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The Illusion of the Container Based Sanitation Solution: Lessons from Khayelitsha, South Africa

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ABSTRACT: Container Based Sanitation (CBS) is seen, by some, as a sustainable sanitation 'solution' for informal settlements. Presented as a cost-effective form of improved, safely managed, affordable, and water-saving sanitation, proponents argue that it not only enhances safety for vulnerable groups, but that it can also be funded through innovative market and circular economy solutions. The City of Cape Town (CoCT) provides CBS on a large scale to informal settlements for free. Yet residents are notoriously unhappy with CBS. This paper is based on two years of fieldwork in BM Section, Khayelitsha, Cape Town, which included transect walks, participant observation, engagement with community leaders and civil society activists, and in-depth interviews with 42 respondents including BM Section residents, City of Cape Town officials, and private sector contractors. The paper applies the concept of infrastructural citizenship to examine the provision of Portable Flush Toilets (PFTs), a form of CBS, in Khayelitsha. Our data reveals conflicted views in relation to the (non)adoption of CBS, which are deeply entwined with frustration at the unmet promises of the post-apartheid state. At face value, CBS in Cape Town is an acceptable and successful form of sanitation for informal settlements. However, this paper suggests that this is an illusion. Our case study reveals that PFTs are experienced as neither a dignified nor a sustainable sanitation solution. This paper shifts the debate surrounding the adequacy and nature of sanitation provision in informal settlements, from focusing on material technological systems to the complexity of sanitation-related infrastructural citizenship.

KEYWORDS: Sanitation, Container-Based Sanitation (CBS), Portable Flush Toilets (PFTs), informal settlement, infrastructural citizenship, infrastructural violence, off-grid, Cape Town, South Africa

INTRODUCTION

Basic, safely managed sanitation is a fundamental human right and central to human dignity according to the United Nations General Assembly (UN, 2010). Sustainable Development Goal (SDG) 6.2 aims to "achieve access to adequate and equitable sanitation and hygiene for all, end open defecation, and paying special attention to the needs of women and girls and those in vulnerable situations". Yet there are still billions of people without access to basic sanitation. In 2017, the WHO and UNICEF's Joint Monitoring Programme (JMP) for Water Supply, Sanitation and Hygiene indicated that "the world is off track for SDG WASH targets", and that 2.2 billion urban residents (or 29% of the entire global population) do not use safely managed sanitation services (WHO/UNICEF, 2019). They further indicated that over 60% of urban dwellers in sub-Saharan Africa are poor and reside in unserved, informal settlements (Sinharoy et al., 2019).

Rapid urbanisation compounds the challenge of achieving adequate and equitable sanitation for all. As low-income migrants move into cities, often settling on the margins of the city and in informal settlements – or slums – services such as sewerage sanitation (if they exist at all) become overburdened. While there is "international agreement that bad sanitation is degrading, disagreeable and unhealthy", there is "widespread disagreement, however, over what should be done" to remedy this problem (McGranahan, 2015: 242). In contexts where there are large, unsewered populations, low-cost alternatives are assumed to be critical to universal provision. The JMP notes that if there is to be progress towards achieving sanitation for all by 2030, there is a need for "a quadrupling of current rates of progress in safely managed drinking water, safely managed sanitation, and basic hygiene services" (WHO/UNICEF, 2019).

Container-Based Sanitation (CBS) is one form of off-grid sanitation service, framed by proponents as an "effective solution to answer an urgent need" for safely managed sanitation (Couder and Kibuthu, 2020: 77) or "an alternative sanitation option" for areas that do not have sewers (Russel et al., 2019). It is viewed as one of the forms of sanitation that can support implementation of city-wide inclusive sanitation (CWIS) (Gambrill et al., 2020). CBS is defined as "a non-sewered sanitation strategy, through which excreta is captured in sealable containers and transported to semi-centralised facilities for treatment, requiring limited in-home infrastructure" (VanRiper et al., 2022: 1-2). Current examples of CBS are being piloted, by municipalities as in the case of Cape Town but more commonly by non-state actors such as Sanergy in Nairobi, Sanima (formerly X-Runner) in Lima, and Soil in Cap-Haitien (Russel et al., 2019).

