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An experiment with the minor geographies of major cities: Infrastructural relations among the fragments

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Abstract
Research on urban water infrastructures has seldom reached across the Global North-South divide owing to their apparent developmental incommensurability. Yet, the universalising tendencies of urban theory has meant that cities of the Global South are often deemed to have 'fragmented' infrastructures or incomplete circulations in implicit comparison to the northern infrastructural ideal. So, in order to truly 'world' the study of infrastructures and cities, it is important to go beyond these dominant paradigms and attend to how infrastructures actually work and what socio-technical implications they have in cities of the Global South and North. Building on these provocations, this paper places the water infrastructures of two 'most different cities' – Chennai, India and London, UK – alongside each other in 'experimental comparison', where the aim is not to arrive at paradigmatic urban theory but to highlight heterogeneity and excavate themes for further critical thinking on each case. This paper will delineate the dialogic and reflexive method of research and analysis adopted, tracing how it led to the practice of 'minor theory', which focuses on processes that do not find expression in dominant universalising analyses. Here, minor theory is mobilised towards challenging dominant or major constructs about each city and across cities, while amplifying urban multiplicities and enabling a deeper engagement with infrastructure making in the Global South and North, thus expanding urban studies' toolbox of critical thinking.

Keywords
fragmentation, infrastructure, minor theory, technical expertise, water

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摘要

由于全球南方和全球北方城市水基础设施的发展具有明显的不可通约性，这方面的研究很少跨越全球南北鸿沟。然而，城市理论的普遍化趋势意味着，与北方的基础设施理想隐约形成对比的是，全球南方的城市基础设施通常被认为是"碎片化"的、或者说，没有形成完整的循环。因此，为了真正实现基础设施和城市研究的"世界化"，重要的是要超越这些主导范式，关注基础设施的实际运作方式以及它们对全球南方和北方城市的社会技术影响。基于这些灵感，本文将两个"最不相同的城市"—印度钦奈和英国伦敦—的水基础设施放在一起进行"实验比较"，目的不是得出典型的城市理论，而是强调异质性并针对每个案例挖掘可开展进一步批判性思考的主题。本文将描述所采用的对话式和反思性研究和分析方法，追溯它如何导致"次要理论"的实践，该实践侧重于在主流普遍化分析中找不到表达的过程。在这里，次要理论被调动起来挑战关于每个城市和跨城市的主导或主要结构，同时扩大城市多样性并促进全球南方和北方在基础设施建设方面更深入的对话，从而扩展城市研究的批判性思维工具。

关键词

碎片化、基础设施、次要理论、技术专长、水

Introduction

Comparative urbanism has emerged in 21st-century urban studies as an argument for wider and prolific comparisons between cities of the world, thus diversifying urban thought and collapsing developmental or regional analytical silos (Robinson, 2011; Roy, 2017). Urban scholars have been drawing equal attention to the 'necessary multiplicity' and discursive specificities within cities, which muddles the broad brush of universal theory, be it from the Global North or South (Parnell and Robinson, 2017; Simone, 2010). This then calls for not only diversifying the range of cities the discipline is informed by but also amplifying their heterogeneities, in the process provincialising canonical northern cities and bringing them into conversation with other ordinary cities (Myers, 2014; Robinson, 2006; Sheppard et al., 2013). It is precisely this manoeuvre this paper attempts by adopting a comparative approach to thinking through the specificities of water infrastructure in Chennai, India and London, UK.

In order to do so, the paper draws analytical and methodological inspiration from two distinct works. First, it builds its methodology from Lancione and McFarlane's (2016) 'experimental comparison' framework, whose focus is on urban heterogeneity as a basis for identifying avenues for further critical thinking on each case. The comparison here is 'experimental' because it deliberately places two ostensibly 'most different' cities alongside each other. However, this difference is arguably a function of their apparent developmental incommensurability more than metrics of size or density. It therefore sets out with an open-ended question on their respective infrastructure-making processes rather than any a priori hypothesis of similarity, difference or qualitative gradation, thus allowing for each city to ask questions of and spur thinking on the other while staying alive to the socio-material specifics and corresponding research demands of each city (Robinson, 2011, 2016).

Second, the above experimental approach mobilises what cultural and environmental geographer Katz (1996) has called a shift to the 'minor register' – a theoretical practice derived from Deleuze and Guattari (1986) to draw attention to processes that can challenge dominant paradigms about each city and across cities. It is a move to focus on processes usually dismissed as 'minor' in the path to theory building. The aim ultimately is not to negate such 'major' theory but rework its terms of engagement by amplifying the significance of processes that seemingly fall outside of it. It is to always insist on the existence of one or many minorities that temper the majority.

Both Chennai and London opened their first seawater desalination plants in 2010, creating ripples locally about dipping into the sea or the tidal Thames for urban water needs, and the forms of techno-managerial authority applicable in such a development. Unsurprisingly, these two cities were never in conversation in academic or media discussions. In terms of urban comparison, the desalination plants are ostensibly classic 'repeated instances' (Jacobs, 2012; Robinson, 2016) of an infrastructural phenomenon – a technological intervention proliferating around the world, often from the same centres of expertise, and promising futuristic transitions towards water security (Swyngedouw, 2013).

But analytically they can also serve more as empirical pivots into the worlds of infrastructure-making they were embedded in, rather than as evidence of, a repeated pattern or a developmental contrast in urbanisation. As an ongoing process, the two desalination plants enable a granular engagement with urban infrastructure-making across geographies and can be taken as 'ways to keep conversations going about cities, always in a world of other cities, by opening more opportunities to think through elsewhere' (Robinson, 2016: 5).

In particular, the conversation this comparison enables is on the notion of an integrated infrastructural ideal in the Global North and its fragmentation in the Global South, a dominant paradigm in urban infrastructure studies. A brief review of literature in the following section outlines the limitations of this construct to establish the particular relevance of a South-North comparison when studying urban water systems. This paper attempts to decompose (Katz, 1996) this dualistic construct by positioning similar infrastructures in the Global South and North, that is, Chennai and London, alongside each other and tracing the distinct socio-technical processes through which they were assembled. In doing so, it argues for a study of the urban, or in fact many urbans, that emphasises multiplicity and heterogeneity.

The paper will develop its analytical framework by delineating the minor theory approach and then exploring its compatibility with experimental comparison as method. It subsequently outlines three themes that emerged through the comparative analysis, discussing one of the themes in detail – technological expertise. The paper then reflects on how this helps the interrogation of infrastructures in both cities in the minor register. The paper concludes by advancing a minor theoretical approach to studying cities that builds on urban heterogeneity, attending to both situated and globally implicated urban histories. In doing so, it moves beyond North-South dualisms in infrastructure studies and contributes to extending the vocabulary of urban theorising.

