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Editorial

Configuring knowledge in urban water-related risks and vulnerability

1. Introduction to the issues

Urban water-related risks and vulnerability are set to increase in the coming decades, as climate change is being increasingly experienced in extreme weather events (floods, droughts, storms), expected global temperature rises of up to 4°, and sea level rise. Especially cities, the majority of which lie in the LECZ (McGranahan, Balk, & Anderson, 2007), will be impacted by these changes. The concentration of populations, wealth and infrastructures in cities that will be affected suggests that it is important to focus on how cities experience water-related risks and vulnerabilities currently, their knowledge and interpretations of such risks and climate-change related events, and how they expect to deal with them.

In this special issue, we take up this issue from the perspective of how knowledge is constructed and organizationally embedded in governance processes, specifically among the different actors in cities who are involved in dealing with water-related risks, or experience them in their daily lives. We do this for three reasons. First, many actors hide behind the rationale that new and more knowledge must be produced before they can tackle the issues effectively. The contributing articles suggest that the issue is rather that different sets of knowledge are not considered legitimate, and therefore dominant actors do not engage with them. Second, having knowledge itself is not a sufficient guarantee that such knowledge is utilized effectively; it needs to be embedded in institutions and institutional networks that work together well in order to become effective. The ways in which knowledge on risks and vulnerabilities are integrated and combined with preventative measures are the result of political processes, that reflect existing interests and power relations. The recent agreement signed at the COP21 in Paris illustrates such political processes, and makes this an even more crucial junction in time to take up this issue. Third, different perceptions and framings exist concerning water risk realities, which lead to a great diversity of mandates for interventions, and their outcomes.

The question of knowledge construction and embedding fits into several wider debates: urban metabolism and political ecology (Broto, Allen, & Rapoport, 2012; Boelens & Zwarteveen 2014), spatial knowledge management in urban configurations (Baud, Scott, Pfeffer, Sydenstricker-Neto, & Denis, 2014; Sliuzas, Flacke, & Jetten, 2013; Sutherland, Scott, & Hordijk, 2015) linked to issues of participatory and reflexive local governance (Gaventa & Barrett, 2012; Scott & Barnett, 2008).

In discussions on urban metabolism and political ecology, a major issue is the recognition of material flows in and through cities, how they are conceptualized and measured, in ways that allow urban planners and those steering urban development to assess the impact of their decisions on the ecological risks of the city concerned. Material flow analysis (MFA) and energetic metabolism studies can indicate the imbalance of a city's material flows and the global capacity to sustain such flows, which are necessary components for assessing future risks to resource systems that can emerge from current patterns of resource flows. However, they generally do not provide practical solutions that can be translated to urban planning and management (Broto et al., 2012; Minx et al., 2011). To enable this, material flows analysis needs to be coupled to more organizational and process analysis, in which human activity is assumed to sbe an integral part of the ways that ecological systems work. Complexity theory offers a useful approach in this respect, defining cities as “dynamic, complex, and adaptive systems linking social and ecological systems” (Broto et al., 2012, p. 853; Minx et al., 2011). The authors in this special issue argue that more attention is needed for the “social and political drivers of material and energy flows” and their stakeholders and management strategies, as well as their social and economic consequences (Broto et al., 2012, p. 854; Minx et al., 2011). This is based on their recognition that cities can never become internally sustainable, because they are embedded in larger socio-ecological systems across different scale levels, but that local stakeholders do need to strive for adaptive capacity that allows them to deal with future shocks and stresses (Peyroux, Scott, Baud, & Jameson, 2014).

In political ecology approaches to urban resource flows, issues of power and framing of priorities in dealing with urban environmental risks and flows come to the forefront. Ways of framing water provision and distribution, or the extent to which flood risks are recognized and defenses are built up, reflect how powerful groups in cities set priorities. These framings can lead to situations of elite capture of resources and unequal distribution between different groups of urban residents, and between urban and rural users of water (Follmann, 2015; Miranda Sara, Pfeffer and Baud, in press; Sutherland et al. 2015). Inequality in access to water resources and vulnerability to flood risks thus become the result not of scarcity, but of “socially reproduced and reproduced discriminatory processes” (Broto et al. 2012: 856; Karpouzouglou & Zimmer, 2016). Marginalized social groups often have to deal with parallel provision systems, which make access more expensive, and also

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make them dependent on political patronage rather than a right to basic provision of an urban citizen (e.g. McFarlane, 2013). The results are hybrid arrangements in cities for (in this case) water provision, and unequal exposure to water-related risks (van den Brandeler, Hordijk, von Schönfeld, & Sydenstricker-Neto, 2014).

This brings us to the second debate around spatial knowledge management in urban configurations linked to issues of reflexive local governance. In discussions on urban governance, a main concern is the extent to which different actors are involved in urban policy-making and implementation and the power to express their priorities in governance networks (cf. Baud et al. 2014). Classic debates have focused on either the relations between local government and the private sector (regime theory) or the relations between government and urban residents, represented through political mobilization or civil society organizations. The relative power of the actors involved in such relations affects the ways that water-related risks and vulnerabilities are framed and tackled. Deliberative processes and the 'participative spaces' in which they take place, provide opportunities for producing civic knowledge, and for it to be recognized and incorporated in building adaptive capacities at the city level, building citizenship of less politically powerful groups, and producing reflexive governance towards future water-related risks (Bankoff, 2007; Desportes & Colenbrander, 2016; Jameson & Baud, 2016; Ryan, 2015; Sutherland et al. 2015).

