



King's Research Portal

DOI:

[10.1016/j.gloenvcha.2019.01.001](https://doi.org/10.1016/j.gloenvcha.2019.01.001)

Document Version

Publisher's PDF, also known as Version of record

[Link to publication record in King's Research Portal](#)

Citation for published version (APA):

Borie, M., Pelling, M., Ziervogel, G., & Hyams, K. (2019). Mapping narratives of urban resilience in the global south. *Global Environmental Change*, 54, 203-213. <https://doi.org/10.1016/j.gloenvcha.2019.01.001>

Citing this paper

Please note that where the full-text provided on King's Research Portal is the Author Accepted Manuscript or Post-Print version this may differ from the final Published version. If citing, it is advised that you check and use the publisher's definitive version for pagination, volume/issue, and date of publication details. And where the final published version is provided on the Research Portal, if citing you are again advised to check the publisher's website for any subsequent corrections.

General rights

Copyright and moral rights for the publications made accessible in the Research Portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognize and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the Research Portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the Research Portal

Take down policy

If you believe that this document breaches copyright please contact librarypure@kcl.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.



Mapping narratives of urban resilience in the global south

Maud Borie^{a,*}, Mark Pelling^{a,*}, Gina Ziervogel^b, Keith Hyams^c

^a Department of Geography, King's College London, Bush House (North East Wing), 30 Aldwych, London, WC2B4G, United Kingdom

^b Department of Environmental and Geographical Sciences and African Climate and Development Initiative, University of Cape Town, South Lane, Rondebosch, Cape Town, 7701, South Africa

^c Department of Politics and International Studies, University of Warwick, Coventry, CV47AL, United Kingdom



ARTICLE INFO

Keywords:

Urban resilience
Narratives
Science-Policy
Manila
Cape Town
Nairobi

ABSTRACT

In the context of global environmental change much hope is placed in the ability of resilience thinking to help address environment-related risks. Numerous initiatives aim at incorporating resilience into urban planning practices. The purpose of this paper is to open up a conversation on urban resilience by unpacking how diverse science methods contribute to the production of different narratives of urban resilience mobilizing different experts and forms of evidence. A number of scholars have cautioned against uncritical approaches to resilience and asked what resilience means and for whom, also pointing out the normative dimension of the concept. Building on this emerging scholarship we use insights from science and technology studies (STS) and critical social sciences to look at the knowledge infrastructures and networks of actors involved in the development of resilience strategies. Drawing on fieldwork in Manila, Nairobi, and Cape Town, we map different narratives of urban resilience identifying the ways in which science serves to legitimate or alienate particular perspectives on what should be done. We discuss the multiple roles that science methods have for resilience planning. Whereas urban resilience is often portrayed as consensual, we show that a range of narratives, with diverse socio-material implications, exist at the city level. In this way we unearth the conflict that lies beneath an apparent consensus for resilience policy and outline future research directions for urban sustainability.

1. Introduction

The resilience agenda is being pushed forward in urban governance, in both developed and developing countries. The Sustainable Development Goals (SDGs) directly call for 'inclusive, safe, resilient and sustainable' cities (SDG 11). In this context, urban planning is a central component of global ambitions to deliver climate change adaptation and disaster risk reduction and emerging urban policy agendas have galvanised around the notion of resilience (Moglia et al., 2018; Pelling et al., 2018; Elmqvist et al., 2014). This movement has placed intuitive, lay interpretations of resilience at the level of policy discourse, somewhat separating this from more precisely defined technical applications within socio-ecological systems, engineering and disaster risk reduction. This has been successful in providing a logical framing to help organise risk management as part of integrated development planning. Through this process, resilience has become a discursive field deployed to represent the city and particular visions of its future, often independent of the technical scrutiny the term has previously benefited from.

If adaptation is about shaping the future through judgements on what to enhance, retain and discard, then resilience helps set the frame of reference to legitimate these decisions. Resilience narratives frame policy discussions, bound the aims of climate change adaptation and disaster risk management, and give legitimacy to specific forms of knowledge – and to those who hold and produce this knowledge (Owens et al., 2006; Goldstein et al., 2015). These narratives are constructed by dominant actors and countered by subordinate actors to shape the possible for urban futures and are associated with clear practical and material implications (Friend and Moench, 2015, Sandercock, 2003). In this context, the dominant urban policy narrative often projects resilience as a consensual object, on which hardly anyone could disagree. For example, in the context of the 100 Resilient Cities programme supported by the Rockefeller Foundation, urban resilience has been defined as:

"The capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience." (Resilient Cities, 2018)

* Corresponding authors.

E-mail addresses: maud.borie@kcl.ac.uk (M. Borie), mark.pelling@kcl.ac.uk (M. Pelling), gina@csag.uct.ac.za (G. Ziervogel), k.d.hyams@warwick.ac.uk (K. Hyams).

<https://doi.org/10.1016/j.gloenvcha.2019.01.001>

Received 25 August 2018; Received in revised form 19 December 2018; Accepted 3 January 2019

Available online 16 January 2019

0959-3780/© 2019 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

This is just one, albeit prominent, example of resilience presented as a common ground for otherwise diverse urban interests. To a certain extent this framing is perceived as an opportunity for those operating in interdisciplinary domains where multiple values can slow-down or block decision-making progress (Chelleri et al., 2015; Leichenko, 2011, Pelling, 2010). Resilience made apolitical in this way can enable actors who do not necessarily share values and aims to reposition themselves and aspire for consensus.

However superficial value neutrality does not mean that value conflicts are resolved, rather conflicts over values may be suppressed and hidden (Simon and Randall, 2016; Welsh, 2014). If so this may only delay and deepen tensions and potentially undermine the long-term functioning of integrated planning approaches that are thought essential for sustainable urban development (McEwen et al., 2017; Mitra et al., 2017; Bull-Kamanga et al., 2003). The meaning as well as practice of resilience is shaped by competing and unequally powerful actors in the city and beyond (Leitner et al., 2018; Wilson, 2012). Where diversity is not acknowledged debates over resilience will undermine the potential for more integrated policy and democratic decision-making. Consensus will be built on false foundations and may undermine trust between urban actors (Solecki et al., 2017). On the other hand, if urban resilience is negotiated, and even contested, through a process, it can help to surface these tensions and better situate and ground the focus of resilience goals and activities (Harris et al., 2017; Friend and Moench, 2013).

Critical readings of resilience have emerged, in particular, in the field of anthropology, critical geography and other constructivist paradigms (MacKinnon and Derickson, 2013, Leach, 2008). A recurrent criticism directed towards resilience points towards the falsely apolitical aspect of the concept (Cretney, 2014; Béné et al., 2012; Coaffee et al., 2008). With regards to urban planning, several studies emphasize the need to look at what resilience means in practice (e.g. Kythreotis and Bristow, 2017; Wilkinson, 2012) and a smaller literature has begun to tease out the different deployments of urban resilience (Pelling et al., 2017; Coaffee, 2013). In this respect, White and O'Hare introduce a distinction between 'equilibrium resilience' and 'evolutionary resilience' (2014). They suggest that the former facilitates a focus on infrastructure while the latter is more sensitive to change and social concerns. Resonating with this distinction, we differentiate here between conservative and transformative approaches (Pelling, 2010) to resilience and suggest that such distinction is useful to make sense of different resilience narratives. Scholars working with environmental and social justice approaches have also begun to uncover the latent ethical and justice questions around urban governance and resilience strategies (Allen et al., 2017; Ziervogel et al., 2017; Shi et al., 2016). A major point here is that the use of resilience is not neutral and the ways in which resilience policies are made deserves more attention. Resilience is deeply normative and the assumptions underpinning different perspectives have to be made explicit (Alexander, 2013, Brown, 2014).

This paper advances a field of critical research on the application of urban resilience by drawing on Science and Technology Studies (STS) and narrative analysis. This opens analysis onto the forms of knowledge that underpin and legitimise particular resilience narrative positions. The following section presents this analytical framework, followed by a methodological note and individual and comparative analysis of narratives in three cities: Cape Town, Manila and Nairobi where resilience programming is active and through which the value of a narrative lens is demonstrated. Cape Town and Nairobi are part of the Rockefeller 100 resilient cities programme.

