

Submission to Call for Evidence on Flooding and Coastal Erosion by the Department for Environment, Food and Rural Affairs

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The Centre for Climate Change Economics and Policy (CCCEP) was established in 2008 to advance public and private action on climate change through rigorous, innovative research. The Centre is hosted jointly by the University of Leeds and the London School of Economics and Political Science. It is funded by the UK Economic and Social Research Council. More information about the ESRC Centre for Climate Change Economics and Policy can be found at: www.cccep.ac.uk

The Grantham Research Institute on Climate Change and the Environment was established in 2008 at the London School of Economics and Political Science. The Institute brings together international expertise on economics, as well as finance, geography, the environment, international development and political economy to establish a world-leading centre for policy-relevant research, teaching and training in climate change and the environment. It is funded by the Grantham Foundation for the Protection of the Environment, which also funds the Grantham Institute – Climate Change and the Environment at Imperial College London. More information about the Grantham Research Institute can be found at: www.lse.ac.uk/grantham/

About this submission

In July 2019 the Department for Environment, Food and Rural Affairs (Defra) launched a call for evidence to seek guidance on policy direction to prepare the UK for flooding and coastal erosion. See <https://consult.defra.gov.uk/flooding/call-for-evidence-flooding-and-coastal-erosion> for more information.

This paper summarises the submission to this inquiry by Swenja Surminski, Viktor Roezer, Sara Mehryar and Rebecca Byrnes on behalf of the Grantham Research Institute on Climate Change and the Environment at the London School of Economics and Political Science and the ESRC Centre for Climate Change Economics and Policy (CCCEP). A pre-published version was submitted to the call for evidence on flooding and coastal erosion policy on 19 August 2019. This version of the submission was copyedited by Georgina Kyriacou.

Authors' note

The Grantham Research Institute welcomes this opportunity to assist and support the work of Defra. We have been actively working with the insurance industry and policymakers for a decade to address issues around climate change and adaptation and the evidence provided in this submission is based on this work, in particular the [Zurich Flood Resilience Alliance project](#), where we are collaborating with communities at risk of flooding; the EU-FP7 project [ENHANCE](#), which focused on flood insurance; our work on the UK Climate Change Risk Assessments (CCRAs) 2 and 3, which explores risks to [businesses and industry](#); and recent engagements with the Geneva Association on Flood Risk Governance in England and the Cambridge Institute for Sustainability Leadership on implications of flood risk for mortgage portfolios. The Institute also works closely with the financial sector on integrating physical climate risk such as flood risk into scenario planning.

Our research experience and engagement ranges from sustainable flood insurance to testing pre-event flood risk reduction strategies at community level, investing in a just transition, understanding litigation risks, and the role of risk transfer in driving climate resilience in developing countries. Progress has been made in many of these areas, with genuine efforts from some industry leaders to mainstream sustainability and demonstrate that this is good for their business, clients and society. But at the same time there are challenges that have not been resolved and which will require joint efforts to address.

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This policy paper is intended to inform decision-makers in the public, private and third sectors. It has been reviewed by at least two internal referees before publication. The views expressed in this paper represent those of the author(s) and do not necessarily represent those of the host institutions or funders.

Summary and recommendations

- Improving the resilience of countries, companies and communities through adaptation to the current and future climate is absolutely critical for securing sustainable economic growth and development across the world. Resilience has benefits beyond simply reducing losses from possible flooding events.
- Resilience need not only refer to physical infrastructure: it can also include improving education, awareness, community planning, people participation, and natural solutions.
- Building resilience to floods requires planning for increased future flooding events that will become more frequent and more intense, but also more unpredictable.
- Flood resilience should not be considered in isolation but rather mainstreamed into broader risk management planning to account for instances where several shocks might occur simultaneously.
- There are limits to how much a community can adapt to future risks and in some instances, relocation or transformational behaviour changes of populations may be required instead.
- An effective flood resilience strategy should consider how to build the capacity of vulnerable groups to prepare and respond to flooding events.
- Creating resilience is not only about *protection now and in the future* – it is also about *reducing risk creation*. An important starting point for this is the consideration of different drivers of resilience.
- Community-owned participatory methods such as the Flood Resilience Measurement Tool are needed to secure buy-in and local relevance for resilience strategies.
- There are currently two main barriers to identifying and disclosing financial exposure to flood risk:
 - i. Technical challenges in modelling flood risks, including uncertainties about future risk in regard to climate trajectories and potential tipping points as well as assumptions on future exposure and uptake of private level adaptation
 - ii. A lack of understanding of financial exposure to flood risk in a wider flood resilience context.

