Defra
National flood resilience review

Background to CIWEM

CIWEM is the leading independent Chartered professional body for water and environmental professionals, promoting excellence within the sector. The Institution provides independent comment on a wide range of issues related to water and environmental management, environmental resilience and sustainable development. CIWEM welcomes the opportunity to respond to the National flood resilience review by providing the following published evidence.

Answer to consultation questions

1. Future flood risk / rainfall extremes in England

Dale, M. Luck, B. Fowler, H. *et al.,* 2015. New climate change rainfall estimates for sustainable drainage. *Engineering Sustainability.*

https://www.researchgate.net/publication/284546535_New_climate_change_rainfall_estimates_for_sustainable_drainage

This paper reports on new approaches to estimate potential future rainfall intensity changes over the UK at temporal and spatial scales that impact on urban drainage systems. The research has produced estimates of rainfall intensity change over different parts of the UK using a climate analogue approach and a very high-resolution (1·5 km) climate model developed by the UK Met Office. The new estimates produced are, in general, higher than existing UK climate change allowances for rainfall intensity. Sewer flooding volumes, flooding frequency and frequency of pollution events are also investigated for one location; indicating that these incidents and flood volumes are also likely to increase in the future.

This work has informed the recent guidance published by the Committee on Climate Change (below) and can be considered 'state of the art' for the consideration of future urban drainage related flood risk in the UK. UKWIR are extending this work in 2016 to provide greater coverage in England and the wider UK. For urban drainage modelling we are most interested in the sub-daily rainfall patterns as it is these which govern the performance of urban drainage system and the onset and occurrence of sewer and pluvial flooding.

Sayers, P.B; Horritt, M; Penning-Rowsell, E; McKenzie, A. 2015. Climate Change Risk Assessment 2017: Projections of future flood risk in the UK. Research undertaken by Sayers and Partners on behalf of the Committee on Climate Change. *Committee on Climate Change, London.*

https://www.theccc.org.uk/wp-content/uploads/2015/10/CCRA-Future-Flooding-Main-Report-Final-06Oct2015.pdf

This report presents the analysis for future flood risks. The assessment of future flood risk presented considers three climate change scenarios (a 2°C and 4°C change in Global Mean Temperature by the 2080s and a H++ scenario) and, three population growth projections (low, high and no growth). For the first time the analysis presented covers the whole of the UK (England, Wales, Scotland and Northern Ireland) and the risks associated with coastal, fluvial, surface water and groundwater flooding. Eight individual Adaptation Measures (including, for example, spatial planning, flood defences, catchment storage) are used to construct five Adaptation Scenarios (including enhanced and reduced levels of adaptation ambition in comparison to present day). Future flood risks for a range of climate, population and adaptation combinations are assessed using the UK Future Flood Explorer and the results presented.

2. Communication of risk and uncertainty

A. Strathie, G. Netto, G.H. Walker and G. Pender. 2015. How presentation format affects the interpretation of probabilistic flood risk information. ***Journal of flood risk management***

http://onlinelibrary.wiley.com/doi/10.1111/jfr3.12152/abstract

In many European countries, flood awareness information is communicated through flood extent maps and probabilistic language. However, research suggests that probabilistic information is difficult to understand and that presentation format affects understanding and risk perception. In this study participants experienced difficulties interpreting probabilistic information. In the questionnaire, understanding was high across statements for both self-report and objective measures. However, the standard way of communicating risks, in terms of years per flooding event, evoked the lowest levels of understanding. For risk perception, there were differences in mean risk ratings across statements, and in general, people perceived the risk as greater when presented in terms of cumulative probability over a number of years than in terms of the probability of a single event. This suggests that by making alterations to the standard format used to communicate probabilistic flood risk information, it may be possible to increase understanding and awareness of the risks posed by flooding.

3. Other countries' approach to floods resilience policy

J. Vávra, M. Lapka, E. Cudlínová and Z. Dvořáková-Líšková. 2015. Local perception of floods in the Czech Republic and recent changes in state flood management strategies. ***Journal of flood risk management***

http://onlinelibrary.wiley.com/doi/10.1111/jfr3.12156/abstract

The objective of this paper is to study the social perception of selected water-related issues and to find possible compatibilities with existing flood management. The results are discussed in relation to changes in Czech flood management governmental policies over the last 15 years. We conclude that the local population accepts floods as regular events, expects their increased frequency and prefers natural measures of flood mitigation. Czech flood management governmental policies are moving from flood defence and hard structural measures (e.g. dams) to flood risk management and more natural solutions (polders, free spill, etc).

