



Power, politics and a poo pump: Contestation over legitimacy, access and benefits of sanitation technology in Kampala

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Most literature on sanitation largely follows a developmentalist approach, searching for the right combination of public education, appropriate technology, and partnerships across local and international institutions. Such works are useful, but also can be read as demonstrating the limitations of focusing on the modern infrastructural ideal of uniform, networked services. Studies of household experiences and practices of infrastructure in global south cities have increasingly drawn attention to the heterogeneity of sanitation infrastructure, associated everyday practices and power-laden relationships. In this study, we analyse the introduction of the gulper pump (a new sanitation technology in Kampala) and the political processes that have shaped its slow and stochastic uptake. Advocates suggest that the gulper might well redress gaps left by the more commonly used technologies, yet procedural concerns led to conflict over the introduction of the gulper. In a wider context of new governance arrangements and infrastructural experimentation, controversy over the gulper contributed to new institutions and imaginaries of what good urban sanitation entails. We emphasize that thinking through heterogeneous infrastructure configurations highlights how social norms and relations, economic gain as well as the state play an important part in both politicizing and legitimizing more heterogeneous urban sanitation services.

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Introduction

Poor sanitation is amongst the significant causes of water contamination and disease transmission in many cities. While the numbers have been cut significantly since 2000, the World Bank estimated in 2017 that ten per cent of the world's population still practice open sanitation (Kashiwase, 2019). Further, between 60 and 100 per cent of people in low and middle income countries rely on non-networked sanitation solutions (World Bank, 2016). These numbers are highest in Sub-Saharan Africa (SSA), where only 20 per cent of people have access to improved facilities and collection of

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excrement (Roche *et al.*, 2017). The Government of Uganda (GoU, 2014) and the Water and Sanitation Program (WSP, 2012) estimated poor sanitation in the country to have taken up to 230 000 lives annually from illness related to water contamination.

The implications of poor sanitation are particularly acute in urban areas of the global South because of high population densities; this problem is likely to increase as rapid urbanization continues. In Kampala, less than 10 per cent of households are estimated to be connected to the national sewer system. Many households have pit latrines, yet the city's governing body Kampala Capital City Authority (KCCA, 2016) estimated that only 360 of the 900 m³ of sludge produced daily is actually collected. The difficulties with pit emptying are longstanding, and many point to the limited capacity of state septic trucks to provide this service across the city. Yet for a long time, it was not legal for pits to be emptied in any other way. Recently, however, there have been both ongoing technological innovations and a reworking of governance to enable eco-sanitation toilets, bio-fills and in recent years, the gulper.¹ While this has resulted in increased sludge capture, there remain logistical, financial, social and political challenges associated with each of these options.

Faecal sludge management is therefore vital to improving global health and achieving many of the Sustainable Development Goals (Ekane *et al.*, 2014). Sanitation has received attention from scholarly fields such as development studies, health, and sustainability studies. Most of these literature largely follow a technical or development policy approach, searching for the right combination of public education, appropriate technology, and partnerships across local and international institutions. Despite significant global efforts, sanitation often remains overshadowed by other concerns as the stigma of excrement contributes to the limiting of funding, public attention and research (Black & Fawcett, 2008; Jewitt, 2011). This is despite sanitation being 'arguably the single most vital provision in a city, the most important techno-environmental advance in the history of urbanization' (McFarlane, 2018: 1241). Further, while existing scholarship has provided useful insights into the limitations of many ongoing approaches, as well as charting alternative pathways to better sanitation conditions, it typically avoids questions of politics and power (see McFarlane & Silver, 2017; Jewitt *et al.*, 2018). In this context, there remains a need for studies of the social, technical and ecological impacts of sanitation as well as interventions that seek to improve urban sanitation.

We look to wider literature on urban infrastructure in the global South as a lens through which to begin deepening this understanding. Studies of infrastructure in global South cities have increasingly drawn attention to everyday practices and the power-laden relationships that shape them (Truelove, 2011; Neves Alves, 2021). Lawhon *et al.* (2018) advance these accounts by developing the idea of 'heterogeneous infrastructure configurations'. These configurations are comprised of dynamic relationships between and across people, artefacts and the environment. Changes, such as the introduction of new actors, institutions or technologies, reconfigure the already dynamic configurations, reworking both everyday practices and the power relationships that shape them. While we see promise in thinking through heterogeneous infrastructure configurations, this conceptual approach requires further reflection and advancement through situated fieldwork and analysis.

