Multilevel Governance for Urban Water Resilience in Bengaluru and Cape Town

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Abstract The multifunctionality of water in social–ecological processes complicates its governance, especially in cities where heterogenous populations lead different lives and hold different values. This challenge can potentially be addressed by combining bottom-up and top-down approaches through multilevel governance. Drawing on research from two large, water-stressed cities in the rapidly urbanising global South, this chapter presents concrete examples of how this has been tried to various degrees of failure and success. First, formal authorities need to recognise local initiatives and organisations as legitimate stakeholders, in order to build trust in the process and create buy-in from relevant communities. Second, it is important to understand these communities: their internal differences and power struggles, various priorities and needs, in order to design policies that will be effective and fair. Third, multilevel collaborations entails shared burdens between actors with very different abilities and resources; this requires realistic expectations and considerable facilitation in order to identify innovative and sustainable solutions to the complex set of problems at hand. By linking conventional 'managerial' and grassroots 'user' perspectives, multilevel governance holds the potential to strengthen cities' resilience against the broad range of challenges stemming from the multifunctional nature of urban water.

1 Introduction

Water is fluid and integral to all life, not just in terms of its physical properties but also figuratively. This makes it essentially multifunctional, as it is central to daily household uses, sustains complex ecosystems, shapes weather dynamics, provides

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electricity for entire nations, and so on. Management and governance that seeks to promote water resilience thus needs to anticipate and respond to a myriad of different types of fast and slow changes, across levels from the global down to the individual.

Anthropogenic influence on social-ecological systems is arguably most visible in urban areas, where land-use has changed dramatically and intensive use of finite resources such as water creates tensions between human needs and protection of ecosystem integrity (Groffman et al., 2016; McDonald et al., 2011). Urban areas' need for water and other resources means that they are intimately embedded in other higher regional, national and international levels – both directly by consuming water needed elsewhere, and indirectly by importing produce and products that have required or polluted water in their manufacturing. These cross-level dependencies become more important given the rapid changes and growing global water crisis of the twenty-first century described in chapter "The Emergence of Water Resilience: An Introduction", making it increasingly urgent to find ways to effectively address them. While cities contribute to undermining sustainability, it is also important to recognise their potential contributions. For instance, urban landscapes are becoming more homogenous globally as cities converge around similar types of heavily altered habitats and controlled environmental parameters like temperature and light. Locally, however, cities often display higher biodiversity than surrounding landscapes, since indigenous flora and fauna is mixed with exotic species in the mosaic of altered and preserved patches in the landscape (Pickett et al., 2011). Knowledge about such social-ecological diversity can be a source of resilience in the face of regional water scarcity, if a wider range of species are present to support ecological response diversity (Colding, 2007; Elmqvist et al., 2003) and help preserve urban green cover and ecosystem services when the climate changes (Enqvist & Goodness, 2019; Goodness, 2018).

Cities face growing international calls from a continuum of actors – from intergovernmental bodies to social movements – for reducing urban inequality and poverty, strengthening resilience and making cities "climate smart" (McPhearson, Iwaniec, & Bai, 2017; United Nations Framework Convention on Climate Change [UNFCCC], 2019; World Wildlife Fund [WWF], 2019). As mentioned in chapter "The Emergence of Water Resilience: An Introduction", water is central to addressing these issues. However, promoting water resilience requires taking into account the different and often competing ideas that local people have about what forms of water supply, distribution, use and recycling are necessary, sustainable and desirable from social, economic and/or environmental perspectives. In other words, if cities are to become more resilient, the multiple functions that water performs to different stakeholders need to be acknowledged in the governance arrangements set up to address pressing as well as long-term issues.

Starting with the challenges of urban water's multifunctionality, this chapter examines the potential in strengthening the linkages between bottom-up and top-down approaches through multilevel governance. Cognisant of the range of alternative prefixes to governance in resilience literature that praises the potential of bottom-up approaches (i.e., polycentric, decentralised, cross-scale, adaptive, see chapter "The Emergence of Water Resilience: An Introduction"), we use 'multilevel

governance' because our investigation is primarily focused on and limited to coordination across levels from the city to local. Rather than discussing different theoretical frameworks, our aim is to demonstrate and compare practical examples of how bottom-up alternatives can be relevant for improving governance of multifunctional urban water. This is particularly relevant in rapidly changing cities with populations that are highly diverse in terms of income, ethnicity, language and culture, for example. There is also a specific need for lessons and insights from cities in parts of the world where most urbanisation is expected in coming decades: sub-Saharan Africa and South Asia (Fragkias, Güneralp, Seto, & Goodness, 2013). From a theoretical perspective, there is a need to "generate new concepts and revise old theories" particularly in cities that have not traditionally been well resourced and/or where histories of colonisation have actively undermined contributions to theoretical developments (Bhan, 2019; Parnell & Robinson, 2017). The growing urban areas in the global South have their own characteristics, not always consistent but often including high levels of informality, and should be feeding their own lessons into theoretical understandings (McPhearson et al., 2016; Nagendra, 2018). Correcting these wrongs is a need that goes far beyond the scope of this chapter, but we hope to contribute to wider perspectives on southern urbanism.

To contribute to this, this chapter focuses on the governance of urban water, a natural resource that is particularly important to both the well-being of urban residents, city functioning and economic growth. We draw on insights from our own research in Bengaluru (formerly known as Bangalore), India, and Cape Town, South Africa; both cities that have attracted international media attention to the growing threat of urban water scarcity (BBC News, 2018; Bhasthi, 2017; Onishi & Sengupta, 2018) which according to hydrological models is a growing concern especially for cities in Asia and Africa (McDonald et al., 2011). As we describe in the following, Bengaluru and Cape Town are growing rapidly, largely due to immigration from the regions around them, and have considerable economic inequality as well as demographic diversity based on culture, ethnicity and race. This will serve as a basis for examining the potential of, obstacles to and limitations of bottom-up approaches, and at the end of the chapter, recommendations for how these can be more effectively linked.

2 Multifunctionality in Two Water-Stressed Cities

Bengaluru and Cape Town are both among the most populous and economically important metropoles in their respective countries. They share a British colonial past, and are relatively cosmopolitan and linked to global trade; Cape Town especially through tourism and agricultural exports, Bengaluru through its numerous call centres and IT companies supporting overseas businesses (Sudhira, Ramachandra, & Subrahmanya, 2007; Wilkinson, 2000). As growing economies, they attract significant numbers of immigrants from nearby rural areas as well as further away in southern Africa and south Asia, respectively.

