Water International

ISSN: 0250-8060 (Print) 1941-1707 (Online) Journal homepage: https://www.tandfonline.com/loi/rwin20

Editorial

Thomas Hartmann, Willemijn van Doorn-Hoekveld, Marleen van Rijswick & Tejo Spit

To cite this article: Thomas Hartmann, Willemijn van Doorn-Hoekveld, Marleen van Rijswick & Tejo Spit (2019) Editorial, Water International, 44:5, 489-495, DOI: 10.1080/02508060.2019.1671464

To link to this article: https://doi.org/10.1080/02508060.2019.1671464

Published online: 10 Oct 2019.

WATER INTERNATIONAL
2019, VOL. 44, NO. 5, 489–495
https://doi.org/10.1080/02508060.2019.1671464

Routledge
Taylor & Francis Group

Editorial

Increasing flood risk asks for new approaches

Flooding is among the most expensive climate-related disasters and a threat to urban life. Although investments in flood protection measures have continued to increase for decades (Loucks, Stedinger, Davis, & Stakhiv, 2008), severe flooding events still occur that cause enormous damage, particularly in vulnerable urbanized areas. The Intergovernmental Panel on Climate Change (2014) states with 'high confidence' that damages from water-related risks will continue to substantially increase. Not only is the likelihood of floods increasing, but, due to continuing development in hazard-prone zones resulting in higher vulnerability, it is more and more challenging to protect all properties to the same standard, also leading to climate injustice (van Doorn-Hoekveld et al., 2016). Consequently, these more frequent extreme events cause severe damage.

These events lead to failure or overtopping of current flood alleviation schemes that were not designed to withstand such extreme events (Jüpner, 2017). The impacts result not just from the frequency and magnitude of natural hazard events and increasing exposure of buildings and infrastructure, but also from the vulnerability of residents and businesses (Fuchs & Thaler, 2017). Recent extreme events have bluntly exposed that due to socio-economic vulnerability to river and flash flooding, some of Europe's presumably best-protected regions often face residual risk. Given this residual risk despite flood protection schemes, nobody can guarantee complete safety in the case of extreme events.

Resilience: a boundary concept

In response, resilience is attracting increasing attention in flood risk management. The flood-resilient city is currently much discussed in academia to reduce the impact of flooding (Liao, 2012; Matczak & Hegger, 2019; Petrow, Thieken, Kreibich, Merz, & Bahlburg, 2006; Rodina, 2018; Roth & Warner, 2007; Trell, Restemeyer, Bakema, & van Hoven, 2017). But the term 'resilience' itself is not well defined. A definition generally accepted across disciplines does not exist (Hegger et al., 2016).

Etymologically, the term has a history of different meanings. In essence, resilience was the bouncing-back of a system after a disturbance (Alexander, 2013). In this sense, it can be understood as the ability of a system to absorb disturbances (shocks) without major irreversible consequences (Holling, 1973). But Holling also questioned the idea of returning to the original state after a disruption. Instead, he suggested (based on his work on the stability of ecological systems) that after disturbances systems do not only bounce back but develop, to reduce vulnerability. In that respect, resilience includes more than just a bounce back to the previous situation but also 'the ability of complex socio-ecological systems to change, adapt, and, crucially, transform in response to stresses and strains' (Davoudi, 2014, p. 302).

This very broad definition allows much room for operationalization when applied to a specific spatial implementation. Therefore, in various disciplines questions are discussed such as whether resilience is complementary to or part of flood risk management, how it fits in the disaster cycle, how it can be measured (Jüpner et al., 2018), what are the appropriate system boundaries and how to determine the state of the system (Bogardi & Fekete, 2018; Carpenter, Walker, Anderies, & Abel, 2001; Folke, 2006; Liao, 2012). Some even suggest that resilience is a boundary object (Baggio, Brown, & Hellebrandt, 2015), in other words, a concept that can promote interdisciplinary discussions, in particular through the fuzzy definition (Brand, 2007; Gunder & Hillier, 2009).

