 and 15. Government organisations, notably Defra and the Environment Agency, have responded to the challenge with a programme of action. Good work has been done to improve awareness of specific flood risks amongst local responder organisations, particularly in those areas which face the most significant problems. This is coupled with positive work at the local level to enhance the resilience and effectiveness of emergency response, supported by new guidance from government. I am pleased to see these improvements, and overall we are already better prepared for future flooding emergencies.

Nevertheless, there are areas for concern. In particular, it is disappointing that insufficient progress has been made against the recommendations which relate to critical infrastructure and public awareness: recommendations 10, 11, 14 and 15

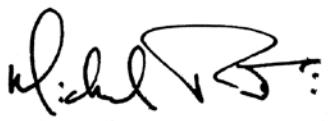
Recommendation 10 asked for LRFs to be given basic briefing on critical infrastructure located in their areas, so as to prevent the sort of confusion around the location, criticality and vulnerability of essential sites that we witnessed last summer. Although a briefing arrangement has been agreed in central government, this is not yet leading to sufficient action at the local level. In this respect, responder awareness of critical infrastructure and its vulnerability to flooding has not significantly improved, save for those areas which have undertaken local initiatives.

Recommendations 11, 14 and 15 related to public awareness and engagement, something which the interim report recognised as crucial to effective flood risk management. Progress has been made, but significantly more needs to be done. Moving to an ‘opt-out’ telephone flood warnings scheme has proved to be complicated, but more should have been done to make decisive progress in this area including a clear timetable for action. In relation to the recommendations directed at the public, progress has also been patchy with no evidence that anything other than a small proportion of people at risk have done anything to help themselves. As a consequence, the public remain little better prepared than they were before last summer’s floods.

I am also surprised by the variation in the levels of engagement, understanding and willingness to pursue improvements as set out in the correspondence from LRFs. Many LRFs were able to demonstrate existing capabilities or a commitment to rapid progress against the issues highlighted for improvement. But others have been slow to tackle the challenge, with some of the reasons cited – such as the complexity of the task, lack of resources or the inappropriateness of the recommendation – lacking credibility in the light of good progress elsewhere. The level of prevention and preparedness in relation to flood risk is variable, with different parts of the country experiencing different levels of assurance.

I hope that you will agree with me that more progress must be made on those recommendations which have not yet been completed. I will provide further commentary as necessary in my final report. To that end, I would be grateful for your views on what more might be done to speed up progress and ensure that the urgent recommendations are all delivered as quickly as possible.

Yours sincerely,



Sir Michael Pitt
Independent Chair

Annex to letter of 16 April 2008

Progress against urgent recommendations in the interim report

Flood risk awareness

Recommendation 1

The Review recommended that more frequent and systematic **monitoring of groundwater levels** at times of high risk should be undertaken by the EA, which should begin as soon as possible to predict and mitigate further serious ground water flooding from this winter onwards. The purpose of this recommendation was to counter the concern that groundwater flooding was a significant risk this winter, and should be factored into the work local areas were doing to improve their flood risk management. This recommendation has been **completed**.

The EA has made progress with this recommendation, and LRFs report good progress. EA have produced national groundwater level forecasts for all of England's major chalk aquifers, from which the risk of groundwater flooding is highest, and shared this at the local level. This was achieved by undertaking two national groundwater level scenario forecasting exercises – one in October 2007 to assess risks at the start of winter, and the second in February 2008 to re-assess the situation after the heavy January rains. These were extended analyses, compared to those undertaken routinely for Southern England, so as to include the chalk aquifers of Yorkshire and North Lincolnshire, thus covering all major chalk aquifers in England. The EA are considering the scope to undertake such national forecasting on a more regular and systematic basis.

Recommendation 2

The Review recommended that the EA, supported by local authorities and water companies, should urgently **identify areas at highest risk from surface water flooding** where known, inform LRFs and take steps to identify remaining high risk areas over the winter months. This recommendation was prompted by the significant problems caused by surface water flooding during the summer, and an assessment that information was not being shared appropriately by the various responsible organisations. **Acceptable progress** has been made against this recommendation.

