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Supporting the uptake of low cost resilience for properties at risk of flooding: Final report (FD2682)

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We hope that communities requiring support to enhance their resilience to flooding will benefit from the results of this research.

Glossary

Action research: participatory (as opposed to ‘practical’) action research is a collective and democratic approach to practitioner research and knowledge generation where participants bring together action and reflection in addressing issues of concern.

Flash Flood: rapid flooding of an area of land as a result of intense or extreme rainfall events or failure of infrastructure designed to store or carry water or protect against flooding (distinguished from general flooding by the sudden onset).

Flood Re: a ‘reinsurance’ scheme, launched in 2016 and lasting until 2039. This enables insurance companies to insure themselves against losses because of flooding, which in turn permits home insurance to be widely available and affordable in areas at risk of flooding for the duration of the scheme.

Flood risk: an expression of the combination of the flood probability (or likelihood) and the magnitude of the potential consequences of the flood event. The higher the likelihood and the greater the impact of flooding, the higher the level of flood risk.

Floodplain: any low-lying area of land next to a river or stream, which is susceptible to partial or complete inundation by water during a flood event.

Fluvial flooding: flooding from a river or other watercourse.

Groundwater: water that collects or flows beneath the earth’s surface, filling the porous spaces in soil, sediment, and rocks. Groundwater originates from rain and from melting snow and ice and is the source of water for aquifers, springs, and wells. The upper surface of groundwater is the water table.

Hazard: a situation (physical event, phenomenon or human activity) that has the potential to produce harm or other undesirable consequences to some person or thing.

Integrated Strategy: requires the use of both structural and non-structural measures to address potential flood risks.

Kitemark(ed) flood protection: flood protection products that have been independently tested (against BSI’s PAS1188-2014) and proved fit for purpose.

Overtopping (of defence measures): when flood water reaches levels that are higher than the flood defence level and flows over the top of the barrier or similar.

PAS64: a BSI Code of Practice that provides guidance on best practice on mitigation and restoration of water damaged buildings.

Property Support Network (PSN): the wide range of professions trades and commercial interests and businesses that householders will turn to for advice and be influenced by, when making decisions about their property.

Repair & Renew Grants: as a result of flooding over the period 2013-2016, the government made grants available to help affected homeowners and businesses install flood resilience or flood resistance measures. Following the winter storms in 2015/16 a revised Government scheme targeted the 17,000 homes and businesses impacted by flooding in the North of England. The **PLR** – the Property Level Recovery scheme is due to close by March 2017.

Repairability (flood repairable): sometimes known as “wet-proofing” or resilience, relates to how a building is constructed in such a way that, although flood water may enter the building, its impact is minimised, structural integrity is maintained, and repair, drying & cleaning and subsequent reoccupation are facilitated.

Residual risk: the risk which remains after risk avoidance, substitution and mitigation measures have been implemented, on the basis that such measures can only reduce risk, not eliminate it completely. This applies equally where property level measures are used and where properties are protected by strategic measures

Resilience: the capacity that people, groups or structures may possess to withstand or recover from emergencies.

Resilience (to flooding): flood resilient; see above repairability.

Resilient adaptation: implementation/retrofit of property level resilient measures (including but not limited to resilient reinstatement)

Resilient reinstatement (resilient repair): implementation of resilient measures during the process of flood damage recovery sometimes known as “build back better”

Resistance (to flooding): sometimes known as “dry-proofing” or water exclusion, this relates to how a building is constructed to prevent flood water entering the building or damaging its fabric.

Return period: long-term average interval of time, in years, between which events occur that equal, or exceed, a given magnitude

Risk: the probability of harmful consequences or expected losses resulting from a given hazard to a given element at danger or peril over a specified time period (Risk is normally calculated as Probability × Consequence).

Risk management: the systematic process of risk assessment, options appraisal and implementation of any risk management measures to control or mitigate risk.

Run-off: the flow of water, caused by rainfall, from an area which depends on how permeable or saturated the land surface is. Run-off is greatest from impermeable

areas such as roofs, roads and hard standings and less from vegetated areas such as moors, agricultural and forestry land.

Water entry strategy/approach: measures designed to make properties more resilient to the effects of flood water, if it cannot be prevented from entering.

Water exclusion strategy/approach: a combination of measures designed to prevent rising flood water from entering properties.

Abbreviations

ABI	Association of British Insurers
CILA	Chartered Institute of Loss Adjusters
CLG	(Dept of) Communities and Local Government
Defra	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EOI	Expression of Interest
EPSRC	Engineering and Physical Sciences Research Council
ESRC	Economic and Social Research Council
FCERM	Flood and Coastal Erosion Risk Management
GRCC	Gloucestershire Rural Community Council
HA	Housing Association
LAA	Learning and Action Alliance
LRF	Local Resilience Forum
PB	Project Board
PSN	Property Support Network
REA	Rapid Evidence Assessment
RICS	Royal Institution of Chartered Surveyors
SME	Small and Medium-Sized Enterprises
UWE	The University of the West of England, Bristol

Executive Summary

The Defra research project FD2682 examined the technical, social and behavioural aspects of supporting low cost flood repairable measures designed to limit damage to buildings during and after flood events. Flood repairable measures (sometimes called 'flood resilient measures') applied to buildings are designed to limit damage, or speed up recovery where water has entered a property. They include strategies to keep water away from building elements (such as raising power sockets) and the internal use of waterproof or water resistant materials, including those capable of retaining their integrity and recovering quickly after inundation. These measures have traditionally been regarded as most useful when water exclusion approaches (measures to keep water out of the building, sometimes called 'resistant measures') are not practical or cost effective.

The investigation took an action research approach, consulting widely and reflecting on findings on an ongoing basis. The research comprised the following stages:

1. A rapid evidence assessment (REA) including a review of relevant academic and grey literature; consultation with a panel of experts; interviews with flood reinstatement and property protection professionals; and interviews with occupants of properties where flood repairable measures have been adopted.
2. An assessment of the costs and benefits of selected low cost flood repairable measures, and illustrative packages of measures.
3. A demonstration project to explore innovative approaches that could be used by local agencies and businesses to address some of the barriers to the use of flood repairable measures. This made use of a co-design process, via the formation of the Tewkesbury 'Learning and Action Alliance' (LAA).

The REA concluded that (in contrast to previous perceptions of repairable measures as a last resort for properties at highest risk) low cost repairable measures are widely applicable as part of an integrated approach to limiting the residual risk to individual properties that may also include water exclusion measures. Interviews as part of the REA showed repairability to be a pragmatic approach that can be applied incrementally at various windows of opportunity with lower financial barriers to implementation than alternative strategies. The assessment of costs and benefits of selected low cost flood repairable measures, and illustrative packages of measures, confirmed their potential cost effectiveness in limiting flood damage.

The REA concluded that the weight of evidence supports the effectiveness of an ever expanding list of low cost resilience measures in limiting flood damage.

However, there are also major gaps in evidence, and in communication and sharing of available evidence, reducing the confidence in implementation of measures within relevant trades and professionals, as well as by owners and occupiers directly. Key areas in urgent need of additional scientific evidence include: the implications of debris and contaminants in floodwater; the effect of hydrodynamic and hydrostatic pressure on 'waterproof' materials; and durability of resilient measures after prolonged flood exposure. However, attention should also be directed towards further understanding the real performance of flood repairable measures in a variety of types of building before, during and after flooding.

The REA and demonstration project both concluded that, in order for the potential benefits of repairable measures to be realised in practice, there will need to be a shift in the repair and reinstatement process. Improved protocols (and incentives) are required that include clarity regarding the autonomy and responsibility of different actors within the repair process to recommend adoption of repairable measures. The inception of Flood Re offers both a challenge and an opportunity in this regard. The research finds that there could be benefits to placing the specification of negligible cost and cost neutral measures within the professional remit of surveyors and contractors on the ground. To support this, improved technical guidance and training is needed to raise levels of understanding and awareness within the industry. The surveyors' checklist, designed within the project, was seen as a useful contribution to this requirement. Improved confidence in appropriate measures could also be fostered through provision of exemplars and factsheets.

The REA and demonstration project highlighted the potential importance of other windows of opportunity (outside the recovery period) in the take up of low cost flood repairable measures. Insurance renewal and property transfer represent opportunities to raise awareness of measures at very low cost with minimal up-skilling of professionals and may provide direct triggers to action. Other building work and redecoration opportunities are harder to target in terms of awareness raising, therefore a well-informed and up-skilled local 'property support network' (PSN) is needed, in order to spot opportunities to support uptake on an individual basis. Evaluation of the demonstration project innovations indicated that implementation was most successful in those innovations driven by members of the LAA, or had significant input from members of the local PSN. Increased awareness of low cost flood resilience measures amongst LAA members was also achieved. Therefore the LAA model was seen as a potential platform to engage relevant local property experts and agencies, and to empower them to encourage property level approaches.

However, the REA evidence and that from the LAA meetings together with the evaluation of the surveyor's checklist suggest that emotional barriers to implementation of low cost resilience are important. Use of repairable measures is a

difficult concept, as it requires an acceptance that water might enter the property (home or business) and changes within the living space that might feel abnormal. Interviews with practitioner experts, together with an assessment of current regulations, suggest that making small adjustments to building regulations, relevant to passive avoidance and resilience, could aid normalisation of such measures. A greater focus on design and aesthetics aspects, and clearer guidance on the ways to deal with perceived contamination is also seen as important by professionals, the PSN and in the demonstration project. Finally, a wider framing of property level flood damage reduction, with suggested schemes including both water entry and water exclusion measures was indicated by the interviews with homeowners and professionals and discussed by the LAA as helpful in addressing emotional barriers.

Note:

For the purposes of this report, ancillary material has been included in the form of a series of Appendices as follows:

Demonstration project:

Appendix 1: Report on Demonstration project

Appendix 2: Evaluation of Demonstration project

Other:

Appendix 3: Report of trial of surveyors' checklist

Appendix 4: Report on the experience of flooding of the 'FLOWS' flood resilient house

Appendix 5: Examples of communication/dissemination materials

Appendix 6: Draft recovery guide

1. Background

The Final Report forms part of the outputs from FD2682, a research project that aims to identify barriers and propose solutions to promote low cost repairable measures that would make properties at flood risk more resilient to damage from flood waters. The project's aim supports the long-term goal of enabling individuals and communities to take more ownership for the management of their flood risk and to recover more quickly as a result. The project sought to identify barriers to adoption of resilient measures and ways to overcome them, both within the affected communities and within the professional networks engaged in the process. The project fits within the context of extensive past research (much of it initiated by Government¹) on 'flood resistance' and 'flood resilience' that has led to structural interventions, community capacity building and planning policies. This new research builds upon earlier work, avoiding replication of previous findings, with a focus on low cost measures and innovative practices (in comparison with those commonly in use) to support uptake of low cost measures.

The scope of interventions for the research was explicitly predicated on excluding measures to keep water out of a building, the focus thus becoming internal adaptation, also known as 'water entry strategy'; 'wet-proofing'; 'flood resilience' or, in this instance 'flood repairable' measures. This involves adapting a building so that when floodwater enters, damage to materials is minimised, and building elements that are damaged can be easily repaired or replaced. Measures include use of waterproof or fast drying finishes and relocation of sensitive services above expected water levels. Flood repairable measures are often recommended to deal with residual risk in properties protected by municipal defence schemes, and in properties where water exclusion may not be practical (for example, historic properties; where extreme depth flooding is expected; or fast onset flooding). Some of the measures can be termed 'no regrets' or 'low regrets' options as they are cheap to install, particularly during reinstatement, or as part of other refurbishment and alteration work to properties. In some cases, the measures may offer other benefits, such as improved air tightness leading to lower heating costs. Low regret/low cost measures are more widely applicable than more costly resilient approaches, extending the potential uptake to any home likely to be flooded (even those with other forms of protection) as a failsafe. The report will, therefore, focus on measures that fall within the low cost category, or low additional cost category, when implemented at the intervention opportunities throughout the building lifecycle.

It is well recognised that, despite efforts by multiple agencies, the tendency of households or small businesses at risk to adopt measures to protect their property

¹ <http://randd.defra.gov.uk/>

from flooding is generally low. A lack of guidance on the range and suitability of low cost flood repairable measures, and the need for deeper understanding of their economic costs and benefits in relation to other mitigation options, are known to be existing and critical barriers. Although other more comprehensive and costly schemes may prevent a higher proportion of damage in an individual building, the rationale for focussing on low cost measures in this project is that they pose the lowest financial barrier to implementation, in some cases being near to zero cost. Therefore, low cost resilience has the potential to be adopted more widely, and thus cumulatively across many properties prevent significant amounts of damage. The project is, therefore, designed to address some of the informational barriers to uptake, while also engaging with those professional networks that would support property owners and occupiers to implement the measures. This report summarises the evidence regarding the range of low cost measures available, their efficacy and their costs and benefits.

The purpose of the Final Report is to summarise the findings from the whole project. It can be read in conjunction with the Technical Report and the Rapid Evidence Assessment (REA) regarding appropriate flood repairable adaptation.

Aim:

This project aims to identify barriers and propose solutions to promote low cost measures that would make properties at flood risk more resilient to damage from flood waters.

Objectives:

The objectives set for the project were to:

- Provide evidence for a package of measures that would make properties more resilient to damage, through identifying the evidence, gathering best practice and generating case studies of flood repairable measures.
- Generate understanding of the behaviour of households and the property support network (PSN) and their interaction, through exploring the perceptions of a wide range of property professionals, damage management experts, support networks, householders and small businesses and their interactions.
- Design innovative practices (compared to those commonly used) to exploit opportunities to increase awareness and take up of measures, by exploring pathways to uptake and the theories of change.
- Demonstrate these innovations (designed with the cooperation of a wide range of property professionals, flood experts and selected households and businesses) in one community, to evaluate their potential.

- Summarise the lessons learned from the demonstration and evaluation of the outcomes from the community trial phase, and derive proposals for addressing gaps or new needs identified through the project.

2. Description of approach

The research adopted a participatory action research approach (see Bradbury, 2015, p1) which is ‘a democratic and participative orientation to knowledge creation. It brings together action and reflection, theory and practice, in the pursuit of practical solutions to issues of pressing concern.’ The research is enhanced by self-reflective enquiry by practitioners who are engaged in practices relating to the problem with opportunities for feedback and formative learning throughout the process (see Altrichter *et al.*, 2002). Within this project, the participatory action-research approach was based around three methods designed to achieve the report objectives: Rapid Evidence Assessment; Cost Benefit Analysis and a Demonstration Project involving a social learning platform (a ‘learning and action alliance’) – see Figure 1. Throughout the research, however, evidence and opinion was also generated from engagement activities and feedback from diverse participant groups, in order to refine and revise the findings that are presented in this final report.

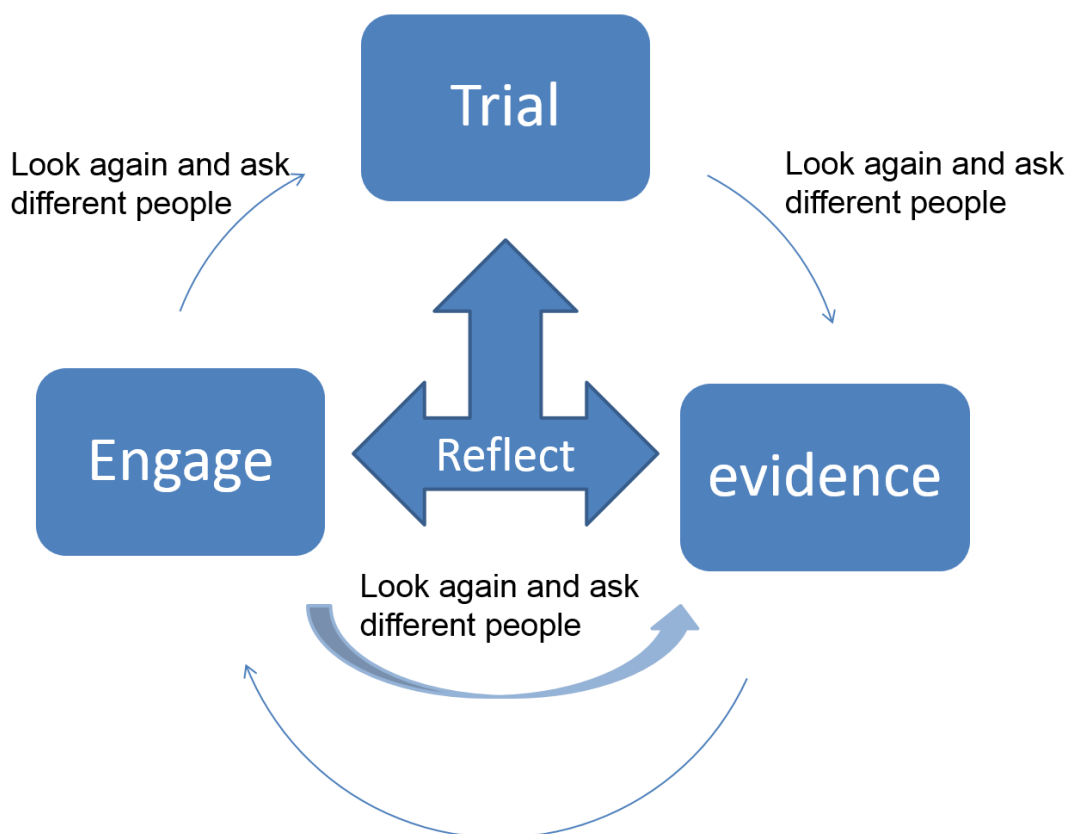


Figure 1 Bespoke Participatory Action Research Approach (source Authors)

The project team designed a bespoke participatory action research plan based around the fundamental ‘look, think/reflect, act loop illustrated in Figure 1. The ‘act’ stage, in this project, comprised assessing evidence; engaging in social learning;

and demonstrating new pathways (see for example Stringer, 2007). The plan involved multiple groups of participants, a project board, interviewees, the Tewkesbury LAA, demonstration households, conference and workshop participants. Thus, outputs have had maximum input from and exposure to a variety of stakeholders and many have been used in and improved by the demonstration project. This approach may inform best practice, as well as enabling experiential development of participants in the process through raised awareness of wider issues and relevant case studies. Reflection was further strengthened through the involvement of an evaluation team that gave feedback throughout the demonstration project.

2.1 Rapid Evidence Assessment

The Rapid Evidence Assessment (hereafter REA) synthesised the available research and practice based information regarding low cost resilience measures. The REA included a review and synthesis of academic, policy literature and technical material. The review was enhanced by targeted searches on selected technical matters and information from repeated consultation with the Project Board experts through structured workshops and written feedback comments. Comments and validation of the findings were also invited during and after a webinar with local authorities that had recently been involved in administering recovery grants. Furthermore evidence was gathered through semi-structured telephone interviews with professionals engaged in supporting resilient adaptation; and semi-structured face-to-face interviews with households and small businesses with water entry measures already installed. These interviews were recorded and qualitatively analysed through a pre-determined framework relating to technical and behavioural aspects of adaptation as it is currently implemented. Further details of the method and findings can be found in the REA report (Sections 3 and 4 respectively). During the course of the project, flooding was experienced in many parts of the country. As a result of severe weather in East Anglia, a property previously adapted to demonstrate flood repairable measures was flooded, and the opportunity arose to evaluate the effectiveness of the resilience measures through interviews with the occupier and relevant housing association. A report of that evaluation is included as Appendix 4.

2.2 Analysis of costs and benefits

Illustrative packages of low cost measures were defined, validated through consultation with the project board, and costed for typical house types and commonly recommended resilient treatments. The costs of individual resilient packages were investigated using a standard desktop cost analysis approach, undertaken by a qualified quantity surveyor employed within a loss adjusting firm. These costs were compared with a 'like for like' alternative treatment of the same element as previously employed in Joseph (2014), and the additional cost of resilient

reinstatement was calculated. Further details of the method can be seen in the Technical Report (Section 3.2).

2.3 Demonstration project

The demonstration project was designed to understand the stakeholder decision-making processes in detail, in order to fully appreciate the most problematic and insurmountable barriers (real or perceived). This dictated a largely qualitative approach, focusing on identifying barriers and their respective solutions, rather than on statistical quantification of the prevalence of such barriers within the floodplain population. Business and other drivers for delivering support via the PSN also needed to be explored. A 'co-design' process, undertaken in collaboration with research participants from the PSN, was therefore seen to be the appropriate approach. The demonstration project used this approach to devise innovative practices for supporting the uptake of low cost resilience in a community with flood experience. Using a Learning and Action Alliance (LAA), comprising members of agencies and businesses that could potentially implement innovations within the community, the project first co-designed and then implemented five innovative practices. There were two types: general awareness raising activities; and detailed consultation activities with participants recruited through the general awareness raising. The opportunity to adapt these innovations as they were in the process of implementation was enabled through the regular meetings of the LAA where progress was discussed and feedback sought. A full description of the demonstration project can be found in Appendix 1.

The aim of the evaluation was to deliver an independent assessment of the demonstration project through participation (for example, in LAA meetings), monitoring and data collection. The second aim was to support and facilitate the design and implementation of the demonstration project. To do this, the evaluation involved a series of tasks relating to three stages of work on the demonstration project, as set out below.

Stage 1: During the design and set-up phase

- Review and input to the development of materials and innovations.
- Review and input to set up of the demonstration.
- Design and run a focus group for LAA members. The focus group discussed the role of the LAA in setting up the small-scale demonstration, designing the innovations and related materials.

Stage 2: During the demonstration phase

- Monitoring the demonstration process, for example, keeping a count of leaflets and other materials taken by members of the public, and maintaining dialogue with LAA and project team members involved in each innovation.

Stage 3: Following completion of the demonstration phase

- Post-demonstration project focus group with LAA members.
- Interviews with LAA members involved in each innovation, members of the project team and where possible participants in the innovations, focussing on the process, utility of materials and the outcomes realised through each innovative practice.

The data collected from the focus groups, the interviews (notes were taken) and other sources (e.g. surveyors' checklist) were analysed using qualitative analysis. This involved systematic reading of the data to draw out themes relevant to the key questions, and drawing out key quotes to illustrate those themes. The aim of qualitative analysis was to look at the range of themes covered rather than to count the number of times a theme was expressed.

The full evaluation of the demonstration project can be found in Appendix 2. During the course of the project, there were some major flooding events that gave the opportunity to test one of the innovations in a post flood scenario in the North West of England. The results of that exercise are shown in Appendix 3.

3. Findings

Flood repairable measures come within the water entry strategy, sometimes also known as 'flood resilience', 'resilient reinstatement', 'resilient repair' or 'wetproofing'. Water entry strategy is defined in the 2007 Defra guidance as: '*Allow water through property to avoid risk of structural damage. Attempt to keep water out for low depths of flooding*' (Bowker *et al.*, 2007, Figure 2, p16).

This may include:

- flood-resilient material and designs; access to all spaces to allow drying and decontamination; and design to drain water away after flooding (Escarameia *et al.*, 2012);
- sacrificial approaches; consideration of hydrostatic pressures/impact loads on structures (Kelly *et al.*, 2011).

Although beyond the scope of the present investigation, there are important structural considerations, particularly regarding the effects of depth and velocity of flood flows on the integrity of the building. These can, in some situations, render it inadvisable for non-specialists to apply resilience measures unless an expert assessment of risk has been obtained in advance of any work commencing. It is also important to consider the points at which water will be allowed to enter a property, and what means of escape will remain available to the building's occupants as a result of these choices. The impacts upon the security of building contents during and after a flood must be assessed. This includes, for example, leaving doors open to permit through-flow during the flood event could permit unauthorised persons to access the contents, or leaving windows ajar to aid the drying-out process. The assessment of the potential for secondary damage, together with security and safety concerns, are considered to be part of the normal professional reinstatement process, as outlined in the relevant standard PAS64 (BSi, 2013).

The distinction between water exclusion and water entry is also a crucial matter to consider. First, there is the question of what is considered to be included in the internal elements of a building. The internal surfaces and cavities of external walls, the sub-floor and the presence or absence of cavity insulation are highly relevant to speed of recovery. Therefore, knowledge of the structural and drying properties of such materials and the impact they have on wall assemblages has been considered within the scope of this report. Second, there is the question of suitable circumstances for implementation of the water entry strategy. In the literature, water entry strategy is usually associated with recommendations about structural stability but it can also be recommended as a failsafe or where water exclusion is inappropriate for other reasons. Examples include: long duration floods where many

resistant methods may fail; flash floods where there may be inadequate time to implement resistance; and historic properties where resistance may be unsuitable. The reason for adopting the strategy, and the associated depth of flooding and duration that is expected, will impact on the suitability of some of the recommended measures.

Flood repairability of a building can be achieved in different ways. Vulnerable elements (for example, electrical installations and appliances) can be raised above the expected flood level or removed (avoidance). Exposed elements can be made of, wrapped or coated in flood resistant materials (for example plastics). Alternatively they may be made of resilient materials that can accept water without deformation or disintegration and can dry quickly afterwards with potential for decontamination (for example, cementitious materials). In all cases, the need to evacuate the water quickly and safely after a flood is important. For resistant and resilient materials, the adequate circulation of air around the exposed elements for reasonably rapid drying must be assured. It follows that there are likely to be multiple possible water entry strategies for any given building, and this was reflected in the evidence found by the REA.

3.1 Measures and packages of measures

The evidence assessment found 139 suggested measures that could be regarded as flood repairable, over half of these being 'low cost' or 'low additional cost' (for example, when adopted during reinstatement or other building work). **The project developed illustrative packages of repairable measures, suitable for different house types, which could prove to be cost beneficial for properties in the UK.**

Some of the measures proposed in the literature were no longer considered to be common or best practice by the Project Board and interviewees; reinstatement practice has changed over the last two decades, with new materials and methods having become more commonly available. Equally, there are differences of opinions as to which methods are most suitable. There were seen to be a core of commonly recommended measures, such as raising of services and replacing mineral wool insulation with closed cell insulation. However, there are also some new ideas emerging and measures suggested by professionals and householders in the interviews that are not in existing guidance or detailed in academic literature. Examples of new or emerging measures include the use of cavity membranes and sacrificial plasterboard, water resistant wallboards, creative design of kitchens and bathrooms (with carefully selected sacrificial items) and nano technology. **The research found that the assessment of flood repairable measures was timely, and that updates of existing guidance to include the findings of the evidence assessment could be beneficial.**

Evidence of performance of a minority of these measures in a flood, or simulated flood, is available from a small number of laboratory experiments, as well as testimonial and anecdotal evidence from professionals, property owners and occupiers. The efficacy of passive avoidance measures (these being permanently in place and requiring no deployment) up to the design depth is seen as self-evident. However, some avoidance measures depend on pre-flood actions by property occupiers and, therefore, in a similar way to flood gates, are subject to risk of non-deployment. The efficacy of other low cost measures varies, and some of the evidence is contradictory, perhaps due to testing under a variety of flood conditions. **The research found that further evaluation and testing of measures is needed to fill the evidence gaps.**

The weight of existing evidence points to the success of flood repairable measures in limiting damage and allowing early reoccupation after flooding. Interviews with homeowners and businesses gave some good examples of this. While very few measures were seen as universally effective and many will eventually fail or be overtopped under particularly long, high velocity or deep flooding, the prevailing flood condition in England is relatively shallow and short-lived. Experts also suggested that repairable measures adequate to prevent damage during deep flooding are unlikely to be low cost. However, even for properties at risk of deep flooding, the application of low cost repairable measures can be used to prevent damage during lower floods and limit damage in the most severe events. **The potential effectiveness of identified low cost repairable measures for reducing residual risk is high.**

Measures and packages of measures also have the potential to reduce reinstatement time following a flood. Examples were seen in the case studies collected where flooded residents re-occupied their flooded living spaces within days of flooding and did not require relocation. Reduced reinstatement time can result in reduced alternative accommodation costs adding to the financial benefit of using repairable measures. However, the reduction is highly dependent on the speed of drying and replacement time for items not covered within the repairable package, and the need to relocate while repairs are carried out. Other measures may offer co-benefits that could offset the cost of installation. For example, changing to closed cell insulation offers potential thermal benefits, and changing to UPVC doors potentially offers improved security, thermal benefits and aesthetic improvement, both seen in recent Defra and CLG supported schemes. **Further research on the co-benefits of measures is warranted in order to refine the industry understanding of cost effective measures.**

Out of the 139 measures, 104 were those that directly applied to building fabric while 35 were related to contents and other strategies. The repairable measures can be categorised in a variety of ways: for example, based on the building element they are designed to protect, or by the kind of water entry strategy adopted. The most

appropriate measures for any individual property depend upon a combination of factors including: type of building and construction; age of building (and any constraints such as listed status); condition of building including pre-existing dampness; preferences, resources and capacities of the building occupants; support available to implement measures (such as flood warning time); and the characteristics of flood itself (including expected flood type(s) and their interaction, annual probability, flow velocity, duration, speed of onset and depth). The actual measures installed may also depend on the skills and capacities of the contractors employed, and the timing considerations regarding disruption to building function while work is carried out. It was also clear that commonly used descriptions of measures concealed a complexity of materials and installation methods that could lead to inappropriate installations if undertaken by non-experts. **Expert advice is usually needed for appropriate specification of building related resilience measures.**

Low cost repairable measures typically involve the application of widely available construction materials applied in a different way or in a different place to their normal situation. These include, for example, standard wallboards applied horizontally; water resistant bathroom wallboards applied everywhere; stone or ceramic tiles; membranes that have been previously applied to basement tanking; waterproofing technology designed to prevent rain penetration. Bespoke materials and approaches such as acrylic kitchen units and fully waterproof wallboards would not generally fall within the definition of low cost. The transfer of existing standards to the context of construction materials used in new applications has implications in terms of relevance to the new use. Standards would need to be examined on a case by case basis, and this research identified that confusion could arise even for professionals. For example, existing materials standards for water resistance apply to rain and groundwater penetration, only, rather than being carried out under the high hydro-static and hydro-dynamic pressures that can be present during flooding. Resilience standards for materials also need to indicate other performance criteria such as resistance to mould growth, keeps integrity, speed of drying. **There are currently no accepted standards that can be applied to demonstrate 'flood resilience' for construction materials.**

It was found that it is not possible to specify an ideal set of repairable measures that will be universally appropriate for properties at risk. Four packages of low cost building related measures were costed to illustrate typical bundles of measures that may be taken. The physical damage potentially prevented was also evaluated, and three of the four packages evaluated could result in a pay back after just one subsequent flood (assuming they were successful in preventing damage). The fourth package fails to do so only due to the inclusion of a single higher-cost component, this being a cavity membrane. These packages would be expected to be more cost beneficial if reduced alternative accommodation costs and co-benefits were also

accounted for. **The uptake of cost effective packages of measures should be encouraged where they are appropriate.**

Low cost measures can also be installed individually; individual measures can present very low financial barriers to implementation. A preliminary assessment was made as to whether the measures identified could potentially be regarded as low cost, either as a stand-alone adaptation or as part of reinstatement or other renewal, based on the existing literature. Individual measures representing a single event payback (if they prevented all damage) include: the raising of sockets; raising hinges on doors and kitchen cabinets; tiling replacement of floor coverings; cement sand render; adding salt additives to lime plaster; adding waterproof grout, and replacing softwood doors with UPVC. **Uptake of appropriate individual measures should be encouraged where packages of measures are not suitable or affordable.**

The research found that for deep flooding, and for some building elements, there were very few low cost recommendations. For example, for kitchen unit carcasses, although resilient options exist, they are perceived as high cost and a sacrificial approach is usually preferred if flooding reaches a level above the height of the kickboards. However, the research found examples of kitchen adaptations that had proved successful and that the owners felt were worth the slight extra cost and effort. The recognition that low cost sacrificial finishes can be used to limit the cost of damage has to be balanced against the knowledge that higher cost measures may be able to prevent more damage based on the flood risk scenario. **Low cost measures may not be suitable to prevent all damage, particularly in properties subjected to deep flooding. More expensive approaches should be considered where appropriate.**

Historic properties present a specific challenge and also an opportunity. As discussed by Historic England (2015):

“...the building and insurance industries’ standard procedures for making buildings habitable again after a flood can be damaging Older buildings (generally those built before 1919) are constructed quite differently to modern buildings in that they are able to absorb and release moisture, rather than exclude it, and as result, need a different approach for flood remedial work.” (Historic England ,formerly English Heritage; Pickles et al., 2015)

The type of ‘damaging’ repairs referred to include attempts to waterproof a structure trapping moisture which would then cause secondary damage; similarly, replacement of (resilient) lime-base plasters with gypsum or cementitious equivalents. **Historically appropriate materials, such as solid wood elements, can often be a resilient choice in themselves for historic properties.**

3.2 Behaviour of households, property support network and their interaction

A great deal is already understood about the barriers, motivations and incentives for taking up measures, and how they may affect the behaviour of property owners and occupiers. Far less has been understood about the perspective of the PSN that may be engaged in supporting households and small businesses in implementing measures. Given the discussion above, it is clear that support from members of this network is usually important in ensuring appropriate strategies are adopted, and that measures are implemented properly. The evaluation of the demonstration project showed that there were three key benefits from bringing together members of a local PSN as a group focussed on flood resilience:

- Improved understanding of the different stakeholder perspectives and challenges;
- Greater awareness and increased technical knowledge of a range of resilience measures;
- More likely to discuss / stock / recommend resilience measures to customers / clients.

An informed and engaged PSN is a critical success factor in widening appropriate adoption of resilience. Some broad lessons may be drawn from the wider behavioural change agenda. The process of 'normalising' desirable behaviours requires consideration of mechanisms that will change underlying attitudes, values and aspirations over time. An example is the wearing of seatbelts, which is not merely a compliance with legislation, but has become a universally accepted social norm in the UK (Knott *et al.*, 2008). As discussed by Harries (2012), the process of normalising household flood protection was begun several years ago via the resilience grant pilot schemes. The increasing availability of 'kitemarked' protection products for water exclusion has also helped to address issues around trust and confidence in the technology involved. There was some evidence from the demonstration project of how the idea of 'letting water in' (which essentially underpins flood resilience measures) is, understandably, a difficult concept to view as 'normal'. **Normalising repairability is likely to take time and could be supported by benchmarks as well as grants directed specifically at water entry approaches.**

Studies in the UK have been carried out to explore the barriers to climate adaptation generally (Bichard and Kazmierczak, 2009) and to flood adaptation (Thurston *et al.*, 2008). The recent work of Joseph *et al.* (2011) has related specifically to 'resilient', 'water entry' or 'flood repairable' adaptations. All these studies have identified a complex set of constraints that need to be addressed in order for change to occur within a variety of 'theory of change' models. For example, Lamond and Proverbs

(2009), adapting Grothmann (2006) specifically for resilience, considered that there were information, financial, emotional and timing barriers that impacted variously on the necessary awareness and perception of risk, ownership of the risk, knowledge of solutions, resources to implement solutions and belief that the measures would work (see Table 1).