Underpinning this championing of CBS is an assumption that capital investment, institutional capability, water, and energy supplies needed for an on-grid sewerage sanitation system are (potentially) impossible in many informal settlements (Haller et al., 2007; Hutton, 2008; Massoud et al., 2009 cited in Russel et al., 2019). The construction of sewers in informal settlements may also legitimise their occupation of the land and thus, for some, negate property laws (McFarlane, 2008; Meeks, 2018). Therefore, in the short term, there is a need to increase the use of off-grid technologies such as CBS, if SDG target 6.2 is to be achieved (Mara and Evans, 2018).

CBS advocates are often attracted by a green, market-based narrative which sits behind the promotion of CBS as one of a "portfolio of solutions" to the sanitation crisis (World Bank, 2019). In this view, CBS is a low-capital investment and a rapid answer to open defecation and the exposure of vulnerable people to the risks of shared group facilities. CBS reduces both water demand and potentially carbon emissions through the recycling of faecal waste (Ryals and Silver, 2013; Andersson, 2016; Muller, 2018; Paustian et al., 2016 cited in Russel et al., 2019). Some NGOs (particularly Sanergy) also go as far as to claim that CBS is a "leapfrog innovation" and an "effective" sanitation for people without sewers (Couder and Kibuthu, 2020: 77). Such claims about CBS construct a success story narrative that can negate such complexities as those explored by this paper in the context of BM Section in Cape Town.

The scaling-up of CBS is thus often presented as an obvious intervention for addressing off-grid residents' sanitation needs. Yet, despite heavy aid-funded investment and capitalist philanthropy promotion, a rapid scaling-up of CBS has not been in evidence over the last decade. Proponents cite a lack of investors and regulatory support from state actors as a key challenge (Russel et al., 2019; Couder and Kibuthu, 2020). However, there is also growing evidence that the reasons are more fundamentally rooted in inflated claims over the market sustainability of faecal waste processing (Mallory et al., 2020); a lack of contextual understanding of political economy and service governance (Mallory et al., 2022); and in assumptions about what is good (or good enough) for the poor (Medem, 2021).

This paper explores the question of whether CBS offers a 'solution' to the sanitation challenge in the BM Section informal settlement in Khayelitsha, Cape Town, South Africa. It is an important case study, as CBS is provided at scale and at no cost to users. Unlike most examples of CBS provision, in Cape Town, the municipality provides tens of thousands of private and shared CBS units alongside shared sewerage

sanitation to all informal settlements, overcoming the lack of regulatory support from state actors experienced elsewhere. About 20% of the city of Cape Town's 1.4 million households are in informal settlements (City of Cape Town, 2021). According to the city of Cape Town:

Close to 36% of informal-settlement households are estimated to have access to full-flush toilets at a maximum ratio of five households to one toilet. 88.61% of households in informal settlements with [sic] toilets at a ratio of 1: 5 through different types of sanitation typologies and 11.36 % of households have 1: 1 ratio in the form of Portable Flush Toilets (City of Cape Town, 2022).

All sanitation in informal settlements is freely provided. Yet, even as a free, state-supported service at the point of use, residents are notoriously unhappy with CBS in Cape Town. We draw on the concept of infrastructural citizenship (Lemanski, 2019) to analyse both citizens' experiences and attitudes and the city's approach in the provision (planning, delivery, and maintenance) of Portable Flush Toilets (PFTs) in BM Section in Khayelitsha. Our findings are based on two years of data collection with users and non-users of PFTs in BM Section, officials from the city of Cape Town (CoCT), contracted service providers, and civil society organisations. The paper has four main sections. We start by outlining the concepts of infrastructural citizenship and infrastructural violence, which provide an analytical framing. We then detail the multi-level qualitative methodology used in our data collection. This enables us to present a rich and nuanced description of the dynamics of PFT provision in Khayelitsha and, more broadly, as a strategy of the CoCT. We then discuss how these dynamics can be understood through concepts of infrastructural citizenship and infrastructural violence (Rodgers and O'Neill, 2012). Finally, we conclude that such an analysis suggests that in a highly unequal city like Cape Town, PFTs, a form CBS, are actually little more than an illusion of a solution to sanitation inequality for informal settlements.

INFRASTRUCTURAL CITIZENSHIP AND CBS IN INFORMAL SETTLEMENTS

Infrastructural citizenship is a broad concept for "analysing how citizens and the state mediate their relationship – in terms of expectations, perceptions and actions – through public infrastructure" (Lemanski, 2019: 1). Infrastructure is therefore "more than just the physical manifestation of the city or the material means through which the urban is able to function" but is "also inherently social in the way it is both produced and used" (Lemanski, 2019: 11). Drawing on Star (1999), Lemanski highlights that the conceptualisation of infrastructure as purely technical obscures the fact that its design is "embedded in humans and their relationships" (p. 11). It is also not a neutral concept, as infrastructure "is a tool of social power that can extend and perpetuate inequality" (p. 11; also see Rodgers and O'Neill, 2012).

