Joint Defra / Environment Agency Flood and Coastal Erosion Risk Management R&D Programme

Improving institutional and social responses to flooding: Synthesis report

Improving Institutional and Social Responses to Flooding

Science Report: SC060019 - Work Package 5

Environment Agency

defra
Department for Environment Food and Rural Affairs

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It's our job to make sure that air, land and water are looked after by everyone in today's society, so that tomorrow's generations inherit a cleaner, healthier world.

Our work includes tackling flooding and pollution incidents, reducing industry's impacts on the environment, cleaning up rivers, coastal waters and contaminated land, and improving wildlife habitats.

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Science at the Environment Agency

Science underpins the work of the Environment Agency. It provides an up-to-date understanding of the world about us and helps us to develop monitoring tools and techniques to manage our environment as efficiently and effectively as possible.

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- **Delivering information, advice, tools and techniques**, by making appropriate products available to our policy and operations staff.

Steve Killeen

Head of Science

Executive summary

This report is a synthesis of the series of reports produced for the project *Improving Institutional and Social Responses to Flooding* The project started in January 2007 and finished in March 2008.

Three cross-cutting themes emerged from the project:

- Driver of effort: institutional needs or addressing the problem?
- Trust, collaboration and engagement: optional extra or essential?
- Expertise, data and evidence: what counts?

The overall recommendation from Work Packages 1 to 4 is that the Environment Agency should urgently consider its approach to managing flood risk, in particular:

- Shifting the emphasis from a focus on internal needs of the Environment Agency onto the problems of flood risk management and joint working to solve them.
- Understanding the needs and roles of others (such as professional partners, community members) and how to work with them effectively across the whole flood risk cycle. This should include national-level exploration of flooding and what to do about it
- Reviewing the way that data, evidence and expertise is valued and delivered.

In order to deliver these changes specific recommendations have been made from each of the work packages and these are included in this report.

The project consisted of five work packages listed below together with their objectives:

Work Package 1 – To understand how to produce flood warnings that result in appropriate responses, are more targeted, match the perceptions and behaviours of different social groupings and are specific to different types of floods and places.

Work Package 2 – To understand how the Environment Agency can improve people's responses to flood warnings for people in different flood risk situations. This is before, during and after a flood so that the Environment Agency and partners can help to improve institutional and community resilience.

Work Package 3 – To understand how collaboration with professional partners (as defined under the Civil Contingencies Act) and communities is currently undertaken, how it could be improved across the flood cycle for improved flood resilience, and which approaches and tools might assist collaboration in the future.

Work Package 4 – To explore to what extent the Environment Agency has embedded collaboration with others within flood risk management and the organisation as a whole, and recommendations for integrated approaches in the future.

Work Package 5 – Synthesis of findings and recommendations from the four other work packages.

The research used a range of methods to collect data: reviews of scientific and policy literature, analyses of case studies, collection of primary data together with an action learning approach where tools were developed and tested as part of the project.

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We would like to acknowledge the support, help and enthusiasm of all those who were involved in each of the work packages, specifically Environment Agency staff who gave up time to be interviewed, take part in workshops and trial new tools, and members of the public who took part in the research in Carlisle.

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1 Overview and context

1.1 Introduction

This report is a synthesis of the series of reports produced for the project *Improving Institutional and Social Responses to Flooding*. The project started in January 2007 and finished in March 2008. The project has five work packages detailed below together with their objectives:

Work Package 1 – To understand how to produce flood warnings that work. So that they are more targeted, matched to the perceptions and behaviours of different social groupings, including vulnerable communities.

Work Package 2 – To understand how the Environment Agency can improve responses to flood warnings for people in different flood risk situations. This is before, during and after a flood so that the Environment Agency and partners can help to improve institutional and community resilience.

Work Package 3 – To understand how collaboration with professional partners (as defined under the Civil Contingencies Act) and communities is currently undertaken, how it could be improved across the flood cycle to improve flood resilience, and which approaches and tools might assist collaboration in the future.

Work Package 4 – To explore to what extent the Environment Agency has embedded collaboration with others within flood and coastal erosion risk management (FCERM) and the organisation as a whole, and recommendations for integrated approaches in the future.

Work Package 5 – Synthesis of findings and recommendations from the four other work packages.

It was recognised when this research project was commissioned that it would be important to make links between each work package. Rather than have four discreet pieces of work (WP1 – WP4) each focussed on a specific part of the flood incident management (FIM) process, from the outset, we were tasked with cross referring and linking between work packages so to bring out recommendations that cut across each part of the FIM process (WP5). It should be noted that whilst this research primarily focussed on the FIM process we suggest that there are implications for wider flood risk management.

The aim of this report is to provide an overview and synthesis of the research project, together with proposals for improving institutional and social responses to flooding.

Given this, this report is not a summary of the four work packages. It draws on the final report from each work package, but proposes a clear direction for the Environment Agency to improve institutional and social responses to flooding through flood warning, response, stakeholder engagement and organisational arrangements. This proposal is based on our research, brief summaries of which can be found in Section 2 of this report. We have focussed on the critical findings from each work package, but the full findings can be found in the final reports. Section 3 outlines the key recommendations from the research, referring to the final reports for the full lists of recommendations.

1.2 Current FCERM context: policy, science and practice

"If the Environment Agency, as a learning organisation, is able to shift the balance of its responses from engineering towards human solutions, there is a greater probability that more people will be better protected from a major environmental threat." (Bye Speech, 7 May 1999, Leamington Spa).

There has been a change in discussions on flooding over the past decade, articulated within *Making Space for Water* (Defra, 2004). This change can be described as a shift from "holding back the water" to "learning to live with floods" (Defra, 2005). Behind this shift is an understanding that physical flood defences will not provide the only solution to current, and more importantly, future flooding in the UK. This change can be thought of as a difference in the framing of flooding (Scrase and Sheate, 2005) with a move from a techno-economic frame towards a socio-technical frame. Guy (2004) defines these as:

- Techno-economic: the idea that if technical knowledge is rigorously tested and demonstrably proved, then consumption choices will be made rationally.
- Socio-technical: the idea that science is a socio-cultural phenomenon and that the technical is always in relationship with wider social, economic and political processes.

FIM can be characterised as a socio-technical system; that is, technology (forecasting, detection and so on) operates within wider processes described above (such as social networks, organisational structures). Given this, it is timely to be researching the whole of the FIM work area to understand how improvements can be made to the institutional and social aspects.

The vision for *Making Space for Water* is described in *Water Strategy: Future Water* (Defra, 2008). The overall high-level vision is summarised in the box below.

Box: Vision for 2030

Flood and coastal erosion risk management which contributes to sustainable development, combining the delivery of social and environmental benefits with the protection of economic assets.

An understanding of the future risks of river and coastal flooding fully embedded into the spatial planning system, including planning for new settlements and other new developments.

Consistent and holistic management of urban flood risk, with strategic planning, partnerships of responsible bodies and clear understanding of various flood risk responsibilities.

Public understanding of the risks we face and the actions we can take to help manage flood and coastal erosion risk.

Community resilience to flooding from improved development planning, emergency planning and response, and resilience of homes, buildings, services and utilities.