Although the EA has limited responsibilities in relation to surface water flooding, it has been working with local authorities and water companies and made significant progress with this recommendation over the past three months.

The EA have pursued a number of short-term actions including meeting with many of the LRFs to share knowledge of historic surface water flooding. Following on from that, the EA is determining what information is needed to gain a fuller picture of historical surface-water flooding. They will then request the information from Local Authorities and Water Companies and, once collated, provide the information to Local Resilience Forums to allow a multi-agency risk assessment of surface water flooding. The aim by August 2008 is to have an initial indication of areas that may, in certain circumstances, be prone to surface water flooding. This will provide indicative information to LRFs.

LRFs are aware of the process, and have timetables in place to incorporate the new EA data into local flood planning. However, should this new information not be issued or prove to be insufficient for local responders, the assessment of progress in this area will be revised downwards.

Defences

Recommendation 3

The Review recommended that the EA should urgently develop and implement a clear policy on the **use of temporary and demountable defences**. This recommendation reflected community and professional confusion about the role of these types of flood defence, and the absence of a clear national approach to dealing with assets which are always in high demand during severe flooding events. **Acceptable progress** has been made against this recommendation.

The EA already has a demountable flood defence policy in place and their temporary flood defence policy will be circulated for comment to professional partners very soon. The EA intends to share and explain these finalised policies to professional partners and the public to make sure that they are clearly understood.

Local responders are informed of progress and anticipate that the guidance on the use of temporary barriers is imminent, not least because of effective dialogue by the EA. However, should this guidance not be issued or prove to be insufficient for local responders, the assessment of progress in this area will be revised downwards.

Local response arrangements

Recommendation 4

The Review recommended that all LRFs urgently reviewed their current local arrangements for **flood rescue** to consider whether they are adequate in light of the summer's events and their local community risk registers. This recommendation was driven by concern about the ad hoc nature of rescue efforts in many places, and the absence of clear operational control structures. This recommendation has been **completed**.

The returns received by the Review show that LRFs have been thoroughly reviewing their current local arrangements for flood rescue over the past three months. There is a clear sense that each area understands the strengths and limitations of local flood rescue capability, and is drawing up realistic (though often limited) plans accordingly.

However, there is no consistent approach to water rescue capabilities in England. Many LRFs have different capabilities and funding structures in place. The Fire and Rescue Service plays a central role, but other organisations (statutory and non-statutory) also form a significant part of the picture. Representations to the Review cite a variety of reasons for the differences in capability – the lack of a statutory duty on any organisation to carry out flood rescue, an absence of funding for equipment and training, no agreed national scheme for mutual aid in flood emergencies. This response to the recommendation is cause for concern. If another wide-area flooding emergency happened in the near future, those responding to the emergency would still not necessarily have the right resources or training to respond safely.

Recommendation 5

The Review recommended that all LRFs should undertake an urgent review of the **resilience of designated rest centres and other major facilities** to ensure either that they can be used in the response to flooding and other major emergencies, or that alternative arrangements are put in place. This recommendation reflected incidents during the summer floods which led to the loss of rest centres, emergency facilities and emergency equipment. This recommendation has been **completed**.

This analysis has been carried out by LRFs and contingency arrangements are being made where there are rest centres which are at risk of flooding. Other major facilities have also been checked and where there are vulnerabilities, these have been highlighted to the appropriate organisations for them to set up business

continuity plans. A number of LRFs have carried our analysis against consequential risks such as loss of power.

The number of rest centres available has also been considered by LRFs with smaller, more localised rest centres being identified in some cases to be used if the emergency causes problems with travelling to rest centres (one of the tactical lessons from the summer floods).

National planning and coordination

Recommendation 6

The Review recommended that the Cabinet Office, with other departments, should urgently consider the costs, benefits and feasibility of establishing arrangements for the urgent acquisition of supplies during a major emergency, including the use of call-off contracts or the creation of national or regional **stockpiles** of equipment and consumables. This recommendation responded to the very significant logistical challenges which the summer flooding presented, particularly in Gloucestershire. This recommendation has been **completed**.

The Cabinet Office, working with other departments, undertook a scoping study on stockpiling. This study surveyed Regional Resilience Forums to see what stockpiling, if any, was used at present and also considered possible options which could be used in the future including traditional stockpiling, call-off contracts and the use of supplies held in the community.

