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As a group of research and policy specialists focused on resilience, we welcome this important inquiry. Recent events have reiterated how pressing the issue of flooding is in England, not least for affected communities and businesses, and it is essential that urgent action is taken to build resilience. As the UK champions the issue internationally, including through the COP Presidency, it is vital that it is also delivering at the national and local level.

1. How effectively do the new Government policy statement and Environment Agency strategy meet the challenge posed by a changing climate?

Planning for flooding in England requires a comprehensive, forward looking, cross-sectoral resilience strategy, to ensure the long-term sustainable development of communities across the country. In light of this, we welcome the new Policy Statement and Environment Agency Strategy. Both are comprehensive and in line with our recommendations for a holistic and forward-looking approach to resilience, advocated in previous submissions to the Environment Agency (Surminski et al., 2019a) and the Department for Environment, Food and Rural Affairs (Surminski et al., 2019b).

It is now crucial that the Strategy is implemented urgently and is adequately resourced, if it is to effectively meet the challenges posed by a changing climate. The Environment Agency should be given the necessary resources and powers, including significant human and financial resources, required for successful implementation. Here the tendency for decision-makers to undervalue investment in pre-disaster resilience, even though evidence shows that strengthening resilience is hugely cost-effective and can generate multiple benefits, should be kept in mind. This tendency has to date caused a major imbalance in disaster funding, with significantly more spent on recovery and repair than on risk reduction and increasing resilience. As set out in Mehryar and Surminski (2020),[1] there is a concerning trend towards reactive governance approaches, focused more on flood response and recovery strategies than on risk reduction or proactive flood risk governance. However, it is encouraging that multi-actor engagement is increasing in UK flood management – there are signs of this shift happening in the flood risk governance arrangements for England and Wales, involving businesses and civil society.

It is also encouraging to see the UK Government recognising that flood risk management is an important investment area: we welcome recent announcements on spending and policy, including the new Flood and Coastal Erosion Risk Management policy and the Government's commitment to double investments in the flood and coastal protection programme in England over the next six years.

The Government must, however, ensure that the positive steps taken in relation to the Strategy are not undermined by the creation of risk elsewhere, for example in the design and construction of non-resilient buildings and infrastructure. In light of COVID-19, it is also important to ensure flood risk management is included in economic recovery efforts, with flood resilience crosscutting a 'building back better' agenda. Without this, recent gains in investment and skills are at risk of being

[1] In work conducted as part of the Zurich Flood Resilience Alliance: https://floodresilience.net/

lost, as are any gains made through investment in the recovery that do not account for future flood risk.

We are also encouraged by the Government's Policy Statement, including the incorporation of a focus on the 'multiple benefits' of building resilience, and the related highlighting of the importance of nature-based solutions. Other notable welcome additions include the intended review of the planning system, and the commitment of government to work with Flood Re and insurers to increase resilience. Progress in these areas is required urgently, and we would urge the Government to build on the momentum, having made the commitments, to move forward swiftly with implementation. One aspect of this should be ensuring the commitments are integrated into wider governmental policy – the detail of which has yet to be made clear. For example, the importance of flood resilience has not been recognised in the industrial strategy. This is an un-fulfilled opportunity, as flooding is an issue that spans policy areas including net-zero emissions, climate change adaptation and the transition of workers away from carbon-intensive industries. As such, there is an opportunity for flood planning to emphasise the importance of a holistic response by being embedded in these interconnected policy areas.

A stronger focus on the role of businesses in meeting the challenges posed by a changing climate than is currently outlined by the new Strategy and Policy Statement would be welcomed. The UK Climate Change Risk Assessment (CCRA) 2 identified the need for more action to address flood risks to businesses (Committee on Climate Change, 2017) and any policy and strategy should be closely aligned with the results of the assessment. In particular, CCRA2 highlighted the challenges to the economic system resulting from interdependencies and cascading impacts – brought about when climate risks interact with business systems and processes. For example, co-located or clustered businesses may all be reliant on the same infrastructure and transport routes. Public policy and regulatory measures can influence the ability of business and industry to take adaptation action and become more flood resilient. However, the Government's role in supporting businesses and in harnessing the private sector's expertise and financial capabilities for flood resilience remains weak and requires urgent attention. The Grantham Research Institute is currently leading the business and industry chapter for CCRA3, reviewing the impacts of current and future flooding for businesses in the UK, and whether adaptation action is taking place. Government action to help businesses understand risk and enable them to act is urgently needed, particularly for SMEs. It is also required for larger companies across a range of sectors that may not feel directly exposed to flooding but are at risk of indirect impacts through distribution networks, supply chains, and flooding affecting their customers and employees (Surminski et al., 2018).