The emphasis here is on a holistic approach to flood risk management in terms of: collaborating with all 'actors' in the system; considering the whole FRM cycle from planning to response and recovery; and the relationships between the different issues that need to be dealt with such as all types of flooding. *Making Space for Water* emphasises resilience to flooding, that is, developing systems and communities that

can cope with flooding. Underlying this is an understanding that flood risk in the UK is a permanent issue. This is highlighted in the interim report of the Pitt Review of the 2007 summer floods:

"Flood risk is here to stay. The review recognises the findings of other reports, such as Stern and Foresight, which predict climatic change and state that this country can expect more extreme weather, with periods of intensive rainfall. The review proposes that the country should confront these mounting challenges and adapt accordingly, recognising that this process of adaptation will take place over a generation."

This research project recognises the connections between the aspects of the FIM cycle, understanding that divisions between warnings and response in reality are blurred, although in responsibility for the Environment Agency they are distinct. One of our approaches was to identify the barriers to improving institutional and social responses to flooding as the starting point, and then to understand how the Environment Agency might lead, and collaborate with others, to find solutions to these problems. To solve these multiple problems identified will take time and we feel this is crucial to appreciate. However, our research shows that some problems can be addressed much more quickly and steps can be put in place now to ease the process of adaptation.

The Pitt Review (2007) goes on to suggest ways in which the impact of the summer floods could have been reduced:

"The impact of the floods and the high level of risk involved could have been significantly reduced with stronger local leadership of flood risk management, clarification of roles, more effective cooperation between responsible organisations, better protection of infrastructure and wider and deeper public engagement."

Cooperation, communication and engagement are thus key to improving resilience and reducing the impacts of flooding. Research suggests that there is no longer any choice in the matter: cooperation, communication, engagement can no longer be considered 'fluffy' or 'add ons' but as vital to managing flood risk. As Watson *et al.* (2007) state, this is going to become more, not less, central to the work of the Environment Agency:

"[Our] account of changing contextual conditions suggests that future flood hazard management strategies and institutional responses must be designed to work in an increasingly complex and chaotic operating environment…In a turbulent environment, flooding requires a very different type of institutional and social response since no single organization, no matter how large or powerful, has the necessary knowledge, skills and resources to cope with the situation effectively."

Understanding and improving cooperation and engagement are a core part of this research project. The only way to manage the complexity of flooding is to develop trusted relationships with partners and communities so that all parts of the system are involved in reducing the likelihood of flooding and in times of emergency, systems are in place that work efficiently and effectively. The research from this project overwhelmingly shows that "one size does not fit all" because of the diversity of flood types, communities and resilience capabilities. It is crucial to accept that diversity and start considering how to manage it both within the Environment Agency and with partners and communities.

Since starting this research project there have been developments in the Civil Contingencies Act, specifically on recovery from emergencies. There is now guidance on recovery (National Recovery Guidance) which covers flooding as well as other emergencies. This idea of flooding being a more prominent part of emergency planning points in the direction of its normalisation, that is, as flooding becomes part of systems and planning it starts to become part of routines and habits. If floods are going to occur more frequently and unpredictably, incorporating them into everyday life

will be central to adaptation. Our emphasis on building relationships over time aims for this normalisation.

A number of *Making Space for Water* projects have been carried out since the strategy was launched in 2005. Of those, several complement this project in focussing on understanding the different types of flooding (rapid-response catchments, groundwater flooding), adaptation as opposed to defence, and community engagement, the work for which was carried out within Work Package 4. Two quotes from these projects highlight the focus on stakeholder engagement and on dealing with complexity:

"Areas of work will include developing and reviewing activities such as community engagement models, particularly for diverse and vulnerable groups, and the importance of managing stakeholder expectations as to how flood risk management measures are assessed and prioritised.

In order to achieve this, it will be necessary to make a clear transition away from defending current decisions to more participation by the public in the overall decision making process. It will also be key to develop a better understanding of how people perceive and understand risk. (Defra, 2007, p 16 update on SD6)

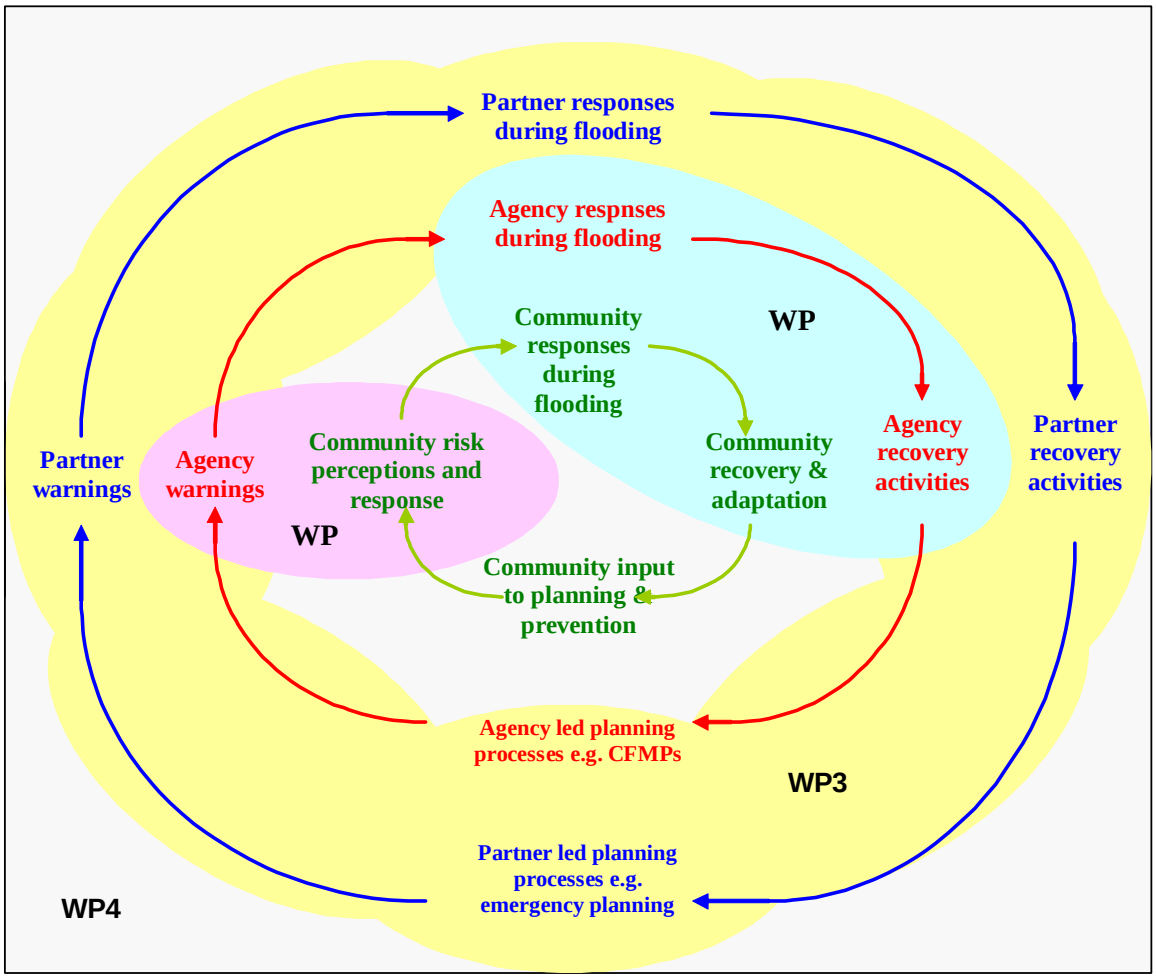
"Although it is recognised that there is no "one-stop" solution that would deal with the complex situations that exist in flood and coastal erosion risk management, the report gives a better understanding of the issues and concerns, including from a social perspective." (Defra, 2007 p12 update on SD2)

Other projects within the Environment Agency show that the issues raised in our research are being taken forward in a number of areas. For example, work on vulnerability to flooding is initially focussing on disability (Emma Hayes, FRM Policy). This is a crucial step towards understanding how to tailor the FIM service to meet the needs of vulnerable people. In addition, the current National Flood Warning Investment Strategy has been renamed the National Flood Incident Management Strategy, acknowledging the interrelatedness of all aspects of the flood incident management cycle. Finally, there is good practice in the Environment Agency where staff are working in collaboration and accounting for diversity (for example in community emergency planning in North West region, and working with specific populations in Southern and South West regions). However, this good practice which involves significant community engagement is currently the exception rather the norm within the Environment Agency.