In this study, we examine the gulper pump, a sanitation technology recently introduced to Kampala to remove faecal sludge from pit latrines. We focus on the political processes that shape its slow and stochastic uptake as we investigate the long process through which the gulper appears to become accepted by both the state and

communities. We show some of the political difficulties and opportunities encountered in the introduction of new technologies that do not clearly adhere to the modern infrastructure ideal of universal, uniform, networked infrastructure. Conflict over the introduction of the gulper contributed to an interest in new institutions through which to regulate sanitation. These new institutions represent new modes of governance, but also new imaginaries of what good infrastructure is and ought to be. Our work helps to critically consider the promise of heterogeneity for urban service provision in the shadow of the modern infrastructure ideal, as well as some of the challenges of finding ways to work with diversity in already-heterogeneous, off the grid technologies.

Infrastructure studies beyond the modern infrastructural ideal

Urban and development scholars have contributed to our understanding of the role that infrastructural systems play in shaping and sustaining urban worlds and life (Simone, 2004; Swyngedouw, 2004; Graham & Marvin, 2001; Harrow, 2008) and addressing a range of global challenges including the Sustainable Development Goals (Pieterse *et al.*, 2018). Studies here have included consideration of fraught, power-laden histories: as Graham and Marvin (Graham & Marvin, 2001: 129) argue, 'infrastructure networks in developing cities were outcomes not of smooth, natural processes of innovation and diffusion but of political and economic battles'. The focus on urban infrastructures as critical artefacts in understanding cities has been advanced in Urban Political Ecology (UPE) which has sought to conceptualize the city through the resource flows that circulate across networks (Kaika, 2004; Swyngedouw & Heynen, 2003). In doing so, it has shown the power relations and associated contestations across infrastructure as central to how cities are shaped and experienced. For instance, the work of Swyngedouw (2004) in Guayaquil shows that power relations across formal and informal water networks in the Ecuadorian city are critical to the making of urban inequalities experienced by different communities.

Infrastructure studies, including work in UPE such as Smiley (2020), Arboleda (2015) and Swilling (2011), are often framed through an understanding of these systems drawn from modernist visions of urban planning. These infrastructures were built with the ambition of providing universally available, networked services, providing various essential resources for social reproduction such as water and electricity (Tarr, 1984). Described by Graham and Marvin (2001) as the 'modern infrastructural ideal', this urban experience was not widely shared in the global South, where the technological promises of modernity have largely failed to deliver (Brown, 2014 on sanitation in Kampala; more generally see Nilsson, 2006; Kooy & Bakker, 2008; Anand *et al.*, 2018). This has a series of implications on how researchers have approached infrastructure in the global South. As Jaglin (2014: 22) states, 'The vast majority of existing studies analyse the situation as a failure of the networks, often seen as a consequence of backwardness: the network model remains both an ideal and a goal of public action'. As Monstadt & Schramm (2017) have argued, the dominant mode of urban planning in relation to infrastructure has been built from an understanding of a future in which cities such as Kampala operate a universal, centralized network.

In response to this variegated geography of infrastructure, some studies focused on the South have argued for shifting beyond a linear, teleological notion of the development of infrastructure and refocusing scholarship on the ways that these systems have actually developed (Furlong, 2014; Lawhon *et al.*, 2018). Such work has led to

burgeoning new literature that have sought to understand infrastructure beyond the networked systems of the global North. Scholars have been particularly attentive to the intersectional ways in which urban life is produced and experienced through infrastructure and the inequalities that may come from infrastructure operation (Castán Broto & Neves Alves, 2018). This has included notions of hybridity, highlighting the ways in which urban populations navigate between the formal and informal networks providing service provisions (Furlong, 2014; Jaglin, 2014). Others have proposed thinking about infrastructure as incremental (Silver, 2014) and ever-shifting, 'always-in-the-making' (Baptista, 2019). There are also studies that have advanced our understanding of the ways in which infrastructure is 'peopled', drawing attention to the more than technical ways in which these urban systems are enacted across urban space through a dense network of different actors (Simone, 2004; Doherty, 2017). Notably, urban residents often engage with the technical management, operation and sometimes building of the configuration to ensure vital resource flows. For instance, Anand (2011) highlights the vital role of residents in Mumbai who have to operate as groundwater harvesters and Silver (2015) shows the ways in which residents in Accra develop new forms of socio-technical collaboration in order to secure flows of energy. Collectively, this work has drawn attention to the role of micro-geographies that enable the workings of infrastructure.