Responses to selected consultation questions

How is the concept of resilience applied in relation to flooding and/or coastal erosion? For example, how do you use it in your own work? How is it used internationally? (Q5)

The Grantham Research Institute has a broad [research programme](#) focusing on climate change adaptation and resilience (Grantham Research Institute, 2019a).

Improving the resilience of countries, companies and communities through adaptation to the current and future climate is absolutely critical to achieving sustainable economic growth and development across the world. Increased, and more unpredictable, flooding events will be a major consequence and impact of climate change in many countries and regions, including the UK. It is therefore vital that the concept of 'resilience' includes consideration of how to ensure communities are able to prepare for and respond to future flooding events as a result of climate change.

The Grantham Research Institute is a member of the [Zurich Flood Resilience Alliance \(ZFRA\)](#),¹ a multi-sector and multi-organisational partnership between the Zurich insurance group, NGOs and academia (Grantham Research Institute, 2019b). 'Community flood resilience' under ZFRA's definition connects development and risk management together and thus it is defined as "the ability of a community to pursue its development and growth objectives, while managing its disaster risk over time in a mutually

¹ ZFRA is funded through the Zurich Foundation and includes nine cross-sector collaborations among nine members: (1) the not-for-profit branch of Zurich Insurance, (2) Concern Worldwide, (3) the International Federation of the Red Cross and Red Crescent Societies, (4) Mercy Corps, (5) Plan International, (6) Practical Action, (7) International Institute for Applied Systems and Analysis, (8) the London School of Economics, and (9) the Institute for Social and Environmental Transition-International.

reinforcing way". Based on this, the Alliance has created a comprehensive and coherent framework for measuring community flood resilience. This framework and its associated tool, the Flood Resilience Measurement Tool for Communities (FRMC), has been implemented and validated in 110 communities across nine countries (including Bangladesh, Nepal, Indonesia, Mexico, Haiti and the USA) with more than 1.2 million data points being collected. In the second phase of the project (from 2018 until 2023), FRMC is being implemented in a number of other countries including the UK. LSE, in collaboration with ZFRA, is leading the FRMC implementation in relation to urban areas in the UK and Germany with the aim of supporting local authorities in the process of decision making for flood resilience.

More broadly, research from the Grantham Research Institute and internationally identifies the following important aspects of resilience for flood risk management:

1. **Resilience has benefits beyond simply reducing losses from possible flooding events.** The Triple Dividend of Resilience concept developed by Grantham Research Institute researchers in collaboration with the Overseas Development Institute and the World Bank assesses the full range of benefits from resilience investments (Surminski and Tanner, 2016). It articulates that in addition to avoiding irreversible losses, building resilience can unlock economic growth through removing the dampening effect of risk and stimulating business and entrepreneurial activity, and can also offer co-benefits through well designed resilience measures, for example flood levies that can support transport infrastructure or ecosystem based flood management approaches that restore local environments and provide carbon sequestration. (See also Tanner et al., 2016 and Surminski et al., 2019.)
2. **Resilience need not only refer to physical infrastructure.** The ZFRA defines resilience based on the five 'capitals': human, social, physical, natural, and financial, under the sustainable livelihoods approach. Resilience can include enhancing any of these five capitals, for example through increased education (human), improved community planning (social), and using ecosystem services such as mangroves and other appropriate species to provide natural solutions that improve water and biodiversity outcomes (natural).
3. **Climate change is non-linear.** Building resilience to floods requires planning for an increased incidence of future flooding events that will become more frequent and more intense, but also more unpredictable.
4. **Macro changes also mean that communities will be exposed to a greater variety of risks and hazards.** These changes include climate change and population growth. Flood resilience should not be considered in isolation but rather mainstreamed into broader risk management planning to account for instances where several shocks might occur simultaneously.
5. **There are limits to how much a community can adapt to future risks.** In some instances, relocation or transformational behaviour changes may be the most resilient solution (Dow et al., 2013).
6. **Poorer populations, small businesses and vulnerable groups can be disproportionately impacted by flooding events** (Buhr et al., 2018). These groups include women, children, people with disabilities and the elderly. An effective flood resilience strategy should therefore consider how to build the capacity of these vulnerable groups to prepare and respond to flooding events.

