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Implicit or Illicit? Self-Made Infrastructure, Household Waters, and the Materiality of Belonging in Cape Town

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ABSTRACT: Residents of informal settlements in Cape Town, South Africa, access water through a maze of infrastructural pieces stitched together by social connections, political solidarities, and intersecting needs. In the absence of sufficient formal provision, the labour of informal settlement residents creates and maintains many of the pieces of water infrastructure used daily to fill gaps in access. Water lines are extended, shared, split and broken, and wastewater disposal spaces are constructed, each forging routes of access beyond formal provision and yet tying residents to wider systems. Based on a decade of ethnographic work conducted with residents of informal settlements in the Khayelitsha area of Cape Town, this article examines the difficulty of differentiating between formal and informal, legal and illegal, and public and private pieces of water systems. I argue for understanding such material pieces at the edges of water systems as implicit infrastructures, wrought at the intersection of local labour to manage multiple household waters, persistent structural exclusion, and neoliberal reworking of public services. Such a naming requires understanding infrastructural systems for water as both porous and exclusionary, highlighting the ways through which logics of urban resources frame everyday lives as beyond the purview of the state.

KEYWORDS: Water, infrastructure, informal settlements, urban anthropology, South Africa

INTRODUCTION

The parking lot of the Site B shopping centre in Khayelitsha, a suburb set in Cape Town's margins, is a busy multi-use space. In addition to the shops and offices that surround the concrete expanse, tents in would-be parking spaces host informal traders, a depot for shared taxis carves a turn-about from one corner, and a hall with the area's ward council office sits between the lot and a nearby road. In September 2015, a billboard hovered over the middle of the lot, shading a clothing trader working below and marking the site of several businesses in repurposed shipping containers. Funded by the Western Cape Province and presented in isiXhosa – the home language of most of the area's residents – the billboard declared in translation: "99.1% of us now have access to running water. Let's look after our services, for a better future".¹ The image showed four rows of twenty faucets, every faucet filled in with blue except for a lone white icon in the middle of the second row (Figure 1).

There were no clear citations for the sign's statistic, but the number closely resembled findings from the 2011 South African Census for Cape Town as a whole (City of Cape Town, 2012).² The promotion of

¹ The original billboard text, in isiXhosa: *lipesenti ezingama99.1 zabantu bethu zineetephu. Masilondoloze iinkonzo zethu, ukuze sibe nekamva elingcono.*

² In the City of Cape Town's summary publications from this census for data about the entire city, several categories of access to running water were noted; these included piped water within dwellings (which was stated as being accessible to 75% of city households), piped water access inside yards (12.3% of households), access within 200 metres (available to 9.3% of households), and access to piped water located at more than 200 metres (2.7% of households) (City of Cape Town, 2012). These percentage figures add up to 99.3%.

this particular statistic in the middle of Khayelitsha was puzzling, however, as the shopping centre sits across an intersection from one of the suburb's dozens of informal settlements – sites defined by inadequate or entirely absent access to water, sanitation, electricity and other basic services. Indeed, the city's summary of the same census noted that in Khayelitsha only 34.6% of households had piped water inside their dwelling and an additional 27.3% had piped access inside their yard (City of Cape Town, 2013). For the remainder, access was either absent or set at a distance from dwellings, suggesting a high likelihood of the shared taps that characterise informal settlement provision.³

Figure 1. Billboard at Site B Shopping Mall, Khayelitsha.



Source: Author's photo (2015).

The billboard's single metric masked the reality of accessing taps within informality and disguised the complexity of local experiences with water in its many forms and related infrastructures (Ahlers et al., 2014). The billboard posited a single type of water (drinking water) and a single household delivery infrastructure (individual taps). This pairing assumed not only a unilineal resource relationship but also a homogenous delivery experience in which all users, taps and related governance systems easily aligned. This is a vision of 'modern water' (Linton, 2010), paired with a modern infrastructural ideal (Graham and Marvin, 2001). Such archetypes affirm through the billboard a mythical singularity of water as a resource, with attendant governance relationships mediated by centralised systems of distribution and homogenous mechanisms of delivery.

However, waters in informality are not singular and the infrastructures used to manage them infrequently look like the taps on the billboard. In informal settlements near the Site B shopping centre, infrastructural lacunae require residents to do significant daily work to access and manage water; this includes water that is experienced and understood in many forms – as drinking water, wastewater and flood water. Each of these types of household water requires a set of materials and labours to manage,

³ For the remainder of the households in Khayelitsha, the census summary reported that 28.1% had taps within 200 metres of their dwelling, 9.2% had access to taps that were located more than 200 metres from their dwelling, and .8% had no access to piped water at all (City of Cape Town, 2013).

and the resulting infrastructures often sit within a nebulous zone located between categories of formal and systemic pieces and legal and illegal connections.

By its framing, the billboard presented connectivity to water was a part of what made a 'we' of being Capetonian – the "99.1% of us" with access – and called viewers to care for shared infrastructures. The placement in Site B, amid so much absent connectivity, implied an opposite claim: that those who were disconnected were not within the 'us' of access or relations of care. Placed here, the message marked less the inclusion of water systems and, rather, the exclusion of those who remained beyond such linkages. More than 20 years post-apartheid, such exclusions were increasingly concretised within layers of infrastructural violence (Rodgers and O'Neill, 2012). Efforts to measure and prove connectivity fit into a historically deep material politics in which infrastructural linkages have been central to desires for post-apartheid citizenship and provide grounds upon which citizenship's contours are contested (Etzo, 2010; Robins, 2014; von Schnitzler, 2016; McFarlane and Silver, 2017).