The call to take seriously these actually existing configurations opens up new imperatives in how we undertake research on infrastructure, including potentially new concepts, methods and normative approaches. In a recent paper, Lawhon *et al.* (2018) argue for the building on of this wider understanding about heterogeneous infrastructure configurations as dynamic and relationally-constituted (even when they are not 'networked' in a conventional sense). Drawing on wider literature, they argue that interventions are not isolated but interwoven with multi-scalar implications. Such a framing 'enables a clearer analysis of infrastructural artefacts not as individual objects but as parts of geographically spread socio-technological configurations: configurations which involve many different technologies, relations, capacities and operations, entailing different risks and power relationships' (Lawhon *et al.*, 2018: 730). Further, they suggest that while much ongoing work has usefully drawn attention to 'what is there' in Southern contexts, there is a need to work towards analyses that open up possibilities for understanding interventions in already-existing configurations (see Jaglin, 2008; 2014). This includes moving past the search for a single technological artefact that will work for all households and towards the possibility that a range of different options might more adequately provide access to a diversity of residents in heterogeneous places. Given the widespread struggles to access services in Southern cities, we too are interested in understanding how Southern residents might access better sanitation infrastructure.

Here, then, we draw on this framework to ask: what institutional, financial or technological interventions work with, rather than displace, the heterogeneity of already-existing infrastructure? What might redress the very real and widespread concerns about sanitation without resorting to the modern infrastructure ideal in a context where networked flush toilets are, for the near-term future, little more than a dream for most urban residents? If sociotechnical transition studies have elaborated different pathways through which niche technologies displace old regimes (Geels & Schot, 2007; Lawhon & Murphy, 2012), we are interested in how such technologies might contribute to technological *diversity*, co-existing with old regimes rather than displacing them (see Furlong, 2014). Textured understanding and analysis of everyday experiences,

operations and politics is critical in generating knowledge about urban sanitation and the possibilities for 'feasible reform' (Sharada Prasad & Ray, 2019).

In the analysis that follows, we examine the gulper pump, a recently introduced technology in Kampala. Technologies such as the gulper pump have a long history of being referred to as 'alternative technologies', a conceptual frame that arose during the 1970s amongst environmental and development practitioners. While precise definitions have long been elusive (Willoughby, 1990), these are technologies that work against the dominant framing of infrastructure as modernist, industrial, networked and universal. New designs and practices continue to emerge (and are particularly prevalent in Latin America; see also Smith *et al.*, 2014), but social scientists have largely turned away from such questions. Both residents and scholars often denigrate 'alternatives' as racist or pejorative (Fredericks, 2018; Smiley, 2020). Consequently, the modernist infrastructure ideal continues to underpin the aspirations of many states, municipal authorities and critical scholars both for its material and symbolic powers (Mkhize *et al.*, 2017; Anand *et al.*, 2018; del Carmen Morales *et al.*, 2014). Yet as recent social and environmental pressures once again push us to question modernist aspirations across the global North and South, we believe it is important for critical scholars to once again consider the possible role for such technologies (see Nilsson, 2016; Lawhon *et al.*, 2018). Specifically, finding better ways to remove faecal sludge in ways that are socially, politically and ecologically acceptable as well as affordable is essential to urban health across the global South.

In sum, we suggest that research on heterogeneous infrastructure configurations inspires ways of thinking about infrastructure beyond the modern infrastructure ideal. Yet, more detailed studies are needed: we need to better understand how heterogeneity works, including the circumstances under which it might, or might not, contribute to improved and accessible sanitation. We therefore do not ask 'does the gulper work for everyone in Kampala?' (the answer here is clearly 'no'). Instead, we ask who might this technology work for (or be made to better work for), and what service gaps remain that might be redressed through different alternatives. This includes consideration of the myriad of ways in which politics shape the uptake and use of particular technologies (Smith, 2005; Lawhon & Murphy, 2012), particularly those that fall outside the modernist norm (Lawhon *et al.*, 2018; Sseviiri *et al.*, 2020).

Context and methods

In Uganda's capital city, KCCA is responsible for urban governance including over infrastructure. While it must work within a context provided by national regulations, it is the main institution overseeing and enforcing sanitation standards. The authority became statutory in 2011 replacing Kampala City Council (KCC) and, in a rather atypical political configuration, is governed by the national Ministry of Kampala Capital City Authority Affairs. The new KCCA consists of two main wings: the technical wing headed by the Executive Director who is appointed by Uganda's national president and the political wing headed by the Lord Mayor (who is elected by the five divisions of Central, Makindye, Lubaga, Kawempe and Nakawa). Also, each of the five divisions has a KCCA division office to cater for their specific needs. This new arrangement has many supporters, but is equally seen by many as an abrogation of local democracy: while the national government has been dominated by the National Resistance Movement (and continues to be led by President Museveni), Kampala's residents have largely supported opposition political parties (including the Democratic Party) and

elected prominent opposition figures as its mayor (Lambright, 2014; Lindell *et al.*, 2019). While reports suggest that longstanding multi-party politics have negatively affected delivery of urban services in Kampala (Lambright, 2014; see Ekane *et al.*, 2014 specifically on multi-level governance of sanitation in Uganda), our focus in this paper is rather different. Instead, we focus on the political processes involved in reworking the dominant conceptualization of what infrastructure is and ought to be.

