



The Barriers to Resilient Reinstatement of Flood Damaged Homes

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Abstract

The current debate about flood management in the UK involves the notion of making space for water, recognising the fact that it is impractical to defend large floodplains to a standard which excludes any possibility of flooding. Coupled with development controls to discourage new building in the floodplain is the desire to encourage inhabitants of the floodplain to render themselves less vulnerable to flood damage by building resilience into their homes. Advice on resilience is available via flood forums and insurers but historically take up has been low. In a bid to increase the installation of individual flood protection measures there are nascent grant schemes underway or proposed in England and Wales. A review of the international literature relating to flood proofing of homes and the attitudes of floodplain residents reveals that there are many barriers to overcome in encouraging the installation of resilient measures. Financial concerns are of course a primary factor, the presence of almost universal flood insurance cover for UK residents detracts from motivation to take individual responsibility. However it emerges from this review that other considerations should not be disregarded. Any proposed scheme must contend with the preference for community measures, informational barriers, emotional constraints, aesthetic considerations and timing issues. The provision of finance for resilient schemes could be more effective if incorporated within the reinstatement process in order to minimise cost, distress and disruption to the home owner.

Keywords: (flood risk resilience resistant)

Introduction

The costs of flood damage in the UK has risen over the past decade. A series of major flood events have followed closely on one another starting with

Easter 1998 floods. The latest flood event in summer 2007 was the largest event since insurers took on the burden of funding repair work, an estimated £3bn was covered by insurance and government has also spent an estimated £57 million to date (ABI, 2007). UK Government policy on flood management can be summed up by the strategy of "Making space for Water" which combines the provision and maintenance of engineered flood defences with the recognition that flooding can never be prevented entirely (Rooke, 2007). Other measures such as planning restrictions, warning systems and temporary and individual barriers are necessary. A recent report from the insurance body the Association of British insurers (ABI) (2007) has called for a number of government actions to reduce the cost of future flood events among which is an increased focus on increasing the resilience and reparability of homes and businesses. This shift from flood defences to flood risk management has also been a feature of recent European flood management (Ashley et al., 2007; Kelly and Garvin, 2007).

The distinction between resistant measures, those designed to keep floods out of a property and resilient measures, those designed to reduce the impact of a flood which is allowed ingress is an important one. Keeping water out is a natural desire of property owners but, as mentioned above, it is not always possible or cost effective to prevent flooding of property. In some cases, attempting to keep water out can result in more damage to the property during high velocity or deep flooding. A matrix displaying appropriate flood proofing technologies is offered by Zevenbergen et al (2007) showing the important aspects of flooding to consider before any practical and costing aspects are investigated. Resilient measures are sometimes preferred, allowing water into the property in the knowledge that preparations have been taken to minimise the damage caused. Resilient measures are designed to achieve two important things: to limit the financial impact on the flood victim or their insurer by reducing damage to contents and building fabric and to reduce the time to reinstatement of property allowing communities to return to normality quickly in the aftermath.

In order to realise the aim of these emerging flood management strategies it becomes necessary to engage floodplain populations in the process. Owners of property in the floodplain must be encouraged to take actions ranging from registering for flood warnings to installing their own defence and alarm systems (Pitt, 2007). In the UK, the Environment Agency (EA) has instituted a public awareness programme and undertaken extensive consultation. Take up of measures remains low (BMRB, 2006) and in a desire to boost the implementation of individual flood mitigation measures, pilot funding schemes have been set up. The success or otherwise of such schemes is not yet established but further research is being undertaken to find ways to increase take up within at-risk populations.

This paper investigates the barriers to the take up of resistant and resilient measures by applying findings from international research within the UK context.

Research method

The research employed is a review of international literature relating to the take up of flood mitigation measures. The aim of the review is to determine whether common features of floodplain populations could help to explain why the take up of measures is so low in the UK. If such features can be established it may be possible to distinguish between take up of resilient and resistant measures. Different strategies may be successful in increasing the take up of resilient rather than resistant measures.

Research questions:

- Why is the take up of individual flood resistant and resilient adaptation measures so low even among populations at high risk flood or previously flooded?
- Do populations prefer resistant or resilient measures and why?

The review will identify barriers to take up of individual measures from the flooding literature. These barriers will be considered in the light of whether they are likely to decrease the take up of resistant or resilient measures.