1.3 Characterising the flood risk cycle and processes

For the purposes of this research project, the flood risk cycle was initially characterised by the diagram in Figure 1.1. This shows the focus of each work package as part of the flood incident management cycle, together with recovery and planning for emergencies. The figure does not cover the development and implementation of flood risk management schemes, which are typically thought of as flood defence schemes; yet, if FRM was taking an integrated approach, a FRM scheme would include flood warning and emergency planning alongside structural defences as a package of measures.

Figure 1.1 The four research packages addressing institutional and community responses at each stage of the flood risk cycle



Throughout the project, it has been difficult to refer to the flood risk cycle in a way that is readily accepted and understood by most flood risk staff[1]. This is due to a number of reasons.

Firstly, the flood risk cycle is complex and multi-faceted and staff are in different positions with respect to it and have different perceptions of it.

Secondly, the structures of the Environment Agency separate the different aspects of the cycle (capital investment, catchment planning, flood incident management) reinforcing different views of the process.

While different views are inevitable, they can become a barrier to effective working if there is not a shared view of what roughly constitutes the flood risk cycle that people can locate themselves within. Without such a shared version it can become easy for staff to spend time contesting others' views which differ from their own experiences. There needs to be a willingness to understand and appreciate such perceptions and experiences for people to work together on the problems to be solved.

[1] This observation comes from discussions with staff around the characterisation of the flood warning service in Work Package 1 (Twigger-Ross *et al.* 2008)

1.4 The research process – method and reflections on learning

This project was carried out by researchers from a range of backgrounds and perspectives. The aim with the method was to carry out a project that used sound principles of academic social research, that is, using literature reviews of past research to develop arguments and hypotheses which were developed further by collecting data (such as for the Carlisle study) together with elements of action research or action learning. Action research can be characterised as part of the 'interpretative" tradition[2], with a focus on the research process as a change process. Warburton *et al*. (2005) provide an excellent review of the area of action research which has been developing since Kurt Lewin first coined the term in the 1940s.

"Action research works, as Lewin originally proposed, through four basic activities: planning, acting, observing and reflecting (Hart and Bond, 1995). These activities are not, though, linear. They should instead be seen as "in a spiral of steps each of which is composed of a circle of planning action and fact-finding about the result of the action." (*Lewin, 1946, cited in Hart and Bond, 1995). Constant evaluation of the action is central to decide what to do next, based on whether the action taken has led to an improvement."* (Warburton *et al.* 2005, p 41).

Broadly, WP1 and WP2 followed the social research route, with WP3 and WP4 following the principles of action research. Bringing the different strands together raises some questions about what constitutes evidence and how we evaluate it. We suggest that the approaches complement each other. An academic social research perspective locates current research within wider contexts and builds on what has been written and evaluated, enabling reflection and consideration of patterns, trends and principles. The action research element provides for more immediate testing and development of tools, which are refined as needed; the role of research is to facilitate change and reflect on it as it happens. Both draw on wider bodies of research and practice. WP1 and WP2 used literature reviews, workshops, questionnaires, interviews and focus groups to collect evidence to analyse and reflect upon. In WP3 and WP4, practical tools[3] were developed on the basis of good practice and expertise in real circumstances (the summer floods of 2007). The tools were refined in the light of experience and then finalised.

The project was run in a more collaborative manner than perhaps is usual for research projects, involving a range of people from the flood risk cycle and using a virtual sounding board (VSB) of internal and external people interested in the project, who were invited to comment as the project progressed. As people were interviewed or took part in a workshop, they were invited to be part of the VSB. Further, we linked to the FLOODsite liaison project, inviting staff to attend two seminars focussed on the outputs of the social science projects from FLOODsite.

[2] Gilbert (1993) "*A split between what we might want to call, on the one hand a 'positive' tradition, begun at the very inception of sociology by August Comte, and, on the other, an interpretative tradition, largely associated with the work of Max Weber. The word 'positive' is used here to connote a view of sociology as a progressive, cumulative, explanatory, 'scientific' project…This positive tradition posits that society can be explained 'scientifically', according to laws and rational logics…The second tradition, the 'interpretative' tradition, seeks not so much explanations and predictions of social events as understanding what meaning and what significance the social world has for the people who live in it*."

[3] In WP3, a tool for running collaborative meetings was developed and in WP4, tools for drop-in surgeries and supporting communities were developed.

2 Summary of work package findings

2.1 Introduction

This section summarises the findings from each of the work packages. Here we have focussed on the key findings; readers are directed to the individual work package reports for more details and supporting evidence.

2.2 Work Package 1: More targeted warnings

This research highlights certain characteristics of floods, people and areas within the risk communication context that have implications for flood warnings:

- Warning methods need to be varied to reach different people.
- Messages need to be focussed on actions, enabling people to respond effectively.
- The communication context, that is, trust and credibility of the sources of warnings needs to be attended to. Investment in accurate flood warning may be wasted if these issues of trust have been ignored such that people do not trust and do not respond to the warnings.

From the current practice review we found evidence that there is good practice happening at the area level that does allow flexibility in warnings, focuses on the risk communication context and develops relationships with key community members. However, we also found the following issues:

- In general, Environment Agency staff agree that the 'one size fits all' approach to flood warning followed by the organisation is not considered effective.
- Much of the good practice in community engagement on flood awareness and warning in the areas is down to individuals' initiative, contacts and experience and is not embedded through the organisation or supported in organisational measures, such as key performance indicators (KPIs).
- Area staff perceived a lack support in their work from head office.
- The current national approach works best for a 'typical' flood: a slow-rising river flood or other event that can be forecast with the current system, such as some tidal surges and flashy catchments that happen in the day.
- The current approach to awareness has a dual focus: on getting people to sign up to Floodline Warnings Direct (FWD) and increasing preparedness through engagement. There is a KPI for recruitment to FWD which means that considerable resources are targeted at this activity, giving it a higher priority and profile, making it harder for area staff to focus on responses to warnings. There is a perception that there are far fewer full-time equivalents working with communities in the areas than working on warning and forecasting; although in reality people from warning and forecasting do work with communities, they need clearer permission, support and resources to do this well.

The key conclusions from WP1 are as follows.

