Written evidence submitted by The Yorkshire Integrated Catchment Solutions Programme (iCASP)(FLO0019)


## Summary

This response to EFRA's inquiry into the Government's approach to managing the risk of inland flooding in England covers all the terms of reference outlined; our particular focus is on addressing the issues of flood risk using an integrated catchment management or landscape-scale approach. We draw upon examples and evidence from research translated through our programme of work on issues including natural flood management, flood risk communications and improving SME and business resilience.


## About iCASP

1. The Yorkshire Integrated Catchment Solutions Programme (iCASP) is a five-year (2017-2022) Natural Environment Research Council-funded partnership established to support the UK Industrial Strategy. iCASP aims to generate £50 million+ of benefits to Yorkshire's economy by influencing investments, informing policies and strategies, identifying cost savings, and creating new products and jobs. It will do this through projects that support the use of environmental science in catchment management. As well as regional impact, iCASP is aspiring to national and international influence through sharing the experience of regional projects at the national level.

2. iCASP works with a broad range of partners, at the programme and individual project level. More details about these and the programme are available from the iCASP website

3. iCASP is based out of water@leeds at the University of Leeds, one of the largest interdisciplinary centres for water research in any university in the world.

4. iCASP has already had success in providing evidence for major flood risk mitigation business cases in Yorkshire, supporting the development of the Leeds City Region Green and Blue Infrastructure Strategy and creating a Natural Flood Management Community of Practice as well as providing evidence and expertise to a range of NFM activities.

5. This response is from the iCASP Programme Office based at the University of Leeds, rather than on behalf of the iCASP partners and draws on expertise from across iCASP and water@leeds. The following experts contributed to this submission: Professor Joseph Holden, Professor Piers Forster, Professor Jouni Paavola, Dr Paola Sakai, Dr Tom Willis, Dr Jenny Armstrong, Dr David Dawson, Shelley Evans and Peter May.

## Response to the inquiry

### Are the current national and local governance and co-ordination arrangements for flood and coastal risk management in England effective?

6. There is a need for better integration of the latest science into flood and coastal risk management. Many of the governance processes appear to be rather political and there is a need to ensure this is appropriately balanced with science evidence and new science.

7. 'Nature-based solutions', such as Natural Flood Management (NFM), are increasingly implemented on the ground as they can provide complementary and additional protection from flood risk in conjunction with traditional flood defences. NFM continues to gain traction with both management authorities and landowners, and the implementation of NFM frequently involves, and is sometimes lead by, community organisations or other comparable local groups of non-governmental nature. NFM highlights the importance of working over large geographical areas (catchment scale management), however, local governance structures can present barriers where catchments span more than one local authority

8. Current governance and funding structures make it difficult for NFM to be integrated into mainstream, more traditional flood management and agri-environment schemes, for example Local Levy funding applications must detail how many houses are protected from flooding – this is not always possible to ascertain with high confidence for NFM.

9. While there is increasing emphasis on partnership working in flood risk management, the current governance arrangements do not address the roles of the variety of new actors who are active in flood risk management. Governance arrangements also fail to address many NFM issues such as access to interventions and maintenance responsibilities which can lead to substantial ambiguity which can be an obstacle for action on flood risk.

## What lessons can be learned from the recent floods about the way Government and local authorities respond to flooding events?

10. Clearer communication is needed, to the public and to government officials, about the science of flooding, the 'causes' of flooding, and what are suitable mitigation measures. During the recent flooding there was the usual speculation on social media, news stations, popular radio etc., about dredging or about how a flood defence in one place caused the floods to occur somewhere else. The population need to be better informed about flooding and its causes to avoid misinformation.

