

Consultation on policy options for promoting property-level flood protection and resilience

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Executive Summary

- 1 This consultation sets out options on ways to increase the use of property-level measures to reduce the impacts of flooding for those homes facing the highest risk of flooding. These measures include property-level flood protection, such as door-boards and air-brick covers, which keep water out of properties, and resilience measures such as water-proof walls and floors and raised electrics, which reduce the damage caused by floodwater. Property-level measures could form an important part of our adaptation response to climate change.
- 2 Few people currently take such measures of their own accord. Awareness of the available measures and confidence in their effectiveness are both low, and some householders feel that managing flood risk is the responsibility of the state and not of the individual. Furthermore, should insurance terms not fully reflect the scale of the risk, as we are told is sometimes the case, the financial benefits of taking measures can be limited and might only accrue in the long-term.
- 3 The Environment Agency continues to maintain and improve community-level defences in areas where it is most cost-beneficial. However, where only a small number of properties would be protected or where defences would be particularly expensive or very difficult to implement, the relative benefits are often too small to meet the Agency's criteria for spending on flood defence. As a result, households in such areas currently receive little state help to reduce their flood exposure. Clearer data should become available when the Environment Agency publishes its Long Term Investment Strategy, but initial estimates suggest that about half of the 400,000 households currently in areas identified as at significant risk (an annual chance of flooding greater than 1.3% or once every 75 years on average) might remain undefended. Of these the 10,000 or so most at risk would experience the greatest benefit from taking up property-level measures. Data on the number of homes at risk of surface water or sewer flooding are not currently available, but it is clear that their inclusion would increase our estimate of the total number of homes at high risk of flooding.
- 4 In communities that are unlikely to benefit from investment in traditional flood defences, one way to complement the current approach is to support householders to improve the flood protection and resilience of their own homes. The Government's Foresight report found that employing a portfolio of different responses was the most effective way to keep flood exposure in check and prevent it increasing dramatically in the face of climate change.¹ As well as conventional community-level flood defences, Foresight suggested that this portfolio should include property-level measures. The promotion of property-level measures is also supported by Sir Michael Pitt's review on lessons learned from the 2007 floods,² which recommends that the Government does more to promote flood protection and resilience, both for new buildings and for existing properties in flood risk areas. This consultation takes forward these recommendations for the existing housing stock in England.

¹ Foresight (2004) *Future Flooding*, http://www.foresight.gov.uk/Previous_Projects/Flood_and_Coastal_Defence

² Sir Michael Pitt (2008) *Learning lessons from the 2007 floods*, The Pitt Review, <http://www.cabinetoffice.gov.uk/thepittreview.aspx>

- 5 This consultation builds on Defra's pilot grant scheme and sets out two policy options to increase the use of property-level measures amongst households at the greatest risk. Defra plans to contribute at least £5 million to a scheme to support households who face a particularly high risk of flooding. The funding, which comes on top of any help already provided by local authorities, the insurance industry and households themselves, is aimed at those in areas that flood frequently but are not protected with traditional flood defences from the Environment Agency. The consultation also seeks to initiate wider discussion on a number of other steps that might increase take-up, including the possibility of amending Building Regulations to make resilient repair compulsory (Part 3).
- 6 The two proposals set out in this consultation both rely on the Environment Agency identifying areas with a significant chance of flooding and where no investment in flood defences is planned. Under these options, the Agency would work with local authorities to identify areas that were most likely to be receptive to property-based approaches. We suggest that in these areas local authorities, working with local Environment Agency staff, would engage and consult with communities as a means of generating buy-in. Local authorities would have some flexibility about how to operate these schemes and might want to consider administering schemes alongside existing programmes, such as that for the renewal of private sector housing. The Government will consider the cost implications for local authorities of any proposals taken forward and will ensure that the net additional cost is fully and properly funded.
- 5 **Option 1 - Free home flood surveys for households in at-risk communities.** Determining the most appropriate set of measures to mitigate flood risk for an individual property can be complex and requires a professional survey. In a telephone poll of at-risk householders conducted for Defra, half of the respondents agreed that they were deterred from taking property-level measures by a lack of confidence in choosing the right set of measures. Under this option, the Government, working through the Environment Agency and local authorities, would engage with communities in the highest risk areas and offer households free, independent flood surveys. Households would cover the costs of the measures themselves, either through an upfront payment or a loan, for example by extending their existing mortgage. We ask stakeholders for views on whether the offer of a free survey to households in a high-risk community would be sufficient to encourage them to make their homes better protected against floods.
- 7 **Option 2 - Government grant to subsidise the costs of measures.** For some, the cost of property-level measures will be a substantial barrier to installing such measures in their home. Others will choose not to spend money on measures – in part because the benefits may not be realised immediately. A government grant could overcome these barriers. In this consultation, we ask stakeholders whether such improvements to private homes are an appropriate use of public flood management funding. Given that funding for such a scheme will always be limited, we ask whether the grant should comprise a full subsidy for a small number of high risk properties, or whether part-subsidy should be offered to a larger number of properties. We also ask if subsidy should be offered to all at-risk properties or only to low-income households or communities.

Part 1: Consultation Overview

Introduction

- 1.1 The floods of the summer of 2007 illustrated the distress and expense that flooding can cause. Not only do householders lose possessions and suffer damage to their properties when there is a flood, often they are also forced to endure the disruption caused by several months' evacuation. Household floods cause damage of an average of £20,000 - £30,000 and can lead to both physical and mental ill-health.
- 1.2 At present, around 400,000 homes and 75,000 businesses in England are located in areas where there is a significant annual chance of river or coastal flooding (greater than 1.3% annual chance or once every 75 years on average).³ Further homes are at risk of surface water or sewer flooding. Climate change is likely to increase these pressures and, consequently, increase the number of properties at risk. Of course, some of these properties will benefit from large-scale community defences, but where smaller numbers of properties are at risk or where the cost of defence would be particularly great, such defences will not be viable. Initial estimates suggest that as many as half of these properties might be in areas where large-scale defences cannot be justified or are unlikely to receive funding.⁴
- 1.3 In such situations, we need other ways to manage the risk of flooding. The Pitt Review on lessons learned from the 2007 floods⁵ recommended that householders take action themselves to reduce their risk exposure and that the Government do more to promote property-level flood protection and resilience – both for new build and existing properties in flood risk areas. This consultation takes forward these recommendations for England, focussing on existing housing where such measures are cost-beneficial.
- 1.4 The 10,000 or so most at risk homes (referred to in this document as the high-risk properties) would experience the greatest gain from taking up property-level measures. In many cases, the annual chance of flooding for these properties could be greater than 10% (once every 10 years on average) and the benefits of flood protection outweigh the costs by between five- and ten-fold.
- 1.5 As part of the first phase of the Government's strategy for flood risk management, Making Space for Water, Defra last year funded a £500,000 pilot scheme to examine whether grants provided an effective means of increasing take-up of flood protection (Table 1.1). This consultation builds on these pilots and sets out two main policy options to increase the use of property-level measures in the existing housing stock. It is supported by detailed analysis by Entec and Greenstreet Berman on the economics of property-level flood protection and resilience and the results of a survey of more than 1,200 households and businesses about the barriers to the use of such measures.

³ Environment Agency (2006) National flood risk assessment

⁴ This figure will be refined as the Environment Agency develops its Long Term Investment Strategy

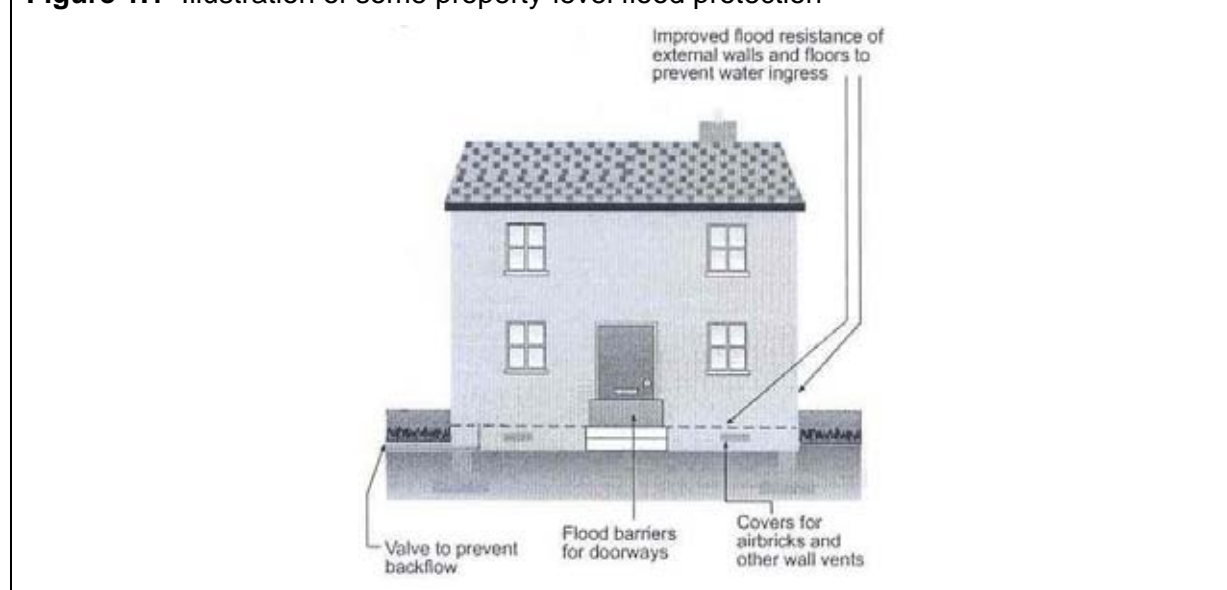
⁵ Sir Michael Pitt (2008) *Learning lessons from the 2007 floods*, The Pitt Review, <http://www.cabinetoffice.gov.uk/thepittreview.aspx>

These results are brought together in the Impact Assessment (Annex C), which reviews the main costs and benefits of each policy option.

Table 1.1 Summary of Defra flood resilience pilots

Location	Central government funding	Number of Properties Protected	Type of Properties
Dunhill Estate, Halton, Leeds	£90,000	68	Residential
Bleasby, Nottingham	£90,000	12	Residential and Commercial
Sandside, Kirkby-in-Furness, Cumbria	£90,000	36	Residential and Commercial
Sunderland Point, Morecambe, Lancs	£110,000	30	Residential
The Sands, Appleby, Cumbria	£80,000	46	Residential and Commercial
Uckfield, East Sussex	£30,000	7	Commercial

Figure 1.1 Illustration of some property-level flood protection



Property-level measures

- 1.6 Property-level measures include flood protection, which limits the entry of floodwater into a property (Figure 1.1), and resilience, which reduces the damage caused by floodwater once it has entered a property. The choice of appropriate measures depends on a reliable assessment of the potential depth and frequency of flooding around a property. Where this is available and

appropriate measures are installed, analysis performed for Defra by Entec and Greenstreet Berman⁶ suggests that the financial costs of floods can be reduced by between 50% and 80% (Table 1.2). Such measures can also give residents more time to organise their evacuation and to move vulnerable people, pets and personal possessions to safety. Importantly, they also lessen disruption and distress by helping prevent damage to items of sentimental value, reducing the need to find replacements for lost possessions and halving (on average) the amount of time to dry out and repair a property.

Table 1.2 Possible packages of property-level flood protection and resilience measures for homes and small businesses.⁷

Package	Measures	Estimated average cost for a semi-detached house
Temporary property-level protection	Demountable door guards and airbrick covers, sump pump systems and remedial works to seal water entry points	£4,000
Permanent property-level protection	Flood-proof external doors, ⁸ automatically sealing airbricks, external wall rendering / facing, sump pump systems and remedial works to seal water entry points	£8,000
Resilience without resilient flooring	Resilient plastering on walls (up-to 1m), light and easily removable internal doors, water resilient window frames, resilient kitchen surfaces and units and raised electrics and appliances	£10,000
Resilience with resilient flooring	As above, but with concrete/sealed floors	£15,000

1.7 Entec and Greenstreet Berman found that temporary property-level flood protection, when applied to the whole house, is likely to be cost-beneficial⁹ if the annual chance of flooding is 2% or more (once every 50 years on average) (Table 1.3). Permanent property-level flood protection is more expensive and is only cost-beneficial for areas with a 4% or higher annual chance of flooding.

⁶ Entec and 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, <http://www.defra.gov.uk/envirom/fcd/policy/strategy/FD2607SR.pdf>

⁷ Adapted from Entec and 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, <http://www.defra.gov.uk/envirom/fcd/policy/strategy/FD2607SR.pdf>

⁸ Flood-proof doors do not currently have the British Standards Institute Kitemark for flood protection, and therefore remain largely untested.

⁹ Benefits and costs differ depending on the perspective that is taken – an individual householder or society as a whole. The individual perspective is useful to understand the motivations for and barriers to action (see next section), while a society-wide perspective is appropriate for appraising public policy options.

- 1.8 Each of these packages of measures has different characteristics and limitations, and is therefore appropriate in different circumstances. Temporary flood protection tends to be the cheapest option and a number of products have been through the British Standards Institute (BSI) quality assurance process and are therefore of known reliability and effectiveness. On the other hand, some of these barriers can be harder to fit and so might not be suitable for elderly or disabled people. Because their deployment requires the presence of the householder they are not appropriate for areas where floods happen without much warning. They also require knowledge about deployment to be passed on when the property is sold.
- 1.9 The effectiveness of the key elements of the package of permanent measures is less certain than that of the temporary measures. We are not aware of any flood resistant doors or automatic airbricks having yet been evaluated for their performance and awarded a recognised mark of quality assurance such as the BSI Kitemark (discussed later). Permanent measures do have the advantage, however, of operating automatically in the event of a flood and, if they have been properly installed and maintained, of not requiring any additional action immediately prior to a flood. As a result, they are suitable for flash flood areas and also for households with less physically capable residents.

Q1 Do you think that the costs and benefits for the measures outlined here and in the Impact Assessment (Annex C) are reasonable estimates? Do you have further information to help refine the estimates?

Table 1.3 Estimated benefit-cost ratios for different packages of measures in different risk bands.¹⁰ Values in bold are greater than one, showing where property-level measures are cost-beneficial.

Annual chance of flooding	Packages of protection or resilience measures					
	Temporary protection	Permanent protection	Resilience	Resilience with resilient flooring	Resilient repair after flood	Resilient repair after flood (with resilient flooring)
20%	10.6	8.4	3.7	3.7	6.7	5.5
10%	5.8	4.3	2.1	2.0	3.9	3.0
4%	2.6	1.8	1.0	0.9	1.9	1.4
2%	1.3	0.9	0.6	0.5	1.0	0.7
1%	0.3	0.2	0.1	0.1	0.2	0.2

- 1.11 Resilience is more effective than property-level protection for deeper floods (above 60 – 90 cm), which would overwhelm barriers such as door guards and cause structural damage to the property if the water was held back. But it is less

¹⁰ Taken from Entec and 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, <http://www.defra.gov.uk/enviro/fcd/policy/strategy/FD2607SR.pdf>; while the research took some account of the health impacts of flooding, it did not take full account of the possible mental and emotional damage that could be avoided by limiting the damage caused by flooding.

effective at reducing damage to personal possessions because, unlike property-level protection, it does not slow the ingress of water and so does not buy householders time to move possessions to safety.

- 1.12 The higher cost of resilience makes it generally less cost-beneficial than property-level protection. Entec and Greenstreet Berman concluded that the introduction of packages of resilience measures in homes not already in need of repair or refurbishment was only cost-beneficial in areas with a 4% or greater annual chance of flooding. However, resilience becomes more worthwhile if it is incorporated during repair (following a flood) or major renovation. Here the extra costs of resilient repair compared with the like-for-like repair/renovation that is taking place anyway are much smaller than doing it from scratch. Their analysis suggests that, like property-level flood protection, resilient repair can be cost-beneficial where the annual chance of flooding is greater than 2% (once every 50 years on average).

Barriers to the take-up of property-level flood protection and resilience

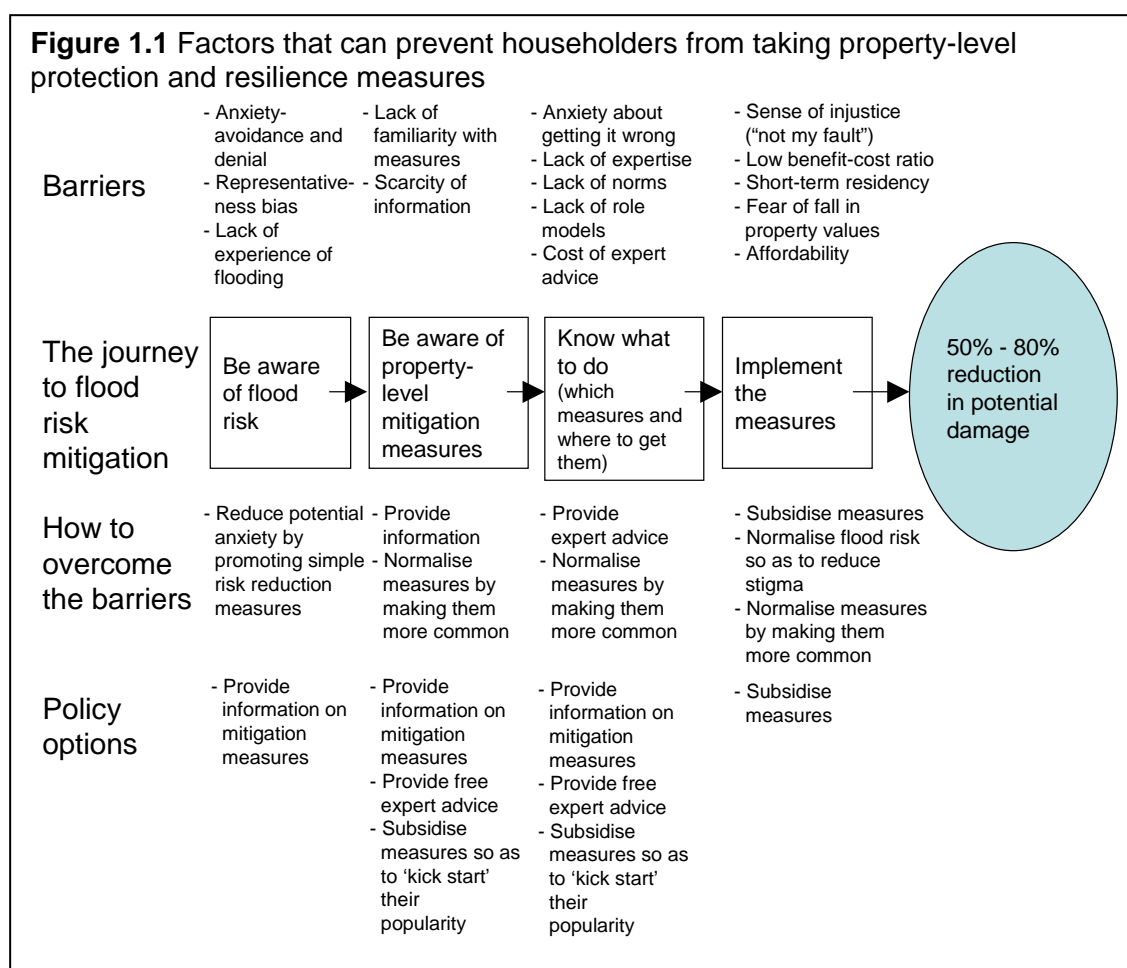
- 1.13 Traditional community-level flood defences are not viable or sufficiently cost-beneficial for every area, leaving some properties undefended for the foreseeable future. Provisional estimates suggest that around half the properties at significant risk of flooding could be in areas where engineered flood defences cannot be economically justified or are not viable at present. Of these, the 10,000 most at risk households would get the greatest benefit from taking up property-level measures.
- 1.14 In spite of this, take-up of property-level flood protection and resilience is much lower than might be expected. Few businesses and even fewer households take any steps to reduce the impact of flooding on their properties.
- 1.15 A survey conducted for Defra by Entec and Greenstreet Berman found that in areas of significant flood risk only 16% of households and 32% of SMEs (small and medium sized enterprises) had taken any practical steps to limit potential flood damage.¹¹ A separate study by Norwich Union suggests that 83% of people living in and around flood risk areas in Gloucester, Tewksbury, Hull, Sheffield and Rotherham believe there is nothing they can do to protect their home from flooding.¹² Consequently 95% have not taken any measures that could help prevent or significantly reduce the stress and emotional trauma of a future event. The Flood Protection Association, which represents the interests of some manufacturers and installers of flood protection products and systems, has reported that less than 5,000 homes have to date taken approved measures. There is little evidence that any of the 55,000 households affected by the 2007 floods have been repaired in a flood-resilient fashion.
- 1.16 A range of factors explain this low level of take-up. These are summarised below and fully explained in Annex A, which draws on evidence from research

¹¹ See Entec and 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, <http://www.defra.gov.uk/enviro/fcd/policy/strategy/FD2607SR.pdf>;

¹² <http://www.norwichunion.com/press/stories/3981-homeowners-fear-future-flooding-but-fail-to-take-measures-to-protect-their-properties.htm>

commissioned by Defra for this purpose and also on other research and on the experiences of the Defra pilots (Figure 1.2).