Implicit comparisons: Infrastructures across the Global South and North

A recent infrastructural turn in geography and urban studies has resulted in rich and varied accounts of urban socio-materiality

from around the world including strong contributions considering Global South contexts, for example, disrupted electricity in Accra (Silver, 2015); 'more than networked' flows in Bangalore (Ranganathan, 2015) or Jakarta (Kooy, 2014) and the vital labour behind urban waste infrastructures in Dakar (Fredericks, 2018). These studies have contributed to expanding enquiry on cities and urban processes hitherto less attended to by urban studies (Furlong and Kooy, 2017). They offer a 'radical change in perspective' (Jaglin, 2014), viewing these Southern infrastructures not as a failure, shortcoming or incompletion of the Northern model, but on their own terms as 'vital and multiple' systems of making and running cities.

Yet, a broad presumption of fragmentation of infrastructure in Global South contexts undergirds even the above studies, attributed to a history of colonisation, corruption and neoliberal structural adjustments in the cities concerned. It is this fragmentation that has commanded scholarly attention, inviting research questions on their social, spatial and material geographies; providing a foil to the supposedly seamless, integrated networks of the North. This premise, then, relies on an implicit comparison (Zérah, 2008). Consequently, the theoretical outcomes of such studies are frequently qualified as Southern theory (see Tuvikene et al., 2017 for a critique of this North-South separation in theory), leaving the contemporary Northern experience unexamined. This has not been productive for the study of Northern cities either, as investigations revealing the less than ideal infrastructures in Euro-American cities have shown (Deitz and Meehan, 2019; Moss, 2008; Ranganathan and Balazs, 2015).

Critical studies of infrastructures in Northern cities have emerged primarily from urban political ecology, which trace their infrastructural ideal to the late 19th- and early 20th-century project of modernity (Gandy, 2004; Kaika, 2005) that also demarcated the 'west' from the 'east' (Kaika, 2005). Soon, under high modernity, 'water flows disappeared underground and in-house. They also disappeared from the urban imagination' (Kaika and Swyngedouw, 2000: 122). Perhaps as a result, investigations into contemporary urban water systems in the Global North have attended more to their political economy than to their infrastructural working as such (Carroll, 2012; Loftus and March, 2016). Consequently, infrastructure is reified as a whole thing, missing the many moving everyday parts that continuously constitute it. Studies of these infrastructures have not focussed much on how they are sustained through myriad actions on an everyday basis; nor do they throw much light on the kind of cities they are located in.

This is in contrast to the Global South, where accounts of infrastructures constantly tell us stories about how they are made and the kind of cities they support – their 'throwntogetherness' (Simone, 2016 citing Massey, 2005) or 'liveliness' (Amin, 2014) or the underlying 'infrapolitics' (Anand, 2017 citing Scott, 2005). There is then the need to provincialise the Northern experience – place the Northern city too 'in a world of cities' (Robinson, 2011) – while at the same time working towards globalising infrastructure studies by deliberately starting with Southern cities as the reference point (McFarlane, 2008; Sheppard et al., 2013). This gives an opportunity to critically examine infrastructures even where they are seemingly seamless, and develop a 'vocabulary' of theorisations from the South that can expand the conceptual remit of infrastructure and urban studies (Bhan, 2019; Schmid et al., 2018). Importantly, it allows for analyses of infrastructures in Southern cities to go beyond notions of fragmentation or failure to develop concepts useful in their own contexts as well as potentially valuable to

understandings of infrastructures and cities elsewhere. In Northern cities, too, a focus on what sustains or unmakes infrastructure could also be relevant.

The study presented in this paper originated with the opening of a seawater desalination plant in Chennai, a sprawling coastal city of about 8 million residents that for decades had relied largely on groundwater reserves soaked through the estuarine and marshy ecologies it was built over (Paul and Elango, 2018). This was placed in comparison with a case in the Global North – London opened its first desalination plant in the same year to augment its centralised network supplying 2.6 billion litres of water per day, albeit processing tidal abstraction rather than water from the open sea.[1] Whereas desalination has primarily been studied through a political ecology lens as a 'terrestrial fix' and an instrument of financialisation, or from a hydro-politics perspective (Loftus and March, 2016; Swyngedouw, 2013; Williams and Swyngedouw, 2018), the experimental comparative approach taken here centres concerns that emerge from the Global South city through fieldwork. These are concerns that might have otherwise not been considered in the London case and, in terms of generalisability or comparability, might have been dismissed as incidental to urbanisation and urban theory.

In other words, it draws attention to 'minor geographies' (Barry, 2017) of the cities, pointing to the local infrastructures of distribution and socio-technical governance that the desalination plants are connected to in each context. Thus, it visualises the desalination plants as embedded within the technological multiplicities of both cities, rather than treating them as repeated instances within a global circuit. To be sure, this is not to deny the role of global circuits of capital or expertise in the making of cities, but adds to those narratives the messy politics of water users, engineers and local

contestations of urban development, generating multiple accounts of infrastructural and urban heterogeneity. More accurately, the comparison allows these heterogenous accounts to enrich analysis of each other as well as overarching theory (Jacobs, 2012). It centres the processes within fragments (McFarlane, 2018) rather than fragmentation as the building block of theory, thus decomposing the infrastructural whole as the analytical point of origin or completion.

Minor theory

The terms 'minor register' or 'minor geographies' (Barry, 2017) do not imply insignificant or negligible aspects of urban life; nor does 'minor' allude to form or structure that is of minor relevance in the city being investigated. Rather, they are a call towards attending to aspects of cities that may not lend themselves to universalising theory easily. Thus, the outcome that such a study aims for is to generate 'minor theory'. The idea of minor theory, developed by Katz (1996) in the context of what was then the 'cultural turn' in geography, built on Deleuze and Guattari's (1986) essay on 'minor literature'. They posited this as writing in the language of major literature but subverting it nonetheless by using it differently, politically. They contended that writing in the dominant language, but from a minority context, could achieve more than just an expression of that subjectivity; it could rework the idioms of major literature in a way that is refracted and modified through the concerns of the minority in that spatio-temporal context. Likewise, Katz argues, minor theory 'tears at the confines of major theory; pushing its limits to provoke a line of escape, a rupture—a tension out of which something else might happen' (Katz, 1996: 489).