Citizenship as a concept is essentially about citizen-state relations. Isin (2009) defines it as an "institution of domination and empowerment that governs who citizens (insiders), subjects (strangers, outsiders) and abjects (aliens) are and how these actors are to govern themselves and each other in a given body politic" (p. 371). On the one hand, citizens have rights and privileges, as well as duties to the state while on the other, the state is supposed to use its various capacities to fulfil citizenship rights (Hadenius, 2001). In the concept of infrastructural citizenship, citizenship is deployed in a non-prescriptive way to retain "a potentially more egalitarian perspective that does not privilege the rights of citizens over the rights of the state, while also recognising the responsibilities of both groups" (Lemanski, 2020a: 2). For Lemanski (2020a: 1),

citizenship is embodied in infrastructure for both citizens and the state. For citizens, the state is materially and visibly represented through every day (in)access to public infrastructure, while the state imagines and plans for citizens through infrastructure provision and maintenance.

This view is somewhat echoed by Wafer (2019: 65), who highlights that urban dwellers clamour for the "state institutions to be increasingly present in the lives of political subjects... as gatekeeper of substantive material benefit, usually in the form of infrastructure provision". Drawing from the likes of

Isin and Nielsen (2008) and Staeheli et al. (2012), Lemanski (2020a: 3) highlights that citizenship is about "the everyday activities and encounters between state and society, in which both agents demonstrate their rights and responsibilities". For Lemanski (2020a), "the provision (or absence of) water, sanitation, electricity, solid waste management and housing, provides the material representation of their civic relationship to the state" (p. 9). Context and history matter to this relationship. The apartheid state in South Africa limited citizenship through segregation and physical removals of non-citizens, while the post-apartheid government has attempted to use the provision of infrastructure to broaden citizenship (McFarlane and Silver, 2017; Lemanski, 2018; Lemanski, 2020b). Infrastructure (non-) provision and the ways in which citizens access and think of infrastructure "[change] the nature and texture of the city in both material and political forms" (Lemanski, 2019a: 9).

The way that the apartheid South African state used infrastructure to segregate citizens can also be explained through the concept of infrastructural violence (Rodgers and O'Neill, 2012). Infrastructural violence refers to human suffering or harm that "occurs when residents are (...) excluded from essential infrastructures such as water or sanitation services by acts of displacement or inadequate infrastructure provisioning" (Kumar et al., 2021: 2). Rodgers and O'Neill (2012: 402) propose the concept of infrastructural violence to analyse the "assumptions built into the design of infrastructure and the social consequences of its day-to-day (mal)functioning". Our analysis also builds on the work of Millington and Scheba (2021), who show how infrastructural violence moved from being active under apartheid to passive in the post-apartheid era.

In our case study, we explore the negotiation and contestation of infrastructural citizenship through an examination of the provision of PFTs in BM Section. The CoCT sees itself as conferring infrastructural citizenship through the provision of a practical sanitation solution, but many residents see PFTs as undignified and representative of the post-apartheid state's broken promises. This reveals the underlying factors that inform both the state's planning and provision of infrastructure on one hand and citizens' access to and attitudes about infrastructure on the other. We further use the concept of infrastructural violence to explore the servicing and delivery of PFTs in relation to citizens' expectations.

METHODOLOGY

This paper draws on a multi-level qualitative investigation that is primarily based on interviews and observation. It forms part of a broader, international collaborative research project using mixed methods. The first and second author each have over ten years of experience working in informal settlements in Cape Town. For our analysis in this paper, we conducted a case study of BM Section, Khayelitsha, Cape Town. BM Section is an informal settlement in one of Cape Town's largest and predominantly Black townships, Khayelitsha. The township itself was established on the outskirts of Cape Town in the 1980s for Black Africans as part of the segregated planning of Cape Town under apartheid laws. While it was initially established as a formal area, over time it grew into a mixture of formal and informal housing. BM Section is one of the informal settlements that emerged in the early 1990s when residents from Khayelitsha and other areas occupied an empty piece of land. According to the city of Cape Town's basic services asset register, obtained by the authors, BM sits on 32.42 hectares and has 4093 residential structures and a population of 13,671 people. Some of our respondents were among the first residents of the informal settlement when there were no services like water and sanitation. Like most informal settlements in South Africa, it is still regarded as an illegal settlement and thus, BM Section residents lack the security of land tenure. Their insecure tenure results in limited investment from the residents and the CoCT, which affects the provision of services such as sanitation (Groenewald et al., 2013).