Table 1 Barriers affecting the desire and ability to adopt flood resilient adaptation

		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

Other models include Spence *et al.* (2011), Bubeck *et al.* (2012) and work summarised by Fell *et al.* (2014). Awareness, resources and knowledge have been heavily targeted by agencies but the issues of perception, ownership and belief are also critical to examine, and are considered more fully below. These issues are particularly relevant in the interaction between owners and occupiers of property and the property support network. **Awareness is a necessary first step but other barriers, particularly emotional barriers, can prevent the uptake of resilience.**

The findings of Brown and Damery (2002) suggest that the public's trust in information sources (or lack thereof) and the messengers has been shown to be a key factor in actions taken in response to flood warnings. Sources already trusted by the public include the Fire and Rescue Service, as well as a range of professional advisers. **Ensuring advice and information are available from appropriate persons and institutions is, therefore, important in bringing about behaviour change.**

From the interviews, it is clear that experts in the repair and protection industry are successfully applying experiential knowledge along with current guidance on an *ad hoc* basis. The wider industry was seen as less well informed, with some flood repairable features being removed at reinstatement, as their purpose and value is not understood. From work during the recovery in Cumbria, the LAA and from the interviews, it appears that anecdotal evidence of problems with resilience and repairability measures resonate with households and professionals, perhaps more strongly than examples of successful adaptation. Professionals with lower levels of experience, feeling a duty of care and following precautionary principles, may be reluctant to persuade their clients to try something different. **Lack of testing and good exemplars is having an impact on the belief in repairable adaptation in the PSN as well as in owners and occupiers.**

Resilient features may also be removed to reduce drying times for a variety of reasons including target drying schedules. Inundation of materials by contaminated water is an issue which not only poses particular challenges for householders, but also for industry professionals, who are reportedly divided in their opinion on the need to replace contaminated materials. This is also an area with a paucity of scientific evidence, as most testing is carried out with clean water. Even if materials survive a flood with their structural integrity intact, the desire to remove contaminated materials means that resilient features may still be removed at the insistence of the occupant or the insurer. **There is a need to abide by the (possibly misplaced) preferences of households, and to understand the protocols within the repair industry.**

Lack of knowledge of flood repairable measures and lack of detailed guidance is also seen as a barrier to installation of measures. Measures are often most cost effective during reinstatement or planned building work, however, these opportunities may be overlooked due to the desire to reinstate quickly and not delay other works. In the opinion of the professionals, the recent Repair and Renew Grant opportunity was helpful in raising the profile of flood repairable measures, but also highlighted the general lack of experience in, and guidance available to, the industry. This was further demonstrated during the reinstatement following the 2015 flooding where agencies and professionals expressed doubt regarding the desirability of delaying repair in order to build in resilience. Even where households acknowledged that they were “*bound to flood again*”, the incentive to engage with resilience was not recognised. **The need to make decisions rapidly during reinstatement limits the desire of all stakeholders to explore the complexities of resilient options.**

Rates of physical adaptation to reduce the damage caused by flooding among households and small businesses in the UK are low. Our interviewees confirmed that among physical adaptations, those that can be classified as water entry strategy measures are rarer than those that can be classified as water exclusion measures. The research found that there was a lack of knowledge and belief in the water entry approach to reducing flood damage in many of the professionals that may be supporting owners and occupiers, as well as in the owners and occupiers themselves. This ranged from those that had limited belief in effectiveness of measures, to those that believed in the approach but still felt it was too difficult to ‘sell’ to the owner or occupier. There was also a frequently expressed view that water entry is seen as a last resort, and that promoting repairability without first or simultaneously exploring other options might not deliver the “best” advice to customers. **Water exclusion is usually the preferred option by households and professionals.**

Bearing the above preferences in mind, the market for flood repairable measures is generally perceived as small by professionals and businesses. It is also received wisdom that repairable measures are not supported by grants or insurance

companies. This is in contrast to the energy efficiency field and to a certain extent the water exclusion market where government grants and incentives have been widely used. Therefore developing a business led approach towards encouraging uptake by developing a profitable market opportunity has proved to be extremely challenging. In addition, the small, periodic and unpredictable demand for bespoke repairable products (such as kitchens) has resulted in near monopoly of supply, bespoke and small production runs. Such markets are characterised by high production costs and therefore prices and limited profitability. **The promotion of repairability is not presently perceived as an attractive market opportunity by small businesses.**

Prior learning on emotional barriers particularly relevant to the water entry strategy includes the increased need to consider the aesthetics of adaptations that are carried out inside a property, even more so than outside (Harries, 2010). The present research saw further evidence to support the view that aesthetics are important from interviewees, the PSG, homeowners in Cumbria and the Tewkesbury LAA. Given that aesthetic judgements are highly subjective, a range of repairable options for decorative finishes is likely to boost acceptance, for example offering choices between tiles, acrylics or treated hardwood for floor surfaces. Perceptions of some measures might change with 'normalisation'. Raised sockets were seen by some to be undesirable, however, they are the norm in some places and it may be possible to change this view over time if raised sockets were mandatory in all properties, regardless of flood risk. Contamination of living spaces is also recognised as a highly emotive subject for owners and occupiers that reduces the acceptability of the water entry approach. Professionals interviewed judged that homes and businesses can be adequately decontaminated, but recognise that owners and occupiers are difficult to convince. This can lead to 'strip out' at the behest of policyholders that is excessive in the view of some professionals. **Aesthetics and contamination issues are important barriers to acceptance of the water entry approach.**

In common with the water exclusion approach in the context of ownership of risk, it is critical to counter the abrogation of responsibility (Harvatt *et al.*, 2011) associated with insurance and the expectation that government will shoulder the burden. The role of insurers and their refusal to implement betterment was raised by multiple participants from all stakeholder groups. This leads to a culture where some owners and occupiers feel justified in their own inaction in the face of insurers' perceived indifference to damage limitation. **Owners and occupiers often expect others to take action.**

This abrogation of responsibility also extends to the PSN to some degree. For example, claims handling processes involve multiple professional and administrative personnel (Samwinga, 2009) that interact directly with flooded households. Many of them see it as someone else's job to give advice on resilience. The view of some

surveyors interviewed is that the commercially viable customer visit duration, allowed by claims handling contracts, constrains them from taking the extra time to offer advice on resilience. Customer service and complaints personnel may unintentionally undermine resilient choices in the name of improved consumer relations, for example where a customer perceives that their neighbour having a more comprehensive strip out is getting a better deal. Insurance companies' policies point to the avoidance of betterment given that their customers may not stay with them beyond the next annual renewal. Companies making materials used in the repairable approach, for example water resistant wall boards created for use in bathrooms or roof spaces, permeable paint and hardwood fixtures, are not usually designing for, or marketing specifically to, the flood repairable market. This is in contrast to products used in water exclusion strategies, many of which are expressly designed for use in flood affected properties. **There is no natural champion for resilience measures within the commercial PSN that has a vested interest in supporting the uptake of resilience.**

The pivotal role of insurers, loss adjusters and restoration professionals was confirmed within this study. The research sought to engage with property professionals not generally seen as part of the flood risk management community. This was successful in that the Tewkesbury LAA recruited representatives of many such groups (e.g. solicitors). However the level of motivation for members of the broader PSN to own responsibility for advising on flood risk and devote resources to necessary upskilling is highly germane. Discussions with members of the LAA, some of whom took less active interest in the project, suggested that commitment by individuals to the vision of improved flood resilience is highly dependent on personal views and values, prior capital and experience, and also other commitments and personal resources. **Many individuals in the extended PSN are interested in making a contribution to supporting the uptake of low resilience.**

Although provision of increased support for households and small businesses can be viewed by enlightened PSN members as part of enhanced customer service potentially offering a competitive edge, the evidence to support this as a sound investment process is low. Indeed the demonstration project reinforced the view that business gains need to be viewed as long term and hinge on the frequency and currency of flooding concerns in an area. Engagement is, therefore, rarely driven by any expectation of direct profit but through notions of altruism, personal growth, enhanced reputation and personal or vicarious experience of the trauma associated with flooding. **Implementation of innovative practice by members of the extended PSN can be limited by the competing pressures of normal business and the need to convince others within their organisation of the benefits.**

As discussed by Harries (2012), the process of normalising household flood protection began several years ago via the resilience grant pilot schemes. The

increasing availability of 'kitemarked' protection products for water exclusion has also helped to address issues around trust and confidence in the technology involved. However, Harries (ibid) found some householders were reluctant to adopt such measures, as they feared this could compromise their homes aesthetically, give rise to embarrassment or potentially diminish the property's value at resale (Harries, 2010; Defra, 2008). It is important to recognise that the processes by which people learn, acquire and create interpretations of risk are subject to social influences; official sources of information may be disregarded in favour of social networks (for example, Harvatt *et al.*, 2011). **Trust in measures can be undermined through peer pressure and social networks.**

In many respects, the detailed process of normalisation for flood adaptation differs from other health and safety behaviour change scenarios, due to a number of characteristics of the flood hazard. These include, for example, complexity of different strategies and difficulty in prescribing a 'one size fits all' resilient package. A legislative process, as used for the implementation of seatbelts, via building regulations may make a contribution, but a large proportion of the damage associated with flooding is to building elements not covered by regulations (Wassell *et al.*, 2009). Second, some relevant regulations (for example, raising of sockets that might represent resilience) do not apply to existing domestic dwellings. Third, some current regulations, for example insulation requirements, can sometimes conflict with perceived best practice in a property at risk. **The complexity of water entry strategies coupled with the existing identity and character of a property makes simple guidance and legislation difficult to deliver.**

3.3 Windows of opportunities and innovative practices to support uptake

Successful adaption of buildings is most likely when stakeholders have the desire and ability (financial, practical) to make changes. The most commonly reported factor that contributes to the desire to adapt property to flooding is flood experience, usually direct experience of flood damage to the home or business. It is also commonly recognised that this desire is strongest in the period immediately following a flood diminishing with time (Steinführer *et al.*, 2009). These are also occasions where cost of installing resilience measures may be at its lowest. Within the property lifecycle, it has been suggested that adaptation can take place naturally and most cost effectively at reinstatement (Joseph *et al.*, 2011) or at pre-planned maintenance or renewal of fixtures and fittings (Soetanto *et al.*, 2008). The disruption associated with installing resilience measures will also be lower at this point. **Straight after a flood, the flood experience increases the motivation to install measures and reduces the additional cost and inconvenience involved.**

However, it is also recognised that there are emotional barriers and timing barriers that come into play at this juncture due to the stress and trauma of flooding, desire to reoccupy quickly rather than spend time investigating different reinstatement options and reluctance to believe that a flood will recur. **Having thought about possible repair and reinstatement before a flood occurs (in the form of a recovery plan that includes repairability) has the potential to reduce the emotional and timing barriers when a flood occurs.**

As noted above, and long recognised, implementation of building related resilience measures is more cost effective and less disruptive to households during reinstatement, other building works or decorative refresh. However, this is not the only point at which measures can be taken. Some evidence exists that during insurance renewal, businesses in particular may be driven to install measures (Lamond and Proverbs, 2009), and this may increase in importance with the launch of Flood Re. The scheme, launched in 2016, aims to enable home insurance to be widely available and affordable in areas at risk of flooding. Business premises, however, are not included in the Flood Re scheme as it currently operates, which may render smaller businesses more open to resilience measures. Purchase of resilient contents and fittings can similarly be facilitated during reinstatement, redecoration or periodic replacement (e.g. white goods). **This research has started to explore some of the windows of opportunity in building lifecycles in more detail, in order to design innovative practices that can provide guidance and information at the most appropriate time.**

Measures within the water entry strategy can be taken individually or as part of a package of measures, therefore it is possible to improve resilience incrementally at each suitable window of opportunity. This is in stark contrast to the water exclusion strategy, as the installation of water exclusion measures is typically less disruptive and therefore appropriate at any stage of the property lifecycle. That said, installation of some water exclusion measures may be more likely in the immediate aftermath as the motivation of the owner or occupier is highest at that point. Individual low cost water entry measures present a very low financial barrier to implementation. **Repairable measures can be built up over time when convenient during the property lifecycle to limit future flood damage.**

Several of the homeowner interviews illustrated an incremental process and in particular, one couple had benefitted from prior installations by the previous homeowner but had also taken opportunities during renovation straight after purchase, during later building works and as a result of grant opportunities. They had plans to make further improvements in the future when opportunity presented. **Flood recovery and/or the availability of grants were the triggers for many of the repairable and resilient examples within the interviews.**

At property transfer, there is the potential for the vendor to take measures in order to present a lower risk to the buyer either before listing or during negotiations. However, the greater opportunity may be the tendency for new owners to invest in their new property if they are properly advised. As matters stand, signalling of risk at property transfer is also most reliably accomplished by the solicitor on behalf of the buyer rather than the estate agent acting for the vendor. **Solicitors have the best opportunity to provide guidance, and signposting to advice and guidance, during the conveyancing process.**

A major expense during reinstatement is the replacement of fitted kitchens (Joseph *et al.*, 2011). As one homeowner put it “kitchens are difficult” because the recommended available resilient options for kitchens are seen as over expensive and unattractive. Usually during reinstatement, specialist companies are brought in but kitchens may be replaced at any time as part of normal building lifecycle. **Kitchen designers and suppliers have the potential to recommend resilient features during regular replacement of kitchens.**

Major building works, such as extensions and commercial refits, may be subject to permissions and inspections by planning and building control. Although regulations for such alterations are limited in terms of the mandatory installation of measures, **the opportunity already exists for planning and building control staff to offer advice, guidance and signposting to applicants.**

Innovative approaches to encourage uptake were designed in collaboration with the Tewkesbury LAA as follows:

- a. Resilient reinstatement encouraged through loss adjuster/ building surveyor checklist;
- b. Recovery planning in advance of flooding encouraged through fire service/ flood warden or Local Authority (LA) visit;
- c. Encouragement of installation of measures during property upgrade through advice at property transfer;
- d. Adoption of resilient materials in properties at risk through displays at local builders merchants/DIY stores;
- e. Improved resilience of kitchens and bathrooms through creative kitchen/bathroom design;
- f. Encouragement of resilience through advice from building control during significant building work.

Examples of some of the materials developed are included in Appendix 5.

The project then sought to demonstrate the potential of some of these innovations, and to explore the information and guidance materials that would be appropriate to deliver such practices more widely.

3.4 Potential to support uptake and remaining barriers

Five of the suggested innovations were taken forward with the support of the Tewkesbury LAA (as described in Appendix 1) and evaluated during the period January to July 2016 (as described in Appendix 2). As discussed above, and further in Appendix 2, in keeping with the novelty of the approaches, this was essentially a proof of concept qualitative demonstration rather than a statistical study to allow for scalable inferences of national impact. The demonstrated potential of those five innovations is described below in 3.4.1. Other remaining barriers and suggested innovative practices not taken forward for demonstration are described in 3.4.2.

3.4.1 Summary of innovations demonstrated

Innovation 1: Surveyors' Checklist and accompanying guidance materials used during a surveyor visit in the aftermath of a flood, was shown to have great potential in generating a more detailed discussion around repairable reinstatement. The timing of the use of the checklist is important, however, with its use in Cumbria directly after flooding proving more effective than encouraging those who had previously been flooded in Tewkesbury to participate in the demonstration.

The checklist in itself does not upskill surveyors but if completion was encouraged or enforced, it would act as a prompt for surveyors to consider the widest range of options. The checklist needs to be backed up with appropriate briefing, accompanying materials and guidance that surveyors can access and share with owners and occupiers. While the evaluation showed that the checklist encourages discussion and improves information, it does not directly address some of the other crucial barriers such as resource and emotional concerns. Of the 20 uses of the checklist nine policy holders made some resilient and/or resistant changes. Those policy holders who did not take actions expressed a lack of confidence in the measures; interest only in resistance measures; and a general lack of interest in making any changes. Belief in measures and skill in communication of that belief are also requirements for surveyors using the checklist. However, of the observations made, there were only three where lack of confidence or attention to the checklist was an issue, suggesting there is some understanding of these measures and their value among surveyors. **As an opportunity to deliver well qualified advice at a crucial window during reinstatement, the surveyors' checklist is seen as a useful contribution to supporting uptake.**

Innovation 2: Recovery Planning, with the use of a recovery plan that includes reinstatement planning, was judged by two homeowners to be very useful for themselves. Both homeowners and the Tewkesbury LAA saw this use as potentially valuable for others that could be persuaded to take it up. Key to the success of this measure is the support of local agencies / volunteers that can guide owners and occupiers through the process. Therefore these individuals need to be sufficiently briefed on the measures to assist and provide signposting to appropriate expertise. The innovation is subject to the well-recognised limitation that people are generally reluctant to engage in flood planning between events, and is unlikely to be pursued in isolation from the delivery of more general flood awareness and planning activities. In the demonstration discussions with homeowners, prevention measures as well as resilience measures were included. The extent to which this plan leads to actions after a flood would need further evaluation. **A reinstatement plan can be incorporated in emergency and recovery planning guidance, and agencies and volunteers can be trained to deliver appropriate advice and guidance.**

Innovation 3: Creative kitchen design can lead to kitchens that are both attractive and more resilient without increasing the cost, particularly if the flooding is not expected to be deep. Often the changes do not need to involve specialist suppliers although specialist elements may offer resilience at greater depths. Where existing kitchens are bespoke, replacements made of different materials such as marine plywood may not add much to the replacement cost. Creative designs may reduce the previously identified barriers around appearance and cost of resilient and repairable kitchens. Homeowners in the demonstration were receptive to the ideas for shallow floods. However, one major emotional barrier for kitchen reinstatement is around contamination and the reluctance to re-use units that have been inundated with dirty water. This could be reduced through use of biocidal detergents and appropriate testing post flood. **Appropriately briefed kitchen designers and loss adjusters may offer an enhanced service to floodplain occupants and support the uptake of resilient measures.**

Innovation 4: Property transfer advice to raise awareness of measures to mitigate risk at point of purchase or rental could lead to better informed transfer decisions. A suitable method for delivering advice from solicitors to clients in the process of buying a property in the floodplain was co-developed during the demonstration project, with a member of the Tewkesbury LAA taking a lead on this innovative practice. Having a champion for this was seen as key to its success. Using an email delivery with awareness materials, coupled with signposting to further advice, was seen by the professionals as a proportionate approach to deliver good due diligence while not over-burdening either party. During the demonstration the mailing was seen to generate some, but limited, interest in further discovery. Thus far, with a sample of five clients, it has not had any detrimental impact on the conveyancing process with no withdrawal of buyers from the solicitors involved and

no sale falling through (these being some of the concerns expressed by the LAA). The involved solicitors view this ability to signpost guidance as a useful part of their client service that will enhance the potential for early uptake of measures. An interviewee also pointed out the desire for potential purchasers to access as much information as possible before completion. **Provision of awareness materials and signposting to existing guidance and expertise by solicitors during property transfer is a very low cost opportunity to support uptake.**

Innovation 5: Displays at builders' merchants and DIY shops were seen to be a point of sale opportunity to raise awareness that might translate into the seeking of further advice and guidance around resilience, or immediate purchase of resilient materials. Displays were co-designed in collaboration with two businesses in Tewkesbury that were suitable in size to allow for long term hosting in store yet big enough to be noticed. This innovative practice was led by the two businesses and, as with property transfer, having such champions was key to this innovation going ahead. Some evidence of awareness raising was evident, and also of further investigation: 44 people picked up the flood repairable flyer/postcard from the builders' merchants, which resulted in one expression of interest in being part of the demonstration project and one purchase (of sandbags). However, as a passive display, this innovation is subject to the usual inertia and reluctance to engage with flood related issues: as a commercial proposition, therefore, it would be unlikely to be widely adopted although some stores in frequently flooded areas may provide displays periodically on the basis of good customer service. It was also observed that stores preferred to offer a wider range of products on such displays, including water exclusion measures. The strongest potential for this innovation was seen, particularly by the professionals in the LAA, to be at a local level in the aftermath of a flood event, or as part of more widespread flood awareness events. The flyer/postcard was considered by interviewees to be the most effective in engaging members of the public. **Lists of suitable repairable materials and awareness flyers made easily available for builders' merchants would allow them to support uptake by providing suitable displays after flood events, seasonally or during awareness events.**

Evaluation of the demonstration project indicated the innovations that appear to have been most successful were those driven by members of the LAA, or which incorporated significant input from members of the local PSN. Although there was limited evidence of homeowners taking up low cost resilience measures, such changes were not to be expected considering the short timescale of the demonstration phase. There was, however, evidence (from the evaluation) of a small increase in awareness of low cost resilience to flooding amongst owners of residential properties at risk. The evaluation found an increased awareness of low cost flood resilience measures amongst LAA members, such that they are now more likely to discuss or suggest such measures. As the LAA comprised a range of

stakeholders from different backgrounds, professions and interests, an enhanced understanding of these different perspectives amongst both the PSN and within the local community was also noted. Anecdotal evidence of cascading awareness through social and professional networks was also seen. **Learning networks formed among members of the PSN at a local level (e.g. Tewkesbury LAA) can be instrumental in raising awareness, knowledge and skills directly in members and indirectly through cascading social and professional networks.**

3.4.2 Other opportunities identified

The opportunity for insurers and Flood Re to become engaged in supporting uptake is very apparent. It was not explicitly explored in the demonstration, partly due to the timing of the introduction of Flood Re during the project and associated uncertainties as to the details of the final implementation of the new scheme. This was also partly because changes to insurance policy are not a matter within the remit of a local PSN. However, several participants in the demonstration were very keen to get advice on insurance and were given advice and guidance that they found valuable. **As a trigger to action, insurance renewal is a key window of opportunity, and the role of local insurance brokers in facilitating uptake may become a major factor as the flood re scheme evolves.**

Existing standards for materials and building regulations cut across the reinstatement or refurbishment process. However, it is noted that in some instances, standards may only be indicators of improved water repellent properties and not applicable under hydrostatic pressures. Equally some passive measures - notably raising of sockets - could become part of building standards and thus be enforceable through regulation. **Making a small number of repairable measures mandatory through building regulations would offer the potential for greater awareness raising of the new British Standards.**

Trust in the message and messenger was highlighted as a critical success factor. One such example would be if Health Protection England could produce guidance specifically targeted at the issue of contamination during and after reinstatement. The Scottish Fire and Rescue Service has already conducted a pilot scheme in which (after suitable training) they supplied an impartial and independent property level protection survey to households. (Perth and Kinross Council, 2016). **The involvement of already trusted advisors such as the fire service in delivering property specific advice would be expected to contribute to greater uptake but was not able to be demonstrated in Tewkesbury.**

The designed innovations focussed on timing and windows of opportunity, and did not directly set out to tackle some of the more emotional barriers. However evidence and discussions that arose during the project strongly suggest that there is a need

for more positive exemplars to back up the signposting and existing guidance. Aesthetic considerations were highlighted as important in interviews, and during the work in Cumbria: any 'unattractive' or 'abnormal looking' measures met with opposition from building occupiers. However, some measures can be seen as enhancements and provide the opportunity to portray flood resilience as property improvement. Therefore in particular, images of 'nice' or 'normal' looking measures already installed and accounts of measures performing well in real floods were indicated as valuable to participants. Some examples have been provided during the project but **the provision of more readily available example case studies of successful adaptations would help build trust and break down barriers.**

Some proprietary products, such as insulation and plasterboards, are already suitable for use in repairable approaches. However, the suitability is not always obvious. **Households and professionals need to take care to consult technical specifications as the descriptive terms used by manufacturers, such as waterproof, can cause confusion.** Despite the inherent difficulties in designing such standards, suitable standards would increase confidence in resilient approaches within the professions, insurance industry and in owners and occupiers. In a practical sense **testing protocols and introduction of a flood resilience indicator that could be applied to resilient products would support uptake.**

While literature and guidance often makes a distinction between water entry and water exclusion, interviewees and some members of the LAA were less comfortable with categorising measures in this way. Repairability and resilience are often implemented as part of a holistic scheme that might also have some exclusion features. Furthermore discussion of back up repairability can be usefully included along with any water exclusion measures. **It may be helpful to reflect the concept of an 'integrated strategy' to reduce the risk of flood damage at a property level in communications targeted at the general public as well as in industry guidance.**

The issue of perceived contamination leads to unnecessary strip out and reluctance to install repairable measures. The use of biocidal detergents (as used in the hotel industry) has been suggested as a reactive means of addressing some of these concerns. A preventative approach would be the wider adoption of non-return valves to prevent sewage ingress via toilets/internal drains. **Further research and guidance in the area of contamination is critical to increasing the popular acceptance of repairable measures.**

3.5 Limitations of the study

The aim of the study limited the scope of measures to be considered to *low cost repairable measures* as defined in the introduction. While the research team sought to abide by this restriction, in reality the definition of low cost and the lack of a clear dividing line between water entry and water exclusion measures meant that some higher cost and water exclusion measures feature in the report.

The limitation to water entry and low cost measures also reduced the enthusiasm and engagement of some potential practitioner participants that perceived these as a last resort approach, not a large part of their professional remit or that advice should be given more holistically.

Although awareness raising and empowerment of participants was achieved during the timescale of the study, no actual physical alterations to buildings were made in Tewkesbury. Physical changes were limited to the demonstration of the surveyor's checklist in Cumbria. Other windows of opportunity for implementing measures did not fall within the demonstration project timeline. For example, homeowners received plans for improving resilience of their kitchens that may be implemented when they next make changes to that room in their house.

During the project, general awareness advice was provided by the members of the Tewkesbury LAA; they were empowered to do so through the social learning process. However, detailed advice was mainly provided to households in Tewkesbury by highly experienced members of the research team (with the exception of the Kitchen Design innovation). The demonstration showed clearly that empowerment of LAA members and households to determine appropriate measures is limited by the lack of available specific guidance and the need for household risk and appropriateness of some measures to be evaluated by experts. (The provision of detailed flood risk assessments was not within the scope of the present study).

The REA was limited to publications in the English language, and to countries with construction types similar to the prevalent construction types in the UK. Further limitations specific to the demonstration project are mentioned in Appendix 1 and 2 of this report.

4. Conclusions and issues to consider

The project's aim was to identify barriers and propose solutions to promote low cost measures that would make properties at flood risk more resilient to damage from flood waters. The conclusions, together with issues for consideration going forward, are here grouped according to the project objectives.

Objective 1 - Provide evidence for a package of measures that would make properties more resilient to damage, through identifying the evidence, gathering best practice and generating case studies of flood repairable measures.

The project demonstrated that packages of measures could be cost beneficial for properties in the UK; however, further research on the co-benefits of measures is recommended, in order to refine understanding of cost effective measures. Flood repairability can be achieved in different ways and for different reasons, not just as a final resort for properties subject to deep flooding. It is, therefore, important to understand the goal and the strategy when selecting measures.

Both individual and packages of measures also have the potential to reduce reinstatement time following a flood. The potential effectiveness of identified low cost repairable measures for reducing residual risk is high. The complexity of water entry strategies, coupled with the existing identity and character of a property, makes simple guidance and legislation difficult to deliver.

Care is needed when specifying measures because understanding of materials properties and testing is highly specialised. While low cost repairable measures are accessible, in that they typically involve the application of widely available construction materials, expert advice is usually needed for appropriate specification of measures used differently in the flood context. There are currently no accepted standards that can be applied to demonstrate 'flood resilience' for construction materials.

Objective 2 - Generate understanding of the behaviour of households and the property support network and their interaction, through exploring the perceptions of a wide range of property professionals, damage management experts, support networks, householders and small businesses and their interactions.

The research found that major emotional barriers that are particularly relevant to the water entry strategy include: aesthetics and not wanting to have 'abnormal' living spaces; contamination issues; abrogation of responsibility;

reluctance to accept water will enter the home; lack of belief in the effectiveness of measures; and not wanting to add extra decisions during the stress and trauma of the post flood period. Awareness of measures is a necessary first step to uptake, but other barriers (particularly emotional barriers) can prevent the uptake of resilience. In the short term, there is a need to abide by the preferences of households and water exclusion is usually the preferred option. It follows that normalising repairability is likely to take some time and considerable effort.

Ensuring detailed advice and information are available from appropriate persons and institutions is, therefore, important in bringing about behaviour change. The pivotal role of insurers, loss adjusters and restoration professionals was confirmed within this study. However, an informed and engaged wider PSN is a critical success factor in widening appropriate adoption of resilience. There were, however, some similar emotional barriers apparent within the PSN: a reluctance to subject owners and occupiers to stress; a reluctance to challenge householders' preferences; lack of belief in measures; preference for water exclusion; and issues around professional solidarity in adopting standard reinstatement protocols.

The research found that, nonetheless, members of the PSN nationally and locally are interested in making a contribution to supporting the uptake of low cost resilience (and other property level measures). The research found that the lack of commercial market drivers, lack of incentives and standard reinstatement protocols contribute to the lack of championship within the commercial PSN of low cost repairable measures (as opposed to water exclusion and higher cost measures). Despite willingness to participate, in light of the limited direct commercial benefit to the wider PSN in supporting uptake of low cost measures, the PSN will also need to be supported in assuming this new role by provision of (national) standards, guidance and training. Timing and resource constraints are also a limiting factor on the ability of the PSN to support owners and occupiers. For example, motivation is highest in the period following a flood event, but this is also the time when resources are most stretched and professionals are keen to speed up reoccupation.

Objective 3 – Design innovative practices to exploit opportunities to increase take up of measures, by exploring pathways to uptake and the theories of change, and development of new training and guidance materials. Trial these innovations (designed with the cooperation of a wide range of property professionals, flood experts and selected households and businesses) in one community to evaluate their success.

As a trigger to action, insurance renewal is a key window of opportunity, and the role of local insurance brokers in facilitating uptake may become a major factor as the Flood Re scheme evolves. Provision of awareness materials and signposting to existing guidance and expertise by solicitors during property transfer also presents a very low cost opportunity to support uptake. Similarly, as an opportunity to deliver well qualified advice at a crucial window during reinstatement, a surveyors' checklist is seen as a useful contribution to supporting uptake.

Repairable measures can be built up over time, when convenient during the property lifecycle, to limit future flood damage; owners and occupiers can be encouraged to consider the possibility by a wide range of actors in the PSN. Appropriately briefed kitchen designers may offer an enhanced service to floodplain occupants and support the uptake of resilient measures. Likewise, lists of suitable repairable materials and awareness flyers made easily available for builders' merchants may allow them to support uptake (for example, by providing suitable displays after flood events, seasonally or during awareness events).

Objective 4 – Summarise the lessons learned from the testing and evaluation of the outcomes from community trial phase, and derive proposals for addressing any gaps or new needs identified through the project.

The research found some changes in practice and evidence of effectiveness that could be incorporated into updated guidance. However, further evaluation and scientific testing is needed to strengthen the evidence base. Low cost measures may be encouraged in a pragmatic way, proportionate to available resources and circumstances; more, readily available, example case studies of successful adaptations would be of benefit here. Further research and guidance in the area of contamination is critical to increasing the popular acceptance of the repairable approach.

Individual low cost measures and packages of measures can be cost beneficial but in some cases a more costly holistic approach may be warranted. Historic properties present a specific challenge and also an opportunity, as '*standard procedures*' can be damaging, whereas historically appropriate materials can often be a resilient choice in themselves.

Local networks are also highly important for the PSN as they help to deliver trust in the relevance to local needs, as well as allowing development of integrated and consistent advice and support in the local area. Groups such as the Tewkesbury LAA can also raise the saliency of flood management between floods. Whilst solicitors, kitchen designers, builders' merchants, building surveyors and community flood advisors were involved in the

demonstration project, the research also identified the potential for support by other actors (including building control officers, planning officers, social housing providers, fire service, local authority, insurance brokers, estate agents and others). A reinstatement plan may be incorporated in emergency and recovery planning guidance, and agencies and volunteers could be trained to deliver appropriate advice and guidance.

Although many repairable measures are not suitable for inclusion in regulations, making a small number of passive repairable measures mandatory through building regulations could reduce future damage, and would offer the potential to raise awareness of the new British Standards. Introduction of a flood resilience indicator that could be applied to resilient products may also support uptake.

Finally, although the current research focussed on low cost repairable measures, it was able to gain broader insight through the inclusive action research paradigm adopted. A strong message emerging from all stakeholders is that it may be helpful to reduce the compartmentalisation of messages (resistance *versus* resilience or repairability). The concept of an 'integrated strategy' to reduce the risk of flood damage at a property level could be used in communications targeted at the general public, as well as in industry guidance.

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Appendix 1: FD2682 Supporting the uptake of low cost resilience: Report on Demonstration project

Authors: Jessica Lamond, Lindsey McEwen and Amanda Wragg

Introduction

The primary aim of the demonstration project was to design and demonstrate innovative approaches for removing at least some of the barriers to implementation of repairable measures that can be applied in a local setting by agencies in flood risk management, working with communities and small businesses. These relevant agencies and businesses comprise an evolving community of practice that can support households and small businesses in managing their property at flood risk throughout the property life cycle. This group of organisations is hereafter referred to as the Property Support Network (PSN). The demonstration aimed:

- To explore whether raising awareness at appropriate intervention points in the property lifecycle will increase the likelihood that measures will be adopted;
- To demonstrate the level to which knowledge and capacity already within the PSN can be channelled to contribute to the decision making process; and
- To distribute, obtain feedback and refine new information and signposting materials designed to assist households/businesses and the PSN during the decision making processes.

The research team included members who are actively engaged both in the process of property reinstatement, and in the development of property level resilience more broadly (for example, in property care advice; insurance advisers; and in the capacity building of property professionals). However, the design of the demonstration acknowledged the need to understand the local stakeholder decision making processes in detail, in order to investigate fully the most problematic and insurmountable barriers (whether real or perceived). A *co-design* process, undertaken in collaboration with research participants was therefore seen to be the most appropriate approach. This was achieved through the identification of a demonstration community, and the establishment of a 'Learning and Action Alliance' (LAA) formed from the local PSN. A 'Learning and Action Alliance' is a type of multi-organisational, non-hierarchical, capacity building forum, previously implemented successfully in other projects (see later).

Rationale for selection of Tewkesbury as setting

It was considered to be important to engage with homeowners and business people who live and work in properties with a range of flood histories, different structural

characteristics, building types and with varied intervention opportunities. This shaped the selection criteria for the demonstration community.

The design needed to take into account the flood experiences, property characteristics, range of intervention opportunities and the scale of the necessary property support network and the trial duration. It sought to maximise the range of circumstances explored by the trial rather than to select a representative sample. In order to capture the desired variability of flood type, homeowners and businesses, it was decided to focus on one geographical setting (e.g. small town) that could be extended to surrounding villages and the wider region if necessary. A pool of more than twenty community flood risk settings were initially identified as potential case-study sites by the consortium, informed by knowledge of existing flood risk communities which had already been engaged in previous research, such as the Defra Community Pathfinders, ESRC *Sustainable Flood Memories* project, and the EPSRC's *SESAME* (small business flood adaptation project). From these, Tewkesbury was identified as best meeting the criteria. It episodically experiences both fluvial and surface water flooding of varying depths, contains a sufficient number and a mixture of property types (including historic and newer build; some with insurance issues; some harder to treat). The mix included residential and business (mainly retail).

Great weight was given to the factor that prior links between the research team and this community built through previous research projects were already strong. There is also a deep-seated desire within the community to continue to strengthen its resilience. Experience shows that engagement of communities takes time, and therefore the use of existing longitudinal relationships contributed greatly to the project team's ability to deliver a feasible demonstration within the project's timescale. Furthermore, the lack of previous Defra funded physical interventions in this setting was perceived to reduce the prior expectations that Defra would provide direct grants under the project.

Purpose and Ethos of the Tewkesbury LAA

A Learning and Action Alliance (LAA) typically is 'an open arrangement where participants create joint understanding of a problem and its possible solutions based on rational criticism and coherence through discussion' (Lawson, 2014 *Learning and Action Alliance Fact Sheet*). This approach was used in relation to the Property Support Network (PSN) in Tewkesbury and surrounding area, to bring key actors together to discuss ideas that could lead to increased community awareness about wet-proofing of properties and flood repairable measures, while at the same time allowing local people to take more ownership of the management of their own flood risk. Such an approach has previously been employed in other projects, and proved to be a useful innovation (for example, in projects such as *Managing Adaptive*

Responses to Changing Flood Risk (MARE project partners, no date) and also *Blue-Green Cities* (Thorne *et al.*, no date).

In short, the LAA aimed:

- To encourage people to become informed and share experiences about low cost approaches to minimise the effects of flood damage inside buildings;
- To identify opportunities for providing guidance, especially when people make changes to their properties, and the times in the property cycle when this might be appropriate;
- To co-design, with the research team, innovative solutions (including guidance materials);
- To plan for the use of these in the proposed demonstration phase of the project.