The current flood warning system needs to be re-focussed as a response-based service, changing the question from “How can we warn lots of people?” to “How can effective responses be encouraged from people and what role does flood warning have within that process?” Messages need to be focussed on actions, enabling people to respond effectively, and embedded in a context of collaboration and engagement.

The current system must deal with diversity in terms of people/floods/places because it is this very diversity, often reduced to context or local variability, that determines the outcomes of a flood. Specifically:

- The types of flood forecast to increase with climate change are rapid onset and unexpected; these types are not at the heart of the current service.
- The people for whom the current system typically works are likely to be those who already have a reasonable level of connection with systems, resources and officials. Vulnerability can be characterised as disconnection from systems, resources and officials, and the current system is likely to reproduce those vulnerabilities rather than mitigate them. This means that people with vulnerability characteristics are those least likely to receive a warning from this current service unless there has been specific effort to target them such as a locally based tailored service.

The flood warning system must be integrated to a far greater degree with response and recovery work and planning and awareness work for it to be really effective. The divisions between the different parts of the flood risk cycle are artificial: each part is only as good as the rest of the cycle. This can only be done through investing in internal and external collaboration and engagement.

The system is designed from a technology perspective which means that the communication context is ignored. The communication context, that is, trust and credibility of the sources of warnings needs to be attended to otherwise investment in accurate flood warning may be wasted.

Staff working in flood incident management need to have the permission and support of head office to initiate and continue innovative local collaborative solutions to flood warning and for this practice to be embedded in the organisation. Resources and skills need to be re-thought in terms of the balance between technical and social activities.

2.3 Work Package 2: Towards effective response, recovery and adaptation

This work package aimed to better understand how the Environment Agency can enhance resilience by improving people's response to flood warnings and by strengthening the ways in which it and partner organisations respond before, during and after a flood.

The research confirmed that the social impacts of flooding are widespread and interconnected and may be long-lasting. Often, the long-lasting effects of a flood may be caused or exacerbated by the stress of dealing with the aftermath of a flood: cleaning up, dealing with insurers and builders and returning to the home. People are vulnerable in different ways at different times of the flood incident cycle. In addition, negative social impacts may be exacerbated by characteristics of the flood, (such as depth and velocity) individual (such as low income), and/or community.

In terms of response, we found that people often prioritise actions designed to alleviate psychological discomfort and don’t just focus on moving material property. These

actions include firstly moving people and pets to safety and helping vulnerable neighbours. In terms of saving possessions, people focus more on items of sentimental value than on other belongings. In Carlisle, participants who had focussed on saving material possessions wished they had focussed on items of sentimental value, underlining their significance. The key factors affecting response are similar to those that affect the social impacts. People's construction of what a flood is like often underestimates the speed and depth of the flood waters. The consequences of a flood and the devastation it can cause are often unknown and unanticipated by people. We need to understand more about how these constructions of flooding and flood risk affect people's response and preparedness.

Receiving a timely, informative and credible flood warning is a key factor in responding to and recovering from a flood. However, taking action does not necessarily follow from receiving a warning. A number of factors affect this response, which include providing locally relevant, consistent and repeated information. Other characteristics of the recipient and the social context where a warning is received can affect this response.

The recovery process after a flood may last for months or even years. Ongoing sources of stress and negative impacts that take place during this phase often make it worse than the actual flood. The main sources of stress include cleaning up and dealing with builders and insurers.

Regarding adaptation to flooding, this research challenges the assumption that there is a linear relationship between flood experience, adaptation and preparedness. The research shows that only a small proportion of flood victims are prepared for a future event. The causes for this low preparedness range from an understandable wish to move on and reduce anxiety to feeling that they cannot do anything about flooding.

The research into resilience showed that whilst it is important to protect people and property from flooding by building and maintaining flood defences and providing effective flood warnings, the shift to flood risk management should also be a shift to another type of resilience that includes learning from past events and adapting to future risk. This is particularly important in the context of climate change and changes in population. We cannot keep attempting to put things back to normal because the baseline is constantly changing and these kinds of actions will actually perpetuate or even increase the risk of future flood damage.

In terms of positive examples the research found that a quick, effective and co-ordinated response from authorities can do much to alleviate the negative impacts of a flood, particularly those of the immediate aftermath, and can consequently aid recovery. Strong informal local networks were shown consistently to improve response (including to flood warnings) and recovery. These networks include the voluntary sector and facilitate contacts with formal networks, but also fill gaps in the response capacity of 'official' networks. We found that most of the (scarce) examples of adaptive resilience are in some way related to this: for example increase in social networks and community cohesion and collaboration between the local authority and the voluntary sector following flooding.

A key issue that affects the whole incident, response and adaptation to flooding has also emerged from this research: there is a clear gap between the public's perception of their own responsibility and that of authorities in terms of reducing flood risk. This has serious implications for the Environment Agency and other authorities. If the public do not perceive that reducing flood risk is their responsibility they will not do anything about it and will not adapt to the future risk. Whilst the scientific community and institutions have moved from flood defence to flood risk management, this paradigm shift is not currently recognised by members of the general public who still expect the authorities will protect them from flooding.

2.4 Work Package 3: Collaboration with civil contingency partners and communities for improved FCERM outcomes

Examples of good collaboration tend to come from individual initiative rather than from corporate incentives and processes. It is of some urgency now, to deliver effective and consistent FCERM services to take decisions across the organisation about the 'direction' in which its collaboration and engagement.

Three possible levels of change are put forward:

- **Level 1:** Improving collaboration through the provision of better expert analysis and data
- **Level 2:** Improving collaboration through the development of more accessible, actionable information and relationships
- **Level 3:** Improving collaboration by enabling integrated planning and action

The Environment Agency may naturally focus on the first level. This, however, will not enable the Environment Agency, professional partners, communities and individuals to manage the complexity and urgency of flood and coastal erosion. Given this, focussing on the first level could lead to reputational and business resource risks for the Environment Agency. Increased investment in technological solutions may lead to little if any improvement in collaboration and flood response if the social dimension is not addressed. Effort should thus focus on Level 2, that is, developing actionable information and relationships through:

- Equipping staff with the permission and skills to collaborate with professional partners and communities as a core part of their work.
- Greater emphasis on recovery and planning for effective collaboration in the future, rather than relying on collaboration in a crisis.
- Greater recognition of the value of what others do, and developing processes which enable the Environment Agency to support and benefit from their work.
- Improving the way that day-to-day meetings and partnerships with professional partners and others are planned and run, building in a greater element of more two-way collaboration to overcome the current emphasis on one-way information giving.
- Improving the way that data and information is shared with professional partners and others, in particular overcoming some of the 'myths' on sharing information and data and how to enable two-way exchange of actionable information rather than one-way provision of data.
- Bringing consistency and clarity to the way the Environment Agency works with and supports efforts by communities, specifically around the use of drop-ins, flood ambassadors, flood wardens and community flood plans.

A toolkit and examples of current practice are provided to support the immediate resolution and application of some of these findings.

2.5 Work Package 4: Mainstreaming collaboration with communities and stakeholders for FCERM

Work Package 4 suggests that flood and coastal erosion risk management (FCERM) solutions can no longer be imposed or delivered by the Environment Agency using traditional decide-announce-defend (DAD) approaches alone. Instead, a broader range of approaches is required, especially those which enable others to engage-deliberate-decide (EDD).

