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# Mapping flood recovery gaps

## Multi-method research into flood recovery

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# Mapping flood recovery gaps: Final project report

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## Executive summary

An extensive piece of work to investigate the provision of post-flood recovery, "Mapping Flood Recovery Gaps", was conducted in the Humber region as a successful collaboration between the University of Hull and Aviva, supported by the Aviva Foundation.

The project developed and tested a suite of tools capable of deployment across different areas and regions. The tools include:

- A detailed review of available academic and policy literature which identifies thematic and specific gaps in post-flood response
- Information about experiences of flood recovery gaps from experts and stakeholders, collected through semi-structured interviews informed and guided by insights from the literature
- A new, bespoke serious game which can be distributed and used in structured, facilitated workshop events to surface, identify and seek solutions to flood recovery gaps, encourage stakeholder engagement, communication and coordination, fostering and building common purpose.
- This report provides a synthesis of the outcomes from the project's investigation of flood recovery gaps and identifies measures and opportunities to improve, provided through recommendations tailored for the local area.

Gaps in the provision of flood recovery were found to be numerous and widespread across the literature, in the semi-structured interviews and in the workshop exercises. The fragmented nature of flood governance resulted in gaps in communication and co-ordination, procedural standardisation, provision and availability of funding and other resources and information sharing.

The consequences of these deficits for affected individuals extended beyond adverse financial and property impacts, with prolonged effects on physical and mental wellbeing widely reported. Disadvantaged and elderly groups were particularly highlighted. Gaps also resulted in opportunities to build back better after flood damage often being missed.

Once implemented widely, these tools have the capacity to identify gaps in post-flood recovery, support action to close gaps and improve confidence and wellbeing in communities at risk of flooding.

Initial indications suggest there is wider demand for the tools developed in this project. Further work is indicated to evaluate demand systematically and refine the tools for more widespread deployment and implementation.

The project team is working with Aviva to co-create additional new resources to secure legacy support for the project deliverables.

# Introduction

Flooding is one of the most widespread and devastating consequences of extreme weather. According to the OECD, each year floods cause more than \$40 billion in damage worldwide (OECD, 2016). In England alone, five major flood events since 2007 caused an estimated £7.6bn of economic damage (Environment Agency, 2022b). Research from Oxford University identified infrastructure or networks serving more than two thirds of England's homes was at risk of flooding (Environment Agency, 2022a), whilst 5.2 million homes and businesses were at direct risk of flooding in the UK in 2020 (Environment Agency, 2020). There is also extensive, compelling evidence linking floods to adverse mental health and wellbeing outcomes (French, Waite, Armstrong, Rubin, et al., 2019; Jermacane et al., 2018).

The intensity and frequency of flood events is predicted to worsen in future due to climate change. According to current forecasts the number of people at risk could double as early as 2050s (Betts et al., 2021), and if further actions are not accomplished, under a 2°C by 2100 warming scenario, the damages for non-residential properties across the UK are expected to rise 27% by 2050 and 40% by 2080 (Sayers & Rowsell, 2020). Furthermore, under future scenarios, raising flood and coastal defences will become technically and socially challenging, as the Environment Agency (2020) estimates that in the long term, it will be necessary to spend approximately over £1 billion annually over the next 50 years to prevent further flood risk.

Thus, it is clear that society must adapt. We need to make dramatic and urgent reductions in the generation of greenhouse gases to mitigate climate damage, but we must also learn to live in a wetter world, including how we prepare for, and recover from, extreme flood events.

The Energy and Environment Institute at the University of Hull is a centre of excellence for floods research, with a collaborative reach that emphasises delivering real impacts at a regional and national level. As part of that regional focus, the Institute hosts the Flood Innovation Centre. The Flood Innovation Centre is an ERDF-funded scheme to foster growth in the nascent flood marketplace, and with a remit to increase regional resilience to flooding.

# Project background

The "Mapping Flood Recovery Gaps" project is a research partnership for delivering effective post-flood support. The project is led by the Energy and Environment Institute and the Flood Innovation Centre (both University of Hull), and is funded by the Aviva Foundation\*. The project aims to explore gaps in the provision of post-flood support and how to best achieve 'effective' post-flood recovery.

The project applies different research methods such as a systematic literature review that analyses the state-of-the-art knowledge at international, national and regional levels, as well as participatory methods that engage the knowledge and experience of regional and local stakeholders.

An important part of the project was to organise a workshop with local and regional stakeholders engaged in flood risk management, emergency planning and resilience as well as those previously affected by flooding, where a serious game created by the researchers was used as a tool to stimulate discussions and share ideas about flood recovery.

The current patchwork of national agencies and government departments involved in responding to flood incidents can lead to fragmented and inconsistent post-flood interventions. This means that flood-impacted householders and businesses can struggle to access timely, affordable, and effective resiliency-focussed recovery. The Mapping Flood Recovery Gaps project has investigated the reasons for these struggles, identifying gaps in the provision and deployment of post-flood recovery. Bringing together a multi-disciplinary team of academics, professional and strategic staff, the project has mapped

knowledge and communication gaps to develop tools and resources that can enable the 'build back better' principle to be applied effectively after major flood events. Aviva is a leading property insurer in the UK with extensive first-hand experience of the devastation that floods can cause for its customers. Within the insurance industry, Aviva has taken a leading role in providing advice and support to customers and encouraging them to implement resilience measures. The project team has been supported by regular meetings with colleagues from the Aviva Claims Services and communications teams, and by the project's advisory board comprising flood and insurance industry experts (See Appendix I), in order to provide an informed insight into the role and support that the insurance industry plays in flood recovery.

Combining qualitative research methods with innovative participatory tools in the form of 'Serious Games', we have brought together stakeholders from the Humber region and beyond to identify and resolve gaps in flood recovery. The first section of this report provides a brief explanation of the hydrological and socio-hydrological contexts in which this work has been undertaken. The second details the activities we have undertaken in the course of the project, before the third sets out our findings from the different stages of our research. The fourth and final section presents our conclusions, together with recommendations.

\*Additional funding was provided by the ERDF and the University of Hull.

# Part one: Project context

## The Humber region

The Humber region is a relatively low-lying area of Northern England, straddling the banks of the Humber estuary and bordering the North Sea. Comprising parts of the counties of East Yorkshire, North Yorkshire, North East Lincolnshire, and North Lincolnshire, it contains three of the UK's busiest ports in Hull, Grimsby and Immingham. The Humber estuary drains one fifth of England, with extensive wildlife habitats and a number of nature conservation designations. The region is home to 500,000 people and contains 120,000 ha of agricultural land. It hosts the second largest chemical cluster in the UK, two of the country's six oil refineries, and five power stations. More than 25% of the UK's primary energy supply flows through the region, and its ports handle 14% of UK trade (Environment Agency, 2019).

## Flood events in the Humber

The Humber region is the most flood-prone in the UK outside London, with over 190,000 properties at risk (Environment Agency, 2019). Whilst flooding in the region has always happened - and is responsible for the richness of much of the estuarine farmland - the past 15 years have seen two of the most extensive flood events ever recorded. In June 2007, unusually high rainfall over a ten-day period caused devastating surface water flooding which impacted 1,300 businesses, 8,600 homes and 91 of Hull's 99 primary schools (Coulthard et al., 2007). In many cases, families were relocated to caravans whilst repairs to properties were undertaken, sometimes for many months. Extensive research carried out since 2007 has highlighted the devastating economic, psychological and social impacts of the flooding, and the multi-generational impacts it continues to have.

It was doubly devastating therefore, when a significant storm surge overtopped Hull's extensive coastal defences in 2013, causing flooding within the city and across the region. Whilst the damage caused was mitigated by infrastructure such as Hull's tidal barrier, the 2013 event served as a timely reminder that the region faces threats from multiple sources of flooding, and needs to continually improve resilience. This is particularly so given that climate change is increasing the intensity and frequency of storms, as well as increasing sea-level. As much of the region sits at or below mean sea-level, innovation, resourcefulness and urgency are required to face the Humber's future flood risk.