1.17 In part, the low take-up may relate to the limited nature of risk-pricing reported in the flood insurance market. In a perfectly functioning risk-based insurance market, insurance premiums should reflect the average expected damages caused by flooding and this should act as an incentive for households and businesses to improve risk management and take steps to protect their property. This already happens in relation to theft - premiums reflect insurers claims experience and crime statistics for the area and, in higher risk situations, theft cover may only be available if appropriate risk management measures, such as alarms or safes) are in place. The Association of British Insurers have told us that, because the Environment Agency does not provide accurate flood risk data based on individual property locations, covering both the chance and potential depth of flooding and because insurers lack a clear understanding of which areas are expected to be defended by community schemes, insurance terms do not always reflect the risk exposure of individual properties. The Environment Agency's long-term investment strategy (to be published in Spring 2009) and the continued development of more comprehensive and accurate flood risk data will provide more information and detail about flood risk at community-level, which will enable insurers to take greater account of property-level risk information.¹³



¹³ Further details available from <http://www.defra.gov.uk/news/2008/080711a.htm>

1.18 A host of social factors also act as barriers to individual action on flood protection (Annex A).

- **Moral hazard – assumption that the state should provide protection**
According to the Entec and Greenstreet Berman survey, 42% of householders in areas of significant risk believe that the state has already provided them with adequate community-level protection from flooding. Furthermore, evidence from in-depth interviews with at-risk households suggests that some consider it to be their right to have such protection. Some consider planning policies and decisions by local and central authorities to be the cause of flooding and argue that these same authorities should therefore protect them from the consequences. People also use arguments of justice to explain their lack of action to protect their own properties, stating that if public money is spent protecting other areas then it should also be spent on protecting them.
- **Lack of information and awareness about levels of risk**
At present, the Environment Agency's publicly available flood maps allow users in the floodplain to find out whether the risk in a particular part of the floodplain is 'significant' (greater than 1.3% annual chance or once in 75 years on average), 'moderate' or 'low'. It does not, however, provide finer grained information about the chance of flooding, for example where the annual chance might be 10% or greater. Where people do not seek out more specific information from their local Environment Agency office, for example for insurance purposes or to inform their purchase of a property, they would not have more in-depth understanding of their local flood risk. As a result, many householders lack a firm grasp of the real extent of the risk and continue to believe that floods are rare events that will occur no more than once in any lifetime.
- **Lack of awareness of, or confidence in, property-level flood protection and resilience options**
Entec and Greenstreet Berman found that only 22% of residential respondents are able to call to mind any property-level protection measure other than sandbags and only 10% were able to think of any example of a resilience measure – this, in spite of the fact that 35% of households say they have looked for information on how to protect their homes from flooding. In a study by the insurer Norwich Union, nearly one-third of people in flood hit areas say they do not know what they can do to protect their home, while one-in-five say it is too much hassle and could be too expensive.¹⁴
- **Other barriers**
Other barriers indicated by evidence from the Entec and Greenstreet Berman survey and elsewhere include a concern that property-level flood protection and resilience make homes look less attractive; an expectation, amongst some, that they will not live in the property for very long and a concern that noticeable measures would make the property harder to sell, and a desire not to be reminded of the existence of the flood risk. All of these factors are complemented – and perhaps sometimes motivated – by

¹⁴ <http://www.norwichunion.com/press/stories/3981-homeowners-fear-future-flooding-but-fail-to-take-measures-to-protect-their-properties.htm>

a desire to avoid anxiety about flood risk by representing it as negligible or as someone else's responsibility.¹⁵

Rationale for government action

- 1.19 There are two main justifications for government action to encourage greater household take-up of property-level measures. The first is that existing levels of take-up are low and that the nature of the existing barriers means that they are only likely to rise slowly. The second relates to the principle of fairness - government support for property-level measures would spread the benefits more widely than investment in traditional flood defences.
- 1.20 As we have seen, very few households take any steps to protect their property from flooding, even when the risk is quite significant. As the benefits of such measures to society outweigh the costs by ten to one for homes with the highest annual chance of flooding,¹⁶ there is a case for government intervention to ensure that more households take these measures.
- 1.21 Some of the barriers to take-up are unlikely to change very quickly in the absence of government intervention. The evidence from the related areas of household fire risk, burglary and seat-belt use, for example, suggests that protection measures do not become accepted as 'normal' until some form of external pressure obliges people to adopt them. Similarly, a critical mass of people need to use a measure before it starts to become well-known and well-trusted as a response to a risk, and at the present rate of use it appears that flood protection is some way from reaching that critical point. At the same time, there is no evidence of any change in the view of many that government, and not the individual householder, is responsible for managing flood risk.
- 1.22 The significance of the barriers to take-up is likely to reduce over time. However, it is not clear whether and how quickly these changes will occur. We believe that government policies will be required to speed up the rate of change.
- 1.23 Government action to encourage property-level protection and resilience would also spread public resources more evenly across communities at floodrisk. Under the present system, a home in a large, highly populated area of risk is more likely to be defended from flooding than an equally at risk home in a sparsely populated and smaller area. To allocate all state funding to the most cost-beneficial forms of flood risk management would deprive many householders in smaller clusters of risk of any government assistance whatsoever. Under the current system of prioritisation, such areas are disadvantaged by the fact that any defence scheme would protect less homes and would therefore have lower benefits. These proposals go some way toward addressing that situation. In communities that are unlikely to benefit from investment in traditional flood defences, one way to complement the current approach is to support householders to improve the flood protection and resilience of their own homes.

¹⁵ Harries T (2008) 'Feeling secure or being secure? Why it can seem better not to protect yourself against a natural hazard'. *Health, Risk and Society*, 10 (5).

¹⁶ That is, for homes in areas with a 10% or greater annual risk of flooding.

Q2 Do you think that the Government needs to give more information to high-risk and help them do more to protect themselves? Alternatively, do you think that the level of property-level flood protection and resilience should be left to market forces and individual choice?

Details of pre-consultation activities

1.24 Initial thinking on measures to encourage take-up of property-level flood protection and resilience was developed through the consultation process for the government's new strategy for flood and coastal erosion risk management, Making Space for Water. This took account of over 250 formal responses to the consultation from a wide variety of stakeholder organisations, companies and individuals, as well as several stakeholder consultation workshops.¹⁷ Ongoing consultation on the implementation of Making Space for Water occurs through the Defra Flood Management Stakeholder Forum.¹⁸

1.25 This consultation draws on various sources of research and expertise:

- In June 2007, Defra commissioned Entec and Greenstreet Berman to evaluate the likely economic costs and benefits of property-level protection measures and to investigate the barriers to their wider take-up. The report of this work provides a core part of the evidence on which the consultation is based.¹⁹
- Also in June 2007, Defra initiated a pilot to test the viability and impact of a scheme to provide government grants to householders in areas of high flood risk. The evaluation of this pilot by its Environment Agency and local authority administrators and by Defra staff has also contributed to the design and evaluation of the policy options²⁰.
- In January 2008, Defra and the Flood Hazard Research Centre co-hosted a meeting of experts from universities, public bodies and consultancies to discuss the emerging set of options.
- In April and May 2008, Dr Tim Harries of the Flood Hazard Research Centre interviewed householders in Nottinghamshire and Leeds who had received publicly funded protection measures.
- In May 2008, Defra convened a meeting with stakeholders, at which Entec and Greenstreet Berman presented their draft research findings and Defra presented its draft policy ideas.
- Defra staff have engaged in ongoing communications with various stakeholders, including the National Flood Forum, Association of British Insurers, Royal Institution of Chartered Surveyors, and the Flood Protection Association (trade association of manufacturers and installers of flood protection products and systems).

¹⁷ Further information from <http://www.defra.gov.uk/enviro/fcd/policy/strategy.htm>

¹⁸ More details <http://www.defra.gov.uk/enviro/fcd/policy/forum.htm>

¹⁹ Entec and 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, <http://www.defra.gov.uk/enviro/fcd/policy/strategy/FD2607SR.pdf>;

²⁰ See <http://www.defra.gov.uk/enviro/fcd/policy/strategy/RF1summaryreport.pdf>

- Between 2004 and 2008, in work sponsored by the Economic and Social Research Council and the Environment Agency, Tim Harries researched the barriers to householder-level barriers to flood protection and resilience.

How to respond and timing

- 1.26 The deadline for responses is **31 October 2008**. All responses should be sent via e-mail to floodresilience@defra.gsi.gov.uk or by post to:
- 1.27 Alternatively, responses can be sent by post to: Flood Resilience Consultation, Defra, Ergon House, Area 2D, Horseferry Road, London SW1P 2AL. If you have any queries, please call the Flood Resilience Consultation Co-ordinator on 020 7238 6239.
- 1.28 You are welcome to comment on all aspects of this consultation, but there are some specific issues on which we would particularly value your input. These are presented as questions throughout the document and are also summarised below for your convenience.
- 1.29 In your response please:
- Explain who you are and, where relevant, who you represent. Also include your name and address.
 - Order your comments under the same headings as the consultation paper.
- 1.30 Please note that comments received might be made publicly available unless those providing comments clearly mark them “In Confidence”. All responses will be included in any statistical or other summary of the results. Please see the section on Freedom of Information in the Cabinet Office consultation guidance for more information.²¹ You should also be aware that Defra might, in some circumstances, be required to communicate information to third parties on request, in order to comply with its obligations under the Freedom of Information Act 2000 and the Environmental Information Regulations. All responses received by the deadline will be analysed and a summary placed on the Defra website.²²

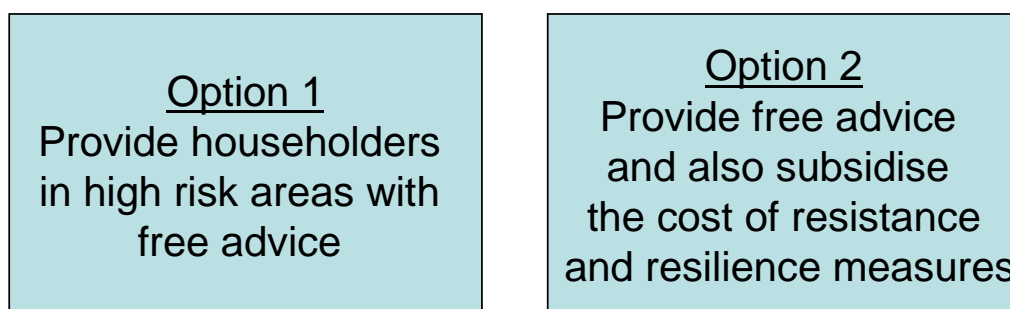
²¹ The Better Regulation Executive works across government to reduce and remove unnecessary regulation for the public, private and voluntary sectors; <http://bre.berr.gov.uk/regulation>

²² Further information at <http://www.defra.gov.uk/enviro/fcd/adaptationandresilience/propertyresilience.htm>

Part 2: Increasing take-up of property-level flood protection and resilience

Introduction

- 2.1 Defra plans to contribute at least £5 million to a scheme to support households who face a particularly high risk of flooding.²³ The funding, which comes on top of any help already provided by local authorities, the insurance industry and households themselves, is aimed at those in areas that flood frequently but are not protected with traditional flood defences from the Environment Agency.
- 2.2 This part of the consultation describes two potentially complementary options to increasing the take-up of property-level measures as part of this scheme: (1) providing at-risk communities with free and independent household-level advice on how to reduce potential flood damage²⁴ and (2) subsidising the costs of the measures for households who could not afford to purchase them by themselves. This section of the report does not cover the issues of resilient repair or resilient new-build. These are covered briefly in Part 3 of this document.



- 2.3 The first option involves providing free, independent and tailored advice to at-risk households in the form of a free home flood survey. Households would be responsible for funding the costs of the measures themselves, either as an upfront cash payment or a loan, for example by extending their existing home mortgage. In the second option, householders would not only be offered free advice, but also a contribution toward the cost of the measures. We propose initially that this would be capped at £4,500 per property.
- 2.4 The two approaches are not mutually exclusive. Indeed, the scheme could be made flexible enough to allow funding packages to cover a combination of the two approaches, in line with local circumstances.
- 2.5 Both options rely on the Environment Agency identifying areas with a significant chance of flooding and where no investment in flood defences is planned. The Agency would need to work with local authorities to identify areas with local

²³ This is part of the £28 million that Defra has set aside for 2008 – 2011 to assist communities in adapting to change where constructing defences is not the most appropriate means of managing flood and coastal erosion risk.

²⁴ Unlike the information currently offered by the Environment Agency, the focus of this advice would be on measures to reduce the risk rather than on the existing size of the risk.

flood problems (including surface water drainage) and communities that were most likely to be receptive to property-based approaches. The criteria for assessing risk will need to be robust and comparable nationally.

- 2.6 We propose that in these selected areas, local authorities, with the support of local Environment Agency staff, would engage and consult with communities as a means of generating buy-in. The Government will consider the cost implications for local authorities of any proposals taken forward and will ensure that the net additional cost is fully and properly funded.
- 2.7 Our present proposals apply only to households and not to businesses. Although businesses, too, can benefit from protection and resilience measures, take-up rates are far lower amongst householders, so we believe that take-up in this sector is in greater need of a kick-start. Businesses – and particularly larger businesses – tend to have more experience and knowledge of risk management techniques.

Q3 If a government grant scheme were to be introduced, do you agree that it should initially focus on households rather than businesses?

Free home flood survey

- 2.8 Under this first option, local authorities would use a central government grant, administered by the Environment Agency, to offer at-risk households a free home flood survey, which looked at the sources and scale of possible flooding, and ways to reduce its impact. The funding would cover all administration and management costs associated with the scheme. Free surveys would be targeted at areas and households that had annual chance of flooding of 2% or greater (once every 50 years on average) and where there was little prospect of traditional flood defences.
- 2.9 Independent professional advice is fundamental to increasing take-up of property-level flood protection and resilience measures. Professional advice is important for ensuring that solutions work with the structural characteristics of the house and are appropriate for the type of flooding expected. Furthermore, half of the householders participating in the Entec and Greenstreet Berman survey agreed that they were deterred from taking property-level measures by a lack of confidence about which measures to take. In-depth interviews with at-risk residents has suggested that anxiety about making the wrong choice was an important barrier to take-up.²⁵
- 2.10 Due to the various means by which water can gain entry into a property and the technical difficulties of blocking these entry-points, flood protection for an individual property can be complicated. The selection of an appropriate and effective measure depends on many different factors: the type of soil on which the house is built, the likely depth of water, the length of time for which it is likely to remain, the possible impact on the structural integrity of the building, etc. Households find this amount and nature of information too complex to marshal.

²⁵ Harries T. (2007). *Householder responses to flood risk: The consequences of the search for ontological security*. PhD thesis. London: Middlesex University.

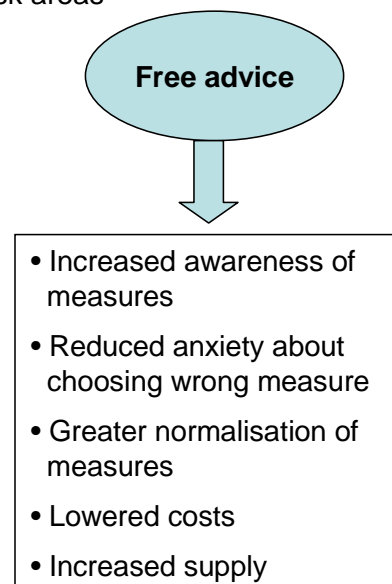
Furthermore, aside from the use of sandbags,²⁶ there are no well-established norms for how a home can be protected.

- 2.11 These factors make it difficult for many householders to choose a measure with any confidence unless they have expert advice. And if this advice comes from a purveyor of a particular product then it might be treated with suspicion. In the words of one at-risk resident in Reading:

It's hard enough buying double glazing, where you all know how it happens, without having to go off and be ripped-off by someone who sells you plastic sandbags or something which is, for all we know, a snake-oil not going to do any good. Whereas if somebody came with a sort of recommendation or seal of approval to everything, 'we have tested these products, we know they've worked in other areas with similar problems', then that would, you know, I would be more confident about shelling out however much it was.²⁷

- 2.12 These arguments suggest the need for independent, expert advice that is tailored to households' particular situations. Offering free surveys should lead to the adoption of more appropriate and effective measures than would be the case where no such advice was taken.
- 2.13 Advice would take the form of standardised Home Flood Risk Surveys. These would need to be delivered by qualified flood risk experts, such as surveyors or structural engineers, and should include analyses of the extent and nature of the risk as well as suggestions for property-level flood protection and resilience options. Professionals providing this advice would need to be covered by liability insurance.
- 2.14 Based on experience from the Defra pilots, purchased individually, surveys can cost up to £1,000, but if purchased collectively through the local authority the costs are closer to £500. Households would be responsible for funding the costs of the measures themselves, either as an upfront cash payment or loan, for example by extending their existing home mortgage.
- 2.15 According to the National Flood Forum, sources of such advice are in short supply and difficult to locate. This view is supported by evidence from a survey by the Royal Institution for Chartered Surveyors, which indicates that only 14% of its members would "feel professionally competent to undertake a survey of an individual property and provide

Figure 2.1 Anticipated benefits of the provision of free advice to households in at-risk areas



²⁶ The Pitt Review received much evidence that sandbags were relatively ineffective in helping householders mitigate the effects of flooding; Sir Michael Pitt (2008) *Learning lessons from the 2007 floods*, The Pitt Review, <http://www.cabinetoffice.gov.uk/thepittreview.aspx>

²⁷ Taken from Harries T. (2007). *Householder responses to flood risk: The consequences of the search for ontological security*. PhD thesis. London: Middlesex University.

advice on the implementation of flooding property-level protection and resilience measures.” The web-pages of the Royal Institution of Chartered Surveyors (RICS) display just seven surveyors who offer this service.²⁸ However, RICS tells us that a substantial proportion of their membership would like to work in this area of practice. The implementation of this option should provide an incentive for companies to enter the market place and train more of their staff in this speciality.

- 2.16 Providing a home flood survey free of charge would remove one part of the cost deterrent to the take-up of measures. It should also increase awareness of the available measures, reduce anxiety about the choice of measure and help embed the concept of individual preparedness into social normal. Furthermore, by generating more demand for flood surveyors, it should bring down the costs of such services and the measures that they offer (Figure 2.1). The resulting advice could also be used to negotiate with insurers, as it should allow the insurance industry to improve their own assessment of risk and the insurance terms that they offer to customers.
- 2.17 Precedents for provision of free advice already exist. Household visits and advice on both fire safety and burglary prevention are offered to householders free of charge.²⁹ Tailored advice on reducing radon levels, by contrast, attracts a fee,³⁰ although the Health Protection Agency offers a free telephone hotline. In addition, government funded telephone advice on reducing household energy bills is available free of charge from the Energy Savings Trust.³¹

Q4 Do you think that a free home survey scheme would be an effective way to drive increased take-up of property-level flood protection and resilience? What else could be done to encourage greater voluntary take-up of such measures?

