

## Flood Resilience in England: Call for Evidence

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I am an Environmental Scientist specialising in the assessment and communication of flood disaster vulnerability, resilience, and risk at micro-levels. I have developed a Flood Resilience Hub at LJMU that now leads research on **(i)** building resilience to coastal flooding: the application to decommissioning Nuclear Decommissioning Authority Assets with the National Nuclear Laboratory; **(ii)** understanding and modelling the resilience of traditionally constructed buildings to flooding with Historic England; **(iii)** establishing Resilient Community Flood Groups to reduce flood impacts in the UK with the National Flood Forum; and **(iv)** effective flood risk communication with GeoSmart Ltd<sup>1,2</sup>. I have also secured funding from Ordnance Survey<sup>3,4</sup>, Royal Geographic Society<sup>2</sup>, Manchester Geographical Society and Liverpool John Moores University as P-I on projects related to flood resilience<sup>5</sup>. I have also worked extensively with the National Flood Forum over the last decade, including running external workshops for them at international conferences/meetings and developing funded pilot studies<sup>6</sup> and a fully funded PhD research project (2024-2027) on the resilience of community flood groups<sup>7</sup>. During my external work and research, I have also fortified an expansive flood stakeholder network including members from The Alan Turing Institute, Environment Agency, DEFRA, National Nuclear Laboratory, Nuclear Decommissioning Authority, local councils, Cabinet Office, different Trusts, CIWEM, FloodRe, Historic England, Natural England, and National Flood Forum (NFF). Finally, I am also the External Examiner for the University of Portsmouth's MSc on Crisis and Disaster Management, I was the Vice Chair for the Coastal and Marine Royal Geographic Society Research Group (2020-2024), and an invited academic member of the Flood Prevention All Party Parliamentary Group (APPG).

I welcome the opportunity to respond to this Call for Evidence and submit the following comments for your consideration.

### **1.To what extent are current flood resilience assets and interventions fit-for-purpose and what are the strengths and weaknesses?**

**1.1** It is acknowledged that the Environment Agency are in the process of updating their flood risk modelling<sup>8</sup>, and initial review looks promising compared to the prior assessments. However, flood vulnerability and risk models need to combine all vital components of vulnerability (physical, social, and resilient elements) into one framework and at an appropriate level e.g., neighbourhood. Analysing the 'physical',

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<sup>1</sup> [How AR technology could transform flood risk understanding and build resilience in the face of climate change](#)

<sup>2</sup> [Effective flood risk visualisation](#)

<sup>3</sup> [Urban neighbourhood flood vulnerability and risk assessments at different diurnal levels](#)

<sup>4</sup> [A methodology for urban micro-scale coastal flood vulnerability and risk assessment and mapping](#)

<sup>5</sup> [Dr Sarah Percival LJMU](#)

<sup>6</sup> [Flood resilience expert leads research with vulnerable communities in Cumbria](#)

<sup>7</sup> [Flood Action Group Research - National Flood Forum](#)

<sup>8</sup> [National assessment of flood and coastal erosion risk in England 2024](#)

‘socio-economic’ and ‘resilient’ composition of an area at neighbourhood scale produces an opportunity to unearth the principal factors and dimensions of vulnerability<sup>4</sup> prior to any management decisions. By deciphering, assessing, and illustrating key local contexts that formulate the local flood risk problem<sup>9</sup>, we can venture towards flood risk management practices that are successful and embed resilience into a community. I.e. what vital characteristics within communities/areas need to be assessed to understand the reality of vulnerability to truly pinpoint areas of high flood risk?

**1.2** It is also recognised that the Environment Agency has also updated the National Coastal Erosion Risk Map (NCERM) for the first time since 2017<sup>10</sup>. However, flood risk information can be complex and current practices of flood risk mapping can be difficult to understand<sup>2</sup>. Common approaches to flood hazard/vulnerability/risk mapping are still mostly technical, map-based and often statistical<sup>11</sup>, generating maps with contents that regularly do not match end-user requirements<sup>12</sup> or visualised in a way that cannot be easily understood<sup>13</sup>. Hence, flood hazard/vulnerability/risk maps are predominantly seen as informative tools rather than communicative ones, resulting in a real challenge to present this information in a way that is both meaningful and helpful (i.e. prompts communities to act)<sup>11, 12</sup>.