Issues of knowledge building have been influenced heavily by the exponential growth of geo-technologies and their implications for new sources of data and ways of mapping knowledge (Khan, Miranda Sara, Sydenstricker-Neto, Sutherland, & Hordijk, 2015; Pfeffer, Martinez, O'Sullivan, & Scott, 2015). Defined as "technologies and computer tools used in spatial knowledge production and management [they] capture and analyse features, patterns and relationships on the ground in space and time" (Pfeffer et al. 2015:149). Such geo-technologies can support the whole range of information and knowledge, from quantitative data generated from technical and survey sources to qualitative, locally embedded community knowledge (e.g. Patel & Baptist 2012; Sliuzas et al. 2013; Filippi, Hordijk, Alegría, & Denis Rojas, 2014). A number of issues similar to those indicated above affect the production and use of mapping processes. The visibility of marginalized groups and the risks they face may not be included in the classifications in which maps are built; alternatively, risks may not be indicated because of real estate interests who fear that the value of land and property will be substantially reduced. Such examples indicate that mapping processes are political in themselves, and that the genealogy of maps needs to be taken into account to read them effectively (Kitchin & Dodge, 2007). However, the examples shown in the article by Pfeffer et al. (2015) show how mappings can also produce empowering processes for local communities in situation where space is provided for interactive knowledge building processes. Their conclusion is that whether "practices of geo-technologies enable, constrain or disrupt inclusive and sustainable development" is influenced by the locally embedded geo-technological configuration (Pfeffer et al., 2015: 168).

More generally, the ways that knowledge is built, exchanged and contested in urban contexts is closely related to the ways that local governance networks and the processes in which they are involved play out. Recognizing such situated contexts, an earlier research article outlined the concept of (spatial) knowledge configuration, showing how discourses, actors and their networks, knowledge construction, exchange, and contestation, technologies and material conditions, come together in complex patterns (Baud et al. 2014). The role of knowledge production, contestation and exchange on water-related risks and vulnerabilities, is increasingly being recognized in international debates (Pfeffer et al. 2015; Sutherland et al. 2015), and provides a strategic lens with which to examine issues of water-related risks and vulnerabilities. Although the complexity of configurations makes it difficult to predict outcomes, by following the dynamics of these configurations, the contributions of different framings and knowledge construction by actors can be traced.

Water-related risks and vulnerabilities in cities are related to both biophysical hazards and socially constructed vulnerabilities, related to inequalities in access to water and sanitation provision (Miranda Sara et al. 2014; Van Voorst, 2016). Long-term risks are also related to water basin ecosystems and their management, where both future droughts as well as flooding may be the result of human interventions (cf. special issue HI 2016).

The contributing articles analyze how spatial knowledge about urban water-related risks and vulnerability is configured, drawing on new collaborative practice-based mapping methods from cities in India, Peru, and South Africa. Policy makers, academics, and local communities contribute a variety of risk frameworks in such collaborative mapping processes. Producing maps, which can be utilized in decision-making processes requires reflexive, iterative and collaborative data collection and analysis, and map-making. Each article contributes to this discussion in specific ways through displaying the varieties, institutional arrangements, and outcomes of configurations and their knowledge on water risks and vulnerabilities. Together they provide recent insights into the debates concerned.

In their article on risk governance and disaster management in the megacity of Mumbai, Butsch, Kraas, Sridharan and Peters (in this issue) reflect on the framing of risks and resilience in cities. Such megacities are characterized by a high level of complexity and are extremely vulnerable to various hazards. Framing cities as complex adaptive systems (CAS), and including a comprehensive, complex, holistic multi-stakeholder risk framework within CAS, helps explain the multiple dynamic interactions between different societal and environmental factors, which eventually cause disasters. They combine a perspective on the risk configuration with a more dynamic perspective by taking into consideration the ways that disaster responses can trigger further disasters through their concepts of 'risk chains' and 'risk cascades'. Risk chains emerge when the direct effects of a disaster constitute new hazards through linear pathways, whereas risk cascades are also triggered by the effects of the disaster but unfold through multiple and complex pathways in a non-linear fashion (cf. Peters et al. 2015).

Quoting from their article, the CAS perspective contributes a holistic perspective on risk and disaster including strategic aspects: 1) the complex causation of disasters which include "not only [what does not work] at the triggering event and the primary influencing factors but also takes root causes into consideration"; 2) "multiple interactions and reinforcing processes in the causation of disasters and in disaster management"; 3) "direct effects as well as indirect long-term effects of disasters, which can be understood better from a systemic point of view"; 4) "for understanding risk in a complex socio-ecological system like a megacity, different types of knowledge need to be combined, as the dominant scientific-technological approach, usually applied in risk governance, is inadequate to integrate social aspects"; 5) "combining different types of knowledge (institutional knowledge, scientific knowledge, experiential knowledge etc.) on the actual situation and past events are needed to understand mega-urban disaster risk complexes." (Butsch et al., in this issue).

The extraordinary floods in Mumbai in 2005 were a wake-up call for city government, residents, and civic organisations. Using this event as example, the authors analyse the complex and dynamic interactions between different societal and environmental

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