- 2.18 Under this option, households would be responsible for funding the costs of the measures themselves. This, of course, introduces the risk that householders will accept the free survey but then not pay for the measures themselves – leading to wasted effort in surveys. In this option, the conversion rate from survey to installed measures is critical. If the conversion rate for households who receive a free survey drops below around 3 in every 20, the policy will no longer be cost-beneficial (Annex C). On the other hand, if local authorities carry out a certain amount of vetting to ensure that households are only given the free survey if they have shown some signs of commitment to the idea of purchasing measures, the net benefits will increase.
- 2.19 We have little evidence on the likely impacts of the provision of free flood risk surveys. In-depth interviews with beneficiaries of state funded protection in Leeds and Gunthorpe indicate that most would probably not have paid for any measures themselves, even if they had received advice on which measures were appropriate. This is supported by evidence from one of the pilots in Cumbria, where it was reported that households who had received free flood

²⁸ <http://www.ricsfirms.com>

²⁹ HM Government & English Fire and Rescue Services (2007) *Fire Gateway*, <http://www.fire.gov.uk/Home+safety> ; Association of Chief Police Officers, Local Government Association, Nacro, Crime Concern, Centrex, Criminal Justice IT, National Community Safety Network & Home Office (2006) *Beat the burglar – An on-line leaflet providing home security advice to members of the public*. BiP Solutions, on behalf of The Home Office.

³⁰ <http://www.bre.co.uk/radon/feepaid.html>

³¹ <http://www.energysavingtrust.org.uk/content/view/full/20402>

barriers for some of their doors were unwilling to pay for the protection of the remainder.

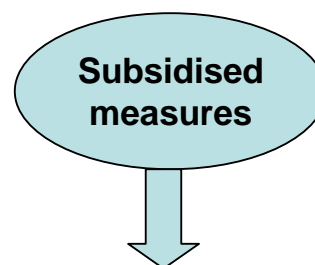
- 2.20 Nevertheless, there are now some good options for funding the extra costs. In high-risk areas, flood protection and resilience work could help protect the value of properties. The Council for Mortgage Lenders have confirmed that lenders would normally be willing to consider extending loans to cover such additional costs where homeowners have sufficient equity and can afford to meet any additional repayments.
- 2.21 For poorer households, the per-household cost of protection (between £4,000 and £8,000) is likely to represent an insurmountable barrier. In such cases, the provision of a free survey is unlikely to be a sufficient incentive to prompt take-up of the measures. In the absence of any other source of funding, therefore, this option is likely to lead to low levels of take-up amongst poorer households. In such cases, communities have the possibility of using local funding sources should they wish to do so: for example the local floods levy raised through local authorities or the Regional Housing Pot (although local authorities and the regions will need to consider this against other competing priorities, such as increasing the number of vulnerable households in private sector decent homes). Some areas have demonstrated commitment to resilience approaches, as shown by the Gunthorpe project near Bleasby in Nottinghamshire where a £250,000 project provided protection for 34 houses without central government support.³²

Q5 Is it reasonable to expect people living in high-risk areas to pay much or all of the cost of protecting their homes from flood damage? What viable options exist for supporting lower-income households?

Government grants to subsidise costs for lower income households

- 2.22 In the absence of financial support, the cost of property-level measures (£4000 - £8,000) is likely to prevent those on low incomes from installing such measures in their home. Others will choose not to spend money on measures – in part because the benefits may not be realised immediately. A government grant administered through the local authority that fully or partially subsidised the costs might overcome these barriers.
- 2.23 Defra has piloted such an approach with six local communities. This followed a grant scheme established by the Welsh

Figure 2.2 Additional benefits of subsidising the cost of the measures



- Better affordability
- Diminished sense of injustice
- Greater normalisation of measures
- Better benefit-cost ratio
- Increased confidence in measures

³² Defra (2008) *Resilience Grants Pilot Projects – Final Report*, <http://www.defra.gov.uk/enviro/fcd/policy/strategy/RF1summaryreport.pdf>

Assembly Government, and the work of several water companies, including Severn Trent Water and Thames Water, to provide customers who were at greatest risk of sewer flooding and where a capital solution was not cost-effective with property-level flood protection measures.

- 2.24 In this option, either a capped level of support would be provided to all households or packages of measures could be fully funded for poorer households. At present, we have assumed an across-the-board cap of £4,500 per property. This was the value used in the six Defra pilot projects and would constitute a complete subsidy for many homes. However, it would not pay for full protection for larger houses (where the costs of protection are higher) or households requiring permanent protection measures, such as those vulnerable to flash-floods or where residents would not be able to deploy temporary protection. Central government would provide additional funding to cover the full amount of any administration and management costs incurred by local authorities and the Environment Agency.
- 2.25 In the Entec and Greenstreet Berman survey, over half of people living in areas of significant flood risk gave expense as a reason for not taking property-level protection or resilience measures, even though 61% said that they believed such measures would save them money in the longer term.
- 2.26 For some, cost will be an absolute barrier. The margin between their basic living costs and their income will not allow them to spend money on property-level flood protection and resilience measures – or they may not have enough credit-worthiness to raise the money with a loan. Others, however, will choose not to spend the money on property-level measures because they do not deem them worthwhile or because of the opportunity costs. This is illustrated in the following exchange between an interviewer and a resident of a high-risk area of London:
- | | |
|-------------|--|
| Interviewer | Is expense the kind of thing that's just deciding ...? |
| Respondent | It would be one of the things. |
| Interviewer | I think it's something like 300 quid or something. |
| Respondent | Yeah, for 300 quid I'd get a wardrobe to replace the rack in my bedroom. You know, you live on your own in Zone 2 in London and 300 quid is a lot of money. So yeah, it would be an expense I'd have to think really hard about. ³³ |
- 2.27 In these circumstances, subsidising the costs of measures is likely to increase take-up of property-level flood protection and resilience considerably (Figure 2.2). In the six Defra resilience pilots, seven out of ten households who were offered the grant accepted the offer. A subsidy scheme will go some way to satisfying the need amongst households for the state to make a contribution towards the cost of protection (see arguments on barriers to action in Part 1). And as public money is being spent on property-level measures, this can help drive home the message that a state funded community defence is unlikely.
- 2.28 We also anticipate spill-over effects. Given the likely visibility and profile of such schemes, we expect them to influence perceptions of property-level measures amongst a far greater number of householders. This was the case in the Nottinghamshire pilot area, where some of the surrounding villages are said to

³³ Taken from Harries T. (2007). *Householder responses to flood risk: The consequences of the search for ontological security*. PhD thesis. London: Middlesex University.

have become interested in risk mitigation as a result of the use of these measures in the pilot village.

Q6 Is it appropriate to use public funds to subsidise the costs of flood protection or resilience for individual properties, rather than just paying for a free home survey?

2.29 A balance will need to be found between the amount spent on consulting with residents and administering the schemes on the one hand, and the amount spent on the surveys and subsidies themselves on the other hand. In some of the Defra pilots, the costs of the subsidies and surveys only comprised 60 – 70% of the total Defra grant – in part, because of the relatively small number of homes protected in each area.

Q7 Do you have suggestions on how we could ensure that any future grant scheme is simple to administer but also fair? Do you think that it would be a good idea to deliver the free surveys or the subsidies via teams who already deliver similar schemes, such as those responsible for private sector housing renewal?

2.30 Given that funding for such a scheme will always be limited, one option would be to offer a reduced level of grant to a larger number of properties. In the pilots, some property owners were prepared to bear some of the costs themselves. The Uckfield pilot, where business premises were targeted, insisted on a minimum owner contribution of 25% of the costs. At the Sands in Appleby, however, about 10% of properties only installed works to the value of the available grant, deciding to complete the works when more funding was available. Here there was a clear feeling that households should not have to contribute toward property-level protection when people benefiting from community-level defences made no such contribution.

2.31 Evidence from the Appleby pilot indicates that householders will sometimes be content, at least initially, to leave their homes semi-protected, even if, in practice, the risk has not been reduced at all. Such householders are only likely to be persuaded to complete the protection measures when they have been flooded again and have witnessed the benefits experienced by neighbours with full protection. On the other hand, as the following quote illustrates, a state grant to cover a part of the costs of measures might prompt some people to spend their own money on completing the work:

Interviewer	What role would the financial help...?
Respondent	[Interrupting] Showing that it was, in their opinion, something worthwhile. It wouldn't be so much that ... You know, that if there is a collective conviction. I mean, you know, they have more experience than I have. I mean, more competence I hope. And if they're ready to sort of say, we shall help you, it corresponds to their kind of judgement, not that... it's so much the money itself [...] ³⁴

2.32 This quote highlights the importance of the visibility of the subsidy. This option not only helps overcome the financial barrier to take-up, it also provides evidence of the state's commitment to the principle of property-level protection.

³⁴ Taken from Harries T. (2007). *Householder responses to flood risk: The consequences of the search for ontological security*. PhD thesis. London: Middlesex University.

Offering the subsidy in a less visible guise, for example by exempting flood protection products from VAT, would reduce this benefit by making the subsidy less apparent.

- 2.33 In order to have any significant impact on take-up, therefore, subsidies should constitute a reasonable proportion of the overall cost of the measures. In the sensitivity analysis that we carried out as part of the Impact Assessment (Annex C), we found that if the level of subsidy dropped to such a level that it cannot attract at least one-in-five households to take up the subsidy, the policy ceases to be cost-beneficial, primarily because of the high costs of administering a subsidy scheme.

Q8 Should any subsidy scheme offer full subsidies for a small number of high risk properties or partial subsidies for a larger number of properties? Is a £4,500 cap for the measures themselves (excluding survey) an appropriate level for the subsidy?

- 2.34 Another important consideration is whether all households in areas of high risk (i.e. a 10% or greater annual risk) that are not going to be defended would qualify for a subsidy on the costs of the measures, or whether only low-income households would be eligible. Some may argue that public funds should only be used to help those who can least afford to pay for flood protection or resilience themselves. On the other hand, others could argue that the grant should be available to all those, regardless of income, who are at high risk and have no prospect of benefiting from community-level defences.
- 2.35 The feedback we have received from the local authorities who participated in the Defra pilot indicates that means-testing would significantly increase the administrative costs of any scheme, even if it was managed alongside an existing scheme such as private sector housing renewal. Some of these local authorities suggest those of qualifying benefits may be an easier and less expensive proxy to full means testing. This approach is used in the Government's Warm Front grants scheme. This scheme offers fuel-poor households that are on qualifying benefits a grant of up to £2,700 where a gas central heating measure is required or up to £4,000 where an oil measure is needed.³⁵

Q9 Should the subsidy be offered to all appropriate at-risk properties or only low-income households or communities? Should the subsidy be available to all those on qualifying benefits or based on full means-testing?

Comparison of the two approaches

- 2.36 Because of the lower public spend per household, we estimate that, for the same public investment, the free survey option would lead to the protection of three times as many homes as the subsidy option (10,000 vs. 3,800 homes for a notional investment of £20 million).
- 2.37 The survey option assumes that one in three at-risk households who are given a free home flood survey then go on to install an appropriate set of measures.

³⁵ http://www.direct.gov.uk/en/MoneyTaxAndBenefits/BenefitsTaxCreditsAndOtherSupport/On_a_low_income/DG_10018661

However, there remains a risk that a higher proportion of households than expected will not act on the advice set out in the survey and that the number of protected properties (and the net present value) will be lower than anticipated. Any scheme should include some kind of vetting, so that surveys are not carried out for householders who have no desire to pay for the measures themselves.

Table 2.1 Summary results for main policy options, assuming a notional total sum of £20 million over five years for a scheme. Defra has committed at least £5 million to support the first two years of a scheme.³⁶

Option	Baseline (do-nothing)	Survey-only (net of do-nothing)	Survey-and-subsidy (net of do-nothing)
Number of properties adopt measures	500	10,000	3,800
Public spend per protected household	£0	£1,900 ^a	£5,400
Societal Benefit-Cost Ratio	3.3 ^b	1.5	1.6
Societal Net Present Value (over 20 years)	£8 million	£43 million	£19 million

^a As some surveys are wasted and do not result in property-level protection, this is greater than the £500 for a single household survey

^b The baseline has the highest benefit-cost ratio, because there are no administrative costs of implementing a government scheme. However, total benefits are much smaller because of low total take-up of property-level measures.

Q10 Do you think that the costs and benefits for the government schemes outlined in the Impact Assessment (Annex C) are reasonable estimates? Do you have further information to help refine the estimates?

2.38 On the other hand, offering to subsidise the costs of the measures could be considered fairer than only providing a free flood survey, as it does not disadvantage those on lower incomes. The survey-only option will leave poorer households unprotected if they are unable to afford measures.

2.39 A further advantage of the second option is that it facilitates collective action on property-level flood protection and resilience; unlike the first option, which leaves it to individual households to decide whether to purchase property-level protection and resilience and when to do so. This has implications for costs, because local authorities purchasing products on behalf of groups of households are likely to be able to obtain a lower price than could be obtained by loan householders. It also has implications for effectiveness. Floodwater can pass through party walls and can flow along shared foundation cavity spaces. As a result, for property-level protection measures to be fully effective, adjoining semi-detached properties both need to be protected. Depending on the design of the building, so too, potentially, do all the homes in a single terrace. This is far more achievable when take-up percentages are higher. Finally, the second option has the advantage that it facilitates the setting up of community flood

³⁶ This is part of the £28 million that Defra has set aside for 2008 – 2011 to assist communities in adapting to change where constructing defences is not the most appropriate means of managing flood and coastal erosion risk.

response schemes, which are more viable where the majority of neighbours employ flood protection measures of the same type.

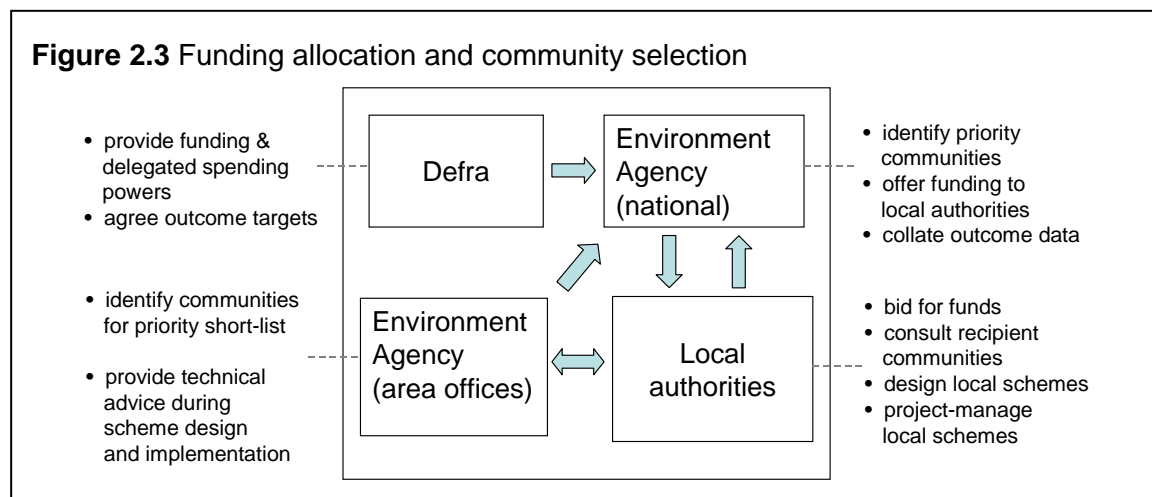
Q11 Which approach do you think will be most effective at increasing take-up – offering free home surveys to households in a large number of high-risk communities, or offering to subsidise property-level measures for households in a smaller number of communities?

Delivery mechanisms

- 2.40 Under both these options, Defra would provide the funding – initially via a ring-fenced portion of the block-grant to the Environment Agency (Flood Defence Grant in Aid), which would then be passed on to participating local authorities (Figure 2.3). This would cover the grant costs plus any net additional administration and management costs borne by the delivery partners. The Environment Agency would set clear criteria for the use of this funding, so that the criteria for assessing risk needs to be robust and comparable nationally. It would also, in discussion with those local authorities who were willing, decide and nominate communities to be given priority access to the initiative, namely areas with significant chance of flooding and unlikely to receive a community flood defence. The approach should allow local authorities to bring local flood risk problems, such as surface water drainage, to the attention of the Agency.
- 2.41 Ideally, the Environment Agency would put together a two- to three-year programme of funding agreed upfront and planned in advance. The Agency would also co-ordinate the collection of outcome data, including statistics on the number of homes that benefit, the types of measures implemented and, over time, the durability of these measures and their effectiveness in actual flood events. All of these roles are consistent with the Environment Agency having a strategic overview for all sources of flooding, as set out in the original Making Space for Water and, subsequently, in the Government's initial response to the Pitt Review.
- 2.42 The Environment Agency already assesses flood risks and designs flood risk management approaches for its Catchment Flood Management Plans and Shoreline Management Plans and also in its strategy-level planning processes. At present, however, proposals for property-level solutions tend to be marginalised in these processes by the lack of suitable funding mechanisms and an absence of agreed methods for calculating their likely benefits.³⁷ The provision of a separate funding stream and of evaluation guidelines would remove these barriers and encourage the Agency's flood risk managers to look more favourably on this approach. Furthermore, the Environment Agency's long-term investment strategy (due to be published in Spring 2009) will combine a wide range of data sources and should provide a strategic overview of flood risk, thereby enabling government to assess funding needs, evaluate appropriate mechanisms and prioritise allocation of resources more efficiently.

³⁷ Schanze J, Hutter G, Harries T, and others (2008) *Systematisation, evaluation and context conditions of structural and non-structural measures for flood risk reduction*, FLOOD-ERA joint report. London: CRUE ERA-Net

2.43 Currently, the Agency does not have the legal powers to carry out works on individual properties. However, the proposed Floods and Water Bill, which will be published in draft form in 2009, will provide an opportunity to ensure that a more holistic and wider ranging portfolio of approaches becomes part of the options considered for managing flood risk rather than strictly "defence".³⁸ The Bill will also look at the powers and responsibilities that local authorities will require to carry out their role in local flood risk management.



2.44 We propose that local authorities should take the lead role in managing the initiative for each of the identified communities within their jurisdiction. Rather than implementing schemes itself, the Agency would deliver them in partnership with the local authority. Once the Environment Agency's national office had selected its short list of areas in discussion with local authorities, area offices would offer the relevant local authorities the opportunity to participate in the scheme. The initiative would only go ahead in areas where the local authority was willing to do so and showed commitment to the principles and aims of the initiative.

2.45 Local authorities are probably in the best position to lead on the implementation of such schemes – although any net additional resource costs would be paid for by central government. Local authorities know the needs and characteristics of their communities and often have a good idea about local flood risk issues (including surface water problems). In particular, they would be able to identify properties at risk of flooding from multiple sources, such as from overland run-off, culverts, highways and sewers. They will be able to identify those areas where people are most likely to respond positively to the offer of free surveys or subsidised measures and where take-up, therefore, is likely to be higher. This role would fit with Sir Michael Pitt's recommendation that local authorities take the lead in flood risk management for their local area.

2.46 While the Agency has the requisite expertise in flooding and flood risk management, local authorities are more knowledgeable about the composition and nature of their local populations and businesses and are more practiced at engaging with them on local matters. They also have more experience in building and property management. This puts local authorities in a better position to select an approach that is most likely to be successful with any local

³⁸ More information from <http://www.defra.gov.uk/enviro/fcd/floodsandwaterbill.htm>

community and to implement that approach effectively. Given the experience local authorities already have of delivering home improvement grants, we also believe that they already have the experiences and many of the systems necessary for the implementation of these initiatives. The Government will consider the cost implications for local authorities of any proposals taken forward and will ensure that the net additional cost is fully and properly funded.