Following the review, some specific resistant and resilient measures taken from suggestions of appropriate measures by the ABI will be considered. In the light of the review findings. The most significant barriers to their implementation will be analysed. This will lead to suggestions for improving the take up of these measures.

Research Objectives:

- Identify barriers to installing flood mitigation measures from international literature.
- Explore difference between barriers to resistant and barriers to resilient measures from international literature.
- Analyse specific resistant and resilient measures for the UK in the light of literature review.

Research results

In order to take mitigating action a floodplain resident must go through several stages grouped into two major phases: the desire to act and the ability to act. The individual must be aware that there is a risk of flooding and they must perceive that this risk is great enough to warrant action. In order to wish to act the individual must own the problem rather than expect an outside agency to solve it. Once the desire to act is in place the resident must have the knowledge of what action they can take to mitigate the flood risk. They must

have the finance to implement the solution and they must believe that the solution will be beneficial, not only solving the problem but also in the context of their wider lifestyle. Barriers which stand in the way of any of these stages can upset the process of installation of mitigating measures. The barriers have been divided into four categories, financial, information, emotional and timing. Table 1 below shows that different barriers impact at different stages of the road to mitigation, they are considered in more detail below.

Table 1. Barriers to developing the desire and ability to install flood mitigation methods

		Financial barriers	Information barriers	Emotional barriers	Timing barriers
Desire	Awareness	No	Yes	Yes	No
	Perception	Yes	Yes	Yes	Yes
	Ownership	No	Yes	Yes	Yes
Ability	Knowledge	Yes	Yes	No	Yes
	Finance	Yes	No	No	Yes
	Belief	No	Yes	Yes	Yes

Financial Constraints

Financial constraints can occur at an early stage of the path to mitigation. A general awareness of areas subject to flood risk is freely available from the EA flood maps. However the EA maps are not suitable for generating a realistic estimate of the risk to individual properties. There will be a cost associated with gaining more detailed assessment of risk to a property in advance of flooding.

The first difficulty is to overcome the fact that many individuals see it as the responsibility of some other body to provide finance (Brilly and Polic, 2005; Krasovskaia, 2005). This question of who should pay for resilient adaptation has been the subject of much debate (Clark et al., 2002; Crichton, 2005; Huber, 2004). Government, insurers and the homeowner are the main contenders. Until recently in the UK the consensus has been that the homeowner should be responsible (Clark et al., 2002; Crichton, 2005) because in a open and competitive insurance market insurers cannot rely on payback from reduced damage claims and because government funds are directed to the greater good of providing community level defence.

Not all measures have an associated financial cost but some can be very expensive. For the UK homeowner, finance can be raised by extended borrowing, the Council of Mortgage Lenders policy on the matter is that lenders should be sympathetic. Tenants are likely to take the least expensive options to protect their property without the capital to back up loans. Pilot grant schemes are also being introduced for example the Welsh assembly has a grants scheme which allows up to 85% of the costs of flood alleviation

work to be paid. Take up of the scheme has been fairly low perhaps because individuals must pay for the initial survey and if the application is not accepted must bear the cost of the feasibility report. After a major flood in Carlisle in the north of England, the city council fitted 72 properties with door and airbrick guards at a cost of £285,000, not all residents accepted their offer of help. Further pilot scheme funding was announced by the government in May 2007 of grants up to £5,000 per property to help pay for surveys and flood proofing measures.

However, even though finance may be available, in the presence of almost universal insurance little financial benefit accrues to the homeowner in addressing flood risk. Residents are more likely to expend their limited financial resources in other directions with demonstrable financial benefits such as double glazing.

Information Barriers

Since the 2000 floods in the UK there has been a conscious effort dedicated to raising the awareness of flood risk amongst at risk communities which has met with a measure of success (BMRB, 2006). Despite the large amount of work put into public education campaigns in general, specific actionable information is lacking. As described above the likely depth of flooding and the velocity of flood flow determine to a great extent the appropriate mitigation strategy. In the UK the publicly available information on the Environment Agency website gives return information but does not provide depth or velocity predictions. It is also not clear whether the increase in flood frequency predicted to occur in the future will result in markedly higher levels during floods. Since anticipated depth of flooding is a crucial decision factor in designing adaptation it should be made more widely available.