The tension that she refers to emerges from major theory being unaccustomed or oblivious to, and so not easily lending its

tools for, the effective expression of the concerns of the minor; major theory here being ways of doing theory that are 'dominant in a particular historical geography' (Katz, 1996: 490).

An experimental comparison catalyses this very tension by placing cities, infrastructures, engineering and water use cultures that are potentially worlds apart in conversation with each other, 'creating conditions to see multiplicity' (Jacobs, 2012) and 'subtract a minor space' from dominant theory (Secor and Linz, 2017). To 'subtract', in this context, is to account for difference without the nature of that difference being 'ordained in advance' (Barry, 2017). It is in 'valuing contextuality and difference' (Lancione and McFarlane, 2016) that experimental comparison enables operation in the minor register. It is not that minor theory rejects dominant tools, instead it refashions them for a different cause that could also ultimately change what the major edifice looks like. It is less an end goal and more a way of doing theory that is constantly reflexive as to what the context, material and discipline warrant.

For urban studies, which focuses on processes that lead to generalisable concepts, a response in the minor register would be to amplify the specific and the miscellaneous. Take for example Simone's (2010: 279) argument for what he terms black urbanism, which involves 'affirming and engaging forms of articulation amongst different cities and urban experiences that otherwise would have no readily available means of conceptualization' – an objective also of experimental comparison according to Lancione and McFarlane (2016). He makes this claim with respect to African cities, whose geographies, for him, evidently do not fit into urban studies' dominant idioms or demands of generalisability. 'Black urbanism' is thus located in a minority position from where it claims the tools of urban theorisation to point precisely to the inherent limitation of any theory to encompass urban multiplicities.

A 2017 forum on minor theory (Jellis and Gerlach, 2017) draws attention to its implications for, and close alliance with, research on micropolitics (Anderson, 2017; Lancione, 2017) and relational urbanism (Temenos, 2017), both grounded in methodological empirical praxis. Discussing micropolitical ethics in conducting politically conscious research, Lancione (2017) stresses the significance of context and dwelling on the details of the everyday, its material and social preoccupations. This, Anderson (2017) argues, invites engagement with 'ongoing, unforeclosed situations' that nonetheless may be part of the operationalisation of power rather than 'counter' to it. Thus, minor theory does not necessarily have to be radically oppositional or counter-hegemonic, but in its focus on the specific and the different, might reveal the limits of social relations that critically constitute urban space (Katz, 2017). Further, Temenos (2017) observes, relational urbanism could in itself be thought of as emerging from a minority position. But it is in empirical engagement, that is, tracing and examining the practices and politics within such relations that the minority position can actually be exercised. As Katz puts it 'the intent was and remains to recognize and release a multitude of "whole other stories vibrating within" the claims and arguments of major theory' (Katz, 2017: 598 citing Barry, 2017).

In the study of urban infrastructures, major theory could mean the notion of an infrastructural whole in the Global North and of fragmentation in the South; or it could be how infrastructures are critiqued overwhelmingly for how they circulate capital in and between cities. The dominance of the 'modern infrastructure ideal' then pushes the Southern city to inevitably speak in the minor register, towards 'disavowal of mastery and embrace of marginality' (Katz, 2017: 596), since it cannot be the site where theory, in its dominant form, is mastered.

This is why theory from the Global South often gets slotted as merely a 'variation' on universal urban theory or as 'Southern theory', its independent heterogeneity unacknowledged (Robinson and Roy, 2016).

Infrastructural normativity, however, has also limited the kind of critical thinking possible in Northern cities, where the sociotechnics of their making – like the compulsions of uninterrupted supply or the role of users in shaping the system as later sections in this paper will discuss – are left unattended. So, a minoritising approach would be to forefront everyday processes of (dis)connection and take fragments themselves seriously beyond their critical role (commonly assigned to Global South experiences) as an anti-thesis to a normative whole. Bringing into comparison two cities bracketed within the theoretical silos of the Global North and South is also a useful strategy for minoritising the positions of both cities, allowing their concerns to speak to each other rather than to interpret each in relation to a pre-determined theoretical paradigm.

In terms of empirical research, embracing analytical marginality in Chennai meant attending to the work of engineers that is considered peripheral to the operation of the centralised system – such as the day-to-day work of area level distribution engineers, or operation and contract engineers, whose roles in shaping and sustaining the city's water system have typically been underrepresented. It also involved considering what were ultimately failed or marginal contestations of the desalination plants as unsustainable technologies. When these experiences were drawn on as the reference points for the study of a Northern city like London where centralised seamless networks are assumed to exist, opportunities for interrogating the infrastructure ideal opened up. In addition, the inevitable differences and (dis)connections across the two cases which the comparison identified then become provocations for critical contextual thinking (Lancione and McFarlane, 2016).

Methodological experiments

An important objective of the comparative analysis here, as the above section indicated, is to wrest some agency in theory-making away from the established canon and towards heterogenous and shifting urban processes themselves, specifically the making of infrastructures. As Lancione and McFarlane (2016) put it 'The richness and value of the experimental comparative approach was to push us in ways of thinking about contemporary urbanism that begins with the heterogeneity of urban inframaking' (Lancione and McFarlane, 2016: 2414). This paper's account of urban heterogeneity builds on an ethnographic study of the making of water infrastructures in Chennai and London, which involved spending six months in each city, conducting interviews and observations in sites of socio-technical practice, primarily with engineers, technicians and technocrats, but also with water users, politicians and planners, where relevant.

Star (2002) observes, in one of the early instances of 'ethnography of infrastructure' conducted on information systems, that there is not much to be learnt out of 'using fieldwork to stand and watch people punching keys and looking at screens' (p. 108). In some ways sites like the desalination plants are similar. Comprised of purification tanks and reverse osmosis filters functioning on a largely automated process, there is little activity happening in the plant that can offer meaningful insight into the social or material constitution of cities. But, fortunately for the ethnographer, infrastructures constitute a 'peculiar ontology' as 'things and also the relation between things' (Larkin, 2013: 329). This dual identity of infrastructure is

sustained through the relational work of a range of actors, including engineers and technical professionals, governmental and political actors as well as water users, all of whom play a role in reproducing socio-material flows. It is this bridging work that my fieldwork focussed on.

I set out with open ended and exploratory questions for research participants; some questions were broad, such as how a desalination plant came to be built in this city, and some were tangential, like what prompted the use of a certain filter or how water usage numbers were reported in a particular area. Usually preliminary contact with individuals, mostly engineers, in the water companies led to a trail of connections involving planning, regulation, distribution, consultancy and government organisations, or sometimes just published text. In this sense, infrastructures were not a 'bounded' site for ethnography, but required techniques of 'following' to trail social and material connections involved in their making and maintenance (McCann and Ward, 2012). However, it was documents or movements of material and expertise within cities that were followed rather than policies, plans and models from elsewhere in the world. The North-South comparison, however, did organically point to – connections, flows of ideas and global urban imaginaries.