- 2.47 Delivering such a scheme would comprise several key components of work, including encouraging communities to engage in the design and implementation of the schemes so as to foster their commitment to its principles and increase levels of take-up (Figure 2.4). It would also include procurement of the surveys and measures. This would not only introduce economies of scale, but would also send a clear and positive message to the markets that provide these services, encouraging them to develop provision and build their skills in these areas.
- 2.48 The Environment Agency would work in partnership with local authorities throughout the process. For example, Agency staff would be closely involved in the process of consulting and engaging with communities and could advise on the procurement process for home flood risk surveys. The communication of information on the scale of risk will also be a key element of the process of engaging community members with these schemes (see later). Furthermore, Environment Agency involvement will be useful for ensuring that any grant for temporary flood protection is conditional on sign-up to an existing flood warning scheme.
- 2.49 Local authorities might want to consider administering the scheme alongside an existing programme, such as the private sector housing renewal grants / loans programme (which is part of decent homes). Local authorities would have some flexibility and local discretion about how they operate such a scheme. The aim of the Private Sector Decent Homes policy is to increase the number of vulnerable households living in private sector decent homes. Vulnerable households are defined as those on the principal means tested or disability benefits. In order to make public funding go further and reach those most in need local authorities, where appropriate, are encouraged to fund private sector improvements for vulnerable people through loans rather than grants.
- 2.50 The Regulatory Reform (Housing Assistance) (England and Wales) Order 2002 gives extensive powers to local authorities to develop flexible solutions to deal with poor condition housing according to local priorities. These include the power to offer loans and equity release, as well as grants. It is for local authorities to decide the circumstances in which to give discretionary assistance and what form that assistance may take. Before the powers contained within the Regulatory Reform Order can be used, the local authority must publish a policy on how it intends to use them.
- 2.51 For example, St Leger Homes, which manages 22,000 homes on behalf of Doncaster Council, made resilient repairs to 138 properties that flooded in the summer of 2007. The homes, originally designated for improvements under Doncaster Council's Decent Homes Scheme in 2009/10, were brought forward in the scheme as a result of the floods. The flood resilient repairs form part of wider improvements that cover kitchens, bathrooms and electrical wiring.

Q12 How could local authorities, the Environment Agency and communities best work together to deliver property-level schemes? What should their respective roles be?

- 2.52 Any approach would involve consulting with the affected communities. This can be a challenging and resource-intensive activity. We know from the pilot evaluations and from interviews with householders in the pilot areas that people living in areas that frequently flood tend to attribute blame to past planning decisions, asset / river maintenance programmes and decisions made by responsible authorities during flood events. We also know that their clear preference is to “keep the water right away” from their properties rather than to stop it at their perimeters.
- 2.53 To foster public engagement in the schemes and to ensure high take-up of the surveys and / or subsidies, effective consultation and communication with the selected communities will be essential, as will the harnessing of the commitment and enthusiasm of existing community bodies. Experience with Defra’s pilots suggests that take-up was definitely influenced by the level of existing community involvement in flood risk management and awareness and acceptance of risk. Public engagement activities should target private landlords and social landlords, as well as owner-occupiers. We would expect the Environment Agency and local authorities to both contribute to this part of the process. Although we would expect local authorities – as the bodies with the best links into communities – to lead on this process, the role of the Environment Agency in communicating risk levels and explaining property-level protection measures would also be critical. The administrative and programme resources needed for this process would be paid for by the central government grant.

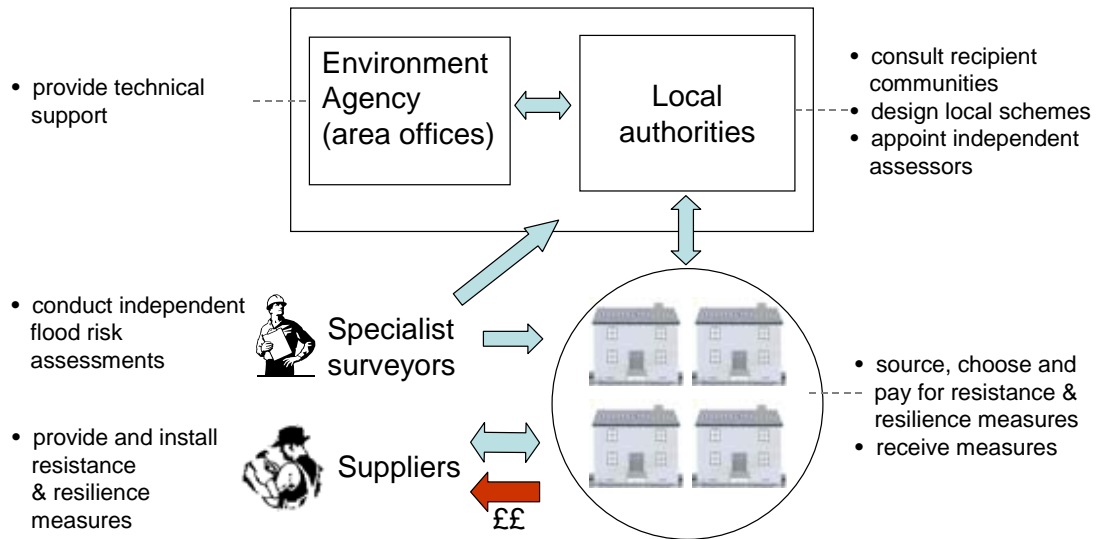
Q13 What would be the most effective ways of consulting with members of selected communities in order to communicate risk information, help them understand flood protection and resilience, and engage them fully in the schemes?

- 2.54 It will be important to balance the degree of local flexibility with the need to avoid overly complex administrative burdens. One approach might be to give local authorities a fixed amount of grant for each suitable high-risk household in their area. This would allow them to apportion that money to whatever mix of the two approaches they deemed appropriate, perhaps within certain bounds. For example, local authorities might choose to use the funds they receive from central government to pay for the costs of measures in poorer areas whilst only paying for surveys in relatively wealthy areas. Alternatively, the scheme could be made flexible enough to allow funding packages to cover a combination of the two approaches, in line with local circumstances of special need, such as low-income areas where residents would be less able to afford to pay for their own protection.

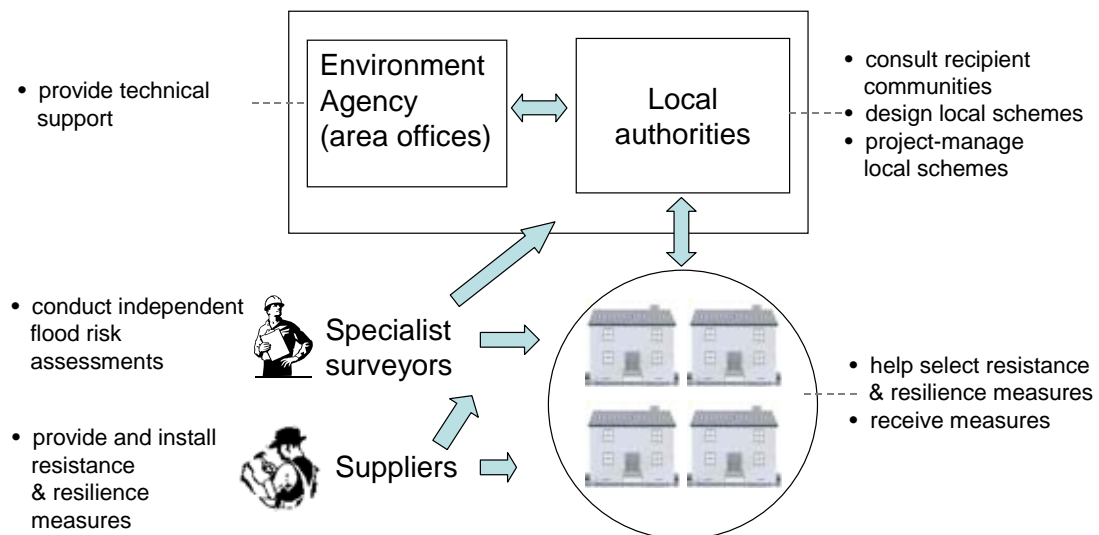
Q14 Do you support an approach that promotes local flexibility of spend or do you prefer a more nationally consistent approach?

Figure 2.4 Scheme design and implementation

(a) Free home flood survey



(b) Subsidise costs of property-level measures



Part 3: Further issues, including encouraging resilient repair and refurbishment

Professional expertise and product certification

- 3.1 The current shortage of professionals offering flood risk surveys could hamper implementation of this initiative. Defra has been working with the Royal Institution of Chartered Surveyors (RICS) and are encouraging them to consider ways to increase capacity and expertise, for example through continuing professional development or by a system of self-certification for surveyors with specialist flooding expertise. Other institutions (e.g. the Association of Building Engineers) might also want to take such steps. This would be more likely once the proposed initiative was announced and there was an assured growth in demand. The commitment of such institutions would be encouraged, in particular, if local authorities let contracts for surveys rather than this being left to individual householders. The amount of extra training needed by a qualified surveyor or building engineer is not substantial, so the number of certified professionals could grow quickly in response to increased demand.

Q15 Which professional groups are appropriate for the role of conducting household flood risk surveys? What more needs to be done to increase capacity and expertise on flood risk issues amongst these professional groups?

- 3.2 An Environment Agency sponsored British Standards Institute (BSI) Kitemark scheme exists for temporary flood protection measures. Any company gaining approval offers flood protection products that have been tried and tested. However, there are supply-side issues, because the suitability and effectiveness of recently developed products, including flood/waterproof doors, have not been tested. The testing facilities have been dismantled due, we are told, to a lack of demand.

Q16 How can we encourage new innovative flood protection products, while ensuring a robust system for testing new products? What is needed to provide assurance that products are suitable for their intended use, such as the reinstated BSI Kitemark or an alternative quality assurance mark?

Resilient repair and refurbishment

- 3.3 When a building is flooded, it is common for floors, kitchens, walls and electricity circuits to be damaged. Floor timbers, carpets and laminate coverings may need to be replaced; new kitchen units and white goods may need to be purchased; walls may need to be stripped down to the brick and then re-plastered, and electricity cabling may need to be renewed.
- 3.4 Flood-resilience measures (Table 3.1) reduce the cost of flood damage by at least half and reduce the time for which householders have to vacate their

properties. For those that have renovated their property with a resilient finish, the benefits can be real and tangible. For example, Norwich Union funded the retro-fit of a house in Lowestoft with resilient measures (tiled concrete floor, water proof plaster, raised electrics, appliances on plinths). After the property flooded late in 2006, the householder only had to mop floors and walls in order to return the home to its normal state, and was back in the property a few days later. In contrast, neighbours had to replace carpets and wooden flooring to make their homes habitable again, leading to prolonged stays in alternative accommodation while properties dried out properly and were repaired.

- 3.5 However, use of flood resilient materials is even lower than take-up of property-level flood protection. Evidence collected by Entec and Greenstreet Berman³⁹ suggests that, in areas of significant risk, only one in twenty-five flooded households have taken such measures. Anecdotal evidence from the aftermath of last summer's floods reinforced the message that very little resilient repair is taking place on the ground.

Table 3.1 Examples of options for resilient repair of flood-damaged homes

Example of resilient repair	Advantages
Replace damaged floating timber floors with concrete floors	Improved resistance to groundwater flooding No need to replace floor after next flood
Replace damaged carpets with tiles	Floods less likely to damage floor coverings
Use solid wood, plastic or metal kitchen units instead of MDF units (which absorb water and therefore damage more easily).	Less likely to be damaged by future floods
Install replacement white goods on raised plinths	White goods will be safe from future low-level flooding
Use water-resistant (lime-based) plaster on walls	Floods less likely to require re-plastering of walls
Raise electricity supply cables and sockets above floor level	Floods less likely to necessitate re-wiring

- 3.6 If a building is not already due to be repaired or refurbished, implementing a full set of resilience measures costs between £10,000 and £15,000. However, if repair or refurbishment is already necessary then the cost of making this work flood-resilient is typically only an extra £5,000 - £10,000. Implementing resilience measures when a home has already been damaged by flooding therefore reduces its net cost.
- 3.7 Entec and Greenstreet Berman's analysis suggests that the benefit-cost ratios for resilience more than double if they are implemented when there is already a need for repair or refurbishment. Resilient repair may be cost-beneficial provided the flooding is likely to occur once every 50 years (2% annual chance)

³⁹ See Entec and 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, <http://www.defra.gov.uk/enviro/fcd/policy/strategy/FD2607SR.pdf>.

or more (Table 1.3).⁴⁰ For properties at very high risk of flooding (10% annual chance or once every 10 years), the benefits of resilient repair outweigh the costs by three- to seven-fold.

Q17 Do you think we have identified the correct costings and the range of costs are right? Do you agree with our analysis of the costs and benefits of flood resilience (Annex C)?

- 3.8 Improving flood resilience could potentially have significant benefits for the country's economy. Our provisional calculations indicate that applying guidelines to all homes with a 10% or greater annual chance of flooding could lead to savings of tens of millions of pounds. Since such measures are not typically reflected in house-prices, the costs that might fall to individual householders could outweigh the benefits to them. And householders might object to having to repair their homes in a manner that they might not like and having to incur extra costs at a time when they are potentially already financially stretched.
- 3.9 Furthermore, after a major flood, demand would be particularly high and there could be shortages of builders/construction materials and consequent price rises. Care would need to be taken that this did not undermine the long-term effectiveness of the new guidelines by creating a norm of non-adherence.

Q18 In the event of a major flood, would the supply of skills and materials be sufficient to enable the resilient repair of all affected homes? Would bottlenecks in the supply system cause delays in restoration?

Existing guidance and voluntary standards on resilient repair

- 3.10 Planning Policy Statement 25 has introduced a sequential, risk-based approach to planning for new development in order to avoid and manage flood risk. Wherever possible, new development should be located in areas of low flood risk. Where, in exceptional circumstances, new development in areas of significant or moderate risk, PPS25 requires Local Planning Authorities to ensure that all new development is appropriately protected or resilient against flooding.
- 3.11 The Government and the Environment Agency have sponsored two guides to flood resilience. The first sets out clear standards for the repair of flooded buildings – both using a resilient finish and not.⁴¹ The second draws together guidance on improving the flood resilience of new buildings. A comprehensive literature search revealed that most existing guidance was based on assessments of building techniques rather than controlled tests of materials or forms of construction. As a result, this project developed guidance by actually

⁴⁰ Entec and 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, <http://www.defra.gov.uk/enviro/fcd/policy/strategy/FD2607SR.pdf>

⁴¹ CIRIA (2005) *Standards for the repair of buildings following flooding* (C623), <http://www.ciria.org/acatalog/C623.html>

testing materials (walls and floors) in a hydraulics laboratory and subjected them to flooding for several days.⁴²

- 3.12 The Environment Agency has recently published a new guide on recovering from floods, including advice on how to protect your property to minimise damage in the future.⁴³ The insurance industry has also published, in collaboration with the National Flood Forum a range of guides on resilient repair.⁴⁴
- 3.13 An industry sponsored code could be a useful step forward in developing standards for the flood performance of buildings and raising consumer awareness. Clear standards on resilient repair could help those who have been flooded to make a decision about how to repair their property. It would also provide assurance to the insurance industry that the repair has been carried out to a consistent standard. The Association of British Insurers has called for the development of an independent quality-assurance scheme on flood resilience in new developments. This could also apply to resilient repair.

Q19 Do you think that an independent quality-assurance standard would help to encourage resilient repair? Are there other viable voluntary approaches?

Building Regulations and flood resilience

- 3.14 One possible way of ensuring that new and existing buildings incorporate appropriate property-level resilience measures might be to include a requirement in Building Regulations. Although Building Regulations set legal requirements and are supported by statutory guidance, in response to a number of natural hazards, they do not currently include any advice on flooding. Sir Michael Pitt has recommended that Building Regulations should be revised to ensure that all new or refurbished buildings in high flood-risk areas are flood resistant or resilient.⁴⁵ Some stakeholders, such as the Association of British Insurers, have similarly proposed that consistent standards of resilient repair should be required in properties undergoing major refurbishment in flood risk areas.⁴⁶
- 3.15 The Government has agreed to look at the flood performance of new and refurbished buildings in the 2010 review of the Building Regulations. This will include consideration of whether the regulations should also apply to building repairs after a flood.

⁴² Communities and Local government and Environment Agency (2007) *Improving the Flood Performance of New Buildings: Flood Resilient Construction*, RIBA Publishing,

http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf

⁴³ Environment Agency (2008) *After a flood – practical advice on recovering from a flood*,

<http://publications.environment-agency.gov.uk/pdf/FLHQ1007BNER-e-e.pdf>

⁴⁴ Association of British Insurers and National Flood Forum (2006) *Repairing your home or business after a flood – how to limit damage and disruption in the future*,

<http://www.abi.org.uk/BookShop/ResearchReports/Flood%20Repair%20Doc%201.pdf>

⁴⁵ Sir Michael Pitt (2008) *Learning lessons from the 2007 floods*, The Pitt Review,

<http://www.cabinetoffice.gov.uk/thepittreview.aspx>

⁴⁶ Association of British Insurers (2007) *Summer floods 2007: learning the lessons*,

<http://www.abi.org.uk/BookShop/ResearchReports/Flooding%20in%20the%20UK%20Full.pdf>

- 3.16 This will of course need to consider public attitudes to compulsory flood resilient repairs and cost effectiveness. Any proposals would be subject to a specific consultation and preparation of a robust and proportionate Impact Assessment . Even at this early stage of consideration, however, it is clear that this idea presents some major challenges, for example a more thorough evaluation of costs and benefits, and will need to consider alternative approaches which might be more beneficial.
- 3.17 In addition, identifying which properties fall into different flood risk categories is currently very difficult and even if a case could be made to introduce Building Regulation requirements for flood resilience, it would be essential for legal reasons that government would be able to clearly identify those high risk properties where resilient work would be appropriate. Currently, flood maps do not distinguish those properties with a 1 in 75 risk of flooding and those with a much higher risk.

Q20 Is compulsion an appropriate way to increase the use of resilient repair in high-risk homes or do you think individual consumer choice is the right route? Would you support a compulsory requirement for resilient repairs if an economic case could be made for such a requirement?

Annex A. Overcoming the barriers to higher take-up of household-level mitigation

- A.1 A complex mix of barriers currently deter householders from taking property-level protection and resilience measures. In their analysis of survey data and benefit-cost calculations, Entec and Greenstreet Berman draw particular attention to three: the impact of insurance on the financial benefit, for a householder, of taking protection and resilience measures; the perceived costliness of mitigation measures, and the argument that the state has already reduced the risk sufficiently by implementing community level risk mitigation measures. These factors are complemented – and perhaps sometimes motivated – by a desire to avoid anxiety about flood risk and represent it as negligible or as someone else’s responsibility.⁴⁷
- A.2 The text that follows discusses all of the barriers identified by Entec and others. It also presents the arguments for government intervention and suggests some possible forms for that intervention. As shown in Figure A.1, these barriers and interventions can be presented as applying to one of four notional stages through which householders have to pass before they can implement any protection or resilience measures.