From this study, guidance has been written which lays out the options available. This guidance is currently going through Cabinet Committee clearance and will be issued to both the regional and local level in the summer after the National Capabilities Survey has concluded.

Recommendation 7

The Review recommended that Department of Health guidance clarifying the role and accountabilities of organisations involved in providing **scientific and technical advice** during a major incident should be implemented as soon as possible and understood by Gold Commanders. This recommendation reflected the confusion which occurred around different sources of scientific advice, and lack of clarity around the split between national and local responsibilities. This recommendation has been **completed**.

Guidance to the NHS on providing Strategic Command Arrangements across the healthcare sector was released, updating roles and responsibilities for NHS organisations during major incidents. It specifically clarifies the role of the Strategic Health Authority as the principal healthcare system manager during a crisis. Local responders have already begun incorporating the new advice into their planning activities, leading both to greater consistency and improved awareness of the role which health service organisations can play.

The Department of Health is continuing to work closely with the Cabinet Office to develop further Science and Technical Advice Cell (STAC) guidance at the local, regional and national level, including clarifying the roles of central advice and that of other health agencies. This guidance is due to be published in early summer 2008.

Recommendation 8

The Review recommended that the guidance currently under preparation by Cabinet Office to provide local responders with advice on the definition and identification of **vulnerable people** and on planning to support them in an emergency should be issued urgently. This recommendation was prompted by the particular problems faced by vulnerable people during the summer floods, and the problems which some local responders had in delivering a consistent and effective approach. This recommendation has been **completed**.

The Cabinet Office published guidance on 'Identifying People Who Are Vulnerable in a Crisis' at the beginning of March. LRFs have received this and are using it to further develop their humanitarian assistance arrangements. This fits well with a wider effort which local responders are making to improve the way they meet the needs of vulnerable people during emergencies. This work, informed by the guidance, should prove helpful during future emergencies.

Recommendation 9

The Review recommended that, in order to effectively fulfil its Lead Department role for flood risk management and emergency response, Defra needs to urgently develop and share a **national flood emergency framework**. This reflected the fragmented nature of local flood risk planning and the benefits of national level frameworks on other issues. **Acceptable progress** has been made against this recommendation.

Defra completed a review of its Lead Government Department Plan to take account of the Pitt Interim Report findings and reissued this in early 2008. This will provide a basis for developing a flood emergency framework for England. New guidance on producing Multi-Agency Flood Plans was issued in early 2008, and local areas are already using this.

Defra have explained that an outline national framework is at an advanced stage of preparation, and should be ready during April for review and initial consultation. Defra anticipate that feedback and recommendations in the final Pitt Report will be incorporated into the work with a view to finalising the framework in the autumn. Work will then begin on a planning a national exercise that will test key components of the arrangements set out in the Framework and the Defra Lead Department Plan.

This is good progress, and a clear timetable for action. However, should this new work not be delivered or prove to be insufficient for local responders, the assessment of progress in this area will be revised downwards.

Critical infrastructure

Recommendation 10

The Review recommended **that Category 1 responders should be urgently provided with a detailed assessment of critical infrastructure** in their areas to enable them to assess its vulnerability to flooding This recommendation was a direct response to the loss and potential loss of essential services during the summer, and was the starting point for a much wider programme of engagement and information sharing. **Insufficient progress** has been made against this recommendation.

The Cabinet Office wrote to LRF Chairs in mid-March to outline the standardised procedures for how they can access this information on critical infrastructure in their areas. The EA are ready to share information on the probability of flooding from rivers and the sea to enable Category 1 responders to assess urgently the vulnerability to flooding of critical infrastructure in their areas. They have very recently been given notification of the agreed Cabinet Office process for securely sharing such information.

However, LRFs have reported or displayed uncertainty and confusion over the process, and none have presented evidence of any briefings yet taking place or even being timetabled. Many local areas seem to be

trying to initiate their own programmes of critical infrastructure planning, but claim to be hampered by legal limitations or operational security concerns.