2. Conceptual framework

Resilience has now become a buzzword and is being used by actors and organizations from both science and policy backgrounds, operating at different scales and with different purposes and meanings (Brown,

2014; Meerow et al., 2016). In this respect, while becoming a hegemonic framing at the policy level, resilience acts apparently as a boundary object (Brand and Jax, 2007) in urban politics, able to bring together actors and organizations with otherwise different agendas and interests:

“Boundary objects are objects which are both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use, and become strongly structured in individual-site use. They may be abstract or concrete. They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation. The creation and management of boundary objects is key in developing and maintaining coherence across intersecting social worlds.” (Star and Griesemer, 1989:393)

From this perspective resilience has the potential to allow heterogeneous actors and organizations to work together - stabilizing relations despite heterogeneity of concerns and interests between actors. Yet, boundary objects, due to their malleability, often hide important conflicts and disagreements (Forsyth, 2018, Borie and Hulme, 2015). They render collaboration possible but between actors who do not necessarily share the same aims: conflicts over values may be rendered invisible. This suggests that resilience can only be understood relationally. We need to enquire not about resilience *per se*, but about the resilience of whom to what (Ziervogel et al., 2017; Meerow et al., 2016a, Meerow and Newell, 2016). Urban resilience processes are deeply political, often leading to disagreements and forcing trade-offs between values (McEwen et al., 2017; Cretney, 2014). At the same time, political, social, and ethical assumptions are rarely explicitly surfaced by resilience planning methods which tend instead to infer value neutrality and frame decision-making around tangible and quantifiable indicators and physical features (Eakin et al., 2017). Efforts to monitor and measure urban resilience itself are multiplying (e.g. Bozza et al., 2015; Cutter et al., 2008). A number of policy frameworks at different scale call for 'evidence-based' approaches for resilience planning. At a global scale, the Sendai Framework strongly encourages the use of scientific knowledge for disaster risk reduction. Welsh observes the development of an 'emerging form of governmentality through resilience' (2014:16).

In this context, recent research has called for more attention to be dedicated to urban knowledge systems (Jon, 2018; Muñoz-Erickson et al., 2017). A number of scientific tools and technical devices, such as maps and Geographic Information Systems, are routinely used in urban planning and support the development of resilience strategies (Pelling, 2011, Godschalk, 2003). Practices such as community vulnerability and risk assessment as well as resilience action plans pervade and also delineate how resilience is constructed. Yet science and technology are not value neutral, they have performative effects that need to be studied (Kitchin et al., 2012; Porter, 1996). Science is not a monolithic block and different epistemologies and forms of knowledges exist (Knorr-Cetina, 2007). With regards to resilience, much knowledge comes from natural science disciplines, with social science often limited to vulnerability assessments (Donovan and Oppenheimer, 2015). Quantitative tools are generally granted more authority than other forms of knowledge (Kovacic, 2018). Yet, rather than more physical science knowledge it has been argued that it is more social scientific knowledge that is needed to understand, for example, barriers to climate change adaptation (e.g. Hackmann et al., 2014; Lorenzoni and Whitmarsh, 2014). At the same time, a number of authors have questioned the dichotomy between lay and expert knowledge (Wynne, 1992) and emphasized the value of local knowledge, such as in the case of climate change adaptation (Naess, 2013).

Which forms of knowledge and epistemologies are mobilized also matter. Different forms of knowledge underpin different narratives, legitimating different actors and solutions. Resilience narratives

emerging from art-based methods, for example, are unlikely to overlap neatly with those emerging from conventional methods, yet narratives have material implications (see [Moglia et al., 2018](#); [Heras and Tàbara, 2014](#)). Knowledge itself is often contested, for example hazards maps and other land use documents, which are pictured as objective, can hide important controversies through the use of scale or selective depiction of component parts, or through the politics of their production ([Haughton and White, 2017](#), [Desportes and Colenbrander, 2016](#)). The use of science and scientific methods in the presentation of resilience is then mutable – science can be openly deployed as a critical tool, a veil to obscure values and a common language to facilitate communication. More than this, the borrowing of scientific methods and approaches confer to resilience narratives the appearance of scientific objective rationality. Analogous of advertising campaigns, the symbols of science can be deployed in communication strategies to project rigour, impartiality and systematic process. This further projects the image of resilience as an urban planning device that is value neutral and so apolitical.

This is not to argue for scientific methods to be left out of resilience planning. On the contrary scientific methodologies and approaches can bring transparency in decision-making, they can offer a common language and motivation to democratise decision-making as well as holding decision-makers to account. Much depends on the ways in which methods and their surrounding relationships are managed. Building on Stirling's metaphor, science can either 'open up' or 'close down' the range of policy options and possible futures (2008). To understand what resilience does (how it is used, what it means to different actors), one needs to analyse how it is constructed through particular knowledge-making practices, and by whom: whose disciplines and expertise shape resilience strategies.

In doing so we are particularly interested in the knowledge infrastructures underpinning those strategies, and in the ways that some knowledge practices are institutionalized by public authorities for resilience planning. Attending to the interactions between diverse actors (e.g. intergovernmental organizations, universities, think tanks) and the forms of knowledge they rely on is also important to understand how particular understandings of urban resilience circulate (see [Bulkeley, 2005](#)). The concept of knowledge infrastructure has been defined by Edwards as:

“Robust networks of people, artefacts, and institutions that generate, share, and maintain specific knowledge about the human and natural worlds.” ([Edwards, 2010:17](#))

Narrative analysis has been applied to a range of topics such as food security ([Sonnino et al., 2016](#)), biodiversity conservation ([Hutton et al., 2005](#)) and climate change ([Hulme, 2009](#)). A narrative can be understood as a technique to gain coherence ([Nash, 2005](#)). Following [Haraway \(1989\)](#), we are more particularly interested in the performativity of these narratives: they are not flat discourses but become embedded in practice and policy actions. In this sense, narratives resonate with the notion of the 'socio-technical imaginary' ([Jasanoff and Kim, 2013](#)) which highlights the co-production between science and societies. Particular narratives are underpinned by diverse forms of evidence and disciplines but little is known about the kind of resilience they actually support. Our results are based on qualitative research methods and analysis which are introduced in more details in the section below.

3. Mapping resilience narratives: a methodological note

The resilience narratives of three case study cities are presented below. Before introducing further our methods we introduce our study sites and explain the rationale for conducting fieldwork in Manila, Nairobi and Cape Town. All three cities have active resilience agendas deployed as part of responses to recognised challenges of risk associated with wide social and economic disparities including large populations forced to live in slums and informal settlements with inadequate land-

tenure and service provision ([Amin and Cirolia, 2018](#); [Porio, 2011, 2014](#); [Shatkin, 2004](#)). Disaster risk is manifest through chronic everyday events as well as episodic catastrophic disasters – both products of constrained development choices ([Mulligan et al., 2017](#); [Ziervogel et al., 2016](#)). In each city resilience agendas were championed by city government and civil society agencies working together, separately or in contestation providing a rich context to examine the deployment of resilience and its consequences for inclusive and integrated development paths to sustainable development.

The derivation of narratives in each city drew from 31 semi-structured interviews (12 in Manila, 8 in Nairobi, 11 in Cape Town) with public authorities at the municipal level, NGOs, and the corporate private sector. The interview guide and interviewee profiles are presented in supplementary material¹. In addition to face to face interviews, we gathered and analysed documents relevant to our study including policy documents, institutional websites and newspaper articles. The material gathered was analysed using qualitative coding, paying particular attention to the following themes: *conception of resilience, challenges with resilience, use of science and knowledge, responsibility and ethics*. We then identified empirically different narratives of resilience in each city. These narratives are not necessarily mutually exclusive and can coexist in different places or policy documents and be mobilized by the same actor or organization depending on the situation. Some are supportive of each other while others are incompatible. In each place, the explicit use of the term 'resilience' also differs. For example, some individuals explicitly refuse to engage with the term that they perceive as already too biased towards powerful interests.

We applied the following analytical framework to describe each narrative:

- *Conception of resilience*: Distinguishes between resilience understood predominantly to protect (conservative) or challenge (transformative) established development practices and processes, and whether policy preferences are biased towards short- or long-term solutions;
- *Mode of governance*: We differentiate between three modes: bottom-up, top-down, and co-production, to characterize the processes underpinning those narratives and the extent to which they are participatory and include the views of communities;
- *Actors*: Identifies those individuals, groups and organizations whose conception of resilience falls under this particular perspective;
- *Use of science and technology*: The ways in which scientific tools are mobilized focusing on the motives underpinning their use and on Stirling's metaphor (2008), whether they *open-up* or *close down* conversations;
- *Forms of knowledge used*: An indication of the forms of knowledge perceived as relevant in each narrative. We differentiate between natural science knowledge, social science knowledge and multiple forms of knowledge.
- *Examples*: We give an example emerging from analysis to illustrate perspectives.

Building on this analytical frame we derived two figures that help visualize similarities and differences between the narratives. On [Fig. 1\(a\)](#) we cluster the narratives according to their predominant topical focus – what are they about? - including modernization, social justice, environment and security. On [Fig. 1 \(b\)](#) we map narratives in relation to the governance approach they are associated with: top-down vs. bottom-up and conservative vs. transformative. Other visualizations could have been used but these two allow us to discuss two important aspects: the *content* of the narratives and the *processes* that underpin them.

¹ Materials and quotes from interviews are referenced in the text via codes; each interviewee has a code – for example IM1 means first interviewee in Manila. See supplementary material.