Unlike the billboard's claims to singular access and a related 'us'-ness, in this article I ask how water's myriad infrastructural systems and attendant ideas of belonging are navigated by the residents of informal settlements in Khayelitsha who exist at the statistical and geographic margins of the city. I emphasise the necessity of examining everyday access to multiple household waters and to multiple water infrastructures as connected questions. From this, I argue for a category of infrastructure that emerges from daily praxis: basic connections that are unclear in their relation to formal metrics or to systems themselves. This category – that of implicit infrastructure – names a set of linkages born from necessity and crafted by community, but which appear through use and context to be built into wider systems as assumed, potential or nebulous extensions. These connections are implicit because they are necessary parts of the workings of these systems, and yet are not sanctioned pieces of the systems themselves. They exist as the result of a metaphoric wink or a nod from planners, a gap that logically needs filling but must be done by illegal or informal means. Such connections might count in state metrics, like those given on the Site B billboard, and yet they remain materially inadequate and are often framed by the city and in popular discussion as evidence of the illicit nature of daily life within informality. At this juncture – this tenuous placement between formality and informality, legality and illegality, and public-ness and private-ness – material things occupy a potential space of systemic inclusion, even as they define exclusions.

I argue that implicit infrastructures are particularly salient for our understanding of water systems, with the material malleability, environmental ubiquity, and heterogeneity of water crafting less easily bound and more porous systems (Rademacher, 2011; Carse, 2014; Björkman, 2015; Anand, 2017). In their connection to natural processes and more flexible movement, water systems offer a flexible edge through which systems expect extensions and users are able to make change (Ahlers et al., 2014; Kemerink-Seyoum et al., 2019; Silva-Novia Sanchez et al., 2019). Indeed, the necessity for water to have both ingress and egress marks its uniqueness as an urban resource. Although we often academically divide discussions of water access, sanitation management and flooding, I argue for the need to link them into a wider understanding of multiple household waters and their infrastructural realities. This approach reveals the work that residents are forced to do across points of access and categories of services, and it pushes us to rethink how pieces relate to wider systems.

At the core of this article sits a modest premise: that acknowledging a multiplicity of household waters refigures what we see about the ways water is managed within informality. This rethinking highlights the role of self-made infrastructures that sit between individual access and systems, refiguring them as expected and implicit pieces of wider systems instead of unexpected and illicit extensions.

In order to examine how multiple household waters are managed, moved and systematised within informal settlements, I utilise two ethnographic vignettes drawn from a decade of research in Khayelitsha. These are not isolated examples, but rather are representative of the endless spaces of infrastructural labour required within informality. In naming implicit infrastructures, I explore how

individual pieces of water systems occupy nebulous spaces at the edges of formal systems, blurring boundaries and troubling assumptions of what it means to be connected.

BACKGROUND AND METHODS

Making water's infrastructural world

Modern water and its infrastructural control offer tightly linked resource imaginaries. In naming modern water, Linton (2010: 14) argues for the popular, scientific and political prevalence of a conceptualisation that "all waters can be and should be considered apart from their social and ecological relations and reduced to an abstract quantity". In this hydrological singularity and uniformity, modern water is not only heavily managed but also systematised: it is the product and focus of myriad technological and scientific regimes of expertise (Swyngedouw, 2004). This imaginary provides justification for the commodification and privatisation of water as a bound and saleable product, despite the many complications of such processes in practice (Bakker, 2003; McDonald and Ruiters, 2005). Social scientists have argued, in response, for the necessity of exploring water's deeply relational state; they call for it to be seen as a product of the social worlds, materials and spaces through which it flows, and defined by a multiplicity of worlds, waters and states (Strang, 2004; Ballesterio, 2019). As the wider pieces in this special issue contend, to see water as heterogeneous requires us to acknowledge the unending forms that water can take and to imagine and act accordingly. Indeed, naming water's multiplicity and heterogeneity prompts us to consider water's related materials, actions and interactions in markedly new and ever-changing ways.

The hegemonic conceptualisation of a singular, highly regulated and scientifically managed modern water still frames political and technological control of water around much of the globe. In South Africa, water is increasingly a commodified resource, with access heavily framed by the country's expanding reliance on delivery through in-home, prepay meters (McDonald, and Ruiters, 2005). Through metering, the state has quantified a set amount of 'free water' to meet the constitutional declaration of water as a human right; water and its infrastructures, however, remain deeply contentious spaces through which ideas of belonging within the post-apartheid state are negotiated (Dawson, 2010; von Schnitzler, 2016). Infrastructure has long been hyper-politicised in South Africa, from the rent boycotts of the anti-apartheid movement (von Schnitzler, 2016) to the use of human excrement to call attention to inadequate sanitation provision in the so-called 'poo protests' of recent years (McFarlane and Silver, 2017). While lauded internationally for the inclusion of water as a constitutional right, water access, in practice, has been consistently contentious, as communities and residents remove meters in protest, upset installations, and rework lines of connection. This visibility of access to water taps, however, does not often spill over to public scrutiny of the infrastructures for other household waters such as wastewater (other than human waste) or flood water, despite remaining deeply contentious parts of everyday infrastructural experience. Within South Africa's informal settlements, infrastructure is starkly visible and deeply political; it is the grounds upon which community groups, social movements, political parties, and development projects seek to contest persistent exclusions and to build support (Harvey, 2005; Ballard et al., 2006; von Schnitzler, 2013).