2. Are the current national and local governance and co-ordination arrangements for floods in England effective?

Current national and local governance and coordination arrangements for flood management in England require a paradigm shift – from a reactive approach towards proactive, risk-based management. Although flood risk management in England has shown positive shifts from hazard management to a recognition of the need for wider resilience, there is still an over-reliance on structural flood protection.

In general, promising data and procedures are present, but gaps exist in using this information to inform implementation. Specifically:

- Regular 'lessons learned reviews' on legislation are being conducted and offer important insights, but often these do not translate into implementation.

- Risk information capability and data accuracy are strong, and England does have a highly developed flood forecasting system, but given that the level of general flood risk awareness remains low, it appears that the use of this information needs to be increased.
- Funding flood risk management (FRM) at the local level remains challenging.
- Installation of property-level protection remains low, despite growing recognition of its effectiveness (explored further in response to Question 6 below).
- Although the planning system does consider flood risk for new developments, outside pressure on housing and land use creates additional challenges for actual zoning and planning decisions.
- There is very limited evidence of 'building back better' and of factoring resilience into reconstruction, even though significant financial efforts support timely recovery and reconstruction.
- Specific roles and responsibilities within FRM are often unclear due to the many actors involved. The real estate, banking and investment sectors have not fully recognised the importance of flood risk and because of that, there is a systemic risk of over-reliance on the future availability of insurance.

Further, the local evidence base that informs the governance of resilience to climate risk needs to be improved, as evidence from the Place-based Climate Action Network[2] (PCAN) initiative highlights (in Howarth et al., 2020):

- More empirical work is needed to explore how different actors react to climate risks such as flooding, the types of climate decision-making processes that are involved and evidence used.
- The rapid evidence assessments conducted on DEFRA's Flood Resilience Community Pathfinder programme are considered useful for understanding the effectiveness of interventions. Datasets for managing and responding to flooding at county level are generally considered to be reasonably accurate, boosted by the availability and usefulness of the EA's flood maps.
- The factors limiting access and use of data include a lack of knowledge on what exists where and its quality, prohibitive access costs (e.g. to data held by insurance companies, academic research papers), sensitivity of releasing personal data, as well as a lack of interoperability between related datasets. Evidence can be poorly communicated, requiring better translation of evidence (limiting technical jargon) for policy use to enable better connection between evidence producers and users.
- Several barriers are considered to limit the usefulness of existing evidence to inform decision-making, including inaccessibility and data-sharing issues, lack of technical capacity to utilise existing data, a disconnect between evidence producers and users, and difficulties in operationalising evidence in decision-making. Building the evidence base is compounded by challenges such as inherent difficulties associated with trying to forecast or predict the (uncertain) future, or in producing evidence on impacts, due to missing information and climate impacts changing and evolving over time.

With this in mind, efforts to address these evidence gaps should focus on:

- Social and economic data, including data on vulnerable people and their exposure to risks, behavioural aspects of responses and socio-economic assessments.

[2] https://pcancities.org.uk/

- Assessment of policy mechanisms and other interventions which utilise evidence and inform decision-making.
- Scientific and modelling evidence aligned with decision-maker needs.
- Geographic or spatial data to better capture meteorological and climatological risks as they evolve.
- Local and real time evidence-capturing processes and impacts on the ground.
- More effective communication of evidence that is translatable and transferable across scales and decision-makers.

3. What level of investment will be required in future in order to effectively manage flood risk in England, and how can this best be targeted?

It is encouraging to see the UK Government recognising that flood risk management is an important investment area. We welcome recent announcements on spending and policy, including the Flood and Coastal Erosion Risk Management policy.