F.H.M. van de Ven, B. Gersonius, R. de Graaf, E. Luijendijk and C. Zevenbergen. 2011. Creating water robust urban environments in the Netherlands: linking spatial planning, design and asset management using a three-step approach. *Journal of flood risk management* 4, 4, 273-280

http://onlinelibrary.wiley.com/doi/10.1111/j.1753-318X.2011.01109.x/abstract

Changes in climate will likely have major implications for the layout of cities, buildings and residents. A three-step approach is presented to respond to these changes. The approach is applied to steer expansion and redevelopment towards water robust urban environments through integrated planning and action at local level. The three steps are (1) vulnerability analysis, (2) selection of a strategy to reduce vulnerability and (3) selection of an appropriate set of measures. This approach leaves much freedom to parties involved in specific urban (re)development projects. Local conditions to a large extent determine what can be done. It is up to these stakeholders to select a vulnerability reduction strategy that fits local conditions and preferences. An appropriate set of measures provides a level of robustness that is acceptable for all stakeholders and that stakeholders are willing to pay for. Creating a water robust urban environment requires continuous attention of many individuals and organisations, often including the residents.

Mayor's Office of Sustainability. 2015. A Stronger, More Resilient New York. New York Mayor's Office of Recovery and Resiliency.

http://s-media.nyc.gov/agencies/sirr/SIRR_singles_Lo_res.pdf

A comprehensive $20 billion plan to ensure an even safer, stronger, resilient city.

NYC Department of city planning, city of New York. 2014. Retrofitting Buildings for Flood Risk

http://www.nyc.gov/html/dcp/html/retrofitting/retrofitting2.shtml

Retrofitting Buildings for Flood Risk is a unique resource to help New Yorkers in the floodplain navigate the new regulatory landscape and learn how to adapt buildings for flood resiliency. By applying a clear step-by-step methodology on how to approach adaptation projects, the report shows a range of retrofit solutions for New York City's most common building types, from bungalows to multi-family residential structures and mixed-use buildings.

NYC Department of city planning, city of New York. Coastal climate resilience. 2013. Designing for Flood Risk

http://www.nyc.gov/html/dcp/pdf/sustainable_communities/designing_flood_risk.pdf

Designing for Flood Risk focuses on preparing buildings to withstand the threat of coastal flooding, while ensuring that they support everyday liveability and quality of life. The devastation in waterfront communities brought by Hurricane Sandy has brought a new level of urgency to this work.

US Environmental Protection Agency guidance. 2014. Flood Resilience – A Basic Guide for Water and Wastewater Utilities.

http://www.epa.gov/sites/production/files/2015-08/documents/flood_resilience_guide.pdf

Flooding is one of the most common hazards in the United States, causing more damage than any other severe weather-related event. It can occur from tropical storms, hurricanes, swollen rivers, heavy rains, tidal surges, spring snowmelt, levee or dam failure, local drainage issues and water distribution main breaks. This guide is particularly useful for small and medium utilities. It provides easy-to-use worksheets with corresponding videos to increase resilience to flooding, considering utility's priorities and available resources.

Association of State Floodplain Managers. 2003. 'No Adverse Impact' a toolkit for common sense floodplain management

http://www.floods.org/NoAdverseImpact/NAI_Toolkit_2003.pdf

A tool kit and group of manuals on various aspects of flood resilience particularly relevant to planning.

4. International approaches to improving flood resilience for communities and infrastructure

US Army Corps of Engineers. 2012. Hurricane and Storm Damage Risk Reduction System Design Guidelines

http://www2.mvn.usace.army.mil/ENG/PageA.asp

Hurricanes Katrina and Rita caused tremendous loss of life and destruction of property when they struck coastal Louisiana in 2005. The US Army Corps of Engineers and the New Orleans District continue to investigate the shortcomings of the hurricane and storm damage reduction system. This guide is presented in two parts. The first part, "Design Guidelines," presents methods and criteria that shall be used by engineers in the design of hurricane system components. The second part of this guide is a compilation of "Standards" used by the New Orleans District. This includes requirements for surveys and typical details for common construction elements.