Figure 1: The Humber Bridge from the East Riding of Yorkshire



Figure 2: Grimsby docks and dock tower



Figure 3: Hull Floods 2007, Chevening Park, Kingswood - photo by Paul Lakin



Figure 4: Tidal Surge Barrier, Kingston upon Hull - photo by Sean Spencer

# Part two: Project activities

The Key Performance Indicators (KPIs) identified in the project proposal (Table 1) shaped the planning of the activities undertaken by the project team. Part two of this report describes the extensive desk-based activity that allowed us to target the KPIs effectively, and goes on to detail the actions that led from the identification of gaps from the literature review and stakeholder interviews.

Table 1: Project Key Performance Indicators

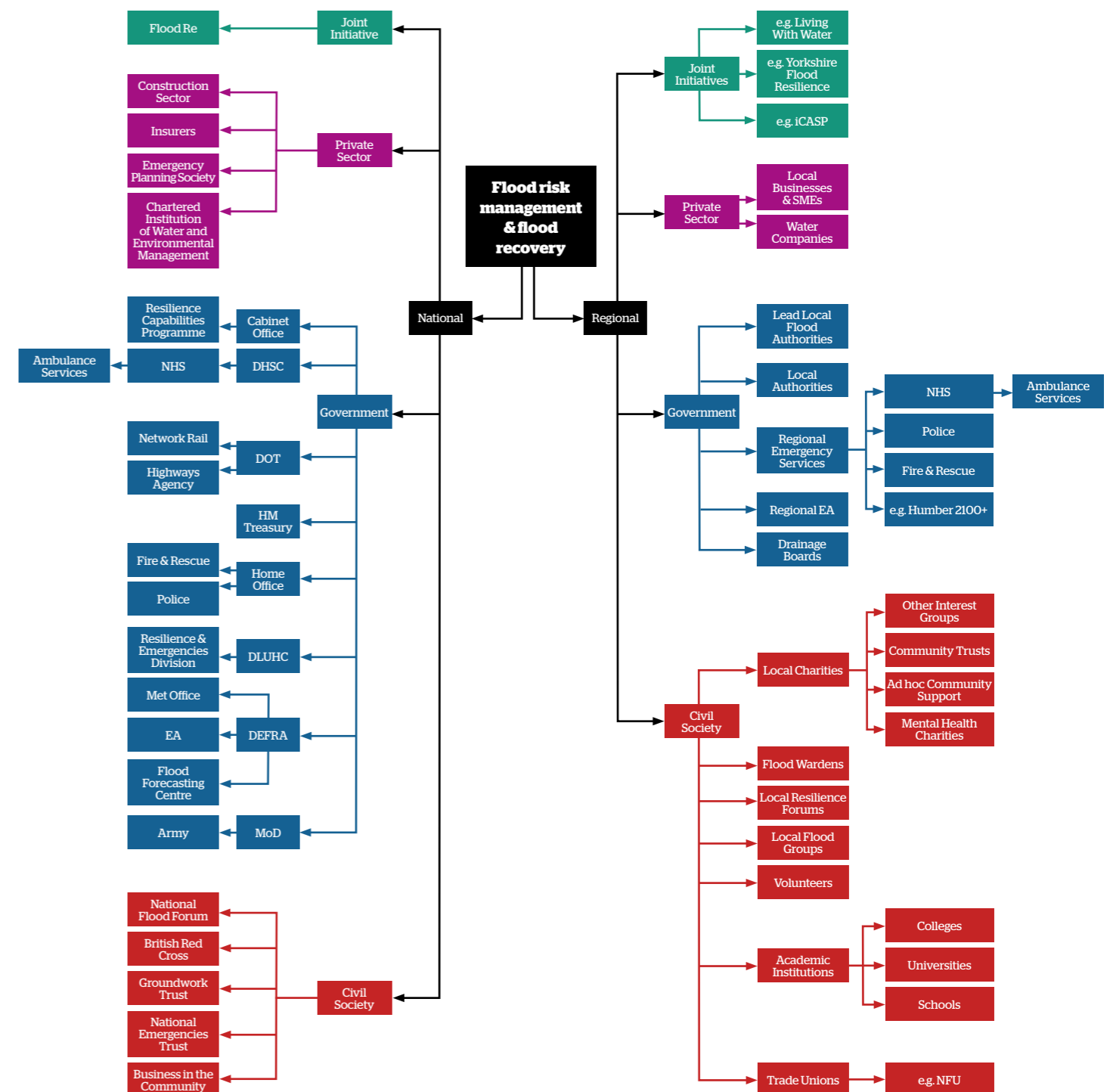
KPI	Description
1	Improvements to confidence and wellbeing in communities at risk of flooding
2	Number of households with improved access to resources to build back better after flooding
3	Increase in number of properties protected by property-level flood resilience measures
4	Improved collaboration between key agencies and stakeholders in response to a flooding event
5	Improved data capture on risk management and feedback loop to improve underwriting [In close collaboration with Aviva]
6	A tried and tested local protocol that can be scaled up across the UK through partnerships with DEFRA pathfinders, roundtable and other inter-regional bodies
7	Identification of knowledge gaps for metrics of property level flood resilience measure [In close collaboration with Aviva]

## Desk-based activities: literature review and stakeholder interviews

Stimulated in part by the fragmented nature of roles and responsibilities in flood risk management and flood recovery in the UK, the project needed to establish a clear picture of governance arrangements around flood recovery. An early activity was therefore a mapping exercise to illustrate the linkages and gaps within flood recovery (See Figure 5).

This initial flood governance mapping exercise was paired with a formal academic systematic literature review, to examine the current state of knowledge within the different disciplines that share an interest in flood resilience. The primary aim of this was to achieve a robust list of research-based gaps which would inform later activities, as well as using the literature review to understand more about what is meant by 'effective' post-flood recovery.

Figure 5: Map of flood governance actors and stakeholders in the UK



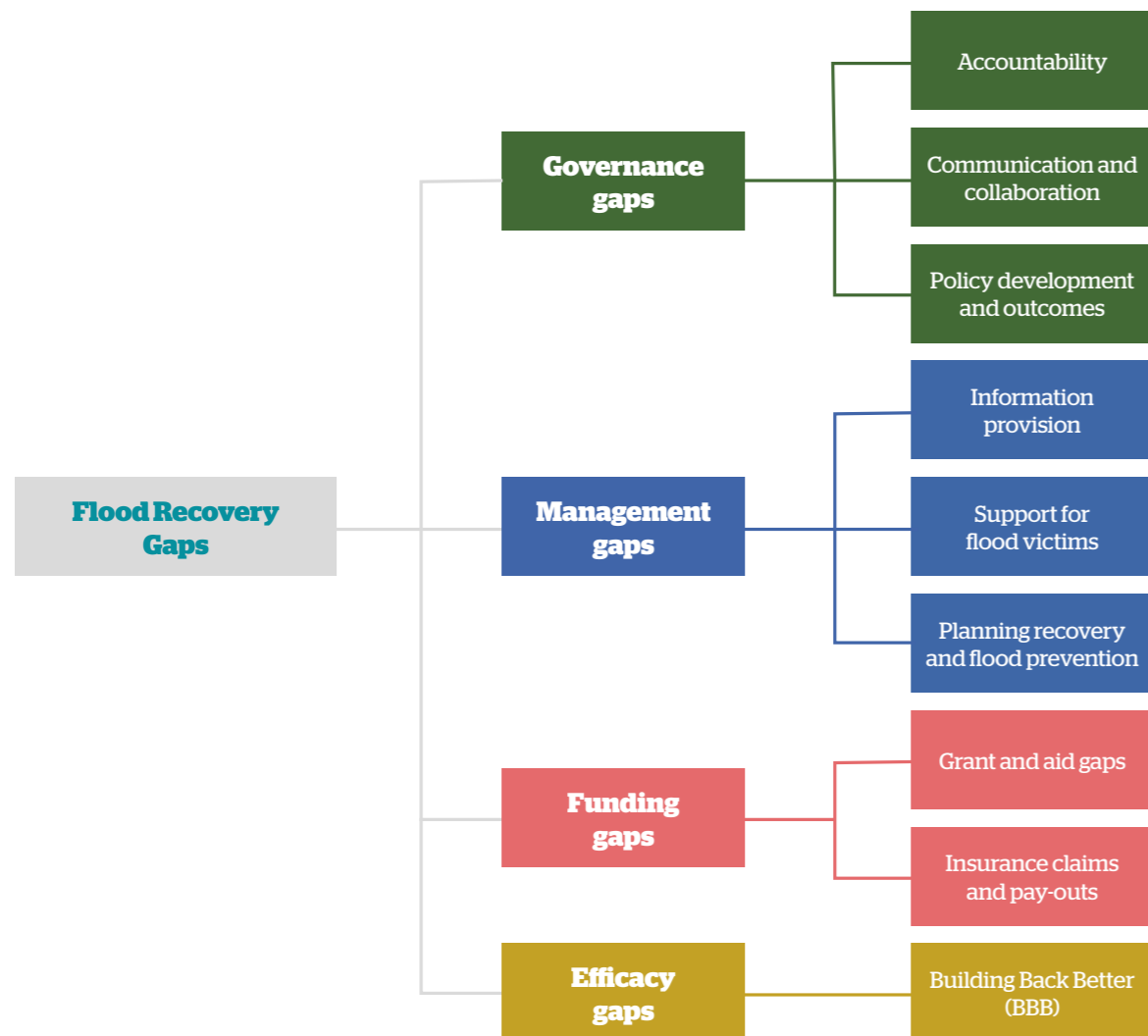
An extensive search of relevant evidence identified 733 academic articles and 80 policy reports relating to flood recovery. After sifting, a detailed review of 64 academic articles and 36 policy reports produced a wide range of flood recovery gaps which were organised into four broad themes (see Appendix II):