Broad ethnographic work on infrastructure looks at processes of enrollment in, or exclusion from, increasingly neoliberal systems of access across the Global South, as well as its implications for our understanding of citizenship, subjectivity and belonging (Anand, 2012; Larkin, 2013; Robins, 2014; von Schnitzler, 2016; Dubbeld, 2017; Appel et al., 2018). Broad, centralised infrastructures name a modern and disappearing ideal of citizenship, one forged through the materiality of links to wider systems (Graham and Marvin, 2001). This connection is so potent that even the time lag of waiting for such infrastructure crafts modes of belonging and state-based identity (Hetherington, 2014; Oldfield and Greyling, 2015; Appel et al., 2018). Infrastructures offer material grounds through which to name and

examine the myriad political relationships and modes of contestation that shape access to public things and public experiences (McDonald, 2016).

Infrastructural systems are often defined by slipperiness; their wavering edges and ambiguous forms are not easily bound or even clearly named (Larkin, 2013; Howe et al., 2016). Systems expand and contract across seasons, with the involvement of varied actors, and through a shifting array of material inputs. While the centrality of a system is often the focus of practical understandings, the edges are places where unexpected uses, forms of hybridity, and changing linkages can be productive to think with (Simone, 2004; Ahlers et al., 2014; Silver, 2014; Simone and Pieterse, 2017). Edges are also framed by the creation of infrastructural systems that have historically left the 'last-mile problem' to be solved by communities themselves (Ashraf et al., 2016). Who is relegated to such margins and how do we variously define the material work that happens within these in-between sites? What might we understand about infrastructural systems when we think from the position of specific material pieces used to manage household waters at the peripheries of formal systems?

The material actions of users can expand and change the edges of systems in small but useful ways, from redirecting the flow of a weir to extending self-made taps. Such actions of "sociotechnical tinkering" with water systems are dynamic spaces through which to understand practice and agency (Kemerink-Seyoum et al., 2019; Silva-Novia Sanchez et al., 2019). Tinkering prompts a re-evaluation not only of the materiality of systems but also of processes of water governance, emphasising the possibilities and actions of individuals within, and adjacent to, infrastructural systems. In beginning an analysis from the position of everyday practices, governance thus becomes a process "always in-the-making and inherently performative" (Kemerink-Seyoum et al., 2019: 2), one that posits the presence of multiple infrastructural worlds and sees the intersection of these worlds as mediated by dispersed, myriad, material actions. The reworking of systems through various extensions, technologies and modes of labour challenges their boundedness. Lawhon et al. (2018) argue for the naming of the resulting networks as heterogeneous infrastructure configurations, or HICs, that – like tinkering – are performative and are rooted in everyday actions and labour that link individual pieces to wider systems. They argue that "thinking through HICs (...) enables a clearer analysis of infrastructural artefacts not as individual objects but as parts of geographically spread socio-technological configurations" (ibid: 722).

This approach fits into wider scholarship that troubles the divide between formal and informal systems and spaces (Roy, 2009; McFarlane and Weibel, 2012). As Ahlers et al. (2014) argue, a conceptual approach that includes water delivery forms beyond the formality/informality dichotomy allows for the examination of systemic co-production, one that is "tense and riddled with power asymmetries and political aspirations, thereby producing uneven and highly contested water service provisioning" (Ahlers et al., 2014: 2). Seeing infrastructural systems as heterogeneous embraces the practices of actors that may work towards disparate ends, material pieces of systems that might hold conflicting understandings, and the agency of water users that is not wholly limited by the state. It also pushes us towards seeing the multiplicity of resources themselves, like water.

Water in its ubiquity, its slipperiness, and its easy movement between natural and built systems, provides a unique platform upon which to discuss the difficulty of bounding infrastructural systems and the ways in which such systems build into their workings the dynamics of the resources they carry (Rademacher, 2011; Carse, 2014; Anand, 2017).

Methods

This article draws upon data collected between 2010 and 2019, in the course of 22 months of ethnographic research completed by the author in Cape Town. Participant observation was conducted within the homes and public spaces of several informal settlements in Khayelitsha, and with community-based organisations and social movements working to expand access to basic services, including within offices, at events, and during community meetings. Data here focuses on semi-structured interviews

about access to basic services and participation in local organisations; interviews with 86 residents of three proximate informal settlements were conducted in 2013 and 2014, and follow-up interviews were conducted with key informants in 2015, 2017 and 2019. Infrastructural walking tours also took place within these and other informal settlements. Qualitative data and ethnographic information used in this article is drawn from representative responses of community members and from observational patterns.