11. iCASP recently started a new project on 'Improving flood risk communication through engagement tools'. The project will meet a need voiced by Flood Risk Managers (FRMs) across Yorkshire who have requested support to overcome challenges, some identified in the recent floods, that impede their efforts to communicate with, and build resilience of, those at flood risk. These include difficulties with:
    - Selecting the right language and context when communicating flood risk and how to set the right tone for the right time and place
    - Understanding different interests, perceptions and cultures amongst individuals and groups within a target audience
    - Information fatigue and diminishing interest in flood risk with the passage of time following a flood event
    - Reluctance to acknowledge flood risk due to stigma and the effect such a status may have on the saleability of property
    - Raising the profile of flood risk against other competing pressures
    - The emotional state of people in the immediate aftermath of a flood event

- Determining what action is taken as a result of flood risk communication efforts

iCASP is working with FRMs to overcome these challenges by using key principles established in the literature to develop tools and guidance for their organisations.

12. A previous iCASP project on 'Enhanced surface water flood forecasts' explored how the latest advances in probabilistic rainfall forecasting could be integrated into sub-regional forecasts to support incident decision-making. The project report and feedback from an incident response workshop run during the project are helping scope out future forecasting opportunities and better understanding user needs.

## Given the challenge posed by climate change, what should be the Government's aims and priorities in national flood risk policy, and what level of investment will be required in future in order to achieve this?

13. Two main pieces of evidence produced by the Government's own advisers on the risks posed by future flooding need to be fully integrated into the flood risk policy:
    - The 2017 and upcoming 2020/21 Climate Change Risk Assessment produced by the Committee on Climate Change, which shows the clear future risk of more intense winter storms, with stronger rainfall events and increased risk of winter flooding. Adaptation policies are behind what is needed in every area and sector.
    - The Net Zero 2050 target, now signed into law, requires all sectors including housing and transport to be zero-carbon. This will require new housing, refurbished housing stock, nature-based solutions, new transport links such as cycle paths etc. This expected massive infrastructure change will need to consider both flood risk and net-zero seriously from both directions; i.e. new infrastructure will need to reduce flood risk and withstand higher temperatures; likewise flood protections will need to be net zero and able to cope with higher future temperatures.

14. There is a need to take a more integrated approach to flood management; landscape measures that enhance carbon sequestration and biodiversity can at the same time improve water quality and reduce flood risk and in some situations also make the system more resilient to drought. We need to invest in landscape-scale thinking to reduce flood peaks, manage groundwater and to think about integrated environmental benefits. Policy needs to be integrated to support such measures. This requires a radical overhaul of environmental management schemes to encompass catchment-scale thinking and multi-benefit approaches, and of the oversight process for managing catchments.

15. There is a particular synergy with upland planting for flood protection and carbon capture. Existing restrictions and protections of upland areas are an issue for tree planting at scale, so different agencies and stakeholders need to be brought together for successful deployment of nature-based solutions.

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

16. Communities need to be engaged from the outset in both education and in being able to mobilise to develop community and property level resilience measures. Flood resilience co-ordinators could be deployed to provide advice, gather feedback from communities and

support mobilisation of community efforts. In addition, efforts to help the public understand their flood risk and responsibilities, e.g. riparian ownership should be increased.

17. Transparency of decision-making is key: more resources should be ring-fenced for consultations on schemes to enable more support and increased involvement of those at flood risk to shape policies that will impact their lives.

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

18. We need an integrated approach to landscape measures to tackle flooding which also provide wider environmental benefits. NFM measures need to be integrated with other environmental measures and also recognised for the wider environmental benefits they bring. Agricultural policies need to appreciate the integrated nature of these benefits and also that some benefits may not be manifest for many years as it takes time for the system (e.g. soils) to shift in their functioning once a measure is implemented. If we implement some small on-farm measures and changes in practice, but on a very large scale with wide compliance, these may have a significant effect downstream.

19. Land use and underlying catchment characteristics should dictate the type of interventions used, and a balance between resources for agriculture and wider flood risk reduction methods should be considered. In upland and lowland areas there is a difference in impact between the measures applied; policies should be shaped to reflect this

20. In upland catchments, a wide range of interventions are implemented ranging from large scale land use change, to small physically based interventions. Research by the University of Leeds with the Yorkshire Dales Rivers Trust and Calderdale Council highlighted that catchment-wide soil improvement measures were the most effective measure for reducing flood peak in the Bishopdale catchment[1] - these measures clearly also have impacts upon farmland. Research[2,3] highlights how extensive NFM measures, such as those that cover a wide land surface, or interrupt defined flow paths (e.g. contour hedge planting), prove to be the most effective when working in steep, upland catchments.