The style of meetings was inclusive, participatory, and enabled frank and open conversations within an atmosphere of trust. People who wished to become members of the LAA signed an 'Expression of Interest' (EOI) form giving consent for their contact details to be confidentially shared amongst the group. Members were also invited to suggest others who might usefully be involved in the PSN, and these suggestions were followed up either by individual LAA members or the research team.

Establishment of the LAA

The research team initially identified relevant sectors that it would be useful to have representation from in the LAA, in consultation with Defra. Researchers already had local knowledge of Tewkesbury and surrounding area, and therefore were able to work quickly to develop further a list of local people who were involved with property support. Internet searches and local knowledge of businesses provided a useful starting point for phone calls and visits to individuals and businesses with whom the research team aimed to engage. In order to ensure that LAA meetings were well-attended and to create sustained interest and momentum, the research team kept in regular contact with LAA members. This included one-to-one discussions about individual people's roles in the demonstration phase. This regular communication proved beneficial in terms of capitalising on networks and building trust within the LAA. A 'Google group' was established for those who signed the EOI to enable closed, confidential e-mail communication within the group. There are thirty-two local people in total who are classed as being part of the LAA (in that they have attended one or more meetings; filled out EOI forms; and in many cases joined the 'Google group'). An active core group of around sixteen local people evolved over the course of the meetings. This proved effective in terms of the process of developing ideas for the trial. Others maintained a less active participation and some that could not attend meetings, stayed in discussion with the research team and took part in the demonstration phase.

During the demonstration, the LAA comprised people from the following areas of property support, defined inclusively:

- DIY/builders merchants; electricians/plumbers; builders and designers; kitchen designers;
- business advisors; solicitors; estate agents; architects; surveyors;
- property care and flood protection; drainage companies; flood reinstatement (e.g. cleaning and drying companies)
- insurance companies; loss adjusters;
- social landlords, local councillors; and the Local Flood Action Group.
- Flood Risk Managers (local authorities and Environment Agency representatives); Rural Community Council advisors on 'Flood Repair and Renew Grants'; Fire and Rescue Service

Operation of the LAA

Ten meetings took place in Tewkesbury during the project; the content of each is summarised here:

<i>Meeting details</i>	<i>Agenda</i>
<i>LAA Meeting 1 (29/06/2015)</i>	<ul style="list-style-type: none"> • Introduction to project; • Presentation about what it is like to flood and how to mitigate effects; • Discussion about low cost solutions – people’s experiences, examples, and identification of barriers to people taking up measures. • Identification of roles of those in Property Support Network to best support people with take up
<i>LAA Meeting 2 (22/07/2015)</i>	<ul style="list-style-type: none"> • Presentation of results from international evidence review on low cost flood resilience measures; • Group sharing of ideas on tried and tested innovative flood resilience measures with discussion of photographs and experience; • Mapping of residents’ time line in a property and opportunities and barriers relating to property support personnel encouraging take up/offering of guidance.
<i>LAA Meeting 3</i>	<p>Facilitated group discussions about:</p> <ul style="list-style-type: none"> • Who is best placed to provide

<i>(27/08/2015)</i>	<p>guidance/advice/encouragement to people to make flood repairable changes to properties and at what points might people want to/ be encouraged to make changes?</p> <ul style="list-style-type: none"> • What materials (guidance and information) do people need to inform them about building resilience in the face of flooding? • How can property owners and householders be recruited to consider these changes over the next six months? • Development of ideas on the potential roles of the PSN in delivering the pilot project.
<i>LAA Meeting 4 (28/09/2015)</i>	<p>Focus was on further development of innovations that were developed in LAA Meeting 3. These were:</p> <ul style="list-style-type: none"> • recovery planning through fire service and local authority visits; • guidance and product displays at builders' merchants; property transfer/advice (via estate agents and solicitors); kitchen/bathroom design; • loss adjuster checklist; and guidance through building control. <p>The first three of these were discussed in groups with relevant members of the LAA, and further detail added regarding the practicalities of setting up these initiatives. The LAA developed a time-table for introducing the pilot which included local flood-related events; displays of materials; and guidance opportunities.</p>
<i>Between LAA Meetings 4 and 5</i>	<p>Six ideas for innovations were then developed by the research team with support from the LAA. These are explained in more detail below.</p> <ul style="list-style-type: none"> • Recovery planning through Fire Service or LA visit • Loss adjuster surveyor checklist • Displays at builders' merchants • Kitchen / bathroom design • Advice at property transfer • Advice from building control <p>Five were selected for further development within the demonstration and one (advice from building control) was seen as outside the sphere of the LAA. The latter was put forward as a suggestion for CLG/Defra to explore in the longer term.</p>
<i>LAA Meeting</i>	<ul style="list-style-type: none"> • A presentation was given about recent interviews that had

<p>5 (16/11/2016)</p>	<p>been undertaken with householders and professionals about resilient adaptations that people had made;</p> <ul style="list-style-type: none"> • Workshop and feedback on the plans for the trial in groups and the materials that would be needed, identifying actions required and the timelines for these. • This was followed by a plenary discussion and then an evaluation focus group with Collingwood Environmental Planning. The remainder of the group discussed website development.
<p>LAA Meeting 6 (01/12/2015)</p>	<ul style="list-style-type: none"> • Defra staff gave a presentation about findings from the evaluation of the Pathfinder Projects; • Discussion about website development and how to monitor take-up and interest; • Update on the Surveyor's checklist; solicitors'/estate agents' letters; the builders' merchants initiatives; kitchen/bathroom design; fire service involvement and ideas for a flood fair; and, publicity and community awareness.
<p>LAA Meeting 7 (07/03/2016)</p>	<ul style="list-style-type: none"> • Briefing on the ongoing threshold surveys; • Update on website and materials; • Presentation of digital testimonial; • Feedback about discussions on the flood fair; and, focused discussions for planning. • The meeting was followed by a tour of the Incident Room in the Environment Agency Offices.
<p>LAA Meeting 8 (23/05/2016)</p>	<ul style="list-style-type: none"> • Presentation given about recent work in Cumbria with the surveyor's checklist following the floods; • Updates given on the builders' merchant initiative; kitchen design; website traffic; Environment Agency letters regarding household surveys; and the solicitors' initiative. • Purpose of Collingwood Environmental Planning's focus group for the next meeting, and interviews, was explained.
<p>LAA Meeting 9 (11/07/2016)</p>	<ul style="list-style-type: none"> • Updates and discussion on all of the initiatives for the trial: Builders' merchant displays; kitchen/bathroom design; surveyor's checklist; solicitors' initiatives; Flood Recovery Plans; and website activity. • Followed by an update on the work with the Surveyor's checklist in Cumbria.

	<ul style="list-style-type: none"> • Second part of meeting - a focus group with Collingwood Environmental Planning about the evaluation of the trial (held in a separate room)
<i>LAA Meeting 10 (05/09/2016)</i>	<ul style="list-style-type: none"> • Update on activities and monitoring; • An opportunity to reflect on the materials that had been developed and their appropriateness and how they could be improved; • Dissemination of findings was discussed and ideas for who dissemination should be aimed at; • Next steps for innovations and website development; • Finally a new vision for the LAA was discussed; the group agreed to continue meeting following the end of the Defra project, albeit on a slightly less frequent basis. It was agreed to hold the next meeting in December 2016, led by a member of the LAA at which the Research team would present findings.

Underlying the objectives of the LAA was the understanding that the innovative approaches were unlikely (within the timescale of the project) to result in a high number of physical changes in properties in Tewkesbury. As noted above, removing the barriers to implementation requires a structured support system that targets multiple barriers. The innovations were designed to tackle one or more barriers; however, no single innovation could be expected to remove all of the barriers along the decision pathway. The innovations selected were chosen to tackle barriers that had been identified as commonly experienced, critical in the decision pathway and suitable to be addressed at a local level.

Rationale for selected innovations to be trialled

In selecting the demonstration community of Tewkesbury, a community that has experienced extreme flooding relatively recently (in 2007 and 2012 although the latter did not affect many properties), the project team sought to minimise some of the inherent barriers to adoption. In Tewkesbury, there is general awareness of risk because of lay flood knowledge, prior actions of local agencies and relatively recent memory of flooding. As such, Tewkesbury is not a typical community at flood risk, but is representative of those individuals for whom repairable adaptation is likely to be an effective and cost beneficial approach. Selecting such a community allowed for demonstration of innovations that were suitable for removing barriers further along the decision path, and barriers that were most specifically relevant to the water entry strategy. These include, for example: timing barriers to accepting that water might enter their home or business and that internal adaptation can be part of their

flood plan; informational barriers to understanding what measures may be suitable; and that the implementation of measures can be supported locally.

The demonstration implemented or partially implemented five innovations. Three were designed to be partly awareness-raising and to aid the recruitment process into the demonstration; the other two were conceived to be used with people who had already agreed to be part of the demonstration.

Description of innovations

Innovation 1: Advice at property transfer

This innovation was specifically designed to target the window of opportunity of spending to improve or renovate properties that occurs when property changes hands. The process was mapped in consultation with the LAA, and several opportunities were identified (Figure 1).

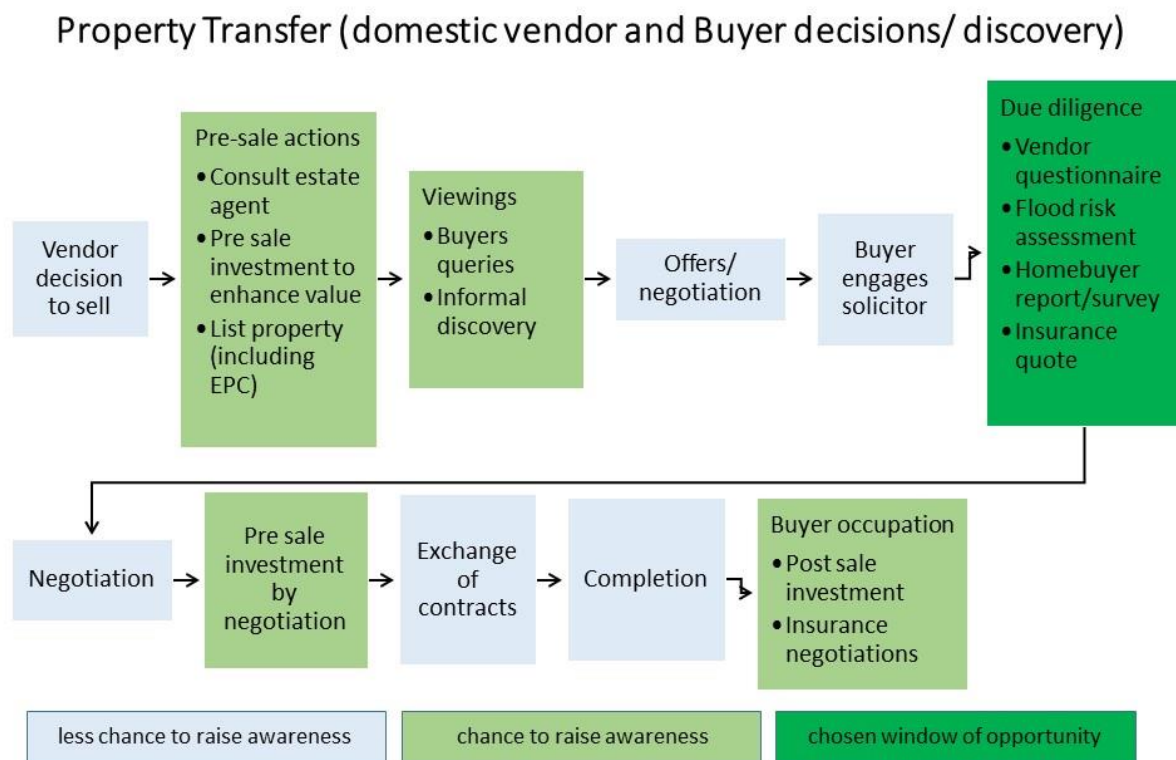


Figure 1: Decision timeline for property transfer (domestic vendor and buyer decisions/ discovery)

Estate Agents

In advance of choosing a property, prospective purchasers may enquire of the estate agent about local flood risk. Estate agents can therefore provide general flyers that advise on how to discover the risk for a property and sources of information on resilience. However, as the estate agent acts for the vendor, they are constrained in their ability to advise about risk to a specific property. They are not qualified to provide advice beyond publicly available sources of information. An opportunity was identified to advise vendors about the potential to undertake measures in advance of listing of property if there were concerns about selling a property in the floodplain. However, it was recognised that this was unlikely to occur during the period of the demonstration.

Solicitors/conveyancers

Purchasers in areas of risk will normally receive information about the risk to their property in the form of a flood risk survey from their conveyancer. This report is specific to the property and uses information over and above what is freely available from websites such as the Environment Agency. It often contains some very general statements about the possibility of protecting or adapting the property. The opportunity here is that solicitors can provide additional information on flood repairable measures at this point, signposting further resources to assist potential purchasers in making an informed choice of whether to purchase the property, and plan for flooding if and when they occupy that property in the future. It may also be that this information would allow for some negotiation on value to allow for investment in measures, or negotiation to have measures installed in advance of purchase. This has the potential to increase the investment in measures so reducing future costs of reinstatement. If the buyer commissions a detailed building survey at this point, they could also ask their surveyor to advise on potential measures and their likely costs.

During the trial, an email was designed to provide a basic flyer and signpost potential purchasers in the floodplain to further resources that might help them in their decision making. The resources were hosted on the project website, and the website also linked onwards to third party resources.

Innovation 2: Displays at builders' merchants and DIY shops

This innovation was specifically designed to target a window of opportunity during the normal changes that individuals make to their property in the course of renovations, redecoration, modernising or extension. The rationale for this innovation was that individuals and/or their (local) contractors would be likely to source some or all materials from a local retailer. This would not require an official advisor unless the changes were to be of a substantial nature requiring building control or planning

consent. The process for small scale building work was mapped out (as in Figure 2), and the window of opportunity identified is highlighted in green.

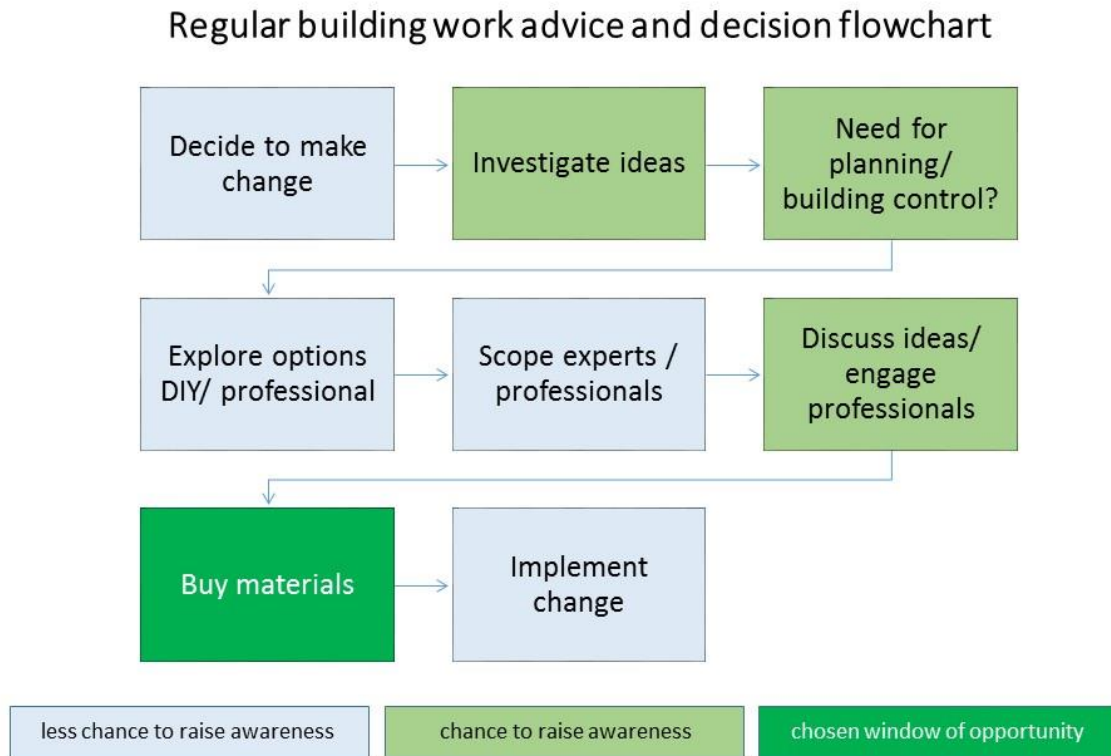


Figure 2: Decision timeline for building work

By providing awareness raising and guidance at point of sale, the innovation was seen to have the potential to intervene at a crucial point in the decision process – when changes were about to happen. The other major advantage of this innovation was seen to be the immediacy of the advice in the same location as the materials, enabling individuals to see/handle and evaluate price alternatives. Having such displays in local shops can be an additional resource towards which people can be signposted if they are engaged in thinking about changes to property for some other reason (e.g. property transfer or recovery planning).

Two different stores were involved in the builders’ merchant innovation: one was an independent store (SME) and the other a large chain store. Both managers had the flexibility to be able to adapt their space to include a display within their stores, and had space for publicity outside. Initially the chain store did not engage in the Project but after a change of manager, the store was involved and committed throughout the rest of the LAA meetings.

Each store erected different shelving units and sourced some flood repairable materials and information leaflets to display along with leaflets and postcard flyers for customers to take. A pull-up banner was made and placed in the independent store, and waterproof banners were put outside the shops so that passers-by could see them. The owner and manager were each involved with the design of the materials, particularly the independent store who recommended a local printer for promotion materials. In terms of the process of engagement and design, it was found that there was significant input and knowledge from the builders' merchants, in relation to expert knowledge about materials, and knowledge of customers and what would attract them to look at the displays. Particular members of staff were also interested and although they did not attend the LAA, they were key players within the shops in terms of speaking to customers, following staff briefings by a research team member.

Innovation 3: Loss adjuster/ surveyor checklist

This innovation was targeted at the window of opportunity at reinstatement of property following a flood. Loss adjusters and surveyors and damage management contractors are usually employed by insurers to assess the damage and recommend a process for recovery that is within the terms of insurance. Increasingly, according to the interviews undertaken during this project, this process has some flexibility to allow repairable adaptation (especially if it can be managed at no significant extra cost). This represents a significant opportunity for building in flood repairability to the building fabric. However, further evidence from the interviews revealed that surveyors and loss adjusters are on a steep learning curve regarding repairable measures, and some extra support or systemisation would be helpful.

Within the general window of opportunity of reinstatement, the process was mapped using both literature (Figure 3) and the experience of the project team to identify the intervention point during reinstatement where advice on repairability was most likely to be delivered (see Figure 4). This was seen to be in the visit, usually by a building surveyor or contractor employed or commissioned by a loss adjuster or insurer, post drying when the repair strategy would be discussed and tentatively agreed.

A surveyors' checklist and accompanying guide was designed by the project team as part of the technical outputs of phase 1. Using the demonstration project to trial these materials directly with households and small businesses had the potential to provide evidence to the relevant trade bodies (ABI, CILA and RICS) that such an approach could work in practice. Ideally, households might already have ideas about their recovery and reinstatement needs (as per innovation 1). However, if they had not or, if at the point of reinstatement, this plan needs to be adjusted in the light of the actual damage, a standard checklist will prompt appropriate consideration of the alternatives. If the materials are seen to be helpful in the context of this

demonstration they could provide a starting point for the industry to embed low cost resilience into standard practice. This innovation was tested in Cumbria (see Appendix 3).

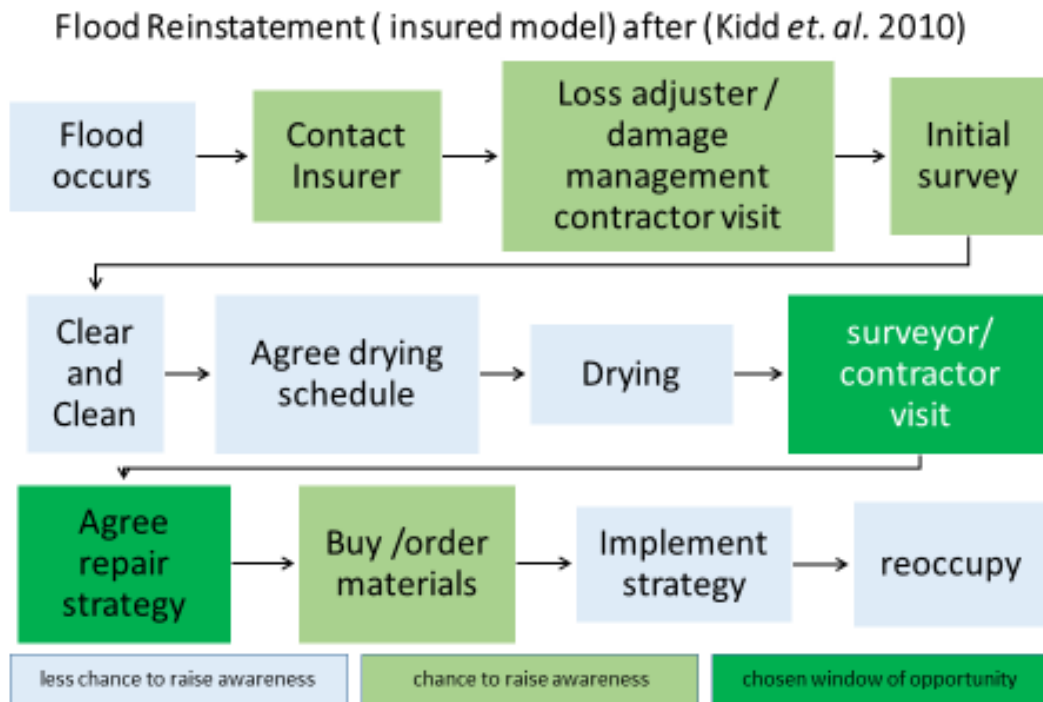


Figure 3: Decision timeline for Flood Reinstatement (insured model) After Stages in restoration of flooded buildings (Kidd et al., 2010)

Innovation 4: Recovery planning through Fire service or LA visit

This innovation was principally designed to target the window of opportunity of resilient reinstatement after an event. Post event reinstatement could not be tested during the demonstration period. However, if households and businesses have planned for the recovery period in advance of the next flood, they will be better equipped to ask for appropriate measures within the reinstatement period from their insurer (or to arrange adaptation if they are organising their own reinstatement).

Recovery planning is, however, a broader activity than simply specifying physical changes to the property, as it can also include advice about contents and arrangement of living spaces to minimise disruption and damage. This activity is valuable in its own right, as it may reduce loss and damage in the event of a flood. However, it can also give a sense of empowerment and peace of mind in previously flooded households. For this reason, the recovery planning advice was targeted at

households that had previously experienced flooding or are at high risk, living in a property that has previously flooded.

Households asking to join the trial were offered a visit to discuss their recovery plan. The visit was carried out by a member of the project team experienced in delivering community engagement visits. Ideally this would have been carried out by flood wardens, local authority or the Fire Service, but it was not possible to arrange this within the demonstration period for reasons outlined below in the 'strengths and limitations' section. During the visit, the purpose of the document was explained, and the document and suggested measures were discussed. The planning booklet was left with homeowners to complete at their leisure.

Innovation 5: Kitchen/bathroom design

This innovation was designed to target two windows of opportunity: reinstatement and normal household renovation cycles. Kitchens and, to a lesser extent downstairs bathrooms and cloakrooms, are often replaced wholesale after a flood. However, kitchens and bathrooms are also examples of major upgrades that many households undertake periodically, in order to better enjoy their homes and add value to them. Usually this involves significant investment of finance, and kitchens are often a major expense during reinstatement. Often households will employ external advisors, such as kitchen and bathroom designers, when they are first installing them, and during reinstatement will demand 'like for like' in terms of quality and appearance.

Reducing the amount of material in a kitchen or bathroom that needs to be replaced after a flood would make a large contribution to reduction in property-level flood losses. However, this is an area where there is very little shared knowledge and the commonly recommended measures (steel or plastic replacement kitchens) have been reported in our interviews to be too expensive to be covered by 'like for like' insurance reinstatement. These may also be unacceptable to homeowners in terms of aesthetics. The innovation attempted to address these concerns, by combining the novel suggestions encountered in the evidence assessment, with previous recommendations and the creativity of local designers. The aim was to design a range of resilient kitchen and bathroom adaptations, using normal kitchen and bathroom suppliers with minimal specialist materials, for different depths of expected flooding.

The output from this demonstration is new guidance for the areas of kitchen and bathroom design and reinstatement, which could lead to increased capacity of the kitchen and bathroom design and supply industry to support the installation of repairable kitchens.

Kitchen design advice and decision flowchart

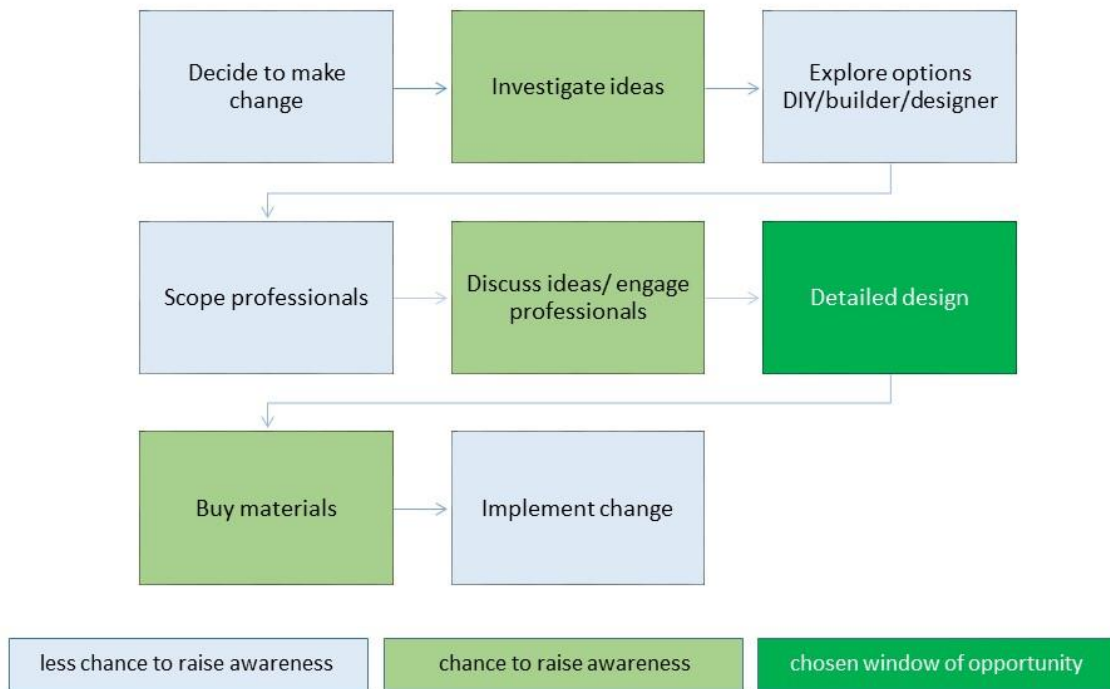


Figure 4: Decision timeline for new kitchen implementation

Design of materials

The new information and knowledge transfer materials produced were as follows:

- Low cost resilience short guide for homeowners and small businesses
- Low cost resilience short guide for surveyors/loss adjusters
- Resilient materials list for builders' merchants
- One page case study examples
- Guide to recovery planning
- Solicitors' letter
- Builders' merchant banner
- Builders' merchant postcard flyers with website and contact details
- One page flier '*Flood - making your home repairable*'
- Website

The materials needed to implement these innovations were prepared and discussed with relevant members of the PSN.

Process of recruitment

Recruitment onto the demonstration and evaluation was managed in two ways. In the first phase, there was recruitment via innovations 1, 2 and 3 as described above. Households and businesses that expressed interest were invited to consult with the PSN member or a member of the research team. They were selectively invited (based on their risk profile and property type) to consider either kitchen/bathroom design or a visit by a PSN member or a member of the research team to trial the recovery planning guide or surveyor checklist. However, recruitment through innovations 1, 2 and 3 did not provide sufficient numbers of households to demonstrate the innovations 4 and 5. Therefore, the local Environment Agency sent a mailing to inviting further participants.

Reflections on the strengths and limitations of the demonstration project

There are evolving principles to community/ stakeholder engagement and associated social learning that the demonstration worked to implement. This was heeded both in the development of the LAA and in the project's engagement of key stakeholders within the five Innovations, as far as project timescales allowed. Key concerns were as follows:

- *Timescales for engagement:* Engagement strategies emphasise the importance of at least six months for community engagement activities, and ideally significantly more. All the innovations would have benefitted from a longer timescale to implementation, recognising that building of mutual relationships and trust takes time. There was also a need to break down barriers between different groups including researchers, professionals and community groups/ members. The monthly or bi-monthly LAA meetings with building agendas helped build momentum and cemented the core group. The ability to learn from the experience of the EPSRC Blue-Green Cities LAA helped the set-up of the LAA in this project.
- *Time-lag since floods:* While Tewkesbury was selected because of its repeat experience of flooding, the time-lag since the July 2007 flood (the last major event that caused significant impact to property) was seen as a barrier to engagement of both the local PSN, key actors in the Innovations and the public in trialling the innovations.
- *Co-design of activities:* Co-development of agendas for the sequence of LAA meetings and the space made for participatory activities that encouraged small group discussion were both important in the development of the LAA.

- *Neutral space:* Critical was finding a suitable and regular venue for the LAA to engage. Tewkesbury Abbey was selected as a neutral comfortable space although once the PSN settled down to a core of committed participants, the regional Environment Agency stepped in to offer space and refreshments for meetings. This resource is likely to aid the sustainability of the LAA.

Engagement within the Learning Action Alliance

- *Participation in LAA:* While the PSN initially had a fluid composition, this settled down to a core of around 16 committed participants. These participants combined those who might be considered routine in a property support network, with others who were less expected but who brought important capital (e.g. a local web designer). The PSN expanded to include those working in local government to support communities and small businesses in their resilience planning, and a committed lead of the local flood action group. That inter-professional community mix worked well in the development of the LAA and augurs well for its sustainability.
- *Sustainability of LAA:* One of the criticisms of engaged action research projects can be the necessity to 'flash and dash' in engagements with communities. The rapid removal of scaffolding with the removal of researchers, resources and capital can jeopardise the longer term status and functioning of initiatives set up with communities. In this case, the core members of the LAA had built up positive working relationships that meant that they took some ownership over the will and impetus to keep the LAA going post project. Colleagues from UWE have agreed to participate in early meetings after the end of the project to aid that continuity and handover. For example, at the time of writing the revised terms of reference are being edited by a member of the LAA for comment and wider adoption.

Implementation of the innovations

Additionally, other factors were found to affect the success of implementing the Innovations to a set timeline.

- *Role of key actors as gatekeepers:* The trialling of working with the Fire and Rescue Service in the delivery of flood repairability guidance did not come to fruition because of changing personnel participating in the LAA. Alongside this, the on-going production of an information sharing document on wider flood resilience (led by the County Resilience Forum) was seen as duplication to the Flood Repairable initiative. In reality, the pamphlet once published was not found to include any information about repairability, and therefore information about flood repairability is now to be added in the next version of

the pamphlet. This may reflect lack of awareness of what flood repairability involves as a strategy, and how it might add to, rather than competing with, other flood resilience messages as part of an integrated strategy.

- *Organisational timelines:* Some organisations had changing representation over the project timeline. However, the persistence and commitment of key individuals as scaffolding to the process was critical to the success of individual Innovations.
- *Involvement of key public/community representatives:* The involvement of key individuals as champions or ambassadors for the Flood Repairability approach was critical. This involved capitalising on pre-existing networks of contacts established before the start of the project.

Use of different media to engage stakeholders

The project used different media, messages and messengers to engage stakeholders within Tewkesbury and about the project more widely. Evolving best practice in flood risk communication indicates the power of communications between individual residents in social learning for increased resilience. Media were selected and developed after early discussion with the LAA. For example, Facebook was not widely used by LAA members and hence was not used in this project. It might, however, be a useful vehicle to consider in future projects.

- *Short digital testimonies (audio and images).* These were an adaptation of the methods of digital stories (short audio with images identified by the speaker), used within the ESRC *Sustainable Flood Memories* project (esrcfloodmemories.wordpress.com). Themes of these digital testimonies included the process of installing a flood repairable kitchen. These ‘stories’ or personal accounts were shared (e.g. with the LAA) to promote critical reflection on the opportunities and challenges of different innovations, and have potential for wider sharing post project.
- *A website (<https://floodrepairable.wordpress.com>)* was set up to record downloads of resources produced for innovations (e.g. surveyors’ checklist) as part of the project. Unfortunately there were technical issues with versioning of Wordpress (the website shell) that meant that downloads could not be recorded.
- *Use of Twitter* – The project set up a Twitter account *@Floodrepairable* which is being used to engage a wider audience with the themes and outputs of the project. Although the majority of ‘followers’ (39 by 30th September 2016) are not local to the demonstration; Twitter now provides a vehicle for sharing

learning across the wider sector and building capacity. UWE has undertaken to keep this thematic Twitter feed going for two years post project.

- *Google group* – While this shared group was set up for mutual exchange between LAA members, in reality it was mainly used for one-way communications between the research team and the LAA.

Summary of findings

Summary of innovations demonstrated

Surveyors' Checklist. The use of a checklist and accompanying guidance materials during a surveyor visit was shown to have great potential in generating a more detailed discussion around repairable reinstatement. The checklist in itself does not upskill surveyors but if completion was encouraged or enforced, it would act as a prompt for surveyors to consider the widest range of options. The checklist needs to be backed up with appropriate briefing, accompanying materials and guidance that surveyors can access and share with owners and occupiers. While the checklist encourages discussion and improves information, it does not directly address some of the other crucial barriers such as resource and emotional concerns. Belief in measures and skill in communication of that belief are also requirements for surveyors using the checklist. As an opportunity to deliver well qualified advice at a crucial window during reinstatement, the surveyors' checklist is seen as a useful contribution to supporting uptake.

Recovery Planning. The use of a recovery plan that includes reinstatement planning by was judged by two homeowners to be very useful for themselves, and by homeowners and the Tewkesbury LAA as potentially valuable for others that could be persuaded to take it up. Key to the success of this measure is the support of local agencies / volunteers that can guide owners and occupiers through the process. Therefore these individuals need to be sufficiently briefed on the measures to assist and provide signposting to appropriate expertise. The innovation is subject to the well-recognised limitation that people are reluctant to engage in flood planning between events, and is unlikely to be pursued in isolation from the delivery of more general flood awareness and planning activities. A reinstatement plan can be incorporated in emergency and recovery planning guidance, and agencies and volunteers can be trained to deliver appropriate advice and guidance.

Creative kitchen design. This can lead to kitchens that are both attractive and more resilient without increasing the cost of a kitchen. Often this does not need to involve specialist suppliers although specialist elements may offer resilience at greater depths. Use of different materials such as marine plywood may not add much to the cost of kitchens. These designs may reduce the previously identified barriers around

appearance and cost. However, one major emotional barrier for kitchen reinstatement is around contamination, and the reluctance to use units that have been inundated with dirty water. This could be reduced through recommended use of biocidal detergents and appropriate testing post flood. Appropriately briefed kitchen designers may offer an enhanced service to floodplain occupants, and support the uptake of resilient measures.