Stage 1: Awareness of the flood risk

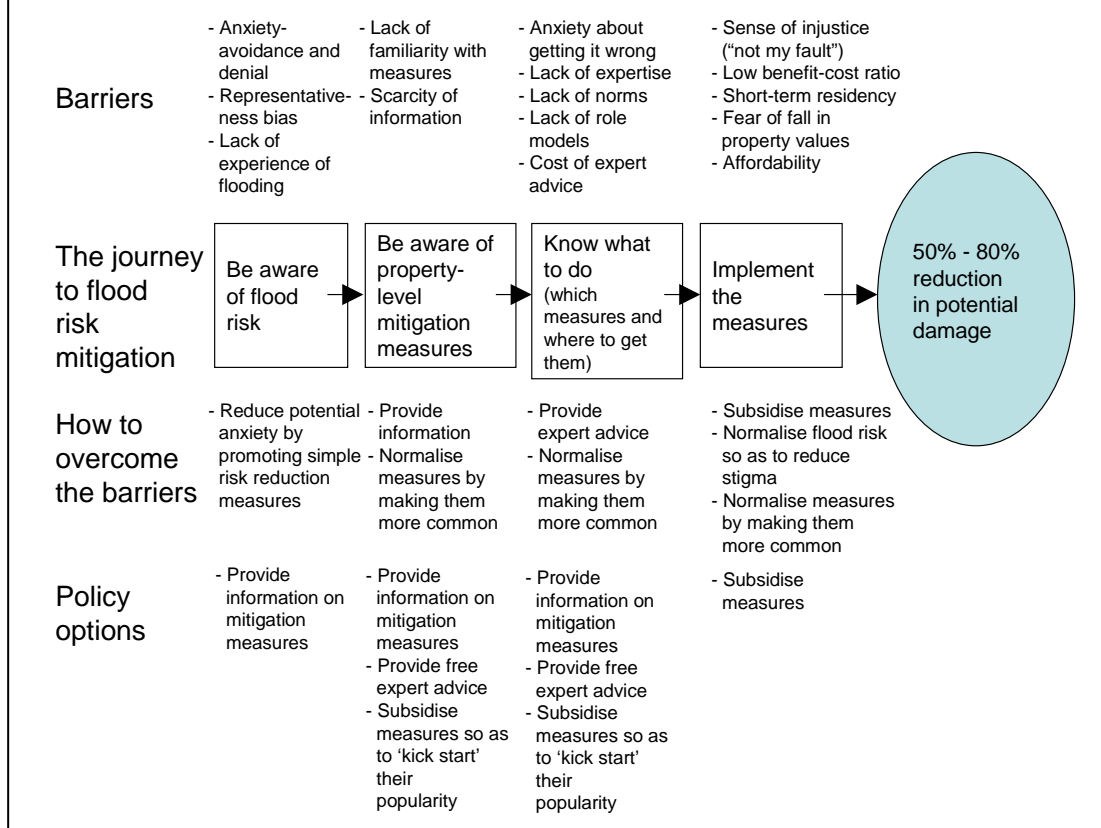
- A.3 In the past, much attention has been focussed on the first stage: awareness. However, it is clear from published research that increasing awareness does not, by itself, have much impact on behaviour. This conclusion is supported in analysis of survey data on flood risk response, which shows that only about 20% of householders who believe their home to be at risk take any steps to mitigate the risk.⁴⁸ In fact, a number of barriers prevent people from hearing, accepting or properly understanding messages about flood risk (Figure A.1).
- A.4 One of these barriers is the desire to avoid anxiety and the potentially destructive effects of anxiety. This can lead to denial of the existence of flood risk⁴⁹.

⁴⁷ See Harries T (accepted) ‘Feeling secure or being secure? Why it can seem better not to protect yourself against a natural hazard’. *Health, Risk and Society*, 10 (5)

⁴⁸ See Entec and 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, <http://www.defra.gov.uk/enviro/fcd/policy/strategy/FD2607SR.pdf>; and Harries T. (2007). *Householder responses to flood risk: The consequences of the search for ontological security*. PhD thesis. London: Middlesex University.

⁴⁹ See Harries T (2008) ‘Feeling secure or being secure? Why it can seem better not to protect yourself against a natural hazard’. *Health, Risk and Society*, 10 (5)

Figure A.1 Factors that can prevent householders from taking protection and resilience measures



- A.5 Another barrier is the use of mental short-cuts to simplify decision-making. Psychologists argue that it would not be possible to navigate the risks of everyday life using a full and rigorous analysis of the available data and that, as a result, people commonly employ a number of mental short-cuts. One of these involves the assumption that recent patterns of events are representative and can be used to predict the future⁵⁰. This assumption leads people to assume that past patterns of flooding will be repeated in the future and to not consider themselves at risk until past experience suggests that they are 'due' another flood.
- A.6 As a result of this same assumption, people who have never been flooded tend to assume that they never will be. Evidence from the survey by Greenstreet Berman⁵¹ suggests that, although such people are aware of the risk of flooding at an abstract and theoretical level, they do not accept that it applies to them and their homes at a practical level.
- A.7 Also as a result of the assumption that past patterns of flooding will be repeated, it is often only after numerous experiences of flooding that people accept the ever-present nature of flood risk. Survey evidence shows that householders that have been flooded once are only one-third more likely to have taken mitigation measures than those who have never been flooded, but

⁵⁰ See Nisbett, R. & Ross, L. (1980). *Human inference: Strategies and shortcomings of social judgement*. Prentice-Hall.

⁵¹ See Entec and 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, <http://www.defra.gov.uk/enviro/fcd/policy/strategy/FD2607SR.pdf>;

that those who have been flooded more than once are more than three times as likely to have done so.⁵²

- A.8 Because it is an essential part of people's strategy for negotiating life, the assumption about past patterns being repeated cannot easily be circumvented. Indeed research evidence suggests that only repeated experience of flooding can break down the preference of many for denying the existence of the risk. On the other hand, research also suggests that anxiety-avoidance strategies can be reduced if people are made more confident that something can be done to mitigate the risk⁵³.
- A.9 As an example of a risk mitigation strategy, therefore, Where people are aware of property-level protection and resilience measures, therefore, they will also be less likely to feel anxious about the flood risk and will be less likely to suppress their awareness of it.

Stage 2: Awareness of property-level mitigation measures

- A.10 The evidence from the Greenstreet Berman survey, however, suggests that awareness of mitigation measures is low. It indicates that almost half of all households in areas of significant risk are aware that sandbags can be used to limit flood damage, but that less than one in four are able to recall any protection measures other than sandbags and only one in ten can think of an example of a resilience measure. Not only will this lack of awareness of protection and resilience measures deter people from remaining aware of the risk; it is also an obvious barrier to their taking any action to reduce it. One way of increasing take-up rates might, therefore, be to provide more and better information on protection and resilience.
- A.11 Experience in other areas of environmental risk, however, has shown that the provision of information about risk reduction is not in itself enough to change behaviours. The Greenstreet Berman survey supports this contention. It found that awareness of the available measures was low, in spite of the fact that approximately 35% of householders claimed to have looked for information on how to protect their homes from flooding and about the same proportion said that they had received such information.

Stage 3: Deciding which protection and resilience measure(s) to use

- A.12 Half of all householder respondents in the Greenstreet Berman survey agreed that they were deterred from taking risk mitigation measures by a lack of confidence about which measure or measures were the best for their circumstances. This finding echoes evidence from in-depth interviews with at-risk residents, which suggested that anxiety about making the wrong choice was an important barrier to take-up.⁵⁴
- A.13 Due to the various routes by which floodwater can enter a home and due also to the technical difficulties of blocking these ingress routes, flood risk mitigation

⁵² Harries T. (2007). *Householder responses to flood risk: The consequences of the search for ontological security*. PhD thesis. London: Middlesex University.

⁵³ See Selye (1958), quoted in: Cox, T. (1978). *Stress*. Basingstoke: MacMillan.

⁵⁴ Harries 2007 (op cit)

is a complicated and challenging area for many householders. In addition, aside from the use of sandbags, which many experts consider to be ineffective, there are no well-established norms for how a home can be protected⁵⁵. These factors make it difficult for many householders to choose a measure with any confidence unless they are first given expert advice.

Stage 4: Implementation of the measures

A.14 Even when people are aware that they are at risk; are aware of the options for how to mitigate that risk, and are confident about their ability to select the right protection and resilience measure, a number of barriers can prevent them from taking the step of implementing property-level protection or resilience (see Figure 2).

A.15 One of these barriers is cost. 57% of people living in areas of significant flood risk give expense as a reason for not taking protection or resilience measures.⁵⁶ This, in spite of the fact that 61% said that they believed such measures would save them money in the longer term. Given the low rates of awareness of the available measures, it is unlikely that many householders are able to make an informed assessment of the cost of such measures. It seems unlikely, therefore, that they are influenced by the benefit-cost ratios calculated by Entec,⁵⁷ which show that protection and resilience measures are only cost-beneficial from the householder's point of view where the annual risk of flooding is at least 10%.

A.16 For some, cost will be an absolute barrier. The margin between their basic living costs and their income will not allow them to spend money on protection and resilience measures, their budgeting skills will be insufficient to allow them to save up the money and they will not have enough credit-worthiness to raise the money with a loan. Others, however, will choose not to spend the money on protection or resilience because they do not deem it to be worthwhile or because of the opportunity costs. This is illustrated in the following exchange between an interviewer and a household who would be able to afford protection measures but who says that she would not choose to prioritise them:

Interviewer	Is expense the kind of thing that's just deciding ...?
Respondent	It would be one of the things.
Interviewer	I think it's something like 300 quid or something.
Respondent	Yeah, for 300 quid I'd get a wardrobe to replace the rack in my bedroom, you know. You live on your own in Zone 2 in London and 300 quid is a lot of money. So yeah, it would be an expense I'd have to think really hard about. ⁵⁸

A.17 The economic analysis performed for Defra by Entec indicates that the single factor with probably the most influence over the perceived benefit-cost ratio of protection and resilience measures is insurance. Should insurance terms be

⁵⁵ Entec and 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, <http://www.defra.gov.uk/enviro/fcd/policy/strategy/FD2607SR.pdf>

⁵⁶ Entec and 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, <http://www.defra.gov.uk/enviro/fcd/policy/strategy/FD2607SR.pdf>

⁵⁷ Entec and 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, <http://www.defra.gov.uk/enviro/fcd/policy/strategy/FD2607SR.pdf>

⁵⁸ Taken from Harries 2007

determined by the specific flood risk in individual properties, Entec conclude, such measures are far more likely to be financially worthwhile for householders than they are if the terms are not at all risk-driven.

- A.18 A second major barrier to this final stage of the process is a reliance on community-level measures such as channel diversions and sea walls, and a belief that the state is morally obliged to provide such mitigation levels.
- A.19 In the Greenstreet Berman survey, 42% of householders said that they believed the state had already taken adequate mitigation measures and that no individual action was therefore necessary. Interviews with householder beneficiaries of the pilot in Leeds and with at-risk householders in London and Reading reveal, in addition, a strong justice imperative⁵⁹. Some householders, they show, argue that it is the state that has allowed building on floodplains and it is the state that has made inadequate provision for water conveyance and that the state, therefore, should somehow put right the problem it has created.
- A.20 Some additional barriers apply only to resilience measures. One is the desire to avoid the disruption entailed in taking out existing fixtures and fittings in order to replace them with more resilient ones. This barrier could be avoided if resilience were proposed at a time when repairs or refurbishment were already planned. A second is the desire to maintain maximum comfort (with regard to a preference for fitted carpets over tiled floors) and aesthetic pleasure (as regards, in particular, views on plastic or metal kitchen units). Finally, there is anecdotal evidence that people who have been flooded sometimes react negatively to the idea of resilient repair because, for emotional reasons, they prefer to have their homes restored to exactly the same state as they were in before the flood and that, in addition, they might be concerned that making restoration more resilient might involve longer delays and a longer spell in alternative accommodation.

⁵⁹ Harries T. (2007). *Householder responses to flood risk: The consequences of the search for ontological security*. PhD thesis. London: Middlesex University and Harries (in preparation) *Analysis of interviews with beneficiaries of state funded flood protection*.

Annex B. Summary of consultation questions

- Q.1 Do you think that the costs and benefits for the measures outlined here and in the Impact Assessment (Annex B) are reasonable estimates? Do you have further information to help refine the estimates?
- Q.2 Do you think that the Government needs to give more information to high-risk and help them do more to protect themselves? Alternatively, do you think that the level of property-level flood protection and resilience should be left to market forces and individual choice?
- Q.3 If a government grant scheme were to be introduced, do you agree that it should initially focus on households rather than businesses?
- Q.4 Do you think that a free home survey scheme to households in high-risk communities would be an effective way to drive increased take-up of property-level flood protection and resilience? What else could be done to encourage greater voluntary take-up of measures?
- Q.5 Is it reasonable to expect people living in high-risk areas to pay much or all of the cost of protecting their homes from flood damage? What viable options exist for supporting lower-income households?
- Q.6 Is it appropriate to use public funds to subsidise the costs of flood protection or resilience for individual properties, rather than just paying for a free home survey?
- Q.7 Do you have suggestions on how we could ensure that any future grant scheme is simple to administer but also fair? Do you think that it would be a good idea to deliver the free surveys or the subsidies via teams who already deliver similar schemes, such as those responsible for private sector housing renewal?
- Q.8 Should any subsidy scheme offer full subsidies for a small number of high risk properties or partial subsidies for a larger number of properties? Is a £4,500 cap for the measures themselves (excluding survey) an appropriate level for the subsidy?
- Q.9 Should the subsidy be offered to all appropriate at-risk properties or only low-income households or communities? Should the subsidy be available to all those on qualifying benefits or based on full means-testing?
- Q.10 Do you think that the costs and benefits for the government schemes outlined in the Impact Assessment (Annex B) are reasonable estimates? Do you have further information to help refine the estimates?
- Q.11 Which approach do you think will be most effective at increasing take-up – offering free home surveys to households in a large number of high-risk communities, or offering to subsidise property-level measures for households in a smaller number of communities?
- Q.12 How could local authorities, the Environment Agency and communities best work together to deliver property-level schemes? What should their respective roles be?

- Q.13 What would be the most effective ways of consulting with members of the selected communities in order to communicate risk information, help them understand flood protection and resilience, and engage them fully in the schemes?
- Q.14 Do you support an approach that promotes local flexibility of spend or do you prefer a more nationally consistent approach?
- Q.15 Which professional groups are appropriate for the role of conducting household flood risk surveys? What more needs to be done to increase capacity and expertise on flood risk issues amongst these professional groups?
- Q.16 How can we encourage new innovative flood protection products, while ensuring a robust system for testing new products? What is needed to provide assurance that products are suitable for their intended use, such as the reinstated BSI Kitemark or an alternative quality assurance mark?
- Q.17 Do you think we have identified the correct costings and the range of costs are right? Do you agree with our analysis of the costs and benefits of flood resilience (Annex C)?
- Q.18 In the event of a major flood, would the supply of skills and materials be sufficient to enable the resilient repair of all affected homes? Would bottlenecks in the supply system cause delays in restoration?
- Q.19 Do you think that an independent quality-assurance standard would help to encourage resilient repair? Are there other viable voluntary approaches?
- Q.20 Is compulsion an appropriate way to increase the use of resilient repair in high-risk areas or do you think individual consumer choice is the right route? Would you support a compulsory requirement for resilient repairs if an economic case could be made for such a requirement?

Summary: Intervention & Options

Department /Agency: Defra	Title: Impact Assessment of Options to Encourage Households to Adopt Property-Level Flood Protection and Resilience Measures	
Stage: Consultation	Version: 1	Date: 30 July 2008
Related Publications: Developing the Evidence Base for Flood Resistance and Resilience, Prepared for Defra by Entec and Greenstreet Berman, June 2008; Resilience Grants Pilot Projects – Summary Report, Defra, June 2008; Flood resistance and resilience solutions: An R&D scoping study, prepared for Defra by Pam Bowker, independent consultant, May 2007		

Available to view or download at: <http://www.defra.gov.uk/enviro/fcd/policy/strategy/rf1rf2.htm>

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Telephone: 020 7238 6138

What is the problem under consideration? Why is government intervention necessary?

Where community-level flood defences are not viable or are unlikely to be funded, property-level measures such as flood-boards or water resilient walls and floors are an alternative and cost-beneficial way of reducing the impacts of flooding on households and businesses, particularly where flooding is relatively frequent (i.e. with a greater than 2% annual probability). Few households take such measures at present. Awareness of the available measures and confidence in them is low, many people feel it is up to the state to reduce the risk and due to a lack of detailed information, insurance terms may not always reflect the real level of the risk. The result is that householders often have little incentive to take such measures and generally consider them too expensive. Changes in insurance and in public attitudes and behaviours are unlikely to keep pace with increases in risk. Furthermore, the present system could be considered unfair by some, because those who do not benefit from investment in a community defence receive no other support from the state.

What are the policy objectives and the intended effects?

The aim is to reduce household damage caused by floods and at the same time speed recovery after a flood and reduce the associated disruption and stress. It targets those people who live in areas with a significant chance of flooding but that are unlikely to benefit from community defences. The policies aim to increase take-up of property-level measures by overcoming existing barriers to action.

What policy options have been considered? Please justify any preferred option.

1. Do Nothing. Assume that property-level flood protection and resilience measures will become part of the normal social response to flooding, so that take-up increases sufficiently without the need for government intervention.

2. Provide local authorities with a grant, through the Environment Agency, to provide households in areas that are high risk but are unlikely to benefit from community defences with:

(a) **either** free flood surveys that advise households how to improve the protection or resilience of their homes; (b) **or** subsidies for the cost of these measures

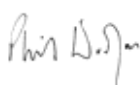
Our preferred option is 2a, because providing professional and independent property-level advice should overcome many of the barriers to normalisation of such measures, and give useful information to insurers, so they take account of property-level measures in a routine way. However, option 2b could be considered in poorer communities or in other exceptional circumstances.

When will the policy be reviewed to establish the actual costs and benefits and the achievement of the desired effects? We propose running such a scheme for two years initially (2009 – 2011). After a review, the scheme would be rolled out for a further 2 – 3 years.

Ministerial Sign-off For Consultation Stage Impact Assessment:

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible Minister: Phil Woolas, Minister for the Environment



Date: 24 July 2008

Summary: Analysis & Evidence

Policy Option: Free home flood surveys

Description: Free flood risk assessments offered to clusters of households identified as suitable for property-level mitigation

COSTS	ANNUAL COSTS		Description and scale of key monetised costs by 'main affected groups' Defra would cover costs of free flood risk surveys (£3 million each year for 6000 homes) and transaction costs for local authorities administering schemes (£1.2 million each year). Households would bear costs of installing and maintaining measures, either through upfront payment or by extending mortgages (£10 million each year for 2000 homes).
	One-off (Transition)	Yrs	
	£ 0		
	Average Annual Cost (excluding one-off)		
	£ 14 million	5	
			Total Cost (PV) £ 82 million (20 years)
Other key non-monetised costs by 'main affected groups' Where householders cannot afford mitigation measures, flood risk surveys could make the risk more 'real' and might provoke anxiety and stress, which could effect health and well-being.			

BENEFITS	ANNUAL BENEFITS		Description and scale of key monetised benefits by 'main affected groups' Around 2000 households each year (building up to 10,000 over five years) will benefit from 50 – 80% reductions in flood damage. For those with insurance, the extent of risk-pricing will determine if these benefits are reflected in annual premiums or excesses.
	One-off	Yrs	
	£ 0		
	Average Annual Benefit (excluding one-off)		
	£ 7.4 million	20	
			Total Benefit (PV) £ 124 million (20 years)
Other key non-monetised benefits by 'main affected groups' Over 6,000 additional homes each year would be left more aware of the level of flood risk to their home and of the potential measures they could take to protect themselves, even if they do not immediately implement measures. This will leave them more able to take property-level measures in the future, and also give insurers more information about flood risk. Households that install measures will benefit from less flooding disruption and this should reduce the health impacts of flooding.			

Key Assumptions/Sensitivities/Risks The benefits are highly dependent on the assumed proportion (33%) of recipients of the Government-funded flood surveys who then fund costs of the measures themselves. An apparent lack of people qualified to conduct flood risk assessments might restrict the numbers of households where such assessments can be performed and might also push up the cost of the surveys.

Price Base	Time Period	Net Benefit Range (NPV)	NET BENEFIT (NPV Best estimate)
Year 2007	Years 20	£ 3 – 82 million	£ 43 million

What is the geographic coverage of the policy/option?		England		
On what date will the policy be implemented?		April 2009		
Which organisation(s) will enforce the policy?		EA and local authorities		
What is the total annual cost of enforcement for these organisations?		£0		
Does enforcement comply with Hampton principles?		Yes		
Will implementation go beyond minimum EU requirements?		Yes		
Will the proposal have a significant impact on competition?		No		
Annual cost (£-£) per organisation (excluding one-off)	Micro N/A	Small N/A	Medium N/A	Large N/A

Impact on Admin Burdens Baseline (2005 Prices)			(Increase - Decrease)
Increase of	£ 0	Decrease of	£ 0
Net Impact			£ 0

Key:

Annual costs and benefits: Constant Prices

Summary: Analysis & Evidence

Policy Option: Subsidised property-level flood measures

Description: Free flood risk assessments and subsidised implementation of resistance and resilience measures offered to clusters of suitable households

COSTS	ANNUAL COSTS		Description and scale of key monetised costs by ‘main affected groups’ Defra would cover costs of free flood risk surveys and much of the costs of measures themselves (£3.5 million each year for 750 homes), along with transaction costs for local authorities administering the schemes (£1 million per year). Households would only bear costs of maintaining measures.
	One-off (Transition)	Yrs	
	£ 0		
	Average Annual Cost (excluding one-off)		
	£ 5 million	5	Total Cost (PV)
Other key non-monetised costs by ‘main affected groups’ No other significant non-monetised costs.			