- Governance gaps: relating to accountability, communication and organisation, policy development and outcomes;
- Management gaps: relating to information provision, advance planning, and support for those affected by flooding (specifically in relation to mental health and support for vulnerable people);
- Funding gaps: relating to insurance claims and pay-outs, and grant aid;
- Efficacy gaps: relating to building back better as opposed to replacing like-for-like.

Policy reports and other flood-related local and national documents were identified using academic and other search engines, governmental and council websites, and other organisations related to flooding and climate change. In total, 80 documents were screened for relevant content of which 36 were coded for analysis (Appendix III).

The coding revealed key themes (see Figure 6) and these were further investigated through semi-structured interviews with 26 key stakeholders in flood recovery. These interviews were used to corroborate, elucidate and triangulate findings that had emerged from the literature review, and helped to understand them in a regional context.

Figure 6: Map of post-flood recovery gaps and subthemes identified in literature review



### Serious game development

Having established and mapped gaps across the literature and stakeholder interviews, the research team embarked on the next phase of the project: devising a serious game which would be the primary tool for engagement and data collection in a participatory workshop. We chose serious gaming as the preferred medium for this workshop because well-designed games can create an immersive and equitable environment for players to engage in problem-solving and information sharing, and can combine an enjoyable and engaging experience with carefully thought out purposes and objectives (Abt, 1987). This creative and innovative approach was deployed to encourage workshop attendance, increase stakeholder engagement, and provide an enjoyable stimulus for participants to share their knowledge and experiences of flood recovery.

Through an iterative design process, we finalised a board-based design which would give participants a tactile game experience, contrasting with online approaches and workshops dominant during recent COVID-19 lockdowns.

The game was created as a facilitated open-style, scenario-based format where participants are guided to create their own 'stories' of how to respond to a series of flood incidents. It comprises two game formats on a reversible board (board A and board B), 7 role cards, 12 scenario cards and 5 resource cards. The scenarios, roles and resources represented on the cards were informed by evidence drawn from the literature review and stakeholder interviews.

Players propose responses and deploy resource cards, reacting to scenarios set out by the facilitator before voting for the best response. The counter of the player receiving the most votes advances along 'the road to recovery', introducing a fun competitive element. Through successive rounds, players collaborate and exchange knowledge. During gameplay, if any player believes they have identified a gap in flood recovery, they sound a buzzer and record the nature of the gap on post-it notes. Facilitators gather these together to be used during a reflective post-game focus group in which each gap is prioritised for urgency and importance, before potential solutions for each one are identified collaboratively by the players.

Figure 7: The Flood Recovery Game



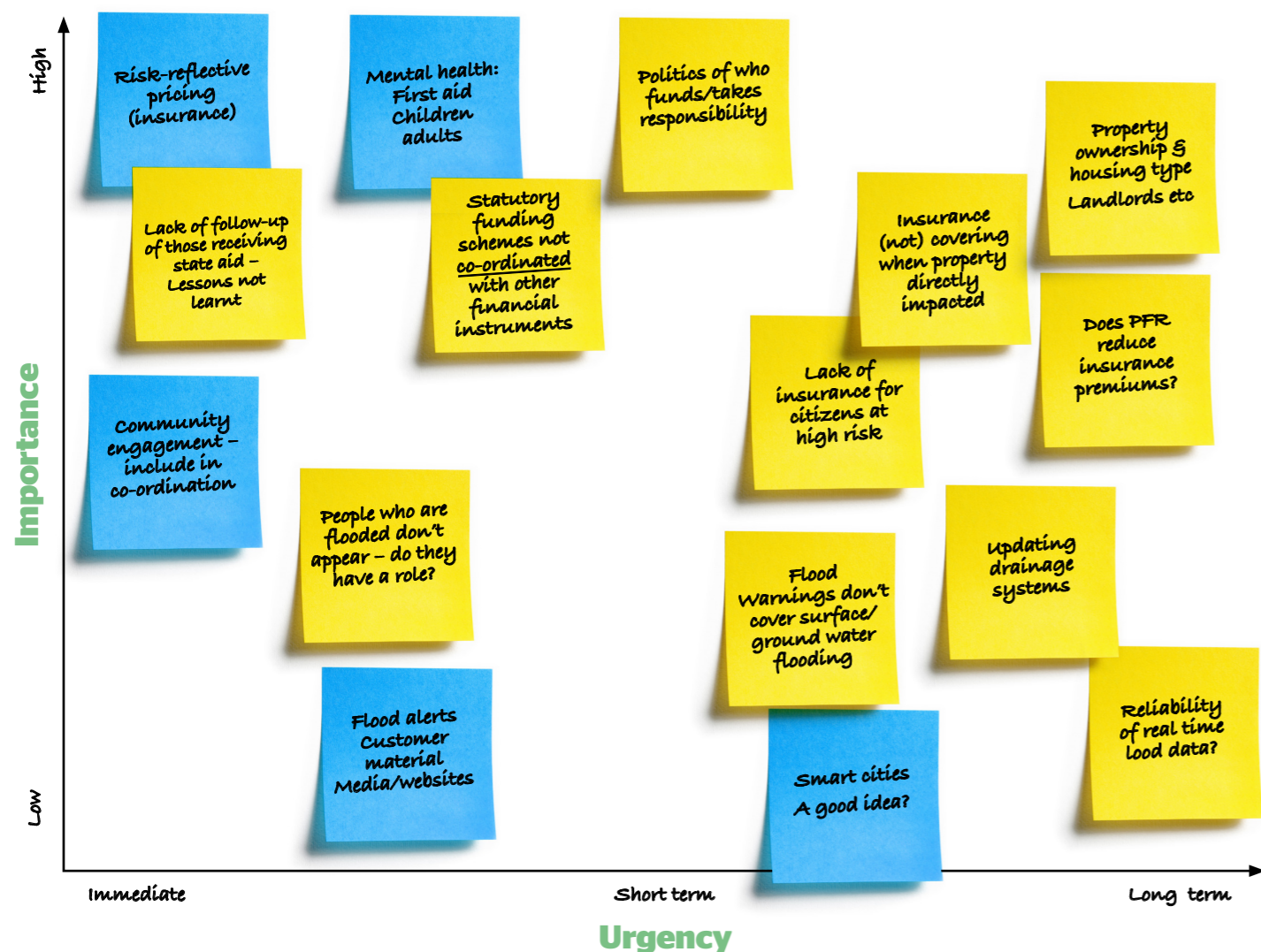
### Participatory workshops

33 stakeholders and community members representing 16 organisations participated in a workshop on Thursday 24th May 2022 at Hull Truck Theatre in Hull to explore post-flood recovery using 'The Flood Recovery Game'. The workshop aimed to:

1. Initiate and encourage discussions between different actors working on post-flood support but not actively collaborating with each other;
2. Verify and validate data collected in the literature review and semi-structured interviews;
3. Capture any additional gaps in post-flood support that had been experienced by actors involved in post-flood support in Hull and the Humber Region;
4. Verify the use of the game as a key element in a toolkit for supporting stakeholder collaboration on post-flood recovery.