Bengaluru, the 'Silicon Valley of India', is located inland in the semi-arid south which has historically depended on small dams storing monsoon rainwater to support agriculture. Since the 1970s, the city's main water supply has been pumped uphill from the Cauvery river located 100 km south; meanwhile the dams that were previously maintained by farming communities have mostly fallen into disrepair, polluted or encroached by the expanding city (Enqvist, Tengö, & Boonstra, 2016; Nagendra, 2016). This expansion has been particularly rapid in recent years, increasing the population from 8.5 million in the 2011 census to over 12 million in 2017 (Sudhira et al., 2007; United Nations [UN], 2014; World Population Review, 2019). Despite costly infrastructure augmentations to keep up with growing water demand, many households are left with intermittent municipal supply, especially during the hot summer months. Millions of residents depend on private boreholes for access to groundwater, which means that the city's neglected dams still play a role in watering its people – giving an advantage to those who have resources to pay for their own borehole, or at least buy water from the informal traders that fill tanker trucks illegally from remaining lakes and unmonitored boreholes (Lele et al., 2013; Sudhira & Nagendra, 2013). Depending on who you ask in what part of town, water bodies in Bengaluru can be seen as stinking cesspools, pristine habitats for birds and amphibians, sources of livelihood through fishing or clothes washing operations, pleasant scenery to enjoy while having a picnic, obstacles to profitable housing development, rainwater harvesting units for groundwater recharge, sources of devastating floods, or suitable for immersion of religious idols and offerings after Hindu ceremonies.

Cape Town, the 'Mother City' of South Africa, sits below the iconic Table Mountain where natural springs attracted Dutch settlers in the seventeenth century. This initiated centuries of varying levels of conflict over land and water, as the often violent expansion of European peoples gradually pushed different African groups either to subjugation or extinction (Brown & Magoba, 2009; Enqvist & Ziervogel, 2019). Today, the metropolitan area is home to around 4 million people and water is supplied from six dams in surrounding mountains; however, municipal service providers still struggle to erase the inequality left from the legacy of colonial and *apartheid* discrimination (Beck, Rodina, Luker, & Harris, 2016; Enqvist & Ziervogel, 2019). During 2017, rains far below the average sent Cape Town into the third year of a record-breaking drought (Wolski, 2018). Only through disaster declarations and massive efforts from municipal authorities, businesses and residents to reduce daily consumption to below 50 litres per person was the threat of 'Day Zero' avoided – this was to be the day when household water would be disconnected and residents would have to queue at public taps for 25 litre rations (Department of Water and Sanitation [DWS], 2018; Ziervogel, 2019b). The experience was in many ways a city-wide trauma; however, hundreds of thousands of Capetonians living in informal settlements already queue at taps for their water, and inferior infrastructure leave many areas historically designated for non-whites particularly vulnerable to seasonal flooding, sewerage blockages, and leaking pipes (Enqvist & Ziervogel, 2019). Water in Cape Town can signify anything from the memory of a looming disaster, to something requiring a daily inconvenience to acquire, to independence

from an incompetent government through a private borehole, to a force that can physically destroy one's home, to a key variable in the Cape's unique endemic *fynbos* ecosystem, to a tool that the state uses to still control the lives of its most vulnerable citizens.

Both Bengaluru and Cape Town are shaped by distinct political geographies, not least in terms of safety from water. In the low-lying Cape Flats, seasonal flooding regularly impacts low-income households more often due to inadequate drainage and lower-quality houses. In Bengaluru, the least affluent often find space for shacks on dried-up lake beds, only to be exposed to flash floods during monsoon rains that previously drained through the network of lakes. The two cities also have somewhat similar future prospects in that they are both reaching limits to how much water their governments can provide: Bengaluru is pushing past its allocated share of Cauvery water, sparking tension with neighbouring states (Enqvist et al., 2016; Lele et al., 2013); meanwhile although Cape Town has no more feasible sites for additional dams, the city is exploring groundwater and desalination options, and its local government's attempts to collaborate with its national-level counterpart are sometimes impeded by party politics or limited capacity within the national-level water authorities (Enqvist & Ziervogel, 2019; Ziervogel, 2019b). However, there are also some positive signs. In Bengaluru, growing engagement from residents forming local trusts to protect lakes has led to formal partnerships with municipal counterparts, sharing management responsibilities for some water bodies (Luna, 2014; Nagendra & Ostrom, 2014). These 'lake groups' often emphasise a broader range of functions that need to be promoted, from groundwater recharge to healthy ecosystems to local livelihoods; furthermore, they have also shown a capacity to collaborate with each other to promote inter-lake connectivity across the fragmented landscape (Enqvist, Tengö, & Bodin, 2020; Murphy, Enqvist, & Tengö, 2019). In Cape Town where the immediate crisis is over, municipal authorities are scrambling to reinvent water governance and increase water resilience by promoting a 'whole-of-society' approach that seeks to build collaborations and trust between city government and the public (City of Cape Town, 2019b; see also Enqvist & Ziervogel, 2019). Given the historical legacy of poor service delivery and neglect of low-income areas, the city has tremendous hurdles to overcome. Fortunately, civil society is also active and organisations that have advocated for improved water services for years, such as the Western Cape Water Caucus, are mobilising to contribute to a process that will hopefully be more than just words.

For both cities, these changes represent critical challenges and a shift away from top-down versions of water governance where central public agencies and large-scale infrastructure technologies are the norm. The cases illustrate that water cannot be treated as one single thing, but that it in fact has multiple functions in across the different parts of the urban landscape. In the following, we will demonstrate the varied and sometimes conflicting uses and values associated with multifunctional water resources and waterbodies. This also means that one water crisis can carry different implications for different people, and finding long-term solutions to them depends on finding a way to work with that inherent complexity. This is critical for guaranteeing that water governance is both effective, i.e. serves intended functions,

and fair, i.e. caters to all stakeholders' needs including those of future generations. A central question that guides our investigation is this: Given the difficulty of grasping the full, multifaceted nature of water, what opportunities are there for sustainable urban water governance?