However, that flood resilience is a useful concept and in particular that urban areas need to be more flood resilient seems to be a general consensus across disciplines (Berke & Campanella, 2006; British Environment Agency, 2012; Clark, 1998; Colucci, 2012; de Bruijn, 2005; Hartmann, Jílková, & Schanze, 2018; Jüpner et al., 2018; Klijn & Koppenjan, 2012; Schanze, 2017; Vis, Klijn, de Bruijn, & van Buuren, 2003). In this respect, this special issue uses resilience as a boundary concept to facilitate an interdisciplinary discussion on implementing flood resilience.

Resilience and property-level protection measures

Despite considerable efforts in flood risk management over the last few decades, the implementation of resilience measures in urban areas is still in its infancy. This is true in particular for existing built-up areas.

Research to date on reducing flood impacts focuses largely on improved planning of future development and on adapting publicly owned infrastructure, such as streets that discharge flumes, evacuation routes, and retention ponds (Berke & Campanella, 2006; Gilissen et al., 2018; Hartmann & Spit, 2015; Knieling & Müller, 2015; Mees, Tempels, Crabbé, & Boelens, 2016), focusing on large-scale policy solutions (Hartmann & Spit, 2015). This is primarily because it is commonly believed by the public that managing flood risk is a governmental responsibility and that water engineers are capable of providing protection against flooding (Thaler & Hartmann, 2016; Wiering, Green, van Rijswick, Priest, & Keessen, 2015). This assumption is increasingly rejected in policy, practice and academia (Butler & Pidgeon, 2011; Krieger, 2013; Mees, 2016; Mees et al., 2016; Vis et al., 2003). But until now, scholars and practitioners have given little attention to existing privately owned residential houses, which constitute the large majority of buildings, particularly in urban areas.

However, to implement policies for flood-resilient cities, measures at the building level (sometimes referred to as property-level protection) can contribute in a number of ways (Holub & Fuchs, 2009; Osberghaus, 2015; Scheibel & Johann, 2015), such as mobile barriers or backwater valves, but also adapted use of floors, i.e., no vulnerable uses in basements (Bubeck, Botzen, & Aerts, 2012; Fournier et al., 2016). These measures can have a substantial damage-reducing effect on an individual building. However, implementation amongst homeowners is low (Thaler, Priest, & Fuchs, 2016).

The problem is particularly acute in historical cities, where the older housing stock and preservation regulations make renovation challenging (Dai, Wörner, & van Rijswick, 2017). Furthermore, post-flood resilient reinstatement of privately owned urban structures is underexplored. In particular, the fragmented property rights in built-up areas are

a major challenge. So, implementing the concept of the flood-resilient city essentially requires action on private land to be taken by the landowners (Suykens, Priest, van Doorn-Hoekveld, Thuillier, & van Rijswick, 2016).

At the same time, private owners may not be aware of flooding risk or lack the means to reduce vulnerability. They may also have insufficient incentives to undertake property-level mitigation measures, and the current legal system might entrench their inertia. All this makes the transition to flood-resilient cities very difficult to achieve.

In light of the above, the roles and responsibilities of private actors, such as insurance companies, in incentivizing property-level risk reduction measures, but also the role and responsibilities of homeowners, need to be discussed (Suykens et al., 2016). This special issue therefore brings together scholars from different countries and disciplines – ranging from flood risk management to law and property rights, to risk governance and planning – to discuss how to best stimulate homeowners to take the initiative to implement property-level flood protection measures for their homes.

Contributions to this special issue

All contributions to this special issue share a focus on individual homeowners' responses to flood risks (mainly river floods and flash floods). This is a unique and innovative perspective, which will be approached from different disciplinary backgrounds – covering engineering, geography, planning, policy and legal approaches – thus embracing a vast diversity of international cases and experience.