This study is part of a research project on heterogeneous waste and sanitation infrastructure configurations in Kampala that has worked in neighbourhoods across the city, aimed at better understanding the diversity of sanitation operations in different spaces. Informed by this wider work, we draw on the following data collected by the first author: i) a 'Follow Along Participant Observation' (McFarlane & Silver, 2017) of 21 households that involved spending two weeks with participants for four hours daily to discuss, move around, record and develop detailed, mobile ethnographic understandings of sanitation practices, ii) participation observation of Gulper operators from two pit emptying companies that was undertaken for two months which involved travelling with them as they undertook daily operations, and iii) in-depth interviews with various stakeholders including households, gulper operators, institutions (e.g. KCCA, Water for People Uganda, NWSC) and community leaders.

Data was collected from September 2017 to May 2018, overlapping with the time that the country's Electoral Commission had declared the holding of an election of Local Council (LC) leaders. These local council leadership teams operate at the most localized scale in Uganda's decentralized political system. Some interviewees reported that this timing shaped the wider context in which the research took place and became a reference point in some interviews, as detailed below.

The politics of introducing the gulper technology

The modern infrastructure ideal is far from realized in Kampala. About 90 per cent of residents depend on onsite sanitation technologies (e.g. pit latrines and septic tanks), resulting in a daily average of 900 m³ of human waste being deposited into onsite technologies (KCCA, 2016). This creates a substantial need for emptying and management of faecal sludge. Some of these tasks were performed by KCCA septic trucks before they were largely phased out and replaced by private trucks in line with neoliberal privatization efforts (see Wiegatz, 2010). Yet many toilets go unemptied for extended periods of time, often overflowing during seasonal rains and are eventually abandoned. Further, less than half of the collected sludge reaches Kampala's two sewerage treatment sites (both of which are operated by the public utility company, National Water and Sanitation Corporation) (World Bank, 2016). Consequently, a considerable amount of raw excrement ends up in the environment (World Bank, 2016). While some aspire to a networked city of flush toilets, and policies such as the National Physical Planning Standards and Guidelines (Ministry of Lands, Housing and Urban Development, 2011) continue to assert the long-term goal of access to formal sewer services, the ongoing reality of ad hoc faecal sludge removal is unlikely to disappear anytime soon.

As complicated as it is for any individual to specifically say, it is unlikely for Kampala to be able to deliver the modern infrastructure ideal of flush toilets connected to sewers any time soon. Further, the supplemental strategy of cesspool emptiers is also unable to fully meet the existing sanitation needs of Kampala's residents. Various international development agencies, NGOs and community groups have introduced new technologies

to redress this challenge. Yet these new technologies continue to be framed largely as temporary measures until full access to flush toilets and sewers is possible.

These new technologies differ substantively from both the networked ideal and state-provided cesspool emptiers. They are heterogeneous both in the variety of technological artefacts introduced and in the actors enrolled into service provision. Specifically, providers of new sanitation technology are neither part of the state nor the informal sector, nor do they consist of large corporations typically associated with the privatization of public services in many cities across the North and South. Instead, sanitation services are intended to be provided by registered small businesses run by entrepreneurs who are expected to compete for customers who pay for their services. Yet this is not a typical 'free market' scenario: there is also an awareness of a need for the state to establish a conducive context for these technologies (and the associated businesses). State actors are therefore increasingly providing support for these new technologies, often by reworking governance arrangements to better accommodate the diversity of infrastructural technologies.

In the following, we examine the introduction of the gulper to Kampala, with an emphasis on the ways in which infrastructural politics continue to be shaped by questions around 'appropriate' technology and who benefits from infrastructure. First, we analyse ongoing struggles to legitimize the gulper in the eyes of the state and users as well as to establish an appropriate regulatory context. Second, we draw attention to how different actors were enabled to participate in and benefit from the use of the gulper. Un(der)employment is prevalent in Kampala: youth unemployment, for example, was estimated by the World Bank in 2008 at 83 per cent. There are notable contestations over who is able to benefit from providing these heterogeneous sanitation services. We also look to ways in which various authorities sought to centralize the service, only to be met by opposition from gulper operators. Finally, we examine how customers were enrolled into the service. Advocates of the gulper had to convince early adopters of the merits of the technology. While this is generally true for those introducing new technologies, we also found that adoption was, at times, allegedly coercive. Local leaders offered financial incentives and were described to have pressurized residents into using the services of gulper operators.