This question will be examined from the perspective of multilevel governance, engaging with government responses, at the city level, through non-governmental and civil society organisations, to local residents at the neighbourhood level. Within this space there are both bottom-up and top-down responses to environmental risk as well as efforts to co-produce and co-create responses across different levels. We seek to understand the multiple opportunities and barriers to exerting influence over the course of events, and to examine the relationship between different 'local' interpretations of resilience and what the concept might mean for a city as a whole. In some of the examples we describe, actors are able to change trajectories and draw on their resources and connections to do so. In other instances, despite what looks like favourable conditions, trajectories are hard to change and an undesirable situation prevails.

3 How Multilevel Governance Can Help

3.1 The Curse of Top-Down Versus Bottom-Up

Water governance refers to the political, social, economic, and administrative systems that control formal and informal decision-making regarding development and management of water resources (Batchelor, 2009; Woodhouse & Muller, 2017). It often rests on normative and sometimes controversial ideas of what is a desirable outcome, where for instance goals like transparency and human rights can stand in conflict with demand for cost recovery and liberalized markets (Batchelor, 2009; Harris, McKenzie, Rodina, Shah, & Wilson, 2016). What is often referred to as 'conventional' water governance includes interventions steered from the top down, focusing on water supply. For some time, many international bodies and national agencies have increasingly advocated for bottom-up alternatives that involve local people and groups, more on the demand side of water use (Batchelor, 2009; Smith, 2008). Top-down approaches relying on a central decision-makers have been criticised for neglecting other actors which inhibits the ability to see weaknesses in the intervention; in cases where no such central entity exists, a top-down model is arguably ineffective (Sabatier, 1986). Top-down failures have also been identified in developing countries, that have often experienced failures when states have been unable to cater for all citizens' water needs, like during public budget cuts to meet international lenders' demands. Paired with high hopes around local community capacities, this fed into an increasingly optimistic discourse around bottom-up alternatives and devolution of water management responsibilities (Smith, 2008).

However, there is also reason for caution. Bottom-up water management initiatives have been criticized for failing to create meaningful, actual participation (tokenism); for assuming that communities are easily identifiable, homogenous and have shared goals; for overestimating local capacity; and for lacking the skill and capacity to facilitate effective participation (Smith, 2008; Ziervogel et al., 2019). Following these criticisms, Smith (2008) presents four recommendations to ensure that bottom-up approaches lead to more effective and sustainable water management strategies:

1. Genuine commitment: avoid tokenism, seek meaningful collaboration and inclusion.
2. Understand communities: be clear about diversity, complexity and dynamics.
3. Realistic expectations: communities have constraints and cannot do everything.
4. Adequate facilitation: participation requires professional and tailored design.

Below, we use these recommendations to structure insights about partnerships that *combine* top-down and bottom-up management, as opposed to choosing one over the other (Sabatier, 1986; Smith, 2008). Different versions of such partnerships are described elsewhere in this volume (Chaps. "The Sustainable Groundwater Management Act (SGMA)—California's Prescription for Common Challenges of Groundwater Governance", "Reconfiguring Water Governance for Resilient Social-Ecological Systems in South America", and "Adaptive Governance in North American Water Systems: A Legal Perspective on Resilience and Reconciliation"); however, we argue that they can be particularly useful to promote multilevel governance that addresses the multifunctional nature of urban water, since multiple actors working jointly are likely to identify a broader range of issues as well as solutions related to water governance. Furthermore, we respond to a critical need to provide lessons about how such partnerships might work in global South cities, where residents often rely on informal as well as formal actors, infrastructure and politics for the provision of basic services like water management (Kooy, 2014; Kudva, 2009; Millington, 2018). The paper draws primarily on our own research in Bengaluru and Cape Town, which has used a range of often mixed methods often with particular emphasis on in-depth qualitative understanding of the problems at hand (Enqvist et al., n.d., 2020, 2016; Enqvist & Goodness, 2019; Enqvist & van Oyen, n.d.; Enqvist & Ziervogel, 2019; Matikinca et al., 2020; Murphy et al., n.d., 2019; Ziervogel, 2019a, 2019b; Ziervogel et al., 2019).

3.1.1 Genuine Commitment

Recognizing non-conventional actors such as local residents and NGOs as important contributors to partnerships can help to create buy-in across levels. By demonstrating that participatory governance arrangements also translate to real devolution of decision-making powers, the process can gain legitimacy and more support on the ground. Our research on lake groups in Bengaluru (Enqvist et al., 2020, 2016)

has revealed a marked difference in attitudes from municipal officials once the first partnership was formalised in 2010:

> I don't think [the municipality] was so approachable before. It was very risky. We couldn't talk to the [local political representative]. I think a lot of gutsy people have stepped in. […] Before, filing [a request for public records] was considered risky – people would be targeted. (Member of lake group formed in 2011)

> In India, […] very often [the] bureaucracy of a civil service and the [local groups] are at conflict. […] But at least [on] this [lake] issue, […] there is no conflict. Whatever they want, we also want the same thing. (Chief Conservator at Greater Bangalore Municipal Corporation)

Once it became clear that officials were more open to civic engagement, the number of lake groups started growing 2–3 times faster than before 2010. Importantly, the groups' strategies also shifted and became less confrontational: while more than half of the pre-2010 groups had resorted to legal action against authorities, none of the newer ones initiated such combative measures (Enqvist et al., 2020).

Reaching this point can be challenging and requires trust in the process as well as both sides showing good faith. In Bengaluru, this often ended up being a function of interpersonal relationships between individuals seeking to reimagine lake management models. Some government branches were still seen as uncooperative which holds back improvement for certain lakes and issues such as groundwater management.

Like many South African cities, Cape Town struggles with a legacy of systematic top-down discrimination of many communities, including but not limited to provision of water services (Enqvist & Ziervogel, 2019). While formally everyone now has the same rights, many still struggle to even know who to contact when faced with a problem – especially in previously underserved neighbourhoods. These problems have contributed to a lack of trust between public agencies and the people they are meant to serve, as some assume that no help will ever come:

> A water [management] device was installed [in my house] about a year ago. Recently I received a water bill totalling more than R16,000. Accepting the device came with an assurance that my water arrears would be scrapped. A week ago my water was cut, [the City] demanding an immediate payment of about R10,000 before reconnection. I tried unsuccessfully to engage with council, saying I don't have that kind of money. They promised to look into matter. Until today, still nothing. (Story 81 of 311 shared to Western Cape Water Caucus interviewer (Enqvist et al., n.d.)