Public awareness and engagement

Recommendation 11

The Review recommended that the EA should work urgently with telecommunications companies, consulting the Information Commissioner as necessary to facilitate the roll-out of **'opt-out' telephone flood warning schemes** to all homes and businesses liable to flooding, including homes with ex-directory numbers**.** This recommendation was driven by the low take up of automated flood warnings, particularly in some of the areas most severely affected by the summer floods. **Insufficient progress** has been made against this recommendation.

The EA are pursuing this issue with the Information Commissioner, British Telecom, the Electoral Commission and the Ministry of Justice. Further discussions will take place at the end of April. However, there is no clear timetable for delivering change in this area despite the wide-ranging support for the proposal. Sufficient progress would be characterised by a clear public timetable for change.

Recommendation 12

The Review recommended that LRFs urgently develop plans to **enhance flood warnings through 'door-knocking'** by local authorities based on an assessment of the post code areas likely to flood. This reflects best practice which emerged during the summer floods, and is already adopted in some areas. This recommendation has been **completed**.

LRFs have carefully considering their plans, taking into account local needs, the practicality of door-knocking in their area, the resources of the local authorities and the other options available to them to enhance flood warnings.

It seems that the effectiveness of door-knocking as a method of disseminating information is well understood by those LRFs who have undertaken it in the past. Some LRFs have plans which utilise resources of the Police, other local community groups and EA staff where appropriate. Others intend to include this in community or parish plans which are currently being developed in their areas. This seems an entirely appropriate and logical development of the recommendation, and will lead to tangible improvements in local capability during flooding emergencies.

Recommendation 13

The Review recommended that LRFs urgently make arrangements to **involve local media representatives** in the local preparedness and response to support their public information role**,** a recognition of the pivotal role that the media played in getting information out to the large numbers of people affected by flooding or loss of essential services. This recommendation has been **completed**.

The proposals for action on this issue have been received with enthusiasm by LRFs. Their feedback suggests that arrangements throughout the country are well underway with local media representatives being involved in various ways depending on the local need. Effective engagement with the media at early planning stages will help this relationship run smoothly during an emergency. The Review will continue to encourage LRFs to foster emerging relationships and look for new ways of encouraging local media to be involved.

Recommendation 14

The Review recommended that **members of the public make up a flood kit** – including key personal documents, insurance policy, emergency contact numbers (including local council, emergency services and Floodline – 0845 988 1188), torch, battery or wind-up radio, mobile phone, rubber gloves, wet wipes or antibacterial hand gel, first aid kit and blankets. **Insufficient progress** has been made against this recommendation.

The concept of flood kits is being promulgated by many local authorities, as well as the EA. Flood kits are highlighted on many local authority and EA websites as a sensible way of coping with the initial problems of being flooded. It is encouraging that this message is being delivered to the public by organisations.

However, it is difficult to measure any increase in the readiness of the British public to cope with another flooding emergency. Certainly, those who were flooded over the summer or who live in an area badly affected by floods are likely to understand the need to be ready for another flood and to lessen its impact. However, we have looked at the sales of those items likely to be found in flood kits to check whether there has been any marked increase in their sale since the summer but so far, we have not seen such a trend. We have also seen no evidence to suggest wider or increasing public awareness in this kind of practical improvement, nor do local or national agencies report any increased demand from the public for advice on this issue.

Recommendation 15

Linked to the recommendation above, the Review also recommended that **members of the public increase their personal state of readiness and resilience to floods by following the EA's practical advice**, where appropriate. As with recommendation 14, this recognises the importance of the public being able to help themselves during wide area emergencies. **Acceptable progress** has been made against this recommendation.

Over 37,500 homes have newly registered on the EA's Floodline Warnings Direct system since January this year. This is a result of both a recruitment campaign and pre-registering over 15,000 customers. The EA are planning on pre registering over 26,000 customers in 2008-09 to make sure more people are able to receive warnings.

So far this year the EA have had over 17,000 people log on to read their website pages on 'simple ways to protect your home from flooding', in comparison to last year when only 7,500 logged on. The EA has also had over 8,000 people log on to view advice on producing an emergency flood plan in comparison to fewer than 1,500 for the same time last year.