The workshop format included sessions in which The Flood Recovery Game was played as well as opportunities for participants to network over coffee and lunch breaks. Post-flood support gaps identified through earlier research were disclosed to participants and the relevance of these to the regional context was explored through facilitated discussion to verify and validate data collected from the literature review and interviews. Gaps in post-flood support identified during the workshop were also discussed and participants were given an opportunity to contribute their own experiences to them. Further group work focussed on prioritising gaps by urgency and importance (Figure 8) and proposing potential solutions. The workshop ended by providing space for participants to feedback on the most urgent gaps in flood recovery and their suggested solutions. Initial findings from the workshop were written up as a Workshop Report (Available from the authors on request).

Figure 8: Mapping flood recovery gaps according to urgency and importance



## Part three: Project findings

### Governance gaps - accountability, communication, organisation and policy

Issues around flood recovery governance primarily related to the fragmented nature of flood management governance in the UK: the fact that the recovery process depends on cooperation and collaboration between various institutions, means that flood recovery is a challenging endeavour requiring a concerted effort in communication and coordination. Indeed, agreement about what comprises flood recovery in the UK even appears elusive, as multiple definitions exist (Adedeji et al., 2019; Cabinet Office, 2013; Defra, 2015). The governance of the recovery process was recognised as a demanding one by UK authorities, requiring a comprehensive strategy, as “experience has shown that the recovery phase and the structures, processes and relationships that underpin it are harder to get right” (Cabinet office, 2013 p83).

We found that gaps in communication, coordination and collaboration were the most common across the literature, both between stakeholders communicating with each other, and when stakeholders engage with communities. We found that influential stakeholders did not always recognise flood recovery resources beyond their own organisation leading to isolation of capacity and capability. Gaps in communication also include receiving contradictory information, for example Pitt (2008) reported that after a flood, residents received conflicting information regarding the risk of leaving flood-impacted homes. During the recovery process there can be a lack of channels to share reliable information, as stakeholders described in past flood events in the Humber: extra efforts were necessary to reach flood victims and distribute grants and information, and community members were not aware of who to call or where to go to acquire information and the help.

Gaps in coordination and collaboration can also undermine recovery effectiveness and efficiency (Atkinson, 2014). For example, the lack of coordination and organisational skills limits the help that non-profit organisations, charities and other community-based organisations can provide for recovery support (Albright & Crow, 2015). Similarly, through the interviews, we identified untapped potential for Small to Medium-sized Enterprises (SMEs) to provide products and services during the recovery stage, primarily due to lack of engagement with SMEs from the national flood governance bodies.

We also found that the lack of standard procedures for recording recovery costs and efforts (Lai et al., 2014) was widely cited as leading to sub-optimal outcomes. Stakeholders mentioned how difficult it was to recover all the information learnt on the ground by the various actors working in the recovery process, and that it is not possible to keep track of all the measures and funding invested in recovery. Stakeholders working in the insurance sector particularly recognised that their accumulated experience is rarely shared outside their sector. SMEs were identified as a complex sector and relatively neglected in policy terms (Drennan et al., 2016). The importance of identifying the “lessons learnt” has been recognised as a key part of the recovery process (Defra, 2015), however stakeholders mentioned how difficult it was to recover information learnt on the ground during the recovery process, and that therefore policy was slow to update.

## Management gaps: information, planning and support

Every flood event presents different challenges, and the source of the flood also influences management strategies, as different organisations are responsible for different kinds of flood. There are limitations in the capacity of local government for drawing up flood risk management. This applies in terms of staffing levels and expertise in accounting for changing patterns of exposure and updating hazard maps. We learned that gaps can occur during the incident response phase if leaders authorised to take consequential decisions lack advice from experienced expert colleagues to support their effective decision-making.

Challenges also vary depending on the magnitude of the flooding. Large-scale flood events intensify demand for resources and materials, often exceeding the available capacity in insurance professionals, recovery workers and the building repair market. This can slow down insurers' ability to respond to their customers and thus hampers the recovery process of whole communities.

Providing support for flood victims displaced or requiring emergency accommodation presents different challenges in the post-flood period. For flood victims with insurance, the capacity of the local area to accommodate potentially large numbers of displaced householders can be limited. In rural areas, for example, there may be no suitable accommodation within a reasonable distance.

Managing the clean-up process after a flood event was identified as problematic both in the literature and during interviews. A larger clean-up process after a flood is the responsibility of multi-agency partners, replicating the challenges of governance identified above. After a flood, the need to dispose of tons of debris is one of the most urgent actions that might hamper recovery (Jukrkorn et al., 2014): our stakeholders confirmed that there is a widespread lack of planning for debris management within the flood planning process.

We identified significant gaps in relation to information sharing by flood management organisations and insurers. The literature suggested that information about how to recover from flooding efficiently and more rapidly was scarce; our interviews confirmed that councils distribute this kind of information after the event has already happened, and there is limited provision of property flood resilience information from insurers to their customers. Householders therefore routinely lack awareness about taking action to protect their property from flooding: there is little action towards reducing flood risk even when the risk is imminent (Bird et al., 2014). Misperception of flood risk can also increase vulnerability of households and businesses as it can prevent people from taking action

(Bhattacharya-Mis & Lamond, 2014; Pathak & Ahmad, 2016). According to a survey commissioned by Aviva (2021), 56% of people living in high flood risk areas do not believe their property is at risk of flooding, and of the 34% that consider that their home is at risk, only 9% believe they are prepared to face a flood. In Hull only 28% of people surveyed who had experienced flooding had installed any property-level protection (Ramsden, 2021).

The challenge of supporting the physical and mental health of flood victims featured prominently in the literature we reviewed. In particular, the impact on mental wellbeing of prolonged displacement (Milojevic et al., 2016; Pitt, 2008; Ramsden, 2021) creates a need for long-term mental health support from services that are already overwhelmed. There is currently a lack of frameworks and initiatives to support and follow long-term mental health care of flood victims (Kiran et al., 2021). This was widely recognised by interviewees from emergency services, charities and in the workshop with stakeholders as a serious gap. Furthermore, there is also evidence of mental health impacts and psychological strain on post-flood responders (Fekete, 2021), which can sometimes be forgotten.

Similarly, we found gaps around the provision of support to more vulnerable individuals and communities. It has been recognised that disadvantaged individuals require more coordination between service providers and uninterrupted services (Atkinson, 2014). Landeg (2019) reported that confusion over criteria for identifying vulnerable people hampered the coordination of post-flood actions between first responders and the NHS. This was confirmed in stakeholder interviews, which also identified the specific challenges of supporting more elderly flood victims. Gaps between stakeholders concerning awareness of, and access to, information about residents with vulnerabilities were also identified through the workshop. Whilst the literature identified the lack of provision specifically targeted at children, this was not a theme that was widely reflected by interviewees (with the exception of those from the insurance sector).

Finally, the literature indicated widespread gaps in ensuring flood recovery support meets the needs of other more vulnerable groups, including migrant households and households with lower incomes. Often the most vulnerable individuals are hit hardest by extreme weather events. Since 2010, over 120,000 new homes have been built in flood prone areas, disproportionately in socio-economically disadvantaged neighbourhoods less able to install resilience measures (Rözer & Surminski, 2020). In Hull, people experiencing economic hardship are less able to take adaptation steps (Hull City Council, 2021): expecting universal uptake of property flood resilience measures would therefore create significant gaps and uneven resilience in areas with widespread deprivation.