ETHNOGRAPHIES OF IMPLICIT INFRASTRUCTURES

Khayelitsha's extended lines and dry taps

In early 2014, I spent a significant amount of time trying to understand a single water tap. I was baffled both by the sociopolitics of its use and by its material provenance. Over the course of a few days, the tap was described to me both as a formal piece of city-provided infrastructure and as an informal connection crafted by site residents. This particular tap was located in an informal settlement in Khayelitsha consisting of several hundred shacks; it was a densely settled community in which sand paths jogged around the metal edges of thinly-shielded interior spaces. An informal settlement had squatted on this publicly owned piece of land since before the first democratic elections, yet they had very few modes of formal service and had never been relocated.

Located on the edges of Cape Town, the suburb of Khayelitsha extends within a triangle created as the N2 highway meets the curve of False Bay. Designed in the 1980s by planners who intended to house Black African workers outside the apartheid city (Cook, 1992), the suburb consists today of areas of formal neighbourhoods, informal settlements, and a few larger spaces for commercial and government activities such as the Site B shopping centre. Although Black residents make up less than half of the City of Cape Town's population (City of Cape Town, 2017), Khayelitsha remains 98.6% Black (City of Cape Town, 2013). Characteristic of the urban fracture of South African cities that persists post-apartheid (Bank, 2011), Khayelitsha is today incorporated into the City of Cape Town and yet exists at its sociopolitical, geographic and economic margins. A significant portion of the suburb's potentially million-plus residents⁴ live in informal dwellings, either in single shacks set in the backyards of formal houses⁵ or in broad informal settlements, the latter often squatting on public lands such as road reserves or electricity byways. Within Khayelitsha's dozens of informal settlements, residents experience a variety of infrastructural micro-worlds; some sites have legal electricity connections while others wait for decades to get access to standard prepaid electricity boxes. Some sites have shared full-flush toilets, while others are forced to use dehumanising and unhealthy chemical toilets. Some areas have taps at regular intervals, while others leave residents struggling to collect sufficient water from sparsely placed standpipes. At this intersection of inadequate provision and immense need, infrastructure becomes an extremely complex way through which everyday politics are enacted and socialities forged.

The pressures that create inadequate service provision within informal settlements are, at a macroscale, the result of apartheid's violent exclusions of non-white residents from urban spaces and services (Makhulu, 2015); this is compounded by neoliberal processes of splintering networks (Graham and Marvin, 2001) and the post-apartheid embrace of technopolitical control (von Schnitzler, 2016). As urban housing needs exceed provided resources and political will, informal settlements have rapidly expanded (Graham, 2006). This often results in a patchwork of access to wider systems that is crafted through short-term city contracts with temporary service provision, formal but sorely limited city-provided infrastructures, and self-made infrastructural connections.

⁴ Estimates of population for Khayelitsha vary widely, from the approximately 400,000 residents of the 2011 national census count (City of Cape Town, 2013) to academic estimates of more than a million (Brunn and Wilson, 2013).

⁵ Backyarders can also sometimes be set behind other informal dwellings, as demonstrated by Ruth's situation, described in the next section of the paper.

It is the obligation of South African municipalities to provide basic services to informal settlements (ibid). In Cape Town's informal settlements, taps are placed and purportedly maintained by the city, with a stated goal of no more than 25 households sharing a single tap and with a maximum tap distance of 100 metres to each household (City of Cape Town, 2020a). Sanitation is also expected to be provided, and the city sets a goal for toilet provision: a maximum of five households sharing a single toilet, whether that be a temporary, pit or flushing unit (ibid). Similarly visible goals for the provision of wider wastewater management are not often articulated, however, nor are goals for flood water management. This is despite the fact that the city's informal settlements experience significant challenges from drainage – including regular flooding risks – which the city has been largely unprepared to address (Armitage et al., 2010; Musungu et al., 2012).

Managing water in informal settlements often relies as heavily upon social links (Dawson, 2010) as it does on the physical availability of connective materials and related knowledges that help to expand access. Necessities include access to pipes for extending water taps, knowledge of how to split a water line, relationships with neighbours that enable the collective creation of shared sites for wastewater disposal, and places to retreat when flooding threatens. Public taps provided by the city are often split into multiple lines to expand access; shared drains – often hand-dug holes protected by inverted plastic milk crates – are constructed by individual households or by a cluster of residents in order to avoid conflict around the dumping on pathways of wastewater from cooking, laundry, washing or urination. Such everyday practices of expanding provision not only change local access; they also reshape the wider networks with which they interface, blurring understandings of access, system boundedness and connections to the city.

In 2014, the tap that held my attention was one of less than a dozen functioning city taps in this informal settlement and it represented one of the very few modes of formal infrastructural provision. Indeed, most households met water, electricity and sanitation needs through a tapestry of extended and precarious connections. A significant amount of daily labour was required by community members to maintain a semblance of infrastructural provision through largely informal and illegal means. This labour of connection also extended into political work. The robust community organisation then active in the area had campaigned for the expansion of infrastructural access through nearly every means possible: direct action, lobbying, coalitions, development aid, and solidarity from extra-local NGOs and individual activists. As with neighbouring informal settlements, infrastructure here was hyper-politicised. In this site the layers of political work were especially dense, drawing in myriad organisations and activists to ally with local struggles. While the political practices of the community were known more widely in activist circles, the everyday infrastructures that attempted to build service access were less visible beyond Khayelitsha.