Awareness itself does not produce action in the absence of relevant information about possible solutions. Increased anxiety and a feeling of helplessness may result (Grothmann and Reusswig, 2006). Floodplain residents do not know what is available and may not choose in a rational way between options. In the 2000 floods sandbags were the primary means of defence (Bramley and Bowker, 2002). The sandbag approach is still the public perception of flood resistance in the UK. Advice given to floodplain residents is usually of a very general nature, multiple websites exist but are not specific to individuals. The personalization of information is an important aid to effectiveness (Sims and Baumann, 1987), advice should be very clear and unambiguous and should come from a credible source.

In raising their houses above flood levels in the US (Work et al., 1999) the extent of elevation were dictated by the requirement to utilise the basement space so created and so, luckily, allowed plenty of margin for flood. In Laska (1986) of those flooded residents who sought information on flood proofing actions two thirds had actually undertaken some measures. However, many of the options were seen as unhelpful by the majority of residents and were therefore not undertaken. The author suggests that despite high awareness of

measures the knowledge was only superficial and did not allow for a realistic evaluation of effectiveness.

Belief in effectiveness is an area where lack of information could have a significantly negative impact. Kreibich et al (2005) found that belief in effectiveness was decisive in the choice of whether or not to undertake building adaptation. And that those experiencing the most damage were least likely to adapt their homes perhaps due to fatalism and a lack of belief in effectiveness of measures.

There is a general perception that methods will be ultimately ineffective possibly because of lack of evidence about the effectiveness of measures but also due to experience of poorly performing or inappropriately chosen defence strategies. The newly released DEFRA scoping document cites rogue traders selling door guards as an example of this phenomenon (Bowker, 2007). Lack of adequate flood warning may also be an issue here, although in general for the larger river systems in the UK sophisticated flood warnings are available where warnings are not issued as for example in Boscastle some resistant and preparedness measures cannot be implemented.

Emotional constraints

It is widely reported feature of floodplain populations that they ignore the risk of flooding or play down the risks (Correia et al., 1998; Krasovskaia, 2005; Lamond and Proverbs, 2006). Cognitive adjustment allows property owners to mitigate the anxiety caused by flood risk by either acting to reduce it or to believe that adaptation is unnecessary (Grothmann and Reusswig, 2006). The process of evaluating the benefits of flood adaptation requires the floodplain resident to destroy this cognitive adjustment and face the unpleasant possibility of a future flood. Thus emotional constraints prevent awareness and perception of the risk of flood.

Ownership of the flood risk problem is also a highly emotional one. Most surveys reveal residents would prefer government to take responsibility and install resistant structural measures (Correia et al., 1998; Krasovskaia, 2005; Laska, 1986; Werrity et al., 2007). The belief that the responsibility for managing risk belongs to someone else is also reflected in reliance on insurance (Brilly and Polic, 2005). This is particularly true in the UK where flood insurance is a standard part of most domestic insurance policies (Clark et al., 2002). There is a reluctance to take responsibility unless frequently flooded (Work et al., 1999). People will first seek to buy insurance and second campaign for global defences before considering personal defences (Correia et al., 1998; Laska, 1986). As insurance in the UK is generally still available at a reasonable rate for the majority of floodplain residents (Lamond et al, 2008) the necessity for personal responsibility is felt by a small minority. With high levels of experience levels (Laska, 1986; Work et al., 1999) a phenomenon known as the 'disaster subculture' is recognised which involves groups of people who have been frequently exposed to a hazard and have derived coping strategies. These are the few who will have purchased flood boards (Correia et al., 1998).

However, even where ownership is accepted by the resident and finance is in place, there are still many emotional barriers which may prevent implementation. Flooding is a very stressful experience which has immediate impacts but which has the power to affect victims for a long period if they are reminded of the flood (Samwinga et al., 2004). Adaptation might be resisted because it involves daily reminder of the flood hazard, and if the adaptation is of the resilient type it is a reminder that water might enter the home. A subsidiary worry that the presence of flood adaptation might signal to potential purchasers that there is a flood risk and reduce the value of the home has also been mentioned. If flood risk cannot be ignored then 'peace of mind' is a primary reason given for installing resistant measures, for example in Work et al (1999). For the UK homeowner the avoidance of the stresses associated with flooding should be a more powerful incentive than the financial one given the availability of insurance to offset financial risk.