Legitimizing the gulper

The gulper was introduced to Kampala in 2012 by the NGO Water for People (WfP) with support from the German Agency for International Cooperation (GIZ). At this time, KCCA considered the use of the gulper to be unhygienic due to high risks of exposure to excrement, and therefore did not accept the use of this technology by residents in Kampala. Gulper operators in our study discussed their experiences during these early years as highly insecure and talked about how KCCA officials and/or police apprehended them for 'manual emptying'. One gulper operator told us, 'at first KCCA didn't welcome us. I think they perceived this kind of service as not good and they used to run after us now and again together with police'. The NGO had introduced this technology, bypassing and without the support of KCCA or NSWC, raising serious problems for those who developed small businesses with this technology.

When WfP came to realize that KCCA was penalizing gulper operators, it began engaging the state authority. The NGO worked to provide a deeper understanding of the benefits of the technology and developed improved safety gear for the gulper operators. Enforcement against gulper operators changed after WfP's engagements with KCCA. The gulper operator quoted above continued by saying, 'It is hardly two years

since we started working well with KCCA. The good working relation started last year through the assistance of WfP which convinced [KCCA] about the relevance of what we do'. Specifically, KCCA was persuaded that the gulper was particularly well suited to many of the challenges of sludge removal in Kampala. WfP demonstrated that the gulper has the capacity to remove solid waste (i.e. garbage that residents throw into the pit latrines or septic tanks), is accessible because it is portable and can travel through dense, informal settlements that often do not have vehicle-sized roads, and involve lower costs of maintenance than emptying from a cesspool emptier (septic truck). We detail and revisit these assertions and their applicability to the conditions in Kampala below.

The timing of this conflict over the use of the gulper in Kampala was fortuitous for advocates of the technology. Many in the sanitation sector were convinced of the potential of exploring different technologies, but also aware of the complicated legal and sociopolitical context in which this infrastructure service would operate. KCCA was open to exploring alternatives to the modern infrastructural ideal (see Sseviiri *et al.*, 2020 on KCCA's regulation of waste recycling at a similar moment). Partnerships between the state and private providers have existed for a number of decades but had previously not been brought together in a single institution. In 2016, the Kampala Water and Sanitation Forum (KWSF) was formed through a KCCA initiative to coordinate actors from various sectors. The KWSF works through four major thematic areas: Governance, Knowledge, Marketing and Public Health Education and Promotion.

The establishment of the KWSF has enabled the oversight and deployment of heterogeneous technologies that the state alone would not be willing to deploy. We suggest that the reasons for this are twofold. Firstly, the state is unlikely to be the provider of alternative technologies when its policies continue to focus on the provision of flush toilets and sewerage. Additionally, new technologies in Kampala typically come with funding from international organizations: the gulper in particular is funded by the Bill and Melinda Gates Foundation. Yet, as has been true for development projects more generally, the introduction of new technologies with donor funds is not unproblematic.²

In order to create a more conducive context for sustainable businesses, KCCA, WfP and gulper operators work together through KWSF to ensure sustainability without continued external funds for operations. The KWSF sought to provide two notable forms of support. First, gulper operators needed a place to deposit the faecal matter they collected. Initially the Bulogobi sewage treatment plant (to the east of Kampala) was unable to take this material. The sewerage plant was set up according to technical specifications that aligned with the modern infrastructure ideal, with the idea that it would treat materials that arrived through the sewers or septic trucks. GIZ and WfP initially remodelled old cesspool tanks into larger transfer tanks that would be mounted to a vehicle to transport sludge. Operators of the gulper were instructed not to directly transport the sludge to the treatment plant and would also have to pay USD 1.20 for every 200 L barrel of sludge they transferred into the transfer tank. Eventually costs arising from the use of transfer tanks surpassed those paid at the treatment plants. For example, to transfer 1000 L of sludge into the transfer tank, operators would have to pay USD 6 while unloading 15 000 L at the treatment plant costs only USD 2. This resulted in strong but indirect resistance against transfer tanks: the operators started hiring or acquiring medium sized trucks which were used to load and transport the barrels of sludge.

Given the existing sanitation situation in Kampala, the KWSF intervened and urged the sewerage treatment plant to open up to more heterogeneous flows and cater for dumping by barrels. This resulted in a reworking of modernist technologies and operations to enable more diverse technologies and a shift towards more open configuration. Permits were also given to members of the Gulper Association of Kampala (GAK) Ltd to transport sludge through the city (they were previously not permitted to do so), and remodeled transfer tanks were no longer used as part of gulper operations.³ In our opinion, this reworking of infrastructural flows to accept multiple ways of moving sludge beyond the sewer network, encourages and supports new imaginaries of what infrastructure is and ought to be.