Many examples of EDD collaboration exist, and programmes such as *Working with Others: Building Trust with Communities* are helping to develop these examples. But two myths pervade, preventing the consistent use of collaboration to improve FCERM outcomes.

Myth 1: Working collaboratively with others is expensive and time-consuming

Reality: A wide range of ways of collaborating with others exist, with a range of associated costs and benefits: matching the appropriate approach with the situation presents cost-effective ways of achieving multiple goals and added value. Collaborative methods also offer a precautionary approach which can reduce the costs and risks associated with non-delivery of flood schemes. The critical factor is for collaboration to be designed for the situation at hand.

Myth 2: It is possible to choose whether or not to work with others on FCERM

Reality: All FCERM work will involve some type of engagement, which will be increasingly required to deliver key services. Working with others is sometimes the only way of getting things done, not just at local level but also nationally. Choices to be made are about the extent and type of engagement with others, not whether or not to collaborate.

To counter these myths, new processes are needed to assist the Environment Agency in deciding when to collaborate with others and how much collaboration is required, in a similar way to current Environment Agency processes which assist engineering-based decision-making.

For collaboration to be used effectively within FCERM, a clear decision-making process is needed right at the start of any project or programme, including what type of decision or situation is being dealt with, and how much and what type of engagement is appropriate (and how much it will cost).

Use of the project's proposed analysis tool, based on a literature review and current practice, could not only improve the Environment Agency's decision-making, legitimacy and trust, but could significantly reduce the risk of non-delivery of flood risk projects, and reduce the costs of controversial decisions. The tool would enable staff to decide on the most appropriate amount and type of collaboration for a given situation:

- Type A situations are characterised by low controversy and/or the existence of few alternative options due to constraints of time, procedure and resources, or by the existence of a crisis (and need to act immediately). The type of collaboration required is mostly to keep others informed of decisions made.
- Type B situations are characterised by the existence of a greater number of options, increased uncertainty around the 'right' decision and/or the need to

make trade-offs and compromises. The type of collaboration required goes beyond the statutory consultation process to engage with a number of individuals, groups or organisations likely to be most affected early on, to ensure they inform the decision-making from the start.

- Type C situations are characterised by the need to make a decision that will affect many stakeholders (individuals, communities and/or organisations) in a situation where there is a great deal of complexity or uncertainty and a wide range of (often entrenched) perspectives relating to the 'right' decision, and a strong likelihood of conflict and resistance. The type of collaboration required is extensive, engaging as widely as possible from inception to delivery.

The project describes classic engagement processes for each of these decision/situation types. The report also analyses the current organisational readiness for mainstreaming collaboration in this way. It identifies a number of barriers including:

- Procedures and systems which do not enable staff to spend time on/reward collaborative efforts.
- Inconsistency in messages and leadership 'from the top' around the desirability of collaboration with others
- Gaps in individual collaborative skills, abilities and knowledge.

The report does not recommend changing the 'culture' of the Environment Agency, but rather that staff (including managers) should be aware of and make efforts to mitigate the inward-focused tendencies of the organisation when undertaking outward-facing collaborative tasks including:

- Build up skills of rapport and planning collaboration (making it a less seemingly chaotic process) with staff in relevant roles and give them recognised formats, systems and processes to execute.
- Recruit and assign or enable people with outward-facing and interpersonal skills to support outward-facing activities, for example through Building Trust mentors and 'key contacts' as well as technical staff who have these skills.
- Work strategically and tactically with other organisations who are culturally better equipped to carry out some tasks, and build recognition of what they do (and how the Environment Agency will link to their work).
- Retain consultancies and agencies skilled not just in PR and consultation (DAD), but in collaborative approaches (EDD). Make it possible for staff to call on them for assistance in designing collaborative programmes, not just for one-off support, but over the longer term/day-to-day work being done.

3 Conclusions and cross-cutting themes

3.1 Introduction

From a review of all four work packages, three cross-cutting themes emerge:

- Driver of effort: institutional needs or addressing the problem?
- Trust, collaboration and engagement: optional extra or essential?
- Expertise, data and evidence: what counts?

These three themes are inextricably linked; the type of data and expertise most valued is dependent on the nature of collaboration and trust within a system which is itself determined by the focus of effort or drive of the institution.

For example, in an organisation focussed on meeting its performance measures (such as KPIs) with respect to flood warning, such as greater coverage and more accurate flood warnings, the focus will be on the data that can achieve that (such as better forecasting, increasing take up of FWD). The relationships with others needed to meet these targets are constructed as one-way: information is given and the person or organisation in need of the warning receives it , with a hope that they will act appropriately.

However, if the drive is solving the problem of how to get people to respond effectively to flood warnings, to reduce the negative impacts of flooding, then the type of information shared and type of relationship with others will change. It will be important to provide information on what to do in the event of a flood in a way that makes sense to people, that enables effective action to be taken, and that is accurate. It will be important to understand what people do with this information and to consider the appropriate method of transmission which will be some form of two-way process. Overall, the development of an effective response-based warning system will be a two-way process in which the Environment Agency learns from and adapts alongside the traditional recipients of flood warnings.

In order to deliver an integrated response to the challenges of flood incident management the Environment Agency needs to understand these key issues and then decide what it wants to do in relation to them. This section sets out the issues and Section 4 discusses recommendations for change.

3.2 Driver of effort: Internal needs of the Environment Agency or flood risk management problems?

The key issue running through all the work packages is what drives action within the Environment Agency with respect to flood risk management: is it predominantly a focus on ‘being an organisation’, that is, meeting targets and managing the reputation of the organisation, or is it a focus on ‘how can the risks from flooding be managed effectively’? Our research reveals both approaches within different parts of the organisation. For example, on recovery there has been internal concern over the

position that some staff put themselves in during floods, that they are going beyond their remit and potentially their skills. This concern reflects a focus on the internal needs: What should we be doing? In contrast, when staff are faced with a flood, the immediacy of the situation leads to solutions on how the risks from the flood be managed effectively? and what help the people who've been flooded need. The example of good practice with flood action groups in the North West shows a focus on the problem first rather than on the institution, as do many of the other area based initiatives.

Clearly, for an organisation such as the Environment Agency there will be a need, at different times and places to be driven more by internal needs than by solving a problem and vice versa. However, we would suggest that currently the emphasis is on starting with the institution rather than with the problems of FRM and that can lead the Environment Agency into defensive behaviour. One important danger is of confusing these two foci, that is, carrying out an activity without being clear what its main aim is and when that happens it is most likely that neither aim will be achieved. Further if different parts of the organisation have different aims in mind that will create confusion and hinder effective management of flooding.

In terms of collaboration with civil contingency partners, the predominant question in some parts of the organisation is: a) what the Environment Agency's role is and b) how much effort is going to be put into a partnership role rather than a leadership role. We recommend instead that the focus should initially be on the problem, which might be "How can the risks from flooding be managed?" However, the question needs to be debated and discussed with a range of stakeholders, because different questions lead to different types of solutions. Once the problem is defined, it is then the time to ask "In what way can the Environment Agency be part of effective solutions?"

In WP1 we suggest that the warning service should be re-focussed as a response-based service, changing the question from "How can we warn lots of people?" to "How can effective responses be encouraged from people and what role does flood warning have within that process?". This is an example of moving from an institutional focus to a problem focus.