This eroding trust is problematic and undermines multilevel governance. Without the groundwork of establishing functioning collaborations before the recent water crisis, it was hard to quickly mobilise support for the city's response during the drought (Ziervogel, 2019b).

Such crises can add further stress to sensitive processes and relationships between government representatives and civic organisations. For instance, when one of the authors joined fellow community representatives to observe the City's trial run of a water distribution centre at a local sports field, organisers were hesitant to allow the

group's presence fearing that information would be disseminated with the intent to discredit the City's work. The possibility of working together to design the water distribution had to be advocated strongly by the local residents. However, there has also been examples of the crisis helping to dissolve other hurdles that initially caused problems. As expressed by one member of staff at the City's Water Demand Management department, collaboration within the municipality improved in some ways:

> It was a fantastic time to work here, as we got cooperation from all departments and were able to get things done that we weren't able to do before. (quoted in Ziervogel, 2019b, p. 14)

This suggests that otherwise rigid institutions can sometimes be pushed to change by external shocks. This was also demonstrated in the City of Cape Town's engagement with the business sector, which during the beginning of the water crisis was frustrated by the lack of information about what was happening. As the drought progressed, significant progress was made in building relationships, networks and sharing of information between businesses and the City government. These networks, that would not have developed independently in the same way, now have the potential to be used in other ways. In Bengaluru, the coincidence of a looming water supply crisis for water sources outside the city, and redrawing of metropolitan boundaries to include several unspoilt water bodies, similarly created a window of opportunity to take control by reforming water governance institutions to better coordinate between regional to neighbourhood levels (Enqvist et al., 2016).

3.1.2 Understand Communities

Bottom-up engagement has a critical role to play in valuing the everyday realities of urban life and enabling multilevel water governance to function in a context of urban heterogeneity and conflicting interests, especially within communities themselves (Ziervogel, 2019a). An ongoing study using Q-methodology (Enqvist & van Oyen, n.d.) shows that fairness in Cape Town's water tariffs means different things depending on what residents you ask. Some considered it most fair that everyone pays for all the water they use, at the same rate; others interpreted fairness as meaning that high-volume users pay a higher per-litre rate to subsidise free water for the poorest; yet another group expressed that fairness should entail public participation in tariff setting and water conservation policies. In Bengaluru, people's motivation to participate in lake restorations stems from a range of meanings that places evoke, such as childhood memories, cultural pride, awe of ecological processes, or influenced by their own stewardship involvement (Murphy et al., 2019). This is critical for helping to push for lake designs and access that cater to different lake uses, which includes fishing, clothes washing, birdwatching as well as depending on it to recharge local boreholes (Murphy et al., n.d.; Unnikrishnan & Nagendra, 2014). Paying attention to temporal changes in people's relation to water bodies reveals considerable differences, as shown in two respondents' description of the same lake:

> I used to farm when the lake was big and had gardens. I used to feel happy. Wherever I went, I'd be like 'No, I have to go back to the lake!' But now I don't have interest, I don't even want to see it. Now it's small, it's dirty. (Villager born by the lake 55 years earlier)

> When I came the lake was dry. I was a part of the revival team from a dump yard to a lake overflowing. This whole year I saw the water level rising from the bed. So now I love coming here, working here, helping out in whatever way possible. (Lake group member living near the lake for 3 years)

Shedding light on the breadth of different lived experiences that exist in a city is particularly important during and immediately after crises such as Cape Town's recent drought. In its wake, municipal authorities have developed a new Water Strategy as well as Resilience Strategy (City of Cape Town, 2019a, 2019b), to take a 'whole-of-society' approach to help adapt to and address challenges such as climate change, rapid urban growth and persistent poverty. While many water-related challenges in low-income areas are well-known (leaking pipes, blocked and overflowing sewers, faulty meters, seasonal flooding, etc.), gaining access to a deeper understanding of people's lived realities in such communities can be difficult in a city still defined by significant spatial segregation. When services fail, many resort to temporary fixes that risk further entrenching their disassociation from the City:

> The plumber was trying to by-pass the [water] meter box but he couldn't do it properly so it started leaking. But the household couldn't go to [the] City as it was illegal, so they don't know where to go to get it fixed now. (Water Caucus member describing a neighbour's situation, Personal communication, 2019-08-29)

To try and address these sorts of problems, we collaborated with a community-based organisation called the Western Cape Water Caucus in a transdisciplinary research project that has collected stories from 311 residents in six different townships and informal settlements of Cape Town (Enqvist et al., n.d.). Using a tool called SenseMaker™ (Lynam & Fletcher, 2015), we developed the interview questions together with the organisation and trained members who live in the study areas to collect the stories using smartphone apps. This approach makes it possible to access people's lived experiences, and includes a way for respondents to signify the meaning of their story – as opposed to the interviewer or researcher interpreting it. Importantly, research officers from the municipal Water and Sanitation Department have participated in this process as observers, hoping to learn about ways to gather knowledge about citizens' lived reality beyond what is captured through their existing customer satisfaction surveys.

3.1.3 Shared Burdens

This section reflects on Smith's third and fourth points (Realistic expectations and Adequate facilitation), which are both part of the challenge of how to share burdens and responsibilities in multilevel partnerships. The local level can typically not be expected to have adequate resources for all tasks, nor is that level ideal for addressing all problems. Furthermore, complementing bottom-up activities with top-down

ones introduces new needs for active facilitation and coordination. There are growing calls for ways to measure and assess what effect bottom-up approaches might have on governance. In Bengaluru, we have tested lake groups' ability to improve 'fit' between management institutions and the hydrological connectivity between lakes, finding that while groups have a positive impact they still rely to some extent on forging partnerships with actors at higher, municipal levels (Enqvist et al., 2020).

Bottom-up initiatives may have limited abilities to implement extensive institutional change but can play a key role in early envisioning processes and model examples of success through pilot projects. This is especially true for identifying more socially desirable and sustainable development pathways. In Bengaluru, where water governance has been locked in an unsustainable trajectory of increased reliance on a single source outside the city, bottom-up lake restorations have contributed a concrete articulation of an alternative vision of water use, that acknowledges the reality of widespread dependence on the city's groundwater and therefore also its lakes (Enqvist et al., 2016). Active scenario-based planning has been used to bring together government officials, civic groups and others in thinking about the city's future water security (The Indian Institute for Human Settlements [IIHS], 2018). In Cape Town, during the City's pilot testing of a public 'point of distribution' in preparation for Day Zero in 2018, a local civic association presented their own work to help map vulnerable residents such as elders or single parents – as well as a plan for how to provide street-level assistance to those that would not be able to access water at such points. Further, the SenseMaker project (described above) attempts to systematically record people's lived experiences in order to develop knowledge both about 'what is' and 'what should be', as well as 'how to make it happen'.