The first two contributions address how flood risk management is a spatial problem that essentially affects homeowners. Ferdous et al. explore the well-known levee effect empirically. They focus on low income countries – in their case, Bangladesh – and show the paradoxical effects of levees. This also provides valuable lessons for high-income countries, where the new construction of levees or changes to them are discussed in the context of the resilience debate and nature-based solutions (Hartmann et al., 2018). Raška et al. then discuss flood risk management in an urban shrinkage context and deliberate how to address resilience as a spatial concept that requires integrated approaches, that is integration of flood risk management with other spatial policies, especially land-use planning. Both contributions discuss what embracing resilience in flood risk management implies – namely, regarding resilience as a spatial challenge, where homeowners are key actors to implement it.

Giving homeowners a central role in flood resilience means addressing them and motivating and prompting them to take action. How this is conveyed and communicated to homeowners and how homeowners receive such communications on flood resilience is at the core of the next two articles in this special issue. Both Davids et al. and Snel et al. discuss the challenges and constraints of flood risk communication. Davids et al. describe a pilot study in Flanders, where homeowners got free tailor-made advice on measures for flood resilience from flood risk experts. They explore how the homeowners took this advice. Snel et al. conducted an in-depth analysis of how communication between flood risk experts and homeowners can be improved. They focused on homeowners' perception and concluded that there is no universal solution for flood risk communication; homeowners may need to be approached in several different ways when communicating matters associated with flood resilience. In conclusion, both articles show that

communication with homeowners on flood resilience is very challenging and can only contribute so much towards bringing about implementation.

The next articles take a legal perspective and contribute to our understanding of the fraught relationship between governmental responsibility and individual property rights or property use rights. Looking at different legal contexts – a civil law context, common law systems and the very specific Chinese system – Rauter et al., Jacobson, and Dai et al. elaborate on how resilience is legally regulated from a state perspective and how the responsibility of the government to protect property rights against floods is framed in these contexts. Although civil law countries can differ greatly, this contribution applies to many civil law countries, and it shows the complexity of the topic. Jacobson illustrates the importance of property rights in the common law context. He shows that in this context property rights can be part of the solution to flood risk management. Dai et al. describe the legal aspects of how China deals with restrictions on land use rights, particularly how compensation is dealt with for measures for flood retention, such as flood retention areas. The three contributions illustrate the fundamental differences between the legal traditions (civil law, common law and Chinese law). These contributions show how the respective legal systems influence the implementation of flood resilience and stress the need to understand these legal contexts when developing measures that improve resilience, and after that, the actual realization of measures for flood resilience that affect private property rights.

Whereas the three previously outlined contributions focus on the government perspective on property rights, Suykens et al. explore how homeowners can deal with the gap between what the government provides and the impact of floods on private homeowners. Comparing different legal systems, they find huge differences in the legal framing and conditions for flood resilience.

So, this special issue explores how property rights matter in implementing resilience from various perspectives, particularly bridging spatial implications for property, communicative and legal aspects. One conclusion that can be drawn is that the implementation of policies to increase the resilience of cities inevitably needs to address private property – either as affected or as essential for implementation. Because communication on flood resilience proves to be complicated and not a panacea, the legal aspects are important. These legal aspects are hugely dependent on the institutional and cultural contexts.

The need to consider property rights in implementing flood resilience and the conclusions drawn in the contributions to this special issue call for consideration of the balance between homeowners' responsibility (e.g., to a significant extent in the United States) and public authorities (such as in many civil law contexts or to an almost extreme case in the Netherlands and China). Flood resilience on private property requires a distribution and definition of responsibility for resilience. This responsibility entails appropriate risk communication that is not only accurate but also reaches the property owners. If the responsibilities are unclear and not well communicated, implementing resilience-improving measures can be hampered.