'Rebuild by Design' - Post Hurricane Sandy

http://www.rebuildbydesign.org/research-2/

Initially run as a design competition, rebuild by design has transformed into an innovative process that places local communities and civic leaders at the heart of a robust, interdisciplinary, creative process to generate implementable solutions for a more resilient region in the way that planners and governments approach both disaster response and emergency preparedness. Rebuild by Design has established an international academic working group on design, politics, and resilience. Looking at how cities around the world incorporate design into their resilience approaches/efforts, and what can be learned from them, Rebuild by Design has identified Universities around the world who are looking at these issues to develop combined research in a network of science, government and other stakeholders.

5. Temporary measures to improve resilience of infrastructure

I. White, A. Connelly, S. Garvin, N. Lawson and P. O'Hare. 2016. Flood resilience technology in Europe: identifying barriers and co-producing best practice*. Journal of flood risk management*

http://onlinelibrary.wiley.com/doi/10.1111/jfr3.12239/abstract

Flood resistance and resilience technologies hold considerable potential to limit the damage caused by flooding. Resistance technologies generally aim to keep water out of buildings, while resilient measures may allow ingress but create the conditions for a quicker recovery of individuals, communities and buildings. However despite their potential contribution to flood risk management, their use remains uncommon. The paper draws upon pan-European research with local communities at risk and their representatives, and professional stakeholders working at a more strategic scale, to explore the barriers to use and describe the co-production of new best practice. The paper interrogates the issues in terms of: level of awareness, degree of acceptance and the integration into decision making. We found that even where awareness was high there was a reluctance to use these measures. This is due to issues related to comparability, costs, installation, performance and maintenance. The research also revealed that flood risk management policy and practice has struggled to incorporate this emergent approach and that many individuals at risk are reluctant to take responsibility and protect their properties in this way. In response, the paper details how good practice guidance – the 'Six Steps approach' – was co-produced with key stakeholders to facilitate the wider contribution of FRe to flood risk management.

S. Surminski, and J. Eldridge. 2015. Flood insurance in England – an assessment of the current and newly proposed insurance scheme in the context of rising flood risk. *Journal of flood risk management*

http://onlinelibrary.wiley.com/doi/10.1111/jfr3.12127/abstract

Flooding is the largest natural disaster risk in England and it is expected to rise even further with a changing climate. Agreeing on how we pay for this now and in the future is a challenge, with competing drivers such as fairness, economic efficiency, political feasibility and public acceptance all playing their part. We investigate this in the context of recent efforts to reform the provision of flood insurance, which have been debated between government and industry over the last three years. Recognising the challenge of rising losses and increasing costs we are particularly interested in how the existing arrangement and the new flood insurance proposal (Flood Re) reflect on the need for physical risk reduction. By applying our analytical framework we find an absence of formal incentive mechanisms for risk reduction in the existing and proposed Flood Re scheme. We identify the barriers for applying insurance to risk reduction and point to some possible modifications in the Flood Re proposal to deliver a greater link between risk transfer and risk reduction. Our investigation offers some insights into the challenges of designing and implementing flood insurance schemes – a task that is currently being considered in a range of countries, including several developing countries, who hope to apply flood insurance as a tool to increase their climate resilience.

W. Medd, H. Deeming, G. Walker, R. Whittle, M. Mort, C. Twigger-Ross, M. Walker, N. Watson and E. Kashefi. 2015. The flood recovery gap: a real-time study of local recovery following the floods of June 2007 in Hull, North East England. ***Journal of flood risk management***

http://onlinelibrary.wiley.com/doi/10.1111/jfr3.12098/abstract

Learning to live with flood requires learning to manage flood recovery. While in the United Kingdom much attention has been given to improving preparedness to flood events – from more sophisticated warning systems to the development of flood event planning – this article brings attention to in-depth research on the processes of recovery and the challenges of addressing what we call the flood 'recovery gap'. Resilience is defined in part by the time it takes to recover, it is imperative that more effective recovery is established. This article reports on the findings of a real-time longitudinal study using an action research model to document and understand the everyday experiences of individuals following the floods of June 2007 in Hull. It argues that recovery involves a more varied process than is assumed within current accounts, one which falls between institutional boundaries. It concludes with suggestions for addressing the 'recovery gap'.

CIWEM. 2014. Floods and dredging – a reality check. ***CIWEM***

http://www.ciwem.org/media/1035043/floods_and_dredging_-_a_reality_check.pdf

Floods and Dredging - a reality check takes an objective look at the role that dredging plays in managing water in our rivers and explains where dredging is an effective and appropriate measure and the circumstances in which its deployment will be far less effective and can even exacerbate flood risk, as well as causing ecological damage. The report encourages a balanced approach, utilising a wide range of measures which should be deployed where they can deliver most benefit.