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Varieties of knowledge for assembling an urban flood management governance configuration in Chennai, India

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ABSTRACT

This article investigates how varieties of knowledge about flooding contribute to a more effective flood management (FM) governance configuration in Chennai, India. Drawing on the assemblage perspective and using the configurations approach for socio-spatial analyses of the city, we trace the knowledge construction processes around two networked FM infrastructures, drawing out the different discourses, actor coalitions and processes of practice. We see how technical knowledge on storm water drains is embedded and transformed within the primary government network, and how complementary knowledges about the *ery* system are expressed through counter mappings by academic activists. Identifying potential intersections between these knowledge processes indicates a strong potential to link long-term water management strategies that would mutually contribute to addressing the city's issues of flood risks and drinking water scarcity. However, we find that the varieties of knowledge around Chennai's FM run in parallel networks with few intersections, presenting distinct institutional boundaries to cross-boundary knowledge sharing. Lastly, using integrated FM as a heuristic framework, we analyse the contributions of the different streams of knowledge and the remaining gaps in order to assess the potential of building up the interconnections in Chennai's FM configuration.

1. Introduction

In this article we take up the issue of how urban flood management is approached in different ways in Chennai, India, and investigate the varieties of knowledge produced within them. We show how the various processes are assembled into a precarious configuration in Chennai and discuss how the currently isolated approaches have the potential to strengthen flood management by building up their interconnections. In doing so, we respond to the growing call for understanding geographical and political contexts within which transitions to sustainability evolve, as well as the need for more theoretically informed analyses of the bringing together of various types of knowledge (Baud, Pfeffer, Scott, Denis, & Sydenstricker, 2014; Hansen & Coenen, 2015).

Urbanization continues to bring a denser concentration of people and economic activities into the Low Elevation Coastal Zones (LECZ); in Asia 13% of the world's urban population lives in LECZs (McGranahan et al., 2007) exposing important socio-economic and biophysical assets to the threat of future climate change, due to expected changing weather patterns and extreme weather events like floods. Floods are considered the greatest and most frequent natural hazard that threatens the world's largest cities (United Nations, 2014), and vulnerabilities in developing country contexts especially are compounded by historical socio-economic inequalities and less durable infrastructures (Satterthwaite, Huq, Reid, Pelling, & Romero Lankao, 2012). Due to continuing high levels of urbanization, Asia will continue to be most impacted by floods (IPCC, 2014).

Urban water management includes a variety of activities, such as water provision and wastewater and flood management. Debates related to these activities suggest that connecting them can strengthen approaches towards each, and help avoid undermining specific activities, when their connections are not recognized. Specifically, urban water management includes local hydro-ecological characteristics, water infrastructures and service provision, such as sourcing, distribution, allocation, recycling and drainage of water (Miranda Sara, Hordijk and Khan, 2014). Flooding can be dealt with either as a specific shock or as a peak in a continuous process of water management throughout the

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hydrological cycle. The latter approach requires an understanding of how processes, which tend to be governed separately – such as drinking water provision and flood defences – interact within the hydrological cycle in order to pinpoint potential leverage points for reducing vulnerability in each activity. This implies that the variety of knowledge about each area of urban water management needs to come together and be exchanged by the actors involved, to produce linkages across activities towards a more integrated approach. In far too many cities such a comprehensive approach is not yet in place.

Chennai is a rapidly developing city in the Indian LECZ that is already highly sensitized to flooding due to the tsunami in 2004 and massive flooding in 2005 (Kennedy et al. 2014). However, in Chennai, flood management is usually not recognized in its own right, but comes together by linking separate infrastructures and knowledge production processes across a series of institutions. Such fragmentation of flood management can undermine the coherence of a citywide approach to urban water management.

By tracing the separated activities related to flood management and their knowledge production processes, and the ways in which flood management is configured in the city, the potential points of improvement will emerge. We draw on the assemblage perspective to highlight the socio-spatial connections that produce [not yet recognized] linkages between these connections. To do so, we compare and contrast two networked infrastructure systems for flood management which present different epistemic communities, discourses and types of practice, and investigate how the varieties of knowledge contribute to producing an urban flood management governance configuration. We see how knowledges are constructed, negotiated and shared; first, in the primary government network and their SWD system, and second, in the complementary knowledge coalition built up around the *ery* system. Then, we analyse the potential interlinkages between the varieties of knowledge and their contributions to strengthening flood management in Chennai.