The data for this paper is primarily drawn from two rounds of interviews with a total of 42 respondents. The first round, conducted in 2021, consisted of 20 (13 PFT users and 7 non-PFT users) respondents. These were randomly selected from an initial list of 250 potential participants who were

identified, through researcher networks, as potential participants in an Open Data Kit (ODK) survey.¹ In our second round of interviews, conducted in 2023, we interviewed 13 respondents (7 PFT users and 6 non-users). These were purposefully sampled from 100 ODK survey participants, using their demographic data. The first round focused on political economy, while the second focused on intersectional vulnerabilities and the provision of CBS in BM Section. The first and second authors, alongside students who assisted with transcription and translation where required, conducted in-depth interviews focused on the pattern of urbanisation, looking at when and how the BM informal settlement developed, how informants had settled there, and how they used basic services, including water and sanitation. We investigated respondents' reasons for adopting or not adopting for PFTs and asked questions on the governance of sanitation (i.e., who makes decisions and how they are made) regarding sanitation and PFTs in BM Section. Lastly, the interviews focused on the experiences of using PFTs or other sanitation facilities in BM Section. The interviews were conducted in the homes of the informants to enable the research team to also observe the location and state of the PFTs. Interviews were conducted in isiXhosa and English, depending on the preference of the respondent. All informants were anonymised and have been allocated pseudonyms in this paper.

To get a full understanding of the PFT service chain, the authors also interviewed seven CoCT officials in the Informal Settlement Basic Services (ISBS) unit and two staff members of a private company contracted by the City to service PFTs in BM Section, as well as leaders of civil society organisations campaigning for decent sanitation in Cape Town. Three officials were interviewed more than once over the two-year period. Interviewing these four groups (BM residents, city of Cape Town officials, the representatives of the contractor, and civil society activists) allowed us to triangulate our data. Our deep case-specific analysis needed a manageable sample size. However, saturation was also another determinant; it was reached with the selected respondents and there was no need to interview more. Saturation, a point where no new data is emerging, is one of the key determinants for the number of respondents (sample size) in a qualitative study such as ours (Hennink and Kaiser, 2022).

Alongside interviews, the first author conducted four observational site visits and the second author conducted three. We also undertook three half-day transect walks through BM Section, with community leaders, focusing on sanitation provision in the settlement. The third author participated in one of these. This paper also draws from both grey and published literature on sanitation in South Africa and across different regions of the world. We obtained ethics approval from the University of the Western Cape Human and Social Sciences Research Ethics Committee for all fieldwork. We also obtained research approval from the city of Cape Town to interview city officials and gain access to materials that are relevant to our study but are not publicly available.

As a single case study, our research has inherent limitations, such as providing little basis for the generalisation of our results. However, given the contextual nature of sanitation problems to which CBS is potentially one of the solutions, the case study approach is useful in highlighting lessons for practitioners and scholars. Another limitation is that we did not track servicing over time; the provider (the city of Cape Town) changes contractors every three years and this could possibly change servicing-related perceptions about PFTs. At the time of writing, we were also not able to include data from the ODK survey done as part of our broader research project.

¹ This research is part of a broader study that includes a year-long ODK survey with 100 participants, 50 PFT users and 50 non-PFT users in BM Section.

Figure 1. Map of BM Section (inside the red border) showing the density and location of full flush toilets (blue), container toilets (green), and chemical toilets (red).



Source: City Official 1, (2023).

RESULTS

CBS provision in Cape Town

The CoCT's approach to sanitation is informed by South African legislation and the policies of the post-apartheid state, which frame sanitation as a right for all citizens. The South African Constitution (No. 108 of 1996) and legislation such as the Water Services Act (1997) and National Sanitation Policy (2016) obligates local authorities, such as municipalities like Cape Town, to provide basic services such as water, sanitation, and refuse collection in informal settlements. The legislation was informed by the post-apartheid government's initiatives to provide sanitation to previously deprived populations, thus broadening (infrastructural) citizenship (see Dugard, 2016; Lemanski, 2018; 2020b). Indeed, the percentage of households with improved sanitation facilities in South Africa – whether flush toilets

connected to a public sewer system or a septic tank, or a pit toilet with a ventilation pipe – increased from 61.7% to 83% between 2002 and 2018 (Statistics South Africa, 2019).