This reflects a step change in the level of take-up and interest, and is to be commended. The public have responded positively, and the EA has successfully encouraged that. However, this good progress needs to continue, and the Final Report is likely to return to the role of the public.

Annex G: Glossary

Aquifer – a permeable geological formation of rock, mud or gravel containing or conducting water.

Bowser – mobile water tanks deployed to distribute fresh water in emergency situations where the normal system of piped distribution has broken down or is insufficient.

Bronze command – operational level at which the management of 'hands-on' work is undertaken at the incident site or at affected areas.

Building Regulations – the UK Building Regulations are rules of a statutory nature to set standards for the design and construction of buildings, primarily to ensure the safety and health for people in or around those buildings, but also for purposes of energy conservation and access to and about other buildings.

Business continuity management (BCM) – a management process that helps to manage the risks to the smooth running of an organisation or delivery of a service, ensuring that it can operate to the extent required in the event of a disruption.

Business continuity plan (BCP) – a documented set of procedures and information intended to deliver continuity of critical functions in the event of a disruption.

Cabinet Office Briefing Room (COBR) – the Government's dedicated crisis management facilities activated in the event of a major national emergency. Key meetings are usually chaired by the Prime Minister or senior ministers covering strategic aspects of the response and recovery effort, bringing together relevant departments and/or external parties.

Capabilities Programme – the UK Capabilities Programme comprises a range of capabilities that underpin the UK's resilience to disruptive challenges. These capabilities are either structural (for example regional response),

functional (for example decontamination) or concerned with the maintenance of essential services (for example financial services).

Capability – a demonstrable capacity or ability to respond to, and recover from, a particular threat or hazard. Originally a military term, it includes personnel, equipment, training and such matters as plans, doctrine and the concept of operations.

Catchment – an area that serves a river with rainwater, that is every part of land where the rainfall drains to a single watercourse is in the same catchment.

Category 1 responder – a person or body listed in Part 1 of Schedule 1 to the Civil Contingencies Act (CCA) 2004. These bodies will be at the core of the response to most emergencies. As such, they are subject to the full range of civil protection duties in the CCA.

Category 2 responder – a person or body listed in Part 3 of Schedule 1 to the Civil Contingencies Act 2004. These are cooperating responders who are less likely to be involved at the heart of multi-agency planning work across the board, but will be heavily involved in preparing for incidents affecting their sectors. The CCA requires them to cooperate and share information with other Category 1 and 2 responders.

Citizens Advice Bureau – a registered charity which provides a service to help people resolve their legal, money and other problems by providing free information and advice.

Civil Contingencies Act (CCA) 2004 – Legislation that aims to deliver a single framework for civil protection in the United Kingdom. The CCA is separated into two substantive parts: local arrangements for civil protection (Part 1) and emergency powers (Part 2).

Civil Contingencies Secretariat – sits within the Cabinet Office and works in partnership with government departments, the devolved administrations and key stakeholders to enhance the UK's ability to prepare for, respond to and recover from emergencies.

Climate change – the change in average conditions of the atmosphere near the Earth's surface over a long period of time.

Coastal erosion – the wearing away of the coastline, usually by wind and/or wave action.

Coastal flooding – occurs when coastal defences are unable to contain the normal predicted high tides that can cause flooding, usually when a high tide combines with a storm surge (created by high winds or a deep depression).

Common Recognised Information Picture (CRIP) – all relevant facts known at a point in time regarding a developing situation, consolidated into a single, coherent document. It is usually produced by the Cabinet Office to inform the central Government understanding and response to emergencies requiring central government involvement.

Community resilience – the ability of a local community to prepare for emergencies and to respond and recover from them.

Community Risk Register – an assessment of the risks within a local resilience area agreed by the Local Resilience Forum as a basis for supporting the preparation of emergency plans.

Consequence – the outcome of an event. This can be expressed qualitatively or quantitatively to encompass direct or indirect losses and gains.

Convective rain – occurs mainly in equatorial and tropical regions where the rate of evaporation is very high. The evaporated moisture rises along with hot air and expands due to a decrease in air pressure as altitude is gained. The wind temperature decreases, resulting in an increase in humidity levels that cause condensation of water vapour. This then falls as rain.