While this special issue tries to answer many questions, at the same time it raises new questions for future research on the relation between resilience and property rights. One of these questions concerns the consequences of the diverse legal situations. This will make legal transplants – meaning the adoption of instruments and tools that work well in other contexts – challenging. Many such transplants are discussed in academia and

practice, including tradeable development rights, land consolidation or readjustment schemes, and insurance solutions (Hartmann, Slavíková, & McCarthy, 2019). This special issue calls for caution with these legal transplants.

Acknowledgments

This special issue would not have been possible without the great support from the following projects and institutions. The special issue results from and contributes to the EU COST Action LAND4FLOOD on Natural Flood Retention on Private Land (CA16209, www.land4flood.eu). The preparation of the special issue and a workshop organized to discuss the articles of all the authors was financially supported by the project Preparing Urban Private Property for Floods: Resilience and Recovery in Built Up Areas of the FUTURE DELTAS programme of Utrecht University, the Netherlands, which is now continuing as the programme Pathways to Sustainability, HUB Water Climate, and Future Deltas.

Funding

This work was supported by the COST Action LAND4FLOOD (www.land4flood.eu) [CA16209].

References

Alexander, D. E. (2013). Resilience and disaster risk reduction: An etymological journey. *Natural Hazards and Earth System Science*, *13*(11), 2707–2716.

Baggio, J. A., Brown, K., & Hellebrandt, D. (2015). Boundary object or bridging concept? A citation network analysis of resilience. *Ecology and Society*, *20*(2). doi:10.5751/ES-07484-200202

Berke, P. R., & Campanella, T. J. (2006). Planning for postdisaster resiliency. *Annals of the American Academy of Political and Social Science*, *604*(1), 192–207.

Bogardi, J. J., & Fekete, A. (2018). Disaster-related resilience as ability and process: A concept guiding the analysis of response behavior before, during and after extreme events. *American Journal of Climate Change*, *07*(01), 54–78.

Brand, F. S. J. K. (2007). Focusing the meaning(s) of resilience: Resilience as a descriptive concept and a boundary object. *Ecology and Society*, *12*(1), 23. Retrieved from http://www.ecologyandsociety.org/vol12/iss1/art23/

British Environment Agency. (2012). *Principles for implementing flood and coastal resilience funding partnerships*. Bristol: Environment Agency.

Bubeck, P., Botzen, W. J. W., & Aerts, J. C. J. H. (2012). A review of risk perceptions and other factors that influence flood mitigation behavior. *Risk Analysis*, *32*(9), 1481–1495.

Butler, C., & Pidgeon, N. (2011). From 'flood defence' to 'flood risk management': Exploring governance, responsibility, and blame. *Environment and Planning C: Government and Policy*, *29*(3), 533–547.

Carpenter, S., Walker, B., Anderies, J. M., & Abel, N. (2001). From metaphor to measurement: Resilience of what to what? *Ecosystems*, *4*(8), 765–781.

Clark, M. J. (1998). Flood insurance as a management strategy for UK coastal resilience. *Geographical Journal*, *164*(3), 333.

Colucci, A. (2012). Towards resilient cities: Comparing approaches/strategies. *TeMA: Journal of Land Use and Environment*, *2012*(2), 101–116.

Dai, L., Wörner, R., & van Rijswick, H. F. M. W. (2017). Rainproof cities in the Netherlands: Approaches in Dutch water governance to climate-adaptive urban planning. *International Journal of Water Resources Development*, *34*(4), 652–674.

Davoudi, S. (2014). Climate change, securitisation of nature, and resilient urbanism. *Environment and Planning C: Government and Policy*, *32*(2), 360–375.

de Bruijn, K. M. (2005). *Resilience and flood risk management: A systems approach applied to lowland rivers*. Delft: Delft University Press.

Folke, C. (2006). Resilience: The emergence of a perspective for social–ecological systems analyses. *Global Environmental Change*, *16*(3), 253–267.