How can the different aspects of resilience be brought together into one 'overall resilience' concept?
(Qu 6)

Creating resilience is not only about *protection now and in the future*: it is also about *reducing risk creation*. This requires understanding flooding as a multi-faceted phenomenon that can only be tackled through a broad array of measures that extend beyond the domain of engineers, hydrologists and statisticians. Although a lot has been done to increase awareness around a holistic understanding of flood risk and resilience, such holistic understanding is rarely operationalised through policies and regulation (Keating et al., 2014).

An important starting point for bringing the different facets together is the consideration of different *drivers* of resilience. The Flood Resilience Measurement for Communities (FRMC) created by the Zurich Flood Resilience Alliance provides a holistic and system-level view of the flood resilience of communities.

It combines the four properties of a resilient system (4R – robustness, rapidity, redundancy and resourcefulness) with the five capitals of the sustainable livelihoods approach outlined above (5C – social, financial, physical, human and natural capitals) into the 5C–4R Framework. Linking this framework to the five stages of the disaster risk management cycle (prospective risk reduction, corrective risk reduction, preparedness, response and recovery) has created a holistic approach that provides various lenses through which to look at flood resilience in different communities across the globe (Zurich Flood Resilience Alliance, 2019).

Please provide evidence about approaches which coastal protection authorities and coastal groups can use to make a robust assessment of the long-term affordability and ongoing sustainability of coastal management policies, including any barriers to implementation. (Q9)

Sustainability of coastal management policies is linked to (1) the effectiveness and (2) the acceptability of those policies. Due to the unique characteristics of flood resilience in each community, the effectiveness of flood risk reduction measures in coastal areas needs to be assessed specifically and individually for each community. Moreover, these measures should be developed and adopted via a participatory approach that can guarantee the long-term and sustainable implementation and maintenance of those measures. Participatory approaches help decision-makers to understand the incentives and costs of acting now and the risks of postponing acts in a multi-stakeholder environment.

The Flood Resilience Measurement for Communities (FRMC) uses such a context-specific and participatory approach in assessing the flood resilience and enhancing the effectiveness and acceptability of measures taken by local authorities. Based on the 5C–4R framework (see above), 44 indicators are introduced for measuring community flood resilience. Each of the ‘five capitals’ contains a set of generic and discrete indicators used for measuring the state of those capitals (a list of the 44 indicators can be found in the Appendix). The tool is a hybrid software application comprising an online web-based platform for setting up and analysing the measurement process and a smartphone- or tablet-based app that can be used for data collection.

Data can be drawn from existing secondary data or collected through participatory methods including household interviews, key informant interviews and focus group discussions. The latter is used when data is not available or people’s perception or knowledge is necessary for understanding a specific aspect of flood resilience. The collected data is then used to grade all 44 indicators on an A–D scale, A being best practice, D being poor, following a risk-engineering approach (the systematic identification, assessment and improvement of risk).

Aggregating the graded results under different themes – such as healthcare, education, governance, livelihood – helps to build a more holistic view of a community’s resilience, beyond the resilience of infrastructure, and can guide the implementation of sustainable interventions and management solutions. By measuring the resilience of a community across several points in time evidence can be gathered around the impact of these interventions with regard to an increase in resilience. Both the framework and the tool are designed to cover all types of flood hazard including coastal flooding and erosion over a wide range of contexts.