The formal water taps in this site were provided by the City of Cape Town, but their usage challenged an easy categorisation as pieces of formal infrastructure. Some taps had run dry, mysteriously disconnected from water distribution and seemingly unable to be fixed. Others had become host to many self-made spur lines, so-called 'pulled lines' or extensions fit in by local plumbers to bring water directly to specific households or to different sections of the site. Pulled lines provided much of the water used within this area; their plastic pipes snaked along and below the sandy substrate and zigzagged around edges of shacks, tracing the narrow, non-linear paths within the site. With an increasing number of pulled lines, the original tap might unreliably splutter forth or drip itself out, its water diverted, and the entire local ecosystem of pipes from a tap might slow as lines expanded. Shared taps – formal city taps and pulled taps alike – often broke, gushing into surrounding homes, pooling outside of the concrete ring drains, and carving trenches through the sand paths between shacks.

The tap that caught my attention in 2014 was used as a primary water source by residents in a sloped corner of the community. My interest was piqued by the variety of ways in which the users with whom I spoke described the tap. To some, this was a city tap to which everyone had a right of use; other residents described the tap as belonging to a particular man and his family – a pulled line thus owned by his

household – and for which use by neighbours was dependent upon the owner's approval. Sometimes access to the tap was framed as overtly political, belonging to one set of residents, or, at other times, controlled by social favour.

The first I heard of the tap was on a summer day in late January. Esihle,⁶ a soft-spoken Xhosa woman in her 30s, told me in an interview that one of her neighbors was a plumber and that he had moved the city tap into his gated yard. When the gate was locked or he was away, nearby residents were forced to walk 50 metres to the next tap; sometimes the man left the gate key with a community leader who lived nearby. Two days later, another woman told a similar story in our interview, but now there were two taps in the area that had been moved into gated yards. The continuity of this explanation of a tap's unexpected movement caught my interest and I started asking other residents about these mobile taps.

Soon afterwards, an activist resident who was positioned near the centre of the community political structure told me another version of this story, one with sufficient specificity to buoy my belief. Tata Menzi, a Xhosa man who had long lived in this site, seemed to know everyone who stayed there and also to know every twist and turn of the site's pulled lines as well as the political contours that guided the movement of both people and pipes. He said that the tap in question had initially been a pulled line extended from a city tap. The new connection was located in a small yard beside the owner's shack, surrounded by a fence and a few prickly bushes. Sometime later, the main city tap it was pulled from stopped working, but the extension remained functional. Menzi said that city workers came to fix the primary tap but realised that a problem had occurred in pipes running underneath a row of shacks, and that addressing the problem would require significant labour. This was determined to be either unfeasible or unlikely.

In Menzi's telling of this story, during the process of investigating the dry tap the city workers and the nearby residents had deemed the extended tap to be the new city tap. This pulled tap – a piece of illegal, informal, self-made infrastructure – thus became enrolled as a part of the formal water system, resulting in myriad interpretations by residents and evoking new socialities and patterns of usage. The truth within this story remained a mystery, but the impact of the tap's nebulous state as in between the realms of formality and informality was poignant, as was the nonchalance with which residents moved between starkly different understandings of this plastic pipe and spigot. For some residents, this pulled line had seamlessly *become* a city tap, made real through the thinking, explanations and everyday experiences of residents.

The difficulty of categorising this single tap prompted me to rethink the categorisations of other taps in the community; if every city tap was split into multiple individual lines and pulled taps could *become* city taps, what pieces of this provision were legal, formal provision, and which were illegal, extended infrastructures? If taps consistently ran dry, as they often did, might the city *expect* that pulled taps would serve as stand-ins for communities struggling with severely inadequate formal provision? If the city workers had the capacity to independently christen a tap and thus reforge it as city infrastructure – or even if residents believed this to be possible – what connections were the result of centralised planning and which were the result of on-the-spot reworkings? As residents often fixed broken city taps, the taps themselves changed materially, slowly becoming assemblages of plastic, metal and piping that had been paid for and maintained by the community. Where do such chimeric taps fit within this complex assortment of formality and informality?

What can we learn by getting to know a single object set within a wider assemblage of materials and uses? As Kaplan (2011: 517) argues in their examination of the uses of drinking fountains and other forms of water delivery, ethnography provides us with the contexts, details and multiplicity for understanding the "everyday entwining of people with (...) technologies". Working from a single tap provides a way to question assumptions about how individual material pieces fit into expected or clear positions within

⁶ All individual names used are pseudonyms.

wider systems. It can trouble the relationship that exists between the users and creators of that piece, or challenge the implications of linking to wider systems, processes of governance, and related ideologies of belonging (Kemerink-Seyoum et al., 2019; Silva-Novia Sanchez et al., 2019). Indeed, if the categories of connectivity and access to water within informality are metrics through which the City of Cape Town purports to exceed national expectations on service delivery (City of Cape Town, 2020a), the definition of this access needs to be articulated. While the municipality states that there is near-universal access to water (ibid), it does little to explain what this looks like on the ground beyond making claims for their success in expanding formal access (City of Cape Town, 2015b); illegal water connections made by communities are, in the meantime, vilified (Mlamba, 2018), and it is left to be assumed that these categories are mutually exclusive. In contrast, naming pulled taps as forms of implicit infrastructure frames them as pieces of wider systems that are designed to do the dual work of deepening exclusion and of requiring household labour to address such exclusions.