With such sprawling, complex systems as these infrastructures, an ethnography cannot claim to cover all the actors responsible for their form and function. In the end, around 80 interviews were conducted in Chennai and about 40 in London. The volumes of published data on public consultations and policy decisions in London made up somewhat for this discrepancy. The research design privileged fieldwork that could mobilise the vital and affective visibility of infrastructure-making (Amin, 2014) considered typical in the Global South. The comparative method pushed for a similar approach to be adopted in London (Myers, 2014), however, raising questions as to why such infrastructural work was not more apparent in the Global North.

In London a significant part of infrastructural work aims to sustain the invisibility of infrastructure in everyday life (Larkin, 2013) and so, there was limited accessibility to its making except when approved and overseen by the water company. In both cities, though, state and private actors also work to create specific forms of visibility through regulatory documents, public announcements, customer communications etc. This meant that the nature of data from each city – often textual in London and oral in Chennai – has the agency to shape the kind of theory it germinates. In this case, textual, published material from London often communicated certainties that the discursive interviews and observations from Chennai muddled.

Navigating these different information sets in comparison compelled what Katz (1996) calls 'renegade cartographies' required for productive minor theory – going back and forth between cities, embracing 'position, difference and the multidirectionality of change' (Katz, 1996: 496) but firmly from a minority context. In this case, this often meant from the point of view of the Southern city. So, the wider comparative analysis relied on a mapping of a range of divergent themes in each city between which commonalities and differences were drawn. Further, specific processes in each city linked to those themes were delineated, noting productive conceptual cues. Finally, a set of three common themes were arrived at, drawn from distinct infrastructural processes in each city and intended to organise the analysis more than draw parallels. The themes are not constitutive of theory on their own, but act as guidelines to pay further attention to the processes they map on to, and thus identify starting points for

critical thinking. Working from the minor register, they disrupt existing conceptualisations. They also do not aim to produce universal theory but rather develop a method to understand and amplify the specifics of making infrastructures in the two cities.

Renegade comparison

Chennai and London occupy almost non-intersecting geopolitical and climatic worlds in popular as well as academic imagination. Yet, a focus on their water supply infrastructures, and more narrowly the events and processes around their recent construction of desalination plants, revealed productive connections and, though not inevitable, differences. Both sprawling cities with significant areas under estuarine and wetland ecosystems, they are perceived to be 'wet' regions where seawater desalination should not be a requirement. Thus, there is normalisation of certain technologies of accessing, using and governing water in both cities through everyday socio-technical practices and distinctive historical techno-scientific formations. For instance, it is the abundance and annual replenishing of groundwater through rains that is prized, albeit mismanaged, in Chennai (Srinivasan, 2008) as opposed to the 'fetishisation' of the piped network and the assembling of technologies required to sustain it in London (Kaika and Swyngedouw, 2000).

Water supply and sewerage in Chennai has been managed by a public utility called the Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB – Metrowater for short) since 1978, before which the Municipal Corporation was directly responsible for these services. Metrowater is funded and governed under the Ministry of Municipal Administration, Water Supply and Sanitation (MAWS) of the State of Tamil Nadu (of which Chennai is the capital), while the City Corporation is represented by a nominated Commissioner rather than elected Councillors in the Metrowater board. In contrast to this elaborate patchwork of public officials constituting the Metrowater Board, London's water services are completely privatised, managed by a single multinational corporation called Thames Water, although this has changed hands between a patchwork of international investors over time.

In fact, it is not only the water supply service but the water assets themselves that are privatised for management by corporations in England and Wales. Bakker (2001) has argued that the nationalisation of water management in the UK in the 70s, which created river basin water authorities, was a precursor to the river basin based private monopolies that manage water in England and Wales today. While similar arguments have been put forth about the creation of Chennai's Metrowater in 1978 (Coelho, 2006), it remains a state utility with limited private intervention in special projects like desalination. Both cities, in the late 90s, saw the emergence of institutional arrangements for a directly elected Mayor, who is expected to play a voluntary role in water planning for the city, especially if they happen to be from the same political party as the ruling government.

A back-and-forth comparative analysis between the above cases was, in practice, a trial-and-error process, with many iterations of connecting the dots within and across cities. It started with a list of themes, actors and practices in the two cities, and accounted for the differentiated agencies involved in shaping infrastructures. Based on this exercise, the themes identified broadly encompassed the nature of the technopolitical set up in the two contexts: (i) State formation, (ii) Political contestation and (iii) Constitution of technical expertise. The detailed processes considered were those concerned with the everyday practices of

making infrastructures. Two of these themes will be outlined here briefly before the following section elaborates on the third.

(i) State formation: While there was direct state involvement with urban water supply in Chennai and hence, formation of the 'urban infrastructural state' in recent times, it was the comparative analysis that drew attention to the constitution of a 'technoscientific state' in London (Carroll, 2012). This fulfilled a regulatory function by framing a strict set of parameters and mathematical equations around the political ecology of water for its management.

(ii) Political contestation: In this managerial set-up, it was the London Mayor's discretionary powers which were used to contest the building of a desalination plant on grounds of ecological sustainability (London Assembly, 2007). In Chennai, although there was seeming consensus on the desalination plant between the arms of the state as well as among urban residents, there was longer term mobilisation among coastal fishers and other marginalised groups to challenge infrastructure building over the city's marshy coast (Kumar et al., 2014). Attending to these contestations, which were largely unsuccessful in stopping the machinery of the desalination 'factory' from taking hold in these cities (Williams, 2018), still offered ways of imagining 'alternative subjectivities' (Katz, 1996) from which to think about cities and the environments, including the ocean, they are imbricated in.

The following section will detail the third theme emerging through the analysis – technical expertise – in order to illustrate how the comparative method can operate to generate minor theory. While any of the three themes could have been chosen for elaboration, the process through which technical expertise is constituted in the two cities offers particular opportunities for decomposing the major theory of 'fragmentation' this paper aims to intervene in.

Engineering expertise

Investigating the idea of engineering expertise or technical knowledge was inevitable in this study, since it originated with the parallel construction of two desalination plants – considered advanced technology, even futuristic. Desalination plants are comprised of filtration membranes that work on the chemistry of reverse osmosis to eliminate mineral salts contributing to salinity and toxicity in sea or recycled water. Most cities building these plants contract the manufacture and installation of the filtration membranes to a handful of companies based in Southern Europe and West Asia (Swyngedouw, 2013). Expertise on membranes, in any case, lies with the developer and manufacturer rather than the urban water or infrastructure engineers, who instead emphasise their expertise in other aspects of the system like distribution, leakage reduction or groundwater recharge.