To improve community responses, communication and dissemination of flood risk are vital<sup>14, 15</sup>. Simply identifying vulnerable areas is insufficient to successfully mitigate risk and minimise impact. There is also a need for high levels of awareness via effective communication. Yet currently, public awareness is very low<sup>16</sup>, despite vast amounts of flood risk information readily available via governments and organisations<sup>15</sup>. In fact, recent surveys by the Environment Agency<sup>10</sup> highlighted that around half of households at risk of flooding don’t believe it will happen to them. Furthermore, most do not understand the potentially devastating long-term

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<sup>9</sup> Maskrey SA, Mount NJ, Thorne CR, Dryden I (2016) Participatory modelling for stakeholder involvement in the development of flood risk management intervention options. *Environ Model Softw* 82:275–294. <https://doi.org/10.1016/j.envsoft.2016.04.027>

<sup>10</sup> [Environment Agency publishes major update to national flood and coastal erosion risk assessment](#)

<sup>11</sup> Sciencewise (2014) What does flood risk mean? Co-creating new risk communications with the public. ASCE Library. <https://sites.cardiff.ac.uk/secq/files/2016/03/Paper-4-Communicating-Flood-Risk-Project-Overview.pdf>

<sup>12</sup> Warburton D (2016) Tracing the impacts of public dialogue projects supported by Science wise: Flood risk communications. Evidence Environment Agency. <https://webarchive.nationalarchives.gov.uk/20180103170554/http://www.sciencewise-erc.org.uk/cms/assets/Publications/Sciencewise-Flood-Risk-dialogue-impacts-March2016.pdf>

<sup>13</sup> Meyer V, Kuhlicke C, Luther J et al (2012) Recommendations for the user-specific enhancement of flood maps. *Nat Hazard Earth Syst* 12:1701–1716

<sup>14</sup> IPCC (2012) Managing the risks of extreme events and disasters to advance climate change adaptation. Cambridge University Press, Cambridge. doi:10.1017/CBO9781139177245

<sup>15</sup> Haer T, Botzen WJ, Aerts CJH (2016) The effectiveness of flood risk communication strategies and the influence of social networks—Insights from an agent-based model. *Environ Sci Policy* 60:44–52

<sup>16</sup> Rollason E, Bracken LJ, Hardy RJ, Large ARG (2018) Rethinking flood risk communication *Nat Hazards* 92:1665–1686. <https://doi.org/10.1007/s11069-018-3273-4>

consequences flooding can have, including having flood response measures ready in place<sup>4</sup>.

To ensure flood risk visualisation practices, especially accessible flood risk maps, communicate flood risk in an understandable or useful way, certain changes need to be implemented to meet critical users' needs. Firstly, there are key flood risk visualisation users (i.e. those that need this facility more than most) who need to be considered when establishing future flood risk visualisations<sup>2</sup>. In fact, there are many high priority flood risk visualisation users (local authorities, emergency services, specific members of the public, i.e. elderly, renters etc.) and crucially they share and need key criteria (Table 1) that current flood risk visualisation is not delivering. In fact, different users have similar or very dissimilar requirements. However, for the user group communities only when all the identified key criteria (Table 1) are practiced will flood risk visualisation successfully communicate flood risk to this critical user. In fact, results from previous research<sup>2</sup> crucially highlight why current communication practices to communities are not always effective, as key provisions/features are missing, emphasising that not only are the requirements of this user greater, but they also are more complex.

<b>Key flood risk visualisation criteria</b>	<b>Description</b>
Criteria 1—user-driven maps	User-driven maps with varying degrees of complexity depending on the end user
Criteria 2—different visuals available for same data sets/problem	Different visuals available for the same problem for different users, i.e. maps do not always work
Criteria 3—terminology	Visuals with consistent use of terminology, symbology, and definitions
Criteria 4—central Hub of Information	Many critical users need an obvious central hub of information that holds multiple outputs
Criteria 5—community knowledge	Visuals that utilise community/local knowledge and understanding