It is estimated that more than seven million citizens of South Africa live in informal settlements and backyard shacks, some without running water, sanitation, or electricity (Sobantu et al., 2019). The post-apartheid government's goal to provide housing with adequate sanitation was outpaced by rapid urbanisation, prompting the government to introduce other policies such as the Free Basic Sanitation policy (FBSan) to fully-subsidise basic water and sanitation services for the poor (Huchzermeyer, 2006). Other policies such as the Upgrading of Informal Settlement Programme (UISP) have also seen the national government provide funding to municipalities to upgrade informal settlements, providing security of tenure and access to services.

The CoCT provides free basic water and sanitation services to residents in all informal settlements with a target ratio of one shared toilet to a maximum of five households and one tap to 25 households within a maximum walking distance of 200 metres (City of Cape Town, n.d.). About 36% of Cape Town residents living in informal settlements have access to full flush toilets in communal blocks, while the rest are catered for through chemical toilets, container toilets, and PFTs. When a new informal settlement emerges, the first sanitation option considered by the CoCT is a full flush toilet system. However, installation of full flush systems, shared or otherwise, is made difficult by many factors, including land ownership disputes, settlement density, and topographical and financial resource constraints. In these instances, the CoCT installs one of the CBS technologies. Where it is feasible to provide full flush toilets, it provides shared facilities. As a senior city official explained:

Full flush toilets will always be our preferred technology (...) it's what people aspire to; it's what you and I would prefer to use as opposed to a container. But the challenges are that a lot of informal settlements are located on land that is not owned by the city, and the city is bound by the Municipal Finance Management Act, which clearly states that we're not allowed to expend capital funds or permanent infrastructure on land that is not owned by the city. So, that immediately excludes those settlements from being provided with flushing toilets. In a lot of instances, the settlement is far too dense for us to provide flushing toilets because there is no space to excavate (...) sewer mains within the informal settlement (City Official 1, 2021).

It is important to note that PFTs are the only truly private-access sanitation technology provided by the CoCT. All other options are either shared or public. Only 11.36% of informal settlement households have a 1:1 ratio in the form of PFTs (City of Cape Town, 2022). The city provides nearly 26,000 PFTs across all informal settlements. However, the number of PFTs barely meets the ever-rising levels of demand for safely managed sanitation in informal settlements. The CoCT cannot provide more PFTs, as it is constrained by financial resources. It is only able to provide 1000 additional PFT units per quarter to the whole of Cape Town (City Official 3, 2021). The next subsection delves deeper into the types of toilets provided to residents in BM Section, the rationale for their provision, and how users and non-users experience them.

PFTs and infrastructural citizenship in BM Section

The CoCT provides four types of free sanitation in BM Section (see Table 1): (1) communal full flush (sewer) toilets connected to the city's grid, situated in many single concrete cubicles and two ablution blocks (with attached bathrooms and a laundry area); (2) shared chemical toilets (similar to a 'festival toilet'); (3) shared container toilets (shared container-based toilets with a detachable 200-litre tank) and (4) PFTs, the only form of private CBS.

Table 1. Sanitation technologies in BM Section, ideal ratio of users, servicing frequency, and provision of superstructure for user interface.

Type of toilet	Number in BM & user ratio (per household)	Servicing interval	Serviced by	Superstructure provided	Private or shared
Portable flush toilet (PFT)	930 (1: 1)	3 times/week (sealed and transported)	Private company hired by CoCT	No	Private (household)
Chemical toilet	30 (1: 5)	3 times/week (vacuum emptying)	Private company hired by CoCT	Yes	Shared
Container toilet	228 (1: 5)	3 times/week (sealed and transported)	Private company hired by CoCT	Yes	Shared
Sewer toilets	680 (1: 5)	Daily	CoCT contract workers	Yes	Shared