Cost-benefit analysis – a decision-making technique that analyses and evaluates the implications of alternative courses of action by assigning a quantified monetary value for each positive criterion (benefits) and negative criterion (costs).

Critical national infrastructure – the national infrastructure comprises those sectors that supply essential services to the citizen on which normal daily life in the UK depends. These are energy, water, communications, transport, finance, government, health, food and emergency services. The most important sites within these sectors, whose loss would have a major impact on the delivery of essential services, are deemed the critical national infrastructure.

Criticality – a relative measure that combines the consequences of a particular failure mode and its frequency of occurrence.

Culvert – a covered structure under a road, embankment etc, to direct the flow of water.

Dams – a barrier constructed across flowing water that obstructs, directs or slows down the flow, often creating a reservoir.

Depression – an area of low pressure in the atmosphere.

Detention basin – depressions in open spaces that help to slow down the run-off rate and store water on a temporary short-term basis during extreme events.

Emergency (in the UK) – an event or situation that threatens serious damage to human welfare in a place in the UK or to the environment of a place in the UK, or war or terrorism that threatens serious damage to the security of the UK.

Emergency management – the process to deal with the initial or acute phase of an emergency.

Emergency planning – development and maintenance of agreed procedures to prevent, reduce, control, mitigate and take other actions in the event of an emergency.

Ensemble – a unit or group of complementary parts that contribute to a single effect. In the context of weather forecasting it refers to running a weather prediction model a number of times with differing initial conditions to give outputs from which the most probable scenario can be derived.

Essential services – the fundamental services that underpin daily life and ensure the country continues to function socially and economically.

European Commission – an institution of the European Union, located in Brussels with 27 members (Commissioners). It is responsible for proposing new policies, implementing existing policies, and ensuring that EU rules are obeyed by Member States.

Exercise – a simulation to validate an emergency or business continuity plan.

Fire and Rescue Authority (FRA) – the legislative, public and administrative body made up of civilians and councillors that runs the Fire and Rescue Service.

Fire and Rescue Services (FRS) – the operational fire fighting body for an area.

Flash flooding – a rapid increase in water levels, leading to flooding, occurs when excessive rain falls over a short period of time.

Flood – temporary covering by water of land not normally covered with water.

Floodplain – low-lying area adjacent to a watercourse and prone to flooding.

Flood risk – product of the probability of flooding occurring and its consequences of happening.

Flood Warning Codes – the Environment Agency's flood warning system, which consists of codes: Flood Watch; Flood Warning; Severe Flood Warning; and All Clear.

Fluvial flooding – same as river flooding.

Focus group – a qualitative research technique in which a small cross-section of people are brought together to discuss issues or views on a particular topic, through unstructured but guided discussion by a moderator.

Frontal rain – (also known as **frontal precipitation**) is formed when two air masses of differing temperatures, humidity and density levels meet, with a layer separating them called the 'front', consisting of two parts – a warm and cold front. A warm front occurs when the warm, lighter air rises over the cold, heavier air, which cools causing moisture to condense and form clouds. The resulting rainfall is steady, lasting from hours to days. A cold front occurs when the cold air forces the warm air to rise rapidly, causing moisture to condense quickly. The rainfall is usually heavy and lasts for a short period of time.

Generic plan – a single plan designed to cope with a wide range of emergencies.

Geographic Information System (GIS) – a mapping system to display geographic information.

Gold command – strategic decision-making group at the local level. They establish the framework within which operational and tactical managers work in responding to, and recovering from, emergencies.

Government Offices – 9 offices represent 11 Whitehall departments in English regions.

Green roof – a roof purposely covered in vegetation to reduce and treat water run-off.

Greenhouse gas – a gas that absorbs infrared radiation in the atmosphere.

Groundwater flooding – occurs when water levels in the ground rise above the natural surface. Low-lying areas underlain by permeable strata are particularly susceptible.

Hesco Bastions – welded mesh, multi-cellular baskets filled with aggregate stones to form a barrier against flood water.

Home Information Pack (HIP) – a pack containing a set of documents that aims to provide house buyers with some of the information that they need to make an informed choice about a property they wish to buy.

Hydrology – the scientific study of water, including its properties, movement and effects on the Earth's surface, underground and in the atmosphere.