Fournier, M., Larrue, C., Alexander, M., Hegger, D., Bakker, M., Pettersson, M., … Chorynski, A. (2016). Flood risk mitigation in Europe: How far away are we from the aspired forms of adaptive governance? *Ecology and Society*, *21*(4). doi:10.5751/ES-08991-210449

Fuchs, S., & Thaler, T. (2017). Tipping points in natural hazard risk management: How societal transformation can provoke policy strategies in mitigation. *Journal of Extreme Events*, *4*(01), 1750006.

Gilissen, H. K., Driessen, P. P. J., Mees, H. L. P., Rijswick, M. F. M. W., Runhaar, H. A. C., Uittenbroek, C., & Wörner, R. (2018). The climate resilience of critical infrastructural network sectors - An interdisciplinary method for assessing formal responsibilities for climate adaptation in critical infrastructural network sectors. In S. Maljean-Dubois (Ed.), *The effectiveness of environmental law* (pp. 15–36). Cambridge: Intersentia.

Gunder, M., & Hillier, J. (2009). *Planning in ten words or less: A Lacanian entanglement with spatial planning*. Farnham, Surrey: Ashgate.

Hartmann, T., Jílková, J., & Schanze, J. (2018). Land for flood risk management: A catchment-wide and cross-disciplinary perspective. *Journal of Flood Risk Management*, *11*(1), 3–5.

Hartmann, T., Slavíková, L., & McCarthy, S. (2019). *Nature-based flood risk management on private land: Disciplinary perspectives on a multidisciplinary challenge*. Cham, Switzerland: Springer Nature.

Hartmann, T., & Spit, T. (2015). Implementing European climate adaptation policy. How local policymakers react to European policy. *Tema: Journal of Land Use, Mobility and Environment*, *8* (1), 51. Advance online publication.

Hegger, D. L. T., Driessen, P. P. J., Wiering, M., van Rijswick, H. F. M. W., Kundzewicz, Z. W., Matczak, P., … Ek, K. (2016). Toward more flood resilience: Is a diversification of flood risk management strategies the way forward? *Ecology and Society*, *21*(4). doi:10.5751/ES-08854-210452

Holling, C. S. (1973). Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics*, *4*(1), 1–23.

Holub, M., & Fuchs, S. (2009). Mitigating mountain hazards in Austria: Legislation, risk transfer, and awareness building. *Natural Hazards and Earth System Science*, *9*(2), 523–537.

Intergovernmental Panel on Climate Change. (2014). *Climate change 2014: Impacts, adaptation, and vulnerability: IPCC WGII AR5 chapter 23*. Retrieved from http://www.ipcc.ch/report/ar5/wg2/

Jüpner, R. (2017). Coping with extremes: experiences from event management during the recent Elbe flood disaster in 2013. *Journal of Flood Risk Management*, *133*(1), 53.

Jüpner, R., Bachmann, D., Fekete, A., Hartmann, T., Pohl, R., Schmitt, T., & Schulte, A. (2018). Resilienz im Hochwasserrisikomanagement. *Korrespondenz Abfallwirtschaft*, *2018*(11), 656–663.

Klijn, E.-H., & Koppenjan, J. (2012). Governance network theory: Past, present and future. *Policy & Politics*, *40*(4), 587–606.

Knieling, J., & Müller, B. (2015). *Klimaanpassung in der Stadt- und Regionalplanung: Ansätze, Instrumente, Massnahmen und Beispiele. Klimawandel in Regionen zukunftsfähig gestalten* (Vol. 7). München: Ökom.

Krieger, K. (2013). The limits and variety of risk-based governance: The case of flood management in Germany and England. *Regulation & Governance*, *7*(2), 236–257.

Liao, K.-H. (2012). A theory on urban resilience to floods: A basis for alternative planning practices. *Ecology and Society*, *17*(4). doi:10.5751/ES-05231-170448

Loucks, D. P., Stedinger, J. R., Davis, D. W., & Stakhiv, E. Z. (2008). Private and public responses to flood risks. *International Journal of Water Resources Development*, *24*(4), 541–553.