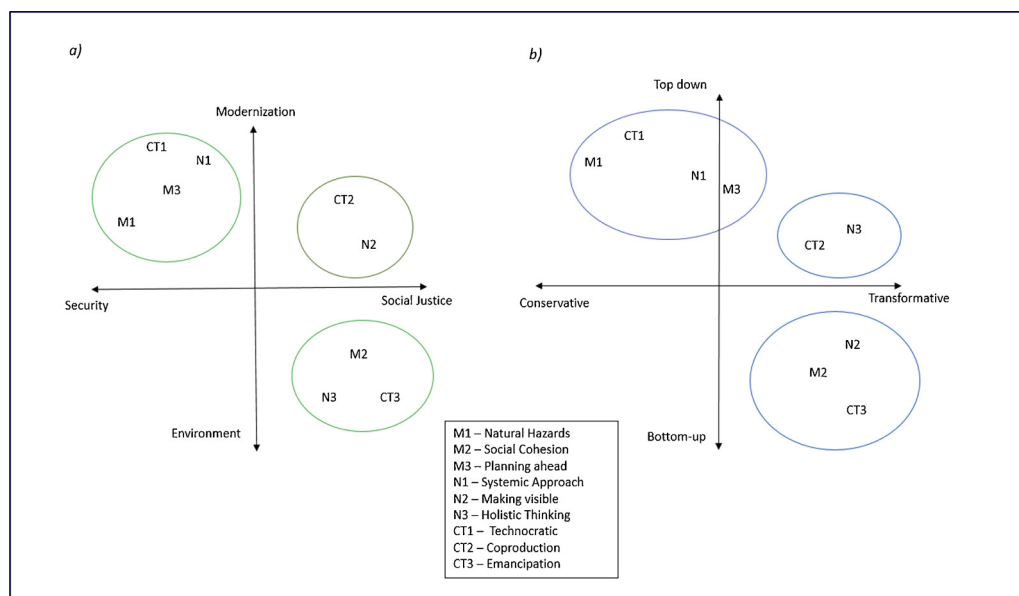


Fig. 1. Urban resilience and the uses of science a) Purposes ('Why is science used?'); b) Approaches ('How is science used?').

4. Resilience narratives

This section demonstrates the richness in the range of narratives found in each city. Some narratives resonate across cities, for example, narrative *M1* (Natural Hazards), predominant in Manila, has a counterpart, *CT1* (Technocratic Resilience) in Cape Town. We chose to present narratives separately as each city has its own particular context and history, to emphasise diversity at the city level. They are not intended to be an assessment of how resilience strategies are implemented in these places. Rather, our interest is to map the multiplicity of resilience narratives, reflecting on their similarities and differences and on their socio-material implications.

4.1. Manila

We identified three competing resilience narratives operating in Manila characterised by a focus on enhancing resilience through Natural Hazards, Social Cohesion and a call for long-term planning (Planning Ahead).

4.1.1. *M1* - Natural Hazards

Most visible in national policy documents (e.g. the *National Disaster Risk Reduction Framework in the Philippines*, see Shaw et al., 2017) this narrative emphasized resilience to natural hazards through preparedness and response. Geohazards maps identified areas at risk of floods, liquefaction, and landslides to delineate locations as 'safe' or not – security was the focus. Maps did not account for the social and economic aspects that mattered for people living in those places. Maintenance and reconstruction of infrastructure were an important concern and engineering teams were given key responsibilities. Technical devices were perceived as essential to monitor and predict weather events. For example, the city of Manila recently invested in a Command Centre equipped with a wide number of screens to visualize different parts of the city. The narrative focus on geo-hazards and the technical framing of risk management produced a narrow understanding of risk, going against other understandings of resilience which focused on the well-being of communities or/and on the longer term planning concerns.

4.1.2. *M2* – Social Cohesion

This narrative was promoted in particular by civil society organizations and researchers and emphasized that, beyond security, the resilience of people and communities depends on their ability to maintain

social networks. What mattered was to allow people to live close to livelihoods and families. The *National Disaster Risk Reduction Framework in the Philippines* identifies communities as a key component of resilience and the government recognized that local communities must be placed at the forefront of resilience planning. Yet, concurrently, the focus on security directly hampered the well-being of some of those communities, low income urban households in particular. For people living in areas identified as unsafe by government geohazards maps (*M1*) 'security' had sometimes been used in an instrumental manner by public authorities as a way to push to evict poor communities and justify relocation. These were also often blamed for contaminating the environment. While invoked by public authorities to take responsibility over disaster risk reduction, 'security' can also serve to avoid taking responsibility over poverty alleviation. These divergent views about resilience therefore crystallized more clearly over the issue of relocation: under *M2* relocation is legitimate but preference is given for relocation on-site. Beyond the issue of relocation, people advocating for these perspectives argued that ultimately what matters is that people talk to each other and that bridges exist between different governance levels and areas.

4.1.3. *M3* – Planning Ahead

A focus on short-term economic interests and on emergency response undermined investments in longer-term planning. This narrative emphasized the unequal distribution of resources in the city and a lack of anticipation in development planning to reduce risk. There was a desire for widespread human capital technical investment – for example to make GIS available to City Planners to make possible a more systematic approach to risk identification and management by facilitating data management, project monitoring, and evidence-based decision-making. As emphasized by an architect working for Manila City Council:

"We are also just beginning to work with GIS. It will definitely make our lives easier. The problem with City Hall as of now is that all departments are not integrated at all. The right hand does not know what the left one is doing. Divisions have different data. We cannot resolve differing data and we don't know who is right." (IM3)

So far most data, including planning maps, were only available in paper form and this limited the ability to plan, anticipate and predict. GIS would strongly benefit planning by making possible a more systematic approach. In particular, it would facilitate record keeping,

monitoring and evidence-based decision-making. In this perspective, modernizing the city by equipping it with computers and GIS systems would allow better planning as this would facilitate bringing together comprehensive datasets. In addition to the lack of digital infrastructure, one problem was a lack of in-house expertise in at least some areas of the public sector.

4.2. Cape Town

Information technology was a fault-line in the deployment and ownership of resilience in Cape Town. This was associated with a City administration with high technical capacity and resource for building and analysing large population datasets and sophisticated GIS systems, represented enthusiastically in narratives around Technocratic and Coproduced Resilience, and more critically in a narrative seeking to move beyond reductionism: Emancipation.

4.2.1. CT 1 - Technocratic Resilience

Science, maps and spatial knowledge were used for planning purposes including ‘Cityviewer’, a sophisticated GIS system operated by the City of Cape Town. City officials could *see* the city virtually, with a high level of detail. This amount of data provided them with what bore some similarity with a “God’s eye view” of the city or what STS scholars have termed a “view from nowhere” (Haraway, 1988). This describes an aspiration to provide objective knowledge whose validity is universal—true everywhere no matter the context (e.g. Davies and Burgess, 2004, Shapin, 1998). The approach developed by the City of Cape Town, at least in some departments, echoed those aspirations: of an all-encompassing, objective, picture of the city allowing rational management and control. Yet, the high degree of technology did not reflect the realities of living in informal settlements without access to services at risk from flooding and did not necessarily lead to better planning practices (see also Watson, 2014, Dierwechter, 2004). To some extent, technology was used to shortcut direct engagement and consultation with citizens. Maps could be interpreted as giving a summary of what is happening on the ground rather than trying to get officials to visit and interpret conditions locally. Officials might think that they *see* the city and do not need to *sense* it. This reflected an aspiration to build technical skills to solve problems rather than appreciating socio-technical realities. This also entailed a degree of depersonalization in exchange, as technology was used to support apparently democratising but simultaneously technocratic, top-down interventions, that disconnected local at risk poor communities from planning authorities. This use of technical devices in an attempt to suppress political debates has been widely documented elsewhere (e.g. Latour, 2004; Lupton and Mather, 1997). At an extreme this use of GIS and mapping reinforces and aggravates existing divides and inequalities.

4.2.2. CT 2 - Co-Producing Resilience

Knowledge and maps were extensively used with an explicit attempt to foster engagement and conversation between different actors and organizations via practices such as participatory mapping, qualitative mapping, participatory scenario planning and games. This narrative included both city and non-city officials, with NGOs such as the Community Organization Resource Centre (CORC) and the Development Action Group (DAG). Actors in this perspective often suggested that “The city is working for you”, the motto of the City of Cape Town, ought to be “The city is working with you”. They saw processes as being as important as outputs and mapping was often used to trigger a conversation such as in the case of this city official:

“I try to find solutions using maps and drawing contours to identify places where houses could be moved to distribute services, and then new houses could be built. Sometimes I know what a solution could be but I need to let the community come up with it, and sometimes they come up with new points that I hadn’t thought of. Dialogue is

needed. We need to use both technical and local knowledge.” (C19)

NGOs also used maps as advocacy tools to render visible things which some city officials, despite their modern facilities, could not see. How information is mapped facilitates other interpretations. For example, rather than presenting a map indicating the location of toilet facilities in a particular settlement, indicating *who* had access to them and *when* (e.g. for most women going out at night is unsafe so access will be bounded in time) changed how *access* was perceived. In addition to alternative maps, some NGOs routinely used GIS and participatory mapping in their activities, as in the case of CORC. Their approach was quite formalized and followed different steps: enumeration; data collection; analysis; presentation of results. They always gave knowledge (e.g. statistics and maps) back to communities. Sometimes civics knew those tools, maps for example, better than the City, and used them to engage with the City and challenge official views.