**Table 1. Key flood risk visualisation criteria**

There is also an overall need for simplicity and consistency, a practice current flood risk visualisation approaches are not undertaking. In fact, presently there are many flood risk map services available to the public, from a variety of sources (governmental, insurance, private), communicating different messages (threat, vulnerability, risk, defences/no defences) with little or too much explanation. This is not only overwhelming, but also confusing, potentially resulting in further misunderstanding of flood risk which is detrimental to flood resilience. Nevertheless, many of the key flood risk visualisation criteria identified above (Table 1) reiterate key messages from other studies - Flood Risk Communications Public Dialogue project (2015)<sup>11</sup>, the IPCC report<sup>14</sup> and other flood communication studies<sup>15</sup>, including being conscious of the needs of different users (Criteria 1 and 2); one size does not fit all—proliferation of different routes for conveying core key messages needed, as maps are not always helpful (Criteria 2); be clear about risk and its potential impacts, i.e. do not assume information will scare people (Criteria 3); do not describe probability and risk in mathematical language (Criteria 3); language needs to be simple, clear and precise (overarching theme and Criteria 3); be clear of preventative actions that can/should be taken (Criteria 5); highlight what type of help is available (Criteria 5); and focus on making information have a local and historical context (Criteria 5)<sup>12</sup>.

#### **4. To what extent are current metrics for monitoring the effectiveness of flood resilience fit for purpose, and what improvements could make them more effective?**

4.1 Building flood resilience at community level, is key to mitigating risk and reducing flood impact costs (cost of reducing floods, cost to the owner and costs to the insurer) as flood disasters (complex, costly and life-changing) are expected to increase drastically in the future<sup>17</sup>, and a real shift in flood management from risk- based to resilience-based approaches, is vitally needed<sup>18</sup>. This shift is crucial to ensure management of our complex systems and reduce vulnerability within areas most at risk to flooding<sup>19</sup>. It is widely accepted that floods cannot be stopped from occurring, therefore learning from previous experiences to help reduce hardship and community vulnerability (resilience) is essential to help us deliver effective flood risk management<sup>20</sup>. Whilst considered a novel approach in natural hazards and flooding, resilience is widely used in other disciplines, such as psychology, ecology, and medicine. However, within flood resilience, there is ambiguity surrounding a definitive application of the concept, with no single definition available<sup>21, 22, 23, 24, 25</sup>, and with different branches within flood resilience (i.e., community flood resilience, urban flood resilience, climate resilience) produced, all utilising different definitions<sup>25</sup>. Understanding the definitions of flood resilience is important in creating clarity within the field, which is currently lacking in several aspects of the term and the corresponding management<sup>23, 25</sup>. Whilst risk-based approaches can consider resilience within vulnerability measurements<sup>26, 4, 27</sup>, it may lead to generalisation or marginalisation of resilience, and therefore reduces its significance within flood risk analyses and the measures based on them. This creates irregularities that can lead to questions regarding the dependability of the measurements and the flood risk management established due to them.

To close these gaps and provide further understanding of our resilience to flooding across the wider sector, including what is flood resilience and the factors needed to measure it,

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<sup>17</sup> IPCC (2022) Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate [doi:10.1017/9781009325844](https://doi.org/10.1017/9781009325844).

<sup>18</sup> Aven T (2019) The call for a shift from risk to resilience: What does it mean? Risk Anal. <https://doi.org/10.1111/risa.13247>

<sup>19</sup> Morrison A, Westbrook CJ, Noble BF (2018) A review of the flood risk management governance and resilience literature. J Flood Risk Manag. <https://doi.org/10.1111/jfr3.12315>

<sup>20</sup> Kuang D, Liao KH (2020) Learning from floods: linking flood experience and flood resilience. J Environ Manage. <https://doi.org/10.1016/j.jenvman.2020.111025>

<sup>21</sup> Adedeji TJ, Proverbs DG, Xiao H, Oladokun VO (2018) Towards a conceptual framework for property level flood resilience. Int J Saf Secur Eng. <https://doi.org/10.2495/SAFE-V8-N4-493-504>

<sup>22</sup> McClymont K, Cunha DGF, Maidment C, Ashagre B, Vasconcelos AF, de Macedo MB, Dos Santos MFN, Júnior MNG, Mendiondo EM, Barbassa AP, Rajendran L (2020a) Towards urban resilience through Sustainable Drainage Systems: A multi-objective optimisation problem. J Environ Manage. <https://doi.org/10.1016/j.jenvman.2020.111173>

<sup>23</sup> McClymont K, Morrison D, Beevers L, Carmen E (2020b) Flood resilience: a systematic review. J Environ Planning Manage. <https://doi.org/10.1080/09640568.2019.1641474>