Property transfer. A suitable method for delivering advice from solicitors to clients in the process of buying in the floodplain was co-developed during the demonstration project. Using an email delivery with awareness materials coupled with signposting to further advice was seen by the professionals as a proportionate approach to deliver good due diligence while not over-burdening either party. During the demonstration the mailing was seen to generate some, but limited, interest in further discovery. Thus far, with a sample of five clients, it has not had any detrimental impact on the conveyancing process with no withdrawal of buyers from the solicitors involved and no sale falling through. Solicitors within the engaged firm, able to signpost guidance, view this as a useful part of their client service that will enhance the potential for early uptake of measures. An interviewee also pointed out the desire for potential purchasers to access as much information as possible before completion. Provision of awareness materials and signposting to existing guidance and expertise by solicitors during property transfer is a very low cost opportunity to support uptake.

Displays at builders' merchants and DIY shops. These were seen to be a point of sale opportunity to raise awareness that might translate into: the seeking of further advice and guidance around resilience, or immediate purchase of resilient materials. Displays were co-designed in collaboration with two businesses in Tewkesbury that were suitable (in size) for allow for long term hosting in store yet big enough to be noticed. Some evidence of awareness raising was evident, and also of further investigation. However, as a passive display, this innovation is subject to the usual inertia and reluctance to engage with flood related issues. As a commercial proposition, therefore, it would be unlikely to be widely adopted although some stores in frequently flooded areas may provide it on the basis of good customer service. It was also observed that stores preferred to offer a wider range of products on such displays, including water exclusion measures. The strongest potential for this innovation was seen, particularly by the professionals in the LAA, to be on a local level in the aftermath of a flood event, or as part of any more widespread flood awareness event. Lists of suitable repairable materials and awareness flyers made easily available for builders' merchants would allow them to support uptake by providing suitable displays after flood events, seasonally or during awareness events.

Evaluation of the demonstration project indicated the innovations that appear to have been most successful were those driven by members of the LAA, or which incorporated significant input from members of the local PSN. Although there was limited evidence of homeowners taking up low cost resilience measures, such changes were not to be expected considering the timescale of the demonstration phase. There was, however, evidence of a small increase in awareness of low cost resilience to flooding amongst owners of residential properties at risk. An increased awareness of low cost flood resilience measures amongst LAA members was achieved, however, such that they are now more likely to discuss or suggest such measures. As the LAA comprised a range of stakeholders from different backgrounds, professions and interests, an enhanced understanding of these different perspectives amongst both the PSN and within the local community was also noted. Anecdotal evidence of cascading awareness through social and professional networks was also seen. Learning networks formed among members of the PSN on a local level (e.g. Tewkesbury LAA) can be instrumental in raising awareness, knowledge and skills directly in members, and indirectly through cascading social and professional networks.

Other opportunities identified

The opportunity for insurers and Flood Re to become engaged in supporting uptake is very apparent. It was not explicitly explored in the demonstration, partly due to the timing of the introduction of Flood Re during the project and associated uncertainties as to the details of the final implementation of the new scheme. This was also partly because changes to insurance policy are not a matter within the remit of a local PSN. However, several participants in the demonstration were very keen to get advice on insurance, and were given advice and guidance that they found valuable. As a trigger to action, insurance renewal is a key window of opportunity, and the role of local insurance brokers in facilitating uptake may become a major factor as the Flood Re scheme evolves.

Trust in the message and messenger was highlighted as a critical success factor. One such example would be if Health Protection England could produce guidance specifically targeted at the issue of contamination during and after reinstatement. The involvement of already trusted advisors, such as the fire service, in delivering property specific advice would be expected to contribute to greater uptake but was not able to be demonstrated.

The designed innovations focussed on timing and windows of opportunity, and did not directly set out to tackle some of the more emotional barriers. However evidence and discussions that arose during the project strongly suggest that there is a need for more positive exemplars to back up the signposting and existing guidance. Aesthetic considerations were highlighted as important in interviews, and during the

work in Cumbria as 'unattractive' or 'abnormal looking' measures met with opposition from building occupiers. However, some of measures can be seen as enhancements, and provide the opportunity to portray flood resilience as property improvement. Therefore in particular, images of nice or normal looking measures already installed, and accounts of measures performing well in real floods were indicated as valuable to participants.

While literature and guidance often makes a distinction between water entry and water exclusion, the LAA saw repairability and resilience as part of an integrated property level approach that might also have some exclusion features.

The issue of perceived contamination leads to unnecessary strip out and reluctance to install repairable measures. The use of biocidal detergents (as used in the hotel industry) has been suggested as a reactive means of addressing some of these concerns.

Appendix 2: Evaluation of Demonstration project

(Prepared by Collingwood Environmental Planning August 2016)

FD2682 Supporting the Uptake of Low Cost Resilience for Properties at Risk of Flooding - Evaluation report

Authors Clare Twigger-Ross, Liza Papadopoulou, and Owen White (Collingwood Environmental Planning)

1. Introduction

This report represents the findings of the evaluation of the project: *Supporting the uptake of low-cost resilience for properties at risk of flooding* (the project). It sets out the evaluation objectives, framework and approach before describing the evaluation findings and conclusions. The project was undertaken for Defra by a consortium led by the Centre for Floods Communities and Resilience at the University of the West of England, Bristol (UWE). As part of the project consortium Collingwood Environmental Planning (CEP) were responsible for an independent evaluation of key aspects of the project activities and outcomes, and in particular the small-scale demonstration of innovative approaches to supporting the uptake of low-cost resilience that was delivered under the project. A summary of the project is presented in the box below.

The evaluation sought to gather evidence and provide an independent assessment of how successful and replicable the project intervention was, so that it may guide future activities. The added value of the evaluation lies in providing evidence to ensure that lessons can be learnt from the small-scale demonstration and the project.

Following this introduction the evaluation report includes:

- Section 2: The evaluation objectives and theory of change.
- Section 3: The evaluation approach and methodology.
- Section 4: The evaluation findings relating to the design and set-up of the small-scale demonstration, its implementation and outcomes.
- Section 5: Lessons and conclusions from the evaluation.

Project summary

The project's aim was to identify barriers and propose solutions to promote low cost measures that would make properties at flood risk more resilient to damage from flood waters. The project's aim supports the long-term goal of enabling individuals and communities to take more ownership for the management of their flood risk and to recover more quickly as a result. With the establishment of Flood Re it will prove of real help to property owners to build resilience and limit the claims they make on their existing policies in order to maintain cover and reduce cost to society as a whole.

The project used an action research approach and was carried out in two phases:

Phase 1: The project team looked at past research, guidance and experience gathered via

a Rapid Evidence Assessment (REA). This work involved considerable consultation with the project board in identifying a range of low cost measures that can reduce flood damage to property suffered by households and small/micro-businesses, and speed up recovery. Phase 1 also included the preparation of a scoping report on the small-scale demonstration (phase 2).

Phase 2: In Phase 2 the project established a Learning and Action Alliance (LAA) to work closely with the at-risk community (the town of Tewkesbury was selected for the demonstration phase) to develop and trial innovative approaches for removing some of the barriers to implementation of flood repairable measures that can be applied in a local setting with the collaboration of the Property Support Network (PSN). The objectives of small-scale demonstration were:

- To explore whether raising awareness at appropriate intervention points in the property lifecycle will increase the likelihood that measures will be adopted;
- To demonstrate the level to which knowledge and capacity inherent within the PSN can be channelled to contribute to the decision making process; and
- To distribute, obtain feedback and refine new informational and signposting materials designed to assist households/businesses and the PSN during the decision making process.

Underlying these objectives was an understanding that the innovative approaches were unlikely (within the timescale of the project) to result in a high number physical changes in properties in Tewkesbury.

2. Evaluation objectives and theory of change

2.1 Evaluation objectives

The evaluation objectives are presented in Table 1, with a set of evaluation questions proposed under the two high level objectives designed to guide the evaluation evidence collection (e.g. through interviews) and help structure the assessment of and presentation of the evaluation findings.

Table 1: Evaluation objectives and questions

Objectives	Evaluation questions
1. To evaluate the innovations and related materials to be developed under the project, and the forming of a Learning and Action Alliance (LAA)	a) Do the innovations and materials contribute to project objectives? b) Are there additional innovations or materials that could be developed? c) To what extent and in what ways has the LAA contributed to the design of the demonstration phase?
2. To evaluate the	a) To what extent has the LAA supported the running of the

Objectives	Evaluation questions
demonstration phase (set up, during and after)	<p>demonstration phase?</p> <p>b) Has the LAA actively participated and demonstrated ownership of the demonstration / outcomes?</p> <p>c) Are the materials and innovations² effective in use (i.e. during the demonstration phase)?</p> <p>d) How have participants (e.g. home-owners, businesses) engaged with the innovations?</p> <p>e) To what extent has the demonstration, and specific innovations, resulted in expected outcomes (as described in each innovation)?</p> <p>f) Is there evidence of longer-term changes in behaviour and/or attitudes towards low cost resilience measures among participants?</p>

The evaluation also sought to assess the benefit of the project *qualitatively* measured in the success it had in encouraging people to consider and/or uptake low-cost resilience measures and ownership of flood resilience for their homes and businesses. The evidence available from the set-up and implementation of the small-scale demonstration has not supported an assessment of any quantified benefits.

What was evaluated?

Through the Learning and Action Alliance (LAA) process and meetings the project team working with members of the local PSN proposed a number of potential innovative approaches to supporting the uptake of low-cost resilience measures. These were discussed and five ‘innovations’ were selected, developed and taken forward for demonstration in the implementation phase:

- Displays and leaflets for placement in local builders’ merchant shops;
- Design of a resilient kitchen/bathroom working with a designer and participating homeowners;
- Development of materials and a checklist to be used during a loss-adjuster/surveyor visit to flooded properties;
- Development of materials to be used by estate agents and solicitors to help inform vendors / buyers of possible resilience measures that could be carried out as part of property transfer (buying and selling);
- Materials and a checklist related to recovery planning for homeowners and businesses, designed to be delivered through visits by local agencies such as fire service and flood wardens.

² The term ‘innovations’ is used to describe the activities undertaken in the small-scale demonstration. Five innovations were taken forward.

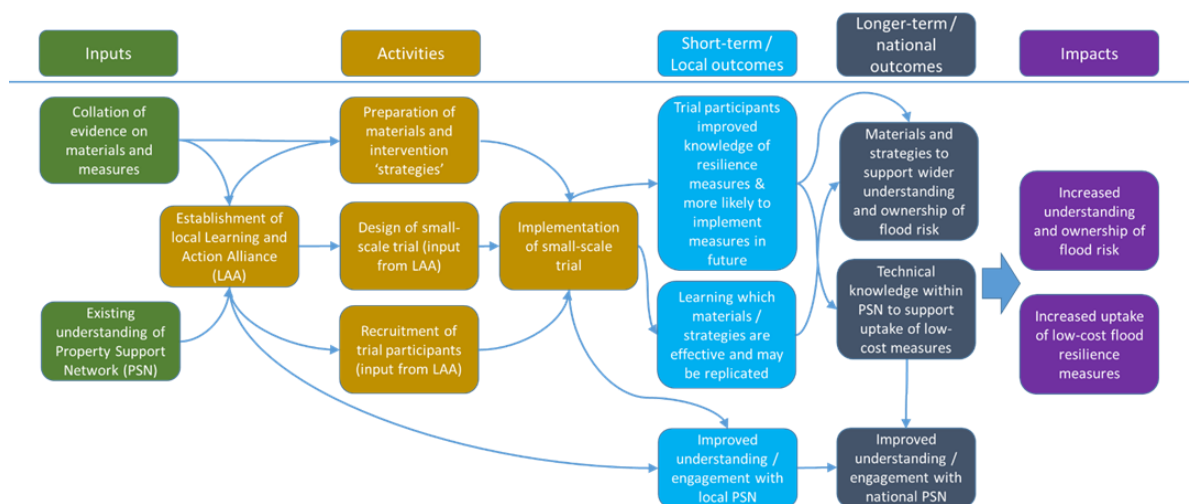
To support the implementation and monitoring of the innovations and provide a centralised source of related information and materials a website³ was also developed by the project team. The evaluation objectives in Table 1 set out how the evaluation sought to understand the process of setting up and implementing these innovations and the outcomes achieved.

2.2 Evaluation framework and theory of change

To evaluate the project activities and outcomes related to the design, set up and implementation of the small-scale demonstration, the evaluation team established a theory of change for the project and for each of the five innovations taken forward in the small-scale demonstration and described in Appendix 1. These theories of change provided a framework to understand how, in theory, the activities of the project and the LAA, lead to outcomes and impacts, in this case the successful implementation of the innovations, potential uptake of low-cost resilience measures by participants in the demonstration phase of the project, and learning from this to support the long-term goal of enabling individuals and communities to take more ownership for the management of their flood risk and to recover more quickly as a result.

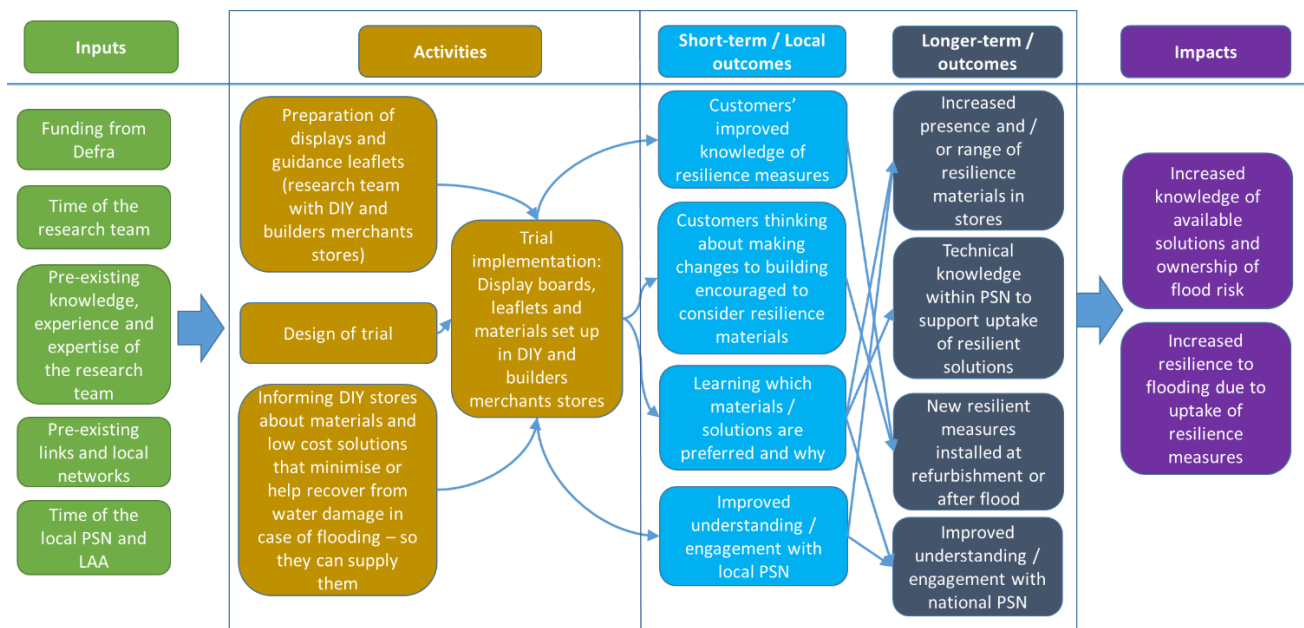
The evaluation has gathered evidence to test the assumptions behind the theory of change (see Section 3 for more information on the evaluation activities and evidence collected). Where these assumptions are supported by the evidence (and views of stakeholders) this helps to show that the intervention was successful (i.e. has met its objectives), and also identifies what factors have supported, or acted as barriers to, this success. The overall theory of change for the project is presented in Figure 1. Figure 2 presents an example of a theory of change developed for one intervention, in this case the design and use of displays and other materials in builders' merchant shops.

Figure 1: Theory of change for the low-cost resilience project



³ <https://floodrepairable.wordpress.com/>

Figure 2: Example innovation theory of change: builders' merchant innovation



3. Evaluation methodology

3.1 Evaluation activities

The evaluation aim was to deliver an independent evaluation of the project through participation (e.g. in LAA meetings), monitoring and data collection while also supporting and facilitating the design and implementation of the project and in particular the demonstration phase. To fulfil this dual role and meet the evaluation objectives, the evaluation involved a series of tasks related to three stages of work foreseen under the project, as set out below.

Stage 1: During the design and set-up phase

- Review and input to the development of materials and innovations.
- Review and input to set up of the demonstration.
- Design and run a focus group for LAA members. The focus group discussed the role of the LAA in setting up the small-scale demonstration, designing the innovations and related materials.

Stage 2: During the demonstration phase

- Monitoring the demonstration process, for example keeping a count of leaflets and other materials taken by members of the public, and maintaining dialogue with LAA and project team members involved in each innovation.

Stage 3: Following completion of the demonstration phase

- Post-demonstration focus group with LAA members

- f) Interviews with LAA members involved in each innovation, members of the project team and where possible participants in the innovations, focussing on the process, utility of materials and the outcomes realised through each innovation.

3.2 Evaluation evidence and analysis

Each of the evaluation activities is intended to identify and help collate relevant information and evidence to support the evaluation. Table 2 sets out the evaluation objectives, questions, evidence needs for each question and the sources of evidence used. Table 3 then describes how each source of evidence has been assessed or analysed to inform the evaluation.

Table 2: Evaluation evidence needs and sources

Objectives	Evaluation questions	Evidence needs / measures	Evidence sources
1. To evaluate the innovations and related materials to be developed under the project, and the forming of a Learning and Action Alliance (LAA)	a) Do the materials and innovations help / contribute to project objectives?	<ul style="list-style-type: none"> Materials developed (e.g. flyers, posters/banners, displays, leaflets, website) Number of people participating in the demonstration (e.g. expressions of interest received) Number of materials / leaflets distributed / taken Website traffic LAA as a proxy of a strengthened / more knowledgeable PSN in Tewkesbury 	<ul style="list-style-type: none"> Focus groups Interviews Innovation monitoring data Website traffic
	b) Are there additional materials or innovations that could be developed?	<ul style="list-style-type: none"> Change and/or progress against initial plan for carrying out the innovations – as opposed to what was feasible 	<ul style="list-style-type: none"> Focus groups Interviews
	c) To what extent and in what ways has the LAA contributed to the design of the demonstratio	<ul style="list-style-type: none"> Range and number of LAA members LAA members engagement level, contributions, attendance, links developed 	<ul style="list-style-type: none"> Focus groups Interviews

Objectives	Evaluation questions	Evidence needs / measures	Evidence sources
	n phase?		
2. To evaluate the demonstration phase (set up, during and --after)	a) To what extent has the LAA supported the running of the demonstration phase?	<ul style="list-style-type: none"> • Participation of the LAA in the set up and delivery of the innovations • Extent to which the LAA came together as a group • Number of people engaged in the demonstration as a result of the LAA member's efforts • Number of LAA meetings held • Duration the innovations 'ran' 	<ul style="list-style-type: none"> • Focus groups • Interviews • Innovation monitoring data
	b) Has the LAA actively participated and demonstrated ownership of the demonstration / outcomes?	<ul style="list-style-type: none"> • LAA management / ownership (LAA and/or Innovations' /work continuity following the end of the project) • The extent to which the members brought in local knowledge, contacts and expertise 	<ul style="list-style-type: none"> • Focus groups • Interviews
	c) Are materials and innovations effective in use (during demonstration)?	<ul style="list-style-type: none"> • Number of flyers and other materials taken from builders merchants • Number of people visiting the website • Opinions of members of the LAA about the qualitative aspects of the materials used • Opinions of members of the public about the qualitative aspects of the materials used 	<ul style="list-style-type: none"> • Focus groups • Interviews • Innovation monitoring data • Website traffic • Loss adjuster checklist feedback
	d) How have participants (e.g. home-owners, businesses)	<ul style="list-style-type: none"> • Number of expressions of interest received and number of participants visited/contacted for each innovation • Number of people visiting the 	<ul style="list-style-type: none"> • Focus groups • Interviews • Innovation monitoring data

Objectives	Evaluation questions	Evidence needs / measures	Evidence sources
	engaged with the innovations?	website <ul style="list-style-type: none"> • Number of people buying resilient products • Number of people engaged in designing a flood resilient kitchen • Number of people enquiring solicitors about resilience measures • Number of people drafting a Recovery / Emergency plan • Number of people taking on resilience measures as a result of the loss adjuster's visit 	<ul style="list-style-type: none"> • Website traffic • Loss adjuster checklist feedback
	e) To what extent has the demonstration, and specific innovations, resulted in expected outcomes (as described in each innovation)?	<ul style="list-style-type: none"> • Number of people buying resilient products • Number of people engaged in designing a flood resilient kitchen • Number of people drafting a Recovery / Emergency plan • Number of people taking on resilience measures as a result of the loss adjuster's visit 	<ul style="list-style-type: none"> • Focus groups • Interviews • Innovation monitoring data • Loss adjuster checklist feedback
	f) Is there evidence of longer-term changes in behaviour and/or attitudes towards low cost resilience measures among	<ul style="list-style-type: none"> • Change in perceptions around resilience among homeowners • Homeowners more likely to consider resilience measures in the future • Local PSN more likely to discuss / stock / recommend resilience measures • Demonstration participants talking to friends and/or neighbours 	<ul style="list-style-type: none"> • Focus groups • Interviews • Loss adjuster checklist feedback

Objectives	Evaluation questions	Evidence needs / measures	Evidence sources
	participants?		

Table 3: Evidence sources and analysis

Evidence source	Evidence collection and analysis
Focus groups	<p>Two focus groups (FG1 pre-demonstration, and FG2 post-demonstration) were carried out, one at the beginning of the trial (November 2015) and one at the end of the trial (July, 2016). Each focus group lasted 45 minutes and consisted of seven participants. They followed a pre-designed protocol (set of discussion points), and detailed notes were taken of the discussions held and key points arising.</p> <p>These notes were compared to the evaluation objectives and questions and used to generate an overview of the LAA's perceptions and views on specific aspects of the LAA process and the set-up and implementation of the small-scale demonstration.</p>
Interviews	<p>Interviews were 'semi-structured' and followed tailored set of questions in each case (i.e. for each innovation and type of interviewee). Notes were taken of the interview outcomes and these were compiled in an Excel spreadsheet to enable qualitative analysis across the evaluation questions. Key themes and messages were identified to inform the evaluation findings. Four interviews were carried out with project team members (PT interviewees), five interviews with members of the LAA involved in the innovations (LAA interviewees), two interviews with members of the public participating in the demonstration phase of the innovations (D interviewees) and one interview with a PSN member (PSN interviewee). Each interview lasted between 30 – 45 minutes⁴.</p>
Innovation monitoring data	<p>Specific quantified data collected during the implementation of the innovations were compiled to provide an indication of e.g. uptake and/or levels of interest.</p>

⁴ The abbreviations in brackets are used to clarify the origin of the quotes used in this report and to protect the anonymity of interviewees and participants.

Evidence source	Evidence collection and analysis
	<p>In practice only the builders' merchant innovation has had a systematic monitoring approach: a count of leaflets and brochures handed out or taken by members of the public, although for other innovations some quantified data are available (e.g. number of letters sent by solicitor, number of homes visited to demonstrate the loss adjuster checklist). Due to the nature of these data analysis took the form of simple calculations (e.g. of totals, percentages).</p> <p>For the loss-adjuster innovation further structured feedback was received from the supplementary work undertaken in Cumbria, where the project team was able to practically test the innovation in properties that had been flooded. From the 20 properties visited by loss adjusters were filled in and data were collated offering insight on the type of enquiries made by policy holders, cost implications, and advice given. The forms were filled in as the loss adjusters were carrying out their visits by a member of the project team. In addition, data on whether or not measures were actually taken was collected. These data were analysed for themes and quotes from those feedback forms are labelled FF 1 -20.</p>
Website traffic	The website developed by the project team has been designed to monitor traffic, i.e. number of 'unique page views' as well as which specific innovation pages have been visited.
Participation	The evaluation team participated in five of the LAA meetings. As part of the participation the evaluation team fed back to the project team on process aspects. Participation in LAA meetings has also enabled the evaluation to gather a practical understanding of the LAA as a group, develop relationships with LAA members and better understand the project development and evolution.

4. Evaluation findings

4.1 Learning and Action Alliance, innovations and materials

This section presents the evaluation findings related to the evaluation Objective 1: To evaluate the innovations and related materials to be developed under the project, and the forming of a Learning and Action Alliance (LAA).

Did the innovations and materials contribute to project objectives?

The individual innovations and the materials developed as part of those innovations, sought to address to varying degrees one or more of the objectives of the demonstration phase (refer to Project summary box). Therefore, while some, such as the solicitor's letter and recovery planning innovations, were focused on exploring how raising awareness of resilience measures may increase the likelihood that measures will be adopted (demonstration phase Objective 1) by engaging directly with members of the public, other innovations followed a less direct route. For instance builders' merchants sought to make the information and materials developed available and appealing, yet relied on the customers to initiate any discussions or purchase products by expressing interest in the resilience materials and/or the demonstration project.

Other innovations such as the loss adjuster/surveyor checklist explore ways in which existing knowledge and capacity inherent within the PSN could be channelled to contribute to the decision making process (demonstration phase Objective 2) by supporting professional loss adjusters/surveyors in providing comprehensive advice on resilience measures to interested participants (homeowners, businesses).

"The checklist is there to help the surveyor advise house owners properly." (PT Interviewee 2)

Finally, materials such as the 'Draft Recovery Guide' (see Appendix 10), were developed to provide information and encourage demonstration participants to consider resilience measures, while a dedicated 'flood repairable' website developed by the project team (see <https://floodrepairable.wordpress.com/>) served to support the innovations by hosting the materials developed so interested parties could be directed to the website (demonstration phase Objective 3). The website further enabled the project team to monitor interest revealed in the website's traffic, with that data also acting as input for the purposes of the evaluation.

Thus, the various innovations contributed to the overarching aim of increasing take up of low cost resilience by exploring different routes and formats for providing information at different stages of the property lifecycle. The versatility in the channels explored offer valuable insights in direct and indirect approaches of promoting the uptake of property level resilience.

Were there additional innovations or materials that could have been developed?

A total of six ideas for innovations were discussed as part of the LAA meetings during early stages of the demonstration phase. Of these, five ideas were chosen to be taken forward. As the project evolved and the practicalities of the innovations, as well as their potential, became clearer, adjustments were made in response to what was feasible in the timescale of the project, and the amount of support provided by the local PSN and other stakeholders.

Other factors taken into consideration included aspects external to the project, such as the existence of other ongoing or recent flood related initiatives in the Tewkesbury and Gloucestershire LRF (Local Resilience Forum) area and flooding events occurring in other parts of the country. Such events presented both challenges and opportunities, as in the case of flooding in Cumbria, and are further discussed in sub-section 4.3 (Overall findings). Table 4 presents the initial six ideas for innovations (left column) and the final five innovations in their final form and as delivered in the innovation phase. Some comments are included in the middle column noting challenges and outlining the reasoning behind the selection of the final five.

Table 4: List of innovations taken forward through the demonstration phase

Ideas for innovations	Challenges / Opportunities	Innovations taken forward
Recovery planning through fire service and local authority visits	Lack of resources (human, financial) and time from the Fire Service. Unfortunate timing: internal reorganising, people off sick or on leave from the Fire Service. Similar/'competitive' initiative promoted at the same time by the Tewkesbury Borough Council.	Innovation adjusted: Innovation redesigned to involve household visits from a member of the project team.
Guidance and product displays at builders merchants	Builders' merchants participating as LAA members.	Innovation taken forward as planned.
Property transfer/advice (via estate agents & solicitors)	Potential conflict of interest arising for estate agents as they are acting on behalf of the vendor and would therefore not have a role in alerting potential purchasers to the risk. Rather they would provide advice on potential adaptations but only if the enquiry was made by a purchaser or vendor	Innovation adjusted: Property transfer advice via solicitors' email.
Kitchen/bathroom design	Lack of forthcoming demonstration participants. Complex and sensitive area of the house.	Innovation taken forward for the kitchen design, working with a local kitchen designer and housing association.
Loss adjuster checklist	Reduced interest in Tewkesbury due to lack of floods during demonstration phase: surveyors are normally invited to properties damaged by flooding. Flooding in Cumbria presented an opportunity.	Innovation adjusted: Innovation taken forward in Tewkesbury and also trialled in Cumbria.
Guidance through building control	Outside the sphere of the LAA.	Innovation not taken forward Suggestion was made for CLG/Defra to explore in the longer term.

While the majority of interviewees could not recall any further ideas for innovations discussed, a few mentioned involving Flood Wardens in raising awareness about the project and recruiting interested members of the public for the demonstration phase. This was not necessarily discussed in the context of delivering a specific innovation, but more in relation to reaching and engaging a larger number of community members in the demonstration phase overall. While this idea was not realised within the timeframe of the project, due to the Flood Wardens already being engaged in a similar activity, it was being considered as a follow-up action at the time of authoring this report. Further discussion about a Flood Fair and a meeting to this end were held in one of the LAA member's organisation but lack of resources from key agencies meant it was not feasible within the timescale of the project.

In what ways did the LAA contribute to the design of the small-scale demonstration?

Through the LAA meetings and process the project managed to engage a good range of local actors, from different organisations, with different roles in the property support network and from diverse areas of interest. The structure of the LAA group included core and wider membership (for more details on the specific stakeholders involved refer to Appendix 1). Discussions in the two evaluation focus groups identified that most participants felt that, through the LAA meetings, they had many opportunities to actively contribute their views and experience, and that these were reflected by the project team in the design of the innovations and materials. The frequency of the LAA meetings and the 'progression' from one meeting to the next in terms of developing ideas for the innovations and then materials was also felt to have helped LAA participants contribute from the perspective of their own knowledge and expertise.

However, some focus group participants expressed that there was some lack of clarity about the objectives of the LAA and the roles of members, which meant that some participants were not sure of what was expected of them, or what the end product of the LAA process and thus the demonstration was to be.

The LAA maintained a core group of members who regularly attended meetings and contributed to both the design and the implementation of the innovations. Interviewees across the LAA members and project team agreed that a good mix of people comprised the LAA, offering different perspectives and professional expertise thus benefitting the LAA as a unit.

"We have had a good range of stakeholders and a good cross-section of people attending." (PT Interviewee 3)

As noted by a member of the project team, LAA members engaged throughout the project and were prepared to *"stick with the LAA"* (PT Interviewee 1) as the need to extend the project duration and hold additional meetings emerged.

A few of the interviewees, both LAA members and members of the project team, mentioned the participation of business representatives, namely the builders' merchants and solicitors, was very interesting as these tend to be the harder to engage as stakeholders. Members of the project team noted that the demonstration phase could have also benefited from the participation of the Fire Service whose members, although keen, lacked capacity. One interviewee mentioned local architects and surveyors would have been helpful but were found difficult to engage despite repeated invitations following their expression of interest. The difficulty in engaging with professional stakeholders, as commonly identified and confirmed by interviewees in this project, lies in the time commitment required and the lack of a clear business incentive.

"...from a business / employer's point of view 'what is the benefit?'" (PT Interviewee 2)

Apart from the benefit of developing an appreciation of different perspectives, members of the project team found business participants were also key in the design of the specific innovations offering valuable knowledge and insight on what approaches may work better in their particular business. For instance, solicitors were able to specify the point in the property transfer process that is most suitable for providing the flood resilience information. Similarly, builders' merchants' expertise and knowledge of their customers was vital in the selection of materials for the display in their stores.

"In terms of the design the professional input was key because it was happening in their businesses so they were really the most able to say what it would work and how" (PT Interviewee 4)

"[Builders' merchants provided] A lot of input in the type of materials we should be including in the trial. We provided them with a full list of potential materials and they went into the nitty-gritty of the materials. 'This will work, this type of plaster is better, this is useless'." (PT Interviewee 1)

It is interesting to note difference in perspectives, when in response to a similar question to the LAA members, one member suggested that the LAA did not contribute much to the design of the demonstration phase but it was the project team that was responsible and key by providing a *“strong steer consistently and throughout the project”* (LAA Interviewee 3). The project team’s input to each of the innovations varied, depending on the nature of the innovation and need, but differences in perceptions were observed with reference to the same innovations. These are further discussed in Section 4.2 in relation to ownership.

With regards to interviewees’ expectations of participation from additional stakeholders, the absence of councillors and council representatives was mentioned by both LAA participants and the project team with some noting they expected a greater interest to have been expressed. A couple of interviewees noted that it would also be beneficial to include members of the public in the LAA while others argued it would have been extremely difficult to engage them in such a lengthy process as the LAA.

This was also raised in the focus group discussions, one suggestion was that there would have been value in engaging participants (e.g. home-owners and businesses) in the LAA meetings, so that their views and perspective could be considered. However, other participants in the focus group felt this would not have been practical, and that since representatives of the local community regularly attended the LAA (e.g. Seven and Avon Valley Combined Flood Group and Gloucestershire Rural Community Council GRCC) these perspectives were effectively represented

The majority of interviewees found the size of the LAA fit for purpose, with one LAA member expressing that a small active group is preferable *“to get something established”* (LAA Interviewee 1). However, another participant felt a slightly larger group would have been advisable to *“offset those who didn’t come”* (LAA Interviewee 3).

The format of the meetings reflected the principles of an LAA as a group that learns and evolves with the guidance of the project team. While the initial LAA meeting was led by the project team, the following meetings included loose activities and small group discussions facilitating members’ interaction and input to the design of the demonstration phase and individual innovations. The initial informal setting was found to *“break down barriers”* with all of the interviewees agreeing that the LAA meeting format contributed to a positive attitude and created an engaging atmosphere.

“People liked that they participated and had the opportunity to give their own perspective and share their experience” (PT Interviewee 1)

During the demonstration phase and innovation design the LAA meetings incorporated dedicated sessions in smaller group discussions around the specific innovations and the materials that were being developed. One interviewee expressed that this was also important in the development of a common understanding around the innovations from members of the LAA, even though the nature of some of the innovations (Property transfer and Surveyor checklist) meant that there was limited support non-professionals could offer.

“Because it is a solicitor letter there is little input that they [members of the LAA] could provide – but it was nice to get a feedback” (LAA Interviewee 5) .

4.2 Implementation of the innovations (demonstration phase)

This section presents the evaluation findings related to Objective 2: To evaluate the demonstration phase (set up, during and after).

To what extent did the LAA support the running of the demonstration phase?

The ongoing participation of LAA members in the meetings even though more were held than planned (nine rather than six) and the location was changed for latter meetings, was felt, by participants in the post-

demonstration focus group, to be indicative of the level of commitment and interest in the LAA members to supporting the demonstration.

Challenges for LAA members to their participation, raised through the focus group discussions were:

- The amount of time required to participate fully in the LAA.
- The timing of meetings (i.e. after work / clashing with dinner and after school), although other participants felt that this time was the best compromise and enabled participation of many LAA members.

Communication between members of the LAA group appeared to be restricted to the LAA meetings. Although a Google group and Twitter account were set up to facilitate communication, those were only used by the project team to coordinate meetings and share information and according to the focus group participants were not used by LAA members to interact with each other. However, it should be noted that the project design did not require or expect LAA members to interact outside the meetings especially with reference to professionals involved in different innovations.

The extent to which members of the LAA participated in the implementation of the demonstration phase differed considerably across the innovations and a separate evaluation overview is therefore included for each, see Table 5.

Did the LAA actively participate and demonstrate ownership of the demonstration / outcomes?

As set out in Table 5 there were significant differences between the five innovations. The builders' merchants and solicitor innovation provide good examples of the LAA's professional members taking ownership of the innovations. On the other hand the surveyor's checklist and the recovery planning were led by the project team and their implementation involved little or no input from the LAA members. The kitchen design provides an example of an innovation that was initially heavily led by the project team but generated interest from a member of the LAA who subsequently took a more active role in the implementation of the innovation.