In Chennai, located in a region with a remarkably widespread adoption of engineering education (Department of Technical Education, 2016), a wide range of technology professionals were involved in managing the growing centralised supply and other means of water access. There were civil, chemical, mechanical, and environmental engineers of varying qualifications employed primarily in setting up and integrating supply from different sources like groundwater, recycled water and water tankers – the so-called fragments of this city's infrastructure – at the household level (Niranjana, 2021). This diversity in technical practice is however almost entirely missed amidst narratives

of infrastructural fragmentation and hege-monic planning systems in the Southern city, which emphasise engineering as elite knowl-edge and erasure of other vital technical work in making infrastructure across differ-ent systems of supply. As Subramanian (2019) has shown, this reinforces the colonial and caste appropriation of artisanal techni-cal skill while simultaneously devaluing it. A minor theory approach on the other hand can draw attention precisely to these see-mingly inconsequential or marginalised aspects of infrastructural engineering.

What is also striking in looking within the fragments of water infrastructure in Chennai is the prolific use of reverse osmosis filters for purification of ground or recycled water at household, building or community scales. Metrowater's centralised pipelines, although desired by residents, were obliged to fit into this infrastructure of the household. This was achieved through area-wiseco-ordina-tion between Metrowater's engineers, water users and other private technology profes-sionals working in that neighbourhood. At a meet-up of the Society of Public Health and Environmental Engineers (SoPHEE), orga-nised by Metrowater engineers by way of asserting their claim to expertise on broad public infrastructure engineering rather than single technologies, an engineer narrated his experience of working on a leakage reduc-tion project:

> 'We would be standing there supervising work on the pipes when neighbourhood residents would walk over to us, on their way to work or dropping their kids at school, wanting to know what we were up to and how exactly this would affect or benefit supply in the area. More often than not', *he chuckled*, 'this would be accompanied by the enquiry if we could also take a look at the last mile connectivity to their house or street.'

In the process, the engineer and the local residents ended up exchanging knowledge about pipes, hydrology and sometimes the social geography of the area. This was useful to the engineer because water users often had detailed diagnoses of supply issues in their area, like the one below offered by a South Chennai resident in the author's presence:

> Earlier it used to be a standard pipeline of ¼ inch for all apartments and houses. Now, they have different dimensions for different building sizes, which are connected to the main through a head, in which water bubbles up before going into the connecting pipes, thus buffering flow uniformly in all directions. Our building with 43 flats gets the maximum dimension pipe and is located at the end of a seaward road which, despite its flat appearance, hides sand dunes underneath. The size of the pipe along with gravity means water pressure is never enough to pump to our building

Irrespective of the accuracy of this diagnosis, it gave the engineer a tangible problem to work on, while forging a social relationship over the air of conspiracy in taking up work additional to his mandate. It was also the method by which he established a domain of expertise that relied on the continual repro-duction of the social networks that kept the water network functioning.

Metrowater's distribution structure relies largely on its 15 Area Engineers, each appointed to a specific area, but often rotated between them. So, it was not an engineer's existing knowledge or social net-work within an area that constituted his expertise, but his skill in getting to know the pipelines and socialising with their users. It is what Simone (2014: 18) calls infrastruc-tures of relationality where 'relationships themselves constitute an infrastructure for inhabitation'. Such relationships, he argues, are not merely social exchange but material carriers of circulation and 'tools through which political imaginations and claims are exerted' (Simone, 2014: 18).

Even as knowledge claims are made over the infrastructural network and consequently, the city, through shared inhabitation of these relations, these also reflect that it is also a classed society. Residents, like the one cited above, express what seems to be the near universal middle-class complaint about plumbers, even as they collaborate with less-than-expert engineers over fragmented knowledges on the behaviour of pipes and water in their neighbourhood. But these middle-class residents do not build similar relationships with the area engineer of the Municipal Corporation, who is accountable to the elected ward councillor, who in turn is believed to rely on working-class voters rather than needing to strike up a middle-class alliance. In all, technical expertise was localised, distributed amongst different water engineering professionals, and entwined with the very social geography of the city it shaped.

At the same time, members of the water industry in both cities mobilised projects, like desalination, towards marketing their own areas of hydrological expertise, such as drawing up contracts or conducting environmental impact assessments. In London, this was the domain of managerial consultants rather than technology professionals. Yet their expertise was mounted on a platform of the city's longstanding engineering achievements, such as the Victorian-era water mains, the Thames Barrier and now the desalination plants. The building of the desalination plants as drought contingency also fed into the rhetoric of planning for future cities and their resilience, by 'future-proofing' their water systems (Atkins, 2012). This projection of futuristic ambition was frequently directed outward, with British technocrats seeking global opportunities, urging water utilities especially in the Global South to invest in their expertise (e.g. United Kingdom Trade and Investment, 2016).

To be sure, Chennai's water engineers, especially those working on desalination technologies, had global ambitions too, which entailed working a few years in East or West Asia. These were framed by my interlocutors as learning experiences, however, rather than as contributions of their expertise. Metrowater's desalination plants had just about earned a place in global knowledge circuits, but more as a place for consultants to visit, seeking a market for their expertise rather than as a knowledge exporter. In contrast, London's water experts were often 'travelling technocrats' (Larner and Laurie, 2010) who built on a neo-colonial imaginary of London's water supply technology and its recent distinction in having a 'completely privatised' water management system to exert a global influence. In a direct comparative formulation, one of Chennai's polluted rivers, the Cooum, is frequently described as what once used to be the 'Thames of Madras', especially when plans for its clean-up are reported (Daniel, 2009). Some of my interviewees in Chennai promised me that I would come back one day to see the Cooum transformed as the Thames I see in London.

The Thames' transformative history is frequently invoked in trade and industry events in London too, as the journey from the 'Great Stink to the Great Think'. As an official in the Government Office for Science put it:

> Arguably, our greatest achievement has been the separation of the water we drink from the water we excrete. Our roads are still Roman and our sewers Victorian.

At an industry workshop on infrastructure planning, a researcher from one of the UK's largest engineering consultancies divided the world neatly into regions of infrastructural legacy and deficit.

> If you take India or Africa, there is deficit; and here we have a tremendous legacy. Now, this legacy gives us the strength and experience to

plan for robust infrastructures in those deficit regions.