A second point that the KWSF sought to clarify was the arrangement between funding agencies and proprietors of gulper operating businesses. One of the two gulper operators whom we interviewed in this study indicated that Bill and Melinda Gates Foundation (BMGF) was actively seeking to directly engage with his business outside the KWSF arrangement. He claimed, 'they approached me, but I am careful not to get confused. They have taken me for trainings in Asia, but the problem is the gender balance conditions they set for me'. Specifically, he explained, the funder wanted him to hire women to operate the gulper. Yet as a labour intensive technology (given longstanding cultural practices that suggest this labour ought to be done by men) this was seen as an unachievable and inappropriate request. Such arrangements bring to question the manner in which all partners of the KWSF are to benefit from the operations, adjustments and improvements around this technology. They also speak to the uniformed conditions that are often times set by funders to finance projects in sub-Saharan African cities—conditions that raise complex questions around the meaning of multi-cultural justice.

Operators and their recruitment process

We interviewed two main groups of gulper operators. The first group (and the majority of gulper operators) were private entrepreneurs directly recruited by WfP. Our findings suggest that these operators had been introduced to the organization through friends who worked with WfP and were then trained in the gulping business. However, not all of those trained continued in the pit emptying business; some sold the equipment on to others, who became current operators of gulper technology.

While these operators had the benefit of training from the NGO, the relationship between WfP and operators had grown distant in recent years. Misunderstandings arose regarding the repayment of equipment provided to gulper operators by WfP. Additionally, controversy arose around prices that stemmed from WfP and KCCA intervention in particular localities. Despite emptying prices fixed by the (GAK) Ltd at USD 5–8 per 200 L barrel/emptying tank (depending on whether or not the pit chamber was built with brick/cement), in Kibuye where WfP set out its own sanitation store, services were provided at USD 5.50. The consequence was that households could not agree to spend an extra USD 1–3 to meet the fixed prices for private operators. While the operators chose to withdraw from rendering their services in the area, WfP could not sufficiently provide such service on its own. We are unsure if these two scenarios are related but they disclose how actors continually emphasize their role by taking advantage of what is at their disposal. Mistrust was also evident when companies initially declined to participate in this study, questioning if the researchers were sent by WfP.

The second group comprised of youths recruited by Local Council (LC) leaders in their communities, usually village (LC1) or parish (LC2) chairpersons, to join the pit emptying business using gulper technology. One LC chairperson elaborated:

WfP told me to look for youths and I did. They are children⁴ born in this area and WfP took them for training. They were taught how to operate the technology and they are equipped with the health basics. There are two systems we reach out to them. I went to our community radio called Bipiira FM and I announced, the youth came and I briefed them about what the job was. Those who picked interest stayed and I forwarded them to WfP for training.

The other one was that there are people in our community who have emptying experience but do it the illegal way of scooping and drain into channels. So I include them into the target and advise them to abandon the practice because KCCA might arrest them and talk them into training and adopting better emptying technologies, learning about what is legal and healthy and some of them listen . . . in fact they are working.

The involvement of LC leaders in part was to enable the youths to embrace a technology that would not expose them to health risks or the possibility of being arrested for manually scooping excrement. It was also a call to youths to harness business and livelihood potentials in the sanitation sector. These youths were then sent to WfP for training in gulper technology. Predominantly though, local community leaders were engaged by WfP because they were familiar with social structures and the mode of social and other service provisioning in their communities including manual emptying and its operators. These LC leaders were often born in the settlement and/or had spent long periods of time in the area (often more than 30 years). The LC leaders and Village Health Team (VHT) members had more often than not referred to manual emptiers as 'children of the community' during interviews.

Sanitation was being politicized by urban communities through social and leadership structures in which open conflict was not evident but highlighted as a potential outcome. The recruitment of youths to operate the gulper technology and therefore gain employment was contingent on the continued support by the families of those who worked for the LC leaders during elections. The threat of reporting these workers to KCCA remained an option that was open to an aggrieved chairperson who felt they were not being supported.

Recruiting youths for recognized emptying technologies resulted in three achievements. First, the 'children' gained some legitimacy in pit emptying operations even without evidence of training from WfP. Second, the leaders were also intentional about securing their positions in the elections from both the children and their families which at the time of data collection were due to take place in ten months. Finally, even after elections, there was a consolidated relationship in the community between the leaders and the children's families by eliminating the upper hand of the state which was after manual emptiers in Kampala.

Introducing the gulper technology to users

The introduction and adoption of the gulper has been an inherently political process: this has not been an 'open market' situation where customers could freely make choices between various workable options. New technologies require early adopters and promoters to demonstrate viability and convince other consumers to be willing to try the new technology. While the message conveyed by the WfP and KCCA was that the gulper is affordable, can access hard-to-reach settlements through common narrow

roads, and can remove solid waste, our findings suggest that the benefits are not entirely straightforward.