Please provide examples of initiatives delivering flood and coastal erosion outcomes which have been funded from sources other than the public sector, and explain how they were funded. (Q14)

The ZFRA is implementing flood resilience projects locally, including in the UK (see Q19 below). This has also led to additional financial and technical support being provided from non-Alliance members, for example: JBA Risk Management through the JBA Trust, and RMS and Aon Benfield through support to the development of Post Event Review Capability reports in the UK and the US.

The Grantham Research Institute is also currently discussing with Flood Re (a joint initiative between the UK Government and Insurers) about the possibility of securing financial support for the implementation of FRMC in urban communities in the UK. More broadly, Grantham Research Institute researchers have been working on resilience finance and are supporting the [Climate Bonds Initiative](#) in its development of investment principles for resilience and adaptation (Climate Bonds Initiative, 2019).

There are two overall concepts of resilience finance:

1. Generating new investment flows to increase resilience, making resilience an investable proposition.
2. Ensuring that investment flows help to increase rather than decrease resilience (resilience as a co-benefit/co-cost) by mainstreaming resilience as part of investment decisions, for example in infrastructure or low-carbon innovations.

Identifying and measuring the resilience impact of these investments remains a challenge. See, for example: Centre for Global Disaster Protection and Lloyd's of London, 2018; Hall et al., 2017.

Another major focus of the Grantham Research Institute's research is the role of the insurance industry in incentivising and investing in resilience (see Surminski, 2017a; Surminski et al., 2018). Several of the Institute's papers have investigated the role of the insurance industry in England, highlighting that the current flood insurance approach is not sufficiently geared towards flood resilience (Surminski, 2017b; Surminski and Thieken, 2017).

What could be done to encourage private and community-funded initiatives and help them succeed?
(Q16)

The Flood Resilience Measurement for Communities supports communities to systematically identify their weaknesses in regard to flood resilience and helps to prioritise flood resilience investments in a community. The holistic view of resilience creates greater buy-in from a wide range of community initiatives and supports a more efficient use of the available resources. This inclusive approach encompassing many community-based stakeholders, such as local authorities, local business associations and flood networks, helps to create a sense of ownership over issues around flood resilience, which can strengthen community-level engagement, and it provides a platform for a wider discussion on potential development pathways and solutions.

Please provide examples of cases where authorities have sought (successfully or unsuccessfully) to pool contributions to build larger pieces of flood or coast infrastructure that benefit more than one local authority area. (Q19)

Currently, the local authority of Lowestoft is implementing the Flood Resilience Measurement for Communities to measure various aspects of community flood resilience in the Eastern region. Lowestoft local authority collaborates with the larger East Suffolk Council and the Coastal Partnership East regarding the coastal flood risk management projects in this region. One benefit of applying FRMC for the local authorities in East Suffolk will be to understand the challenges, weaknesses and potentials of the cross-council and cross-authority collaborations in enhancing community flood resilience. One example of a collaboration of this nature is the development of an inter-community flood coordination plan that helps local authorities to coordinate their risk response and recovery efforts when a flood happens. FRMC provides information for the local authorities to understand the weaknesses and strengths of such collaborations in their region and identify potential improvements.

With several large river systems that cross both national and international borders, Germany and its neighbouring countries have developed a number of initiatives to coordinate flood protection and to pool resources. For both the Rhine and Elbe catchments, international commissions with all riparian states have been established for an integrated flood protection that includes joint management of reservoirs and polder areas as well as arrangements on protection standards and joint ecological development goals. At the sub-national level, local water boards jointly manage river systems that stretch over several local authority areas with the aim of maximising benefits of investments in flood infrastructure for all affected communities in the watershed.

Please provide examples of public and private organisations which are already disclosing their financial exposure to flood or other climate risks and how they go about it. (Q21)

Swenja Surminski, Head of Adaptation Research at the Grantham Research Institute, is currently investigating risk disclosure of the private sector for the business and industry chapter of the *Third UK Climate Change Risk Assessment*. This builds on evidence Surminski gathered for the *Second UK Climate Change Risk Assessment* (Committee on Climate Change, 2017).