21. The same measures may not always be as successful in lower catchments, where the opportunity to implement effective (i.e. will capture a significant amount of water) leaky dams is limited. The measures considered for lowland farming areas include winter crop cover, woodland planting, hedgerow improvements[4] and improving soil quality by reducing compaction to increase infiltration[5]. In this respect, NFM and soil conservation measures should be considered simultaneously for better effect.

---

[1] Kingsbury-Smith, L (2019) Testing the effectiveness of land use management as a Natural Flood Management technique, *Masters by Research Thesis, School of Geography, University of Leeds*

[2] Gao J, Holden J, Kirkby M (2016) Modelling impacts of agricultural practice on flood peaks in upland catchments: An application of the distributed TOPMODEL *Hydrological Processes.* 2017;31:4206–4216

[3] Gao J, Kirkby M, Holden J (2017) The impact of land-cover change on flood peaks in peatland basins. *Water Resources Research*. 52(5)

[4] Holden, J., Grayson, R., Berdeni, D., Bird, S., Chapman, P.J., Edmondson, J.L., Firbank, L.G., Helgason, T., Hodson, M.E., Hunt, S., Jones, D.T., Lappage, M., Marshall-Harries E., Nelson, M., Prendergast-Miller, M., Shaw, H., Wade, R., Leake, J.R. (2019). The role of hedgerows in soil functioning within agricultural landscapes. *Agriculture, Ecosystems and Environment, 273, 1-12,*

22. Whilst catchment-wide approaches may be highly effective, smaller scale NFM interventions such as swales and online/offline ponding should also form part of any policy. These measures provide a benefit but will potentially impact the amount and profitability of farmland by temporarily flooding grazing areas. This is being considered in the wider ELMS scheme. In terms of studying the problem, the iCASP Payment for Outcomes project, in conjunction with The National Trust, has demonstrated the complexity of this approach which future policy should reflect. Implementation of NFM requires careful design to both optimise the effectiveness of the design and ensure additional risks to farm land are not created[6].

23. In incorporating flood risk measures into agricultural policy, consideration should be given to balancing flood risk benefit and agricultural requirements. Research has demonstrated that even where damage led to negative impacts in biomass production in agricultural soils, soils can recover within a year and management of the soil could improve this recovery rate[7]. Further research is required to understand the recovery time, from flooding, for grasslands on upland farms in order to cost the total time land may be lost to flooding or storing water, and determine broader guidance for effective NFM measures.

24. iCASP have several projects underway to support the use of NFM, including addressing specific needs in an area at the local level (eg Calderdale NFM project), translating the evidence base to ensure the most appropriate monitoring and measuring regimes in NFM pilots and building the capacity and knowledge of Yorkshire NFM practitioners through the formation of a Community of Practice (these latter two are delivered by the iCASP Natural Flood Management project)

## 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?

### Planning Policy

25. iCASP was established because of the consensus of its partners for the need to work at catchment scale. Without such an approach, upstream factors contributing to housing flood risk may not be mitigated, and the downstream impacts, including on flood risk, water quality and ecology will not be recognised adequately and addressed in housing design/planning

26. Critically, planning at the catchment scale facilitates the consideration of cumulative impacts which could result from the combined effect of a number of new housing developments. Notably this combined effect is not merely the sum of effects from a set of new housing developments. Rather the effects interact because at a catchment scale the altered timing of flows from different parts of the catchment interact with the timing of the flows in the main channel creating non-linear responses[8]. Furthermore, some parts of the catchment will be

---

[5] O'Connell, E., Ewen, J., O'Donnell, G., Quinn, P. (2007). Is there a link between agricultural land use management and flooding? *Hydrol.Earth. Syst. Sci*., 11(1): 96-107