One of the limits of co-production identified in this narrative is that some datasets produced by non-city actors did not directly interface with official city datasets, being placed in different data repositories. This lack of interfacing can be explained by logistical reasons and concerns over data curation but also by the fact that not all datasets were perceived as equally credible. It is also worth underlining that there were numerous micro-politics regarding data-sharing and accessing datasets that depended on who one liaised with. An additional limit to coproduction is that many perceived the City of Cape Town as operating in a very top down manner.

4.2.3. CT3 – Emancipation

This narrative was explicitly mobilised as a critical response to the dominant (CT1) resilience narrative by NGOs, placemaking activists, and researchers operating outside the City of Cape Town. ‘Emancipation’ argues that dominant resilience framing served to maintain existing power relations in an unequal society. Some deliberately refused to use the term ‘resilience’, which they saw as already owned by powerful economic actors. The failed promise of resilience highlights a gap between people’s expectations and city action connected to an overly technical framing of resilience. To move beyond this, there is a need to develop more bottom-up, participatory, planning practices (Parnell, 2002, Parnell and Pieterse, 2010). Actors advocating for this perspective often emphasized a need to make more room for qualitative data and stories, allowing multiple interpretations of resilience to coexist. With mapping, for example, this implied mapping social networks, to avoid reductionism, oversimplification, and decontextualization (e.g. Dovey and Ristic, 2017). Another example relates to the ways in which people navigated in the city. City maps showed cycling lanes but did not say anything about different people’s experience when using cycling lanes at different times of the day – this plurality of experiences was seldom captured and therefore not used to build resilience. Art-space methods were also perceived as a fruitful way to move beyond technocratic and Western ways of thinking and planning to help residents develop a sense of place and generate creative ideas about their own future (Pieterse, 2006).

4.3. Nairobi

Resilience policy was undeveloped in Nairobi City County Government, despite its being made one of the Rockefeller Foundation’s 100 Resilient Cities, a formal policy agenda and public debate had yet to emerge. This challenge was reflected in the dominant narrative (Fragmentation) and through more optimistic future facing narratives built on Making the Invisible Visible and Holistic Thinking.

4.3.1. N1 - Fragmentation

In this narrative, lack of knowledge and data was recurrently emphasized and identified as a factor hampering the ability of urban planners and citizens groups to manage, plan and predict risk. It also

Table 1
Summary table – Narratives of urban resilience and their characteristics (each is commented on and compared in the following sections).

	Conception of resilience	Mode of governance/ Participation	Actors	Use of science and technology	Forms of knowledge used	Examples
M1 Natural Hazards	Focus on infrastructure; Conservative; Short term	Top-down	City of Manila, Metro Manila, National government	Prediction/monitoring; Technocratic, To assert authority; Closing down	Predominantly natural science knowledge	Geo-hazards maps; Command Centre for Disaster Risk Reduction
M2 Social Cohesion	Focus on social networks and livelihoods; Transformative; Short and long term	Participatory; Bottom up	Christian Aid, Urban Poor Associate, Some city officials	Advocacy; To gain credibility; Opening up	Multiple knowledges	Social network analysis; Qualitative mapping
M3 Planning Ahead	Resilience as a modernization project; Transformative; Long term	Top down	City of Manila, Private sector	Ability to know, anticipate, integrate; Technocratic; Closing down	Natural science; Social science	GIS
CT1 Technocratic Resilience	Resilience as bouncing back; Conservative; Short and long term	Top-down	City of Cape Town	Ability to know, anticipate, integrate; Technocratic; Closing down	Natural sciences	Cityviewer (GIS software)
CT2 Coproduced Resilience	Taking responsibility together; Transformative; Short/long term	Participatory; Co-produced	CORC, DAG, City of Cape Town	For engagement/ discussion; Opening up	Natural sciences, GIS, maps	Conventional GIS Participatory mapping Qualitative GIS
CT3 Emancipation	Social justice; Transformative; Short/long term	Bottom-up	Re-claim the city	Emancipatory; For advocacy, to disrupt; Opening up	Desire to use more qualitative data	Social sciences; Creative practices; Innovative maps GIS; Digital tools
N1 Fragmentation	Systemic; Transformative; Short/Long term	Top down	Private sector, Nairobi City County	Ability to know, anticipate, integrate; Technocratic; Opening up and closing down?	Natural sciences	GIS; Digital tools
N2 Making Visible	Social connections; Transformative; Short/long term	Co-produced; Participatory	NGOs (KDI)	Advocacy; Opening up	Multiple forms of knowledge	GIS; Qualitative mapping; Digital tools
N3 Holistic Thinking	Socio-ecological Systemic; Transformative; Short/Long term	Co-produced Participatory	NGOs, activists	Advocacy; Opening up	Use of GIS and maps	Mapping public spaces initiative,

undermined more systemic and holistic ways of thinking. Cumulative effects, for example regarding water supplies and flood risks, were not taken into consideration by contemporary development planning. This was emphasized in particular by an engineer working for an international company operating in partnership with local authorities:

“For example, when there is a new development, its impacts on traffic are to be considered so there is a traffic impact assessment which has to be validated by the Nairobi Road Department but then what about storm water channels. Who is responsible for this? Who should assess the drainage system and the impacts the new development is likely to have on its capacity? Road and sewage systems are interconnected, but who is checking that when there is a new development project? There are multiple connections to assess but many of them are left out.” (IN7)

The vision and practice of resilience was then described as fractured by this interviewee and compartmentalized between different sectors with an unclear distribution of responsibilities. Proponents saw no clear process to tackle tensions between short-term priorities and long-term interests. For example, there was a tendency for planning decisions to prioritise the short-term and economic development while ignoring the longer-term effect on the soil and water supplies. As in *M3*, many expectations were placed in the potential for technical improvements, principally in access to GIS, to improve planning practices, monitor changes and facilitate record-keeping, but there was first a dire need to develop inclusive, up to date, datasets.

4.3.2. N2 - Making the Invisible Visible

Science and technology were used in an emancipatory manner by

organised civil society; for example by Muungano wa Wanavijiji, a social movement of Kenya slum dwellers which uses household surveys to challenge official data or its absence and so to raise voice and the visibility of the urban poor. This was deployed to encourage public authorities to take responsibility in the most vulnerable areas of Nairobi including for example the Mukuru Special Planning Area ([Urban ARK, 2017](#)). Actors advocating for this perspective completed different kinds of tasks. They sometimes provided conventional maps for areas which were left out of official maps but also routinely used participatory mapping techniques, working with the communities, and provided alternative maps. The Kounkuey Design Initiative (KDI), an NGO operating in Kibera, the biggest informal settlement in Eastern Africa was one example. The data gathered by this organization were freely accessible and often served to trigger conversation with Nairobi City County. When providing conventional high resolution maps, such as hazard maps, KDI emphasized the value of including local knowledge, for example about flood risks (see also [Mulligan et al., 2017](#)). Their projects in Kibera were organized around the idea of ‘productive public space’ and combined expert and lay knowledges. In addition to GIS mapping, KDI also used digital tools and social media where people living in Kibera could share their stories. As emphasized by Slum Dwellers International (SDI), depending on where they work, data on informal settlements in particular could be completely missing from official registers and they had to produce it entirely. SDI formed relationships with local governments and shared data to encourage planning interventions.

4.3.3. N3 – Holistic Thinking

This narrative represented the vision of a resilient city in which

there were numerous public spaces, parks and a well-connected public transport system. One in which public authorities saw the value of public and green spaces, their advantages in terms of public health rather than perceiving them as hampering economic growth and profit. There was a need to overcome the opposition beyond short term and long term by considering all the costs that public spaces and parks allowed avoiding. This meant, for example, being aware that the diminution of pollution levels also means less respiratory diseases, diabetes, and numerous positive externalities in term of public health. Advocates of the ‘green city’ were trying to make the case for this alternative imaginary of Nairobi, showing that it was worth investing in public spaces and green infrastructure. Maps were used to provide evidence that this alternative vision was possible (e.g. [UN Habitat, 2016](#)). This narrative advocates for a holistic vision of a resilient city. The biggest challenge is entrenched sectoral thinking, especially amongst public sector technocrats.