Some of the limitations of community-based groups can be compensated for by shifting to a different level: forming umbrella organisations, to coordinate efforts and engage as equals with higher-level actors. By acting as bridging organisations and knowledge holders, such entities can help translate setbacks and failures from local-level experiments into learning opportunities for the broader communities. In Bengaluru, an international NGO lent critical support through funding and expertise when the first lake group negotiated its partnership with municipal authorities (Luna, 2014). Subsequently, the Save Bangalore Lakes Trust has emerged as an umbrella initiative by lake groups to host workshops where groups can learn from each other, and coordinate advocacy with public officials for policy change at the city level, beyond individual lakes (Enqvist et al., 2016). This can also favour inclusivity, by fostering relationships between municipal government and neighbourhood-level intermediaries who live in the areas affected by an issue and understand the local context well (Ziervogel, 2019a). In Cape Town, the Water Caucus is itself an effort by members from different low-income communities to act jointly to learn about and address water issues at city and state level; it is also linked to chapters in other provinces as well as the national South African Water Caucus (Environmental Monitoring Group, n.d.).

Multilevel governance shifts the roles and responsibilities of city governments that partner with grassroots organisations. This can be a difficult process. Ten years

ago in Cape Town, an experiment around trying to co-produce potential solutions to reduce flood risk between city officials and residents in a low-income area effectively failed (Ziervogel, Waddell, Smit, & Taylor, 2016). Expert facilitators helped to conceptualise the process, recognising that power dynamics were likely to be tricky, but City actors were worried about how they would maintain control and were concerned about safety issues. As a result, instead of a full co-production process a shorter, limited process of engagement was undertaken.

In both our case studies, it has been critical for bottom-up groups to access information on who is responsible for water and what is being done within the respective bureaucracies. Bengalurean lake groups often made use of the Right To Information Act to find out what department to hold responsible for deteriorating lake conditions (Enqvist et al., 2016); in Cape Town, municipal authorities went through a steep learning curve and eventually made data about dam levels, water use and supply augmentation plans available (Ziervogel, 2019b). Sharing information about the increasing likelihood of Day Zero turned out to be a more effective demand management tool than increasing water tariffs, but inconsistencies in and politicised messages undermined trust and collaboration with many community organisations (Matikinca et al., 2020; Ziervogel, 2019b).

3.2 Summary: Multilevel Partnerships in the Global South

As argued in Cape Town's recent Water Strategy (City of Cape Town, 2019b), addressing urban water needs is likely to be a whole-of-society endeavour – especially in sub-Saharan Africa and south Asia where urbanisation and climate change are likely to have more severe impacts than elsewhere (Fragkias et al., 2013; McDonald et al., 2011). The insights presented above are therefore particularly valuable because they help build knowledge about how multilevel governance can work in two cities located in these regions. While they do not represent all of the urban South, the cases provide several empirical examples to further nuance how Smith's four recommendations can be interpreted and applied in the real world – especially facing complex challenges like water governance. Genuine commitment to partnerships with bottom-up initiatives is particularly important to demonstrate in contexts where participatory approaches have previously been unreliable or non-existent (as is the case in both our examples). Understanding communities is a greater challenge when these communities are changing rapidly due to urbanisation and growing partially in unplanned settlements, where informal authority figures and powerholders emerge with great influence over people's daily lives. It is worth repeating that 'communities' are also highly heterogeneous and one group of local residents do not speak for all. Our Cape Town case demonstrates examples of different informal settlement residents working jointly to communicate grievances to the municipality; in Bengaluru on the other hand, some lake groups view informal settlements as a threat to their view of a fully protected and restored lake. The tension between realistic expectations of communities and adequate facilitation of

collaborations requires special attention in societies defined by a greater distance between rich and poor, between well- and poorly educated, and where the fundamental task of water governance involves greater challenges than those where urban development is easier to manage.

4 Discussion: What Are the Implications?

In light of an emerging new water paradigm around water resilience, our chapter draws attention to water's multiple and fluid roles especially in urban settings. As illustrated in Sect. 2. in the cases of Bengaluru and Cape Town, water plays different roles in people's lives and few people see the full range of uses it can have. Consequently, water resilience also has a multitude of definitions depending on place, level of analysis, and subjective values. This has important implications for finding pathways forward, not least in light of calls for more interventionist approaches to sustainability expressed through ideas like 'urban tinkering' (Elmqvist et al., 2018) and 'ecology *for* cities' where "urban ecologists, designers, planners, engineers, residents and other are actively pursuing more sustainable futures" (Childers et al., 2015, p. 3778–9).

Resilience thinking is integral to navigating change in such interventions, in two major ways: in order to strengthen resilience of systems that are in a desirable condition, and, importantly, to weaken resilience of systems that one wishes to change towards a more favourable situation (Walker & Salt, 2006). For example, the formal water supply system in Bengaluru is undesirable from the perspective of those whom it does not provide reliable services or who wish to preserve traditional water sources – but its reliance on a single source and single technology also undermines its resilience to fluctuating rainfall and growing water demand. The innovations explored by lake groups in Bengaluru, based on multiple different understanding of water, has the potential to spread up from the neighbourhood level to help adjust the broader, city-level development trajectory (Enqvist et al., 2016). Similarly, the drought in Cape Town prompted thinking and action around securing more diverse sources of water as well as a recognition of the need for more adaptive, collaborative approaches to managing water. The city government managed to adapt in some ways, exhibiting more system resilience than before the crisis. Still, it was constrained in other ways, often because of rigidity stemming from national-level stalling and confusion of mandates which undermined potential governance innovations to deal with the crisis.