The asymmetric cartographies of expertise sketched above, as Bok (2020: 1236) puts it, 'call attention to how the broader positionality of states can influence nationally-inflected relations of power' in the global footprint of engineers and technocrats. However, the comparative framing of the different forms that technical expertise took in the two cities meant that Chennai's highly localised and arguably 'minor' expertise on engineering could be juxtaposed with the expansionary ambitions of water expertise in London, interrogating what counts as engineering knowledge in making both urban and transnational infrastructures (Björkman and Harris, 2018).

A comparison of the engineering expertise undergirding water infrastructures in the two cities prompted a further question as to what kind of social or public interface mediated technological work to the water user (Björkman, 2018). The prompt came about because of how much user access to water in Chennai was contingent upon their participation in and knowledge of the city's socio-technical relations. In the London context, this raised the question of why the undoubtedly skilled work that goes into maintaining the city's complex network was not more visible or public-facing – a 'minor' concern that nonetheless brings to the fore issues with what makes modern infrastructures seamless or public.

In Chennai, where there was a creeping in of the kind of managerial technocracy (Coelho, 2006) that is prominent in London, engineers worked to retain their expertise by strengthening and sustaining the socio-technical relations they employed to perform their everyday work. This included Metrowater's engineers as well as private technical professionals who co-opted water

users' knowledge of consumption and local available sources towards making and managing disparate supply systems. In the process, the technological basis of infrastructure-making was socialised; at the same time the diverse fragments of infrastructures and the epistemologies behind them were cohered through everyday socio-technical practice that constituted 'infrastructures of relationality' (Simone, 2014).

In London, this socialisation was deliberately avoided for two interconnected reasons. One was to sustain the separation of the expert from the user (Anand, 2015), and the second was to make invisible the work of infrastructuring and project a seamlessness in water flows. The ultimate aim of the infrastructural ideal, according to several water engineers and managers in London, was that the user should not have to know the work, and the problems, which lay behind their water supply. This was achieved even as the financialisation and mathematical regulation of the privatised water industry in England and Wales formed a power-laden socio-political interface with the water user or 'customer', who in practice did not need to engage with its technicalities. For instance, neither the development of Thames Water's desalination plant nor its implication for water bills are common knowledge; but the company's rationale for constructing it was ostensibly to fulfil its commitment to customers, as required by regulation, to prepare for a potential shortfall in water supply in the near future in a 'seriously water stressed' area with growing demand for water (Thames Water, 2006).

The regulatory provisions were also a mechanism for the company to prioritise investments towards accumulating profitable assets such as the desalination plant, rather than spending on the maintenance of existing infrastructure or demand reduction (Loftus and March, 2016). Simultaneously user perception surveys were conducted and

used to demonstrate why undertaking a leakage reduction project or recycling potable water were not options. As the engineer in charge of these surveys assured:

> There is a clear line dividing the water user from the expert in this city – the latter actually understand the ecology of water supply, while the former can only be reactionary.

This divide rendered water users as 'human revenue streams' (Allen and Pryke, 2013) with little social or political role in shaping the city's material networks (Page and Bakker, 2005).

Discussion

The above comparison of socio-technical infrastructure-making on the one hand and financially abstracted water systems on the other enabled going beyond a preoccupation with fragmentation or circulatory flows in infrastructures to attend to the myriad of other relations that they sustain. If fragmentation is a fundamental urban condition, as McFarlane (2018) has argued, then it follows that urban research demands attention to those fragments, each potentially generating critical thinking and conceptual inspiration. These fragments are relatively visible in cities of the Global South because 'here fragments are often especially vital elements in the experience and politics of urban life and the city' (McFarlane, 2018: 1008). A comparative framing between the Global South and North is therefore potentially productive in drawing attention to the fragments that structure and support apparently seamless water supply in a Northern city like London. In undertaking such a comparison, this paper set out to upset the notion of infrastructure as a circulatory whole, an idea that has remained dominant in urban studies even as it moves away from idealising infrastructure's seamlessness.

Starting from a premise that does not take universal round-the-clock supply for granted meant that the provisions made within England's regulatory framework to maintain that level of service, including those that enabled the building of a desalination plant, could be brought into view. Likewise, an engagement with Chennai's water infrastructures as if they were the norm rather than a fragmentation of the Northern ideal enabled delving into the details of how engineering work was carried out towards making infrastructures on an everyday basis; how expertise was sustained in these networks; and how class and caste underpinned operation within and across those fragments of water systems. These insights are not a new or alternate theory of infrastructures but an amplification of heterogeneity in infrastructures as well as cities.

As Katz (2017) argues, such an analysis is made possible only in the minor register since major theory, while useful in offering causative and paradigmatic explanations, is unsuited for meandering into how social relations work or 'feel'. This study, by positioning itself in the minor register, was however able to delve into not only under-examined everyday engineering practices but also the 'infrastructures of relationality' (Simone, 2014) they operationalised through social connection. Similarly, political ecology frameworks have revealed the financialisation of London's water supply and the rendering of water users into profit-generating consumers (Allen and Pryke, 2013). A minor focus on users' knowledge of and participation in this network, however, also brought into view how the clear divide between the user and the expert was constructed; and how this made the users unknowing contributors to the financialised model. Further it was the comparative juxtaposition with Chennai, where users are by default active participants in the infrastructural network, that flagged this as a matter

of concern at all in London. In raising these fundamental questions about how an uninterrupted centralised supply is sustained or the roles of user and expert in a water system are defined, urban comparison in the minor register has introduced lines of rupture in major theoretical edifices like the infrastructural ideal.

Conclusion

The experimental comparison described above is at its basic quite the same as thinking a city 'through elsewhere', usually another city (Robinson, 2016). However, for Katz (1996), there is a politics to this 'becoming minor' thinking or theory, which lies in attending to what kind of knowledge is produced through the research exercise. 'Not surprisingly, the major language tries to hide its inadequacies' (p. 496), she writes and in the case of urban studies, this shortcoming is pronounced in grappling with urban heterogeneity – the messy everyday practices of city-making that do not easily lend themselves to generalisable concepts. So, in undertaking a methodological experimentation comparing two ostensibly 'most different' cities, this study was designed precisely to amplify heterogeneity by thinking cities not as additive multiples produced through globalising circulations (Jacobs, 2012), but as necessarily different parallel formations.