Employing the gulper, for example, is more costly than using a cesspool emptier truck. The benefit of the gulper is its flexibility: customization helps to break down costs which other technologies cannot provide. In a context whereby achieving significant household savings is often difficult, gulper operators can remove small amounts of sludge rather than emptying a whole pit at once. For example, a gulper operator might charge USD 5–7 per 200 L barrel of sludge from a toilet while it may cost USD 50–100 for a septic emptier to fully empty a pit which contains often times 1000 L or more of waste.

The accessibility of the gulper is also considered one of its merits in informal settlements where roads are often narrow—preventing trucks from accessing many homes. Gulper operators operate on foot or, at times, with motorcycles, a common mode of transportation in Kampala. But gulper operators are not the only ones adapting technology to such settlements: operators of cesspool emptiers have also found ways of modifying their technology to increase its accessibility. They have been known to join multiple hosepipes that would enable emptying of facilities further from roads. This implies that they can compete fairly well with gulpers when it comes to rendering services in dense settlements.

Interestingly, one of the main benefits for the adoption of the gulper in Kampala is related to ongoing changes in a different infrastructure: solid waste removal. The ability of the gulper to remove solid waste from pit latrines emerged as the major benefit of the gulper when compared to other sanitation options. Several households interviewed during our fieldwork said that they dump their garbage into pit latrines. This is due to a lack of operating solid waste infrastructures and the new city ordinance that requires households to pay for garbage collection services. At times, it is easiest for households to resort to dumping the rubbish in pit latrines as payment for removal of sludge is reportedly typically cheaper than removal of solid waste.

Promoters of the gulper technology introduced it into communities in various ways. The most common method used by the gulper operators is the ‘door-to-door’ sanitation marketing technique in which they randomly approach households informing each of them about pit emptying services in the community using this technology. Social networks therefore, became the major means through which users recommend and spread information about the new technology. At the neighbourhood level the trend was for neighbours who had emptied their facilities to recommend the technology to those they knew needed pit emptying service. In Bwaise settlements, where gulper operators did not use local leaders but instead more directly sought customers, community members admitted to having used the gulper technology but refused to name the companies or individuals who rendered the services. This was presumably out of fear that the researcher might report their usage to KCCA (despite the researchers’ assurances of confidentiality). Even though this technology is now largely recognized and accepted as legitimate by KCCA (and neither gulper operators nor users reported experiencing problems from the authority), there remain questions in the minds of many respondents as to whether the gulper really is an acceptable technology in the eyes of the state. This is because while its operations are similar to manual emptying, the early failings of WfP to consult the state, we suggest, continue to impact overall perceptions of the gulper.

In many cases, the support of local leadership such as LC leaders, Village Health Team members and Health Inspectors from KCCA is central (similar to what we

described above with the recruitment of gulper operators). In Kibuye where the use of this technology was initiated by WfP's engagement with the local council leadership (particularly the chairpersons), community members look to the LC leader as the custodian of the technology. Interviewees observed that people doubted the legality of this technology and were therefore afraid that they might be fined by KCCA if they used the service. Using local leaders to champion the gulper was a way of building confidence about the technology as their emptying choice would then be vested in the authority of the local council chairperson. This often removed or reduced fear of punishment for hiring a gulper operator.

LC leaders were also influential because they would identify individuals whose facilities required emptying. They could use their influence both by highlighting the advantages of the gulper or suggesting that KCCA would lock or tear down their pit latrines if they were not emptied. In such cases, the community member's 'choice' on whether or not to use the gulper service was minimal. Importantly, chairpersons were often motivated to encourage the use of the gulper through financial incentives: gulper operators expressed that they give a minimum of USD 0.30 commission on every barrel to whoever helps them acquire customers.⁵ Thus, although the information given by the chairperson was true, there is a sense that the motivation for proposing the use of the gulper is the commission rather than genuine belief in the merits of the technology itself.

In response to the overarching difficulty with generating interest, demonstrating legitimacy and connecting customers with service providers, KCCA experimented with a centralized sanitation system to enable residents to reach gulper operators quickly and efficiently. The system is part of the KCCA Call Centre, has its own desk operator at the KCCA headquarters, and is supported by a GIS based system that runs nine hours a day, five working days a week. Gulper operators are given mobile phones which are GPS enabled, meaning that KCCA can monitor and keep track of operators' locations in case they are needed. The monitoring is also done to aid accountability, including checking whether gulper operators are dumping excrement at designated sites and also for clients to give feedback concerning the service rendered.