The examples presented in this chapter illustrate how working with water's multifunctionality serves resilience better than conventional attempts to control and focus on a single function at a time. Similar thoughts have been expressed in writings about cities as following 'composite trajectories', made up of multiple development pathways running in parallel (Parnell & Robinson, 2017). Cape Town both seeks a fair way to provide water services for all residents, and simultaneously implement tariffs to fund this. Bengaluru's breakneck population growth encroaches

on its lakes, but growing needs for water supply and disposal also requires that lakes ecosystems are protected. These pathways all shape how the cities develop, and therefore all need to be considered to effectively navigate pressing problems. Multilevel governance that brings in complementary bottom-up perspectives promotes participation and learning, and therefore stands a better chance of finding sustainable management approaches (Ziervogel, 2019a). Focusing on 'approaches' rather than 'solutions' or 'outcomes' is particularly important in times of change, whether driven by climate change, urbanisation or other factors. A better understanding of the complexity and heterogeneity of a system also makes it easier to question the status quo and explore different ways to adapt and transform. Building such understanding requires partnerships, which cannot be formed by just one type of stakeholder. A full roadmap of all those that could play a part in this remains outside the scope of our chapter; instead, we have focused on demonstrating how partnerships require genuine commitment, good understanding of communities, and clear and realistic expectations on the responsibilities of the parties involved. Critically, for this to help strengthen multilevel governance there is a need for accountability mechanisms, a topic beyond the scope of this chapter. Below, however, we outline some starting points and further research needs regarding the role of three key actors: city governments, residents, and researchers.

City governments need to take residents and community organisations seriously and make good on ambitions to promote collaborative approaches in water governance (e.g. Cape Town's Water Strategy). This includes municipal, provincial and national branches of government operating at city level. They are important gatekeepers for gaining access to information and resources through formalised collaborations (e.g. Bengaluru's lake partnerships), but they also need to acknowledge the challenges associated with participatory approaches, and the importance of facilitation in enabling this. This typically requires an understanding of the needs and vulnerabilities as well as capacity and knowledge held by local residents. We see a need for research about how to facilitate multilevel partnerships, especially in low-trust environments where both authorities and communities have limited resources, and in cases where more powerful vested interests in the private sector might already have established communication and collaboration with city officials. From a resilience perspective, the benefits and constraints brought by more or less urgent water crises can be useful entry points for such studies.

Residents need to draw on their strengths, which include a better presence to monitor on-the-ground problems and solutions, and a power in numbers (if a cause rallies enough enthusiasm). Since they are typically the direct beneficiaries of water resources – or the victims of water-related disasters – residents have a different perspective and sometimes more immediate experience than those who merely manage urban water. In the right partnerships, this can be a critical asset for setting up management arrangements that align well with local social and ecological processes. Residents-based organisations often need to balance work to push authorities to do their job with seeking self-empowerment to take over some responsibilities from those authorities. While the latter can give greater influence over outcomes, it requires more effort and might therefore not be a tenable option for all groups,

especially not in the long term. Here, inspirational 'success stories' and information about best practices can make a bit difference, showing the importance of umbrella organisations or NGOs at a higher level. Documenting such practices, as well as developing tools to assess the impact of bottom-up approaches – without idealising communities as a panacea for all management problems – remains an important study area particularly in the urban South.

Researchers increasingly need to play a part in multilevel governance, beyond their traditional role as knowledge producers. In addition to helping to fill the research gaps described above, their 'third party' position can also allow them to broker and even facilitate collaborations between governments and residents that might struggle to establish working relationships on their own (Hamann & April, 2013). Scholarly expertise on the hydrology of, engineering around and ecology intertwined with water can be an important resource to complement local knowledge, in particular if there is a need to translate information gathered through bottom-up initiatives into reports and briefs that decision-makers will pay attention to. If there is room for prolonged engagement, this can also involve activities to empower citizens to carry out studies and engage in participatory processes to promote their goals. Importantly, researchers should acknowledge that this pushes the boundaries of conventional academic work and need to be wary of their own positionality and subjectivity, and the power relations they are part of and engage with.

5 Conclusion

To conclude, we argue that governance for urban water resilience requires an understanding of how actors at the city level versus neighbourhood level respond to water-related problems based on their preferences, and how trade-offs, negotiations and conflicts play out when preferences are misaligned. Understanding such multilevel dynamics involves both recognising the current state of affairs, discerning future desirable outcomes, and the transformational knowledge and capacity of how to realise that outcome.

Knowledge about water challenges and how to enable responses to them cannot effectively be held by a single actor or even organisation, given the conditions that define a growing number of cities globally. As we have shown, multilevel governance that draws on the respective strengths of bottom-up and top-down approaches holds important potential for working with water's multifunctionality. It is not a panacea, but by building on pre-existing formal and informal governance institutions it can prove to be a more realistic option in cities where there are not enough resources, capacity or time develop entirely new ones. This approach to multilevel governance may also prove to be more adaptable and in tune with urban dwellers' water needs in current times of rapid change and increasing climate-related uncertainty.

References

Batchelor, C. (2009). *Water governance literature assessment* [PDF file]. Retrieved from https://pubs.iied.org/pdfs/G02523.pdf

BBC News. (2018, February 11). The 11 cities most likely to run out of drinking water—Like Cape Town. *BBC News*. Retrieved from https://www.bbc.com/news/world-42982959

Beck, T. L., Rodina, E., Luker, L., & Harris, L. (2016). *Institutional and policy mapping of the water sector in South Africa*. Retrieved from Program on Water Governance: https://doi.org/10.13140/RG.2.2.32761.88164

Bhan, G. (2019). Notes on a Southern urban practice. *Environment and Urbanization, 31*(2), 639–654. https://doi.org/10.1177/0956247818815792

Bhasthi, D. (2017, March 1). City of burning lakes: Experts fear Bangalore will be uninhabitable by 2025. *The Guardian*. Retrieved from https://www.theguardian.com/cities/2017/mar/01/burning-lakes-experts-fear-bangalore-uninhabitable-2025

Brown, C., & Magoba, R. (2009). *Rivers and wetlands of Cape Town: Caring for our rich aquatic heritage*. Cape Town, South Africa: Water Research Commission.