The current insurance regime in the UK favours like with like reinstatement and accords well with the instinct of homeowners to retain their chosen aesthetic. Some flood proofing adaptations could be considered unsightly, for example external coatings or raising on stilts. If properties in the floodplain are 'character' dwellings the loss of aesthetic merit may be regarded as too high a price to pay. Owners may prefer to install replicas of the antique features they admired in purchasing the original property.

Where funds are available victims would often rather replace than clean their belongings. The feeling that submerged goods, fittings and appliances can never be cleaned sufficiently may lead to replacement of salvageable items. This failing may not be limited to the victims themselves. In the Carlisle clean up victims felt that over zealous stripping of homes sometimes resulted in the needless disposal of irreplaceable items and desirable architectural features (Hendy, 2006). For insurers the extra effort entailed in investigating the state of existing doors and floors, making judgements and then salvaging the existing fittings may cost more than a complete systematic refit. An anecdotal example of an antique shop in Carlisle which was considered destroyed by unsympathetic reinstatement was provided by Hendy (2006). Ensuring protection of architectural features in advance of flooding by ensuring that for example all wood is sealed against water penetration is therefore highly desirable.

Timing Sensitivity

It has often been demonstrated that as time elapses after a flood populations forget and are not so concerned about risk (Eves, 2002; Lamond and Proverbs, 2006). The desire to take action subsides with the memory of the disruption and distress. For those who actually suffered flooding the memory fades and for the total floodplain population with the migration of residents in and out of the at-risk area awareness may also decline.

In addition the added cost of installing flood mitigation measures can be reduced when undertaken as part of a necessary restoration. Therefore the

optimum time for retrofitting many measures is in the immediate aftermath of a flood (Laska, 1986). However, in the wake of flooding residents are not in the best frame of mind to make decisions, and research into the most effective measures to employ can take time. When victims' perceptions following flooding were explored by Samwinga et al (2004) speed of return and the stress of displacement were mentioned frequently among the many worries they had. The loss of irreplaceable personal possessions was mourned and so preparedness and the length of warning was addressed but structural adaptation was not on their priority list. In the wake of a large flood event the issue of manpower may also deter victims and their insurers from initiating extra work when local resources are overstretched as was seen in Carlisle (Hendy, 2006). Applying for grants will inevitably delay things.

Differences between Resilient and Resistant measures

The first instinct of the floodplain resident when considering protection of their home is to keep the water out. Laska (1986), for example, showed that encircling walls were the most popular flood risk management technique. Resistant measures could reduce the impact of flooding to the inconveniences associated with larger system failure such as power supply interruption. The preference for community measures and abdication of responsibility favours resistant measures and encourages the resistant mentality. Resilient measures offer lower 'peace of mind' but the emotional stress of long periods of displacement from home would be minimised by resilient adaptation if barriers fail. Resilient adaptation gives the signal of risk without the reassurance that water will be kept out. To move towards resilient adaptation requires a shift in perception and a recognition that all barrier techniques will eventually fail or that they are uneconomic.

In choosing between resistant and resilient measures, resistant measures seem easier to understand and have been more widely tested achieving kite mark status in some instances. The low take up of resilient adaptation in general makes more general assessment of effectiveness problematic. Measurement of the impact of resilience measures has largely been limited to preparedness rather than structural adaptation with the exception of Kreibich et al (2005) and the resilient measures installed in a housing association property in Norfolk (Norfolk County Council, 2005) which have demonstrated that the time to reoccupation can in some circumstances be dramatically reduced by such measures.

Resistant measures may also enjoy more publicity because specific branded and kitemarked products are involved which are promoted by their manufacturers. The grants to date have concentrated on resistant methods whereas the new grants announced in May would cover both resistant and resilient measures. While resistant flood proofing adaptations may be considered unsightly, for example external coatings or raising on stilts, resilient installations such as replacing wooden floors, plastic kitchens or raising appliances on plinths may face even greater opposition. The fact that resilient adaptations will change the interior rather than the exterior of the home may place a greater emotional barrier for them.

Timing considerations also favour resistant solutions rather than resilient ones. Many resistant solutions such as barrier walls or door guards can be easily installed at any time. Resilient ones such as replacing wood floors with concrete ones cause a lot of disruption and would be best installed during reinstatement.

Table 2 summarises the major barriers to adaptation for specific resistant and resilient measures. The table assumes installation during planned repair works. The column labelled “timing sensitive” reflects whether there would be significantly increased cost and disruption incurred if such works are not carried out during reinstatement but undertaken at some other time.