With respect to emergency response and recovery, there is a clear need for a core group of people working quickly and flexibly to meet the changing needs of an emergency and its aftermath. The Environment Agency as a Category 1 responder should be part of that core group and therefore current barriers to collaboration within the institution need to be addressed for this to happen.

If the focus remains on the institution rather than the problem then it is not surprising that the method of engagement will tend to be Decide Announce Defend, since defending institutional boundaries and reputation becomes the drive for action.

3.3 Trust, collaboration and engagement

A second key theme that runs through the four work packages is the central role of trust, collaboration and engagement. These might be considered as the "social context" of flood risk management. These concepts are often regarded as commonsense but immeasurable, which is linked to a technological worldview. Not surprisingly given the backgrounds of the majority of staff (engineering, environmental sciences) and the types of issues the Environment Agency deals with now, and historically had to deal with, the Environment Agency's way of seeing the world emphasises the physical and engineering sciences. Thus, these issues can easily be regarded as extras or "nice to haves" as well as expensive and time consuming (WP4).

However, a key conclusion from this project is that collaboration and engagement with others are central to effective flood risk management but have been kept at the periphery and ignored for too long. In improving responses to flooding it is clear that the risk communication context is as important as having an accurate warning. If people do not trust the source of the message they will not take any notice of the message. If they cannot confirm easily that it is an emergency they will not take action. In this situation, it could be argued that the investment in accurate flood warning may be wasted if these issues of trust have been ignored such that people do not trust and do not respond to the warnings. The Environment Agency plays a role in the creation of an effective risk communication context but does need to appreciate that the knowledge and ability to act is distributed amongst many parts of the system and therefore collaboration is essential. Furthermore for civil contingency partners to work effectively and flexibly together in an emergency they need to have a shared understanding of the problem, to know and trust each other, and work as a team because flooding is complex and each flood is different.

It is clear that working collaboratively with partners and communities will have to be at the heart of any flood risk management strategy. This comes through clearly in WP2 because the Environment Agency is not the lead on response, recovery and adaptation. Evidence from the analysis of Stockbridge (WP2) showed that working in collaboration with other authorities helped to present a united front in the immediate aftermath of floods, which was clearly valued by community members. More importantly because the flood risk management cycle is exactly that, a cycle, with each part dependent on the other parts, good flood warning means that people know how to respond effectively which means that the response works when a flood happens. If responses are effective, recovery should be more effective. Understanding how recovery works feeds into planning for flood risk management and understanding what measures need to be taken to build community resilience. For example, WP3 shows that information gathered from others during a flood is critical to improving the Environment Agency's models and warnings. WP3 provides tools for collaboration and WP4 provides an analysis of how to work with the Environment Agency culture to implement collaboration.

Introducing this collaborative world view to the core work of the Environment Agency will become increasingly important if the Environment Agency take on roles such as the strategic overview of flooding inland and on the coast. The analysis in WP3 and WP4 shows that currently the Environment Agency is not 'naturally collaborative' but increasingly, collaboration is being done by staff out of necessity in order to provide solutions to flood risk management problems.

In WP2 we suggest that the Environment Agency could have a role in creating bridging social capital; after a flood, as one of the few organisations that has experience of flooding it could provide a link for affected people to services and resources. The work in Carlisle showed that there are opportunities for connecting the public and institutions after a flood which can be fostered and developed, creating resilience. Environment Agency staff in the North West have done this by developing longer term links with communities through flood action groups which in turn are concerned with emergency planning. WP3 highlights the surprising variation in community-related practice not only between regions but also within regions in terms of approaches. Some areas such as Thames consider flood ambassador schemes essential to post-flooding work while others (such as Midlands) have found the approach not helpful. Wessex are actively promoting flood wardens (in conjunction with the writing of community emergency plans) to support communities in preparing for flooding while other areas and regions actively discourage them. Locally-tailored approaches make sense, but only in the context of a system that enables learning about what is effective. There are signs that this learning is happening on a small scale through the Building Trust mentor programme and individual initiative and contacts of staff but it will need to be developed

considerably for advances in collaboration to go beyond the local exceptions and to be embedded as a core part of the Environment Agency's work.

However, those who are removed from the flood incident and perhaps are higher up in the Environment Agency are, not surprisingly more focussed on the institution than the problem and this can create conflict within the organisation. WP4 provides an analysis tool which could assist the Environment Agency in considering 'how much' and 'what type' of collaboration and engagement is appropriate in a particular situation. The cost/benefit of each and the characteristics/requirements of each are explored.

WP3 provides a second layer of practical tools and some examples of practice which have been tested and developed before and during flood situations. Some are as simple as ensuring that meetings (such as Local Resilience Forums or their subgroups) are run in a collaborative way rather than focusing on one-way information giving.

Not only are trust and collaboration key to relationships between organisations and between the Environment Agency and communities and the public, they are crucial internally to the organisation. In this project (see Twigger-Ross *et al,.* 2008) and others (see Twigger-Ross and Scrase, 2006) we have encountered lack of trust between levels of the organisation and between different parts of flood risk management to such a degree that we would say it could be detrimental to the delivery of an effective flood risk management service.

However, we have also found many examples of good practice in collaboration and engagement and the Environment Agency's programme of development on engagement, *Working with Others: Building Trust with Communities,* is a good foundation on which to build further approaches to collaboration. Currently, this work is supported through individual managers supporting external relations staff and is not officially recognised, nor is it embedded within performance measures, a step which might make it part of the fabric of the Environment Agency

WP4 provides an analysis of how collaboration could be taken forward within the Environment Agency, suggesting not a culture change but awareness of and working against the natural inward-focused tendencies of the organisation. A first step is for the Environment Agency to learn from local practice, and to decide where it wants to be on collaboration, trust and engagement. Until that decision is made, we would suggest that the current resistance to collaboration for FCERM is likely to continue.

3.4 Expertise, data, and evidence: what counts?

As noted at the beginning of this section, what data and expertise is valued and produced is related to how the problem is framed.

Within flood risk management at the Environment Agency the emphasis is on technical data, that is, information on hydrology, modelling, forecasting as opposed to the social aspects of flood risk management. As noted above, this is not surprising. The emphasis on technical data is reflected in the proportions spent on research projects (see Twigger-Ross, 2005 for analysis), in the training and backgrounds of staff, and there is also a perception of an imbalance between the amount of time FRM staff spend on technical tasks compared to engagement and collaboration activities.

This focus on the technical creates a tendency to oversimplify the social aspects of flooding, for example to assume a direct relationship between sending a warning and getting a response. Further, the emphasis on technical data can lead to communications being treated as an add-on and this is partly reflected in the organisational structures of the Environment Agency, with those who have engagement and collaboration expertise largely located within corporate affairs rather than within,

for example, FIM teams. For collaboration and engagement in FIM to be effective, it will be crucial for that expertise to be located alongside technical expertise.

Not surprisingly it is apparent that staff at the Environment Agency can be uncomfortable when they are not working with technical data. For example, in developing a flood risk scheme for Shaldon in the South West (see Johnston and Wettenhall, 2007), it took more than a year before community information on surface water problems and their causes was taken seriously. Possibly some of the problems with knowing what to do on response and recovery are because what is needed is flexibility, openness to shared understanding, and acknowledgement of uncertainty and complexity rather than the provision of technical data, as noted in WP2 in the case example of Stockbridge. There are always staff who show the former is possible and that the results are positive but because the institution is generally focussed on the technical, they remain the exceptions.