5. Discussion

The narrative evidence presented for Manila, Nairobi and Cape Town demonstrates the significance of narrative analysis for revealing value contestation in the city. Despite the fact that resilience was often pictured as consensual, a diversity of perspectives, sometimes contradictory, existed. These narratives were associated with different science methods and have implications for resilience planning and risk governance. Although a few narratives dominated in the different cities, looking across the cities to explore the similarities and differences between narratives is also useful. In the discussion we draw on the elements summarized in [Table 1](#) and reflect on:

- (i) Relations between knowledge infrastructures and specific narrative positions in Cape Town, Manila, and Nairobi
- (ii) The multi-faceted roles of science and technology in resilience planning
- (iii) Implications for the governance of risk and resilience
- (iv) Ethical issues arising for resilience planning

5.1. Knowledge infrastructures in Cape Town, Manila and Nairobi

Knowledge infrastructures are useful to describe the range of actors whose knowledge is made legitimate and underpin the construction of specific narratives. They open up analysis into the relationship between knowledge and power in the city by helping to understand who is given responsibility and the division of labour between different actors. Although the three cities operated with different knowledge infrastructures, in all of them dominant narratives were those organized around technological capacity. In both Manila (M3) and Nairobi (N1) dominant narratives placed expectations for improved policy making and outcomes on enhanced technology for data collection and analysis (e.g. GIS system). Lack of resources and appropriate equipment at the municipal level were perceived as limiting this vision. More specifically, a striking observation in both cities was a fragmented landscape in terms of both distribution of data and expertise. Datasets were decentralised, often held by multiple organisations in diverse locations with much data not being shared, even between government agencies. Fewer datasets and technical human resource were available for public agencies administering low-income areas. Spatial analysis skills tended not to be held by the municipality but rather by higher levels of government, NGOs, consultants and universities. This led to a diffusion of power from the city region upwards to the municipality and outwards to non-state actors.

Where capacity gaps were recognised and relationships between actors were open this led to collaboration, for example in Nairobi where Slum Dwellers International and the Kounkuey Design Initiative generated and shared data on hazard and vulnerability with the municipality. In both Kenya and the Philippines, recent legislation mandating

community involvement in risk management (Manila) and decentralisation of government functions (Nairobi) provided a context for continuing collaboration in the construction of knowledge infrastructures. In the Philippines this was motivated by a Department of the Interior memorandum recalling that in the *Philippine Disaster Risk Reduction Management Act* (2010) Local Government Units had to ensure the “safety and resiliency of communities to face the challenges of disasters” ([DILG, Memorandum Circular, April 2016](#)). In Kenya, the 2010 Constitution implemented a strategy of government decentralisation that had given more responsibility to local authorities and sought to enhance public participation. But while devolution processes were on-going, there was a lack of capacity and expertise at the local level and institutional features (such as joint management boards) had not been established making claims about collaboration aspirational more than operational. Interviewees working for the Nairobi City County or Manila City Hall often emphasized that they had growing responsibilities but not necessarily the means to achieve them.

In contrast to Nairobi and Manila, the City of Cape Town had invested significantly in technology and digital infrastructure. Technical expertise was concentrated though combined with a strong ethos of multi-stakeholder participation. All officers had access to a GIS platform and to a wide range of datasets which were regularly updated. The city employed close to 22,000 employees with 21 departments using GIS and roughly 300 using GIS in their everyday work ([Steenekamp, 2016](#)). Cape Town was pushing forward the development of a ‘smart city’ strategy. From the perspective of city residents at risk, however, the high capacity of the City could be alienating. The scale of inequality and political legacy of apartheid had generated expectations (e.g. poverty reduction, settlement upgrade) among the urban poor that had not been met. Knowledge infrastructure was dominated by a technical elite despite its desire for inclusivity. While this may have allowed better planning practices, this infrastructure also encouraged a very technocratic and top down approach to urban planning and hampered the development of more participatory processes (see also [Kitchin, 2014](#)).

5.2. The multi-faceted roles of science and technology in resilience planning

The role of science and technology in urban planning and resilience depends on how, and by whom, knowledge is mobilized ([Fig. 1](#)). Science can either open-up a conversation between different stakeholders or close it down ([Stirling, 2008](#)). [Fig. 1](#) groups narratives by a) stated policy purpose and b) predominant science approaches. Almost paradoxically, the very different knowledge infrastructures in place in Cape Town and Nairobi limited the ability of officials to take responsibility. In Cape Town data and technology contributed to the separation of officers from local reality, in Nairobi a lack of data prevented the take up of responsibility.

With regards to a) where mobilizing science and technology in resilience planning was framed to serve modernization ideals (M1, M3, CT1, N1), associated with the idea of progress, with much emphasis placed on the ability of science for security to help anticipate, predict, plan, monitor and control. These approaches were focused and efficient but tended to close down alternative ways of doing and knowing within narrative accounts. A similar observation can be made for Natural Hazards (M1) that falls in the same quadrant, where technology was placed at the forefront of disaster risk reduction. On the other hand, where narratives were organized around social justice (M2, N2, CT2), science and technology were used to give voice to marginalized or vulnerable populations and through this to engage with public authorities and challenge their views. More explicit is CT3 which invoked the language of transformation to position resilience as an agenda for challenging established visions, administrative priorities and practices in the city. A particular variant is N3, where the point of science is to help make a space for nature – to open up towards an alternative way of making the city that connects environmental and social sustainability to

resilience.

Presented in this way narratives appear to diverge. As shown on across Fig. 1 a and b there is a gap between top-down approaches in b), which overlaps with concerns over modernization and security in a), and bottom up approaches in b), which are more oriented towards social justice and environmental concerns in a). As shown in b), those with social justice purposes also deploy more open science methods associated with transformative and bottom-up approaches; narratives championing engineering and natural hazards management as the purpose of resilience deploy more top-down command and control structures of science with conservative approaches aimed at improving the effectiveness of existing policy rather than opening discussion on alternative futures. However, when looking at more detail into city departments, some city officials already used science and technologies as engagement tools too (e.g. using games and participatory mapping). The potential for lay knowledge and participatory methodologies, or for multiple-values to influence formal planning processes was small, though for many actors this was an aspiration. This suggests that there are already some opportunities to develop more collaborative approaches for resilience planning and policy in all three cities.

5.3. Implications for the governance of risk and resilience

Ways of knowing resilience facilitate particular ways of governing and contribute to the distribution of roles and responsibilities to diverse actors (Jasanoff, 2004, Sheppard, 1995). Science methods can be mobilized to implement both a transformative view of resilience, oriented towards social justice, or a conservative one, that maintains existing power relations and interests. Yet, as highlighted in Fig. 1 (a) and (b), the use of science and technology is never neutral for governance and policy and contributes to particular understandings of the problems at stake. It therefore matters whose perceptions or understandings of risks are included in resilience programming (Harris et al., 2017). This brings up the question of how compatible the different narratives are in each city. For Manila, there is clearly a contradiction between the predominant narrative M1 and M2 as the focus on natural hazards can go against concerns over social networks and livelihoods. This reflects dynamics in urban governance for Manila, where technical skills and capacity are unevenly distributed between and within city authorities and civil society. In Nairobi short term concerns over economic growth and sectoral approaches hamper more holistic visions such as the one promoted by N3 (Makworo and Mireri, 2011, Oyugi and K'Akumu, 2007). Capacity for urban planning is so constrained and unbalanced by the requirements of large private developments that while these development may meet global standards their impacts on surrounding risk through overland water flow, water extraction, traffic flow or consequences for surrounding land values and use are not included, so that resilience is separated from strategic urban planning capacity. Similarly, in Cape Town, the lack of systemic thinking and collaboration between different levels of governance and community actors has hampered successful management of flood risks (Ziervogel et al., 2016).

Risk management often follows technocratic, top-down, approaches, as in the case of Cape Town (CT1). This tension between top-down versus bottom-up approaches is recurrent and widely reflected in numerous debates on environmental change (Beck et al., 2014). There is an intimate connection here with the literature on the social construction of risks (Douglas and Wildavsky, 1983): a risk perceived as very important by some actors (e.g. climate change impacts) might not be perceived as such by others with different perspectives and priorities (e.g. poverty reduction). Although, the use of science and technology varies in different places and is socially and culturally shaped, understandings of risk emerging from the natural sciences, delineated according to geophysical criteria, are generally given priority over alternative understandings. Positivist disciplines are often perceived as more credible and authoritative, being able to speak 'truth to power', yet in

contrast to this linear conception of science-policy relations many have emphasized the need to redistribute expertise and to recognize local knowledge, for example with regards to flood risks (Mulligan et al., 2017; Lane et al., 2011).