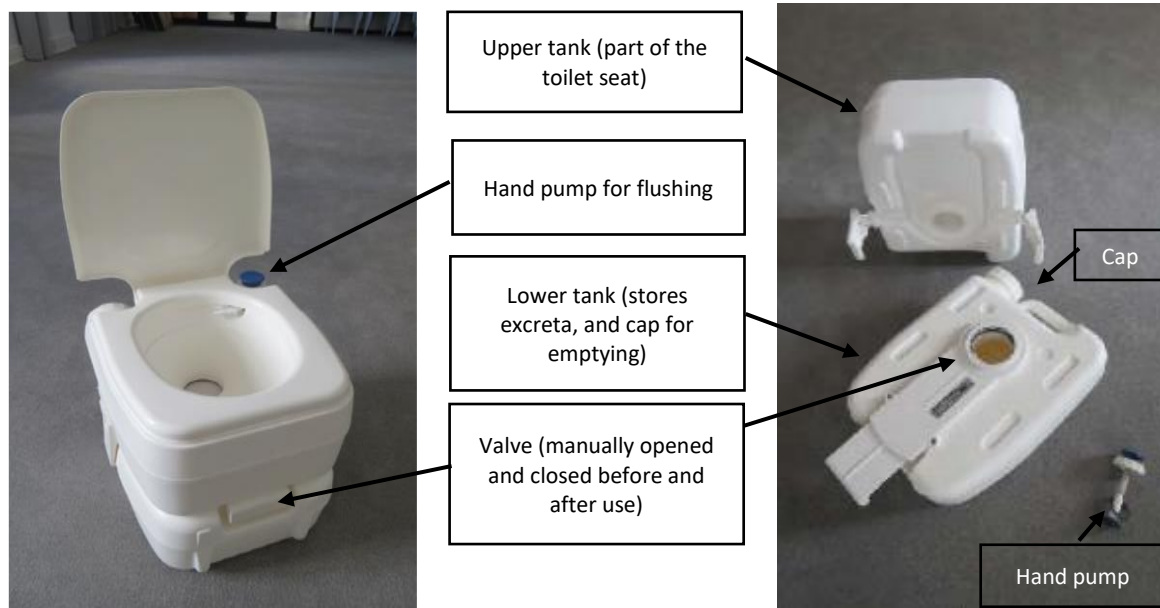
Source of data: City Official 1 (2023).

Full flush toilets are connected to the city's sewer system. These are housed in single concrete panel cubicles or brick-and-mortar structures within the informal settlement. Full flush toilets are cleaned and maintained by city workers under a program known as the Expanded Public Works Program (EPWP). Container toilets are a shared type of CBS with a 200-litre tank that holds human waste. This type of toilet is housed in concrete panel units. The tank is detached, transported, emptied, and cleaned at Borchers Quarry Wastewater Treatment works. Chemical toilets are shared toilets with a non-detachable tank that is cleaned by a honey-sucker (vacuum truck). They are housed in single plastic cubicles placed at level ground. PFTs are made up of three parts: a top tank that holds water for flushing, a toilet seat combined with the top tank, and a lower tank that holds human waste. Waste is flushed into the lower tank, which is then detached, transported, emptied, and cleaned (see Figure 2). Data obtained from the city shows that 930 of these are provided to almost a quarter of the households in BM Section informal settlement. All CBS toilets typologies in BM Section are serviced by private companies hired by the city on three-yearly fixed-term contracts.

BM Section is composed of shacks constructed with corrugated iron, close together and in irregular clusters. There are no roads in between them, just narrow sandy pathways. PFTs are issued to households, and their detachable waste containment cartridges are carried to the nearest road three times per week to be transported for emptying into the CoCT's Borchers Quarry Wastewater Treatment Works, cleaned, and returned to users. The CoCT initiates the distribution of PFTs as an additional type of sanitation to close gaps where the numbers of shared existing sanitation facilities do not match the 1: 5 ratio in relation to the population size in a settlement.

[When] there is an informal settlement, and the city has provided full flush toilets but it does not meet the minimum requirements of one toilet servicing five families, it might be one toilet servicing more than five families, maybe seven, ten families, etc. And the reason why the standard ratio is not made 1: 5 is that there may not be sufficient space within the informal settlement to install more toilets or access to construct more toilets. So, at this point the City Environmental Health Department would recommend that we provide alternative sanitation technologies, which should be portable flush toilets or containers or the chemical toilets, depending on the technical assessment by the project manager if it is possible or not (City Official 2, 2021).

Figure 2. Left: Portable flush toilet (PFT). Right: components of a PFT.



Source: GreenCape, n.d.