Overall, the project team was described during the focus groups as the "driving force" behind the LAA and was deemed crucial in the functioning of the LAA by all interviewees. The project team provided ongoing communication and was (by design) responsible for organising all LAA meetings setting the agendas and steering the project and innovation design and delivery. However, as the project and innovations progressed the LAA was recognised to grow stronger and take more ownership of those innovations where related professions were members of the LAA. As one of the project team interviewees noted, a manifestation of that growing ownership were discussions on what will happen following the end of the project, with many LAA members appearing willing to maintain the LAA.

"The project team were important but the LAA grew together. You can see that from people discussing what will happen next and trying to continue what has started. Some people are very committed." (PT Interviewee 2)

A similar view was expressed through the post-demonstration focus group, with all participants expressing an interesting in maintaining the connections made and LAA process if at all possible, even if on a less frequent basis.

Table 5: LAA’s input in the implementation of the demonstration phase

Innovation	Extent of LAA input in the implementation	LAA taking ownership of the innovation/outcomes?
Recovery planning	The initiative was led by a member of the Project team who undertook home visits. However, the recruitment of participants for this innovation was supported by other innovations that included significant input from the LAA (i.e. Builders’ merchants) or by activities undertaken by members of the LAA (i.e. Environment Agency letter)	The innovation was delivered by a member of the project team however discussions around the materials <i>“helped them think about the issues of flooding and resilience”</i> . The use of that knowledge and materials remains to be seen.
Builders merchants display	Despite the project team being responsible for the development of the materials for this innovation (with input from LAA members through meeting discussions), the builders’ merchants were invaluable for their insights and support in the practical application of the innovation ranging from ensuring the display materials in coordination with suppliers, to providing a local contact for a banner manufacturer and finally setting-up the displays in the stores and responding to any expressions of interest by customers. One of the builders’ merchants involved in the demonstration phase also actively pursued discussions with suppliers to enhance the range of flood resilient materials and products available in the store.	LAA (relevant professional members) took clear ownership of the demonstration phase. <i>“Absolutely. Their knowledge of customers and their store was important: Knowing where to set up the display so that customers would see it – what would work in their own premises.” (PT Interviewee 1)</i>
Property transfer advice	LAA member-led. Both the design of the solicitor email and the implementation of this innovation were undertaken by a local solicitor firm with only initial support from the project team. The final email included the flyer drafted by the project team attached in its original form but was otherwise re-written and included as part of the firm’s property transfer due diligence process.	LAA (relevant professional members) took ownership of the demonstration phase. <i>“We provided them with a letter and they completely rewrote that so they have taken ownership of it.” (PT Interviewee 4)</i> <i>“I drafted the solicitor letter using materials supplied by the team and we sent a flyer that was drafted by the project team.” (LAA member 5)</i>
Kitchen design ⁵	According to the project team interviewee involved in this innovation finding a local resident willing to be involved in the demonstration phase has been challenging. Similarly while a local kitchen designer has agreed to participate in the demonstration phase he/she has not been an active member of the LAA. Therefore, to date, this innovation has been driven by the project team but progress is underway with two willing participants coming forward.	There were challenges in getting people on board, however a member of the LAA was liaising with kitchen designers to implement the innovation towards the end of the evaluation period.
Loss adjuster checklist	Project team-led. The nature of this innovation required certain technical expertise. Therefore according to a project team interviewee, the list was shared with the LAA but not with an expectation from them to contribute.	Despite the project team being responsible for the design and implementation of the small-scale demonstration, one of the LAA members was particularly interested in how that work could

⁵ Any evaluation of the kitchen design has to be caveated on the fact that it has only started being implemented at the timing of this report being authored.

Innovation	Extent of LAA input in the implementation	LAA taking ownership of the innovation/outcomes?
	Indeed this innovation included significant input from the Project Board to the design of the Checklist and the compilation of the list of materials. Members/ of the project board included professionals such as surveyors, loss adjusters, architects and insurers.	be used to link up with their colleagues/professional counterparts in Cumbria.

Were the materials and innovations effective in use?

As part of the small-scale demonstration, a number of materials were developed: to support those implementing the innovations by, for example, providing templates and checklists; to provide descriptive information on one or more innovations for participants; and to describe in an accessible way types of low-cost resilience measure possible as well as providing links to sources of additional information.

The specific materials developed and their proposed function are described in the box below.

Materials were developed to support the small-scale demonstration

Project demonstration phase information sheet

A two-page, non-technical description of the project: *Supporting the Uptake of Low Cost Resilience: Demonstration phase*. The information sheet was developed to provide people who expressed interest in participating in demonstration phase with a short and accessible overview of the project aim and objectives, what would be required of participants, and a short (one paragraph) description of the three innovations taken forward in the demonstration phase that required public participation (developing a flood recovery plan, designing a resilient kitchen, and the surveyors checklist). The information sheet also provided contact details for the Defra project manager and the project team. The information sheet was designed to be read alongside the letter of invitation.

Flood repairable postcard/flyer

A post-card style 'flyer' for the project, providing essential information (website, contact details etc.) and designed to be picked up by members of the public to attract interest in the project. The postcard was made available through the demonstration phase, for example in the builders' merchants.

Homeowner guide: Planning to recover quickly, and making your home flood repairable

A 10-page document setting out various aspects of how to prepare for a flood and plan for recovery as well as options to create a more flood resilient / repairable home in a relatively non-technical manner, making use of figures and pictures, such as a cross-section diagram of a 'flood-repairable house' indicating resilient measures possible in different rooms / areas of the home. The guide was designed to provide space for and encourage homeowners to note down information such as useful numbers for use in an emergency, as well as a checklist for 'resilient recovery'. The homeowner guide was designed to provide interested people with a document to take-away and keep, and to be used for future reference.

Making your home flood repairable leaflet

A 2-page leaflet providing a short, non-technical overview of flood repairable options for the home. The leaflet provides a shorter, more accessible overview of information on flood reparability that was included in the homeowner guide, include the flood-repairable home cross-section picture.

List of resilient building materials

A list of resilient building materials was drafted as part of the builders' merchant innovation and is suitable to be developed into a guide to be used by builders' merchants.

Banners

Banners were set up in the two stores participating in the builders' merchant innovation to engage members of the public/customers of the store.

Solicitor's email

An email was developed to accompany the Flood Risk report for properties a risk of flooding. The email was designed to raise awareness of resilience and to signpost other resources.

Letter from the Environment Agency

A targeted mailshot was sent by the Environment Agency to members of the public in Tewkesbury at risk of flooding, identified using the flood risk registry. In total 371 properties were contacted with information about the project and an invitation to participate in the demonstration phase.

Surveyor's checklist

A checklist of items related to 'flood resilient recovery' developed for use during surveyor's visits to participating homes and businesses. The checklist provided a comprehensive list of building elements (both structural / finishing such as flooring and walls, and fixtures and fittings such as electrical socket and meter positioning) and facilitated the discussion of current and 'resilient' choices for each of these.

List of suggested low cost measures

A comprehensive list of possible suggested low-cost flood resilience measures, divided by type (e.g. walls, floor, building services). The list aims to act as a step-to-step guidance for loss adjusters and surveyors ensuring all aspects and potential solutions are assessed during a home visit. The short technical descriptions of all measures – including those that would not appear in traditional templates currently used in the industry - facilitate the loss adjuster's/surveyor's work.

The majority of the materials described were used by more than one innovation and were also made available on the 'flood repairable' website developed to support the demonstration phase. All of the innovations provided a link to the website directing those interested to further information and enabling them to download the materials.

A general observation, raised by the post-demonstration focus group, was that as there were no specific (e.g. quantitative and measurable) targets or objectives for what was expected to be achieved by the innovations or materials, and that it was therefore difficult to measure their effectiveness. Therefore, the evaluation looked at the effectiveness of the materials depending on what their role was as part of the demonstration. With reference to the majority of the materials listed above that role was to engage and inform participants. However, the surveyors' checklist and list of suggested low-cost measures were more technical and were aimed at supporting the role of the LAA and professionals involved in delivering the demonstration.

The effectiveness of the materials and innovations was further explored with focus group participants and interviewees. A few specific issues related to efficacy noted during the focus group discussions included:

- There was some concern raised related to the solicitor's letter, that the information it contained could discourage potential buyers and therefore represent a business risk (also relevant for estate agents). A challenge identified by an estate agent was a potential conflict of interest between their duty to act in the interest of a vendor and the disclosure of information on risk of flooding to potential buyers, but that was resolved following discussions with the project team (see Table 9 for further information).
- The banner developed for the builders' merchants store front was considered by the LAA member to be small when compared to other commercial banners on display in the shop. Similarly a member of the LAA interviewed felt the flyers developed could have been larger and slightly more comprehensive. *"I was expecting a proper leaflet (...) It was just a postcard (...). A larger leaflet would have been better in drawing the attention of customers passing by."* (LAA Interviewee 3).

It is understood, and was recognised by LAA interviewees that the size of the banner was restricted by budgetary constraints. However, according to the project team the size of the flyer was a decision guided by the aim of designing a postcard to be to be easily picked up by customers. Other information was displayed in the form of A4 posters and a letter to invite people to participate in the trial.

The materials aiming to engage members of the public in Tewkesbury, were predominantly used by the builders' merchants and the recovery planning innovation. The research team in collaboration with support from members of the LAA, undertook monitoring of those innovations to establish how effective these materials were in engaging members of the public, generating interest for the project's demonstration phase and encouraging homeowners to consider low cost resilience measures.

In the builders' merchants where the materials were displayed in two local stores, a count of materials was undertaken. The results presented in Table 6, show the number of each material taken from both stores during the two months of the demonstration phase.

Table 6: Materials taken from builders' merchant stores

Type of material	Flood repairable postcard/flyer	'Making your home flood repairable' sheet	Project information sheet	Expression of interest forms
Total taken	44	7	9	8

In total 44 Flood Repairable flyers/postcards were taken, which is felt to be a relatively large number, in view of the size of the community in Tewkesbury, the timing of the demonstration phase (summer) and the fact that no flooding occurred in the area during the demonstration phase. On the other hand a very small number of the detailed information sheets and expressions of interest forms were taken. As confirmed by the project team, a total of 14 expressions of interest were received from members of the public willing to participate to the demonstration phase. Out of those 13 came as a result of the Environment Agency's email and one was prompted by the builders' merchant innovation.

According to interviewees, and confirmed by the numbers above, the postcard was the most effective material developed in engaging with the public as it offered concise information visualised in an attractive way. The information sheets were found to be slightly lengthy which may partly explain the lower uptake.

"[The information sheet was] Perhaps a bit too much and a bit too wordy The colourful little flyers were nice and worked well [people picking them up]." (PT Interviewee 1)

Nonetheless, these more detailed materials were useful in the context of the house visits carried out as part of the recovery planning innovation. Interviews with two members of the public who participated in the innovations, demonstrated that for those that do have an interest in flood resilience, the level of information provided in these materials is valuable.

"[X] left a booklet with us [reference to the Homeowner recovery planning guide]. I read through it, it was interesting." (D Interviewee 1)

"[X] provided me with the guide to flood resilience (...) the 'How to recover quickly' leaflet, ' How to make your home flood repairable'. I looked through the documents they were very useful. Of course in the meantime [even before the visit] I had decided to do as much as I could do." (D Interviewee 2)

Therefore, the materials as a whole are considered to have been effective in covering the different information needs of members of the public. Flyers were successful in engaging with those that were intrigued by the banners and displays in the builders' merchants' stores, but may have not previously considered undertaking flood reparability work. For those with some prior knowledge and awareness of flood mitigation or resilience measures, the detailed guides offered additional information.

Regardless of the success of the materials in providing useful information at the right level, some LAA interviewees emphasised the greater overarching issue affecting the innovations' success; the public's reluctance to engage on the subject of flooding and even more so in discussions around flood resilience.

"...when you got into the detail of it, it is a difficult message to get across – repairable and not preventable." (LAA Interviewee 1)

Information overload was also a factor identified in relation to uptake of materials and innovations

"[The materials and website developed] That is fine but unless people have a problem –unless you have a problem - you don't go around browsing because you have information overload." (LAA Interviewee 2)

In terms of the effectiveness of the innovations in engaging with people, some innovations appear to have worked better than others and progressed further in the duration of the demonstration phase. Specifically, the builders' merchant, recovery planning innovation and surveyor checklist were fully developed and tested, whereas the kitchen design and solicitor letter innovations progressed more slowly which presents a challenge for their evaluation within the timeframes of the project.

"...some [innovations] didn't work how we wanted. We still need some time to see how the ones in place will pan out (...). For example the solicitor [innovation] was set up but we won't know how it worked. The kitchen [innovation] could have gone further." (LAA Interviewee 1)

There was no evidence to suggest that the checklist was anything other than useful to the surveyors/loss adjusters. From the feedback from the 20 uses of the surveyor checklist there was only one occasion when the surveyor “*appeared to just flip through the checklist without giving proper attention to content*”(FF1) and two occasions when the surveyor was not confident in talking about a specific resilience measure (cost of resilient kitchen; ease of using rising butt hinges).

How did participants engage with the innovations?

Considering the diversity of approaches in engaging with public participants the various innovations are viewed individually below. Only three of the five innovations are discussed on the basis of participants’ reaction to the demonstration phase, as there was limited or no evidence of public engagement for the kitchen design and property transfer/advice innovations at the timing of this report. A separate category at the end refers to the results emerging from the monitoring of the dedicated website developed for signposting participants.

- **Builders’ merchants:** As described in the previous section (*Were the materials and innovations effective in use*), the store displays led to 44 people picking up the Flood repairable flyer from the builders’ merchant stores. A small number of those people expressed interest in participating in the innovations, and the monitoring of this innovation could only attribute one customer’s purchase to the display (although it is possible that other purchases were made as a result of the materials). The purchase recorded was the purchase of sandbags, which are not in fact a flood repairability measure, and it followed an enquiry from a customer emerging from a concern about flash surface flooding due to heavy rain. Following a discussion with a staff member the customer appeared keen to participate in the demonstration phase and picked up all the relevant materials, although it is not known whether the customer proceeded to take further action as they expressed a preference not to be contacted for interview.

According to a number of the interviewees, the lack of flooding played a role in the lack of interest expressed in flood repairable / resilient materials. A comment of this nature was also received by a customer in one of the participating stores, who commenting on the store display said that it was “*a bit late for that now*”⁶, as there was no recent flooding in the area.

Overall, in relation to the builders’ merchant innovation, it was felt that the engagement with participants (customers in the stores) was more ‘reactive’ than proactive (FG2), due to staff being busy and unable to dedicate time specifically to the promotion of the low-cost resilience materials and information. If such materials were promoted commercially (e.g. by a builders merchant firm nationally) it was felt this could become more of a priority.

- **Recovery planning:** Interviewees who were engaged in the demonstration found the experience very helpful and informative. Both referred to the value of receiving expert advice, with one of them noting that it was “*well-worth*” participating and he was “*glad to participate*” (D interviewee 1). It is worth noting that discussions in both cases were not restricted to resilience measures but also included prevention measures while both participants were grateful to receive information about flood resilience.

“It was very useful, we went through the entire step guide for my emergency plan. We talked about prevention and recovery. We discussed a resilient kitchen and X also gave me advice on insurance which was really useful.” (D Interviewee 2)

- **Loss adjuster/Surveyor’s checklist:** Taking the opportunity presented by the flooding occurring in Cumbria the project team tested the innovation and checklist by undertaking 20 visits in properties in Carlisle.

⁶ Comment quoted as transferred by LAA Interviewee 2

In relation to the demonstration of the surveyors' checklist in Tewkesbury, a member of the project team noted the initial response to the Environment Agency letter (which was intended amongst other things to encourage participation in this innovation) resulted in very few responses. This was likely to be due to:

“(1) People don’t want to talk about it or think about it [flooding] and (2) unless you actually already think about it you wouldn’t invite a surveyor in your house.” (PT Interviewee 2)

Another factor in the choice of location for trialling the innovation was the fact that in Cumbria, in contrast with Tewkesbury, flooding occurs more frequently while there was also a recent experience of severe flooding. According to one interviewee that meant that *“It [flooding] was on people’s minds. They didn’t think ‘oh this is a once in a lifetime event’. Most of the people were aware of that and they were already thinking ‘what can we do differently?’” (PT Interviewee 2)*

Feedback received from participants in this innovation revealed some concerns linked to the options presented to the policy holders in the loss adjuster/surveyor innovation. In three cases there was an expressed lack of confidence by the policy holders that the resilient measures would be effective (kitchen replacement; tiles; rising butt hinges) and in one case the policy holder was not convinced by the surveyor that their concern was not an issue (staircase of two different materials). Further, two policy holders were not interested in resilience measures but only interested in resistance measures – keeping water out. Only one policy holder expressed *“the opinion that if they are flooded again, they will do the repair all over again” (FF5)* and one policy holder saw it as an opportunity to upgrade the property. This provides some evidence for the range of concerns around the options presented as well as around resilience options in general. It also shows that a minority of those who had been flooded did not see the need to make changes to their properties to reduce their risk of flooding.

- **Kitchen design:** Two of the participants in the Recovery planning demonstration phase expressed interest in a resilient kitchen and were provided with the contact details for a kitchen designer who had previously agreed to participate in the demonstration phase. There was no progress in agreeing a meeting within the timescale of the demonstration phase, however, an interview with the particular participant revealed interest but also uncertainty in terms of what a resilient kitchen design might look like or cost.

In the absence of a trial for this innovation, a member of a Housing Association, experienced in managing the repair process and engaging with customers, was interviewed to gain insight into what the potential challenges might be, in the uptake of a resilient kitchen design. Beyond the expected cost implications, the main concern appeared to be a potentially limited pool of choices in resilient kitchen designs presented to customers along a much larger selection of non-resilient designs, making personal preferences the deciding factor:

“It depends on prospective tenants... we can say ‘these are your choices’ but customers have preferences. It is all part of the customer journey.” (PSN Interviewee)

On the basis of this interview the following considerations were identified:

- Durability of the products
- Cost implications
- Knowledge of suitable providers to source the products/materials
- Availability of choice in the type and style of the kitchen doors and handles
- Availability of choice in colour

- **Property transfer/advice:** Due to delays in agreeing the design and implementation of this innovation the demonstration phase was postponed and its full extent could not be evaluated for the purposes of this report. Regardless, the design of the particular innovation did not necessarily invite participants’ immediate response, as it was focused on signposting customers to information on how on how they can make their home more resilient to flooding. An interview conducted with a member of the LAA participating in this innovation noted that up to five members of the public had been contacted, with website monitoring data revealing that indeed five members of the public accessed the website following the particular link sent as part of the solicitor email.
- **‘Flood repairable’ website:** An overall picture of participants’ response to the innovations and the project’s demonstration phase emerged from the ‘flood repairable’ website’s monitoring data. Though the majority of guidance materials developed were used by more than one innovation (see Guidance and links in Table 7), each innovation had a separate web page which could be accessed from the website’s Home page. Traffic data for the individual innovation web pages (Table 7) reveal an interest spread across innovations⁷, while the website’s home page received 347 views in the two months between June and August.⁸

Table 7: Website monitoring data

Web page	Home Page	Kitchen & bathroom design	Builders Merchant	Recovery Planning	Property transfer/ advice	Guidance and links
Number of views	347	41	43	33	38	36

To what extent has the demonstration, and specific innovations, resulted in expected outcomes?

Expectations regarding the outcomes of the demonstration phase link back to the theory of change and the logic model presented in Figure 1. There were three key outcomes from the design and implementation of the small-scale demonstration phase, and progress against these is presented in Table 8. As emphasised elsewhere in the report these outcomes were not necessarily expected to be realised or manifested fully within the timeframe of the project.

Table 8: Expected outcomes of innovation

Identified outcomes	Innovation-specific realised outcomes
Increased awareness of low cost flood resilience measures amongst owners of residential properties	The builders’ merchants and recovery planning innovations were found, by most interviewees, to have a positive impact in terms of raising awareness of low cost resilience measures. Interviewees who participated in the latter noted that measures were discussed during the property visits that they were not aware of and for similar reasons they found the materials provided informative.

⁷ Note: The Loss adjuster/Surveyor’s checklist innovation did not have a web page as it was mainly addressed to surveyors and not members of the public.

⁸ Note: This data must be caveated on the number of LAA and Project team members that might have accessed the website and cannot be identified or removed.

Identified outcomes	Innovation-specific realised outcomes
	<p>However, taking stock of the overall project and innovations some interviewees felt that more could be done on the wider communication and dissemination of the project. Specific examples included the use of radio, local television or local newspapers and newsletters to reach out to the community.</p> <p><i>“You need to be using all forms of media and let the public know this is available and this is where.” (LAA Interviewee 2)</i></p> <p><i>“Publicity in the area could have been better – it could have been publicised to a greater extent. You need to tell people about it- the trial - to participate.” (LAA Interviewee 5)</i></p> <p>From the feedback on the loss adjuster/surveyor innovation it was clear that each policy holder engaged in discussions with the building surveyor around resilient options and that the discussions were tailored to their property. In terms of the items on the checklist that were discussed with policy holders, the four measures which had the most enquiries were: Flooring finishes – 8; Electric sockets positions – 8; Wall plaster type – internal – 4; Wall plaster type – external – 4.</p> <p>The other resilient measures discussed were: tanking of a basement, external doors, kitchen replacement, flood resilient doors, insulation, hardwood skirting, rising butt hinges, wall/floor construction. In addition, policy holders enquired about resistant measures e.g. airbrick covers and flood barrier doors. For 16 of the 20 properties the cost implications of the measures were discussed. In terms of there being cost implications for the policy holders for their measures: six of the surveyed homes there were no cost implications of the suggested measures. For eight of them there were cost implications, two of which were not deemed to be cost-effective.</p>
<p>Increased awareness of low cost flood resilience measures amongst LAA members resulting in a more knowledgeable PSN network</p>	<p>Some members of the LAA said that they had benefited from the range of professionals and experts that participated in the LAA meetings, and all members of the LAA interviewed found some aspects in which the LAA has contributed to a better understanding of either the technical aspects of flood resilience or the different stakeholder perspectives that were expressed by members of the group.</p> <p>Thinking about specific innovations, the surveyor’s checklist was seen as a project output that has the potential to offer considerable support to surveyors and loss adjusters, enabling them to provide comprehensive advice on resilience measures to property owners.</p>
<p>Homeowners taking up low cost resilience measures</p>	<p>The duration of the demonstration phase and the timing of the evaluation imposed restrictions to the realisation (and thus evaluation) of outcomes and impacts. However, looking at the innovations that progressed further there are some early outcomes:</p> <ul style="list-style-type: none"> • The builders’ merchants did not appear to have resulted in any take up of low cost resilience measures, as neither of the stores had any relevant sales (although it should be noted that sales of materials were not monitored, so it is possible some resilience related purchases were made). One of the interviewees noted that they: <p><i>“Couldn’t really make a connection between the innovation and the sale of materials” (LAA Interviewee 4)</i></p>

Identified outcomes	Innovation-specific realised outcomes
	<ul style="list-style-type: none"> • The recovery planning participants interviewed, reported they are now considering taking up resilience measures such as resilient floors and a resilient kitchens. • In terms of the measures actually taken by policy holders in the loss adjuster/surveyors innovation, eight resilient measures were taken by five of the policy holders which were a timber floor to concrete, plasterboard fixed horizontally, replacement of insulation with flood proof insulation, raising of electric sockets and sand cement render. <p>In addition, five resistance measures were taken by five policy holders: renewal of a flood barrier door, installation of flood gates/barrier doors, and airbrick covers. Overall, nine policy holders made some resilient or resistant changes with one policy holder making both types of change. Of the remaining 11, nine did not do anything and for two it wasn't known if measures were taken as the claim was settled in cash.</p>

Is there evidence of longer-term changes in behaviour and/or attitudes towards low cost resilience measures?

There is no evidence as yet of longer-term changes in the behaviour of home owners in Tewkesbury as a result of the project’s demonstration phase. This is not surprising given the scale and timeframe of the project which meant that longer-term changes would in practice not be expected.

However, the evidence suggests (interviews with innovation participants) that those members of the public who engaged with the innovations and received visits from surveyors/loss adjusters or members of the project team (recovery planning), have expressed that they would be more likely to consider resilience measures in their properties in the future. There is also evidence suggesting that increased awareness of resilience measures may be further disseminated as those participants involved were found to already have held discussions with colleagues, friends and relatives sharing their recently acquired knowledge around resilience. One of these participants further noted that during such a discussion it became apparent that others had received the Environment Agency letter and were also considering measures for their properties:

“I mentioned it to X and also found out that a couple of people in the [local club] also received a leaflet and they are considering it for their own properties.” (D Interviewee 1)

This suggests that there may be outcomes resulting from the project demonstration phase that remain hidden and are yet to emerge. It is not possible to assess the extent of these and, while awareness around resilience measures has a role in the take-up of low cost resilience measures, there are other barriers to be overcome. A number of project team and LAA member interviewees referred to these, drawing a less optimistic picture on the long-term impact of the demonstration on changing attitudes towards resilience:

“It’s down to cost. If someone hasn’t already taken resilience measures they wouldn’t unless they flood again (...) – not the majority – some might.” (LAA Interviewee 2)

This challenge and others are further explored in Section 4 (Overall evaluation findings).

One area of change identified during interviews with members of the LAA was the impact of the project on the attitude of the PSN network in Tewkesbury towards resilience measures. Taking a view of the LAA as representation of that network it became apparent that the cumulative effect of helping develop and deliver the demonstration phase had an impact that may well outlive the project. Specifically, members of

the LAA at the end of the project expressed increased understanding of resilience measures and stakeholder perceptions around these, being themselves more likely to consider and suggest these measures in the context of flooding (see Figure 3).

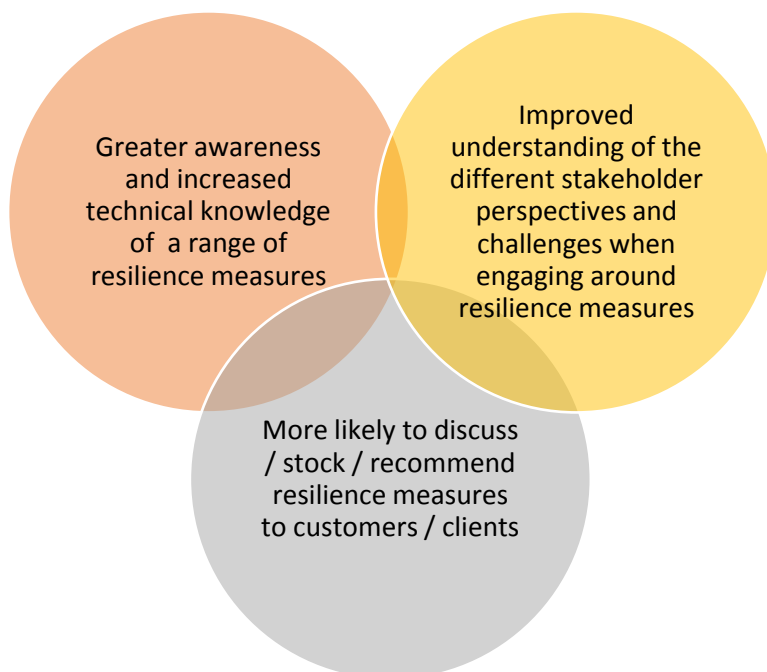
Two members of the project team also noted that the all-round knowledge of members of the LAA means they are now able and more likely to discuss resilience whereas previously discussions about flooding would be framed around prevention:

“Most people who attended were aware of the problem but not the solutions. But now yes they have the awareness of the possible solutions and increased knowledge and understanding of resilience (...) Some of them might advise people [to take out resilience measures].” (PT Interviewee 2)

“Some have taken on an almost self-educated journey – they came to the meeting and it generated interest and went on to learn even more but also discussions within the LAA has boosted people’s awareness of resilience measures out there and also about people’s perceptions around the issue” (PT Interviewee 4)

The post-demonstration focus group discussed possible ways to more effectively disseminate information and engage local people. The example was given of an Environment Agency event in Tewkesbury which included a visit to the flooding incident room, which was well-attended and generated a lot of interest. Another idea discussed was the possibility of engaging with local flood wardens (for example through the LAA) as a group that is both representative of and in touch with the local community on the ground.

Figure 3 Impact on PSN



4.3 Overall evaluation findings

What worked well: Successes during the demonstration phase

The group’s diversity in terms of its members’ background, skill-set and sectors represented, was considered a key success factor in the effectiveness of the LAA, as it brought together multiple different perspectives, some of which were thought to be often missing from similar discussions and forums

(particularly representatives from the private sector, such as solicitors, estate agents and builders' merchants):

"The unique thing and what I like about the group is that it is a much wider group than the usual suspects" (FG2)

Focus group participants expressed that they had personally learned from the LAA meetings and the process of developing the innovations and the demonstration. For example an estate agent said that the LAA meetings had provided them with the right information to pass on to clients.

The main benefits from participating in the LAA identified by participants in the focus groups were:

- Sharing of knowledge and expertise, ranging from community engagement to technical knowledge around resilience measures, for example an LAA member from a builders' merchants expressed the value of having discussion with other members who had greater technical knowledge of flooding and flood responses.
- Facilitating communication between stakeholders that may not traditionally be engaged in similar discussions
- Creating a platform for stakeholders to discuss and learn, which will hopefully outlive the project

"In terms of [setting up] the LAA [the project has been] totally successful!" (FG2)

"There are intangible benefits in terms of the Property Support Network learning more" (FG2)

"Each of us has come out of it with something but it is still emerging in that sense" (FG2)

Interviewees also made reference to innovation specific successes, for example the piloting of the loss adjuster/surveyor innovation in Cumbria, that succeeded in engaging with homeowners under real-life circumstances offering a prime opportunity for the project team to test the checklist and receive valuable feedback:

"We had the opportunity to apply this in Cumbria in a live flooding event – different than most research which is usually abstract. It was an actual flood event" (PT Interviewee 2)

Home visits, carried out as part of the recovery planning innovation, were also felt to have been valuable because they offered participants a wealth of advice with some of them deciding to take on resilience measures.

Increased awareness, understanding of different perspectives and capacity to advise the public on resilience measures, amongst members of the local PSN was one of the main successes related to the LAA, see also the sub-section focussed on: *To what extent has the demonstration, and specific innovations, resulted in expected outcomes.*

"Those that are employed in the public sector are more aware of what the public and business think in their local area – because they tend to have a narrow view or tend to be isolated." (LAA Interviewee 2)

What worked less well: Challenges during the demonstration phase

Table 9 sets out challenges identified that relate to specific innovations. In addition some project-wide challenges and barriers related to engaging homeowners and businesses emerged in discussions around engagement in both interviews and focus groups. These included:

- **Lack of recent flooding**, meaning floods and flood resilience were not at the front of people's minds.

- **The longevity of key champions within organisations** is important in maintaining a continuity of work and people in networks such the LAA.
- **Time**, both in terms of restrictions imposed by the short-term nature of the project and in terms of shifted timing of the demonstration phase as a result of the general elections taking place. The timing of the LAA meetings also proved challenging for some to attend despite best efforts to be as business-friendly as possible and engage professional participants outside working hours.
- **Limited budget** was a consideration in decisions around the materials developed for the demonstration. In addition to the size of the banners discussed in Section 3, this also referred to the development of the website, with a member of the project team noting that if resource was available that could have been developed professionally and maintained as part of the project’s legacy.

“The amount of resource dedicated to the process affected the scale of the transformation [to be delivered/achieved] but that was recognised to start with.” (PT Interviewee 4)

- **Similar initiatives in the locality.** Tewkesbury has been the focus of numerous studies and projects exploring various aspects of flooding resulting in the perception of an “abundance” of communication around flooding in the area. One focus group participant said that they could name “at least half a dozen recent or active flood related initiatives or groups in Tewkesbury area” (FG2). Another interviewee argued that “Tewkesbury has been done to death” (PT Interviewee 3) referring to the implications of 'competitive' initiatives seeking to engage with the same stakeholders:

“I almost feel they have gotten tired of it. [The community?] Not just the community – everybody that is managing. They are tired of being a case study.” (PT Interviewee 3)

- **The subject** of resilience being a sensitive issue as it requires acceptance of water entering the property. This was an issue of concern expressed by members of the LAA (and recognised by the project team) in the pre-demonstration focus group while one interviewee noting at the end of the project he/she still had issues accepting the idea:

“Still can’t get to grips with working on the principle that we are accepting that water comes in then deal with it afterwards. Would still prefer the idea of preventing it in first place” (LAA Interviewee 4)

There may be a reluctance for people, especially those who have experienced flooding, to engage with the subject, and a deep-rooted perception that if experienced once in one’s property flooding is unlikely to occur again:

“You have to be flooded to understand that when you are back on your feet you have this feeling that it is not going to happen again. If you are a house owner (...) they think that is the end of it - that is a typical attitude.” (LAA Interviewee 3)

Table 9: Innovation specific challenges

Innovation	Challenges
Kitchen design	<p>This was identified by a number of interviewees as the most challenging innovation to implement for the following reasons:</p> <ul style="list-style-type: none"> • The kitchen designer was not a member of the LAA and did not attend meetings. Therefore the innovation was driven by the project team with minimal input from professionals of the local PSN. According to an interviewee overall “the innovations that

	<p><i>were driven from the professionals have been easier to implement” (PT Interviewee 4)</i></p> <ul style="list-style-type: none"> • The kitchen is a sensitive part of a property for homeowners while it is also very difficult part to treat. • The cost of replacing a kitchen might have played a role in the lack of volunteers in the community but that was not explicitly mentioned by any members of the public. • From the point of view of the demonstration according to an interview with a member of the local PSN a key challenge lay in finding a property that would be both void/available and at risk of flooding. • In terms of the specific challenges in designing and promoting the installation of a resilient kitchen, an interview with a local PSN member was insightful, providing an overview of potential challenges. These included concerns around the: <ul style="list-style-type: none"> ○ durability of resilient materials ○ cost of resilient kitchen ○ availability of choice of colour, type of doors, style of handles etc., so that customers have a range of options they can choose from to match with their preferences ○ sourcing of the design and product.
Solicitor letter	<ul style="list-style-type: none"> • One of the main challenges with the solicitor innovation was the fact that the letter of advice needed to be adjusted and embedded in the property transfer process of the company. The implication of that was that the content and format needed to be approved by the solicitor firm’s board members. Therefore while there was one solicitor/member of the LAA – “a champion” – more people had to be on board which significantly slowed down the process. <p><i>“It relies on that champion (who is busy) convincing people (who are also busy) and them responding. The concept was arrived at really quickly the delay was in the letter getting designed, approved and in their system so that it is sent out automatically.” (PT Interviewee 4)</i></p> <p><i>“We have had a lot of iterations (internally) trying to get everything right before we implement it – we had to get agreement to get it off the ground” (LAA Interviewee 5)</i></p> <p>Finally there is a business risk involved for the solicitor - that a sale might fall through. However, following discussions both the project team and the solicitors participating in the demonstration phase were confident that the information about risk is <i>“already there”</i> and the innovation lies in providing potential buyers with more information and advice to make an informed decision. While the purchase of the specific property might fall through,</p>

	<p>and the price of the property affected, the solicitor-buyer relationship may in fact be strengthened. As outlined by a project team interviewee the risk mainly lies to the property market:</p> <p><i>“...the price of the property might suffer but that is not something the solicitor or buyer are bothered about”</i> (PT Interviewee 4)</p>
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4.3 Legacy, lessons and future of the LAA

Legacy

One participant in the Focus Groups expressed that the guides and materials developed as part of the project and the links developed between different members of the LAA will hopefully outlive the project and form part of its legacy. The majority of participants agreed with this view, although there was uncertainty about how easy in practice it will be to maintain relationships between actors (i.e. if the LAA will be sustainable).