5.4. Ethical issues surrounding resilience planning

The existence of different conceptions of resilience, and the contacts between different knowledge domains, raises a particular set of ethical issues, to which policymakers and planners involved in developing resilience strategies need to be sensitive. Three such issues are particularly salient. First, there is the risk of epistemic domination as a result of assumed 'expertise' on the part of one group or other (Lane et al., 2011). In order to counter this risk, this paper emphasises the validity and utility of different perspectives on resilience and the need to see each as expressing different forms of expertise rather than treating some views as epistemically privileged over others (Fricker, 2007).

Second, there is the need to recognise that different conceptions of resilience embed different assumptions about distributive justice and other substantive ethical positions, which need to be made explicit and transparent. Similar observations have been made in the field of biodiversity conservation (Martin et al., 2013). There is a rich literature in philosophy and elsewhere on the merits and problems with different models of distributive justice – whether, for example, rights-based, sufficientarian, egalitarian, or prioritarian (Cohen, 1995, Casal, 2007; Parfit, 1997; Otsuka and Voorhoeve, 2009). By exposing justice assumptions present in different conceptions of resilience, we are able to make progress on understanding and reconciling the normative standpoints of different stakeholders. Third, and relatedly, there is the need to ensure procedural justice in resolving conflicts between different conceptions of resilience. One way to do this is to create common ground (e.g. using deliberative spaces) where disagreements about technical, social and distributive justice issues can be fairly resolved, several narratives embody this call to enhance the use of deliberative space (e.g. CT3, N2).

There are opportunities, across all three cities, to make more inclusive the governance of risks and diversify the visions of each city's resilient future. The rich literature in political theory on deliberation, and on public reason, can provide a valuable perspective on how to take advantage of these opportunities in a fair and reasonable way (Dryzek, 2012, Gaus, 2011). Overall, the divergence of views about resilience underlines the central importance of taking a justice-based approach both to academic discussion about resilience and to on the ground policymaking. Only by taking such an approach can we ensure that different perspectives get a fair hearing.

6. Conclusion

Building on narrative analysis and STS insights we have mapped different meanings that urban resilience can take in Manila, Nairobi and Cape Town. These narratives suggest that urban resilience has become a term-in-common, around which different interpretations backed up by specific agendas and priorities associate. One of the key limits of boundary objects is that they often hide important conflicts, an observation which is consistent with our narrative analysis on urban resilience. Often these differences are not brought to the surface until conflicts emerge later on. This is a missed opportunity for resilience to open up the value systems, development visions and project preferences of multiple actors. Using this opportunity would require different actors to come together to approach resolution in the visioning of resilience and the setting of priorities before detailed project proposals or policy agendas become sources of tension. This also suggests that we need to pay attention to the origins of resilience policies to understand the underlying political and value-based disagreements that are often obscured.

Little systematic work has studied the role of science and technology

in shaping resilience policy trajectories. Yet some ways of knowing resilience entail particular ways of governing and distribute roles and responsibilities to different actors. Some views end up being privileged, alienating others. It therefore matters whose perceptions or understandings of risks are included in resilience programming, and how. We show that the use of science and technology is ambivalent. Knowledge can be mobilized both to encourage the implementation of transformative approaches to resilience, inclusive of concerns about social and environmental justice, as well as conservative approaches, driven by concerns over infrastructure and security. Importantly, our results show that the processes of knowledge production matter as much as the knowledge itself: participatory processes that empower different actors tends to produce more transformative outcomes. Fair and open processes are key to ensure that resilience is recognized as legitimate by the people whose future is shaped by these.

Our results suggest that there are some opportunities, and demand, for more collaborative and relational approaches that cut across top-down/bottom-up dichotomies for resilience planning in all three cities. We also found a clear interest for more qualitative and creative approaches that can be used alongside more quantitative approaches. Knowledge and tools emerging from the natural sciences are often perceived as more credible and particularly attractive – numbers and maps circulate more easily than qualitative knowledge or local knowledge, which cannot be so easily decontextualized. Yet, this leaves out forms of knowledge that would allow other necessary values and understandings of resilience to be visible. This would help, for example, understand why some population would rather stay in areas labelled as ‘unsafe’ in geohazards maps. Resilience planning demands greater attention to issues of place, culture, justice, and identity, especially in contexts of deep poverty and inequality. In practice using methods such as deliberative mapping and creative methods, in addition to conventional tools, can help reveal diverse perspectives and values (e.g. Brown et al., 2017; Burgess et al., 2007). This can help develop more pluralist approaches that could map a range of policy options and different futures.

In addition to these implications for urban governance, this paper also suggests that fruitful conversations can be developed between urban studies and STS to better make sense of the challenges awaiting urban sustainability. So far resilience scholars have yet to engage with the knowledge aspects of resilience planning, and STS scholars have paid only marginal attention to urban processes (Fariás, 2011; Fariás and Blok, 2016). Building on emerging studies on urban knowledge systems (Muñoz-Erickson et al., 2017; Blok, 2013) a wider range of questions can be asked such as: What are the politics of resilience knowledge and expertise? How do different understandings of resilience circulate? Which networks of actors and organizations contribute to the globalization of some narratives while other remain marginal? With regards to this study this will help understand why some narratives persist while other disappear or remain marginal – and with what consequences for the ways in which resilient cities are constructed. This will also facilitate the identification and development of innovative and creative methods to encourage transformative and sustainable urban changes.

Acknowledgements

This research emerges from the ‘Why we disagree about resilience’ (WhyDAR) project funded by UKRI Global Challenges Research Fund; grant number NE/P01609X/1. We would like to thank our partners and all the participants who accepted to share their insights by taking part in interviews as well as the reviewers. The views expressed in this paper are in the authors’ personal capacity, and do not represent the views of their respective institutions. Any errors or omissions remain our own.

References

- Alexander, D.E., 2013. Resilience and disaster risk reduction: an etymological journey. *Nat. Hazards Earth Syst. Sci.* 13 (11), 2707–2716.
- Allen, A., Griffin, L., Johnson, C. (Eds.), 2017. *Environmental Justice and Urban Resilience in the Global South*. Palgrave MacMillan, New York US. Political Science Series. ISBN 978-1-137-47354-7.
- Amin, A., Cirolia, L.R., 2018. Politics/matter: governing Cape Town’s informal settlements. *Urban Stud.* 55 (2), 274–295.
- Beck, S., et al., 2014. Towards a reflexive turn in the governance of global environmental expertise. The cases of the IPCC and the IPBES. *GAIA-Ecol. Persp. Sci. Soc.* 23 (2), 80–87.
- Béné, C., Wood, R.G., Newsham, A., Davies, M., 2012. Resilience: new utopia or new tyranny? Reflection about the potentials and limits of the concept of resilience in relation to vulnerability reduction programmes. *IDS Work. Pap.* 2012 (405), 1–61.
- Blok, A., 2013. Blok: urban green assemblages: an ANT view on sustainable city building projects. *Sci. Technol. Stud.*
- Borie, M., Hulme, M., 2015. Framing global biodiversity: IPBES between mother earth and ecosystem services. *Environ. Sci. Policy* 54, 487–496.
- Bozza, A., Asprone, D., Manfredi, G., 2015. Developing an integrated framework to quantify resilience of urban systems against disasters. *Nat. Hazards* 78 (3), 1729–1748.
- Brand, F., Jax, K., 2007. Focusing the meaning (s) of resilience: resilience as a descriptive concept and a boundary object. *Ecol. Soc.* 12, 1.
- Brown, K., 2014. Global environmental change I: A social turn for resilience? *Prog. Hum. Geogr.* 38 (1), 107–117.
- Brown, K., Ernstman, N., Huke, A., Reding, N., 2017. The drama of resilience: learning, doing, and sharing for sustainability. *Ecol. Soc.* 22 (2).
- Bulkeley, H., 2005. Reconfiguring environmental governance: towards a politics of scales and networks. *Polit. Geogr.* 24 (8), 875–902.
- Bull-Kamanga, L., et al., 2003. From everyday hazards to disasters: the accumulation of risk in urban areas. *Environ. Urban.* 15 (1), 193–204.
- Burgess, J., et al., 2007. Deliberative mapping: a novel analytic-deliberative methodology to support contested science-policy decisions. *Public Underst. Sci.* 16 (3), 299–322.
- Casal, Paula., 2007. Why sufficiency is not enough. *Ethics* 117, 296–326.
- Chelleri, L., Waters, J.J., Olazabal, M., Minucci, G., 2015. Resilience trade-offs: addressing multiple scales and temporal aspects of urban resilience. *Environ. Urban.* 27 (1), 181–190.
- Coaffee, J., 2013. Towards next-generation urban resilience in planning practice: from securitization to integrated place making. *Plan. Pract. Res.* 28 (3), 323–339.
- Coaffee, J., Murkami-Wood, D., Rogers, P., 2008. *The Everyday Resilience of the City*. Palgrave/Macmillan, Basingstoke.
- Cohen, G.A., 1995. *Self Ownership, Freedom, and Equality*. CUP, Cambridge.
- Cretney, R., 2014. Resilience for whom? Emerging critical geographies of socio-ecological resilience. *Geogr. Compass* 8 (9), 627–640.
- Cutter, S., Barnes, L., Berry, M., Burton, C., Evans, E., Tate, E., Webb, J., 2008. A place-based model for understanding community resilience to natural disasters. *Glob. Environ. Change* 18, 598–606.
- Davies, Gail, Burgess, Jacquelin, 2004. Challenging the ‘view from nowhere’: citizen reflections on specialist expertise in a deliberative process. *Health Place* 10 (4), 349–361.
- Department of the interior and local government (DILG) of the Republic of the Philippines, 2016. Memorandum Circular 2016-48. April 5th.
- Desportes, Isabelle, Colenbrander, Darryl R., 2016. Navigating interests, navigating knowledge: towards an inclusive set-back delineation along Cape Town’s coastline. *Habitat Int.* 54, 124–135.
- Dierwechter, Y., 2004. Dreams, bricks, and bodies: mapping ‘neglected spatialities’ in African Cape Town. *Environ. Plan. A* 36 (6), 959–981.
- Donovan, A., Oppenheimer, C., 2015. Resilient science: the civic epistemology of disaster risk reduction. *Sci. Public Policy* 43 (3), 363–374.
- Douglas, M., Wildavsky, A., 1983. *Risk and Culture: An Essay on the Selection of Technological and Environmental Dangers*. University of California Press.
- Dovey, Kim, Ristic, Mirjana, 2017. Mapping urban assemblages: the production of spatial knowledge. *J. Urban.: Int. Res. Placemaking Urban Sustain.* 10 (1), 15–28.
- Dryzek, John., 2012. *Foundations and Frontiers of Deliberative Governance*. OUP, Oxford.
- Eakin, H., Bojórquez-Tapia, L.A., Janssen, M.A., Georgescu, M., Manuel-Navarrete, D., Vivoni, E.R., Lerner, A.M., 2017. Opinion: urban resilience efforts must consider social and political forces. *Proc. Natl. Acad. Sci.* 114 (2), 186–189.
- Edwards, Paul N., 2010. *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming*. MIT Press.
- Elmqvist, T., Barnett, G., Wilkinson, C., 2014. Exploring urban sustainability and resilience. In: Pearson, L.J., Newton, P.W., Roberts, P. (Eds.), *Resilient and Sustainable Cities*. Routledge, London.
- Fariás, I., Blok, A., 2016. Chapter 19 – STS in the City in the Handbook of Science and Technology Studies, 4th edition. The MIT Press.
- Fariás, I., 2011. The politics of urban assemblages. *City* 15 (3–4), 365–374.
- Forsyth, T., 2018. Is resilience to climate change socially inclusive? Investigating theories of change processes in Myanmar. *World Dev.* 111, 13–26.
- Fricker, Miranda, 2007. *Epistemic Injustice: Power and the Ethics of Knowing*. Oxford University Press, Oxford.
- Friend, R., Moench, M., 2013. What is the purpose of urban climate resilience? Implications for addressing poverty and vulnerability. *Urban Clim.* 6, 98–113.
- Friend, R., Moench, M., 2015. Rights to urban climate resilience: moving beyond poverty and vulnerability. *Wiley Interdiscip. Rev. Clim. Change* 6 (6), 643–651.