2. Knowledge construction in urban flood management

The main question of how varieties of knowledge about urban flood management come together fits into broader theoretical debates about ways in which different actor coalitions and networks are assembled in urban areas (Baud et al., 2014; Robinson, 2006). Such debates have centred on understanding the framings of urban issues and how different actor-coalitions are assembled in socio-spatial relations to co-produce the city, forming a loose theoretical conglomeration of assemblage theory (DeLanda, 2006). These approaches are based on the assumption of a relational approach to the construction of knowledge, where knowledge is embedded in practices, and thus continually shifts and changes through the relations, which form it (McFarlane, 2011a). This also implies that the 'hard sciences' cannot provide undisputed answers for policy-making because they cannot account for the diversity of people's framings, which translate scientific data into policymaking through an action path (van Buuren, 2009).

Urban governance can incorporate different knowledge types across scales and actors in more inclusive hybrid arrangements (Peyroux, Scott, Baud, & Jameson, 2014). Types of knowledge recognized range from tacit, community and locally based knowledge (including cultural), practice-based knowledge (embedded technical, political or managerial), to expert knowledge (scientific). Embedded community knowledge provides contextualized understandings of "ways of doing" things. Expert codified knowledge is associated with academic, analytical approaches (Van Ewijk & Baud, 2009). For urban planning and management the main types of knowledge used are technical, managerial, and political. Other sources tend to be ignored (community-based and sectoral knowledge from practice) (Rakodi, 1993). The extent to which urban governance networks draw on various knowledge types usually parallels the depth and breadth of participatory models. Recent developments in urban knowledge management mean that there is more potential for including tacit knowledge types through bottom-up and innovative practices (Pfeffer, Martinez, Baud, & Sridharan, 2011).

Several gaps in current debates remain which this article attempts to fill. Assemblage theory (McFarlane 2011b) has been critiqued for its propensity to endless description (Allen, 2011) as well as its apolitical perspective on power relations (Brenner, Madden, & Wachsmuth, 2011). The latter is linked to the high levels of fluidity suggested by the approach, and its lack of recognition of the 'stickiness' of existing institutions and processes (Baud et al. 2014; Harriss & Hunter, 1997). With such fluidity and dependence on context, it is also difficult to distinguish analytical dimensions with which to investigate how assemblages work in practice, and many writings do not present them at all (McCann and Ward, 2011).

We build on the advantages of the assemblage approach shown above by distinguishing multiple and overlapping activities concerning urban flood management in Chennai, each with their own knowledge-building processes. However, the fluidity of the processes of change, which the assemblage approach emphasizes, makes it difficult to identify 'stickiness'. Therefore, we prefer to utilize the configuration concept which includes the assumption of particular institutional boundaries entrenched in socio-historical relations. This produces a degree of path-dependency or 'stickiness' preventing more flexibility. The concept, however, also allows for dynamics resulting from new combinations of urban 'things' (Baud et al., 2014; Peyroux et al., 2014). The configuration concept outlines the ensemble of analytical dimensions to be considered: discourses and framings of policy and practice, actors and institutional coalitions, practices within and between institutions, material and technical aspects of infrastructure in order to understand the outcomes of knowledge building.

Using the configuration concept allows a detailed focus on the mechanisms of different knowledge co-production processes. Tracing the transformations of knowledge through relational encounters highlights how configurations are put together from within and across institutions. Roy (2012: 34) terms this 'ethnographic circulations', which "*draw attention to how socio-spatial scales, from the global to the local, are actively produced: for example, through the calculative practices of middling technocrats.*" The perspective of assembling varieties of knowledge also presents an important analytical lens to capture the spectrum of scales that transform knowledge as it moves up and down and across institutional hierarchies and is shaped by rescaling processes (Baud et al., 2014).

Recent policy discourses on flood management are undergoing a paradigm shift towards more integrated flood management (IFM), as illustrated in Table 1 (based on WMO, 2009; Hooper, 2011; and Plate, 2002). Classic flood management uses a hazards-based approach, assumes that risks are "real, objective, existing and calculable" in a quantitative metric (Larrue, Hegger, & Trémorin, 2013: 21). However, the fact that the risk and vulnerability-based approaches focus on uncertainty challenges the exclusive use of engineering knowledge for understanding flood risk. IFM is part of a broader perspective on Integrated Water Resource Management (IWRM), which emerged in the early 2000s, as a revolutionary approach for bringing together various hydrological and socio-economic dimensions of a river basin level to provide for integrative water resource development. For instance, an IWRM approach suggests a participatory stakeholder process to decide who and what are the critical determinants of variability in the system, and

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