Recent analysis by the Grantham Research Institute indicates that insurers could play an important role in conducting analysis on risks such as flooding and then disclosing this information to their clients (Surminski and Unsworth, 2019). However, to do so will require more transparent relationships between insurers and their customers; disclosure to date has focused on investors and regulators. Insurers could enable their clients to make more informed decisions by communicating the projected future risks that their assets may face and the impact that this may have on their premiums. This could incentivise investment in resilience measures and therefore reduce the risk exposure of their assets. However, this could also lead to some difficult conversations, such as discussion of assets facing rising premiums or becoming uninsurable, increasing the importance of transparent, trusting customer relationships.

ClimateWise, a global network of leading insurers, reinsurers, brokers and industry service providers facilitated by the University of Cambridge Institute for Sustainability Leadership (CISL), has developed a framework for physical risk for real estate lending and investment portfolios to support banks and mortgage providers in disclosing their current and future susceptibility to physical risk as a result of climate change as demanded by the Task Force on Climate-related Financial Disclosures (TCFD). An analysis of the flood risk of more than 7 million mortgage portfolios in the UK of seven large UK retail banks, carried out using this framework, shows a significant expected increase in annual average losses by 2050 both for a 2°C warmer world (61% increase compared with today) and a 4°C warmer world (130% increase compared with today). This analysis highlights the need for banks and mortgage providers to become more active in managing these increasing risks rather than solely relying on insurance. The report asks for a wider analysis and disclosure of these risks for an increase in the collective understanding of physical risks posed by climate change, to enable lenders and investors to take better, more informed decisions (CISL, 2019).

What are the barriers to identifying and disclosing financial exposure to flood risks and how could they be overcome? (Q22)

There are currently two main barriers to identifying and disclosing financial exposure to flood risk:

1. The first barrier comes from technical challenges in modelling flood risks, including uncertainties about future risk in regard to climate trajectories and potential tipping points, as well as assumptions about future exposure and uptake on private level adaptation, as highlighted in the 2019 physical risk framework report by Cambridge Institute for Sustainability Leadership (CISL, 2019). Improved risk models that take into account future risk and climate change as well as a better understanding and integration of human behaviour in risk assessments can help to overcome these barriers (Aerts et al., 2018). This in turn requires access to detailed information regarding the exposure and vulnerability of both people and assets to flooding.
2. The second barrier is a lack of understanding of financial exposure to flood risk in a wider flood resilience context. Currently it is not well understood how the different aspects of flood resilience are linked to financial risks of flooding: in other words, if a high resilience in terms of human, social or physical capital can compensate for a lower resilience in terms of financial capital and vice-versa. With its systems-thinking approach, the FRMC can help to overcome these barriers by supporting a better understanding of these interactions.

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Appendix: 44 indicators of flood resilience from the Flood Resilience Measurement for Community (FRMC) framework

Asset protection knowledge	Business continuity	Communication interruption	Community disaster fund
Community disaster risk management planning	Community participation in flood related activities	Community representative bodies	Community safety
Community structures for mutual assistance	Conservation budget	Disaster response budget	Early Warning Systems (EWS)
Education commitment during floods	Environmental management awareness	Evacuation and safety knowledge	External flood response and recovery services
First aid knowledge	Flood emergency food supply	Flood emergency infrastructure	Flood energy supply
Flood exposure awareness	Flood healthcare access	Flood safe water	Flood waste contamination
Future flood risk awareness	Governance awareness	Household asset recovery	Household flood protection
Household income continuity strategy	Integrated flood management planning	Inter-community flood coordination	Large scale flood protection
Local leadership	National forecasting policy & plan	Natural capital condition	Natural habitat restoration
Natural resource conservation	Priority managed units	Priority natural units	Provision of education
Risk reduction investments	Social inclusiveness	Transportation interruption	Water and sanitation awareness