BENEFITS	ANNUAL BENEFITS		Description and scale of key monetised benefits by ‘main affected groups’ Around 750 households each year (building up to around 4,000 over five years) will benefit from 50 – 80% reductions in flood damage. For those with insurance, the extent of risk-pricing will determine if benefits are reflected in premiums or excesses.	
	One-off	Yrs		
	£ 0			
	Average Annual Benefit (excluding one-off)			
	£ 3 million	20	Total Benefit (PV)	£ 48 million (20 years)
Other key non-monetised benefits by ‘main affected groups’ Households that have measures installed will benefit from less flooding disruption and this should reduce the health impacts of flooding.				

Key Assumptions/Sensitivities/Risks The benefits are highly dependent on the assumed take-up rate (55%) of the grant by households and by the level of subsidy offered. In this case, we set the cap at £4,500 following the approach used in the resilience pilots that we ran. An apparent lack of people qualified to conduct flood risk surveys might limit the number of householders that could benefit from this scheme. It might also push up the contribution of the survey to the total costs. The figures also assume sufficient capacity for the manufacture and installation of property-level measures.

Price Base Year 2007	Time Period Years 20	Net Benefit Range (NPV) £ 2 – 19 million	NET BENEFIT (NPV Best estimate) £ 19 million
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What is the geographic coverage of the policy/option?		England		
On what date will the policy be implemented?		April 2009		
Which organisation(s) will enforce the policy?		EA and local authorities		
What is the total annual cost of enforcement for these organisations?		£ 0		
Does enforcement comply with Hampton principles?		Yes		
Will implementation go beyond minimum EU requirements?		Yes		
Will the proposal have a significant impact on competition?		No		
Annual cost (£-£) per organisation (excluding one-off)		Micro	Small	Medium
Are any of these organisations exempt?		Yes/No	Yes/No	N/A

Impact on Admin Burdens Baseline (2005 Prices)			(Increase - Decrease)
Increase of	£ 0	Decrease of	£ 0
Net Impact			£ 0

Key:

Annual costs and benefits: Constant Prices

(Net) Present Value

Evidence Base (for summary sheets)

1. Introduction

Household flooding causes both direct and indirect damage. Flooding of as little as 20cm above floor level causes damage of between £20,000 and £30,000 per home and far more damage to the average business.⁶⁰ It also damages the mental and physical health of affected people⁶¹ and increases demands on local services such as health and social care as well as on emergency response services.

Of the 400,000 or so houses in areas with a significant chance of flooding (namely a 1.3% or greater annual chance, or a return period of 1 in 75 years or above), at least 45,000 will be provided with community level protection in the current spending review period (2008 – 2011). While continued investment in community schemes will protect further properties for the foreseeable future, we currently estimate that about half will remain unprotected.

Property-level measures can cut the damage and disruption caused by flooding by between 50% and 80%. They are typically cost-beneficial once the annual chance of flooding reaches 2% (i.e. the return period is at least 1 in 50).⁶² They could enable householders to become or remain insured where insurance might otherwise have been unavailable or unaffordable. In spite of this, take-up levels remain very low. This Impact Assessment asks what can be done to improve take-up rates and considers the options for intervention by government. It applies to England only and focuses primarily on household uptake of measures. Separate work is underway to consider business uptake.

In addressing this question, this Impact Assessment draws on three main sources of evidence:

- A review of the costs and benefits of property-level protection and resilience measures carried out for Defra by Entec and Greenstreet Berman⁶³
- Research into the barriers that currently prevent householders and businesses from adopting these measures - drawn from the literature and supplemented by research carried out on behalf of Defra by Entec and Greenstreet Berman⁶⁴
- Evaluation of Defra's pilot of household and small business grants in six areas of England⁶⁵

These property-level measures fall into two groups: those that help keep water out of properties (protection measures) and those that limit the damage that water causes when it does come in (resilience measures). They range from extremely simple and low-cost options, such as moving possessions upstairs or covering airbricks, through to more expensive and technical options, such as fitting purpose built floodgates or raising wiring circuits away from the ground.

On average, a set of commercially available, temporary protection measures that have the British Standards Institute Kitemark costs around £4,000 for a typical home or high street shop. Permanent protection measures that do not need to be deployed immediately before a flood are more expensive, costing between £6,000 and £9,000. In order to be effective, protection measures need to be applied to all the entry points in a property and so need to be introduced

⁶⁰ FHRC Residential Depth Damage Tables 2005

⁶¹ WHO 2002; Tunstall *et al* 2006; Tapsell *et al* 1999; Tapsell *et al* 2003; Tapsell and Tunstall 2001

⁶² Namely the benefits to society as a whole outweigh the costs to society as a whole, that is, benefit-cost ratio greater than 1.

⁶³ *Developing the Evidence Base for Flood Protection and Resilience*, Prepared for Defra by Entec and Greenstreet Berman, June 2008; *Resilience Grants Pilot Projects – Summary Report*, Defra, June 2008, <http://www.defra.gov.uk/enviro/fcd/policy/strategy/FD2607SR.pdf>

⁶⁴ *Developing the Evidence Base for Flood Protection and Resilience*

⁶⁵ *Executive Summary – Resilience Grants Pilot Projects*

<http://www.defra.gov.uk/enviro/fcd/policy/strategy/RF1summaryreport.pdf>

as a package. Resilience measures, in contrast, will bring benefits even when introduced singly. If all possible resilience measures are applied, however, it costs between £8,000 to £17,000 for the average home and £12,000 to £21,000 for the typical high street shop.⁶⁶

Table 1 Packages of Flood Protection and Resilience Measures – Residential. Protection measures are appropriate up to 60 – 90 cm of flooding, depending on the structural integrity of the building, but for deeper floods, resilience is required.

Package	Measures	Estimated average cost for semi-detached house
Temporary protection	Demountable doorguards and airbrick covers, sump/pump systems and remedial works to seal water entry points	£4,000
Permanent protection	Flood-proof external doors, automatically sealing airbricks, external wall render / facing, sump/pump systems and remedial works to seal water entry points	£8,000
Resilience without resilient flooring	Resilient plaster (up to 1m), light and easily removable internal doors, resilient windows and frames, resilient kitchen, raised electrics and appliances	£10,000
Resilience with resilient flooring	As above, but also concrete / sealed floors	£15,000

2. Rationale for government intervention

2.1 The efficiency argument

Where large-scale engineered defences cannot be economically justified, or are not viable, property-level measures are a cost-beneficial way of reducing residential and business exposure to flood risk where the likelihood of flooding is high (at least 2% per year, which is equivalent to a 1 in 50 year return period). Such measures can reduce flood damage by between 50% and 80%.⁶⁷ Initial estimates suggest that, in England, this might apply to about half the homes that have a significant chance of flooding.⁶⁸ If all these households took appropriate flood risk mitigation measures, the benefit to the economy (the net present value) could be over £100 million.

At present, few businesses and even fewer households take any steps to improve the flood protection or resilience of their properties. A survey conducted for Defra by Entec and Greenstreet Berman found that in areas of significant flood risk only 16% of households and 32% of small and medium sized enterprises had taken any practical steps to limit potential flood damage. The Flood Protection Association has reported that less than 5,000 homes have, to date, taken approved measures.

In fact, statistics on take-up levels from a survey in 2004 (Harries 2007) are almost identical to those from one conducted in 2007/8 (Entec and Greenstreet Berman 2008). In both the 2004 and the 2007/8 surveys of areas at significant risk, only one-third of householders with direct experience of flooding and less than one-in-ten of those with no such experience claim to have

⁶⁶ Entec and 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

⁶⁷ Entec and 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

⁶⁸ The exact figure will be clearer once the Environment Agency has completed its Long-Term Investment Strategy.

taken any measures to reduce the impact of flooding. There is little evidence that any of the 55,000 households affected by the 2007 floods have been repaired in a flood-resilient fashion.

The benefits of such measures to society outweigh the costs by seven to one for homes with the highest annual chance of flooding.⁶⁹ Government may, therefore, need intervene to ensure that barriers to uptake are removed and overall levels of uptake increased. Here we outline the primary barriers – as informed by the work of Entec and Greenstreet Berman. Further details are set out in Annex A of the consultation document.

(i) Links between flood risk and insurance and housing markets

In a perfectly functioning risk-based insurance market, insurance premiums should reflect the average expected damages caused by flooding. These would change according to the level of community and property-level flood protection installed, which in turn would act as an incentive for households and businesses to improve risk management and take steps to protect their property.

While we have no reliable evidence on the proportion of householders whose insurance terms are fully risk-priced, there is anecdotal evidence that risk-pricing is somewhat limited. Insurers have told us that this is partly caused by lack of good information about property-level flood risk and a lack of a clear understanding of which areas are expected to be defended by community schemes.

A further factor influencing decisions about the implementation of mitigation measures is householders' views about the duration of their residency. In-depth interviews with homeowners in Gunthorpe who had benefited from state funded protection measures, for example, suggest that some would have refused the free measures if they had not anticipated staying in their homes for the foreseeable future.⁷⁰ One in five householders in areas of significant flood risk echo this sentiment, saying that they do not expect to remain in their current residence for very long, that this deters them from taking measures and that they fear such measures might effect the value of their properties when they decide to sell.⁷¹ Fears over negative impacts on house-prices are fuelled by the fact that flood risk is not normally reflected in market values. Currently, the risk of flooding seems only to impact on house prices in the minority of cases and prices normally return to normal within two to three years.

However, the evidence on the significance of cost as a barrier to uptake is mixed. Entec and Greenstreet Berman (2008) found that almost 60% of households in high-risk areas assume that mitigation measures would be “too expensive”, even when they have no information on their actual cost. Clearly, an outlay of £4,000 would be unaffordable for many poorer households. However, the importance of expense as a barrier is belied by the fact that even the cheapest of measures are rarely adopted. Secondary analysis of survey data⁷² indicates that less than 70% of flooded householders have even taken such simple and cost-neutral measures as moving sentimentally valuable items out of reach of any potential future flood. Similarly, Entec and Greenstreet Berman's (2008) research suggests that only about 30% of flooded householders have even gone so far as to acquire sandbags.

For some, it seems that consideration of opportunity costs is more significant than affordability per se. For others, cost will be an absolute barrier. The margin between their basic living costs and their income will not allow them to spend money on protection and resilience measures, their budgeting skills will be insufficient to allow them to save up the money and they will not have enough credit-worthiness to raise the money with a loan

⁶⁹ That is, for homes in areas with a 10% or greater annual risk of flooding

⁷⁰ Harries 2008 (op cit)

⁷¹ Entec 2008 (op cit)

⁷² Harries (2007) *Understanding householder responses to flood risk: The impact of the need for ontological security*. PhD thesis; Middlesex University.

(ii) Moral hazard – assumption that the state will or should provide adequate protection

According to the Entec and Greenstreet Berman survey, 42% of householders in areas of significant risk believe that the state has already provided them with adequate community-level protection from flooding. Furthermore, evidence from in-depth interviews with at-risk householders suggests that some consider it to be their right to have such protection because they consider planning policies and decisions by local and central authorities to be the cause of flooding and argue that these same authorities should therefore protect them from the consequences. People also use arguments of justice to explain their lack of action to protect their own properties, stating that if public money is spent protecting other areas then it should also be spent on protecting them.

(iii) Lack of information and awareness about levels of risk

In areas of high flood risk, little information is currently available to residents on the likely frequency of flooding. The information provided to householders in the Environment Agency's flood maps tells them that their annual risk is at least 1.3%, but it does not distinguish areas where it is actually higher than this, even where it may actually be 10% or higher. As a result, many householders lack a firm grasp of the real extent of the risk and continue to believe that floods are 'freak' events that will occur no more than once in a lifetime.

(iv) Lack of awareness of or confidence in property-level flood protection and resilience options

The available measures for improving protection and resilience are unfamiliar to the at-risk public. Entec and Greenstreet Berman found that only 22% of residential respondents were able to call to mind any protection measure other than sandbags and only 10% were able to think of any example of a resilience measure – this, in spite of the fact that 47% of flooded households and 22% of non-flooded households said they had looked for and received information on how to protect their homes from flooding.

Half of householders in areas of significant risk say that they lack confidence in their ability to choose the right measure with which to protect their homes. In addition, evidence from the pilots and other research indicates that some householders are reluctant to venture into the market for flood protection products, feeling that they would be vulnerable to unscrupulous sales tactics and poor advice. By subsidising such measures, the state demonstrates to householders its commitment to the measures in question and its belief in their worth.

2.2 Social justice argument

Under the present regime of scheme appraisal and prioritisation, public expenditure on flood defence is less likely in smaller pockets of at-risk properties than it is in larger pockets, where benefit-cost ratios tend to be higher. This approach maximises net benefits and is therefore in keeping with the justice principle that emphasises utility maximisation. However, it is not consistent with the concept of justice as equal treatment.⁷³ Currently, areas that do not receive a community scheme get little tangible support from Government apart from, in some cases, a flood warning service. Householders in isolated pockets of high risk do not, at present, receive equal treatment to those in areas where more property is at risk and the benefits of defence would be higher. Offering state assistance to householders in these smaller clusters of high-risk properties would give some support to the principle of justice as equal treatment and would spread the use of public flood risk management resources more evenly across at-risk communities.

⁷³ Johnson C, Tunstall S, Priest S, McCarthy S & Penning-Rowsell E (2008). *Social justice in the context of flood and coastal erosion risk management: a review of policy and practice*. Final Summary Report for Defra and the Environment Agency: FD2605TR.

Interviews with householder beneficiaries of the pilot in Leeds and with at-risk householders in London, Reading and Nottinghamshire reveal a strong justice imperative.⁷⁴ Some householders, they show, argue that it is the state that has allowed building on floodplains and it is the state that has made inadequate provision for water conveyance and that the state, therefore, should somehow put right the problem it has created. Evidence gathered in in-depth interviews with residents of Nottinghamshire suggests that although householders will not see help with resilience and protection as constituting equal treatment with those who receive community-level protection, it will nonetheless persuade some people that there is a desire to treat them equally and that this can help overcome the barrier to self-help that results from a feeling of injustice.

In the Entec and Greenstreet Berman survey, 42% of householders said that they believed the state had already taken adequate mitigation measures and that no individual action was therefore necessary.

3 Policy options

In considering the barriers to uptake of property-level measures and the rationale for government intervention, this Impact Assessment considers three possible responses. The Government's initial thinking is that any intervention would apply primarily to households, because it is this sector that needs a kick-start on property-level flood protection. Businesses tend to have more experience and knowledge of risk management techniques and their insurance is typically a more targeted product that can take more account of measures the policy-holder has put in place to reduce the risk.

3.1 Do Nothing – rely on existing market forces to increase levels of uptake

The first of these options involves minimal change in current Government policy. Although take-up rates are currently low, there are several reasons for believing that this might change and that take-up rates might increase even without government intervention.

- Insurance terms might reflect flood risk levels more closely, thus encouraging people to take protection and resilience measures to improve their insurance terms. This would occur if:
 - i) property-level information on levels of risk became more easily available to insurers and could be integrated into automated quotation systems
 - ii) information on which areas were unlikely to benefit from future flood defence measures became more easily available to insurers

Evidence in favour of this position emerged from in-depth interviews with residents of Leeds and the Nottinghamshire village of Gunthorpe, all of whom had received protection measures paid for from public sources and some of whom suggested that they would implement such measures if insurance premiums became unaffordable or if they believed that they might be reduced.⁷⁵ **It is not clear to what extent insurance terms are currently determined by risk or to what extent they may be so in the future.** However, in calculating the no-change option for this impact assessment, we estimated that only about one in a thousand (0.1%) householders in high-risk areas would be likely to implement measures over the next twenty years purely as a result of insurance-related incentives.

- Climate change is expected to result in more frequent flooding in the UK (Foresight 2004). This, combined with the growing prominence of the discourse of climate change more generally, might make exposure to flood risk seem more normal, thus reducing the stigma associated with property level flood risk mitigation and increasing take-up.

⁷⁴ Harries (2008). *Analysis of interviews with recipients of state funded protection measures*

⁷⁵ Harries T (In preparation) *Analysis of interviews with beneficiaries of state-funded protection measures*

The scale of any increase, however, is difficult to predict. In-depth interviews with residents in high-risk areas of Gunthorpe and Leeds give no indication that climate change is persuading many people to look more favourably on the idea of property-level flood mitigation. Normalisation as a result of increasing visibility might have more of an influence, but we believe that this too will be minimal in the absence of government intervention. In fact, we estimate that without the government initiatives here proposed, only about one in two thousand householders in high-risk areas are likely to implement measures as a result of their becoming more normal and familiar.

Indeed, the accelerated normalisation of protection and resilience measures is one of the main goals of the proposed initiatives. Given the limited amount of funding likely to be available over the five-year period of the proposed initiative, we only expect it to result in the introduction of measures in between 1,500 and 5,000 homes. However, given the likely visibility and profile of these schemes, we expect them to influence perceptions of property-level mitigation amongst a far greater number of householders. This was the case in the Nottinghamshire pilot area, where some of the surrounding villages are said to have become interested in property-level flood risk mitigation as a result of the use of these measures in the pilot village. Overall savings, therefore, would be significantly greater than those resulting from the reduced damage in the homes benefiting directly from the initiative.

- Flood protection products might be in the first stage of a 'product life-cycle'. In this first stage of the cycle, prices are typically high and efficiency is relatively poor. Over time – and as demand for these products increases – their prices could fall and their effectiveness increase, in which case demand would rise. Similarly, the price of resilience products is likely to fall and their availability is likely to increase over time.

3.2 Survey-only - publicly fund advice to at-risk householders on how they can improve the flood protection or resilience of their homes

One reason for lay people's hesitation over flood risk mitigation measures is the difficulty of choosing a measure. The selection of an appropriate and effective measure depends on many different factors: the type of soil on which the house is built, the likely depth of water, the length of time for which it is likely to remain, the possible impact on the structural integrity of the building, etc. There is evidence that householders find this amount and nature of information too complex to marshal and that they are deterred from attempting to mitigate flood risk by the scale of the intellectual challenge barring any attempt to understand it. Research suggests that some people anticipate the guilt that they might feel if they implement a measure that turns out not to be effective or the ridicule if other people believe it not to be an appropriate measure.⁷⁶

The second option, therefore, entails the provision of free, independent, tailored advice. Good and reliable advice should eliminate the barriers just described. It should also lead to the adoption of more appropriate and effective measures than would be the case where no such advice was taken. However, such advice can cost the individual householder up to £1,000 – a sum that could deter many from considering the option. Free advice would therefore remove one part of the cost deterrent to the take-up of measures. It would also increase awareness of the available measures, reduce anxiety about the choice of measure, and help normalise the concept of household-level action.

The provision of free advice should also stimulate the supply market for these assessments and, over time, increase their availability. According to the National Flood Forum, sources of advice on flood protection are presently in short supply and difficult to locate. In a survey by the Royal Institute for Chartered Surveyors, only 14% of members said they would "feel

⁷⁶ Harries T (2008) 'Feeling secure or being secure? Why it can seem better not to protect yourself against a natural hazard'. *Health, Risk and Society*, 10 (5)

professionally competent to undertake a survey of an individual property and provide advice on the implementation of flooding protection and resilience measures”.

The Association of British Insurers have indicated that insurance companies would be interested in using the information in the surveys if they could be assured of their quality and consistency. It should be possible for the professional bodies (the Royal Institute of Chartered Surveyors, the Association of Building Engineers etc) to provide a survey scheme that provides this assurance, allowing the survey information to be used by the insurance industry to improve their assessments of flood risk.