Two of the innovations that are likely to have a lasting impact are the loss adjuster/surveyor and the solicitor innovation:

- **Loss adjuster/surveyor:** As part of this innovation both an extensive list of resilience materials and a checklist have been developed to support the work of professionals during house visits. These were considered to be superior to the templates currently available in the industry as the list of materials and solutions was felt to be comprehensive, adding solutions that would not be ‘traditionally’ included, while the checklist offered guidance to the loss adjuster/surveyor to ensure that no aspects were overlooked.

“It is better because you can’t miss anything.” (PT Interviewee 2)

Feedback received from professionals undertaking the home visits in Cumbria led to further improvements in these materials, removing some unrelated content, so that a revised version of the list is presented as a final output of the demonstration phase and innovation. A member of the project team referred to the value of these materials for professionals and expressed hope for the wider dissemination of these materials.

- **Solicitor innovation:** The solicitor advice letter was redrafted to be embedded in a specific part of the process of property transfer. The specific point was identified by solicitors participating in the demonstration as the point in the due diligence process following the receipt of the environmental search report conducted as part of the property transfers. According to the participating solicitor and member of the LAA:

“It is a good idea getting the community involved in helping themselves. I would consider to keep signposting people to information on how they can make their home more resilient to flooding.”

For the remaining materials developed and used across the innovations a member of the project team confirmed there was an agreement by Defra on a commons licence so that LAA members and all interested parties can access, edit, re-brand and use the materials as seen fit.

In this sense and though the format and content may be adjusted all of these materials *“may continue indefinitely in some form”* (PT Interviewee 4).

Lessons and future of the LAA

- **The value of bringing people together:** The meetings were seen as a crucial aspect of the LAA “giving it direction and focus” and “gluing” the group” together (FG2). The Environment Agency has been vital in ensuring that there has been a space for the LAA to meet and it is understood that this will continue. Focus group participants acknowledged that although they had each other's contact details they never had to contact each other as the project team ensured LAA members were aware of upcoming meetings. Interviews further confirmed the key role of the project team in organising the LAA meetings and providing guidance on the next steps and activities.

The general consensus among participants in the post-demonstration focus group was that continuing to hold meetings after the demonstration phase and project has finished would be welcome, though they may have to be less frequent (e.g. once or twice a year). As one focus group member said “I would like to find a way of keeping that [the LAA group] and supporting that even if we meet once a year.” (FG2)

A number of interviewees noted that for the continuation of the work undertaken in Tewkesbury, a member of the LAA or the local PSN would be required, who is willing to undertake the administrative tasks of organising the meetings, circulating agendas and bringing members together at regular intervals.

It is worth noting such plans are already in motion with an additional LAA meeting scheduled for September 2016 to discuss the practicalities. The next task according to an LAA member would be to start sharing the knowledge acquired through the project and demonstration phase. Finally, holding the LAA group together was recognised to have benefits in the future in the form of a quicker response to potential flooding in the future and the PSN coming together to provide advice and support.

- **Framing / ‘Hooks’ in engagement:** Future initiatives might benefit from following a more all-round approach to flooding encompassing aspects of both prevention and resilience to get people engaged and then establish what would be appropriate based on a case-by-case evaluation. Three interviewees noted that the impact of the demonstration was limited by the inherent focus of the project on solely resilience measures.

“The target of the project was not wrong but limited (...) I think the team have handled it extremely efficiently but the project was almost doomed in being a very low key result.”
(LAA Interviewee 3)

A number of interviewees also made reference to flood insurance acting as a ‘hook’ to gain people’s attention, since it was mentioned by participants to the demonstration on multiple occasions.

“If you could have gotten the insurance companies involved you could have had a bigger impact.” (LAA Interviewee 2)

“If we perhaps had a hook with flood insurance it might have helped get more people involved. It is the one thing people worry most about. The first thing people tell me is I’ll never get flood insurance again now....Using the ‘help you with your flood insurance’ [catchphrase] gets people interested and involved.” (PT Interviewee 3)

“[X] also gave me advice on insurance which was really useful. I will follow [X]’s advice and talk to my insurance company about my premium.” (D Interviewee 2)

“I only wanted to get involved in the trial to learn more about insurance.” (D Interviewee 3)

One focus group participant further expressed that a change in insurance policy is perhaps the only way of incentivising house owners to take on measures to reduce or mitigate their risk of flooding in the future.

- **Dissemination:** Wider dissemination of both the demonstration phase and the project outputs was discussed during the focus groups and mentioned by a few interviewees. Ideas included all types of media ranging from parish newsletters and local newspapers to the radio and local TV.
- **Linking up:** Linking up with other agencies and initiatives doing similar work in the area. Specific suggestions for the future of the LAA included:
 - An 'open day' at the Environment Agency offices, with suggestions to incorporate more aspects of the Agency's work beyond flooding, was well received by all participants.
 - Linking up with the Flood Wardens and potentially participating at a Flood Warden meeting in October 2016.
 - Linking up with other local flood and resilience groups.

Other comments, made by individual interviewees, referred to more specific actions for the LAA meetings and including members of the public in the LAA.

5. Conclusions

- Across the five innovations piloted as part of the demonstration phase, those that appear to have been most successful were those either driven by members of the LAA or that included significant input from members of the local PSN. Face to face engagement also appeared to have yielded better outcomes in terms of members of the public considering taking up low cost resilience measures.
- That the LAA comprised a range of stakeholders from different backgrounds and interests offered benefits for the project and the individuals participating as it fostered an understanding of different perspectives, collaboration across professions and helped the LAA members gain expert knowledge of the issue at hand.
- Clearer communication of the potential benefits of engaging in the PSN through a group such as the LAA could help encourage wider participation to the LAA. Nonetheless, the amount of time commitment required will always be a challenge in engaging professional participants.
- Resilience to flooding is a difficult message to get across as it requires an acceptance of water entering the property (home or business). The use of a subject that appeals to the public's interests/concerns, such as flood insurance, can act as a 'hook' for the engagement.
- A wider framing of flooding with solutions considered including both preventive and resilience measures could usefully take place. Suggestions can then be tailored to the property's and the homeowner's needs on a case-by-case basis.
- The flooding in Cumbria in December 2015 provided real piloting ground for the loss adjuster/surveyor innovation and delivered insight on practical improvements for the materials developed as part of the innovation's demonstration phase.

- The demonstration phase is believed to have resulted in a small increase in awareness of low cost resilience to flooding amongst owners of residential properties at risk, though that outcome was not equally distributed across innovations. There was limited evidence of homeowners taking up low cost resilience measures. Evidence did suggest an increased awareness of low cost flood resilience measures amongst LAA members, but the main benefit of participating in the LAA was the understanding of the different perspectives amongst the PSN and in the local community.
- The range of materials developed and improved through the demonstration phase are an important part of the legacy of the project. These materials are available to the local PSN to take ownership and disseminate.
- Different materials covered different levels of information needs depending on the engagement target of each innovation. For those members of the public that may not have considered resilience measures before, succinct information flyers were more appealing, while for those who might have had past flooding experience and/or have already undertaken property level measures before, more information was welcome.
- There is no evidence of any longer-term changes in the behaviour of home owners in Tewkesbury as a result of the project's demonstration phase, but as recognised from the outset of the evaluation, such changes were not to be expected considering the timescale of the demonstration phase. There is however evidence to suggest members of the local PSN are more likely to discuss or suggest resilience measures.
- Thinking about the future of the LAA, a person who will take on the responsibility of organising regular meetings, contacting members of the LAA/PSN and setting agendas is a necessary catalyst to ensure continuity of the work undertaken as part of the project. In the duration of the demonstration phase that role was undertaken by the research team and was thought to be crucial in the LAA 'keeping together'.
- There is no reason why the innovations could not be replicated in a different location in the UK affected by flooding. Indeed, according to the pilot in Cumbria, if that location was one that experienced recent and/or frequent flooding, that could act as an incentive for members of the public to engage.

Appendix 3: FD2682 Supporting the uptake of low cost resilience: Report of trial of surveyors' checklist

A flood event in Cumbria (December 2015) provided an opportunity to work further with Cunningham Lindsey to validate the effectiveness of the Surveyor Checklist on a larger number of property types and in a post-flood situation.

Testimonial evidence had suggested that, with the right advice and small grant funding, households are willing to adopt a range of repairable measures. It also suggested that there are a range of materials that are resilient to flooding that are not currently being used or recognised as resilient during recovery. The collation of observational evidence was therefore needed to support the largely testimonial or anecdotal evidence previously available.

Methodology

The process of the validation was as follows:

1. Initial briefing of Cunningham Lindsey loss adjuster/surveyors on the checklist and the research
2. Briefed staff then attended sites with a researcher from the University of the West of England.
3. Staff discussed the resilience option based on the checklist with the homeowner.
4. Researcher took notes regarding:
 - a. The completeness of the checklist (to identify whether content covers items within different buildings);
 - b. The usefulness of the checklist (whether structuring discussion ensures all options are considered);
 - c. The helpfulness of the checklist (including householder reaction to options discussed and the process adopted).

Findings

1. 20 residential properties flooded at various depths from 150mm to 1.8m. The vast majority stated that water entered through the doors and air bricks.
2. Four properties had property level protection installed but they had been overtopped as flooding levels in those properties was 900mm and above.
3. Many of the properties had some level of resilience already as detailed later.
4. All gave river flooding as the main cause with two also citing sewage flooding. Duration of flooding was from 24-72 hours.
5. The majority had 24 hours advanced warning while a few had shorter and some did not say.

6. Surveyors were confident, in general, with using the checklist and giving advice. However, there were occasions where surveyors struggled to answer detailed questions and were less thorough in going through the checklist.
7. Eighteen policyholders were interested in going through the checklist suggesting that it was seen as helpful by the majority of individuals; one was not; one was not interested at all; and one did not attend but specified any appropriate measures without cost implications could be taken. Recommendations are therefore out of 19 properties. Two policyholders took cash settlements and therefore measures taken could not be tracked, therefore measures taken is out of 17 properties. As shown in Figure 1, nine properties installed or renewed measures: four installed just resistance; five installed some resilience; and two more may have installed measures but took a cash settlement.

Interest in resilience – summary of implementation

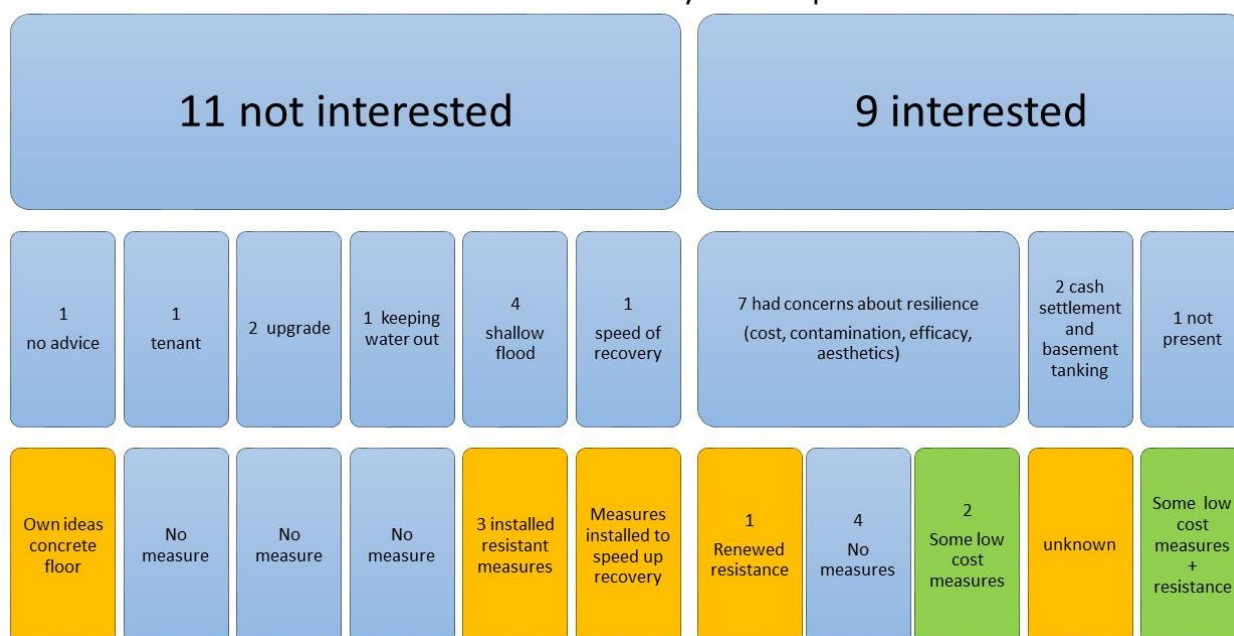


Figure 1: Interest in resilience – implementation of measures recommended during use of surveyors' checklist

8. Sockets were already raised in one property but it was flooded to 1.5m. Two others had partly raised sockets, but with a flood depth of over 900mm in each they were also flooded. As shown in Figure 2, raising of sockets was recommended in 14 of the remaining properties, despite the fact that in many cases this would not have resulted in protection during the most recent (extreme) flood. Two were unaffected due to shallow flooding. Of the 14 recommended socket raising, only two had sockets raised. One of the reasons for declining this measure was aesthetic, as

cost was not stated as a reason. Phone sockets showed a similar picture. Boilers were already high in 18 out of 20 properties and meter relocation was only suitable for one property where the meter was in the basement.

Recommendations for sockets

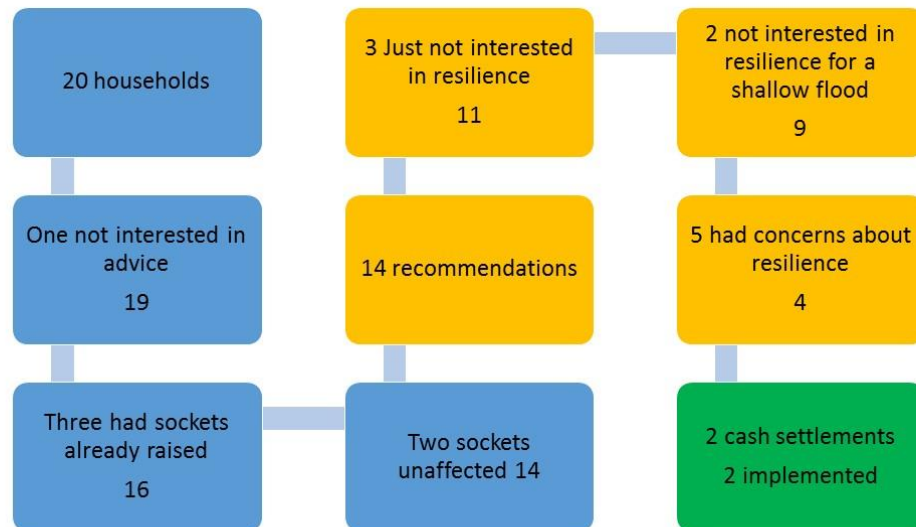


Figure 2: outcomes of recommendation for raising sockets when using surveyors' checklist

9. No low cost recommendations were made for the kitchens. Recommendation for kitchens were mostly to replace like with like, and included plastic, steel and relocation to the ground floor. Similarly no recommendations were made for bathrooms and downstairs cloakrooms.
10. Recommendations for floors included replacing fitted carpets and laminates with tiling, hardwood or removable carpets, but this was not adopted by any of the households in this case. Most of the kitchen floors were already tiled or had vinyl flooring and were recommended like for like. No mention was made of special grout or adhesive.
11. Surveyors generally recommended the low cost option of replacing plasterboard with horizontal plasterboard (10 out of 11 properties with some plasterboard). This was implemented in one property. However finishes were not considered changeable and the choice of emulsion or wallpaper was based on like for like. Four properties had previously been rendered and sand cement render was recommended, with this being implemented on one property while another requested replacing render with plasterboard to speed up reinstatement.

12. Five properties had cavity walls, the rest had solid walls or not specified. Mineral wool insulation was generally recommended to be replaced by closed cell type, with insulation being replaced in two properties. Although this entailed additional costs, the insurance companies paid this, as it was necessary for compliance with building regulations. Closed cell floor insulation was also recommended on multiple properties and installed in two properties, again this being necessary to comply with building regulations.
13. There was barely any discussion around contents, even if they could be fittings such as bookshelves, although it was noted in a few cases that furniture had been moved before flooding. This as seen as outside the role of the building surveyor, as was advice on external features such as oil tanks and non-return valves.
14. Skirting was overwhelmingly softwood before flooding. Surveyors recommended a variety of UPVC, hardwood or tiling. No household chose to take up the suggestions.
15. Replacement of hardwood external doors with UPVC was recommended for eight households; eight of the remainder already had UPVC. None had softwood external doors.
16. For internal hardwood, softwood or hollow doors the low cost option of rising butt hinges was recommended for 11 households. This was not taken up by any and some concern was expressed by one householder on the operation of such hinges.
17. Other concerns expressed by households about the measures proposed included their concern that resilient finishes would slow drying and delay reoccupation; aesthetic considerations; the need to retain original features; contamination issues; reluctance to keep a kitchen that had been flooded; and cost implications of the measures were all mentioned.
18. Other disincentives to considering measures included a preference for keeping water out, and the possibility to continually refresh and upgrade the property during reinstatement.

Appendix 4: FD2682 Supporting the uptake of low cost resilience: Report on the experience of flooding of the 'FLOWS' flood resilient house

Background

This property is a 1970s semi-detached house in the ownership of a Housing Association (HA). The area is subject to both surface water flooding (from road run-off, being at a topographical low point relative to the surrounding land) and fluvial flooding from a local brook, typically occurring concurrently.

This property was the subject of an extensive flood resilience programme as part of the 'FLOWS' project (Norfolk County Council, 2005). Features included:

- Lime-based plaster to 1m above floor level and tiled floors throughout ground floor;
- Steel kitchen units and appliances raised on stainless steel plinths;
- Building services raised to 1m above floor level throughout the ground floor;
- Lightweight internal doors that could be removed for safe storage;
- Lowest tread of staircase replaced by concrete step;
- Water exclusion measures, including door barrier and toilet bung, also provided.

A minor flood (<2" internal depth) occurred within the first two years and no damage was believed to have been sustained from this event at the time. The tenancy then passed to new occupants, who were still in residence when a major flood occurred in July 2015. This was, therefore, twelve years after the initial installation and more than ten years after the minor flood (<12" internal depth; rainfall event assessed as 1:40 year return period). The current resident had a flood plan, which described how measures were to be deployed in the event of a flood, and as much of the plan as possible was implemented. However, the house and contents suffered some damage during the flood event from a variety of causes (as detailed below, and in Table 1), and the repair process was extensive necessitating relocation of the tenant.

Findings

1. The 2015 flood event exceeded the depth that several of the resilience measures had been designed to withstand, such that these measures were 'overtopped'. Even if all the intended measures (toilet bung, removal of doors) had been successfully deployed, however, it is likely that the depth and duration of the floodwater in the 2015 event would still have caused considerable damage.

2. The local flood alarm system also failed to sound (for reasons unknown), and consequently the occupants were not able to deploy all the measures designed to reduce the flood damage. Actions taken too late may have increased the secondary damage from the flood.
3. Contamination led to damage that was perceived to be non-repairable and therefore some resilient features were regarded as having failed and were removed.
4. Prior conditions in the property not related to the 2015 flood made further repairs and building works necessary. Superseded designs and poor understanding of measures following the previous flood may have contributed to this in the years since the original work was done, as best practice relating to flood repair has moved on. Many of the omissions and misunderstandings evident in this case study should not, therefore, pose issues in the present day.

This case study is interesting in demonstrating the following learning points:

- the importance of a clear understanding of the limitations of measures: for example, water exclusion barriers are always liable to overtopping in extreme floods (as can municipal defence schemes), and this should not be seen as failure of the measures themselves;
- the importance of reliable warnings and a plan of implementation to accompany measures (that require any deployment);
- a clear understanding of the purpose and maintenance of measures;
- better understanding of the issues around contamination.

Table 1: Evaluation of the damage suffered and learning points from flooding of the FLOWS house

Area/Measure	Evaluation	Comments	Learning points
<p><i>Internal walls</i> – <i>Limelite Renovating Plaster to 1.0m with Hi-Impact Finishing Plaster throughout all the ground floor rooms; the original specification included finishing with a ‘sealer coat’</i></p>	<p>When walls tested with a moisture meter by the renovating company, they were found to have remained wet to the same degree as the standard gypsum plaster in neighbouring properties. The HA therefore chose to</p>	<p>The vinyl silk finish was not appropriate; only breathable finishes should be applied to lime base plasters.</p> <p>It was apparent that the HA had misunderstood the nature of such plaster, believing it</p>	<p>Best practice has improved in the intervening 12 years, and these issues are now better understood.</p>

<p><i>followed by '2 coats of Vinyl Silk Emulsion'.</i></p> <p>Purpose was that Lime plaster retains integrity after wetting (unlike Gypsum) and should just need redecoration post flooding.</p>	<p>remove all the lime plaster, replacing it with standard gypsum (sacrificial).</p>	<p>was designed to dry out 'more rapidly' than standard gypsum.</p>	
<p>Floors</p> <p><i>– ceramic tiles laid in all ground floor rooms, affixed with Ardurit Bedding Mortar (impervious to water) finished with a cement-based grout.</i></p> <p>Purpose was to keep water out of the floor materials and avoid saturation of the concrete slab.</p>	<p>Raw sewage from the downstairs toilet caused ineradicable staining to the light coloured tiles in kitchen, hallway and downstairs cloakroom. (The dark grey floor tiles elsewhere were retained).</p> <p>The underlying concrete slab was also found to have remained saturated in these areas (although the same problem did not extend to the rear half of the property). The HA took the decision to remove all the floor tiling in the affected area, in order to dry the slab; a bituminous seal was then applied before replacement tiling was installed.</p>	<p>Deployment of toilet bung would have reduced this.</p> <p>This may have been due to water from the saturated soil to the front and side of the property penetrating the concrete, but then being unable to escape by evaporation, due to the water-tight barrier of the bedding mortar.</p>	<p>All flood alarm systems can be subject to failure; 'passive' measures (such as NRV installation) are now deemed preferable to 'active' measures requiring deployment by householders.</p> <p>A moisture proof barrier extending well below ground level would be needed to prevent a recurrence of this, and current best practice would address this.</p>

<p>Kitchen</p> <p><i>– powdered steel kitchen units were installed, with base units raised off the ground; all main appliances raised (on stainless steel box plinths); the dishwasher and washing machine were both fitted with valves to prevent flood water ingress from the sewage system.</i></p> <p>The purpose was that white goods would be kept above flood level, while kitchen units could be washed and disinfected post flood.</p>	<p>The manufacturer of steel kitchen provides an estimated lifespan of 25-30 years. Tenant had already noticed rust patches developing <u>prior</u> to the 2015 flood, on both the carcasses and the door hinges.</p> <p>The latter, coupled with the presence of raw sewage in the flood water from the downstairs cloakroom, led the HA to decide to replace with a standard fitted kitchen (sacrificial approach) at reinstatement.</p> <p>Both the appliance plinths and the elevation of the base units seem to have been designed to cope with a shallower flood than that which actually occurred in 2015; all the appliances were damaged as a result.</p>	<p>Possibly this stemmed from inadequate drying of the void below the units following the minor flood of 2007.</p> <p>Concerns over ‘contamination’ by sewage, even after appropriately thorough cleaning procedures, was stated to be an issue.</p> <p>There is no information now available on how the plinth heights were calculated (i.e. the ‘design event’ is unknown). Any such estimate is always subject to exceedance in extreme events, however.</p>	<p>Best practice now acknowledges the need for removal of kickboards and thorough drying of voids.</p> <p>Industry-wide accepted standards for cleaning and drying would address this.</p> <p>Better understanding of measures can prevent mistakes leading to secondary damage. Management of expectations, particularly the unavoidable limitations of measures is advisable.</p>
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<p>Downstairs cloakroom</p> <p>– a ‘toilet bung’ was available</p>	<p>The rapid flood onset meant the device was not deployed before raw sewage began to spill from the toilet.</p>	<p>A non-return valve fitted in the main sewer pipe would have prevented this, but this measure was not part of the original resilience package.</p>	<p>Best practice now includes use of NRVs.</p>
<p>Internal doors</p> <p>- new doors, frames and linings had been fitted, with the intention of enabling easy removal of the doors (for storage upstairs) in the event of flooding.</p>	<p>The rapid onset of the flood rendered the required action impossible.</p> <p>The doors were subsequently removed, in the hope of salvaging them, but they had already absorbed too much water and were later discarded.</p> <p>Late removal of the doors when wet caused secondary damage to upstairs carpets.</p>	<p>It is important to assess the preferences and capabilities of occupiers. In this case, when the whole plan was unable to be deployed, the tenant prioritised personal items over building fabric.</p> <p>In such circumstances, other measures such as hardwood doors left <i>in situ</i>, or cheaper hollow doors could be used as a sacrificial measure.</p>	<p>All flood alarm systems can be subject to failure; ‘passive’ measures are now deemed preferable to ‘active’ measures requiring deployment by householders.</p> <p>Important to understand the preferences and capacities of occupiers in the selection of strategies.</p> <p>Better understanding of measures can prevent mistakes leading to secondary damage.</p>
<p>Building Services</p> <p>– all electrical sockets, telephone and TV points were raised to 1m above floor level throughout the</p>	<p>This was successful.</p>	<p>Other electrical problems were identified, necessitating complete rewiring of the property.</p>	

<i>ground floor.</i>			
<p>Staircase</p> <p><i>– the staircase leading up from the lounge had been modified by replacing the bottom-most stair with a solid concrete block, which was un-carpeted.</i></p>	<p>The depth of the 2015 flood resulted in water reaching part way up the second riser.</p>	<p>Although the wooden stair itself sustained no damage, it allowed water to seep into the carpeting above the flood level, which had to be replaced.</p>	<p>Important not to see overtopping as failure and to limit expectations that resilience means no damage.</p>
<p>Ancillary measures</p> <p>Water exclusion barrier for front door was available</p>	<p>The rapid flood onset meant the device was not deployed before water ingress commenced.</p>	<p>Neighbours with same devices reported they were ineffective even when deployed correctly. (The design in question has now discontinued, as more reliable barriers have superseded them.)</p>	<p>All exclusion measures are subject to overtopping, but the risk of device failure can be avoided by using measures tested to latest Kitemark standards.</p>

Appendix 5: FD2682 Supporting the uptake of low cost resilience: Examples of communication materials co-developed with user groups

5.1 Homeowner Case Studies



CONSIDER FLOOD REPAIRABILITY

Making changes to your property?



Image courtesy of: The Photo Studio, High Street, Tewkesbury

SOME CASE STUDIES OF REPAIRABLE PROPERTIES TO HELP YOU IF YOU ARE:

Recovering from flooding

Making changes to your home or small business

Thinking about protecting your property from flooding

Planning to recover more quickly next time

INTRODUCTION

Making changes to your property

You can't always keep the water out of your home or small business when it floods. Flood repairability means designing your home to limit the damage if you are flooded and help you to get back to normal more quickly.

There are lots of different changes you can make, and many of the ideas don't cost much, especially if you are already making other changes. Some of them you can do yourself – others would need a specialist. It is also important to understand the sort of flooding you are likely to experience and to think about how much warning time you are likely to have to prepare your house immediately before the flood happens.

This booklet tells the story of some people that have already taken steps to prevent damage to their homes when it floods.

For more information you can go to:

Floodrepairable website

<https://floodrepairable.wordpress.com/>

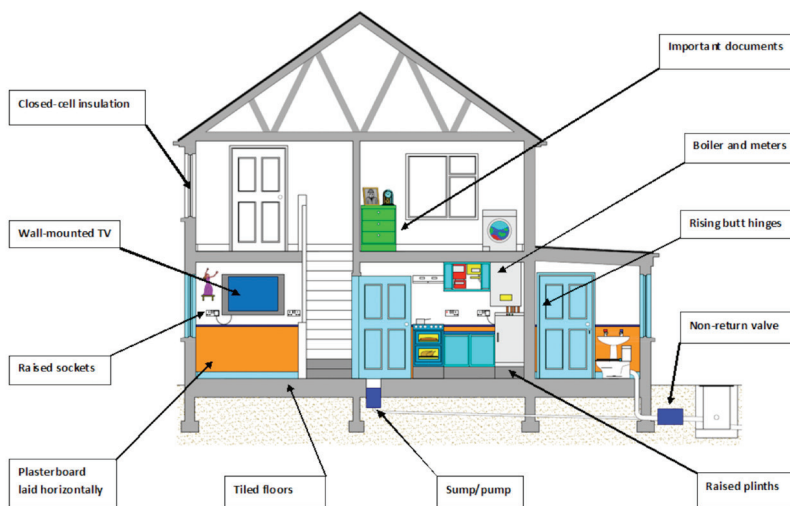
Centre for Resilience website

<http://www.centre4resilience.org/flood-guidance-archive/flood-resilience-measures/>

Homeowners guide to flood resilience

http://www.knowyourfloodrisk.co.uk/sites/default/files/FloodGuide_ForHomeowners.pdf

The Flood-Repairable House



Adapted from original image courtesy of the Eastern Solent Coastal Partnership (www.escp.org.uk)

Case Study:

BUCKINGHAMSHIRE

Minimising the damage

Four storey older property, flooding from watercourse/ groundwater. Flooded twice since current owners' purchase, but long history prior to this.

Low-cost measures include:

- Unplugging all electricals in advance of a flood
- Sofa has legs rather than fabric to the floor
- Tiled floors and sacrificial carpet tiles
- Raised Boiler; tumble drier on top of washing machine
- Owner keeps a sturdy plank to help lever furniture/white goods upon to bricks
- Internal doors are Pitch Pine – these have now survived two floods without damage.



Sump and pump sited in corner of lounge, carpet tiles over concrete floor are easily removable



Antique furniture raised on several bricks, which are enclosed in plastic bags (to prevent water seeping up into wooden legs).



Kitchen units made of Marine Ply (these have already survived a flood event).



Sofa on legs with sacrificial carpet tiles

Why did the owners choose this approach?

“You can't keep the water out, but you CAN manage the water when it comes in ... so it doesn't cause damage”

Case Study: COCKERMOUTH

Back in two days

Victorian property that has been flooded from river 4 times within 10 years. Most recent flood was 5' 4" deep inside property after municipal barrier over-topped.

Low-cost measures include:

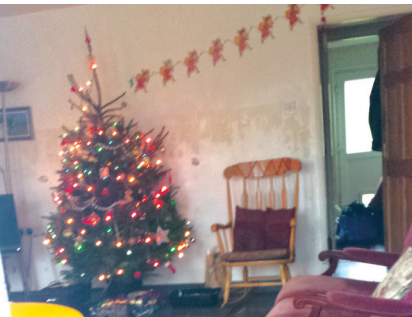
- Owners have purchased their own industrial quality dehumidifier units (less than £750 each)
- Central heating is now run from a wood-burning stove, so that house can be kept warm even when gas and electricity supplies cut off during and after flooding
- All sockets raised, and meters repositioned at ceiling height
- External door frame and windows replaced with UPVC



Lime plaster, and tiled floors installed as a result of insisting on a cash settlement from the insurer



Marine ply kitchen units, with solid oak doors – can be hosed down and disinfected (picture taken 10 days after flood).



Taking their own initiative in starting the drying process allowed reoccupation within days

Why did the owners choose this approach?

“Now easy to sweep and mop out ... got drying under way in a couple of days”

Case Study:

CUMBRIA

Fail safe resilience

Guest house as well as home. Flooded 2005, 2009 and 2015. Water exclusion and resilience installed after 2009 flood.

Low-cost measures include:

- Negotiated with insurer for a cash settlement in order to make resilient alterations.
- Ceramic floor tiles wherever possible fitted using swimming pool adhesive and waterproof grout.
- Wooden skirting boards in the kitchen replaced with half tiles.
- Kitchen cooker replaced with hob and integrated oven, so higher than flood water.
- Phone cables and so on all enter property at a safe height.



Non return valves to prevent back up and minimise clean up



Drainage, pump and sump to get any water out again quickly.



Might not be possible to keep water out entirely but water exclusion / minimisation strategy employed

Why did the owners choose this approach?

“I couldn't go through (flood damage) again ... this is a small business, not just a home.”

Case Study: GLOUCESTERSHIRE

Using renovation

Property was known to have flooded once prior to current owner's purchase, that being the 'exceptional' event in 2007. Owner undertook measures before moving in. Has since flooded twice more within 18 months.

Low-cost measures include:

- Three portable 'puddle' pumps purchased (£500 each).
- TV stand is made from glass and metal, which can be left in place and cleaned afterwards.
- Kitchen units are on 150mm high plastic legs, with removable doors; the kickboards are also removed when flooding is forecast.
- Electrics and boiler had already been raised by previous owner.
- Ground floor is tiled throughout with stone skirtings.
- All window frames have been replaced with UPVC (so now draught proof as well as resilient).
- The sump-pump is on a separate circuit, with the controls high on wall.
- Non return valve on the septic tank.



Hen house has an upstairs for when it floods.



Plastic bucket with sealable lids are used for storing small objects, as these then float inside garage



Carpenters' telescopic metal trestles are used to raise a leather sofa well above flood height.

Why did the owners choose this approach?

“Easy to mop out, and no rot. Well worth (the cost) for the heartache it saves.”

“We did our own research (on pumps)... bought stuff for ourselves and then demonstrated it to all the neighbours... ‘Puddle’ pumps can go down to 3mm depth”

Case Study: SOMERSET

Avoidance for contents

Victorian building that had never been flooded until the 2014 event on the Somerset Levels.

Low-cost measures include:

- All personal/sentimental items are kept on upper floor.
- Lightweight table in kitchen can be moved.
- Repositioned one kitchen floor cabinet to the wall.
- Electric cabling all raised to head-height, within a metal conduit.
- Solid pine doors retained.



Modular units providing storage in the lounge are lightweight so they can easily be lifted to safety



The desk-surface is also removable, and the floor units are on wheels.



Study with wall mounted cupboards, so important documents can be stored safely above flood level



Light-weight kitchen table, that can be moved easily

Why did the owners choose this approach?

“We know we will never be able to stop flooding ... so we have done everything we can to make this house more resilient”

“The resilience measures we have taken will allow us to get back into our house a lot quicker than than the 10 months it took last time”

Case Study: YORKSHIRE

Change use of rooms

Older property on four floors including basement, in which kitchen, utility and downstairs cloakroom were originally located. Flooded on 3 occasions in a single year, from combination of high river levels and drains/sewers.

Low-cost measures include:

- Worktops supported on a sturdy wooden frame – if flooding is expected, the remaining free standing solid wood furniture can be lifted up onto the worktops for safety.
- The flooring in the original kitchen area had already been replaced (after the first flood) with 'very tough' ceramic tiles, affixed with epoxy adhesive.
- No skirting boards now used at all, and special 'renovating plaster' was used to finish the surfaces, which can now easily be washed down after flooding.
- Modern hollow doors were replaced by solid wood doors.
- No carpeting on the lowest flight of stairs.



Boiler (and electrics) mounted above expected flood level



Kitchen and utility moved from basement to ground floor, and space converted to workshop use



Puddle sucker pump purchased able to pump water down to 1mm

Why did the owners choose this approach?

“Sheer exasperation” – and needing a solution which would allow occupant and pets to live upstairs in any future floods.

AFTER THE MOST RECENT FLOOD -
‘ ... I had 4.5ft of water in my basement. I power hosed and pumped out. Resilience measures definitely aided recovery’

Case Study: GLOUCESTERSHIRE

Easy to move

Older property half mile from river, had not flooded since 1947 but has recently flooded twice in 7 years.

Low-cost measures include:

- Skirtings made of oak held by screws, so can be removed.
- Lightweight table and chairs.
- Bookcases made of removable shelving supported on wall-fixed brackets.
- Bought a 'sack truck' for moving items when flood warnings received.
- Raised boiler, tumble drier on top of washing machine.
- Oil tank outside raised above flood level.
- Dishwasher is not permanently plumbed in, so moveable.



Chose lightweight furniture that can easily be taken to upper floor.