Childers, D. L., Cadenasso, M. L., Grove, J. M., Marshall, V., McGrath, B., & Pickett, S. T. A. (2015). An ecology for cities: A transformational nexus of design and ecology to advance climate change resilience and urban sustainability. *Sustainability, 7*, 3774–3791. https://doi.org/10.3390/su7043774

City of Cape Town. (2019a). *(Draft) Cape Town resilience strategy* (March) [PDF file]. Retrieved from https://www.westerncape.gov.za/110green/files/atoms/files/Draft%20Resilience%20Strategy_English.pdf

City of Cape Town. (2019b). *Cape town water strategy* (January). Retrieved from https://citymaps.capetown.gov.za/waterviewer/

Colding, J. (2007). 'Ecological land-use complementation' for building resilience in urban ecosystems. *Landscape and Urban Planning, 81*(1–2), 4–55. https://doi.org/10.1016/j.landurbplan.2006.10.016

Department of Water and Sanitation (DWS). (2018). *Water outlook 2018 report, Revision 25* [PDF file]. Retrieved from http://resource.capetown.gov.za/documentcentre/Documents/City research reports and review/Water Outlook 2018-Summary.pdf

Elmqvist, T., Folke, C., Nyström, M., Peterson, G., Bengtsson, J., & Walker, B. (2003). Response diversity, ecosystem change, and resilience. *Frontiers in Ecology and the Environment, 1*(9), 488–494. https://doi.org/10.1890/1540-9295(2003)001[0488:RDECAR]2.0.CO

Elmqvist, T., Siri, J., Andersson, E., Anderson, P., Bai, X., Das, P. K., … Vogel, C. (2018). Urban tinkering. *Sustainability Science, 13*(6), 1549–1564. https://doi.org/10.1007/s11625-018-0611-0

Enqvist, J. P., Ziervogel, G., Metelerkamp, L., van Breda, J. (n.d.). Community perspectives on water-related issues in townships and informal settlements. *International Journal for Water Resources Development.* Manuscript in review.

Enqvist, J. P., & Goodness, J. (2019). Water awareness before and after Cape Town's three-year drought. *World Water Week.* Conference presentation. Stockholm, Sweden: Stockholm International Water Institute.

Enqvist, J. P., & van Oyen, W. (n.d.). *Splitting the tab? Perceptions of fairness in water tariffs in Cape Town, South Africa*. Manuscript in preparation.

Enqvist, J. P., Tengö, M., & Bodin, Ö. (2020). Are bottom-up approaches good for promoting social–ecological fit in urban landscapes? *Ambio, 49*, 49–61. https://doi.org/10.1007/s13280-019-01163-4

Enqvist, J. P., Tengö, M., & Boonstra, W. J. (2016). Against the current: Rewiring rigidity trap dynamics in urban water governance through civic engagement. *Sustainability Science, 11*(6), 919–933. https://doi.org/10.1007/s11625-016-0377-1

Enqvist, J. P., & Ziervogel, G. (2019). Water governance and justice in Cape Town: An overview. *Wiley Interdisciplinary Reviews: Water, 6*(4), 1–15. https://doi.org/10.1002/wat2.1354

Environmental Monitoring Group. (n.d.). *SA Water Caucus*. Retrieved from https://www.emg.org.za/new-page-16

Fragkias, M., Güneralp, B., Seto, K. C., & Goodness, J. (2013). A synthesis of global urbanization projections. In T. Elmqvist, M. Fragkias, J. Goodness, B. Güneralp, P. J. Marcotullio, R. I. McDonald, et al. (Eds.), *Urbanization, biodiversity and ecosystem services: Challenges and opportunities* (pp. 409–438). Dordrecht, The Netherlands: Springer.

Goodness, J. (2018). Urban landscaping choices and people's selection of plant traits in Cape Town, South Africa. *Environmental Science and Policy, 85*, 182–192. https://doi.org/10.1016/j.envsci.2018.02.010

Groffman, P. M., Cadenasso, M. L., Cavender-Bares, J., Childers, D. L., Grimm, N. B., Grove, J. M., … Ruddell, B. L. (2016). Moving towards a new urban systems science. *Ecosystems, 20*(1), 1–6. https://doi.org/10.1007/s10021-016-0053-4

Hamann, R., & April, K. (2013). On the role and capabilities of collaborative intermediary organisations in urban sustainability transitions. *Journal of Cleaner Production, 50*, 12–21. https://doi.org/10.1016/j.jclepro.2012.11.017

Harris, L. M., McKenzie, S., Rodina, L., Shah, S. H., & Wilson, N. J. (2016). Water justice: Key concepts, debates and research agendas. In R. Hollifield, J. Chakraborty, & G. Walker (Eds.), *Handbook of environmental justice*. New York, NY: University of British Columbia.

Kooy, M. (2014). Developing informality: The production of Jakarta's urban waterscape. *Water Alternatives, 7*(1), 35–53. Retrieved from http://www.water-alternatives.org/index.php/allabs/232-a7-1-3/file

Kudva, N. (2009). The everyday and the episodic: The spatial and political impacts of urban informality. *Environment and Planning A, 41*(2), 1614–1629. https://doi.org/10.1068/a41101

Lele, S., Srinivasan, V., Jamwal, P., Thomas, B. K., Eswar, M., & Zuhail, T. M. (2013). *Water management in Arkavathy Basin: A situation analysis* (Environment and development discussion paper no. 1). Retrieved from Ashoka Trust for Research in ecology and the environment in JSTOR website: https://www.jstor.org/stable/resrep00563

Luna, F. (2014). *Transformation of urban lake governance in Bangalore, India* (Masters thesis). Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:su:diva-105717

Lynam, T., & Fletcher, C. (2015). Sensemaking: A complexity perspective. *Ecology and Society, 20*(1), 65. https://doi.org/10.5751/ES-07410-200165

Matikinca, P., Ziervogel, G., & Enqvist, J. P. (2020). *Drought response impacts on household water use practices in Cape Town, South Africa*. Water Policy.

McDonald, R. I., Green, P., Balk, D., Fekete, B. M., Revenga, C., Todd, M., & Montgomery, M. (2011). Urban growth, climate change, and freshwater availability. *Proceedings of the National Academy of Sciences, 108*(15), 6312–6317. https://doi.org/10.1073/pnas.1011615108

McPhearson, T., Iwaniec, D. M., & Bai, X. (2017). Positive visions for guiding urban transformations toward sustainable futures. *Current Opinion in Environmental Sustainability, 22*, 33–40. https://doi.org/10.1016/j.cosust.2017.04.004

McPhearson, T., Parnell, S., Simon, D., Gaffney, O., Elmqvist, T., Bai, X., … Revi, A. (2016). Scientists must have a say in the future of cities. *Nature, 538*(7642), 165–166. https://doi.org/10.1038/538165a

Millington, N. (2018). Producing water scarcity in São Paulo, Brazil: The 2014–2015 water crisis and the binding politics of infrastructure. *Political Geography, 65*, 26–34. https://doi.org/10.1016/j.polgeo.2018.04.007

Murphy, A., Enqvist, J. P., & Masterson, V. A. (n.d.). *Changing senses of place and local responses to Bengaluru's disappearing lakes*. Invited contribution to C. Raymond, T. von. Wirth, L. Manzo, D. W., & Di Masso, A. (Eds.). (n.d.). Changing senses of place in the face of global challenges. Cambridge University Press. In review.