Jet Stream – relatively strong, high-speed winds concentrated within a narrow current in the atmosphere; they mark the boundary that separates two global air masses with significant differences in temperature. This largely determines where weather systems will develop.

Inundation – the flooding of an area with water.

Land management – This includes the way land is drained, used and farmed in the rural environment.

Land use planning – branch of public policy encompassing various disciplines seeking to order and regulate the use of land.

Lead Government Department (LGD) – government department which, in the event of an emergency, coordinates central government activity. The department that would take the lead varies, depending on the nature of the emergency. The Government regularly publishes a full list of LGDs.

Lead responder – a Category 1 responder charged with carrying out a duty under the Civil Contingencies Act 2004 on behalf of a number of responder organisations, so as to coordinate its delivery and to avoid unnecessary duplication.

Lead time – the amount of time needed to evaluate and prepare for a change or the warning period given.

Local Government Association (LGA) – voluntary lobbying organisation to promote the interest of English and Welsh local authorities.

Local Resilience Forums (LRF) – a forum for bringing together all of the Category 1 and 2 responders within a local police area for the purpose of facilitating cooperation in fulfilment of their duties under the Civil Contingencies Act 2004.

Market Failure – the condition where the allocation of goods and services by a free market is not efficient. Market failure can be viewed as a scenario in which individuals' pursuit of self-interest leads to bad results for society as a whole.

Media Emergency Forum (MEF) – group of representatives from the media to plan and discuss communications challenges and common interests in planning for, and responding to, emergencies.

Meteorology – the scientific study of weather-related phenomena, including the study of the atmosphere and a focus on forecasting observable weather events.

Multi-agency plan – a plan, usually prepared and maintained by a lead responder, on behalf of a number of organisations that need to co-ordinate and integrate their preparations for an emergency.

Mutual aid – an agreement between organisations to provide assistance during an emergency.

National Capabilities Survey (NCS) – part of the Government's programme to make the country more resilient to disruptive events by providing an assessment of current levels of national resilience to inform national policies and prioritisation of investment in resilience. Conducted every other year, the NCS survey gathers information from a wide range of resilience stakeholders, in several different sectors and at all levels of resilience planning, to provide an up-to-date picture of preparedness, and to help plan improvements.

National Severe Weather Warning Service (NSWWS) – a service of the Met Office's Public Weather Service Programme, established as part of their requirement to provide early warnings of potentially severe weather with sufficient lead time for mitigation plans to be put in place.

Permeable – allowing liquids or gasses to pass through.

Permissive powers – the statutory granting of authority (not a duty).

Planning assumptions – descriptions of the types and scales of consequences for which organisations should be prepared to respond. These will be informed by the risk assessment process and are designed to inform emergency planning and policy formulation.

Planning Policy Statement 1 (PPS1) – Government Planning Policy statement relating to sustainable development.

Planning Policy Statement 25 (PPS25) – government policy planning statement relating to development and flood risk.

Pluvial flooding – same as surface water/run-off flooding.

Precipitation – for example, rain, snow, hail and sleet.

Primary care trust (PCT) – Statutory bodies in the NHS responsible for delivering health care in their local area.

Primary legislation – the general term used to describe the main laws passed by the legislative bodies of the UK, for example Acts of the UK Parliament. These types of legislation are sometimes referred to as 'statutes'.

Probabilistic forecasting – a weather forecasting technique that relies on different methods to establish the probability of an event's occurrence and/or magnitude.

Probability – a relative measure of the likelihood or chance that something is the case or will happen, typically expressed as a number between zero and one or as a percentage.

Protective personal equipment (PPE) – equipment and clothing to protect against the environment.

Public Weather Service Advisers – liaise directly with responders, relaying early warnings of potentially severe weather from the Met Office.

Qualitative research – research that derives data from observation, interviews or verbal interactions and focuses on the meanings and interpretations of the participants.

Recharge period – a period of time during which groundwater is absorbed into geological formations below the surface.

Recovery – the process of rebuilding, restoring and rehabilitating the community following an emergency.

Recovery coordination group – The strategic decision-making body for the recovery phase. Able to give a broad overview and present each agency's interests and statutory responsibilities.

