Editorial

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Welcome to this themed issue on flood resilience. Much has been written in recent years about resilience in many sectors of our society and, equally, many definitions of resilience have been suggested. The one by van Veelen *et al.* (2015) is amongst the best in my view and is perfectly applicable to the flooding context: resilience is the “capacity of a system to buffer natural variations, recover from disturbances and return to its previous state without experiencing changes to the system as a whole; however, when certain thresholds are reached (‘tipping points’) systems are no longer able to recover and need to adapt to face changing circumstances.”

Flood events in the last decade – in Europe and worldwide – have brought to light the pressures that increased population and urban development, as well as climatic changes, pose on existing traditional flood defences. The efficacy of traditional methods has therefore been questioned and increased efforts and resources been made available for research into new approaches, focusing on resilience. New approaches include technologies and methodologies that allow a smoother passage through flood events and promote quicker recovery, enabling populations to resume their normal activities faster. These approaches, which are particularly important for the increasingly expanding urban areas, span across various stages of flood management from before the flood event (preparedness, assessment of vulnerability and criticality), during the flood (implementation of protection measures, emergency evacuation) and post floods (reinstatement). They also span across a range of subject areas including urban design and planning, urban drainage, building construction, asset management of infrastructure networks, etc.

When, back in 2013, I proposed a themed issue on flood resilience for *Water Management*, my intention was to capture the breadth of research and practice in the field of flood resilience in a single volume. In this issue, readers would be able to find papers on topics that would not normally be published in *Water Management* (e.g. urban planning), and hopefully they will thereby be exposed to new concepts and ways of thinking. I believe we amply achieved this in this issue. With contributions from the USA (Deatrack, 2015), Thailand (Chinnarasri and Porkaew, 2015), The Netherlands (van Veelen *et al.*, 2015), France (Balsells *et al.*, 2015; Cheetham *et al.*, 2015) as well as the UK (Connelly *et al.*, 2015), this is also a truly international issue, demonstrating the wide-ranging topicality of flood resilience.

van Veelen *et al.* (2015) explore how flexible approaches to urban planning can help in coping with the long-term changes imposed by changing climates and increased urbanisation of waterfronts.

They argue that methods such as the Adaptive Pathways (AP) (including the Adaptation Tipping Point concept) can contribute to more resilient urban waterfront development. Two areas of Rotterdam are presented as examples of application combining coastal and fluvial flood risk, where the AP was found to be an effective tool. It bridges the gap between highly uncertain and long-term climate change and the short-term decision-making horizons of town planners, and enables the development of a portfolio of adaptation measures, their timelines and the identification of possible lock-ins at an early stage in the planning process. For all its merits, van Veelen *et al.* (2015) are open about the method’s limitations, which include the need for detailed local hydraulic conditions as well as consensus on performance criteria and thresholds. The method is also currently hindered by neglecting the impact of urban dynamics, but the authors counteract this by suggesting that planners should incorporate change monitoring in their decision-making structures.

Balsells *et al.* (2015) present an overview of current practices for urban flood resilience, which have been prompted by the increased probability and severity of floods associated with rapid urbanisation and climate change. The authors point out that the main task for flood managers is the development of resilient cities and the paper reports on research undertaken to study how engineering and other design disciplines can improve flood resilience at an urban neighbourhood scale. The literature review carried out revealed a scarcity of references on studies at the neighbourhood level, as well as a lack of tools for raising awareness of flood resilience and providing guidance on how urban design professionals (architects, planners, engineers, etc.) could integrate flood resilience in their daily practices. Balsells *et al.* (2015) also raise some question, to be addressed in following stages of their research: how can flood risk be integrated into the design of new or retrofitted neighbourhoods; what functional, technical and conceptual innovations are appropriate in neighbourhoods; what new amenities and forms of housing and public spaces offer new uses and ways of living with water?

Connelly *et al.* (2015) approach flood resilience from a different angle, focusing on building resilience technologies – a developing market that can complement large-scale flood defences, planning and other flood-management approaches. The paper reports on an EU-FP7-funded multi-disciplinary research project (SmarTest) which investigated, developed and tested innovative technologies to protect buildings and urban infrastructure from floods, concentrating on building aperture technologies and perimeter technologies. As well as technical aspects such as product testing, social aspects

were also addressed in order to understand how flood-resilient technologies could become integrated into flood-risk management, and the barriers that have thus far prevented them from doing so. The authors suggest that harmonised European standards could help the route to market and encourage further innovation of these technologies.

Cheetham *et al.* (2015) take us to the Rhône River in southern France, which undergoes periodic flooding, leaving communities and vast areas of agricultural land inundated for significant periods of time. Levees and other flood-management structures have been constructed since the middle of the 19th century and were later raised and widened following flood events. This has rendered it difficult to assess their capacity to resist floods and recent flood events have resulted in numerous breaches in the existing network of protection. The last important flood event in 2003 led to the development of a global strategy for flood management on the lower Rhône (the “Plan Rhône”). The implementation of this plan, the creation of Symadrem as a flood defence management organisation and the imposition of special status of the railway embankments in the area led to a coordinated response by the main parties. The authors describe the collaboration to identify a resilient system of defence for the communities affected by flooding in the lower Rhône valley, and give details of the different approaches to evaluate the risks associated with the levees and the proposed solutions to enhance the resilience of the global system of defence against a 0.001 annual probability flood.

The paper by Deatrick (2015) on the flood-resilient redevelopment of Cincinnati’s Central Riverfront is a good illustration that perseverance and a clear vision, as well as time, are needed to achieve change. With a history of flooding from the Ohio River dating back to 1788 and regular flood events since, Cincinnati’s riverfront has evolved in multiple waves of development, but none very successful, resulting in an unattractive and not very productive area. Following various attempts at urban regeneration in the past, the paper reports on the current success that has resulted from a fresh approach to the area’s urban design master plan. This was based on flood resilience instead of the conventional wisdom based on flood resistance. The master plan enabled a mixed-use, transit and environmentally friendly development on the riverfront with minimal effect on the storage capacity of the river flood plain. Additionally, it has left it well connected to the central business district, the Ohio River and the wider region. The problems and challenges encountered are discussed as well as the solutions and strategic alliances used to overcome the

obstacles. Being in the realm of urban planning, it is hoped that Deatrick’s paper will be particularly interesting to the normal readership of *Water Management* by highlighting the importance of urban planning in resilient flood management.

Chinnarasri and Porkaew (2015) give us an analysis of the problems previously encountered when dealing with floods in Thailand, and suggest a way forward to improve flood resilience in the country by means of better data archiving and organisational structure. The research undertaken involved document reviews, visits to selected organisations, expert interviews and seminars. The collected data were then analysed using the SWOT technique to determine the advantages and disadvantages and the forms of the present action plan of the core organisations. The authors recommend a series of organisational changes to improve cross-communication. These include speeding up the establishment of the Ministry of Water Resources and developing the organisational structure to integrate the core units and agencies, and setting up a national data archive centre on water resources; this would gather data and analyses and disseminate information to the individuals or agencies involved. Given the major flooding that occurred in 2011 in Thailand and more recently in 2014/2015, Chinnarasri and Porkaew’s recommendations have particular relevance.

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