In winter 2017 I sat again to talk with Menzi, my colleague and I sinking into the couch in his shack's single room while we conversed over the sound of the television. He knew the inner workings of infrastructure in this community and had himself maintained a web of pulled electricity lines that patched into nearby poles and brought light and energy to dozens of residents denied legal connections. A small new set of spigots had been built around the community by the city in the past few years, and a grey and orange double-headed tap now sat slightly downhill from Menzi's home, not 20 metres from the pulled-tap-become-city-tap (Figure 2). With the new taps built, I asked, are old pulled lines still in use? But of course, Menzi replied, smiling widely and suggesting by his tone that the question held an obvious answer. He confirmed that the fenced tap was still there in his neighbour's yard, guarded by some bushes and used by many residents.

Figure 2. New city tap near Menzi's home.



Source: Photo by Shachaf Polakow, used with permission (2015).

The tap's persistence and the story of its approval by city workers (whether true or not) suggest that the edges of Cape Town's water system are both porous and constantly involved in processes of remaking. The reworking of informal taps into formal pieces of wider systems seemed especially plausible from this peripheral space, where taps mysteriously went dry, city workers were rarely found, and most of the

labour of maintaining connections rested upon residents. Pulled taps seemed to be expected and in practice were at times tolerated by city workers. A resident of a nearby site said to me that city workers sometimes maintained the pulled taps in their area, and some, he claimed, were even on the City of Cape Town's own maps.

Despite how city workers might act in daily interactions with pulled taps, such extensions were readily labelled as illegal and illicit by the City of Cape Town. Residents of informal areas, however, also utilised the terminology of 'illegal' services to describe modes of infrastructural tinkering. As a shifting category, illegality names not merely a set of legal mores, but also a socially and practically defined set of relationships (Heyman and Smart, 1999; Farradás, 2013). To Menzi's and Esihle's community, the need to use illegal and extended infrastructure was a marker of their persistent exclusion from formal systems. They spoke often about being forced to use such links and also of being told that illegal infrastructural and service-related actions were the reason for their continued disconnection from formal systems (Storey, 2020).

Residents using such taps exist in a kind of in-between, a space in which their infrastructural everyday combines self-forged, city-provided, and nebulous structures. For Menzi and his neighbours, the taps within the community's service assemblage were understood in specific, practice-grounded ways. The fenced-in tap was seen by some as a city tap, which meant that access should be open to all, in contrast with other pulled taps, which may be viewed as owned by those who constructed the linkage or paid for their creation. No matter how the taps were created or named, their everyday usage sat in between categories of connectivity that appeared to be so easily defined on the provincial billboard that opened this article. This mode of everyday connectivity suggested a hazy space between clear census categories measuring access to, or distance from, a tap – categories in which a single story of a tap's construction would universally be seen as true.

Milk crates and winter floods

Unlike taps, drainage is not a category of provision positioned at the forefront of the City of Cape Town's service delivery metrics or public relations work. Although the municipality regularly and publicly shames individuals and communities for illegal dumping and for waste disposal in storm drains (City of Cape Town, 2015a, 2020b; Storey, 2020), it rarely discussed alternatives for wastewater disposal within informal settlements, nor did it highlight that drainage is almost never provided as a companion to water access (Armitage et al., 2010). Indeed, dealing with wastewater is a significant aspect of water management that is left to be determined by residents (Justo and Kenney, 2015).

Milk crates are a common sight when walking the pathways within informal settlements in Khayelitsha. Set upside down into the ground, the plastic latticework of a crate's base becomes flush with the surrounding land, often blending visually into the wider landscape. Such crates conceal space – holes that have been dug several feet deep into the sandy substrate. They are created by residents as substitutes for what should be a basic urban infrastructure: drainage and sewerage. Into these sand sinks residents empty laundry and dish water, urine from buckets utilised at night in the absence of adequate sanitation, and other grey water. In summer, the acrid smells emanating from sand sinks make them difficult to miss. With the construction of drainage systems not always being a corollary of the provision of water, many of the available drains are storm drains set along bordering roads. With few other options, these storm drains are heavily utilised for waste disposal and often become blocked with food waste, grease and other trash. Residents often told me that even though absent other options, they had been chastised by municipal officials and workers for the frequent need to clear drains.

With drains often blocked, always limited, and usually far away, residents regularly empty wastewater into the sand, either into constructed sinks or onto the land between shacks, in open space, or near taps. The ground around taps is often flooded, filled by dripping faucets and emptied laundry suds. The assumption that the sand will provide adequate drainage is evidenced by the concrete rings that the City

of Cape Town sometimes builds around shared water taps. Such rings were initially filled with larger rocks atop the sandy substrate, apparently to encourage drainage and keep water from running into paths or homes; in practice, however, such rings fill with sediment, hold stagnant water, and become a site for the depositing of waste (Figure 3).

Figure 3. Dripping city tap with concrete ring for drainage.



Source: Photo by Shachaf Polakow, used with permission (2014).