<sup>24</sup> Disse M, Johnson TG, Leandro J, Hartmann T (2020) Exploring the relation between flood risk management and flood resilience. Water Secur. <https://doi.org/10.1016/j.wasec.2020.100059>

<sup>25</sup> [Flood resilience: a review of evolving definitions](#)

<sup>26</sup> IPCC (2014) Summary for policymakers. In: Climate change 2014: impacts, adaptation, and vulnerability. Part A: global and sectoral aspects. Contribution of working group II to the fifth assessment report of the intergovernmental panel on climate change

<sup>27</sup> Biswas S (2023) A review of socio-economic vulnerability: the emergence of its theoretical concepts, models and methodologies. Nat Hazards Res. <https://doi.org/10.1016/j.nhres.2023.05.005>

research has been completed – Laidlaw S, MPhil – <sup>25, 28</sup> and new research (2 years) has been commissioned by Historic England to Dr Percival to develop a methodology to identify the resilience of traditionally constructed buildings in Liverpool to surface water flooding. The Nuclear Decommissioning Authority (NDA) have also funded research (3 years) to Dr Percival to develop the tool (and the necessary scientific understanding) to model and subsequently map levels of resilience to coastal flooding pertaining to the decommissioning processes for NDA assets, at a detailed, micro-scale level. Both these projects are currently in their preliminary stages.

**6. What should the key priorities be for the Flood Resilience Taskforce, and how can it enhance coordination and improve flood resilience?**

***Is there a role for community-based flood response teams, and who is responsible for building that resource?***

**6.1** Overtime the UK has witnessed several severe flood events, and it is becoming increasingly evident that a shift from risk-based approaches to resilience-based strategies is urgently required to manage the impacts flooding can have on vulnerable communities. One way to achieve this is through the creation of community flood groups, namely Flood action groups, as it is the community's resilience that is most effective in managing the risk of flooding and for some, might be the only form of resistance present. Many of these flood groups are set up and supported by the National Flood Forum (NFF), the main charity in England and Wales set up to aid flooded communities. Flood action groups are grassroots community groups, who act as a representative voice for the wider community<sup>29</sup> and can help provide the foundations to build and embed community flood resilience, however, some of these groups can become ineffective over time. Members of these groups have an interest in local flood issues, meeting to discuss flood-related issues, and provide advocacy for local communities, as well as aiding in times of crisis<sup>30</sup>. Expanding and safeguarding the Flood action group network is therefore critical and is part of the new Environment Agency Flood and Coastal Erosion Risk Management (FCERM) Strategy Action Plan 2021<sup>31</sup>. Where a key directive of this strategy is to support vulnerable communities and develop community led flood response plans, elements Flood action groups can deliver, if effective.

These grass root groups are typically composed of residents and volunteers who collaborate to address their local flood risk. They are often intermediaries between the community and governmental/non-governmental agencies, ensuring that local voices are heard in flood management discussions and that the specific needs of vulnerable communities are addressed. They also provide key lay knowledge to flood stakeholders, which in turn can be utilised to assist management and reduce flood impacts. However, the resilience (functionality and practice) of these groups, can be precarious, many of which disband or become dormant. It is therefore vital to establish why this happens and provide these groups with the tools they need to continue and succeed. To close this gap Dr Percival has initiated

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<sup>28</sup> [Understanding Flood Resilience in Vulnerable Urban Communities in England](#)

<sup>29</sup> National Flood Forum 2020 What is a Flood Action Group? (<https://nationalfloodforum.org.uk/working-together/communities/what-is-a-flood-action-group/>)

<sup>30</sup> Forrest S Trell E M and Woltjer J 2017 Flood Groups in England: Governance arrangements and contributions to community resilience to flooding Governing for Resilience in Vulnerable Places Routledge

<sup>31</sup>

[https://assets.publishing.service.gov.uk/media/5f6b6da6e90e076c182d508d/023\\_15482\\_Environment\\_agency\\_digitalAW\\_Strategy.pdf](https://assets.publishing.service.gov.uk/media/5f6b6da6e90e076c182d508d/023_15482_Environment_agency_digitalAW_Strategy.pdf)

funded research<sup>5, 6, 7</sup> (3 years) to assess the current practices of these crucial groups, as well as their relationships with key flood stakeholders, to provide them with best practice that will in turn help them increase their resilience and the flood resilience of the community they represent.