## Funding gaps: aid and insurance

In England, flood recovery can be funded through different models. Flood insurance supports individuals and businesses and can be bundled with standard building and content insurance. The FloodRe scheme is a reinsurance company, set up between the Government and insurance companies to increase insurance affordability and availability for residences in areas at high risk of flooding. As a non-profit initiative, FloodRe is publicly accountable but owned and managed by the insurance industry, however, it is programmed to be a transitional scheme scheduled to move to risk-reflective pricing by 2039.

The lack of funds or the lack of expedited provision of financial resources for the recovery of infrastructure after a flood can exacerbate impacts on the population, delaying recovery further (Aguilar-Barajas & Ramirez, 2019). This can affect further investment in businesses and tourism, and can harm the impacted area's economy in general (Drennan et al., 2016). Stakeholders recognised that more could be done to use available resources from flood grants efficiently, including asking for accountability with recipients of grant-holders.

One of the funding gaps that was reported in the policy documents, was the lack of allocation of funding to agricultural land and the associated financial loss and recovery needs (East Riding of Yorkshire Council, 2019). Although there was a farming recovery fund, only certain uninsurable recovery works were covered by it and is currently closed for applications (DEFRA, 2022).

The primary source of funding for flood recovery in England is the insurance industry, however there are issues around affordability of flood insurance particularly when properties are perceived to be at increased risk of flooding. A household survey about insurance availability and affordability commissioned by Defra (2018), stated that 18% of the households at high flood risk reported that a key barrier for acquiring insurance was affordability - a stark difference compared with the results from the same survey in (2015), where 42% of households at risk stated that affordability was the main barrier. In Hull, despite the high level of flood risk of properties, only 47% of householders surveyed in 2021 reported that they made sure their

insurance covered flooding. One of the reasons was reported to be that building insurance premiums in Hull are some of the highest in the UK (Ramsden, 2021). The same trend was reported in Doncaster, where 68% had insurance that covered flood damage, however, only 25% of tenants stated that their contents insurance covered flood damage and 21% of owner-occupiers did not know if their building insurance also covered flooding (Blanc, 2020). Nevertheless, since FloodRe started in 2016, almost half a million households have benefited from the scheme, and 256,634 policies were ceded in 2021 (FloodRe, 2022).

SMEs in flood risk zones might decide against maintaining or buying flood insurance if they don't consider the compensation worth it, if they cannot afford it or if they do not think their flood risk is severe or imminent (Marks and Thomalla 2017). A further gap arises because FloodRe does not provide cover for businesses. SMEs in flood risk zones can also face difficulties in acquiring insurance.

Customers experience gaps in their flood recovery due to the timescale at which insurance payments are distributed (Bird et al., 2014). Our insurance stakeholder interviewees confirmed that in the case of a larger scale flooding event, the number of available insurance operatives and assessors could be insufficient for all customers to experience a timely response. The Association of British Insurers has reported that in 2022, emergency payments of £13 million were made to relieve immediate hardship and £2.2 million were paid to arrange alternative temporary accommodation (ABI, 2022). Delays in obtaining insurance payments for repairs can, however, delay recovery (Bird et al., 2014; Carter, 2012; Ramsden, 2021). Technology is helping expedite the process, as clients can record the impacts to their property and send information in real time. Furthermore, it was mentioned by stakeholders from the insurance industry that having the ability to make decisions on the ground or being able to communicate with office staff expeditiously was key to efficient customer responsiveness.



## Efficacy gaps: building back better

Traditional narrow definitions of resilience may favour a recovery with success measured as the degree to which the area can be quickly rebuilt to exactly as it stood pre-flood. However, this approach also leads to the rebuilding of the pre-flood vulnerabilities and a maintaining of the status quo. In a world where we expect flooding to worsen, it is not advisable to pursue this approach. More recent interpretations focus on rebuilding with adjustments that reduce pre-flood vulnerabilities and develop additional capacity to prepare for future flooding (Forrest et al., 2019). Achieving this latter interpretation, or 'building back better' (BBB) (Taylor et al., 2016), necessitates reconstruction efforts to be guided by improving physical, social and economic conditions (FEMA, 2000). However, often the need for a quick recovery and a focus on like-for-like replacements means that BBB is not considered (Surminski & Eldridge, 2014). In the UK, FloodRe launched their "Build Back Better" Scheme in 2022, an innovative public-private initiative, where insurers participating in the scheme can offer reimbursements of up to £10,000 over and above the cost of flood repairs, which can allow homeowners to install property-level flood resilience (PFR) measures (FloodRe, 2022).

There are challenges in encouraging property owners to build back better. Even after having experienced a flood, householders might be reluctant to implement flood resilience measures (Ramsden, 2021). Property owners might avoid using PFR measures if they believe they could have unwanted outcomes or are not convinced of their benefits. According to an Aviva consumer research survey (2022) 54% of respondents had not implemented flood mitigation measures because they did not consider it necessary, 18% were unaware of them and 15% because nobody else in the area had installed them, 11% mentioned cost as a reason not to install flood mitigation measures. Further reasons can include an unwillingness to visibly identify their home as being at flood risk and impacts on

property value and saleability. There is limited information about business owners and their role in BBB. However, the Blanc Report (2020), recommends that more extensive efforts should be made to encourage business owners to BBB to limit flood damages but also to improve the recovery of the community in general.

Equally, we found that there has been little motivation up to now for insurance companies to facilitate BBB: one of the major gaps recognised by the literature and stakeholders is the lack of incentives for insurance companies to BBB including PFR measures during the recovery process. Moreover, insurers reported difficulties in coordinating recovery work with the timing of grant payments to householders, limiting opportunities to BBB. Instances were reported where grants had been agreed once repair work had already started and thus too late in the process for the grants to be effective at facilitating BBB. The new FloodRe Build Back Better scheme, which some insurance companies, including Aviva, have signed up to, aims to bridge that gap by funding the use of resilience measures for some customers (FloodRe, 2022). This movement in the right direction will, nevertheless, impose new challenges on insurance companies. Stakeholders reported potential issues regarding, for example, updating the current skills and knowledge of staff and provision of suppliers, the availability of flood surveys recommending the right measures for each property and the effectiveness of the measures recommended.

There have also been differences between the efforts towards BBB in private properties and in public services. For example, since 2015, Hull City Council has invested over £220 million into flood infrastructure to reduce flood risk. This included a £16m update for the pumping station at Bransholme after it failed in the 2007 floods, a massive scheme of major improvements to the city's Humber frontage costing £42 million and implementing property flood resilience measures in four homes in the city, costing £25,000 (Hull City Council, 2022).

## Mapping findings to our project KPIs

### KPI 1: *Improvements to confidence and wellbeing in communities at risk of flooding*

Once implemented widely, the tools developed through this project have the capacity to improve confidence and wellbeing in communities at risk of flooding. We would argue that, within the Humber region, we have already seen evidence of activity to support this objective (see response to KPI 4 below).

Additionally, the project team is discussing with Aviva colleagues the co-creation of new and durable resources to build community confidence and wellbeing.

### KPI 2: *Number of households with improved access to resources to build back better after flooding*

Together with Aviva colleagues we are discussing how to best incorporate the findings of the project and utilise the engagement tools developed to co-create new resources that support more households to build back better after flood damage. By working this way, we aim to secure legacy support through integration with Aviva deliverables.

### KPI 3: *Increase in number of properties protected by property-level flood resilience measures*

Logically, implementation of property-level flood resilience (PFR) measures should be considered as part of post-flood reconstruction. However, current flood recovery practice often fails to coordinate resources to enable flood victims to build their properties back better in this way. By creating tools to expose the gaps that cause this failure, this project has provided authorities and communities with a means to find new ways to overcome barriers to installing PFR measures as an integrated part of flood recovery. Moreover, working with Aviva representatives on resources to support building back better, as described above, will increase the adoption and installation of PFR further.