Sand sinks are self-made infrastructures, dug by hand and whose location is determined through a navigation between social and physical constraints. In an informal settlement a short walk from Menzi's community, I often spent time visiting with Ruth, a quiet, middle-aged Xhosa woman with a sudden laugh and a small vegetable garden outside her shack. To fetch water for cooking, cleaning or watering her plants, she walked to a city tap a few minutes away. She stored the collected water in a plastic tub that sat next to the small gas burners she used for cooking. Her tiny, single-roomed shack was set behind the larger shack of another family, and she shared a very small yard with another backyarder like herself, a preschool teacher. Their wastewater had no logical place to go but into a sand sink that they had constructed themselves inside the yard. At the tap where they accessed water, the sand was often already saturated or pooled. To dump along the road might merit the ire or dismay of those living along it and the many more who traversed it throughout the day. To walk to the nearest storm drain was long and difficult to manage with a full bucket of sudsy water from laundry.

On a sunny afternoon in spring 2015, we sat in Ruth's shack talking infrastructure while a neighbour spoke with my colleague and Ruth checked intermittently on lunch cooking on the burner. Ruth walked the three short metres from her door to the sand sink to pour in water from washing dishes and to demonstrate the necessity for this piece of highly local infrastructure. She leaned slightly forward to use the sand sink and, in that moment, cut a complex and poignant figure of her infrastructural everyday. A mesh of legal and pulled electricity lines crisscrossed overhead and a telltale blue plastic trash bag provided by the city was pegged to the fence behind her. This small yard was host to only the most basic of services and, although devised from only a plastic crate and a short burst of labour, the sink was both as necessary and as expected as the trash bag or the electricity lines. Ruth and her neighbour utilised, required and maintained all of these pieces of their service assemblage themselves (Figure 4).

Figure 4. Milk crate concealing wastewater disposal site in Ruth's yard.



Source: Photo by Shachaf Polakow, used with permission (2015).

Although crafted by residents, sand sinks seemed to be planned into the water systems of informal settlements through a combination of omission and suggestion; the concrete rings around taps suggest that the sand should be used for drainage, the push-back from city workers around wastewater disposal in storm drains makes it obvious that they are not meant for this usage, and the absence of other formal options implies that residents must meet the need for drainage on their own. If sinks are not overtly planned by the city, but function in a field of limited alternatives, their existence seems to be not only a logical extension but even an implicit and integral piece of how people are able to make a life within the absences of long-term informality.

In Ruth's community, the initial residents were moved here by the city to make way for the construction of a building on the site of their former settlement. Resettled here in the 1990s, the community had a more structured and formal appearance than many nearby informal settlements, with linear roads passable by small vehicles, taps set at road intersections, and many residents with legal electricity connections; sanitation provision, however, was very limited. Although residents also needed to provide for their infrastructural everyday, this site had a feel of formal planning that was absent in Menzi's community, despite the latter settlement's presence on their site for a longer period of time. Although some city workers told me that the site of Ruth's community could not be developed into formal houses, many residents said that this was meant to be a place for permanent residence; they thus mobilised and worked through multiple political channels for expanded infrastructural access based upon this understanding of future development possibilities. Ruth's community included branches of local social movements working for expanded access to basic services and rights-based claims, several political parties, and a strong neighbourhood group representing residents to the Ward Councillor.

While drainage may seem a small thing within a space defined by massive infrastructural absences, the sandy substrate of Khayelitsha and the intensity of winter rains (when they arrived) meant that residents in Menzi's and Ruth's communities struggled not only with what to do with daily wastewater but also with how to manage regular flooding. Apparently assuming that the sand would absorb water of all kinds, little work from the city had gone into mitigating the situations in which saturation was reached. Each of the waters that flowed through the communities – wastewater, flood water, tap water – posed

a set of challenges that needed to be met by residents through their own labour and infrastructural creation.

Examining Khayelitsha's material edgework prompts a re-evaluation of the category of connectivity. This power-laden term defines both quality of life and understandings of belonging; it is used not only for metrics within cities but also by non-profits, activist organisations, political parties and international donors alike to weigh the success of democratic processes for improving the quality of life (SJC, 2013; von Schnitzler, 2016). Understanding the lived reality of access to water, and finding ways to quantify this, has critical outcomes for improving health and for deepening scholarship (Jepson et al., 2017). As a proxy for everyday life, however, bureaucratic metrics and their associated documents – such as those on the billboard – are often neoliberal tools that obscure much about the qualitative experience of connection and mask compounding marginalisation and exclusion (Graeber, 2012; Gupta, 2012; Hull, 2012; Hoag, 2014).

In mid-winter 2019, while drinking tea and catching up, Ruth's neighbour pointed out a small area of rough concrete outside her shack that she had poured the year before. It was an attempt to keep the expanding puddles on the unpaved road away from the front room in which we sat. This neighbour had young children who she worried would fall ill from another winter with soggy carpets and damp furniture from the storm-soaked sand. In these frequent moments, the inadequacy and absurdity of needing to use sand sinks came into stark relief; instead of moving wastewater away from the community, such sinks sequester it in ways that solve immediate problems but postpone dealing with the waste itself. In Menzi's community, which also struggled with winter flooding, residents were regularly forced to wade through their own bedrooms during this flooding and would talk of how the waste from self-made disposal sites would circulate back into their homes as water rose. The necessity of providing for one's own daily infrastructural needs posed not only immediate health and safety concerns, but also marked viscerally, materially and bodily the ways in which Ruth, Menzi and their neighbours were set outside of the tangible us-ness of formal, full, homogenous connectivity that the province so blithely displayed on the billboard a short walk away.