Under this option, the Environment Agency would identify areas that would benefit from property-level measures (namely areas with significant chance of flooding and unlikely to receive a community flood defence); a partnership of the Environment Agency and local authorities would design and implement these schemes, and Defra would provide the funding – initially via a ring-fenced portion of the block-grant (Flood Defence Grant in Aid). Households would be responsible for funding the costs of the measures themselves, and could either pay for measures either from savings or by means of a loan. The Council for Mortgage Lenders have confirmed that lenders would normally be willing to consider extending loans to cover such additional costs for homeowners that have sufficient equity and can afford to meet any additional repayments.

The Environment Agency already assesses flood risks and designs flood risk management approaches as part of its Catchment Flood Management Plan and strategy-level planning processes. At present, however, proposals for property-level solutions tend to be marginalised in these processes by the lack of suitable funding mechanisms and an absence of agreed methods for calculating their likely benefits⁷⁷. The provision of a separate funding stream and of evaluation guidelines would by-pass these barriers and encourage the Agency’s flood risk managers to look more favourably on this approach. Furthermore, the Environment Agency’s long-term investment strategy (due to be published in the Spring of 2009) will combine a wide range of data sources to provide a strategic overview of flood risk, thereby enabling Government to assess funding needs, evaluate appropriate mechanisms and prioritise the allocation of resources more effectively.

Rather than implementing schemes itself, however, the Agency would deliver them in partnership with local authorities, who would be the lead agencies. While the Agency has the requisite expertise in flooding and flood risk management, local authorities are more knowledgeable about the composition and nature of their local populations and businesses and are more practiced at engaging with them on local matters. This puts local authorities in a better position to select an approach that is most likely to be successful with any local community and to implement that approach effectively. Given the experience local authorities already have of delivering home improvement grants (e.g. under the Private Sector Decent Homes Programme), we also believe that they already have the experiences and many of the systems necessary for the implementation of these initiatives. Feedback from the local authorities who were involved in the pilots of the advice-and-subsidy option provides some support for this belief.

There are precedents for the provision of free advice by the state. Household visits and advice on both fire safety and burglary prevention are offered to householders free of charge (see HM government 2007; ACPO et al 2006). Tailored advice on reducing radon levels, by contrast, attracts a fee⁷⁸, although the Health Protection Agency offers a free telephone hotline. In

⁷⁷ Schanze J, Hutter G, Harries T and others (2008) *Systematisation, evaluation and context conditions of structural and non-structural measures for flood risk reduction*, FLOOD-ERA joint report. London: ERA-NET CRUE.

⁷⁸ <http://www.bre.co.uk/radon/feepaid.html>

addition, government funded telephone advice on reducing household energy bills is available free of charge from the Energy Savings Trust⁷⁹.

3.3 Survey-and-subsidy - provide free advice to at-risk households, but also subsidise the costs of the measures

Under the third option, householders would not only be offered free advice, but also a contribution toward the cost of the measures. Initially, we propose that this would be capped at £4,500 per property. This was the value used in the six Defra pilot projects and was chosen as it would provide almost complete subsidy for households choosing the less expensive flood protection measures and partial subsidy for the more expensive measures.

For a typical two-bedroom semi-detached house, Entec and Greenstreet Berman (2008) estimate that a full package of temporary protection measures (i.e. measures that need deployment whenever there is a flood) costs about £4,000, a set of permanent protection measures (i.e. measures that do not need deployment) costs about £8,000 and a full set of resilience measures costs about £10,000. Protection against groundwater flooding, in the form of 'tanking' or concrete floors, is said to cost an additional £5,000.⁸⁰

The purchase and installation of property-level flood risk mitigation measures would be a significant outlay for most households and many businesses. The provision of a subsidy would have the advantage, compared to the survey-only option, of further reducing the financial barriers to take-up. It would also send a stronger message to householders about the Government's support for household-level protection and resilience. As with the previous option, the Environment Agency would identify areas that would qualify for such a scheme and would work in partnership with the local authority to handle the administration of the scheme.

Subsidising the measures themselves would help overcome the cost barrier both for those who could not afford the measures and for those who would otherwise choose not to spend their money on them. For the latter, the subsidy would be capped. Evidence from the Defra pilot in Appleby-in-Westmoreland indicates that householders would sometimes be content, at least initially, to leave their homes semi-protected and might only be persuaded to complete the protection measures when they had been flooded again and had witnessed the benefits experienced by neighbours with full protection. Interview evidence suggests that a state grant to cover a part of the costs of measures can persuade others of the value of spending their own money on completing the work. To ensure that homes did not remain partially protected and that public money was not spent on measures that brought no immediate benefits, the subsidy would only be offered on condition that householders implemented the measures recommended in the survey and that they themselves paid for any costs above the level of the subsidy. The offer of a state subsidy can also influence neighbouring households and communities. Evidence from the pilots suggests that it can inspire confidence in the principle of property-level protection and create a growth in demand. Local authority staff from Newark & Sherwood District Council reported that publicly funded schemes in two villages in their area prompted a sharp increase in interest in similar measures in nearby flooded areas. By inspiring others to take measures, therefore, this approach can have benefits beyond those that accrue directly to beneficiaries of the grants. As the measures become seen as more normal and evidence of their effectiveness becomes widely known, their popularity amongst high-risk householders should grow and take-up, we predict, will begin to increase. Of course, although this could prompt householders to spend their own money on measures, it might also prompt them to delay expenditure in the hope that they too might get a state subsidy in the future. In the modelling of the benefits of this approach, we assume that for every 200 households that receive the subsidy, one neighbouring household will be inspired to purchase measures at its own expense.

⁷⁹ <http://www.energysavingtrust.org.uk/content/view/full/20402>

⁸⁰ Values calculated using a median value of the range of identified possible costs.

3.4 Other possibilities for policy interventions

Two other areas were considered for policy intervention but are not presented here as formal options.

Professional expertise and product certification

The current shortage of professionals offering flood risk surveys is said to be hampering the efforts of householders who wish to introduce protection and resilience measures and could hinder the implementation of the options described above. We are in discussion with the Royal Institute of Chartered Surveyors (RICS) and are encouraging them to consider ways to increase capacity and expertise, e.g. through continuing professional development or by establishing self-certification for surveyors with specialist flooding expertise. We are also working with RICS to look at the possible need for standards of conduct and enforcement/complaints handling. Other institutions (e.g. the Association of Building Engineers) might also want to take such steps. This would be more likely once the proposed initiative was announced and there was an assured growth in demand. The commitment of such institutions would be encouraged, in particular, if local authorities or the Agency let contracts for surveys rather than this being left to individual householders. The amount of extra training needed by a qualified surveyor or building engineer is not substantial, so the number of certified professionals could grow quickly in response to increased demand.

Similar supply-side issues could emerge for the supply of flood protection products. An Environment Agency sponsored British Standards Institute (BSI) Kitemark scheme exists for temporary protection measures. However, recently developed products (e.g. waterproof doors) have been unable to acquire the Kitemark due to a lack of testing facilities. Furthermore, it is possible that the expense of the Kitemark process has excluded some products and some companies from acquiring the Kitemark. The National Flood Forum argues that, as a result of this emphasis on the Kitemark, we have over-estimated the costs of the measures in our analysis. They claim that a basic but effective set of protection measures (two door-guards and four airbrick covers) can be purchased for less than £1,500.

Encouraging resilient repair through the Building Regulations

Improving flood resilience could potentially have significant benefits for the country's economy. Our provisional calculations indicate that applying guidelines to all existing homes with a 10% or greater annual chance of flooding could lead to savings of tens of millions of pounds.

The Pitt Review has recommended that Building Regulations should be revised to ensure that all new or refurbished buildings in areas of high flood-risk are flood resistant or resilient. This consultation document only deals with existing buildings. One way of ensuring that new and existing buildings incorporate appropriate property-level resilience measures might be to include a requirement in the Building Regulations. Although Building Regulations set legal requirements – and are supported by statutory guidance – for a number of natural hazards, they do not currently include any advice on flooding. Some stakeholders, such as the Association of British Insurers, have similarly proposed that consistent standards of resilient repair should be required in properties undergoing major refurbishment in flood risk areas.⁸¹

The Government has agreed to look at the flood performance of new and refurbished buildings in the 2010 review of the Building Regulations. This will include detailed consideration and a benefit-cost evaluation of the application of the regulations to the repair of existing buildings,

⁸¹ Association of British Insurers (2007) *Summer floods 2007: learning the lessons*, <http://www.abi.org.uk/BookShop/ResearchReports/Flooding%20in%20the%20UK%20Full.pdf>

which are the focus of this impact assessment. It will, of course, also need to consider public attitudes to compulsory flood resilient repairs and to consider alternative approaches that might be more beneficial. Any proposals would be subject to a specific consultation and preparation of a robust and proportionate Impact Assessment.

Flood-resilience measures (for which, see Table 4.1) reduce the cost of flood damage by at least half and reduce the time for which householders have to vacate their properties. However, the use of flood resilient materials in homes originally built in a less flood-resistance fashion (so-called retro-fitting of resilience) is even lower than take-up of property-level flood protection. Evidence collected by Entec and Greenstreet Berman⁸² suggests that, in areas of significant risk, only 4% of flooded households have taken such measures. Anecdotal evidence from the aftermath of last summer's floods reinforced the message that very little resilient repair is taking place on the ground.

Table 2 Examples of options for resilient repair of flood-damaged homes

Example of resilient repair	Advantages
Replace damaged floating timber floors with concrete floors	No need to replace floor in event of future floods
Replaced damaged carpets with tiles	Floods less likely to damage floor coverings
Use solid wood, plastic or metal kitchen units instead of MDF units (which absorb water and therefore damage easily)	Less likely to be damaged by future floods
Install replacement white goods on raised plinths	White goods will be safe from future low-level flooding
Use water-protection (lime-based) plaster on walls	Floods less likely to necessitate re-plastering of walls
Raise electricity supply cables and sockets above floor level	Floods less likely to necessitate re-wiring

If a building is not already due to be repaired or refurbished, implementing a full set of resilience measures costs between £10,000 and £15,000. However, if repair or refurbishment is already necessary then the cost of making this work flood-resilient is typically only an extra £5,000 - £10,000. Implementing resilience measures when a home has already been damaged by flooding therefore reduces its net cost.

Entec and Greenstreet Berman's analysis suggests that the benefit-cost ratios for resilience more than double if they are implemented when there is already a need for repair or refurbishment. They estimate that resilient repair is cost-beneficial provided the flooding is likely to occur at least once in every 50 years (i.e. where there is a 2% annual chance of flooding).⁸³ For properties at very high risk of flooding (10% annual chance or once every 10 years), the benefits of resilient repair outweigh the costs by between three- and seven-fold. Some stakeholders, including the Association of British Insurers, have proposed that consistent

⁸² Entec and 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, <http://www.defra.gov.uk/enviro/fcd/policy/strategy/FD2607SR.pdf>

⁸³ Entec and 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, <http://www.defra.gov.uk/enviro/fcd/policy/strategy/FD2607SR.pdf>

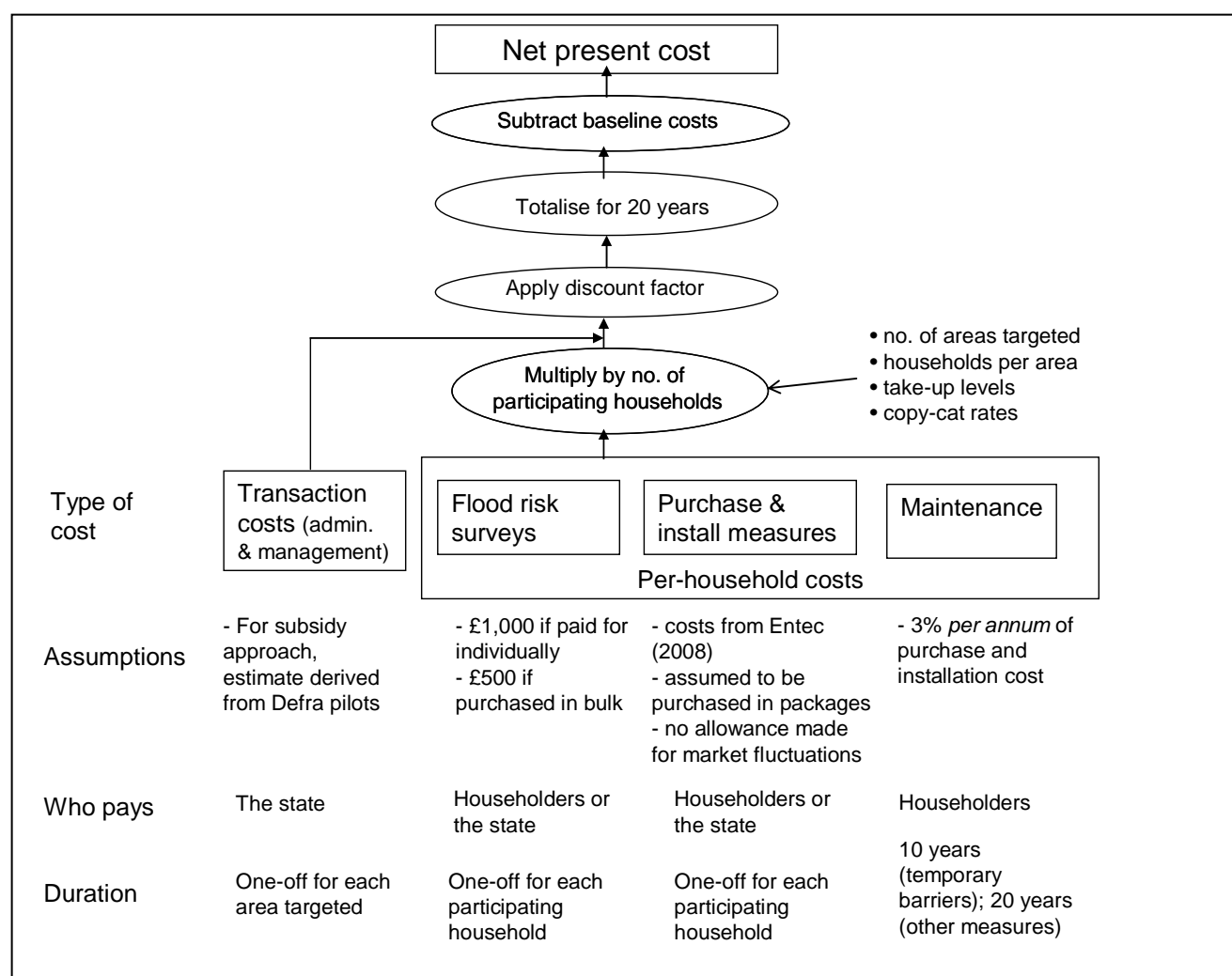
standards of resilient repair should be required in properties undergoing major refurbishment in flood risk areas.⁸⁴

Even at this early stage of consideration, however, it is clear that this idea presents some major challenges. Firstly, after a major flood, demand would be particularly high and there could be shortages of builders/construction materials and consequent price rises. Care would need to be taken that this did not undermine the long-term effectiveness of the new guidelines by creating a norm of non-adherence. Secondly, the costs that would fall to householders would often outweigh the benefits to them and householders might object to having to repair their homes in a manner that they might not like and having to incur extra costs at a time when they are potentially already financially stretched. Finally, identifying areas that fall into different flood risk categories is, currently, very difficult and even if a case could be made to introduce into the Building Regulation requirements for flood resilience, government would need, for legal reasons, to be able to clearly identify those high risk areas where resilient work would be appropriate. Currently, flood maps do not distinguish between those properties with a 1 in 75 risk of flooding and those with a much higher risk.

4 Calculation of benefit-cost figures

This section of the impact assessment describes the methods used for the evaluation of the monetised benefits and costs of the different options considered and outlines the assumptions that underpin the analysis. The methodology used is similar for all three of the options.

Figure 5 The calculation of net present cost – scaling up from the household



⁸⁴ Association of British Insurers (2007) *Summer floods 2007: learning the lessons*, <http://www.abi.org.uk/BookShop/ResearchReports/Flooding%20in%20the%20UK%20Full.pdf>

Table 3 Summary of costs used for each option

Option	Survey costs per household	Costs of measures per household	Maintenance cost per household
No-change	£1,000 Borne by household	£3,500-£14,000 Borne by household	3% of cost of measures each year – for a total of 10 years (temporary protection) or 20 years (other packages)
Survey-only	£500 Borne by the state	£3,500-£14,000 Borne by household	
Survey-and-subsidy	£500 Borne by the state	£3,500-£14,000 Borne by state up to a maximum of £4,500	

4.1 Calculation of Net Present Cost – Per-Household Costs

Three elements of cost are included in the calculation of the net present costs on a per-household basis: the costs of the household surveys, the costs of implementing the measures and the costs of maintaining these measures.

Flood risk surveys

Flood risk surveys of individual homes form a core element of the first two options. Based on the results of the pilot, surveys cost about £1,000 when commissioned by individual members of the public and about £500 when commissioned in larger numbers by a local authority. Under both options, the costs of the survey were assumed to be £500 per property and covered by the state through a Defra grant.

We have not included any survey costs for the resilient-repair option. In this option, households would only need to know the annual risk to their home in order to know whether or not the Building Regulations on resilience were relevant. Of course, if households felt that they might want to use protection measures instead, then they might yet want to have a survey of their property carried out; though given the extra cost and time involved, this seems unlikely in the post-flood event scenario.

Cost of the measures

The largest single element of cost in all the options is that of the measures themselves. The costs of the measures were derived from work by Entec and Greenstreet Berman, put together in packages that deliver whole-property protection (see Table 1).⁸⁵ We used mid-range estimates for each package of measures. Over time, these standard costs are likely to fall, as demand increases. This possibility has not been explicitly modelled in the analysis.

An Environment Agency sponsored BSI Kitemark scheme exists for temporary protection measures, so in this package only products with the Kitemark were included. However, no recently developed products have been able to acquire the Kitemark due to a lack of testing facilities, e.g. waterproof doors. Furthermore, it is possible that the expense of the Kitemark process has excluded some products and some companies from acquiring the Kitemark. The National Flood Forum argues that, as a result of this emphasis on the Kitemark, we have over-estimated the costs of the measures. They claim that a basic but effective set of protection measures (two door guards and four airbrick covers) can be purchased for less than £1,500. Any new products that have recently arrived on the market will not, therefore, have been

⁸⁵ 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

included in these calculations, even if they might have been cheaper to purchase. It is possible, therefore, that we have overestimated the costs of implementing measures.

Our use of 2007 prices might also have led us to overestimate the costs of the measures. It seems likely that prices will fall as the market grows and that the rate of fall would be accelerated if demand was boosted by one of the proposed government initiatives. We have not, however, allowed for this in our model.

In addition, we had to make assumptions about the choice of packages in the survey-only and the survey-and-subsidy options. The cheapest and most cost-beneficial package (according to the Entec and Greenstreet Berman study) is temporary protection. Given that householders in the survey-only option will have to pay the whole cost of the measures and that in the survey-and-subsidy option the subsidy will be capped at £4,500, we assume that 75% of householders will select this package on the basis of cost. However, because permanent protection is more suitable in areas of flash-flood and for people who face difficulties in deploying temporary measures, we predict that 20% of households will select permanent protection measures. Evidence from the pilots and in-depth interviews with at-risk householders suggests that resilience measures are generally the least favoured option amongst households because of concern about having water in your property (even if the building fabric is effectively waterproof) and the disruption involved in putting such measures in place. We predict that just 3% will choose the standard package of resilience measures and that only 2% will also be willing to suffer the disruption involved in installing water-resistant flooring.

Maintenance

The need for maintenance of measures is assumed to incur an annual cost for the household of 3% of the purchase cost of the measures. While one product manufacturer suggested that a warranty on temporary protection measures would cost 5% of purchase costs per year, other stakeholders felt that this figure was too high. Because we assume that temporary protection will only have an effective life-time of ten years (see below), maintenance costs for these measures are only included for this period. For other measures, they are assumed to continue for the full twenty-year period covered by the analysis.

4.2 Calculation of Net Present Cost – Scaling up from per-household costs

In the survey-only and survey-plus-subsidy options, the Environment Agency identifies clusters of properties (approximately 100 in each area) that would benefit most from use of property-level flood protection and resilience measures – namely those with a high chance of flooding (2% annual chance or 1 in 50 years) and where community defences are unlikely to be cost-beneficial. The local authority then administers the scheme to local residents. As a result, the Environment Agency and local authorities, in particular, would incur transaction costs related to administration and management of the scheme.