Murphy, A., Enqvist, J. P., & Tengö, M. (2019). Place-making to transform urban social-ecological systems: Insights from the stewardship of urban lakes in Bangalore, India. *Sustainability Science, 14*(3), 607–623. https://doi.org/10.1007/s11625-019-00664-1

Nagendra, H. (2016). *Nature in the city: Bengaluru in the past, present, and future*. New Delhi, India: Oxford University Press.

Nagendra, H. (2018). The global south is rich in sustainability lessons. *Nature, 557*(7706), 485–488. https://doi.org/10.1038/d41586-018-05210-0

Nagendra, H., & Ostrom, E. (2014). Applying the social-ecological system framework to the diagnosis of urban lake commons in Bangalore, India. *Ecology and Society, 19*(2), 67. https://doi.org/10.5751/ES-06582-190267

Onishi, N., & Sengupta, S. (2018). Dangerously low on water: Cape Town now faces 'Day Zero.' *New York Times*. Retrieved from https://www.nytimes.com/2018/01/30/world/africa/cape-town-day-zero.html

Parnell, S., & Robinson, J. (2017). The global urban: Difference and complexity in urban studies and the science of cities. In S. Hall & R. Burdett (Eds.), *Handbook of social science* (pp. 13–31). London, UK: Routledge.

Pickett, S. T. A., Cadenasso, M. L., Grove, J. M., Boone, C. G., Groffman, P. M., Irwin, E., … Warren, P. (2011). Urban ecological systems: Scientific foundations and a decade of progress. *Journal of Environmental Management, 92*, 331–362. https://doi.org/10.1016/j.jenvman.2010.08.022

Sabatier, P. A. (1986). Top-down and bottom-up approaches to implementation research: A critical analysis and suggested synthesis. *Journal of Public Policy, 6*(1), 21–48. Retrieved from http://www.jstor.org/stable/3998354

Smith, J. L. (2008). A critical appreciation of the "bottom-up" approach to sustainable water management: Embracing complexity rather than desirability. *Local Environment, 13*(4), 353–366. https://doi.org/10.1080/13549830701803323

Sudhira, H. S., & Nagendra, H. (2013). Local assessment of Bangalore: Graying and greening in Bangalore—Impacts of urbanization on ecosystems, ecosystem services and biodiversity. In T. Elmqvist, M. Fragkias, J. Goodness, B. Güneralp, P. J. Marcotullio, R. I. McDonald, et al. (Eds.), *Urbanization, biodiversity and ecosystem services: Challenges and opportunities* (pp. 75–92). Dordrecht, The Netherlands: Springer.

Sudhira, H. S., Ramachandra, T. V., & Subrahmanya, M. H. B. (2007). Bangalore. *Cities, 24*(5), 379–390. https://doi.org/10.1016/j.cities.2007.04.003

The Indian Institute for Human Settlements (IIHS). (2018). *Using transformative scenario planning to think critically about the future of water security in Bangalore* [PDF file]. Retrieved from http://www.uct.ac.za/sites/default/files/image_tool/images/138/Info_briefs/India-IIHS-overall-TSP-report-WEB.pdf

United Nations (UN). (2014). *World urbanization prospects: The 2014 Revision (highlights)* [PDF file]. Retrieved from https://selectra.co.uk/sites/default/files/pdf/WUP2014-Highlights.pdf

United Nations Framework Convention on Climate Change (UNFCCC). (2019). *Climate smart cities in emerging economies*. Retrieved from https://unfccc.int/climate-action/momentum-for-change/activity-database/momentum-for-change-climate-smart-cities-in-emerging-economies

Unnikrishnan, H., & Nagendra, H. (2014). Privatizing the commons: Impact on ecosystem services in Bangalore's lakes. *Urban Ecosystem, 18*(2), 613–633. https://doi.org/10.1007/s11252-014-0401-0

Walker, B., & Salt, D. (2006). *Resilience thinking: Sustaining ecosystems and people in a changing world*. Washington, DC: Island Press.

Wilkinson, P. (2000). City profile: Cape Town. *Cities, 17*(3), 195–205. https://doi.org/10.1016/S0264-2751(99)00059-1

Wolski, P. (2018, Janrurary 22). *Facts are few, opinions plenty…on drought severity agai* [Web log message]. Retrieved from http://www.csag.uct.ac.za/2018/01/22/facts-are-few-opinions-plenty-on-drought-severity-again/

Woodhouse, P., & Muller, M. (2017). Water governance—An historical perspective on current debates. *World Development, 92*, 225–241. https://doi.org/10.1016/j.worlddev.2016.11.014

World Population Review. (2019). *Bangalore population 2019*. Retrieved from http://worldpopulationreview.com/world-cities/bangalore-population/

World Wildlife Fund (WWF). (2019). *One planet cities*. Retrieved from https://wwf.panda.org/our_work/projects/one_planet_cities/

Ziervogel, G. (2019a). Building transformative capacity for adaptation planning that works for the urban poor: Insights from South Africa. *Ambio, 48*(5), 494–506. https://doi.org/10.1007/s13280-018-1141-9

Ziervogel, G. (2019b). *Unpacking the Cape Town drought: Lessons learned* [PDF file]. Retrieved from https://www.africancentreforcities.net/wp-content/uploads/2019/02/Ziervogel-2019-Lessons-from-Cape-Town-Drought_A.pdf

Ziervogel, G., Satyal, P., Basu, R., Mensah, A., Singh, C., Hegga, S., & Abu, T. (2019). Vertical integration for climate change adaptation in the water sector: Lessons from decentralisation in Africa and India. *Regional Environmental Change, 19*(8), 2729–2743. https://doi.org/10.1007/s10113-019-01571-y

Ziervogel, G., Waddell, J., Smit, W., & Taylor, A. (2016). Flooding in Cape Town's informal settlements: Barriers to collaborative urban risk governance. *South African Geographical Journal, 98*(1), 1–20. https://doi.org/10.1080/03736245.2014.924867