To think together about these labours and materials as modes of implicit infrastructure reveals the way in which water management systems force stopgap work upon residents, frequently tolerate its existence, and yet publicly name this work as illicit.

CONCLUSION: TANGLED ASSUMPTIONS AND ACTIONS

Despite the demise of the modern infrastructural ideal, the premise of bounded systems and a resulting implication of belonging remains. Who, then, defines the edge of a system and decides what counts as a potentially illicit extension? The billboard in Site B would ascribe a clear delineation, one symbolised by the filled blue tap of access. Who, though, names that tap? Who builds it? Who maintains it? Where does the wastewater go? Systems for water hold in their networked edges a porousness, malleability and fluidity that calls upon those without connections to do the labour of forging linkages. Such linkages come to define not a clear sense of belonging or connection; rather, they reify the exclusions of systems that require those at edges to do this labour themselves.

If system edges expect extensions, predict porousness and welcome work, then infrastructure itself becomes something new, something implicit; it becomes an invitation, of sorts, to tinker. These vagaries are then a category of connectivity that means something in practice, that does something to ideas of linkages to central bodies, and that reworks dichotomies of formality and informality, legality and illegality.

How do we think productively from such fragments and edges? South African policy shifted in the early 2000s from a focus on providing formal housing with full services, towards *in situ* upgrading which allows for the incremental provision of services to plotted sites and thus works towards fully serviced

housing (Huchzermeyer, 2006); many informal sites, however, languish in the absence of long-term plans. Communities may gain partial service access from the city only to spend years relying on these inadequate formal services and on supplementary informal services. With development plans almost always an unknown to residents, communities spend years waiting for further service provision or for relocation to permanent land; sites where not only permanent services, but also tenure and ownership, are possibilities (Oldfield and Greyling, 2015).⁷ During these years, filling in infrastructural gaps is not an option; rather, it is a requirement for making a site more livable. The resulting sociomaterial assemblages – including those we can name as implicit infrastructures – thus blur the definition of formal infrastructural provision.

For residents of Ruth's and Menzi's communities, as with the millions of other informal settlement residents in Cape Town, everyday reliance upon such extended or makeshift technologies as pulled taps or sand sinks marks unfulfilled promises of post-apartheid resource redistribution. The daily need to use a bucket as a toilet, to draw from illegal electricity connections, or to empty laundry suds into the sand signals the persistence of massive socio-economic inequality and the incomplete transition to full citizenship – a category of belonging that was understood in sociopolitical and material terms during the struggle against apartheid and in the interceding decades (Hart, 2013; von Schnitzler, 2013; Robins, 2014).

Informal technologies often signal spaces of infrastructural violence (Rodgers and O'Neill, 2012) and social abjection (Anand, 2012). They can also indicate ways in which exclusions become enrollments in new forms of belonging, ones that are marked by such omissions, by situated labour, and by the hybridity that is prompted by a position at a system's edge (Kemerink-Seyoum et al., 2019; Silva-Novia Sanchez et al., 2019; Simone and Pieterse, 2017). As scholars have examined the ways in which experiences of waiting for infrastructure produce situated practices of enrollment in the state (Hetherington, 2014; Oldfield and Greyling, 2015), edge practices and implicit infrastructures might also signal unique forms of connection to processes of governance and the materials that craft them. As a modern ideal of fully networked and centralised infrastructural systems – and ideas of modern water as controlled, uniform and compliant (Linton, 2010) – collide with neoliberal provision, massive urbanisation and limited political will, new infrastructural landscapes are emerging across the Global South (Lawhon et al., 2018). Exploring these processes requires an examination of how residents utilise everyday infrastructures and what this says about their connections to the city and state.

The small infrastructural sites outlined in this article are nearly impossible to identify from a distance; they sit in the corners of sandy walkways and in the backyards of shacks. Even when overtly placed, they may be indistinguishable in appearance from the wider landscape of informality. To see them requires not only situatedness within an informal site, but also a perspective that does not think of water in a singular form, one that does not consider drinking water provision as separate from flood water control or wastewater disposal. Highlighting the multiplicity of household waters is a perspective that emerges from everyday life, and one which prompts us to explore waters and infrastructures as necessarily manifold.

Sand sinks and pulled taps are ways of making do in the infrastructural margins, but they are patchwork solutions that ultimately highlight the emptiness of the city's connectivity statistics. No matter how sand sinks or taps are counted in a census or how they are named by residents, they are understood by all to be inadequate, insulting and – ultimately – inescapable. When I asked Menzi in 2017 about the continued use of the reborn city tap, his look spoke volumes: of course it was still in use, of course it was necessary, of course the city had still not built a sufficient number of taps for the thousands of residents who lived on this sliver of sand. The position of these residents in the city was as precarious as ever, with their survival forged primarily by their own material and political work to create connections and manage

⁷ The waiting time for a publicly funded house in Cape Town, based on recent construction rates, is estimated to be about 60 years (Maregele, 2017).

multiple waters. These actions make everyday life more livable, even as they mark residents of informal settlements as outside the us-ness of the post-apartheid city.

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