Even when the 1: 5 ratio is met, the city may still distribute PFTs if there is demand and capacity to do so. There is a high demand for individual household PFTs in BM Section and other informal settlements, to the extent that the city often overruns its annual allocation of 2700 units by 30% (City Official 3, 2021). According to some community leaders, hundreds of residents in BM Section are still waiting for theirs. Residents can request a PFT through their ward councillor or other local leaders such as street committee members. While CoCT staff told us that demand for PFTs is relatively high, the city only distributes them once there is widespread acceptance by a community and its leaders. Such an approach is deemed necessary to prevent vandalism and secures the private contractor's access to the community to distribute, service, and maintain PFTs.

In informal settlements like BM Section, the process to distribute PFTs began after residents' protests and sustained campaigns by movements such as the Social Justice Coalition against a lack of safe and dignified sanitation (Dube, 2022). However, at first, "the approach was top down, the project manager would decide that I would install the service, but (...) now, communities, you must engage them, show them why you can't install the other [types of toilets], why are you giving them these [CBS]" (City Official 4, 2021). The same official noted that the residents "normally don't want any other type of toilet but the flush toilet" but "the project manager would tend to push for the container toilet because it is the cheaper option" (City Official 4, October 21, 2021). However, container toilets are said by informal settlement residents to be the least preferred typology (City Official 1, 2021; City Official 4, 2021).

PFTs: The least worst CBS solution

PFTs offer three sets of advantages over shared off-grid sanitation: improved access and convenience, greater security, and improved privacy and control. First, the provisioning of PFTs increases access to sanitation. While Phila, for instance, would prefer to use a full-flush toilet, the shared full-flush toilets were about a 3-5-minute walk from his shack. "I do not use them; they are too far. I would soil myself before getting there" (Phila, 2021). Many female informants shared that PFTs were convenient for those with children, who could not walk long distances to the nearest shared facilities or were unable to navigate the dirt in the shared facilities. Even where shared toilets are accessible in terms of distance, there may still be access problems, as some residents lock individual units to restrict access to others

they deem unhygienic. When shared toilets (aside from an ablution block) are built or brought into a settlement, the CoCT locks each stand-alone toilet (i.e.; chemical toilet, container toilet, or full-flush toilet) and then gives keys to five households. However, an informant from the city's ISBS observed that "they know that they need to share, but you know people, they will say no, I don't feel my neighbour is tidy so it's unhygienic whenever they use the toilet, and then they change the padlock" (City Official 4, 2021). The portability of PFTs was also highlighted by some informants as making them convenient to manage in the often-small yards and crowded shacks. Portability is important in a context where residents do not own the land they live on and may be hesitant to invest in their own sanitation facilities.

Second, PFTs reduce safety concerns, particularly for women. Using communal toilets in BM Section poses safety concerns for users, especially at night (see Muanda et al., 2020). Several respondents relayed stories of crime occurring at night when going to use a toilet and of theft in the shared ablution block. An elderly PFT user (Zonke, 2021) shared his experience of being robbed while using one of the toilets in the ablution block:

I [got robbed while] I was sitting inside the toilet. Two robbers came in, one carrying a gun and one with a knife. I heard a sound of the gun being cocked. I was wearing shorts, it was in the middle of the night, and I had a running tummy. So, toilet doors have a gap at the bottom, that's where I saw the gun. They took my phone. From then I decided that I should request for a temporary toilet [PFT], not only for me but also for the children, [so that] when we have stomach problems at night [we can use it]. The temporary toilet is very helpful because it's not easy to go to the toilets at night. So that's how we got the temporary toilet.

Thousands of sexual assaults against women going to and from shared toilets have also been reported in Khayelitsha in the past (Totaro, 2016). Some residents therefore adopt PFTs as a safely accessible sanitation solution. The city officials who were interviewed for this research also highlighted that vulnerable groups like women, the elderly, and children preferred PFTs because they could avoid using unsafe shared facilities.

Thirdly, respondents explained that PFTs afforded them privacy and control. For instance, one of the informants said that privacy is uncertain in the ablution block in BM Section: "In that toilet, a man can get in and find a woman using the toilet (...) and the opposite happens too. It's not good" (Khula, 2021, BM Section). While there is a division between toilets for males and those for females, some users just look for an operational and clean toilet regardless of its allocation by sex. PFTs, however, are used by a single family and each user is afforded some privacy. Some informants also pointed out that PFTs gave them control over their sanitation facility. By contrast, "a toilet used by everyone ends up with problems" (Ntando, 2021). For example, in some instances the practice of residents locking shared sanitation units prevents access by the contractors who clean the toilets, which can lead to poor maintenance of shared toilets. For many but certainly not all residents, PFTs are thus preferred to other types of off-grid toilets.