Regional Civil Contingencies Committee (RCCC) – a committee that meets during an emergency when a regional response is required.

Regional Resilience Forum (RRF) – a forum bringing together multiagency responders at the regional level for planning.

Regional Resilience Team (RRT) – operates from the Government Office within their region and works with multiagency responders during planning and response.

Reservoir – a natural or artificial lake where water is collected and stored until needed. Reservoirs can be used for irrigation, recreation, providing water supply for municipal needs, hydroelectric power or controlling water flow.

Resilience – the ability of the community, services, area or infrastructure to withstand the consequences of an incident.

Rest centre – premises used for temporary accommodation of evacuees from an incident.

Return period – this is the measure of the rarity of a flood event and is the average time interval between occurrences of a flood event of a similar magnitude.

Riparian ownership – owning shoreline land or land on the boundary of a river or watercourse.

Risk – measures the significance of a potential event in terms of likelihood and impact. In the context of the Civil Contingencies Act 2004, the events in question are emergencies.

Risk assessment – a structured and auditable process of identifying potentially significant events, assessing their likelihood and impacts, and then combining these to provide an overall assessment of risk, as a basis for further decisions and action.

River flooding – occurs when water levels in a channel overwhelms the capacity of the channel.

Royal Assent – when a bill has completed all of the parliamentary stages, it receives Royal Assent from the Queen. After this the bill becomes part of the law and is known as an Act of Parliament.

Runoff – water that is not absorbed into the ground and drains or flows off the land, often appearing in surface water bodies.

Scientific, Technical Advice Cell (STAC) – technical experts advising Gold commands.

Secondary legislation (also called 'surbordinate legislation) – is delagated legislation made by a person or body under authority contained in primary legislation for example statutory instruments. Typicslly, powers to make secondary legislation may be conferred on ministers, on the Crown, or on public bodies.

Silver command – tactical level of emergency management introduced to provide overall management of the response.

Single point of failure – the part or location in a system which, if it fails, will cause the whole system to fail.

Spatial – relating to relative locations on the ground surface.

Standards of Protection – the flood event return period above which significant damage and possible failure of the flood defences could occur.

Statutory duty – an action required by law.

Storm surge – abnormal rise in sea level along the shore, usually caused by strong winds and/or reduced atmospheric pressure, often resulting from storms.

Strategic Coordination Group (SCG) – a multi-agency group that sets the policy and strategic framework for emergency response at local level (see also **Gold command**).

Strategic Health Authority – responsible for managing and setting the strategic direction of the NHS locally.

Surface water/runoff flooding – occurs when the level of rainfall overwhelms the capacity of the drainage system to cope.

Sustainable Urban Drainage Systems (SUDS) – help to deal with excesses of water by mimicking natural drainage patterns.

Swales – shallow, trough-like depressions that carry water.

Team typing – a system of categorising rescue resources, allowing them to be identified and selected based on the outcome that they are able to safely achieve, rather than through a simple description of the organisation that they represent or equipment that they carry. The team is further categorised depending on its capability to carry out search operations in particular conditions, such as in still or flowing water. Team typing is applied in the UK on an ad-hoc basis.

Topographic – a map showing the physical features of a geographical area. It can include contours, types of water, vegetation and also man-made features, such as roads, utilities and structures.

Trunk main – large-diameter water pipe.

Upper-tier local authority – county councils, London boroughs, metropolitan boroughs and unitary authorities.

Urban creep – this refers to the effect of paving over green areas (such as gardens) with impermeable materials.

Urbanisation – the progressive expansion of cities.

Utilities – companies providing essential services, for example water, energy and telecommunications.

Voluntary sector – Self-governing organisations, some being registered charities, some incorporated non-profit organisations. They deliver work for the public benefit using volunteers.

Vulnerability – the susceptibility of an individual, community, service or infrastructure to damage or harm.

Water table – the upper surface of groundwater; the boundary between saturated and unsaturated soil conditions.

Watercourse – a channel (natural or artificial) along which water flows.

Weather radar – an echo-sounding system that uses an aerial for transmitting a signal and receiving the returned echo from differing weather phenomena.