While acknowledging the recent funding announcements, it is important to recognise that investments in large-scale flood protections will take time to materialise and will never completely remove flood risk. Therefore, it should be kept in mind that flood protection is never absolute and may even create a false sense of security, as it tends to stop other complementary risk reduction and adaptation activities from going ahead. Considering the concept of residual risk, including the potential failure or breach of flood defences, it is important to continue to invest in holistic resilience efforts. This involves greater investment beyond 'hard' engineering and infrastructure solutions to an investment approach that sufficiently covers strategies for increasing human, social and natural capacities. This includes property-level protection measures, improving education, raising awareness, better community planning and nature-based solutions. Such an investment approach is urgently needed for building multi-risk resilience for communities. As such, flood resilience should be mainstreamed into broader risk management planning to account for instances where several shocks might occur simultaneously or in quick succession.

4. How can communities most effectively be involved, and supported, in the policies and decisions that affect them?

Building flood resilience in times of a changing climate needs to go beyond focusing on technical analysis and expert-based decision-making. Instead, all the community members who are and may be influenced by current and future flood risks should be able to be involved in the processes of 1) assessing risks and 2) creating and designing flood-related policies and interventions. The Zurich Flood Resilience Alliance (ZFRA[3]) has introduced a participatory approach to assessing flood risk and supporting decision-making which is based on the engagement and knowledge exchange between different members of the community (https://floodresilience.net/). The Flood Resilience Measurement for Communities (FRMC) tool, developed by ZFRA, has been used by 110 communities across nine countries (between 2013 and 2018) and is being implemented in a number of other countries including the UK and Germany in the second phase of the project (which runs from 2018 until 2023). Using this tool, the local governments (and other stakeholders) collect data, measure their flood resilience and design interventions through conducting community-focused group discussions, workshops and surveys. The participatory nature of this approach also supports

[3] 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 Political Science, and (9) the Institute for Social and Environmental Transition-International.

increasing risk awareness as well as acceptability and credibility of selected measures within the communities.

LSE, in collaboration with ZFRA, is leading the FRMC implementation in five communities in the UK and Germany. This participatory and community-based work shows that flood resilience policies and interventions should be considered holistically to help society move ahead in a sustainable way – that is, by pursuing social, ecological and economic development goals while managing the risk of flooding over time in a way that mutually reinforces these goals. Climate resilience needs to be an essential component of current and future planning and decision-making to ensure that previous gains in community poverty reduction and economic prosperity are not wiped out by adverse climatic impacts. This framework of holistic development benefits is termed a 'triple dividend of resilience investment' and shows how in addition to avoiding loss and saving lives, resilience investment also boosts economic potential and has broader development co-benefits, eventually supporting resilience of different groups of communities.

In addition, decision-making for community flood resilience requires a multi-systems approach – this means that flooding has multi-faceted impacts on communities and can only be tackled through a broad array of measures. Enhancing flood resilience requires ensuring that all necessary social, human, natural, physical and financial systems are in place to mitigate future flood risks. We therefore call for investment in nature-based solutions, community-level planning, education and awareness-raising, spatial planning and property-level protection measures in order to increase flood resilience.

It is encouraging to see that the recently published Flooding and Coastal Erosion Risk Management policy outlines five specific policies and more than 40 supporting actions to increase resilience and prepare communities for future flood risk and coastal erosion. These actions aim to reduce both the likelihood and impacts of future flooding and include measures backing natural solutions – for example, creating sustainable drainage systems and building hollows in the ground to catch flood water in heavy rains, enhancing resilience incentives for property owners through the Flood Re insurance pool, and enhancing planning policies to direct new development policies away from areas at risk.

5. With increasing focus on natural flood management measures, how should future agricultural and environmental policies be focused and integrated with the Government's wider approach to flood risk?

The integration of policies with the Government's wider approach to flood risk and natural capital flood management measures can be enhanced by a triple-dividend approach (Surminski and Szoenyi, 2020). Natural capital can play a key role in a triple dividend of adaptation: not only reducing losses and damages from the impacts of climate change, but also unlocking development potential, and fostering wider social and environmental co-benefits. Better quantification of the co-benefits of natural flood management measures and their resilience is required, looking more holistically than the classical cost–benefit analysis that is focused only on physical infrastructure.

This importance of natural capital is currently recognised, but the triple-dividend approach continues to lack necessary financing, and its translation into policy and business models should be prioritised. In promoting immediate investment in natural capital solutions, policy should better prioritise the urgency of this anticipatory approach to resilience. Funding for preventative adaptation and resilience should match what is currently being spent in reactive response and recovery strategies, as an ex-ante approach will leverage far greater returns in the long run.