While similar themes, events or even processes were identified across the two cities explored here, the paper engaged with dominant concepts like fragmentation, expertise and relationality by localising them; and attending to how they emerged organically in specific contexts through infrastructural practice. For example, relationality has been widely explored in urban research, yet primarily from the point of view of global flows and connections (Temenos, 2017). Instead,

operating in the minor register has enabled forefronting relationality as material, micropolitical (Anderson, 2017) and constituted through socio-technical practice. This is explicated primarily in empirical terms because to practise Katz's (1996) politics of minor theory is to insist on the heterogenous 'becoming' of this relationality as a constitutive outside of major theory (Temenos, 2017).

'[S]ticking to heterogeneity' in this way, as Lancione and McFarlane (2016) argue in their comparison of inframaking Turin and Mumbai, can 'stretch and unsettle any stable understanding of what sanitation "is"' (Lancione and McFarlane, 2016: 2415). Here, when a city like Chennai is placed in experimental comparison with a city like London, it leads to a minor perspective on not only the Southern city, but also potentially on its Northern counterpart, and on the idea of urban infrastructure itself. It is not an urban normative ideal that is interesting and valuable to this comparison, but the deviances and complications in the city, and the shift in language required to discuss its situated and globally implicated histories. Thus, what the comparison seeks to achieve is not just the inclusion of more cities into the fold of urban studies or diversifying its reach, but also the expansion of urban studies' toolbox and vocabulary of critical thinking. It brings to the table a positively promiscuous interest in generating more theories, minor in their position and concerned with otherwise overlooked aspects of urban life, and promises to reshape what we understand as the urban – as many urbans.

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Note

1. See: https://corporate.thameswater.co.uk/Media/Facts-and-figures

References

Allen J and Pryke M (2013) Financialising household water: Thames Water, MEIF, and 'ring-fenced' politics. *Cambridge Journal of Regions Economy and Society* 6(3): 419–439.

Amin A (2014) Lively infrastructure. *Theory Culture & Society* 31(7-8): 137–161.

Anand N (2015) Leaky states: Water audits, ignorance, and the politics of infrastructure. *Public Culture* 27(2 76): 305–330.

Anand N (2017) *Hydraulic City: Water and the Infrastructures of Citizenship in Mumbai*. Durham, NC: Duke University Press.

Anderson B (2017) Hope and micropolitics. *Environment and Planning D Society and Space* 35(4): 593–595.

Atkins (2012) Future proofing the UK water sector: Positioning the UK water industry for long term success. Consultant Report. Available at: https://www.gov.uk/research-for-development-outputs/future-proofing-cities-risks-and-opportunities-for-inclusive-urban-growth-in-developing-countries (accessed 14 February 2022).

Bakker K (2001) Paying for water: Water pricing and equity in England and Wales. *Transactions of the Institute of British Geographers* 26(2): 143–164.

Barry A (2017) Minor political geographies. *Environment and Planning D Society and Space* 35(4): 589–592.

Bhan G (2019) Notes on a Southern urban practice. *Environment and Urbanization* 31(2): 639–654.

Björkman L (2018) The engineer and the plumber: Mediating Mumbai's conflicting infrastructural imaginaries. *International Journal of Urban and Regional Research* 42(2): 276–294.

Björkman L and Harris A (2018) Engineering cities: mediating materialities, infrastructural imaginaries and shifting regimes of urban expertise. *International Journal of Urban and Regional Research* 42(2): 244–262.

Bok R (2020) The relational co-production of 'success' and 'failure', or the politics of anxiety of exporting urban 'models' elsewhere. *Urban Geography* 41(9): 1218–1239.

Carroll P (2012) Water and technoscientific state formation in California. *Social Studies of Science* 42(4): 489–516.

Coelho K (2006) The slow road to the private: a case study of neoliberal water reforms in Chennai. In: *The International Environmental Law Research Centre (IELRC) conference on water, law and the commons*, Delhi, India, 8–10 December.

Daniel S (2009) Will the Cooum river be Chennai's Thames? *NDTV*, 17 December. Available at: https://www.ndtv.com/india-news/will-the-cooum-river-be-chennais-thames-407041 (accessed 14 February 2022).

Deitz S and Meehan K (2019) Plumbing poverty: Mapping hot spots of racial and geographic inequality in US household water insecurity. *Annals of the American Association of Geographers* 109(4): 1092–1109.

Deleuze G and Guattari F (1986) *Kafka: Towards a Minor Literature*. Minneapolis, MN: Minnesota University Press.

Department of Technical Education (2016) *Citizens Charter 2015-16*. Chennai: Tamil Nadu Ministry of Higher Education. Available at: http://www.tndte.gov.in/wp-content/uploads/

2016/07/dote-citizen-charter-english.pdf (accessed 14 February 2022).

Fredericks R (2018) *Garbarge Citizenship: Vital Infrastructures of Labor in Dakar, Senegal*. Durham, NC: Duke University Press.

Furlong K and Kooy M (2017) Worlding water supply: Thinking beyond the network in Jakarta. *International Journal of Urban and Regional Research* 41(6): 888–903.

Gandy M (2004) Rethinking urban metabolism: Water, space and the modern city. *City* 8(3): 363–379.

Jacobs JM (2012) Commentary—Comparing comparative urbanisms. *Urban Geography* 33(6): 904–914.

Jaglin S (2014) Rethinking urban heterogeneity. In: Parnell S and Oldfield S (eds) *The Routledge Handbook on Cities of the Global South*. Abingdon: Routledge, pp.434–446.

Jellis T and Gerlach J (2017) Micropolitics and the minor. Environment and Planning D. *Society and Space* 35(4): 563–567.

Kaika M (2005) *City of Flows: Modernity, Nature, and the City*. Hove: Psychology Press.

Kaika M and Swyngedouw E (2000) Fetishizing the modern city: The phantasmagoria of urban technological networks. *International Journal of Urban and Regional Research* 24(1): 120–138.

Katz C (1996) Towards minor theory. *Environment and Planning D Society and Space* 14(4): 487–499.

Katz C (2017) Revisiting minor theory. Environment and Planning D. *Society and Space* 35(4): 596–599.

Kooy M (2014) Developing informality: The production of Jakarta's urban waterscape. *Water Alternatives* 7(1): 35–53.

Kumar M, Saravanan K and Jayaraman N (2014) Mapping the coastal commons. *Economic and Political Weekly* XLIX(48): 46–53.

Lancione M and McFarlane C (2016) Life at the urban margins: Sanitation infra-making and the potential of experimental comparison. *Environment and Planning A: Economy and Space* 48(12): 2402–2421.

Lancione M (2017) Micropolitical entanglements: Positioning and matter. Environment and Planning D. *Society and Space* 35(4): 574–578.