[6] Senior J (2019) An Analysis of Leaky Woody Debris Implementations Effectiveness in Reducing Overland Flow Discharge into Hebden Water, Hardcastle Crags: Using Both Quantitative and Qualitative Analysis Methods *MSc Thesis, School of Engineering, University of Leeds*

[7] Harvey, RJ, Chadwick, DR, Rafael-Sánchez-Rodríguez, A, Jones, DL (2019) Agroecosystem resilience in response to extreme winter flooding *Agriculture, Ecosystems and the Environment (279, 1-13)*

[8] Acreman, M. and Holden, J. (2013) How wetlands affect floods. *Wetlands* 33, 773-786.

more sensitive to development than others, particularly in terms of the downstream flood risk[9] . Working across traditional planning boundaries is also a more suitable operational scale for nature-based solutions. Delivering flood risk resilient homes at volume means adopting the principle of working at catchment scale. This means thinking about upstream solutions to flood risk for housing, on-site measures that reduce downstream flood risk, and how housing features and impacts combine and interact with the flows of water across catchments.

27. The Government has recognised that balancing development with flood resilience is a key long-term strategic challenge[10]. However, there remain key challenges from the connection of the physical understanding of the problem (i.e. the flows of hazards), and the management systems used to prioritise action and investment to deal with it (i.e. the planning & policy). Both research, industry, and Government widely acknowledge that a whole-system approach in flood risk management is beneficial[1017,11,12]; nature-based solutions, such as blue/green infrastructure/ sustainable drainage are also a priority[13]; and co-ordinated planning and management is championed[1313,14]. So in order to improve the balance of urban development and additional flood risk incurred, system-based approaches that address these agreed measures must be developed, applied, and reviewed, for consideration into mainstream planning.

28. One way to do this is to broaden the spectrum of physical hazard modelling across the catchment to include the source of floodwater rather than just the mandatory risk/hazard maps. This type of approach is particularly useful when applied to urban areas and when assessing the connection or retrofit of sustainable drainage solutions. For example, it can illustrate hydrologically that interventions are often needed in locations far away from where the flood hazard and impacts occur[15]. If developed further and embedded into mainstream management (e.g. planning & financial systems), it could have several benefits:
    - increasing the release of land for development (e.g. housing, transport, etc.) based on the land's known contribution to flood risk across the wider system;
    - through additional spatial analysis of existing planning schemes (masterplans), steering collaborative resilience projects across multiple sectors (e.g. energy, transport, housing) by identifying shared opportunities for urban development and flood interventions collectively**Error! Bookmark not defined.**; and,
    - improving wider benefits of sustainable solutions through shared economic and strategic business cases.

    Building these concepts and methods into our mainstream urban planning, standards and practice is challenging, and is a key long-term strategic priority for the nation**Error! Bookmark not defined.**.

29. The principles of such a 'systems' approach is being co-developed with Leeds City Council and University of Leeds researchers as part of the iCASP project 'Systems approach to urban

[9] O'Donnell, G., Ewen, J. and O'Connell, P.E. (2011) Sensitivity maps for impacts of land management on an extreme flood in the Hodder catchment, UK, *Physics and Chemistry of the Earth* 36, 630-637.
[10] HM Government (2016); *The Flood Resilience Review*
[11] Vercruysse, K., D. A. Dawson, N. Wright (2019) Interoperability: a conceptual framework to bridge the gap between multi-functional and multi-system urban flood management. *J. of. Flood Risk Mgmt*.; Vol. 12, e12535
[12] National Infrastructure Commission (2019): Resilience Scoping Study
[13] HM Government (2019); *A Green Future: Our 25 Year Plan to Improve the Environment*
[14] D.A. Dawson, K. Vercruysse, N. Wright 2020. A spatial framework to explore needs and opportunities for interoperable urban flood management. *Philosophical Transactions of the Royal Society* A. 378.2168;
[15] Vercruysse K, D.A. Dawson, et al. (2019b). Developing spatial prioritization criteria for integrated urban flood management. *Journal of Hydrology*. 578

infrastructure management' which is reviewing collaborative infrastructure development and catchment flood management. And, with another iCASP project 'Green Blue infrastructure business cases', will be integrating this with strategic business case development to provide valuable information and tools for planning.