This technological focus leads to an emphasis on internet and electronic methods of warning and communicating even though the evidence (see Tapsell *et al.,* 2005) from the 2007 summer floods (see Pitt Review) shows face-to-face interaction is preferred and more effective, especially in reaching vulnerable people. Policy and legislation[4] require the Environment Agency to address vulnerability, so only focusing on electronic methods of warning and communication is no longer a viable option. WP3 explores possible ways of improving the two-way sharing and development of effective information before, during and after a flood, including not just warnings but community preparedness, how civil contingency partners can share data and information for more effective joined up planning and response. WP3 also suggests that smarter working with others can reduce the amount of time spent on defensive activities such as explaining why warnings or defences didn't work.

A further issue that stems from the technological focus is the emphasis on provision of technical data rather than on 'actionable information' (WP3). That is, the tendency to focus on increasing amounts of data in the anticipation that this will reduce uncertainty, rather than understanding how data could be used to solve flooding problems. Actionable information refers to data that is linked to a clear framework of collaborative problem-solving, and it may be both lay and expert information that is brought together and used to solve flood risk management problems.

It is clear from all the reports that "one size does not fit all" in terms of flood warning, response and collaboration. This view comes both from the reviewed research and the views of staff interviewed in the projects. Different types of information and data need to be collected and different types of expertise developed. Specifically, expertise and information on collaboration and engagement are needed and this project provides an excellent synthesis of this type of information in WP3 and WP4. WP3 explains how to choose the most appropriate type of collaboration and WP4, how much effort to put into it. Further, expertise and information/data are needed on social aspects of flooding such as demographic data, attitudes towards flood risk and perceptions of flood risk in order to further develop flood incident management processes. In WP1 we suggest that data about vulnerability is needed so that staff can understand the social characteristics of their areas so as to be able to tailor approaches to flood warning. However, that information must be gathered through engagement with other Category 1 responders and representatives of vulnerable groups so that it becomes useful.

A final issue is the emphasis on data that can predict the probability of flooding, rather than emphasising information about the consequences of flooding. WP2 has provided considerable evidence for the social consequences of flooding which needs to be understood and acted on.

[4] Such as the Disability Discrimination Act

4 Recommendations

The overall recommendation from Work Packages 1 to 4 is that the Environment Agency should urgently consider its approach to managing flood risk, in particular:

- Shifting the emphasis onto the problems of flood risk management rather than leading with a focus on internal needs. With clarity about drivers, work can be delivered which will both address flooding and enhance the Environment Agency's reputation.
- Understanding the needs/roles of others (professional partners, community members) and how to work with them effectively across the whole flood risk cycle. This should include national-level exploration of flooding and how to manage it.
- Reviewing the way that data, evidence and expertise is valued and used.

The research has come up with a series of specific recommendations which have been discussed at the project board and with other Environment Agency stakeholders. The recommendations cover different aspects of the flood incident cycle, from emergency planning to improving flood warnings to understanding and facilitating resilience. Sub-sets of recommendations can be used where relevant to influence particular audiences within the Environment Agency and to target the different parts of the business.

In this section, we outline the project's main recommendations. Details of the recommendations can be found in the final reports for each of the work packages. We also provide recommendations on the dissemination of research findings and further research and action learning.

Recommendations for increasing the Environment Agency's capacity to collaborate with others (WP4)

Rather than attempting to change the 'culture' of the organisation, be aware of and work against the inward-focused tendencies of the Environment Agency when undertaking outward-facing collaborative tasks, including:

1. Build up skills of rapport and planning collaboration (making it a less seemingly chaotic process) with staff in relevant roles and give them recognised formats, systems and processes to execute.
2. Recruit and assign or enable people with outward-facing and interpersonal skills to support outward-facing activities, for example through the Building Trust programme mentors and 'key contacts'.
3. Work strategically and tactically with other organisations who are culturally better equipped to carry out some tasks, and build recognition of what they do (and how the Environment Agency will link to their work).
4. Retain consultancies and agencies skilled not just in PR and consultation (DAD), but in collaborative approaches (EDD). Make it possible for staff to call on them for assistance in designing and delivering collaborative programmes.

New processes are needed to help the Environment Agency decide when to collaborate with others and how much collaboration is required, in a similar way to current processes which assist engineering-based decision-making. In order for engagement to be used effectively within FCERM, there needs to be a clear decision-making process right at the start of any project or programme that includes decisions about what type of situation is being dealt with, how much and what type of

engagement is appropriate (and how much it will cost). We recommend the systematic use of the Type A, B, C framework set out in WP4, combined with:

a) development of the analytical/conceptual framework within which to understand the cost/benefits of different types of approach.

b) development of a practical framework that can start to capture the practical costs and benefits of one approach (or set of approaches) compared to others.

Recommendations for improving collaboration with professional partners and communities (WP3)

We recommend urgent and sustained effort to develop actionable information and relationships with professional partners and communities through:

1. Equipping staff with the permission and skills to collaborate with professional partners and communities as a core part of their work.
2. Emphasising recovery and planning for collaboration in the future, rather than relying on collaboration in a crisis.
3. Recognising the value of what others do, and developing processes which enable the Environment Agency to support their work.
4. Improving the way that day-to-day meetings and partnerships with professional partners and others are planned and run, building in a greater element of two-way collaboration to overcome the current emphasis on one-way information giving. Some tools are provided that should be rolled out to support this.
5. Improving the way that data and information is shared with professional partners and others, in particular overcoming some of the 'myths' around sharing information and data and how to enable two-way exchange of actionable information rather than one-way provision of data.
6. Bringing consistency and clarity to the way that the Environment Agency works with/supports efforts by communities, specifically around the use of drop-ins, flood ambassadors, flood wardens and community flood plans. This is especially important for communities that are likely not to receive immediate response from emergency services during a flood. Some examples of existing practice and lessons learned are provided as the basis for ongoing learning about what works and to support development of guidance.

Recommendations for improving response and developing resilience before and during flooding (WP2)

We recommend that the following actions are taken to improve response before and during flooding:

1. The Environment Agency has a key role to play in improving public knowledge and understanding of the realities and varieties of flood experiences, and should develop a programme of awareness raising and discussion so that individuals and communities can be better prepared to take timely and appropriate actions before, during and after a flood.
2. The Environment Agency should examine different flood situations and establish what is effective action for each of those situations (such as rapid-response or slow-rising catchments), and develop specific action lists

that can be disseminated as part of emergency planning and enacted during floods.

3. The Environment Agency should work with other Category 1 responders (local authorities, Health Protection Agency) and with community flood action groups as appropriate to develop knowledge on what actions to take to prepare for a flood and how to prepare not just for the inundation of water but for the recovery period, such as what to do if you are evacuated, what to do with pets, what to expect in terms of insurance companies, loss adjusters.

Recommendations to improve adaptation and resilience after flooding

The orientation of flood prevention and flood incident management needs to be reconsidered. At present, the focus is largely on enhancing resistance via improved flood defences and warning systems, along with emergency planning aimed at providing basic services and restoring infrastructures as quickly as possible. However, restoration is not the same as recovery. In the context of local flood action plans, more emphasis should be placed on vulnerability-reducing adaptation, recognising that such innovations will have to be developed in the medium and longer term alongside more traditional strategies designed to resist flooding and provide emergency relief. Such changes are unlikely to occur unless communities are more effectively engaged in decision-making on flood risk management.