Larkin B (2013) The politics and poetics of infrastructure. *Annual Review of Anthropology* 42: 327–343.

Larner W and Laurie N (2010) Travelling technocrats, embodied knowledges: Globalising privatisation in telecoms and water. *Geoforum* 41(2): 218–226.

Loftus A and March H (2016) Financializing desalination: Rethinking the returns of big infrastructure. *International Journal of Urban and Regional Research* 40(1): 46–61.

London Assembly (2007) Seventy-third Mayor's report to the assembly, 18 July. Available at: https://www.london.gov.uk/LLDC/Data/London%20Assembly%20(Mayor's%20Question%20Time)/20070718/Agenda/4%20Mayor's%20Report%20RTF.rtf (accessed 14 February 2022).

Massey D (2005) *For Space*. London: SAGE.

McCann E and Ward K (2012) Assembling urbanism: Following policies and 'studying through' the sites and situations of policy making. *Environment and Planning A* 44(1): 42–51.

McFarlane C (2008) Urban shadows: Materiality, the 'Southern city' and urban theory. *Geography Compass* 2(2): 340–358.

McFarlane C (2018) Fragment urbanism: Politics at the margins of the city. *Environment and Planning D Society and Space* 36(6): 1007–1025.

Moss T (2008) 'Cold spots' of urban infrastructure: 'shrinking' processes in eastern Germany and the modern infrastructural ideal. *International Journal of Urban and Regional Research* 32(2): 436–451.

Myers G (2014) From expected to unexpected comparisons: Changing the flows of ideas about cities in a postcolonial urban world. *Singapore Journal of Tropical Geography* 35(1): 104–118.

Niranjana R (2021) Between fragments and ordering: Engineering water infrastructures in a postcolonial city. *Geoforum* 119: 1–10.

Page B and Bakker K (2005) Water governance and water users in a privatised water industry: Participation in policy-making and in water services provision: A case study of England and Wales. *International Journal of Water* 3(1): 38–60.

Parnell S and Robinson J (2017) The global urban: Difference and complexity in urban studies and the science of cities. In: Hall S and Burdett R (eds) *The SAGE Handbook of the 21st Century City*. Los Angeles, CA and London: SAGE, pp. 13–31.

Paul N and Elango L (2018) Predicting future water supply-demand gap with a new reservoir, desalination plant and waste water reuse by water evaluation and planning model for Chennai megacity, India. *Groundwater for Sustainable Development* 7: 8–19.

Ranganathan M (2015) Storm drains as assemblages: The political ecology of flood risk in post-colonial Bangalore. *Antipode* 47(5): 1300–1320.

Ranganathan M and Balazs C (2015) Water marginalization at the urban fringe: Environmental justice and urban political ecology across the north–South divide. *Urban Geography* 36(3): 403–423.

Robinson J (2006) *Ordinary Cities: Between Modernity and Development*. Hove: Psychology Press.

Robinson J (2011) Cities in a world of cities: The comparative gesture. *International Journal of Urban and Regional Research* 35(1): 1–23.

Robinson J (2016) Thinking cities through elsewhere: Comparative tactics for a more global urban studies. *Progress in Human Geography* 40(1): 3–29.

Robinson J and Roy A (2016) Debate on global urbanisms and the nature of urban theory. *International Journal of Urban and Regional Research* 40(1): 181–186.

Roy A (2017) Urban studies and the postcolonial encounter. In: Hall S and Burdett R (eds) *The SAGE Handbook of the 21st Century City*. Los Angeles, CA and London: SAGE, pp. 32–46.

Schmid C, Karaman O, Hanakata NC, et al. (2018) Towards a new vocabulary of urbanisation processes: A comparative approach. *Urban Studies* 55(1): 19–52.

Scott JC (2005) The infrapolitics of subordinate groups. In: Amoore L (ed.) *The Global Resistance Reader*. Hove: Psychology Press, pp. 65–73.

Secor A and Linz J (2017) Becoming minor. *Environment and Planning D Society and Space* 35(4): 568–573.

Sheppard E, Leitner H and Maringanti A (2013) Provincializing global urbanism: A manifesto. *Urban Geography* 34(7): 893–900.

Silver J (2015) Disrupted infrastructures: An urban political ecology of interrupted electricity in Accra. *International Journal of Urban and Regional Research* 39(5): 984–1003.

Simone A (2010) *City Life From Jakarta to Dakar: Movements at the Crossroads*. Abingdon and New York, NY: Routledge.

Simone A (2014) Relational infrastructures in postcolonial urban worlds. In: Graham S and McFarlane C (eds) *Infrastructural Lives: Urban Infrastructure in Context*. Abingdon and New York, NY: Routledge, pp. 17–38.

Simone A (2016) Passing things along:(In) completing infrastructure. *New Diversities* 17(2): 151–162.

Srinivasan V (2008) *An integrated framework for analysis of water supply strategies in a developing city: Chennai, India*. DPhil Dissertation, Stanford University, Stanford, CA.

Star SL (2002) Infrastructure and ethnographic practice: Working on the fringes. *Scandinavian Journal of Information Systems* 14(2): 6.

Subramanian A (2019) *The Caste of Merit: Engineering Education in India*. Cambridge, MA and London: Harvard University Press.

Swyngedouw E (2013) Into the sea: Desalination as hydro-social fix in Spain. *Annals of the Association of American Geographers* 103(2): 261–270.

Temenos C (2017) Minor theory and relational urbanism. Environment and Planning D. *Society and Space* 35(4): 579–583.

Thames Water (2006) *Water Resources Plan*. London: Thames Water.

Tuvikene T, Neves Alves S and Hilbrandt H (2017) Strategies for relating diverse cities: A multi-sited individualising comparison of informality in Bafatá, Berlin and Tallinn. *Current Sociology* 65(2): 276–288.

United Kingdom Trade and Investment (2016) Export opportunities in international water markets. Trade event, London, UK, 19 February.

Williams J (2018) Commodifying the Pacific Ocean: Desalination and the neoliberalisation of water in Southern California. In: Williams J and Swyngedouw E (eds) *Tapping the Oceans:*

Seawater Desalination and the Political Ecology of Water. Cheltenham and Northampton, MA: Edward Elgar Publishing, pp. 166–187.

Williams J and Swyngedouw E (eds.) (2018) *Tapping the Oceans: Seawater Desalination and the Political Ecology of Water*. Cheltenham and Northampton, MA: Edward Elgar Publishing.

Zérah MH (2008) Splintering urbanism in Mumbai: Contrasting trends in a multilayered society. *Geoforum* 39(6): 1922–1932.