Number of participating households in survey-only and survey-plus-subsidy schemes

Estimates of the number of participating households are used to scale up these per-household costs. These estimates are a function of three main factors: the number of areas targeted, the number of eligible households per area and, perhaps of most importance, the proportion of eligible households that decide to take-up the offer and install measures in their homes. The model also assumes that the schemes will lead to increased normalisation of the measures and that this will cause a further annual increase in take-up equivalent to 0.5% of the number of households in the targeted areas.

Table 4 Summary of number of homes assumed to be affected each year under the government scheme, assuming public funding of £20 million over five years

		Impact over and above the no-change option		
Option	Number of housing clusters (100 homes per cluster)	Number of homes surveyed as a direct result of the option	Number of homes protected as a direct result of the option	Number of homes protected as an indirect result of the option (i.e. due to increased normalisation)
Survey-only	120	33,000	10,000	500
Survey-and-subsidy	15	4,000	4,000	100

Transaction costs were assumed to be of a fixed amount for each area of 100 homes targeted. For the survey-plus-subsidy option, the value used was taken from the six pilot areas, who reported average costs of £30,000 for each local authority and £52,000 for each Environment Agency office. The survey-only option has not been piloted, but we assume that transaction costs would only be far lower (£10,000) due to the lesser amount of consultation and product sourcing that involved. As each local authority would deal with a greater number of areas under this option, we assume that these they would become more practiced and more efficient, so we have reduced transaction costs by 30% after the first year of the initiative.

4.3 Calculation of present benefits

The monetised benefits of the different property-level protection and resilience measures are derived from the work on avoided damages commissioned by Defra from Entec and Greenstreet Berman, which itself drew heavily on the flood damages dataset built up by the Flood Hazard Research Centre at Middlesex University⁸⁶. These were then annualised by Entec and Greenstreet Berman using the Weighted Annual Average Damage technique that was also developed by the Flood Hazard Research Centre, and which is used as standard by the Environment Agency and others.

Each element of benefit relates to one area of avoided loss or cost. The first, avoided damage to structure, refers to the value of such items as floor timbers, skirting boards and plaster, which will not need to be replaced if protection or resilience measures are in place. The second refers to the value of house contents that would no longer be damaged. The cost to the economy of lost working hours is also included, as is the reduction in the need for temporary accommodation while flooded homes are being dried out and repaired.

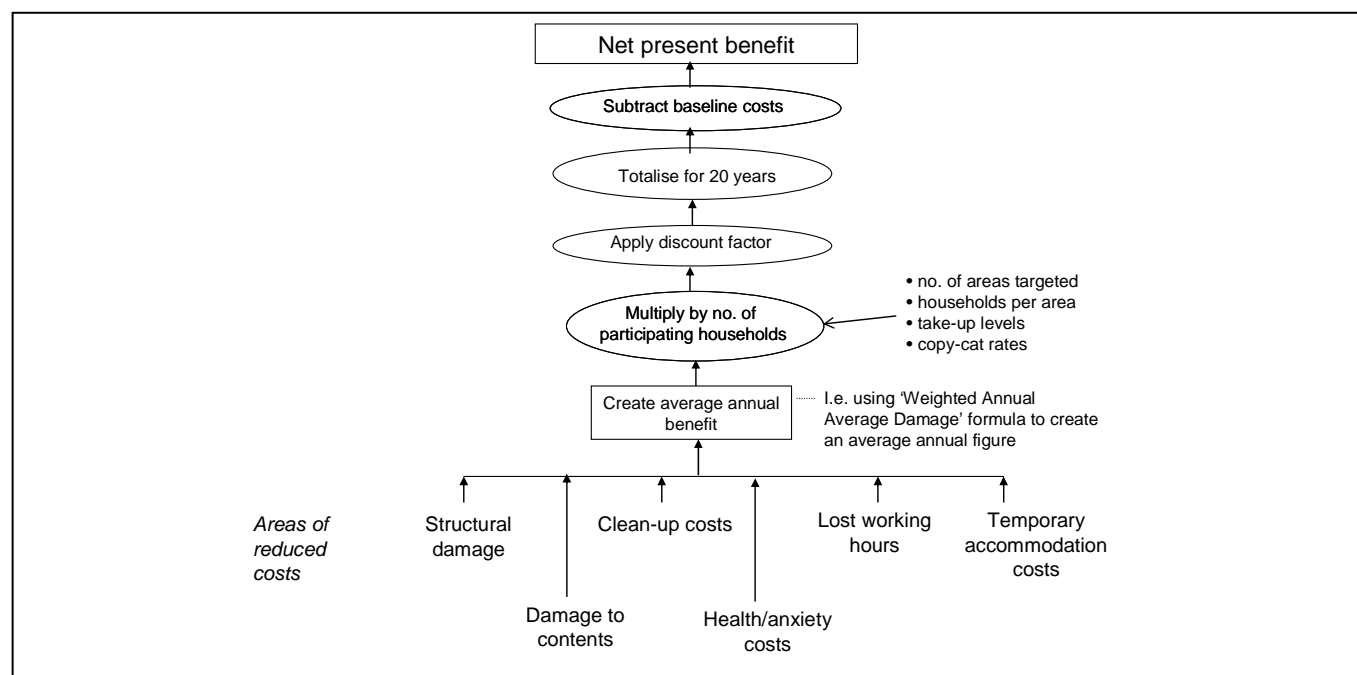
Many assumptions underpin the calculations of the scale of the benefits. More details can be found in the Entec and Greenstreet Berman Technical Report⁸⁷. They assume, for example, that households will always be present to deploy temporary protection measures, that they will always deploy them effectively and that homes with these measures in place will only flood to a maximum of 5 cm as a result. This might have led us to overestimate the benefits of such measures. In reality, householders who are on holiday at the time of a flood might not be able to put up these barriers. Similarly, where there is little warning of a flood, householders who are away from home for the day or the evening might not be able to return in time. The figures for

⁸⁶ Flood Hazard Research Centre (2007). *The benefits of flood and coastal defence*.

⁸⁷ *Developing the Evidence Base for Flood Protection and Resilience*, Prepared for Defra by Entec and Greenstreet Berman, June 2008; *Resilience Grants Pilot Projects – Summary Report*, Defra, June 2008, <http://www.defra.gov.uk/enviro/fcd/policy/strategy/FD2607SR.pdf>

the benefits of both of the protection packages also assume that the main route of ingress into the house would be above the surface and that groundwater flooding is not a major threat.

Figure 6 The calculation of benefits



4.3 Calculation of net present value and benefit-cost ratio

To calculate the present benefit, the average benefits per household were multiplied by the number of households that have installed property-level protection or resilience, either because of the Government scheme, spill-over effects, or mandatory resilient repair.

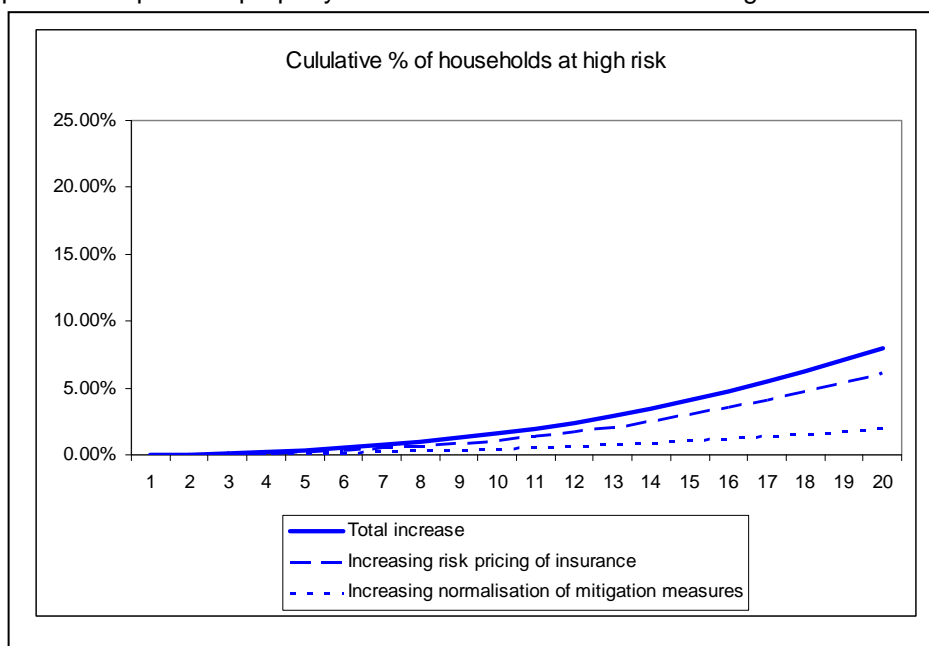
Subtraction of baseline costs

The calculations of the anticipated take-up rate of the measures in the no-change option are based on our predictions of the impact of insurance and of the growing normalisation of household-level mitigation levels, both of which we expect to cause an increased level of uptake. People are more likely to be influenced by these factors, we believe, immediately after a flood. Hence, for the resilient-repair option we have assumed that 1 – 10 % of households in very high-risk areas introduce resilience measures after a flood and that this rate will increase by 0.1 - 0.5% per year. The variation in take-up rates reflects belief that the rate will be higher for flooded households in areas of highest risk, as they are likely to have experienced a flood in recent years.

For the areas that would be targeted by the survey-only and the survey-and-subsidy options, we assume that only 1 in 10,000 currently implement measures every year as a result of insurance-related incentives and that this rate will increase by 0.025% for the first ten years and 0.05% per year in the second period of ten years. We also assume that whereas the measures are not currently considered at all normal, in the absence of any government intervention, increasing normalisation will lead to an increased take-up rate of 0.01% per year.

In the final step in the process of calculating the net present costs and benefits, we subtracted those costs and benefits that would have existed in the absence of any government intervention. For both options, we assumed that 8% of the households in the scheme areas would eventually have taken measures in the absence of any government intervention. The costs and benefits associated with these households were therefore subtracted from those in our evaluations.

Figure 7 Assumed pattern of uptake of property-level measures in the absence of government intervention



Application of the discount factor and totalisation

Costs and benefits were totalled for a period of twenty years, with the standard Treasury discount of 3.5% per year applied to all the costs and benefits in future years. After the extensive survey and measures costs during the five years of the implementation of the schemes, the major costs of the subsequent fifteen years consist of maintenance costs, along with the spill-over costs from those who put the measures in off their own bat. We assume that most of the packages will remain effective and continue to deliver benefits year-on-year for twenty years, but that temporary protection measures will be rendered ineffective by neglect or residential mobility after ten years.

5 Evaluation of the policy options

5.1 A comparison of the options

Of the two options involving government intervention, we expect that, for the same level of government investment, the survey-only option would lead to the protection of more properties (see Table 7). The survey-only option also has higher net benefits and a lower public investment per property because the measures themselves are paid for by the householder. But the survey-only option also has risks, particularly around the number of people who will actually implement property-level flood protection having had a free survey. In this analysis, we assume that a third of surveys lead to the adoption of packages of measures and that two-thirds do not. In reality, this proportion could be either higher or lower. Assumptions about take-up rates are important for the outcomes of the analysis (see sensitivity analysis in next section).

Table 5 Comparison of costs and benefits of the three options from households adopting measures in the duration of the scheme (costs and benefits over 20 years, discounting the baseline)

Option	Total public costs	Total Householder costs	Number of properties adopting measures during life of scheme	Public costs per protected household	Benefits	Societal benefit-cost ratio (over 20 year period)	Present value of societal net benefit (over 20 year period)
Do-nothing	£0	£3.3 million	500	£0	£11 million	3.3	£8 million
Survey-only	£20 million	£62 million	10,000	£1,900	£124 million	1.5	£43 million
Survey-and-subsidy	£20 million	£10 million	3,800	£5,400	£49 million	1.6	£19 million

Because it involves no state intervention, the do-nothing option is free of any transaction costs and therefore has the highest benefit-cost ratio of all the options (3.6). However, we estimate that for any given set of high-risk areas, the advice-only option increases the NPV by a factor of five when compared to the no change option and that the subsidy option increases the NPV by a more than a factor of two. The no-change option, therefore, fails to meet the primary objective of this review, which is to find a way to reduce the amount of overall damage caused to high risk homes that have no community level protection. It fails in this respect because it does not address directly the key psychosocial barriers identified earlier. If the changes in public attitudes and behaviours on which this option is premised do not keep up with increases in risk, this will cause a growth in the exposure to flood risk of those areas that do not benefit from large-scale engineered defences. The cost of property-level flood protection measures might leave poorer at-risk residents unable to afford insurance and equally unable to afford the measures that would reduce the cost of this insurance.

On the other hand, offering to subsidise the costs of the measures could be considered fairer than only providing a free flood survey, as it does not disadvantage those on lower incomes. The survey-only option will leave poorer households unprotected if they are unable to afford measures. The same might also be true for households that are in need of more expensive, permanent, protection, such as those in flash-flood areas and those unable to deploy temporary measures themselves.

A further advantage of the survey-and-subsidy option is that it facilitates collective action on property-level flood protection and resilience; unlike the first option, which leaves it to individual households to decide whether to purchase property-level protection and resilience and when to do so. This has implications for costs, because local authorities purchasing products on behalf of groups of households are likely to be able to obtain a lower price than could be obtained by lone householders. It also has implications for effectiveness. Floodwater can pass through party walls and can flow along shared foundation cavity spaces. As a result, for property-level protection measures to be fully effective, adjoining semi-detached properties both need to be protected. Depending on the design of the building, so too, potentially, do all the homes in a single terrace. This is far more achievable when take-up percentages are higher. Finally, the second option has the advantage that it facilitates the setting up of community flood response schemes, which are more viable where the majority of neighbours employ flood protection measures of the same type.

The subsidy proposal also has a number of potential disadvantages however. Compared to the advice only option, subsidising the measures involves a far higher average public cost for each protected household (see Table 5) and it uses public funds for what is effectively a private good (someone's property and its value). There is also anecdotal evidence that people are less likely to properly maintain or use measures that they themselves have not totally paid for. It is also possible that landlords will be less likely than homeowners to take up the offer of the subsidy, in which case the benefits of this approach would be less for tenants, who tend to comprise the less well-off section of society. Finally, because state funding is limited and unlikely to be sufficient for all at risk homes, new inequities will be introduced into the way in which flood risk is managed.

5.2 Sensitivity analysis

In the survey-only option, the conversion rate (i.e. the per cent of those receiving a free survey that then goes on to install measures) is critical (Table 5). If this drops below about 3-in-20, the policy will no longer be cost-beneficial. On the other hand, if local authorities carry out a certain amount of vetting to ensure that households are only given the free survey if they have shown some signs of commitment to the idea of purchasing measures, the benefits to society increase.

Table 6 Sensitivity analysis for the survey-only option

Scenario	Conversion of survey to practical measures	Number of properties adopting measures	Public expenditure per protected property	Societal benefit-cost ratio	Societal net present value
Central estimate	33%	10,500	£1,900	1.5	£43 million
Worst case	15%	4,600	£4,300	1.1	£3.3 million
Best case	50%	16,000	£1,250	1.7	£83 million

In the survey-plus-subsidy option, the link between the uptake rate of the scheme and the level of the cap is very important. In the sensitivity analysis, the level of the subsidy and the take-up rate were varied together because they are interdependent (Table 9) – with each drop in the level of the cap, we assume there will also be a decrease in the level of take-up. Although this results in an increase in size of the transaction costs for each household protected, Table 9 suggests that this is cancelled out by the decrease in the cost of the subsidies. Hence, the overall public expenditure per benefiting property remains relatively constant. At the same time, private expenditure by households necessarily increases as the cap goes down, so the overall, societal, benefit-cost ratio and net present value also reduces. Indeed, if the cap drops to a level where it cannot attract at least one in five households to take up the subsidy, the policy ceases to be cost-beneficial. The provision of free surveys was not piloted, so we have no evidence on what the level of take-up is likely to be. However, we consider our central estimate of 33% to be a conservative one.

Table 7 Sensitivity analysis for the survey-plus-subsidy option (for an assumed fixed public spend of £20 million)

Scenario	Level of subsidy	Take-up rate of subsidy	Number of properties adopting measures	Public expenditure per benefiting property	Societal benefit-cost ratio	Societal net present value
Central estimate	£4,500	53%	3,800	£5,400	1.6	£19 million
Worse case	£2,000	30%	4,200	£4,800	1.4	£14 million
Worst case	£1,000	20%	3,900	£5,200	1.2	£6 million

6 Summary and Conclusions

The do-nothing fails to address directly the key psychosocial barriers to the take-up of property-level flood protection. Changes in the insurance industry and in public attitudes and behaviours are unlikely to keep pace with increases in risk. This might leave poorer at-risk residents unable to afford insurance but equally unable to afford the measures that would reduce the cost of this insurance.

Taken together, the analysis suggests that the primary focus of Government involvement in promoting property-level flood protection and resilience should initially take place by offering free household flood surveys. This option should lead to the protection of more properties for the same level of Government investment than the survey-and-subsidy option. It has lower public investment per property, because householders would have to cover the costs of the measures themselves - either through an upfront payment or a loan, for example, extending their mortgage, which they are allowed to do. There is, of course, a risk that householders will accept the free survey but then not pay for the measures themselves – leading to wasted effort in surveys. It will be important that any advice scheme considers ways to achieve a high conversion rate from survey to installation of measures.

However, there may still be a case for including some limited element of funding for the measures themselves - for example, in particularly deprived areas or in areas where the issue of social justice is particularly keenly felt. This will be explored with stakeholders in the accompanying consultation

Compulsory resilient repair for the areas at very high risk of flooding is also cost-beneficial, in part because of the relatively low administrative costs. But this policy option also carries significant risks. Following a large flood event, such as that last summer (2007), there could be a shortage of skilled workers who can carry out resilient repair. Households will be required to cover the additional costs of the repair, at a time when they are potentially already financially stretched. For those with insurance, these upfront costs might be covered by an increase in the individual's insurance premium.

APPENDIX 1

Specific impact tests

- **Sustainable development**
Making homes and businesses more resistant and resilient requires the use of more non-renewable resources. It also, however, promises to reduce the waste of such resources in the event of floods and reduced demand for landfill for the disposal of flood-damaged goods.
- **Carbon assessment**
Resilience and protection measures would reduce the use of dehumidifiers to dry out flooded homes and businesses.
- **Competition and Small Businesses**
By promoting property-level measures as a complement to community flood defence schemes, these policies should support small property surveying businesses and practices. They should also increase demand amongst the flood protection suppliers for their products. Currently, the high costs of obtaining a BSI Kitemark can prevent new entrants to the market. But with increased demand, the costs of the Kitemark will be modest in comparison the potential revenue that businesses could gain by having their products used by households in high risk locations.
- **Health impact**
Reductions in domestic and business disruption and the earlier return of residents to their properties should reduce the mental and physical health impacts of flooding.
- **Disability equality**
Property-level resilience measures that need to be put in place on receipt of a flood warning are less effective for some disabled groups (e.g. those with chronic anxiety; those less physically able to put floodgates in place) than large-scale structural measures (flood walls; demountable barriers; flood storage etc). On the other hand, protection measures that are permanently in place (e.g. waterproof doors or self-sealing air bricks) will be of greater benefit to such groups, who may be less able to respond to flood warnings by moving possessions to safety on receipt of a warning and who might also benefit particularly from the extra time that protection measures would afford them.

It will be important to consider accessibility of information on property-level flood protection and resilience for visually impaired or less literate people.
- **Rural proofing**
The current prioritisation system will tend to favour flood defence schemes in concentrated clusters of at risk homes, which are more likely to be in urban areas than in rural areas. These proposals would help redress this situation by facilitating risk mitigation measures that are more economically viable in for small clusters of at risk homes, which are more likely to be in rural areas.
- **Race equality**
It will be important to consider the accessibility of information for non native speakers. For example, in the North Dales area the Environment Agency is producing DVDs specifically for a local ethnic minority.