The Environment Agency should develop an institutional understanding of resilience, using the three types identified in the Carlisle case study: resistance, restoration and reconfiguration. It will be especially important to understand that different communities will express different types of resilience and that this will affect their willingness to adopt measures designed to improve flood incident management.

Recommendations to address the factors that reduce individual resilience

The Environment Agency should work in collaboration to consider vulnerable people's needs. This is likely to take place best at a local level where there would first need to be an understanding of what characteristics might be important in that area, followed by community engagement with different groups as appropriate (recognising that vulnerable people might also be those who are not easy to reach because they are not connected to services), to work with them to develop understanding and capacity to take action. There is a strong case for providing more emotional support for flood victims, including the establishment of self-help groups. It is not suggested that the Environment Agency should provide this support, but it could play a role in bringing this recommendation to the attention of other organisations who could deliver this.

The Environment Agency is in a position to facilitate bridging social capital by focussing on the issues in the recommendations above. Bridging social capital may well improve the rate of recovery for flooded communities. To do this, we recommend that actions are taken to develop institutional resilience (further details in WP2 final report).

Recommendations for focussing the flood warning service on response (WP1)

To improve emergency planning and risk communication we recommend:

1. Working in collaboration with professional partners and with community wardens becomes a key part of the flood warning service. We recommend that there is a link with the Cabinet Office work to establish a baseline of what is working through the LRF at present and develop capacity from there.

2. The Environment Agency establish a baseline in each area of what is being done at present in terms of inter-organisational flood warnings and work with others to develop an integrated flood warning plan. If there is nothing in place we suggest that the Environment Agency is proactive and invite others to be collaborators.

3. Emergency exercises should focus on worst case scenarios, such as flooding at night and at a weekend/bank holiday, and the Environment Agency should establish with local authorities a series of exercises to cover worst case scenarios if these are not in place already.

4. Dialogue and discussion around the perception of risk (both probability and consequences) from flooding should be initiated at the national, regional, area and local level with the view to "normalising" the idea of preparing for flooding. This should be undertaken as dialogue if any trust and credibility is to be developed, and to ensure that the Environment Agency is open to information from others, not just data sets. Preliminary work could be carried out with key external partners to consider how this could be approached.

To develop an approach to dealing with the complexity of flood/area/people characteristics we recommend:

1. Where there are people with vulnerability characteristics that mean that having more tailored warnings would be helpful (such as people with mobility problems) the possibility for providing earlier warnings should be explored. This should be approached through working with affected people (or representatives of groups of affected people) to establish how best this could be done, building on current work on disability.

2. Develop a better understanding of local areas and the different flood/area/vulnerability characteristics in order to understand the most effective approaches to flood warning in each area. As recommended in an earlier paper (Twigger-Ross and Scrase, 2006) we suggest that each area spends time in collaboration with Category 1 responders developing a picture of the social characteristics of that area. Where work on this is already happening, such as on the development of social vulnerability maps, care should be taken that there is an integrated perspective covering all parts of the flood risk cycle and avoiding an over-reliance on data rather than actionable information.

To improve the approach to flood warning and messages we recommend:

1. Alternative flood warning communication methods such as door knocking/face-to-face interactions and two-way conversations on the

telephone should be assessed on a equal basis to FWD. The feasibility of carrying out flood warning in collaboration with professional partners and community groups should be assessed.

2. The Environment Agency should aim to better understand the benefit of working with existing community groups and networks including parish councils, voluntary groups and warden schemes. The Environment Agency should consider the most effective way of working with the community, how effectiveness is going to be shared and whether it needs more staff in the area offices with enough time and skills to engage with the local communities and existing groups.

3. Flood warning methods should be linked to awareness-raising efforts. Staff should get to know the social characteristics of their area, groups, influential people, networks, demographics, and should be engaged with those people to raise awareness and do emergency planning. Through those connections appropriate flood warning methods should be established at the appropriate levels which may be at the level of the community group, organisation, manager or individual householder.

4. Warning messages should include information on response. Based on research and experience from past floods, messages could be tested for effectiveness through, for example, focus groups with at-risk residents. We recommend that work is carried out to trial the length and nature of messages.

5. Floodline should have the actions that need to be taken on the same webpage as the warning information, to make it more straightforward to find details on what actions to take. The webpage and how information is presented should be evaluated and designed so as to provide information on action in as an immediate and obvious way as possible.

6. FWD should be improved so that messages could be given out in languages other than Welsh and English and its full capability should be explored (how flexible could it be with respect to localised information). As a first step, we recommend that a discussion is held with the FWD team to find out what is currently possible and how much could be done to address some of these issues within the current framework.

Dissemination of research findings and lobbying of other organisations

1. We recommend that this research is shared with collaborators through seminars, joint working on research projects and joint working on implementation of findings.

2. Given the stress experienced by flood victims in dealing with insurance, the Environment Agency should lobby for changes in insurance that benefit the flood victim and ensure consistency in approach across insurance companies.

3. Further research (and action learning) should consider joint commissioning by the Environment Agency and others.

Further research and action learning needs

1. The Environment Agency should consider supporting further research in Carlisle and in other parts of England and Wales on human response, adjustment and adaptation to flooding; this could be done in partnership

with other organisations. With some adjustments and refinements to research design and methodology, it would be possible to generate a more substantial body of evidence upon which the future policies and practices of the Environment Agency and other organisations could be based. In supporting future research, particular attention should be paid to ensuring that balanced and representative groups of research participants are recruited from the study areas.

2. We recommend more research to understand people's perception of the consequences of flooding, not just probability, in order to produce more targeted awareness campaigns. We also need to understand more about people's perception of their responsibilities in relation to flooding. If the public perceive flood risk management to be the responsibility of the authorities, they will not have any incentive to protect themselves.

3. Further research should be carried out to develop and evaluate different flood warning scenarios – this would be combinations of messages and methods in different flood situations to see which package is most effective in what circumstances. This could start as an experimental piece of work and then look at applying it where appropriate.

4. Further research should be carried out to better understand the value of different approaches to working with communities to improve flood resilience, including community groups, flood wardens, flood ambassadors, drop-ins, community emergency plans. This could include studying the impact/value of tools recommended by WP3, and would be conceived as establishing ongoing learning and evaluation (perhaps as part of the Building Trust programme).

5. We recommend that further research is carried out into how change takes place within the Environment Agency (building on the initial analysis in WP4) to understand how to effectively embed collaboration within the organisation.

6. We recommend analysis of the different engagement approaches (Types A, B, C set out in WP4) and their effectiveness/cost-effectiveness for different situations. This would require the building of conceptual frameworks for cost/benefits, based on initial analyses carried out for WP4.

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List of abbreviations

DAD	Decide-announce-defend
EDD	Engage-deliberate-decide
FCERM	Flood and coastal erosion risk management
FIM	Flood incident management
FRM	Flood risk management
FTE	Full-time equivalent
FWD	Floodline Warnings Direct
KPI	Key performance indicators
LRF	Local resilience forum
PR	Public relations
VSB	Virtual sounding board
WP	Work package

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