## Improving the insurance offer

30. Flood insurance can be an effective strategy to increase resilience as long as it is affordable. Despite efforts from the Government to enable affordability of insurance, this has not been accomplished for SMEs who are still excluded from Flood Re with no other scheme in place to guarantee the affordability of insurance and to encourage SMEs' flood protection.

31. Research from the University of Leeds has identified two main causes of this failure:
    - A lack of understanding of the economic costs and risks that SMEs represent to insurers;
    - A lack of trust on the realistic flood risk reduction measures that heterogeneous SMEs can undertake and their implications for risk.

    These uncertainties are reflected in high insurance prices and missed opportunities to build flood resilience within SMEs. Affordable insurance is also needed to unlock growth as lenders require SMEs to have flood insurance in place if they require access to finance to expand their activities, get a mortgage, or just continue with their businesses. The Government needs to put more effort into supporting conversations to find a scheme that works for SMEs and insurers, one that enables 'build back better' and unlocks investment.

32. The iCASP project 'Bridging the knowledge gap to boost SME resilience' across Yorkshire has been set up to address some of these problems. The project aims to enable confidence, and investments in resilience, by providing appropriate information to insurers and lenders to expand their coverage and loans to SMEs in flood risk areas and to push SMEs into self-protection. It also aims to increase the capacity of Local and Sub-regional Authorities to co-produce a methodology to carry out economic assessments of the direct and indirect impact of flooding on SMEs in a consistent and timely way. This would allow the preparation of more robust business plans and strengthen the cases of flood alleviation schemes to be better prepared for future flooding events.

## Property flood resilience (PFR)

33. Flood resilient properties, neighbourhoods and communities require a strong, joined up approach between central government, local authorities and insurance companies. Resilience in the flood sense relies on being able to access data during an event, capital to create resistant measures before and to build a system that requires knowledge of the potential risk, enough time to act on this data and the ability to implement resilient measures[16]. Resilience should be aimed at current housing stock that is currently at risk, rather than a method to justify the development of future stock in risk locations.

34. Flood protection technology at the property level is broadly understood in high-risk areas (such as Hebden Bridge, where flood resistant door panels are widely used), and can be effective. Wider usage will require effort to ensure more people currently at risk of flooding become aware of this and take action; likewise it will remain important for the Risk Management Authorities (RMAs) such as Environment Agency and Local Authorities to

[16] Bailca S, Douben N, Wright N (2009) Flood vulnerability indices at varying spatial scales *Water Science and Technology*

continue providing funding support and commitment in delivering PFR schemes to those communities remaining at high risk.

35. iCASP, and project partner JBA Consulting, are part of the City of York Council Defra-funded 'Yorkshire Property Flood Resilience Pathfinder project' to increase understanding and uptake of property flood resilience (PFR) measures. Provisional results from the baseline survey to understand barriers to uptake of PFR measures reveal a range of factors which can be broadly broken down as follows:

- Lack of knowledge and understanding about PFR measures, where to get them or how to use them
- Lack of people able to provide specialist building survey and PFR design
- Lack of recognition within the insurance industry of PFR measures, and lack of capacity and knowledge to handle PFR-related checks
- Lack of awareness of the availability of the Environment Agency's PFR Framework available to all UK RMAs to provide the specialist surveys and funding support needed by those communities at risk
- Perception that PFR is a secondary measure behind major flood defence schemes
- Perception that flood defence is something that 'the authorities' do rather than something individuals and property owners can do to help protect themselves
- Acceptance by people that while resistance measures provide a cost-effective way to protect a property, complete resistance to flood water is not possible. Indeed pumps are an essential component of the measures to manage seepage. The alternative option of adapting the internal fabric of the property to allow water entry and minimise damage can also help a return to normal much faster following a flood. The choice of approach will depend on cost, willingness to pay and individual preference.

These will form a key role in the project helping target engagement to increase the understanding and uptake of PFR measures across the region.

May 2020