### KPI 4: *Improved collaboration between key agencies and stakeholders in response to a flooding event*

No major flooding event has occurred since the implementation of the MFRG serious game workshop. However, it is clear that activity around the project deliverables has acted as a stimulus for significantly increased discussion, engagement and collaboration within and between agencies and other stakeholders. Fifty-nine specific stakeholder engagements (interviews or workshop attendances) were recorded during the project. However, this was the result of an engagement and awareness campaign which reached a much larger number. As a result, we detected increased discussion of flood recovery gaps amongst stakeholders during the project period. There has been particular interest in the Flood Recovery Game which has sparked discussion between agencies and across regional forums – even amongst colleagues who have only seen pictures of it. Beyond the Humber region, the game generated more interest, engagement and discussion when showcased at national events and discussed internationally.

This is evidence that the approach taken has the power to increase collaboration and improve the response of agencies and stakeholders to flooding. It indicates that further work to evaluate the opportunity for scaling up this approach and to deploy it more widely is needed, in order to create a framework able to respond to the needs of flood recovery stakeholders.

### KPI 5: *Improved data capture on risk management and feedback loop to improve underwriting [In close collaboration with Aviva]*

The project team has worked closely with colleagues from Aviva's Claims Services and communications teams. Serious games workshoping led to mutual recognition of the importance of engagement between flood recovery stakeholders and insurance company colleagues, opening the door to opportunities to share expertise, understanding and information. Further engagement with Aviva colleagues is planned, including dedicated workshop events featuring the Flood Recovery Game and focussed meetings with local authority flood teams. This report, and the wider data that underpins it, also contain a wealth of information from stakeholder interviews and extensive literature analysis to support insurance colleagues to improve underwriting. Continued collaboration will support this work further.

**KPI 6:**

*A tried and tested local protocol that can be a scaled up across the UK through partnerships with DEFRA pathfinders, round table and other inter-regional bodies.*

The project has developed and tested a suite of tools capable of deployment across different areas and regions. The tools include:

- A detailed review of available academic and policy literature which identifies thematic and specific gaps in post-flood response;
- Insights into flood recovery gaps from experts and stakeholders, collected through semi-structured interviews informed and guided by insights from the literature;
- A new, bespoke serious game which can be distributed and used in structured, facilitated workshop events to surface, identify and seek solutions to flood recovery gaps, encourage stakeholder engagement, communication and coordination, fostering and building common purpose;
- This report, which provides a synthesis of the outcomes from the project's investigation of flood recovery gaps and identifies measures and opportunities to improve, provided through recommendations tailored for the local area.

**KPI 7:**

*Identification of knowledge gaps for metrics of property level flood resilience measure [In close collaboration with Aviva]*

The information in this report from extensive analysis of academic and policy reports, stakeholder interviews and the serious game workshop, together with the wider collection of underlying data includes information about PFR gaps. Further research and engagement, including workshopping, with Aviva staff and others will generate additional direct information to address this outcome.

**Social value**

Within the Flood Innovation Centre, where possible, our work is evaluated for its capacity to deliver positive social change using a range of impact assessment metrics. In addition to the stated aims and KPIs of the project, we have accessed specialist expertise within the team to explore the extent to which Mapping Flood Recovery Gaps has delivered social value. Using a [Social Value Engine](#), we have been able to undertake a partial evaluation of the project outcomes.

We have calculated that the development of the serious Flood Recovery Game and improvements in connections between flood recovery organisations has delivered £1.45 of social value return for every £1 spent, based upon the amount of Aviva Foundation funding for the project.

We would also expect the wider project KPIs to deliver a similar level of social value, subject to relevant proxy measures being available. These results indicate that, through our stated KPIs, we have delivered demonstrable positive social change.

# Part four: Conclusions and recommendations

**Conclusions**

This initiative set out to map flood recovery gaps, so by design, its *raison d'être* is to expose problems (and to start discussions about potential solutions). Yet it is important to note that in engaging with communities and stakeholders for this project we have met many committed and dedicated colleagues and encountered much excellent practice. The people and institutions of the Humber region have a profound understanding of the devastation caused by flooding and are working together in creative and innovative ways to meet the challenges.

However, when flood recovery gaps occur, the impact on those affected can be overwhelming and it is these problems and challenges that this work aims to help alleviate.

The Humber region has provided a valuable case study. It has been affected by several different flood events in recent years which has led to a relatively well-developed infrastructure and flood governance processes. That the project team at the University of Hull is well connected to the regional flood governance landscape has expedited access to key stakeholders.

We reiterate the complexity of flood recovery. Analysis of reports and literature revealed that gaps in post-flood recovery occur globally in a wide variety of contexts. They are a well-recognised and much reported aspect of the flood recovery process, yet have often resisted resolution. The gaps we identified could be categorised into a small number of themes and sub-themes for analysis.

The gaps identified from academic and policy reports were often familiar to local stakeholders who were able to corroborate and add more detail and local context.

Deficits in the amount of post-flood support available for communities and businesses was a recurring theme. Gaps in economic and social support after flood incidents are particularly damaging in areas of high deprivation or with larger populations of vulnerable or elderly citizens. Since we must recognise that resources are inevitably limited, it is critical to deploy what is available optimally.

A key finding is that governance gaps, management gaps, funding gaps and efficacy gaps remain in UK flood risk management and that these are holding back 'effective' post-flood recovery. The fragmentation of flood risk governance gives rise to multiple interfaces between agencies and actors. This lack of clarity in division of roles and responsibility risks organisational introspection and accountability deficits. Therefore, it is of particular concern that gaps in communication, coordination and collaboration were identified.

Within the Humber region, the principal agencies responsible for flood resilience, together with the University of Hull, have elevated their coordination by pooling efforts and resources to form the Living With Water partnership. The communication and collaboration efforts between key stakeholders in flood risk governance has led to benefits in coordinating efforts to engage with communities and communities of practice; share and exchange knowledge, and work together to achieve projects that a single stakeholder could not achieve on their own. However, even with this innovative and groundbreaking initiative there is a stronger focus on pre-flood preparedness, mitigation and response than on flood recovery support and bouncing back better post-flood.

Collective planning and sharing of resources, expertise and knowledge across agencies is essential to combat disjointed governance but requires preparation. This is sometimes pursued through simulated incident exercises, but these are expensive and logistically difficult to stage frequently.

A serious game was designed utilising information from literature analysis and stakeholder interviews, which was effective in attracting stakeholder interest and players reported that participation in the game was enjoyable and engaging.

Using a serious games approach to facilitate discussion across agencies and stakeholders of how roles and resources interplay in different scenarios, elucidated gaps in flood recovery and helped form and build effective professional relationships, providing an efficient way to grow trans-institutional and cross-sectoral coordination.

Gaps and weaknesses in the availability of timely, accurate and consistent flood recovery information were highlighted, for example flood warnings were reported to provide insufficient instructions about what to do if a flood is imminent (Bird et al., 2014) and mixed messages about whether to stay at home, exacerbate the psychological impact of flooding.

The development and promotion of a comprehensive local post-flood recovery plan is important to address these gaps. Involving a wide range of community members, including businesses, in making the plan will ensure it is tailored to need, uses resources efficiently and engages institutional stakeholders in the interests of citizens. From our work on this project, it is suggested that a serious game such as the Flood Recovery Game would be ideal to facilitate community engagement around the plan, creating a safe space for different voices, whilst encouraging community cohesion and empowerment.

Finally, plans and procedures for post-flood recovery should ensure holistic approaches are taken to maintaining mental health: a key vulnerability during flood incidents (French, Waite, Armstrong, James Rubin, et al., 2019; Jermacane et al., 2018; Ramsden, 2021). Children are recognised as particularly at risk. Again, a serious gaming approach has much to offer in terms of surfacing issues and ideating solutions. In addition, innovative resources such as those created by the University of Hull in collaboration with the Environment Agency through its [Flood Stories](#) work would undoubtedly have a role to play in embedding flood recovery preparation within wider stakeholder capacity building.

## Recommendations and next steps

The collaboration between the University of Hull and Aviva has been fruitful and effective. Further engagement will seek to address additional objectives of this project.