Matczak, P., & Hegger, D. L. T. (2019). Special issue, 'Flood risk governance for more resilience'. *Water*, *11*.

Mees, H. (2016). Local governments in the driving seat? A comparative analysis of public and private responsibilities for adaptation to climate change in European and North-American cities. *Journal of Environmental Policy & Planning*, *19*(4), 374–390.
Mees, H., Tempels, B., Crabbé, A., & Boelens, L. (2016). Shifting public-private responsibilities in Flemish flood risk management: towards a co-evolutionary approach. *Land Use Policy*, *57*, 23–33.
Osberghaus, D. (2015). The determinants of private flood mitigation measures in Germany: Evidence from a nationwide survey. *Ecological Economics*, *110*, 36–50.
Petrow, T., Thieken, A. H., Kreibich, H., Merz, B., & Bahlburg, C. H. (2006). Improvements on flood alleviation in Germany: Lessons learned from the Elbe flood in August 2002. *Environmental Management*, *38*(5), 717–732.
Rodina, L. (2018). Defining 'water resilience': Debates, concepts, approaches, and gaps. *Wiley Interdisciplinary Reviews: Water*, *6*(2), e1334.
Roth, D., & Warner, J. (2007). Flood risk uncertainty and changing river protection policy in the Netherlands: The case of 'calamity polders'. *Tijdschrift Voor Economische En Sociale Geografie*, *98*(4), 519–525.
Schanze, J. (2017). Nature-based solutions in flood risk management: Buzzword or innovation? *Journal of Flood Risk Management*, *10*(3), 281–282.
Scheibel, M., & Johann, G. (2015). Hochwasserpass - Überschwemmungsgefährdungen vorbeugen. *Abwasserreport*, *15*(4), 4–5.
Suykens, C., Priest, S. J., van Doorn-Hoekveld, W. J., Thuillier, T., & van Rijswick, M. (2016). Dealing with flood damages: Will prevention, mitigation, and ex post compensation provide for a resilient triangle? *Ecology and Society*, *21*(4). doi:10.5751/ES-08592-210401
Thaler, T., & Hartmann, T. (2016). Justice and flood risk management: Reflecting on different approaches to distribute and allocate flood risk management in Europe. *Natural Hazards*, *83*(1), 129–147.
Thaler, T. A., Priest, S. J., & Fuchs, S. (2016). Evolving inter-regional co-operation in flood risk management: Distances and types of partnership approaches in Austria. *Regional Environmental Change*, *16*(3), 841–853.
Trell, E.-M., Restemeyer, B., Bakema, M. M., & van Hoven, B. (Eds.). (2017). *Governing for resilience in vulnerable places*. Oxon: Routledge.
van Doorn-Hoekveld, W. J., Goytia, S. B., Suykens, C., Homewood, S., Thuillier, T., Manson, C., … van Rijswick, H. F. M. W. (2016). Distributional effects of flood risk management: A cross-country comparison of preflood compensation. *Ecology and Society*, *21*(4). doi:10.5751/ES-08648-210426
Vis, M., Klijn, F., de Bruijn, K. M., & van Buuren, M. (2003). Resilience strategies for flood risk management in the Netherlands. *International Journal of River Basin Management*, *1*(1), 33–40.
Wiering, M., Green, C., van Rijswick, M., Priest, S., & Keessen, A. (2015). The rationales of resilience in English and Dutch flood risk policies. *Journal of Water and Climate Change*, *6*(1), 38–54.

Thomas Hartmann
Wageningen University & Research, Netherlands
thomas.hartmann@wur.nl

Willemijn van Doorn-Hoekveld, Marleen van Rijswick and Tejo Spit
Utrecht University, Netherlands