Breakfast bar made with steel legs and plastic stools.



Keep small items in plastic trays to make them easy to move

Why did the owners choose this approach?

“... not prepared to go through the upheaval and trauma (over a year in a caravan) again ”

Case Study:

WORCESTERSHIRE

Water resilient materials

Older property close to major river.
3 floods and 2 near-misses in 14 years.

Low-cost measures include:

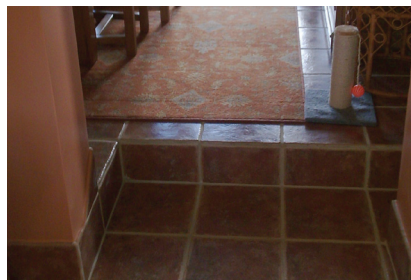
- All sockets raised.
- Wooden skirting replaced by tiled border.
- Sump and pump to control water accumulating in sunken patio area.
- Cement render used on internal walls.
- Items also raised on breeze blocks during floods.



Plastic kitchen units with removable wooden doors.



Non-standard doorway with unobtrusive barrier fittings



Entire ground floor is tiled, with removable rugs/non-fitted carpets.

Why did the owners choose this approach?

“Floods becoming more prevalent ... displaced for 8 months following last flood.”

“... (a) sump was built after 2000 flood but pump was not powerful enough for 2007 flood, therefore sump enlarged and a more powerful pump installed - it worked well in 2014”

Case Study:

SHROPSHIRE

Resilient materials

Older property (c1750) very close to major river; also has groundwater ingress accompanying river flooding. Flooded twice in 2 years.

Low-cost measures include:

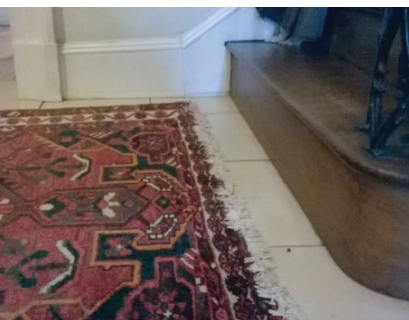
- All sockets raised.
- Wooden skirtings retained, but using 'double VAC-treated' wood finished with multiple layers of coats of paint on all surfaces.
- Solid oak stairs have survived numerous floods for past 60 years.
- Original solid wood doors retained, these have also survived multiple floods.
- A stock of plastic trestles (kept in garden shed) used to support items of furniture.



Original solid wood doors retained



Walls - hydraulic lime plaster (with salt resistant additive) on steel mesh supported by wooden battens (to create air gap).



Concrete floors (put in during post-flood renovations) finished with natural lime-stone tiles.



Kitchen – sturdy marine ply shelving system to support white goods and free-standing furniture.

Why did the owners choose this approach?

“... a way of taking control ... sandbags are worse than useless!”

“... last time it flooded we just washed everything down and moved back in”

Case Study: OXFORDSHIRE

Resilient materials

Listed building (c1800); affected by various combinations of groundwater/surface water flooding 4 times in 14 years

Low-cost measures include:

- Plinths for white goods and range.
- Retained original solid pine internal doors on rising butt hinges (so can be removed).
- All sockets raised.
- Lounge furniture raised on bricks for minor floods.
- Bookcase made of deal with 6 coats of paint, and half-inch above ground (to prevent water getting trapped behind it).
- Non return valve in sewer chamber.



Water comes up through the floor but tiled floors are easy to mop up after a flood.



Walls finished with lime plaster and 'old-fashioned' paint; dado to mark where post-flood decoration needs to go up to.

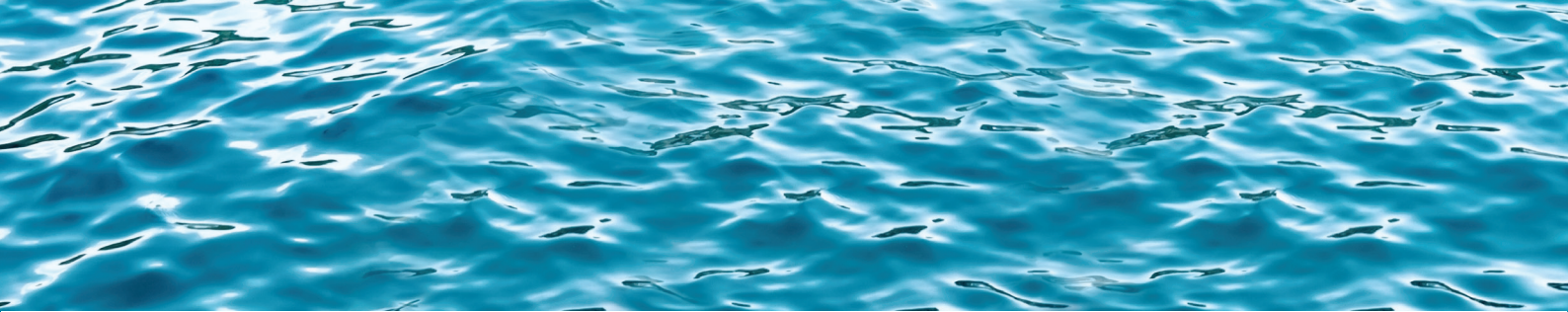


Kitchen has free standing furniture, including a solid wood dresser (same age as house) that has survived countless floods

Why did the owners choose this approach?

“ ... small floods ... enough to take up carpets and put the sofa on bricks ... we can easily deal with. We just scrub the floor and scrub out the cupboards ... and it dries off and goes away”

“Throwing good carpets - only a year old - into the street really didn't feel good ... made us think it would be better to do things differently”



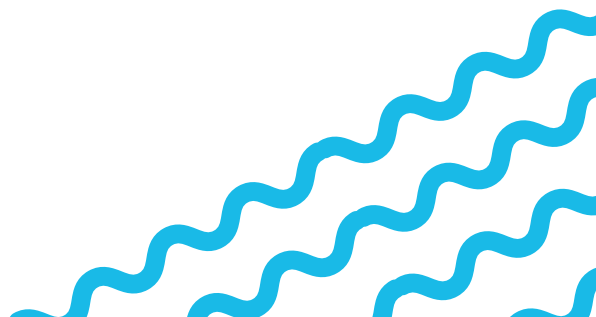
Funded by the joint Flood and Coastal Erosion Risk Management Research and Development Programme (FCERM R&D). The joint FCERM R&D programme comprises Defra, Environment Agency, Natural Resources Wales and Welsh Government. The programme conducts, manages and promotes flood and coastal erosion risk management research and development.

This research (Defra project reference FD2682) was carried out by a research consortium comprising: The University of the West of England, Bristol; Mary Dhonau Associates; Cunningham Lindsay; Collingwood Environmental Planning, the Tewkesbury Property Support Network; and Birmingham City University, on behalf of the Department for Environment, Food and Rural Affairs.

Graphic design by Hatched Graphic Design & Digital Communications Agency.



Graphic Design & Digital
Communications Agency

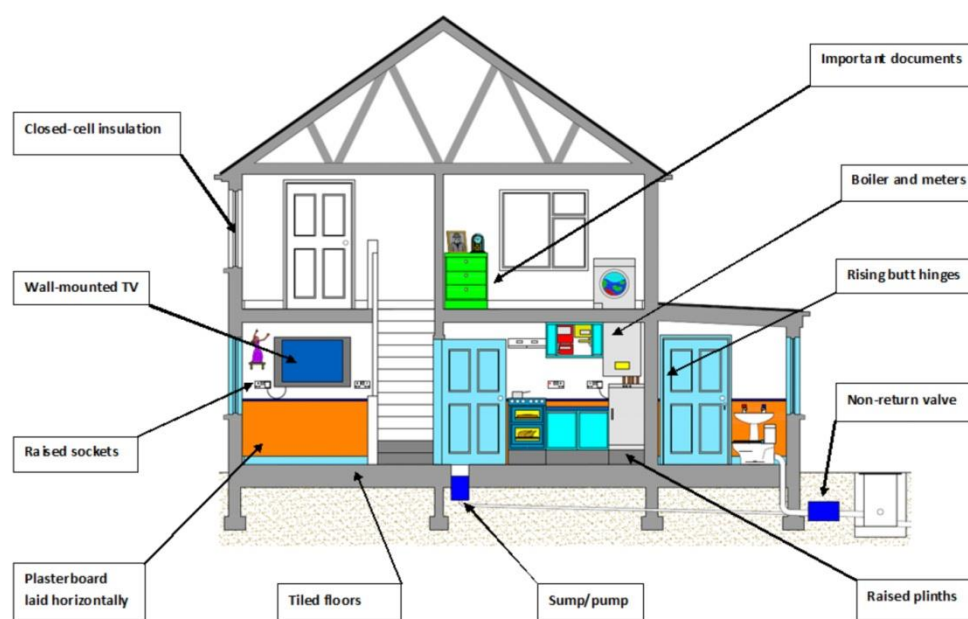


5.2 Surveyor's checklist and accompanying homeowner list

Practitioners' handbook for low cost repairable or resilient reinstatement.

Date in format: February 2017

The Flood-Repairable House



Adapted from original image courtesy of the Eastern Solent Coastal Partnership (www.escp.org.uk)

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Overview of low cost flood repairable approach.....	2
Appendix 1: List of low cost repairable approaches.....	4
Appendix 2: Checklist for surveyors	9
Appendix 3: Further sources of information	11

Introduction

What is this guide?

This handbook provides a summary of measures that may be used to limit damage once floodwater enters a property. The measures have been identified within the Defra technical evidence review as part of the Defra research project FD2682. This review drew on existing guidance, professional and practitioner experience and the evidence from a small number of households that have had measures installed in the past. There are many more approaches that can be used than are included in this handbook (see information sources below). The measures included here have been assessed to have the potential to be installed at no, or no significant, extra cost over like for like reinstatement in different types of property typically found in the UK.

What is the purpose of the guide?

The handbook is designed to be a convenient summary of potentially appropriate alternative approaches to reinstatement that will reduce the cost and disruption of future flood damage. It includes a checklist for surveyors to use in informing their discussion with flood affected households and small businesses during the reinstatement process. This handbook is not designed to be a comprehensive technical manual, as most of the approaches and materials described within this handbook are within the technical competencies of building surveyors. It is intended to highlight those approaches meriting consideration when dealing with flooded properties that are likely to flood again in the future.

The suitability and cost of the different approaches listed here will vary significantly for each individual property, flood risk situation and householder or business owner. This handbook provides a range of approaches that are considered to be low cost options. It is envisaged that surveyors will use their professional judgement and to determine the best and most cost effective reinstatement plan for each property.

Overview of low cost flood repairable approach

Flood resilient reinstatement or resilient repair means reconstructing or reinstating a flood damaged building in such a way that, although floodwater may enter the building, its impact is reduced, i.e. no permanent damage is caused, structural integrity is maintained and drying and cleaning are facilitated quicker when the flood water has receded.

The approach is suitable for any building at risk of flooding even if the intention is to keep water out because measures may be overtopped or fail. However resilient reinstatement is commonly used as part of a wet proofing or water entry strategy for buildings that can include:

- flood-resilient material and designs;
- sacrificial approaches;
- consideration of hydrostatic pressures/impact loads on structures;
- consideration of how the water will be allowed to enter a property, means of escape for the building occupants and security of building contents during and after a flood;
- drying plan - designs to drain water away after flooding and access to all spaces to allow drying and decontamination;

Flood resilience within a building can be achieved in different ways:

- Vulnerable elements (such as electrics) can be raised above the expected flood level or removed (avoidance);
- Exposed elements can be made of, or coated in, flood resistant materials (for example use of ceramic tiles, water resistant paint or varnish, plastic skirting); or
- Exposed elements can be made of resilient materials that can accept water without deformation or disintegration and dry quickly afterwards with potential for decontamination (for example cementitious materials)
- Deliberate choice of low cost, easily replaced, sacrificial elements.

In all cases the need to evacuate the water quickly is important. For resilient materials the adequate strategy for creating the conditions to dry the materials is key to a quick return to the property

A range of measures can be used to make a property resilient to damage from floodwater and those used will depend on the nature of the property and the flood risk it faces. The diagram on the front cover illustrates some of the approaches and a list of potential low cost approaches is set out in Appendix 2.



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Any enquiries regarding this publication should be sent to us at [insert contact details]

This handbook was prepared as part of the Defra Project FD2682 by Jessica Lamond, UWE Bristol; Rotimi Joseph, Cunningham Lindsey; with input from Robbie Craig, Defra, Stephen Garvin, BRE; Ian Gibbs, Cunningham Lindsey; Carly Rose, UWE Bristol.

List of suggested low cost measures for water entry strategy

MEASURE TYPE

Depth

SPECIFIC interventions

Depth Key: Low= up to 100mm; Medium= up to 300mm; High= up to 900mm; Any= up to one storey

Low cost: is defined as having the potential to represent low additional cost at reinstatement and this judgment may vary depending on the specification of the original elements being replaced

Water compatible walls	High	Fix plasterboards horizontally on timber framed walls rather than vertically (aka Sacrificial plaster board/dry-lining)
	Any	Removable timber cladding material
	Any	Cement Render/cement sand render/water-resistant cement-based plaster coated on to internal walls then skimmed
	High	Ceramic/porcelain tiles (with water-resistant grout and adhesives, as used in swimming pools). This can only be low cost if it is specified to replace an existing expensive floor carpet.
	Any	Closed-cell type insulation (to replace mineral insulation in cavity walls) (aka Sprayed polyurethane foam or SPF)
	Any	Cavity wall – use insulation materials that are water resistant/low absorption (expanded polystyrene sheets, EPS water-resistant beads, or semi-rigid self-draining mineral wool slabs/batts that will not collapse on wetting) with stainless steel fixings
	Any	Replace corroded timber frames with treated timber
	Any	Replace corroded steel frames with galvanised steel equivalents
	High	Seal between wall, floor and partitions (continue concrete seal 0.5m up walls)

	Any	Avoid (non-breathable) vinyl wall-coverings, use microporous paint temp finish, then paper (breathable wallpapers must be affixed with breathable adhesives)
Water compatible floors	Any	Avoid fitted carpets, parquet and laminate flooring: use ceramic tiles, loose fitting rugs; removable carpets (e.g. fixed with Velcro or hooks-&-eyes set into floors)
	Any	Quarry tiles, coated to prevent staining
	Any	Cement-rich screed
	Any	3mm epoxy resin waterproof floor treatment added to concrete flood screed
	Any	Suspended floors - preservative-treated joists/ floorboards
	Any	Ensure effective connection between the damp-proof membrane for the floor and the damp proof course in the wall
	Any	If oak blocks on concrete need replacing, use tiles. If oak blocks set in bitumen need replacing, then use screed and new finish on top.
	Any	For suspended floors, if oak floorboards need replacement, then use (cheaper) treated timber.
	Any	Remove ash-bedding from underneath quarry tiles in Victorian houses (retains moisture and impedes drying out)
	Any	Clear and repair air bricks/vents to suspended timber ground floors (aids drying out process via airflow imps)
	Any	Closed cell insulation in boards for floors
Water compatible kitchen fittings	Low	Fit kitchen units with extendable plastic or stainless steel feet or support on raised brick/stonework (for floods)
	Any	Specify the least expensive kitchen possible and to expect to replace it (aka Sacrificial approach)
	Any	Free standing removable units (e.g. pitch pine), then carry upstairs when flood warning rec'd.

	High	Limit number of base units and have removable doors so only bottom carcasses need replacing
	Medium	Avoid built in appliances and have strong work surfaces that can support appliances during a flood
	Low	Removable kick boards – wrapped around units avoiding end sections that extend to the floor
	Medium	Better to have a table and/or high-level 'breakfast bar' than a (fixed) island.
	Any	Avoid kick heaters and use radiators instead.
Water compatible bathroom fittings (ground floor/ basements)	Any	Waterproof tile adhesive and water-resistant grout for tiled walls
	Any	Some acrylic baths have integral encapsulated (i.e. waterproofed) base-boards (cost same as normal acrylic baths).
	Any	Use of an anti-siphon toilet
	High	No vanity unit around wash-hand basin use wall mounted cupboards/shelves
	Medium	Sump and pump system (with alarm in case pump fails)
Building Services	Medium	Raised electrics = dual purpose, as more accessible for older/less mobile people when raised.
	High	Electric cables drop from first-floor level down to sockets at high level on walls;
	Any	Central heating pumps and controls raised above max expected flood level; and any pipe insulation below exp'd flood level replaced by closed-cell type
	Any	CH control unit moved upstairs, so radiators serving upper floor(s) can still be used (ground floor underfloor heating only).
	Any	Wall-hung fires >1m above flood level (depends on expected flood depth)

	Any	Raised meters 1m above expected flood level, and use plastic housing.
	Any	Boiler mounted above max expected flood level
	Any	Seal radiators with polyethylene sheeting
	Any	Where possible, incoming telephone lines/cable services/ and internal control boxes should be raised above the expected flood levels.
	High	Through-wall service connections raised >900mm above the ground floor level
	Any	A house can be wired so that the ground floor ring main can be switched off, leaving supply to the upper floors still available; likewise, smaller vulnerable circuits can be isolated.
	Any	Place services including electrics in easy to access conduits to allow draining and drying
	Any	Anti backflow devices on foul drainage
	Any	Anti-backflow valves (NRVs) to sewer pipework AND dishwasher/washing machine pipes.
	Any	Toilet 'bungs' (e.g. Panseal); sink and shower 'bungs' (to prevent sewage ingress)
	Any	Water supply pipework insulation can be replaced with flood resistant closed cell material below the expected flooding level.
Doors/windows/staircases	Medium	Separate piece of carpeting for bottom-most stairs, removable when flood warning received - then nail back down (but looks like normal fitted stair carpet).
	Any	Replace internal doors with solid hardwood doors (caution - avoid cheap 'oak-style' doors)
	Any	Consider installing cheapest possible doors to be sacrificial.
	Any	Removable /light weight internal doors/Replace door hinges with rising butt hinges. These allow doors to be lifted off.
	Any	Retain traditional solid wood doors, on rising

		butt hinges, and use on trestles to support furniture etc
	Any	For wooden windows and external doors - use oil-based or waterproof stains, paint or varnish timber
	Any	Replace doors, windows, skirting boards, architraves, doorframes and window frames with fibreglass (GRP), PVC-U or similar
	Any	Replace skirting boards with ceramic tiles
	Any	Treat wood skirting, painted on ALL sides
	Any	Oak skirting held with screws, removable.
	Any	Use of toughened glass in doors/windows /cabinets (reduce damage from floating debris)
	Any	Use non-corrosive door/window hardware fittings (eg stainless)
	Low	Wall cupboards/built-in-wardrobes - rebuild off floor with plastic legs, concealed by removable plinth
	Any	Use PVC wall cupboards instead of timber
	Any	Bookcases formed of fixed brackets but with easily removed shelving.
	Any	Oak exterior doors oiled repeatedly with linseed oil
Contents Protection	Low	Plinths (or equivalent methods) for white goods
Miscellaneous	Any	Ext walls - Re-point brickwork with a mix of 1:2:9 – cement: lime: sand mortar (far more likely to survive flood conditions without need for repair)

SURVEYOR'S CHECKLIST FOR FLOOD RESILIENT RECOVERY

Property Address:.....

Date:.....

	Current choice	Resilient choice
Change Room usage		
Wall plaster type		
External walls		
Internal walls		
Floor finishes		
Kitchen		
Bath/cloakroom		
Entrance hall		
Reception room		
Reception room 2		
Other		
Other		
Wall Finishes		
Kitchen		
Bath/cloakroom		
Entrance hall		
Reception room		
Reception room 2		
Other		
Other		
Internal doors		
Skirting board		
External doors		

Staircase		
Windows		
Electric sockets positions		
Phone socket position		
Boiler position		
Meters position		
Change kitchen type or use resilient design features		
Use resilient features bath/cloakroom		
Insulation		
TV and other tech positions		
Fitted cupboard/bookshelves		
Lightweight furniture		
Kitchen		
Reception room		
Reception room 2		

Further sources of information

Relevant standards include:

BS 85500, Guide to Improving the Flood Performance of Buildings

(note that a core standard document is available to download free of charge.

<http://shop.bsigroup.com/ProductDetail/?pid=000000000030299686>.)

Flood products should meet PAS1188 Flood Protection Products. Specification. Building Aperture Products or similar standards.

<http://shop.bsigroup.com/ProductDetail/?pid=000000000030287158>

The handbook and documents above drew on several key existing guidance documents for suggested approaches:

- GARVIN, S., REID, J. & SCOTT, M. 2005. Standards for the repair of buildings following flooding. London: Construction Industry Research and Information Association CIRIA
- ASSOCIATION OF BRITISH INSURERS 2003. Assessment of the cost and effect on future claims of installing flood damage resistant measures. London: Association of British Insurers.ABI
- DHONAU, M. & ROSE, C. B. 2014. Homeowners' guide to flood resilience (3rd edition 2014) [Online]. Know Your Flood Risk Campaign. Available: http://www.knowyourfloodrisk.co.uk/sites/default/files/FloodGuide_ForHomeowners.pdf [2014].
- BRE Good Building Guide (GARVIN S and HUNTER K), Applying flood resilience technologies (GG 84), 1984 (www.brebookshop.com)
- BRE Digest 523 (GARVIN S): Flood-resilient building (www.brebookshop.com)
 - Part 1 – Legislation, planning, flood-risk assessment and performance of buildings DG 523-1 (2012)
 - Part 2 – Building in flood-risk areas and designing flood-resilient buildings DG 523-2 (2012)
- BRE Good Repair Guide 11, Repairing flood damage, 1997.



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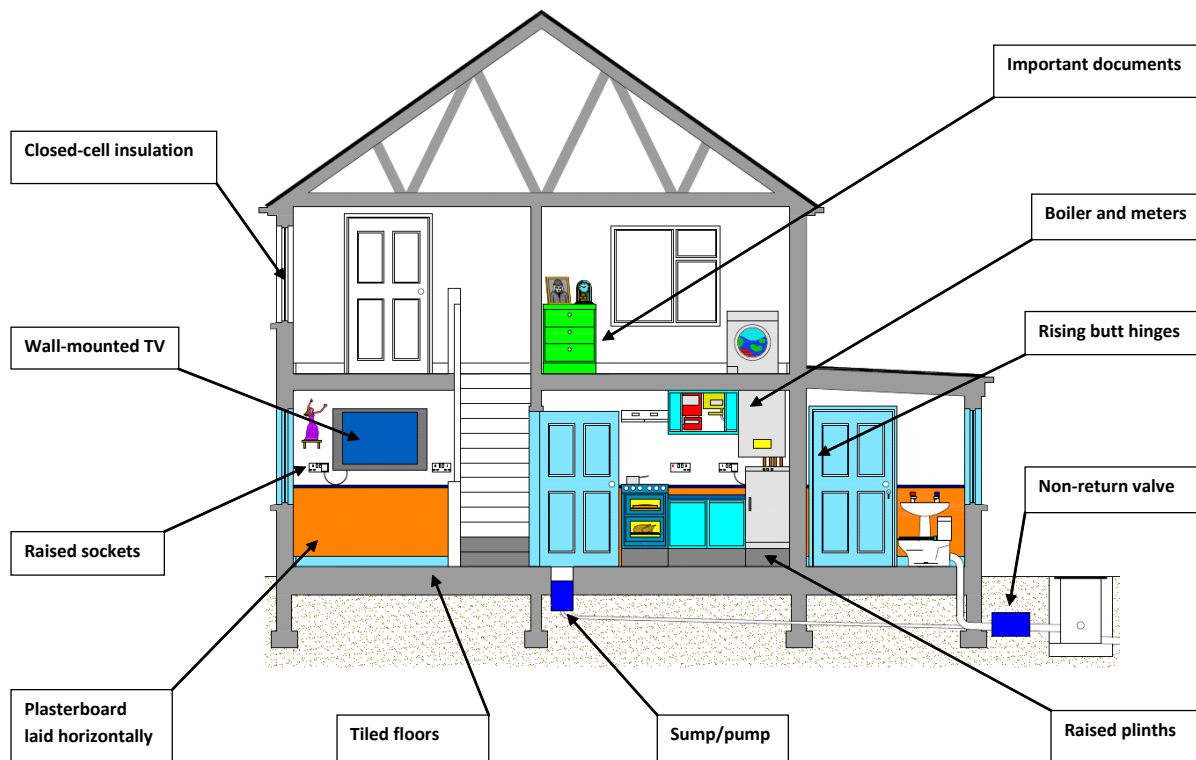
5.3 Resilience Flyer

MAKING YOUR HOME FLOOD REPAIRABLE

Thinking about how you recover from a flood should be a big part of your emergency plan. When people are flooded they often find that recovering their home is even more stressful than the flood itself. If you have been flooded before, you might understand how difficult recovery can be and want to make changes to limit damage and get back to normal more quickly if you were flooded again. There are lots of things you can do to help speed up recovery – some of them mean making changes to your home, **making your home flood repairable so you can get back home as soon as possible**, and you can do this at any time. Some of the ideas don't cost much at all and others don't cost much extra if you are redecorating or buying things for your home after a flood, or at any other time.

The picture shows lots of different ways you can think about making your home more repairable. Some of them you can do yourself – others would need a specialist. It is also important to understand the sort of flooding you are likely to experience and to think about how much warning time you are likely to have to prepare your house immediately before the flood happens.

The Flood-Repairable House



Adapted from original image courtesy of the Eastern Solent Coastal Partnership (www.escp.org.uk)

Go to the floodrepairable website to find out more:

<https://floodrepairable.wordpress.com/>

For more information on how to protect your home from flooding please see:

Homeowners guide to flood resilience

http://www.knowyourfloodrisk.co.uk/sites/default/files/FloodGuide_ForHomeowners.pdf

RAISED SOCKETS

Making sure your sockets are higher than the expected flood depth can save you having to have your property rewired after a flood. Having sockets higher up the wall can be more convenient too and makes your house up to date and consistent with regulations for new houses. If you are having your walls repaired after a flood you can ask the insurance company to do this and often it won't cost you anything. If you are having any building work your electrician can often raise sockets without too much extra cost or disruption.



REPLACING CARPETS WITH VINYL OR RUGS



Some floor coverings can survive most floods and just need a good clean before you can move back in. Examples are tiles, some vinyls and resins - but you must make sure that you get good advice about the adhesive and grouting you need to use to make sure that the tiles and vinyls stay in place during a flood. Depending on the type of flood, and the type of floor, these types of floor coverings might reduce the amount of water that gets into your floor and speed up any drying. You can make this kind of change next time you are thinking of replacing your carpet or you can talk to your insurer after a flood.

RAISING YOUR ELECTRICAL GOODS AND TECH

This can include things like your TV or your oven as well as the white goods in your kitchen. You can mount your TV on a higher shelf or onto the wall above the likely flood level. You can do this at any time and it should be fairly cheap to do. High level ovens can be built in next time you change the kitchen. You can move things permanently or think about how you could move them just before a flood



REMOVABLE INTERNAL DOORS

If you think you will have a warning and time to move things, then make sure that furniture is lightweight and you know where you might put it. Doors can also be removed if they are lightweight and have the right hinges. New hinges can be put on doors at any time and you can also ask your insurer to do this after a flood. This might not cost you anything if your doors are being replaced anyway. You can do the same with kitchen cabinet or fitted cupboard doors.

For more information on how to protect your home from flooding please see:

Homeowners guide to flood resilience

http://www.knowyourfloodrisk.co.uk/sites/default/files/FloodGuide_ForHomeowners.pdf

5.4 Kitchen Design Booklet



Floodrepairable



Repairable & Resilient Kitchen Design

for homes in flood risk areas



ADVICE FOR LOSS ADJUSTERS, CONTRACTORS AND KITCHEN DESIGNERS

Most people would agree the kitchen is at the heart of every home. When a flood happens the kitchen is often the most costly item to replace. If you are visiting a home owner in an area at risk from flooding especially if it is following a flood, this leaflet will help you to discuss the potential to put in some elements of 'flood resilience' in the new design. Emphasis can be placed on the fact that making adaptations to the kitchen could significantly reduce the disruption and loss if a flood or another flood should occur. It doesn't always have to involve great cost.

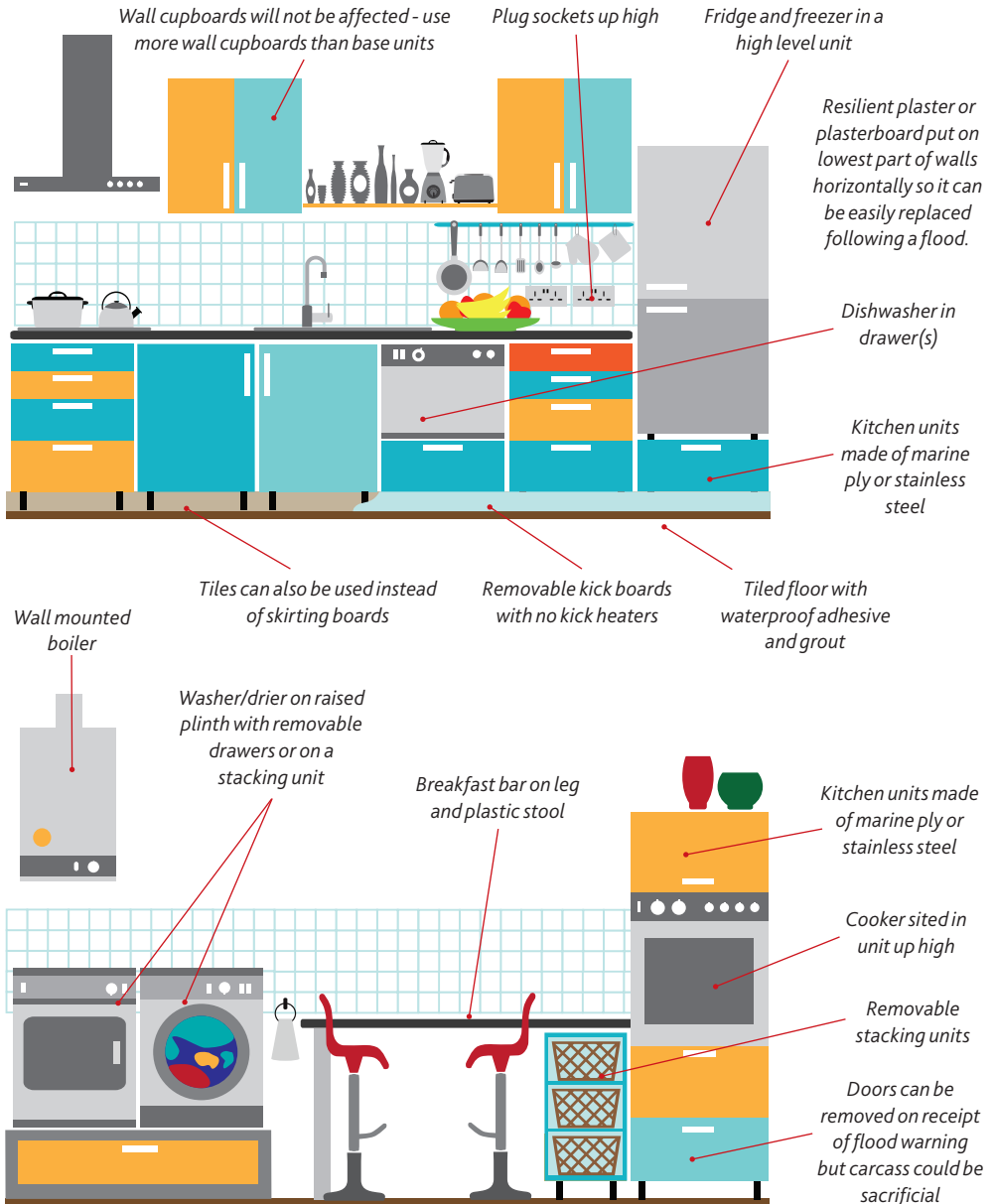
In areas where the floodwater is not likely to be very deep, just using a little creative design can do the job easily. But, for areas prone to extreme flood depths, it is important to completely rethink the design of the kitchen, so that it can become fully functional as soon as possible after the flood water has gone.

This leaflet illustrates some design ideas, with case studies and suggestions for the type of changes that could be made. The leaflet could help you to share ideas that boost the confidence of your customer in the potential for a flood resilient kitchen.



Resilient measures for lower and mid level floods

Small design adjustments (as illustrated below) can help reduce the damage of a lower level flood. Changing the fabric of the kitchen units can be helpful in a midlevel flood.



Resilient measures for high level extreme flood

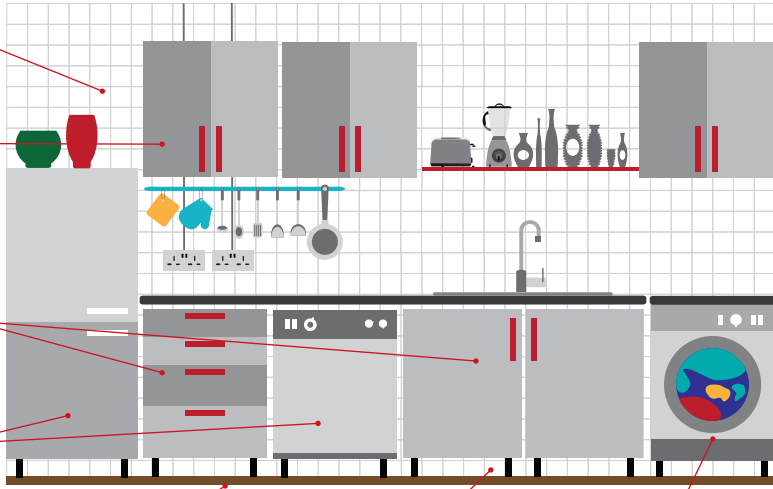
When you expect a flood of this depth, it is a good idea to be able to empty and move as much of your kitchen contents upstairs or to a place of safety.

Tiled to ceiling using waterproof tile grout and adhesive

Air gaps or removable wall cupboards for ease of drying and cleaning

Free standing kitchen units or of different material - steel/plastic/marine ply

Free standing appliances



Central heating boiler to be sited upstairs

Tiled floor with waterproof adhesive and grout

Tiles can also be used instead of skirting boards

Free standing appliances or move washer and dryer upstairs

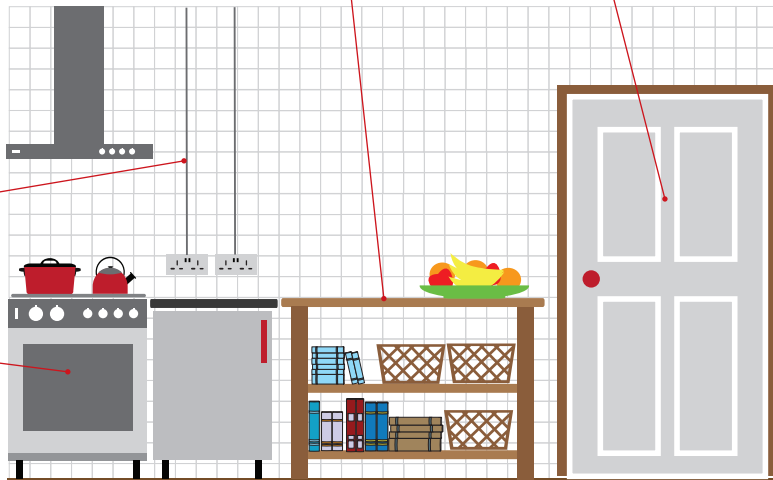
Kitchen table - lightweight and easy to move

Free standing wooden unit

A kitemarked flood door gives you time to move things to a place of safety

Electric wiring coming down from the ceiling

Electric cooker can be unplugged and lifted upstairs



Creative design ideas for repairable kitchens

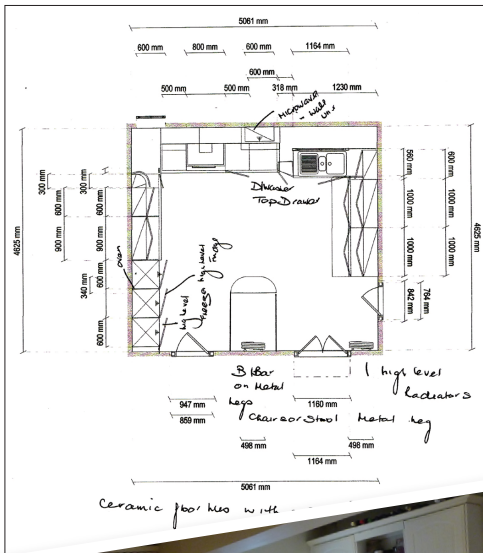
Sally from 'Options Kitchens' experienced flooding herself when her shop in Tewkesbury was devastated during the 2007 floods.