By bringing stakeholders together, and through the interviews, numerous gaps in post-flood recovery provision were identified in the Humber, a region with relatively well-developed flood governance arrangements. Thus, it is likely that there will also be multiple flood recovery gaps in even the most organised of localities.

It is recommended that the serious game developed as part of this work has the potential to help elucidate the gaps that arise largely from fragmented flood risk governance. It proved a useful tool to bridge communication and collaboration gaps between institutions in the Humber region and attracted interest and engagement from wider constituencies and audiences.

Thus, there is merit in developing this framework further to explore demand and potential for wider deployment.

Key aims for further work might include:

- To use the information and networks generated to facilitate the development and implementation of post-flood support and recovery plans.
- To investigate and substantiate the demand for the framework that we have experienced in different events and activities with diverse stakeholders.
- To explore how other jurisdictions and areas would learn about and access the approach.
- To resolve how and by whom the approach would be implemented in future - especially in localities lacking existing flood governance infrastructure, including how this would be resourced (in our hands it has been a resource-intensive process including stakeholder identification and engagement, prior information gathering eg from semi-structured interviews, workshop organisation, facilitator training, hosting and facilitation, post-workshop data collection and analysis).
- To explore refining or simplifying the format to facilitate a wider adoption.

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# Appendix 1.

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Dr Kate Smith	Researcher	Flood Innovation Centre, Energy and Environment Institute, University of Hull
Ms Amy Richardson	Marketing and Communications Lead	Flood Innovation Centre, Energy and Environment Institute, University of Hull
Mr David Ovuakporie	Administration Officer	Flood Innovation Centre, Energy and Environment Institute, University of Hull
Mr Ross Langthorp	Research Intern	Flood Innovation Centre, Energy and Environment Institute, University of Hull
Ms Bella Yerikho	Marketing and Communications Intern	Flood Innovation Centre, Energy and Environment Institute, University of Hull

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Name	Organisation	Job title
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Nick Mallinder	Aviva	ACS lead
Diane Mangan	Aviva	Head of Media Relations
Vicky Saunders	Aviva	Field Operations Lead

## Advisors Board

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Adam Jordan	Hull City Council	Flood Risk Management Officer
James Mason	East Riding of Yorkshire Council	Assistant Emergency Planning Manager
Vicky Saunders	Aviva	Field Operations Lead

# Appendix 2. Documents analysed in the systematic literature review

Author (s)	Title
Abdel-Mooty M.N., Yosri A., El-Dakhakhni W., Coulibaly P.	Community Flood Resilience Categorization Framework
Adedeji, T; Proverbs, D; Xiao, H; Cobbing, P; Oladokun, V	Making Birmingham a Flood Resilient City: Challenges and Opportunities
Aguilar-Barajas I., Ramirez A.I.	Recovering of the Monterrey Metropolitan Area, Mexico, After Hurricane Alex (2010): The Role of the Nuevo Leon State Reconstruction Council
Albright E.A., Crow D.A.	Learning processes, public and stakeholder engagement: Analyzing responses to Colorado's extreme flood events of 2013
Albright, EA; Crow, DA	Learning in the Aftermath of Extreme Floods: Community Damage and Stakeholder Perceptions of Future Risk
Asgary, A; Anjum, MI; Azimi, N	Disaster recovery and business continuity after the 2010 flood in Pakistan: Case of small businesses
Atkinson, CL	The 2011 flood in Minot (North Dakota, USA) and the role of faith-based and nonprofit groups in hazard event response and recovery
Bhattacharya-Mis N., Lamond J.	An investigation of patterns of response and recovery among flood-affected businesses in the UK: A case study in Sheffield and Wakefield
Bird D.K., King D., Haynes K., Box P., Okada T.	Sink or swim? Response, recovery and adaptation in communities impacted by the 2010/11 Australian floods
Bubeck, P; Berghauser, L; Hudson, P; Thieken, AH	Using Panel Data to Understand the Dynamics of Human Behavior in Response to Flooding
Carter N.T.	Federal involvement in flood response and flood infrastructure repair: Hurricane sandy recovery
Chacowry A., McEwen L.J., Lynch K.	Recovery and resilience of communities in flood risk zones in a small island developing state: A case study from a suburban settlement of Port Louis, Mauritius
Chan N.W., Roy R., Lai C.H., Tan M.L.	Social capital as a vital resource in flood disaster recovery in Malaysia
Chatterjee M.	Slum dwellers response to flooding events in the megacities of India

Author (s)	Title
Chinh, DT; Bubeck, P; Dung, NV; Kreibich, H	The 2011 flood event in the Mekong Delta: preparedness, response, damage and recovery of private households and small businesses
Dinh N.C., Ubukata F., Tan N.Q., Ha V.H.	How do social connections accelerate post-flood recovery? Insights from a survey of rural households in central Vietnam
Drennan, L; McGowan, J; Tiernan, A	Integrating Recovery within a Resilience Framework: Empirical Insights and Policy Implications from Regional Australia
Enarson E., Fordham M.	Lines that divide, ties that bind: Race, class, and gender in women's flood recovery in the US and UK
FitzGerald G., Toloo G.S., Baniahmadi S., Crompton D., Tong S.	Long-term consequences of flooding: A case study of the 2011 Queensland floods
Forrest, S; Trell, EM; Woltjer, J	Civil society contributions to local level flood resilience: Before, during and after the 2015 Boxing Day floods in the Upper Calder Valley
Foudi S., Osés-Eraso N., Galarraga I.	The effect of flooding on mental health: Lessons learned for building resilience
Grace-McCaskey C.A., Pearce S.C., Harris L., Corra M., Evans K.J.	Finding voices in the floods of Freedom Hill: innovating solutions in Princeville, North Carolina
Hidayati D.	The role of social capital in enhancing community disaster preparedness and building back better in recovery
Houston D., Werritty A., Ball T., Black A.	Environmental vulnerability and resilience: Social differentiation in short- and long-term flood impacts
Hudson P., Pham M., Bubeck P.	An evaluation and monetary assessment of the impact of flooding on subjective well-being across genders in Vietnam
Hudson, P; Pham, M; Hagedoorn, L; Thieken, A; Lasage, R; Bubeck, P	Self-stated recovery from flooding: Empirical results from a survey in Central Vietnam
Hughey E.P., Tobin G.A.	Hazard response capabilities of a small community: A case study of Falmouth, Kentucky and the 1997 flood
Hyder A., Iqbal N.	Socio-economic losses of flood and household's coping strategies: Evidence from flood prone district of Pakistan
Jehmlich C., Hudson P., Thieken A.H.	Short contribution on adaptive behaviour of flood-prone companies: A pilot study of Dresden-Laubegast, Germany
Jukrkorn N., Sachdev H., Panya O.	Community-based flood risk management: Lessons learned from the 2011 flood in central Thailand
Karunaratne A.Y., Lee G.	The geographies of the dynamic evolution of social networks for the flood disaster response and recovery
Karunaratne A.Y., Lee G.	Traditional social capital and socioeconomic networks in response to flood disaster: A case study of rural areas in Sri Lanka
Kienzler S., Pech I., Kreibich H., Müller M., Thieken A.H.	After the extreme flood in 2002: Changes in preparedness, response and recovery of flood-affected residents in Germany between 2005 and 2011