- Gaus, G., 2011. *The Order of Public Reason: A Theory of Freedom and Morality in a Diverse and Bounded World*. Cambridge University Press, Cambridge.
- Godschalk, D.R., 2003. Urban hazard mitigation: creating resilient cities. *Nat. Hazards Rev.* 4 (3), 136–143.
- Goldstein, B.E., Wessells, A.T., Lejano, R., Butler, W., 2015. Narrating resilience: transforming urban systems through collaborative storytelling. *Urban Stud.* 52 (7), 1285–1303.
- Hackmann, H., Moser, S.C., Clair, A.L.S., 2014. The social heart of global environmental change. *Nat. Clim. Change* 4 (8), 653.
- Haraway, D., 1988. Situated knowledges: the science question in feminism and the privilege of partial perspective. *Fem. Stud.* 14 (3), 575–599.
- Haraway, D.J., 1989. *Primate Visions: Gender, Race, and Nature in the World of Modern Science*. Psychology Press.
- Harris, Leila M., Chu, Eric K., Ziervogel, Gina, 2017. Negotiated resilience. *Resilience* 1–19.
- Houghton, G., White, I., 2017. Risky spaces: creating, contesting and communicating lines on environmental hazard maps. *Trans. Inst. Br. Geogr.* <https://doi.org/10.1111/tran.12227>.
- Heras, M., Tàbara, J.D., 2014. Let's play transformations! Performative methods for sustainability. *Sustain. Sci.* 9 (3), 379–398.
- Hulme, M., 2009. *Why We Disagree About Climate Change: Understanding Controversy, Inaction and Opportunity*. Cambridge University Press.
- Hutton, J., Adams, W.M., Murombedzi, J.C., 2005. Back to the barriers? Changing narratives in biodiversity conservation. *Forum for Development Studies*. Taylor and Francis Group (Vol. 32, No. 2, pp. 341–370).
- Jananoff, S. (Ed.), 2004. *States of Knowledge: The Co-Production of Science and the Social Order*. Routledge.
- Jananoff, S., Kim, S.H., 2013. Sociotechnical imaginaries and national energy policies. *Sci. Cult.* 22 (2), 189–196.
- Jon, I., 2018. Resilience and 'technicity': challenges and opportunities for new knowledge practices in disaster planning. *Resilience* 1–19.
- Kitchin, R., 2014. The real-time city? Big data and smart urbanism. *GeoJournal* 79 (1), 1–14.
- Kitchin, R., Gleeson, J., Dodge, M., 2012. Unfolding mapping practices: a new epistemology for cartography. *Trans. Inst. Br. Geogr.* 38 (3), 480–496.
- Knorr-Cetina, K., 2007. Culture in global knowledge societies: knowledge cultures and epistemic cultures. *Interdiscip. Sci. Rev.* 32 (4), 361–375.
- Kovacic, Z., 2018. Conceptualizing numbers at the science–Policy interface. *Sci. Technol. Human Values* 016224391870734.
- Kythreotis, A.P., Bristow, G.I., 2017. The 'resilience trap': exploring the practical utility of resilience for climate change adaptation in UK city-regions. *Reg. Stud.* 51 (10), 1530–1541.
- Lane, S.N., Odoni, N., Landström, C., Whatmore, S.J., Ward, N., Bradley, S., 2011. Doing flood risk science differently: an experiment in radical scientific method. *Trans. Inst. Br. Geogr.* 36, 15–36. <https://doi.org/10.1111/j.1475-5661.2010.00410.x>.
- Latour, B., 2004. *Politics of Nature*. Harvard University Press.
- Leach, M., 2008. Reframing resilience. STEPS Working Paper 13. STEPS Centre, Institute of Development Studies, University of Sussex, Brighton, UK.
- Leichenko, R., 2011. Climate change and urban resilience. *Curr. Opin. Environ. Sustain.* 3 (3), 164–168.
- Leitner, H., Sheppard, E., Webber, S., Colven, E., 2018. Globalizing urban resilience. *Urban Geogr.* 1–9.
- Lorenzoni, I., Whitmarsh, L., 2014. Climate change and perceptions, behaviors, and communication research after the IPCC 5th Assessment Report—a WIREs Editorial. *Wiley Interdiscip. Rev. Clim. Change* 5 (6), 703–708.
- Lupton, M., Mather, C., 1997. The anti-politics machine: GIS and the reconstruction of the Johannesburg local state. *Polit. Geogr.* 16 (7), 565–580.
- MacKinnon, D., Derickson, K.D., 2013. From resilience to resourcefulness: a critique of resilience policy and activism. *Prog. Hum. Geogr.* 37 (2), 253–270.
- Makworo, M., Mireri, C., 2011. Public open spaces in Nairobi City, Kenya, under threat. *J. Environ. Plan. Manag.* 54 (8), 1107–1123.
- Martin, A., McGuire, S., Sullivan, S., 2013. Global environmental justice and biodiversity conservation. *Geogr. J.* 179 (2), 122–131.
- McEwen, L., Garde-Hansen, J., Holmes, A., Jones, O., Krause, F., 2017. Sustainable flood memories, lay knowledges and the development of community resilience to future flood risk. *Trans. Inst. Br. Geogr.* 42, 14–28. <https://doi.org/10.1111/tran.12149>.
- Meerow, Sara, Newell, Joshua P., 2016. Urban resilience for whom, what, when, where, and why? *Urban Geogr.* 1–21.
- Meerow, S., Newell, J.P., Stults, M., 2016. Defining urban resilience: a review. *Landscape Urban Plan.* 147, 38–49.
- Mitra, S., Mulligan, J., Schilling, J., Harper, J., Vivekananda, J., Krause, L., 2017. Developing risk or resilience? Effects of slum upgrading on the social contract and social cohesion in Kibera, Nairobi. *Environ. Urban.* 29 (1), 103–122.
- Moglia, M., Cork, S.J., Boschetti, F., Cook, S., Bohensky, E., Muster, T., Page, D., 2018. Urban transformation stories for the 21st century: insights from strategic conversations. *Glob. Environ. Chang. Part A* 50, 222–237.
- Mulligan, Joe, Harper, Jamilla, Kipkemboi, Pascal, Ngobi, Bukonola, Collins, Anna, 2017. Community-responsive adaptation to flooding in Kibera, Kenya proceedings of the institution of civil engineers. *Eng. Sustain.* 170 (5), 268–280.
- Muñoz-Erickson, T.A., Miller, C.A., Miller, T.R., 2017. How cities think: knowledge Co-production for urban sustainability and resilience. *Forests* 8 (6), 203.
- Naess, L.O., 2013. The role of local knowledge in adaptation to climate change. *Wiley Interdiscip. Rev. Clim. Change* 4 (2), 99–106.
- Nash, C. (Ed.), 2005. *Narrative in Culture: The Uses of Storytelling in the Sciences, Philosophy and Literature*. Routledge.
- Otsuka, Michael, Voorhoeve, Alex, 2009. Why it matters that some are worse off than others: an argument against the priority view. *Philos. Public Aff.* 37, 171–199.
- Owens, S., Petts, J., Bulkeley, H., 2006. Boundary work: knowledge, policy, and the urban environment. *Environ. Plann. C: Gov. Policy* 24 (5), 633–643.
- Oyugi, M.O., K'Akumu, O.A., 2007. Land use management challenges for the city of Nairobi. *Urban Forum*. Springer, Netherlands (Vol. 18, No. 1, pp. 94–113).
- Parfit, Derek., 1997. Equality and priority. *Ratio* 10, 202–221.
- Parnell, S., 2002. *Democratising Local Government: The South African Experiment*. Juta and Company Ltd.