The system of tracking is, we suggest, increasingly opposed by operators. The operators and KCCA officials we interviewed reported that the mobile phones given by KCCA were often 'lost' (including many reports of phones being dropped into the latrines), but neither KCCA nor the operators replaced them. Reading between the lines, we interpreted these 'lost phones' as indirect protest by operators who do not want to be tracked by state authority.

Conclusion

Infrastructure studies, particularly in the global South (Harrow, 2008; Lawhon *et al.*, 2018; Simone, 2004), have increasingly shown the limitations of the modern infrastructure ideal as an analytical lens and as a socio-political goal. Yet the ideal remains powerful as an underlying objective in the planning of infrastructure, and critical means of assessing development efforts. We are also sympathetic to a reluctance to let go of this ideal: the idea of flushing toilets connected to sewers across the city is surely a compelling story even if it is an implausible practice in many places.

The failure to deliver on this 'model of the networked city' (Monstadt & Schramm, 2017) points us towards a need to understand inequalities not just as the corporate, privatized splintering identified by Graham and Marvin (2001), nor simply

as those with or without modernist infrastructure. As this paper has demonstrated, there is a need for research and analytical approaches that enable scholars to examine actual existing conditions in cities such as Kampala and imagine beyond them. Focusing on these conditions makes visible the heterogeneous (Jaglin, 2014), hybrid (Furlong, 2014) and incremental (Silver, 2014) infrastructure in operation. It also means considering the possibility that, in cities like Kampala, universal access might be provided by a non-uniform plethora of technologies, none of which is satisfactory on its own. In effect, there is a need to think beyond the quest for universal, uniform modernist infrastructure without letting go of the ambition of safe, universal and affordable services in sectors such as sanitation.

In Kampala, various local, national and international actors work towards a more organized and regulated strategy for exploring technologies beyond the grid. This includes the creation of the Kampala Water and Sewerage Forum and various activities that seek to guide residents and entrepreneurs through the political, environmental and economic benefits of technologies like the gulper. While the initial introduction of the gulper to Kampala was rife with conflict between the state and users, KCCA is increasingly working to develop a regulatory context that will enable operators and residents to make use of the gulper and other technological options. The efforts of KCCA and the KWSF includes working with local governance actors, reworking material processes such as opening up the sewerage treatment plant to non-grid sources of faecal sludge and attempting to set up a data-intensive centralized system for managing gulper operations. Yet this new arrangement is not without conflict: many gulper operators are reportedly resistant to codification, many users remain skeptical, and some local leaders are reportedly profiting from unduly pressuring residents to use gulper services.

Our argument here is, therefore, not that heterogeneous infrastructure configurations somehow obviate power or are inherently more just and environmentally beneficial. Nor is it that the gulper is well-suited to all residents, sites and situations. We however see possibilities in exploring technologies that work with the already-existing infrastructures, lives, values and economics of global South urban residents. Again, this is not a search for 'the' single socio-technological solution, but a question of what technologies might work for whom, where and under what conditions. Doing so requires considering initiatives that are dis/replacing the modern infrastructure ideal, including what, whether and how and for whom they might provide just and sustainable infrastructure. We have provided an initial inquiry here into ongoing struggles in Kampala, but know that many more such studies are needed before we can answer such questions.

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Endnotes

- 1 The gulper was developed by the London School of Hygiene and Tropical Medicine as an alternative technology. As summarized by the development NGO WaterAid (2009), 'The Gulper is basically a hand pump that fits on top of a permanent pipe rising out of a latrine pit'. The pump uses complementary items such as a hook, barrel and tricycles or small trucks to remove faecal

- sludge; the handle is raised and lowered and, with the help of valves in the pipe, the waste is lifted out of the nozzle and into a container. This sludge is then ideally taken to a sewage treatment site. Young men typically operate the gulper and manage the transit of sludge, often as an entrepreneurial activity and supported, at least initially, by an international development organization.
- 2 Lwasa and Owens (2018) emphasize that many infrastructural projects in Kampala fail to continue when funding stops. In Kampala, state support for the eco-san toilet (a urine diversion toilet) ceased at the end of the Kawempe Urban Poor Sanitation Improvement Project (AfDB, 2012; Carlesen, *et al.*, 2008) and so was the case with the 'Vacuutag' of NWSC. Whether the gulper will follow the same trend remains unclear.
 - 3 The transfer tank was left for use during the periodic 'Weyonje' sanitation campaigns in which KCCA and partners help low income settlements to access emptying services at much discounted rates such as those offered during the Kampala Sanitation week.
 - 4 The choice of the word 'children' reflects the relationship that has developed over years between local leaders and the families of these manual emptiers; these youth are often between the ages of 18–30.
 - 5 These payments usually go to health scouts and chairpersons although the amount is subject to negotiation, especially for local leaders.

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