Author (s)	Title
Kiran P.S., Mohan B., Abhijith V., Abraham A., Anoop G., Dinesh R.S., Krishnan H., Mahadevan K., Peethambaran M., Kunheen M., Sidharthan M., Prathibha S., Sukesh G., Thomas K.P., Jayaprakashan K.P., Jaisoorya T.S.	Framework for strengthening primary health care and community networks to mitigate the long-term psychosocial impact of floods in Kerala
Krishna, RN; Ronan, K; Spencer, C; Alisic, E	The lived experience of disadvantaged communities affected by the 2015 South Indian floods: Implications for disaster risk reduction dialogue
Kweit M.G., Kweit R.W.	Citizen participation and citizen evaluation in disaster recovery
Lai, A; Leoni, G; Stacchezzini, R	The socializing effects of accounting in flood recovery
Landeg O., Whitman G., Walker-Springett K., Butler C., Bone A., Kovats S.	Coastal flooding and frontline health care services: challenges for flood risk resilience in the English health care system
Marks D., Thomalla F.	Responses to the 2011 floods in Central Thailand: Perpetuating the vulnerability of small and medium enterprises?
McEwen L.J., Krause F., Jones O., Garde Hansen J.	Sustainable flood memories, informal knowledge and the development of community resilience to future flood risk
Medd, W; Deeming, H; Walker, G; Whittle, R; Mort, M; Twigger-Ross, C; Walker, M; Watson, N; Kashefi, E	The flood recovery gap: a real-time study of local recovery following the floods of June 2007 in Hull, North East England
Milojevic, A; Kovats, S; Leonardi, G; Murray, V; Nye, M; Wilkinson, P	Population displacement after the 2007 floods in Kingston upon Hull, England
Mort, M; Walker, M; Williams, AL; Bingley, A	From victims to actors: The role of children and young people in flood recovery and resilience
Parsons, K; Lloyd-Williams, A; Skinner, C	University of Hull. (2022). Flood Stories. <a href="https://www.hull.ac.uk/work-with-us/research/case-studies/flood-stories">https://www.hull.ac.uk/work-with-us/research/case-studies/flood-stories</a> accessed 01/08/2022
Parthasarathy D.	Informality, resilience, and the political implications of disaster governance
Pathak S., Ahmad M.M.	Coping mechanisms of SME in response to 2011 floods in Pathumthani, Thailand
Pathak S., Emah I.E.	Gendered approach towards disaster recovery: Experiences from 2011 floods in Pathumthani province, Thailand
Pathak, S; Ahmad, MM	Role of government in flood disaster recovery for SMEs in Pathumthani province, Thailand
Pathak, S; Ahmad, MM	Flood recovery capacities of the manufacturing SMEs from floods: A case study in Pathumthani province, Thailand
Platt, S; Mahdavian, F; Carpenter, O; Wiens, M; Schultmann, F	Were the floods in the UK 2007 and Germany 2013 game-changers?
Plein C.	Resilience, Adaptation, and Inertia: Lessons from Disaster Recovery in a Time of Climate Change

Author (s)	Title
Rahman M.K., Weller K.E.	Preparation for and response to the flood of 2008 in Cedar Falls, Iowa
Ramachandraiah, C	Coping with urban flooding: a study of the 2009 Kurnool floods, India
Rowlands A.	Disaster Recovery Management in Australia and the Contribution of Social Work
Rumbach A., Makarewicz C., Németh J.	The importance of place in early disaster recovery: a case study of the 2013 Colorado floods
Sciulli N.	Weathering the storm: Accountability implications for flood relief and recovery from a local government perspective
Shinn J.E., Caretta M.A.	"If it wasn't for the faith-based groups, we wouldn't be where we are today": Flooding response and recovery in Greenbrier County, WV
Slavikova, L; Hartmann, T; Thaler, T	Paradoxes of financial schemes for resilient flood recovery of households
Slavikova, L; Raska, P; Banasik, K; Barta, M; Kis, A; Kohnova, S; Matczak, P; Szolgay, J	Approaches to state flood recovery funding in Visegrad Group Countries
Social Value Engine Ltd.	The social value engine (2022). <a href="https://socialvalueengine.com">https://socialvalueengine.com</a> accessed 01/08/2022
Tammar, A; Abosuliman, SS; Rahaman, KR	Social Capital and Disaster Resilience Nexus: A Study of Flash Flood Recovery in Jeddah City
Thieken A.H., Kreibich H., Müller M., Merz B.	Coping with floods: Preparedness, response and recovery of flood-affected residents in Germany in 2002
Thomalla F., Lebel L., Boyland M., Marks D., Kimkong H., Tan S.B., Nugroho A.	Long-term recovery narratives following major disasters in Southeast Asia
Walker, M; Whittle, R; Medd, W; Burningham, K; Moran-Ellis, J; Tapsell, S	It came up to here': learning from children's flood narratives
Walker-Springett K., Butler C., Adger W.N.	Wellbeing in the aftermath of floods

## Appendix 3. Policy reports

Name:	Author:	Year:	Scale
Pitt Review	Pitt, M.	2008	National
Consultation on policy options	Defra.	2008	National
Detailed Guidance on Developing a Multi Agency Flood Plan June 2011.	Defra.	2011	National
The Government's Response to Sir Michael Pitt's Review of the summer 2007 Floods Final Progress Report 27 January 2012.	Defra.	2012	National
Emergency Response and Recovery Non statutory guidance accompanying the Civil Contingencies Act 2004.	HM Government.	2013	National
Securing the future availability and affordability of home insurance in areas of flood risk.	Defra.	2013	National
The National Flood Emergency Framework for England December 2014.	Defra.	2014	National
Flood Support Schemes, Funding available from central government.	Department for Communities and Local Government.	2014	National
NHS England Emergency Preparedness, Resilience and Response Framework.	NHS England.	2015	National
National Flood Resilience Review.	HM Government.	2016	National
Availability and affordability of insurance July 2015.	DEFRA	2018	National
Regulation 27: The Quinquennial Review July 2019.	FloodRe.	2019	National
National Flood and Coastal Erosion Risk Management Strategy for England.	Environment Agency.	2020	National
Independent Review of Flood Insurance in Doncaster.	Blanc.	2020	National
Aviva Flood Report - Adapting to the rising tide, December 2020.	Aviva.	2020	National

Name:	Author:	Year:	Scale
Flooding Fourth Report of Session 2019-21.	The Environment, Food and Rural Affairs Committee.	2021	National
Dealing with Civil contingencies: Emergency Planning in the UK	G. Garton	2017	National
Report of Flood Review Panel May 2008 - Key Findings and Recommendations of the Review Panel.	East Riding of Yorkshire Council.	2008	East Riding of Yorkshire
Hull and Coastal Streams Catchment Flood Management Plan Summary Report December 2010.	Environment Agency.	2010	East Riding of Yorkshire
Flamborough Head to Gibraltar Point Shoreline Management Plan.	Humber Estuary Coastal Authorities Group.	2010	Humber
Willerby and Derringham Flood Alleviation Scheme (WaDFAS).	East Riding of Yorkshire Council.	2012	East Riding of Yorkshire
The Humber Estuary Flood Risk Management Strategy, Summary Strategy and Business Case, August 2014.	Raynor, P.	2014	Humber
Flood Defences Cost Money, No Flood Defences Cost More/ An economic case for the Humber and United Kingdom.	Humber Parliamentarians, Local Authorities and the Humber Local Enterprise Partnership.	2014	Humber
East Riding of Yorkshire Flood Risk Management Plan 2015-2021.	East Riding of Yorkshire Council.	2015	East Riding of Yorkshire
Local Flood Risk Management Strategy 2015-2027.	East Riding of Yorkshire Council.	2015	East Riding of Yorkshire
Local Flood Risk Management Strategy.	North Lincolnshire Council.	2016	North Lincolnshire
River Hull Integrated Catchment Strategy May 2016, Strategy Document.	River Hull Advisory Board.	2016	East Riding of Yorkshire
Anlaby and East Ella Flood Alleviation Scheme.	East Riding Infrastructure and Facilities.	2017	East Riding of Yorkshire
Cottingham and Orchard Park Flood Alleviation Scheme.	East Riding Infrastructure and Facilities.	2017	East Riding of Yorkshire
August 2019 Humber Newsletter.	Environment Agency.	2019	Humber

Name:	Author:	Year:	Scale
Humber-keeping you informed June - July 2021.	Environment Agency.	2021	Humber
Hull/ Frontage Improvements.	Environment Agency.	2018	Hull
Local flood risk management strategy 2021-2027. Consultation draft.	Hull City Council.	2021	Hull
Hull's local flood risk management strategy 2021-2027. Final Consultation Draft.	Hull City Council.	2021	Hull
People's Panel January 2021 Analysis Report	Hull City Council Insight team	2021	Hull
Living with Water Hull Household Flood Survey Autumn 2018.	Ramsden, S.	2021	Hull



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