In addition, Mehryar and Surminski's (2020) research on national flood risk laws calls for an increased emphasis on natural capital in national flood laws specifically, as the current focus is largely on physical and human capital.

6. How can housing and other development be made more resilient to flooding, and what role can be played by measures such as insurance, sustainable drainage and planning policy?

Any effort to keep flood risk at bay is jeopardised by continued risk creation. The way we use land, and how and where we develop property, are currently exacerbating the risk of flooding from climate change in many parts of the UK. This is making it harder for communities, companies and government to reduce losses from flooding events and secure sustainable economic growth.

Despite improvements in the management of flood risk and the introduction of new regulations, losses from flooding remain high. An important driver is the continued building of new assets in flood-prone locations. Ongoing research by the Grantham Research Institute shows that of the 120,000 new homes built in medium and high-risk flood zones in England and Wales over the last decade, a disproportionately higher number are in deprived and struggling areas. Moreover, it is likely that many more new homes will end up in high-risk flood zones over their lifetime, as a result of climate change (Surminski and Roezer, 2020). Therefore, efforts to tackle environmental justice issues related to flood risk and new build homes could be threatened by an uneven increase in flood exposure over the coming decades as a result of climate change. Taking into account future flood hazards in the spatial planning process could help to ensure that local deprivation issues are not exacerbated in future by increasing flood risks to newly built properties.

While flood-resilient design could ensure the long-term sustainability of these homes, there is very little evidence that developers, planners or financiers are taking the implications of climate change into account when deciding how and where to build. Key issues here include the lack of data and mechanisms that allow checks on the extent to which new buildings are built in a resilient way to ensure long-term flood resilience that takes future climate data into account. While the EA is now a statutory consultant on applications for planning permissions for new buildings in flood zones, no mechanisms or datasets exist that enable monitoring of whether the EA's advice is followed. Collecting this information would help to improve planning and would avoid the creation of new risks that jeopardise flood risk investments.

Insurance has a significant role to play in making housing and other developments more resilient to flooding, in part because the insurance industry is very well informed of current and future levels of flood risk. As society's risk manager, the sector can help make the country more flood resilient – but has missed many opportunities to do so. The design of Flood Re – a joint initiative between the Government and insurers that helps make flood risk insurance more affordable – is illustrative of these weaknesses. The initiative has not been designed to support the necessary increase in resilience for current and future flood risks. Any future reform of Flood Re should set out a clear strategy to introduce incentives for resilience measures via insurance. Ultimately, addressing the risks of flooding now and in the future, and building resilience against them, is the only way to help ensure the affordability and availability of insurance.

Insurance can also play a role in housing and development resilience by extending climate risk disclosure to customers, as explored by Surminski and Unsworth (2019). Two key issues currently surrounding insurers' disclosure that need to be addressed are, firstly, that disclosure is not aimed at customers, as the primary audience for climate risk disclosures has been the investor community and regulators. In addition, how insurers themselves are influencing risk levels is not being considered in their disclosure. These gaps should be closed by climate risks being carefully

communicated to customers, including transparency about how risk is priced and how risk reduction is taken into account by underwriters. In addition, insurers should encourage and incentivise customers to build climate resilience.

Insurers also have an opportunity to bridge the knowledge gap on climate change risk, across both the underwriting and assets sides of their own industry, and should work towards ensuring that exposure to climate risks is embedded into investment decisions. After a disaster or climate shock, insurers should play a central role in making sure buildings and infrastructure are rebuilt in a low-carbon and climate resilient way.

It is also important to strengthen standards to encourage 'building back better' after a flooding event, by making damaged buildings and infrastructure more resilient to future risk. This principle should be implemented immediately to avoid continued risk creation and to ensure better alignment with the aims of the Flood and Water Management Act 2010, particularly for implementation of Sustainable Drainage Systems. With regard to the latter, the Committee on Climate Change (2019) has noted that planning policy needs to better align with the aims of the 2010 Flood and Water Management Act, specifically ensuring that Sustainable Drainage System installations maximise their impact of flood risk reduction and co-benefits, as new developments can cause an increase in surface water run-off.

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