Table 2. Anticipated barriers to specific resilient and resistant measures

	Item	Financial concern	Information concern about Effectiveness	Emotional concern appearance	Timing sensitive	Effective in isolation ?
Resistance	Install one way valves	Yes	No	No	no	Yes in some situations
	Install a chemical DPC	Yes	No	No	Yes	Yes in some situations
	Coat exterior walls	Yes	Yes	Yes	No	No
	Re-point brickwork	Yes	Yes	No	No	No
	Replace doors, windows, skirting boards and frames	Yes	No	Yes	Yes	No
	Install air brick covers x6 floodguards	Yes	No	Yes	No	No
	Install front and back door floodguards	Yes	Yes	Yes	No	No
	Install patio door floodguards	Yes	Yes	Yes	No	No
Resilience	Move service meters	No	Yes	Yes	Yes	Yes
	Move electrics	No	Yes	Yes	Yes	Yes
	Mount boilers onto wall	No	Yes	No	Yes	Yes
	Replace floor with treated timber	No	No	No	Yes	Yes
	Fix plasterboard horizontally	Yes	Yes	No	Yes	Yes
	Replace ovens with raised built under type	No	Yes	Yes	Yes	Yes
	Replace chipboard kitchens and bathrooms with plastic or similar	Yes	No	Yes	Yes	Yes
	Replace chipboard stiffened baths with plastic or similar	No	No	Yes	Yes	Yes

In general it can be seen that the resistance measures tend to be more expensive up front and, to be effective, must be taken on wholesale whereas the resilience measure can be quite cost neutral at reinstatement and can often be effective in isolation but raise other concerns and are timing sensitive.

Discussion and conclusions

Key Lessons Learned:

- Individuals can achieve peace of mind either by taking action against flood risk or by ignoring the risk of flooding.
- Resistant measures are more attractive than resilient measures to individuals at risk from flooding.
- The timing of installation of resistant or resilient measures is crucial but resilient measures are more time dependent than resistant ones.

The desire of governments to place more of the responsibility for flood management onto the floodplain population requires the floodplain population to take joint ownership of the flood problem. Emotional issues stand in the way of this ownership as populations can achieve peace of mind by ignoring or minimising the problem as an alternative to taking action. Empowering the population with information which will allow them to easily assess risk and to believe that there are solutions within their reach may help to address these issues. Empowering them with financial help will also help residents to accept ownership. For example, in China, public funds are usually available for the materials needed to rebuild when mud built houses are washed away. When grants for more resilient construction were made available residents were very happy to implement different building techniques (Wong and Zhao, 2001).

The analysis above has identified the financial constraint of the presence of insurance as another major barrier to shared ownership of the flooding problem. Presence of universal insurance allows owners to make emotional judgements with little if any financial detriment. A coordinated or concerted effort on the part of insurers could help to change this.

Some UK insurers state that they have a policy of offering direct discounts for adaptation, however, these are in a minority. A recent survey of policyholders in the floodplain (Lamond et al, 2008) shows the awareness is low within the floodplain population. Regimes differ across other countries for example in the US, state underwritten insurance premiums discount resilience. Work et al (1999) calculated that resistant modifications undertaken by some homeowners in the US had the potential to pay back in reduced premiums within ten to twenty years. In Germany by contrast only 14% of surveyed insurers offered premium reductions for mitigation measures (Thieken et al., 2006).

The analysis suggests that barriers to the installation of resilient measures are greater than those for resistant measures. Information on effectiveness of resilient measures is lacking and emotional aspects relating to visual flooding signals and aesthetics come into play. In addition resilient installations are timing sensitive, being in general more integral within the property. In order to

encourage the use of resilient rather than resistant technology an attitude shift is necessary which may be realised in two ways. The evaluation of the performance of properties gaining resilient adaptation using government assisted funding may provide some much needed empirical evidence about effectiveness. New building regulations could ensure that resilient considerations have to be addressed during any reinstatement of flooded property or major planned work in property at risk of flood.

If resilient restoration is the aim then the clear and timely presentation of simple choices to the homeowner is increasingly important and should form part of the loss adjustment and planning process. Any grant provision must be integrated with these processes and therefore the planners, damage management specialist and granting authority must work closely together.

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