Having a great understanding of the disruption floods can cause, she has been working with flooded households in Tewkesbury to improve their resilience since that time.

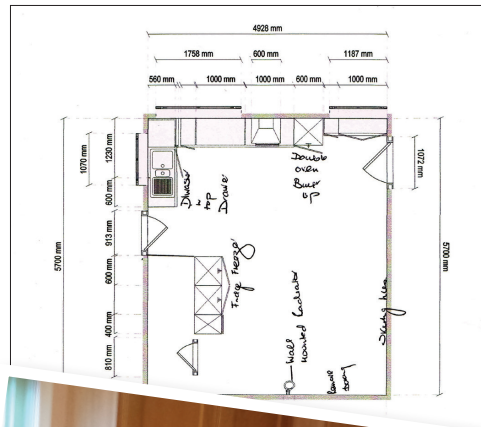


We asked her to create designs for two volunteers in the Tewkesbury area to show how off the shelf products can be used to increase resilience to low to medium level flooding.

Resilient Kitchen Design 1 - see page 6-7



Resilient Kitchen Design 2 - see page 8-9



"Although stainless steel and free-standing units are available, we find most customers prefer their kitchens to appear 'normal' while incorporating lots of ideas that will help save as many appliances and fittings as possible."

Resilient Kitchen Design 1 from 'Options Kitchens'

We find that the most expensive items to replace in a kitchen can be the appliances especially if they are integrated and immediately the householder finds themselves without a fridge or freezer and any means of cooking.

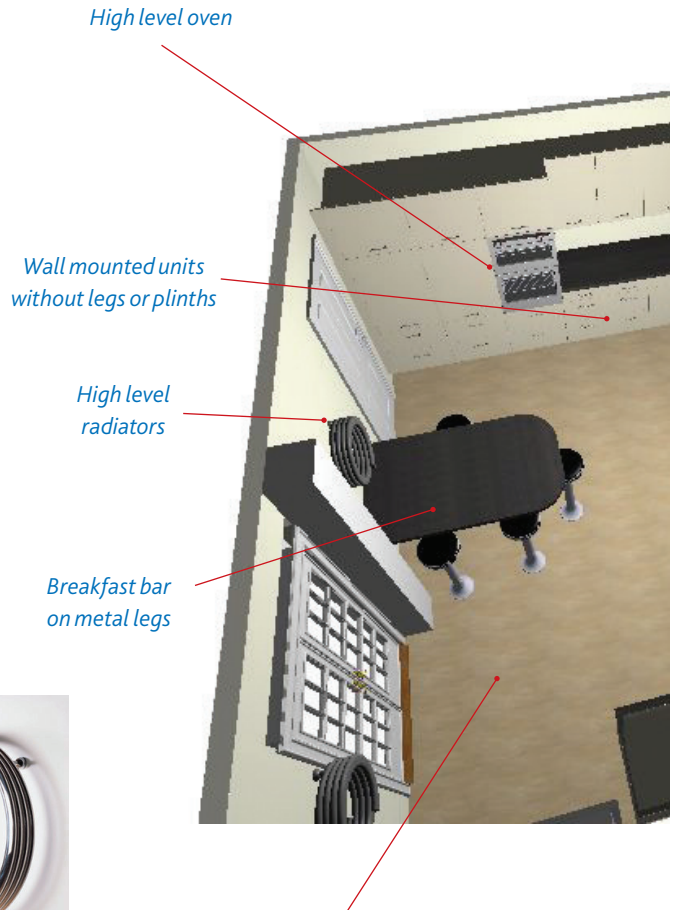


IMAGE © KIRVIAKO

We suggest a high level fridge in one housing unit and high level freezer in the second unit with a built in double oven at high level. Microwave in wall housing unit



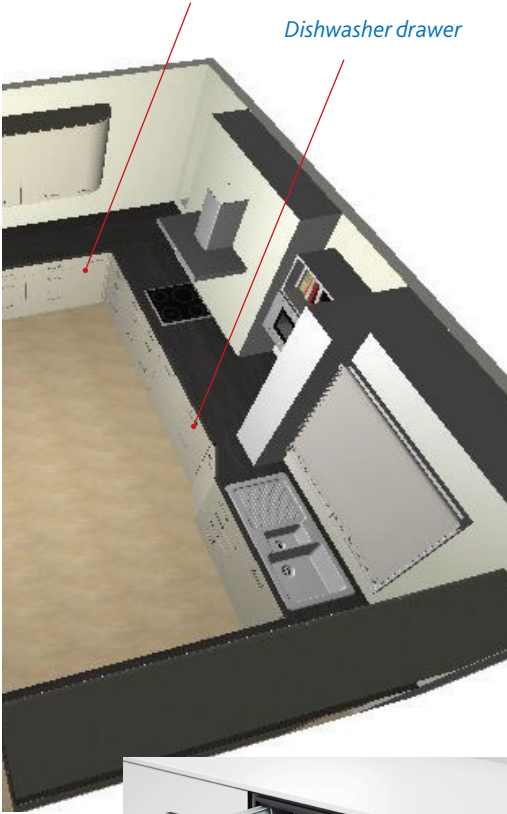
Instead of standard low level radiators, fit high level replacements, with pipes recessed into the walls. Some attractive modern designs are very suitable for this purpose



We suggest that the complete floor is tiled with a ceramic floor tile including a skirting tile. We then seal with clear mastic to stop water penetration into the plaster or plasterboard behind and above the skirting

We sell kitchens that have quick release doors and quick release drawer boxes

Dishwasher drawer



Wall mounted units without legs or plinths



Breakfast bar and chairs both with metal legs



Integrated dishwasher in top large drawer in a set of two drawers. We also fit a lot of deep drawers because they are easier to remove to a place of safety than having no boxes and then trying to empty base units

Resilient Kitchen Design 2 from 'Options Kitchens'

Although stainless steel and free-standing units are available, we find most customers prefer their kitchens to appear 'normal' while incorporating lots of ideas that will help save as many appliances and fittings as possible.

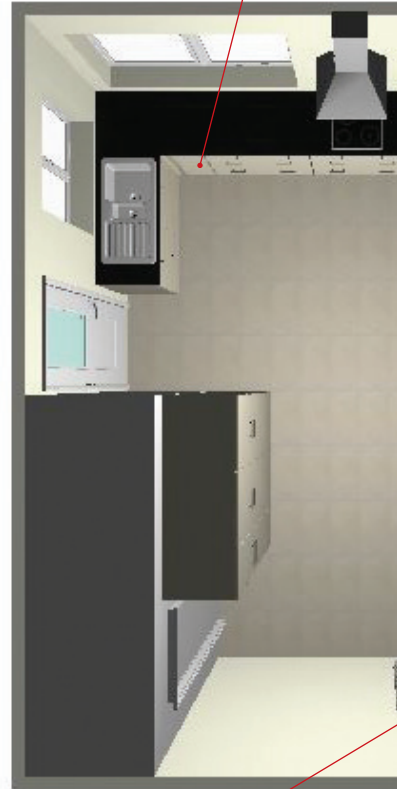


This kitchen had already got some resilient features. It did have a built in fridge freezer but was still too close to the ground. We would normally fit two deep drawers below.



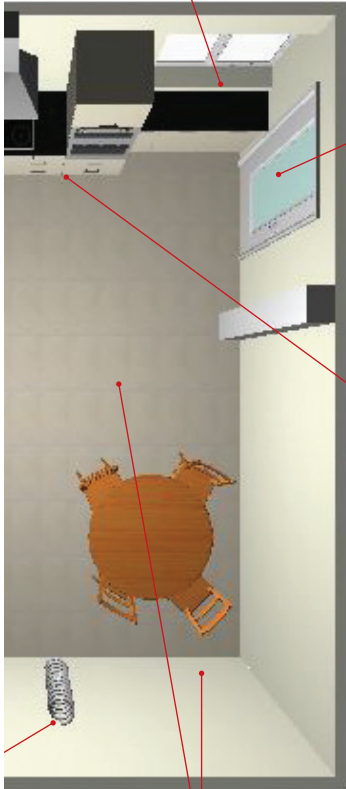
The owner liked the idea of skirting being replaced with ceramic floor tiles up the walls.

Dishwasher drawer



High level radiators

High level sockets as standard



Some of our customers have had glass doors fitted especially to cloakrooms and bathrooms in bungalows that flood

Deep removable drawers

Retain tiled floor and add tiled skirting



Although the radiator had been raised slightly, the pipes were still at low level and boxed with ply, so my drawing shows a wall mounted Bisque spring radiator.



High level sockets as standard. Also use wall mounted boilers. We offer plastic legs with a height of 20cm which can give a bit more protection if we do not have major flooding.



The dishwasher was floor standing so I would suggest one fitted just under the worktop in a deep drawer.

Other resilient design ideas from Sally...

Here are other ideas of flood resilient adaptations that have been made by the homeowners we have talked to during this project.



Designs without frames mean no need to replace trim



Removable drawers preserve the drawer fronts and are a quick way to preserve contents



Dishwasher drawer looks good and is easier to stack



High Level Radiators that look like design features



Doors that unclip without the need to unscrew



Raised island. Built in hobs and ovens can be raised above the likely flood level

...and some more ideas from homeowners and professionals

Move your kitchen: one of our case studies from Yorkshire moved his kitchen upstairs from a basement room. He said this was out of "Sheer exasperation!" and needing a solution which would allow him and pets to live upstairs in any future floods. "After the last flood I had 4.5ft of water in my basement. I power hosed and pumped out. Reliance measures definitely aided recovery".



Wrap the end of units to avoid end boards that reach the floor



Cleaning fluids of the sort hospitals use



Plastic kitchen with removable doors



Pop up sockets



Units on long legs without kickboards

IMAGE © IKEA, Syntra B.V.



Use movable/freestanding units



Under floor heating rather than radiators or kick/plinth heaters

Case Study 1 – Judy’s Kitchen

Judy Gibson was flooded in both the year 2000 and 2007. She spent almost 2 years living in a caravan whilst restoration took place. Her 'never again' attitude involved many adaptations to her home, including her kitchen.



Breakfast bar and plastic stools



Raised Boiler



Resilient acrylic doors and removable kickboards



Steel units with contents stored in removable boxes



Raised electrics



Raised oven and microwave



Detachable radiator



Stacked washer and dryer

Case Study 2 – Buckinghamshire Kitchen

This Victorian House in Buckinghamshire had experienced 2 floods in 5 years. As a result, the home owners made some changes to reduce the impact of any further flood.

This kitchen survived the flood



AGA raised on plinth



Stacked washer and dryer



Raised boiler



Marine ply units and tiled floors



Freestanding white goods can be temporarily raised with the help of a plank



Full range of steel units with floor to ceiling tiles

Case Study 3 – Sue’s Kitchen

Sue Cashmore’s house in Cockermouth has been flooded 4 times. In 2015, she was flooded to a depth of 7ft. Making use of a Government Grant and investing her own money, she has now adapted her kitchen in preparation for the next flood



Free standing white goods and wooden furniture



Ground floor is tiled throughout



Sue can't keep water out because she floods to 7ft but a flood door gives time to move things



Useful links

Flood Repairable:

www.floodrepairable.wordpress.com/kitchens-and-bathrooms

BRE Resilience:

www.bre.co.uk/resilience

Know your flood risk:

www.knowyourfloodrisk.co.uk/sites/default/files/FloodGuide_ForHomeowners.pdf

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With thanks to the many homeowners who have contributed to this guide. Also thanks to Mary Dhonau, Jessica Lamond and Sally Page. Designed by Nigel Long Design in Winchester.

5.5 Kitchen Design Flyer

A large photograph of a kitchen with a stainless steel oven and white cabinets. The floor is covered in brown water, indicating a flood. The water is shallow but covers the entire visible floor area.

Repairable & Resilient Kitchen Design

for people who live in flood risk areas

Most people would agree the kitchen is at the heart of every home. When a flood happens the kitchen is often the most costly item to replace. If you are replacing your kitchen following a flood, or simply upgrading your kitchen but live in an area of flood risk, then now is a good time to think about making things more 'flood resilient'. If you are flooded again, this can significantly reduce the disruption and loss – and it doesn't have to involve great cost.

In areas where the floodwater is not likely to be very deep, just using a little creative design can do the job easily. But for areas prone to extreme flood depths, it is important to completely rethink the design of your kitchen, so that it can become fully functional as soon as possible after the flood water has gone.

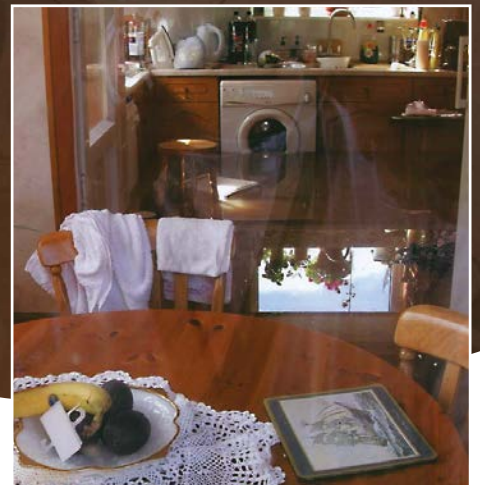
A more detailed booklet, with case studies and further suggestions for the type of changes that could be made, is available from the Flood Repairable website (see below). It will help you to discuss with confidence the potential for a flood resilient kitchen - with a kitchen designer (at any time) or with a designer and your Loss Adjuster (if claiming for a new kitchen on your insurance after a flood).

Useful links

Flood Repairable: www.floodrepairable.wordpress.com/kitchens-and-bathrooms

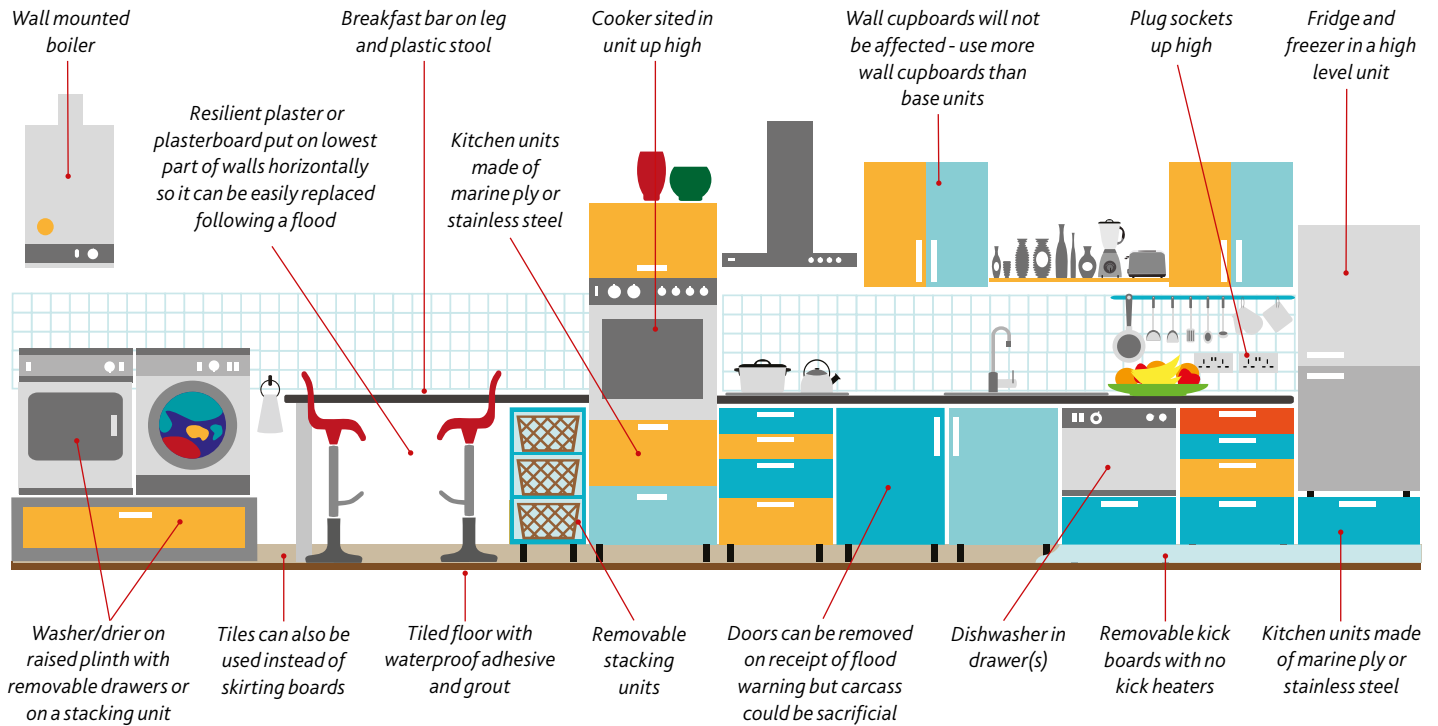
BRE Resilience: www.bre.co.uk/resilience

Know your flood risk: www.knowyourfloodrisk.co.uk/sites/default/files/FloodGuide_ForHomeowners.pdf



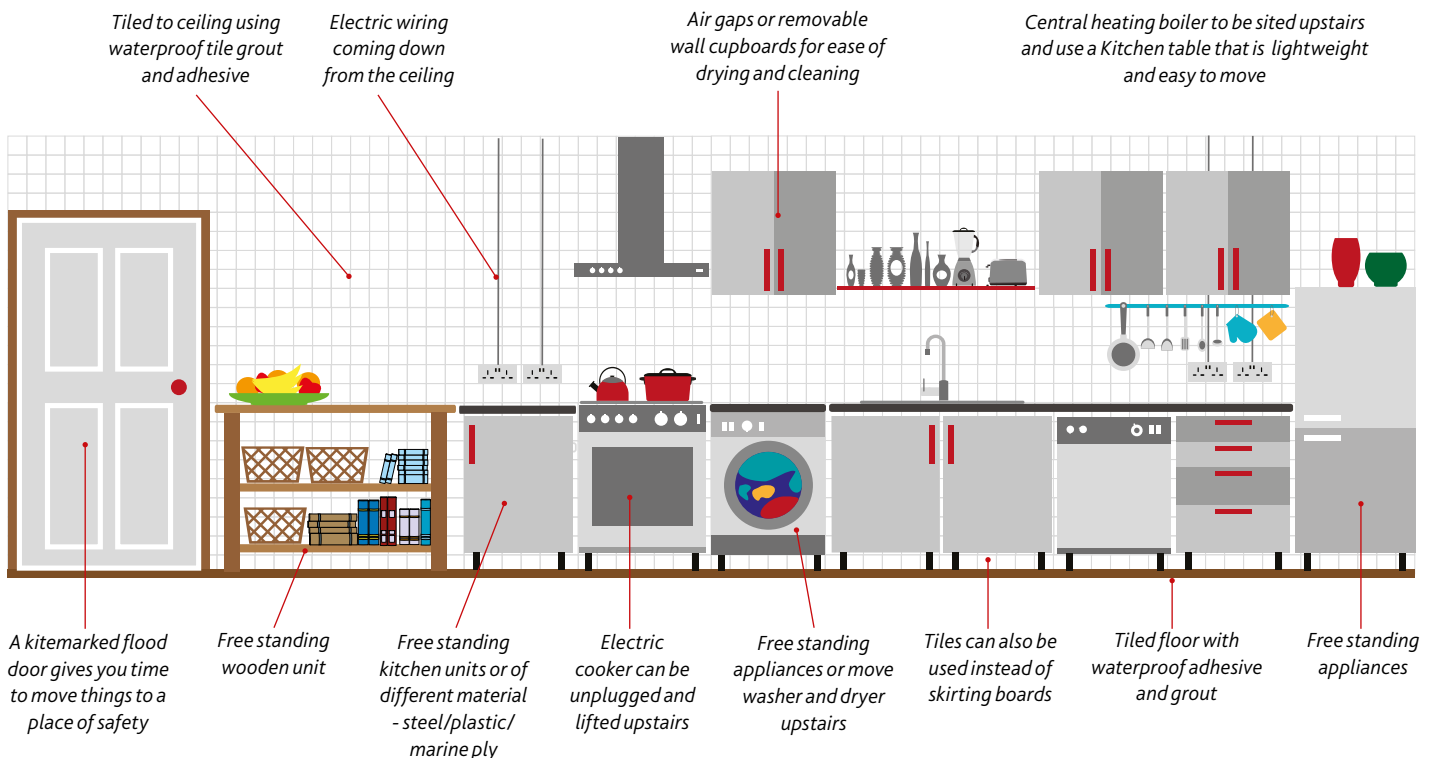
Resilient measures for lower and mid level floods

Small design adjustments (as illustrated below) can help reduce the damage of a lower level flood. Changing the fabric of the kitchen units can be helpful in a midlevel flood.



Resilient measures for high level extreme flood

When you expect a flood of this depth, it is a good idea to be able to empty and move as much of your kitchen contents upstairs or to a place of safety.



Appendix 6: FD2682 Supporting the uptake of low cost resilience: Draft recovery guide

This draft document has been produced as part of the Defra project FD2682 for use during the pilot demonstration phase. Elements of this document may be taken forward into local recovery guidance materials. This version produced 02/03/2016 is **for personal use not for distribution**.



PLANNING TO RECOVER QUICKLY AND MAKE YOUR HOME FLOOD REPAIRABLE

Jessica Lamond & Carly Rose



PLANNING TO RECOVER QUICKLY AND MAKE YOUR HOME FLOOD REPAIRABLE

If you are flooded in the future, you will want to recover as quickly as possible, taking part in all your normal activities and living in your home as you usually do.

The weeks and months following a flood can be extremely stressful for everyone in the household. If you plan ahead, it can make it easier to cope – you'll know what to do, and won't have to make so many choices at a time when you could be feeling physically and emotionally exhausted.

1. An emergency plan

An emergency plan will help you to know what to do when a flood warning is given, right up until the flood is over and you can get back to your home. It might include:

- who you need to tell about the warning
- installing temporary property level protection
- plans for moving your car and precious belongings within your property
- where you will stay while there is water in your home
- what you will do about any pets

2. A recovery plan

A recovery plan will help you to know what to do after the flood is over. This might include:

- who you will need to contact to start the recovery process
- immediate steps to get water out of your home, clean up and prevent more damage
- plans for where you might stay while your home is being repaired

It could also include ideas about how you would like your home to be repaired in order to limit the damage any future flooding could cause.

Please note - this Guide is about recovery planning - for advice on Emergency Planning see: <http://www.gov.uk/guidance/preparation-and-planning-for-emergencies-responsibilities-of-responder-agencies-and-others>

The Recovery Plan

1. Claiming on your insurance

If you have buildings and/or contents insurance, then contacting your insurance provider(s) is a top priority. They will arrange for a Loss Adjuster to visit and assess the situation. If you rent your property, you'll need to contact the owner/managing agent (as they are likely to be responsible for insuring the building itself) as well as the company that insures your own contents.

Buildings cover will usually include the drying, cleaning, repair and restoration of your home to be the way it was before. But, if you want to make your home flood repairable in the future, you should use the checklist on pages 9/10 to think about how you might want things done differently. You may have to pay for some of this work, if it costs more than a 'like-for-like' repair, but this could be a worthwhile investment for the future.

Contents cover usually includes the drying, cleaning and restoration of your possessions. For any covered items that cannot be cleaned up or repaired, a replacement (or money to purchase one) will normally be made. If you wish to make changes, such as choosing new items that are less likely to be damaged in a future flood, you should discuss this with your insurer, it may cost no more or they may agree to a 'cash settlement' for this purpose allowing you to choose whatever you want.

People who do not have insurance will be responsible for covering the costs of the flood damage themselves. The local authority should be able to advise on any grants that may be available, or charities that could help in this situation.

2. Returning home - the first visit

The first time you go back to your flooded home can be very upsetting - the building won't just be wet and muddy, but is likely to smell dreadful, especially if there was sewage in the flood water. You need to take great care, as there could be dangers to consider:

SAFETY FIRST

If you suspect gas is leaking, do NOT enter the building but contact the gas emergency service on freephone:

0800 111 999

All the electrical wiring, sockets and so forth in your home will need to be inspected by a qualified electrician before they can safely be used again.

All gas appliances, supply pipes and flues should also be inspected by a qualified engineer before they can safely be used again.

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You also need to think about other hazards, including:

All surfaces are likely to be slippery. Any puddles/mud on driveways, paths or garden areas could also be hiding uncovered manholes/drains/ damaged surfaces, or sharp objects such as broken glass/pieces of metal.

The following precautions will help keep everyone safe:

- Try to return during daylight hours, taking a large battery-powered flashlight with you. Turn this on before entering the building - you should not attempt to turn on the lights or do anything that could cause a spark.
- Wear waterproof clothing, including gloves, wellington boots and a face mask (from DIY shops) – the floodwater may have contained harmful substances such as sewage/oil etc
- Make sure any cuts, grazes or sores are covered with waterproof plasters (as well as wearing waterproof gloves)
- Don't take children or pets with you on this first visit!

Don't throw anything away at this stage without the agreement of your Loss Adjuster, or it could affect any claim. For insurance claim purposes it is a good idea to make your own record of the damage, so take photographs/videos and/or make detailed notes. Taking the following items with you on this first trip can help with this:

Permanent ink marker; camera/video-camera/camera-phone; notebook and pen; a pair of large, sharp scissors (capable of cutting through carpet); large plastic bin bags

Usually the Loss Adjuster will need to examine everything that has been damaged, but in a major flood it may be several days before they can visit. If so, follow their advice – for instance, they may suggest you take up all floor coverings and put them outside to get the drying process started. This can be difficult, so:

Top Tip: As soaking wet carpets/underlay are very heavy, use the sharp scissors to cut them into sections to make this easier. Cut off and keep a small piece of each carpet and any underlay (about 6" square of each) and put these samples in a plastic bag, to show the Loss Adjuster the type of floor-covering you had.

All the food from freezers and fridges will need to be thrown away (whether it was ruined because flood water got in, or because the power went off). But, before you start filling those bin bags:

Top Tip: If your insurance policy covers your freezer/fridge contents, then take photographs, and also make a list of all the food you throw away.

If your Loss Adjuster has agreed to you disposing of any other items, then make sure you note down important details (such as the make and serial number of things like televisions).

3. Finding temporary accommodation

Your insurers should be able to help with this, typically paying for an hotel/b-and-b for a short time until longer-term arrangements can be made. Bear in mind that, after a major flood, there will be many people looking for accommodation at the same time, and you may be offered a place that is a long way from your workplace/schools. Some people choose to stay with friends or relatives, but even this can become stressful, as the restoration of a home can take many months.

Use this space to record useful thoughts, numbers and contacts for example: arrangements to take care of your pets and the post office redirection service.

4. Cleaning

If you have to undertake the process of cleaning your home, then detailed information on the way to tackle this can be found here:

http://www.knowyourfloodrisk.co.uk/sites/default/files/FloodRecoveryGuide_Interactive.pdf

4. Useful numbers after a flood

You will need to contact a number of people after the flood. Keep a list of important numbers (including your insurance company 24 hour emergency number, your GP etc) in your recovery plan.

Use this space to record useful numbers

MAKING YOUR HOME FLOOD REPAIRABLE

When people are flooded they often find that recovering their home is even more stressful than the flood itself. If you have been flooded before you might understand how difficult recovery can be and want to make changes to speed up recovery if you were flooded again. There are lots of things you can do to help speed up recovery – some of them mean making changes to your home, **making your home flood repairable so you can get back home as soon as possible**, and you can do this at any time. Some of the ideas don't cost much especially if you are redecorating or buying things for your home after a flood or at any other time.

The picture on page 7 shows lots of different ways you can think about making your home more repairable. Some of them you can do yourself –others would need a specialist. It is also important to understand the sort of flooding you are likely to experience and to think about how much warning time you are likely to have to prepare your house immediately before the flood happens.

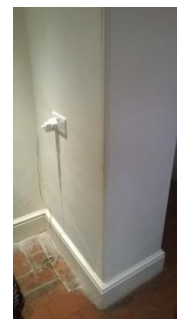
Here are some links to more information to help you decide what to do, followed by examples of some low cost options.

http://www.knowyourfloodrisk.co.uk/sites/default/files/FloodGuide_ForHomeowners.pdf

<http://www.nationalfloodforum.org.uk>

RAISED SOCKETS

Making sure your sockets are higher than the expected flood depth can save you having to have your property rewired after a flood. Having sockets higher up the wall can be more convenient too and makes your house up to date with building regulations. If you are having your walls repaired after a flood you can ask the insurance company to do this and often it wont cost you anything. If you are having any other building work your electrician can often raise sockets without too much extra cost or disruption.



REPLACING CARPETS WITH VINYL OR RUGS

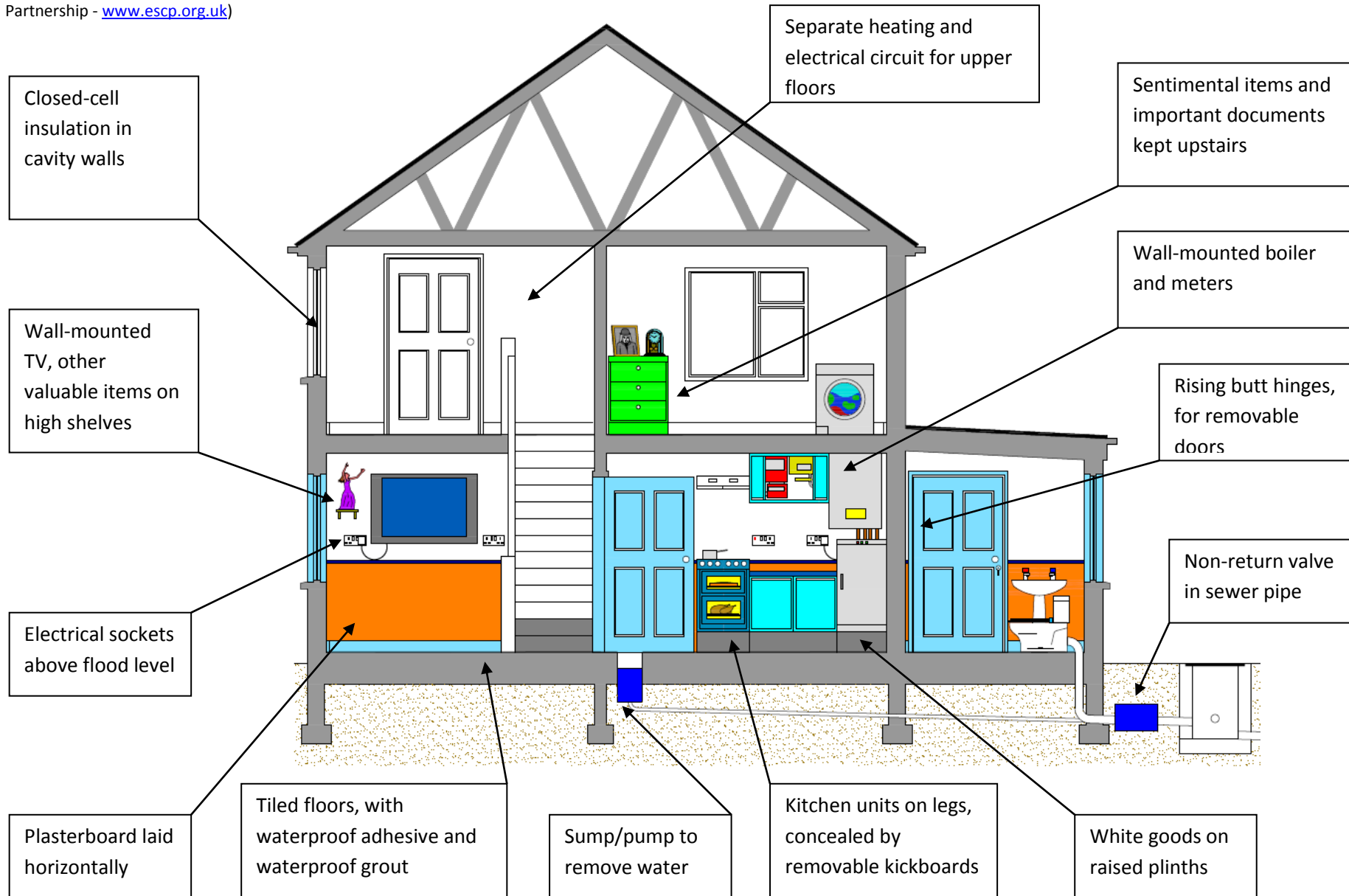


Some floor coverings can survive most floods and just need a good clean before you can move back in. Examples are tiles, some vinyls and resins but you must make sure that you get good advice about the adhesive and grouting you need to use to make sure that the tiles and vinyls stay in place during a flood. This type of flooring also reduces the amount of water that gets into your floor and might speed up any drying. You can make this kind of change next time you are thinking of replacing your carpet or floor covering or you can talk to your insurer after a flood.

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The Flood-Repairable House

(Adapted from original image courtesy of the Eastern Solent Coastal Partnership - www.escp.org.uk)



RAISING YOUR ELECTRICAL GOODS AND TECH

This can include things like your TV or your oven as well as the white goods in your kitchen. You can mount your TV in a higher shelf or onto the wall above the likely flood level. You can do this at any time and it should be fairly cheap to do. High level ovens can be built in next time you change the kitchen. You can move things permanently or think about how you could move them just before a flood



REMOVABLE ITEMS AND INTERNAL DOORS



If you think you will have a warning and time to move things then making sure that furniture is lightweight and you know where you might put it. Doors can also be removed if they are lightweight and have the right hinges. New hinges can be put on doors at any time and you can also ask your insurer to do this after a flood. This might not cost you anything if your doors are being replaced anyway. You can do the same with kitchen cabinet or fitted cupboard doors.

Use the checklist on the following pages to help you to think about the changes you might like to make to increase the repairability of your home and the things you would not like to change.

You can use this in discussions with your insurer if you do get flooded again. They may include your ideas if they do not cost extra. Insurers may advise you how much it would cost you to make the changes and build them into the planned reinstatement

If you are redecorating or thinking about making other changes in your home you can refer to this plan and decide whether to increase your repairability at the same time.

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CHECKLIST FOR RESILIENT RECOVERY

	Current choice	Resilient choice
Change room usage		
Change plaster type		
External walls		
Internal walls		
Changing floor		
Kitchen		
Bath/cloakroom		
Entrance hall		
Reception room		
Reception room 2		
Other room		
Other room		
Changing wall covering		
Kitchen		
Bath/cloakroom		
Entrance hall		
Reception room		
Reception room 2		
Other room		
Other room		
Changing internal doors		
Changing skirting board		
Change external doors		
Resilient staircase		

Change windows		
Relocate electric sockets		
Relocate boiler		
Relocate meters		
Resilient kitchen		
Resilient bath/cloakroom		
Change insulation		
Wall mounted TV and other tech		
Change fitted cupboard/bookshelves		
Raise phone fittings		
Lightweight furniture		
Kitchen		
Reception room		
Reception room 2		
Anti backflow valve		
Secure outside tanks and other garden features		