- Parnell, S., Pieterse, E., 2010. The 'right to the city': institutional imperatives of a developmental state. *Int. J. Urban Reg. Res.* 34 (1), 146–162.
- Pelling, M., 2010. *Adaptation to Climate Change: From Resilience to Transformation*. Routledge.
- Pelling, M., 2011. Urban governance and disaster risk reduction in the Caribbean: the experiences of Oxfam GB. *Environ. Urban.* 23 (2), 383–400.
- Pelling, M.A., Abeling, T., Garschagen, M., 2017. Emergence and transition in London's climate change adaptation pathways. *J. Extreme Events* 3, 3. <https://doi.org/10.1142/S2345737616500123>.
- Pelling, M., Leck, Hayley, Pasquini, Lorena, Ajibade, Idowu, Osuteye, Emanuel, Parnell, Susan, Lwasa, Shuaib, Johnson, Cassidy, Fraser, Arabella, Barcena, Alejandro, Boubacar, Soumana, 2018. Africa's urban adaptation transition under a 1.5° climate. *Curr. Opin. Environ. Sustain.* 31, 10–15.
- Pieterse, E., 2006. Building with ruins and dreams: some thoughts on realising integrated urban development in South Africa through crisis. *Urban Stud.* 43 (2), 285–304.
- Porio, E., 2011. Vulnerability, adaptation, and resilience to floods and climate change-related risks among marginal, riverine communities in Metro Manila. *Asian J. Soc. Sci.* 39 (4), 425–445.
- Porio, E., 2014. Climate change vulnerability and adaptation in Metro Manila. *Asian J. Soc. Sci.* 42 (1–2), 75–102.
- Porter, T.M., 1996. *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life*. Princeton University Press.
- Resilient Cities, 2018. '100 Resilient Cities Programme' [online]. Available at: Last Accessed 20 July 2018. <https://www.100resilientcities.org/>.
- Sandercocock, L., 2003. Out of the closet: the importance of stories and storytelling in planning practice. *Plan. Theory Pract.* 4 (1), 11–28.
- Shapin, Steven, 1998. Placing the view from nowhere: historical and sociological problems in the location of science. *Trans. Inst. Br. Geogr.* 23 (1), 5–12.
- Shatkin, Gavin, 2004. Planning to forget: informal settlements as 'forgotten places' in globalising Metro Manila. *Urban Stud.* 41 (12), 2469–2484.
- Shaw, R., Lu, L., Lian, F., 2017. *Science Technology Plan for Disaster Risk Reduction: Asian and Pacific Perspectives*. ICSU and IRDR, Beijing, China 60 pages.
- Sheppard, E., 1995. GIS and society: towards a research agenda. *Cartogr. Geogr. Inf. Syst.* 22 (1), 5–16.
- Shi, L., Chu, E., Anguelovski, I., Aylett, A., Debats, J., Goh, K., et al., 2016. Roadmap towards justice in urban climate adaptation research. *Nat. Clim. Change* 6 (2), 131.
- Simon, S., Randalls, S., 2016. Geography, ontological politics and the resilient future. *Dialogues Hum. Geogr.* 6 (1), 3–18.
- Solecki, W., Pelling, M., Garschagen, M., 2017. Transitions between risk management regimes in cities. *Ecol. Soc.* 22 (2), 38. <https://doi.org/10.5751/ES-09102-220238>.
- Sonnino, R., Marsden, T., Moragues-Faus, A., 2016. Relationalities and convergences in food security narratives: towards a place-based approach. *Trans. Inst. Br. Geogr.* 41, 477–489.
- Star, S.L., Griesemer, J.R., 1989. Institutional ecology, translations and boundary objects: amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907–39. *Soc. Stud. Sci.* 19 (3), 387–420.
- Steenekamp, S., 2016. Using GIS in the City of Cape Town. Presentation Available at: Last Accessed December 19th, 2018. <https://www.westerncape.gov.za/text/2014/January/stefan-steenekamp-city-of-cape-town-20131114.pdf>.
- Stirling, Andy, 2008. Opening up and "closing down" power, participation, and pluralism in the social appraisal of technology. *Sci. Technol. Human Values* 33 (2), 262–294.
- UN Habitat, 2016. *Nairobi City-wide Open Public Spaces: Inventory and Assessments*. 118pp. .
- Urban ARK, 2017. *A Special Approach to Slum Upgrading: the Special Planning Area in Mukuru, Nairobi*. Available at: Last Accessed on December 17th, 2018. <https://www.urbanark.org/special-approach-slum-upgrading-special-planning-area-mukuru-nairobi>.
- Watson, V., 2014. African urban fantasies: dreams or nightmares? *Environ. Urban.* 26 (1), 215–231.
- Welsh, M., 2014. Resilience and responsibility: governing uncertainty in a complex world. *Geogr. J.* 180 (1), 15–26.
- White, I., O'Hare, P., 2014. From rhetoric to reality: which resilience, why resilience, and whose resilience in spatial planning? *Environ. Plann. C: Gov. Policy* 32 (5), 934–995.
- Wilkinson, C., 2012. Social-ecological resilience: insights and issues for planning theory. *Plan. Theory* 11 (2), 148–169.
- Wilson, G.A., 2012. Community resilience, globalization, and transitional pathways of decision-making. *Geoforum* 43 (6), 1218–1231.
- Wynne, B., 1992. Misunderstood misunderstanding: social identities and public uptake of science. *Public Underst. Sci.* 1, 281–304.
- Ziervogel, G., Waddell, Joy, Warren, Taylor, Anna, 2016. Flooding in Cape Town's informal settlements: barriers to collaborative urban risk governance. *South Afr. Geogr. J.* 98, 1.
- Ziervogel, G., et al., 2017. Inserting rights and justice into urban resilience: a focus on everyday risk. *Environ. Urban.* 29 (1), 123–138.

Maud Borie is a post-doctoral researcher and teaching fellow at King's College London, working at the intersection between Human Geography and Science and Technology

Studies. Maud's research looks at the roles of diverse forms of knowledge and expertise for environmental and risk governance. Having conducted her PhD research on biodiversity governance, she currently works on resilience and disaster risk reduction.

Mark Pelling is professor of Geography at King's College London. His research interests are in the institutions and social relationships that shape vulnerability and adaptation to natural disasters, and in the ways in which conflicting values and practices of development inform resilience and transformation in the face of environmental change.

Gina Ziervogel is associate professor at the University of Cape Town with 15 years of experience in the field of adaptation and vulnerability to global environmental change. Through this she has focused on a number of areas including municipal adaptation strategies, institutional barriers and enablers to adaptation, flood governance, water and food security.

Keith Hyams is reader at the University of Warwick and Deputy Director of the Interdisciplinary Ethics Research Groups. Keith's research interests are united by a concern with global challenges facing humanities. His current research includes questions over equity and ethics in adaptation to climate change and international development.