PFTs: The problems with the least worst option

Whilst our results suggest that the household PFT is considered by many (mostly female) residents as the best of a set of temporary and inadequate options, there remain some significant problems with it as a household sanitation system. These centre on the need for space to house PFTs and concerns with servicing and maintenance (and accountability for this) from the CoCT.

PFTs are relatively small as a form of CBS sanitation provision, but they still require a dedicated space inside or near the user's home. Most residents in BM Section live in small, single-room homes built close to one another and located in congested areas. Colloquially known as 'shacks', they are built from corrugated iron held in place by wooden frames, with small cut-outs for windows and a door. Shacks differ in size, but none of the respondents had space for an internal bathroom. If kept inside the shack, the PFT was most often in the bedroom area. Most of the respondents had built a small wooden structure outside their home to house the PFT. Some "used to have a porta potty in the house because back then it would not smell because of the chemical, but now sometimes it does not have a chemical, so we then

decided to build a structure for it outside", said Buhle, one of our respondents. Building a structure outside one's shack, however, requires space, which many residents do not have.

In some of the homes we visited, we observed that the PFTs were situated in ways that either compromised privacy for the user or were intrusive for neighbours. PFT users improvise with their space; for instance, one told us that "two of my neighbours do not have space, so we all use the same porta potty (PFT), and we only have one space" (Zintle, 2021). The need for extra space was cited by several informants as their reason for not adopting PFTs. Khula, for instance, shared that "my challenge is that I do not have space to keep it (...). The full flush toilets are a better option because with the PFT you have to keep the toilet there with you" (Khula, 2021). Unlike the other participants, though, he was specific that he had space for a seweried toilet, his ideal type, but not for a PFT. Khula's views point to the importance of personal choice when it comes to one's sanitation. He also links the housing problem to the sanitation challenge when he says, "I do not know why the area (BM Section) is not being built up. It is the same with the issue of toilets; they are built far from us, down that side, in the bush". From this view, it is apparent that a non-seweried type of sanitation is not acceptable to those who believe the city should be providing seweried sanitation.

The maintenance and servicing of PFTs is also an ongoing challenge for both users and non-users of PFTs. In BM Section, full PFT cartridges are placed on the roadside for transportation to the City's Borchers Quarry Wastewater Treatment Works for emptying and cleaning, in theory three to four times a week. Empty cartridges are delivered in the same way after cleaning. Among many challenges highlighted in our interviews are that the cartridges get stolen from the roadside, then are destroyed and sold as plastic scrap to recycling companies. Sometimes they are also seized and burnt during protests (City Official 3, 2021). Officials from the company servicing PFTs complained that there was little they could do, as collection points were not guarded or enclosed (Zenzo and Pat, 2022).

Several respondents complained that the handling of cartridges results in leakages of human waste, which leaves a foul smell and dirt on the tarmac. Bonga, for instance, said, "They (PFTs) leak and produce a foul smell. Imagine now it's hot, and what happens when a PFT is used by many people? (...) [Also] the dampness of the area increases maggots and flies" (Bonga, 2021). City officials also confirmed they had received complaints about the same problem (various interviews with city officials and users). Users further complained about leakages inside their shacks and cartridges being returned without caps. Users also get a different cartridge each time they are serviced. Some respondents told us that they fear that exchanging cartridges might spread diseases. Many non-PFT users cited what they perceived as poor cleaning and handling of cartridges as one of the reasons for not adopting them.

This last may seem a counterintuitive finding, as non-users would not have directly experienced the servicing of PFTs. Yet, the experiences – supposedly shared by users with other residents, as well as being spread by observation, such as the 'foul smell' and 'spills of human waste' at the collection points in BM Section – affect both users and non-users. Users' concerns are, however, centred on their lack of trust in the servicing schedule, which may force them to keep their full cartridges in their shacks or to improvise and empty them in drains or nearby open spaces. The perception of such prospects, which they felt would not only be unhygienic but a cause of discomfort to other residents, was enough to deter some residents from adopting PFTs. Some respondents informed us about instances of tension between non-users and PFT users, revolving around the smell from leakages and spills when PFTs are taken to collection points. An extreme case is that shared by Sinda (2021), where non-users complained about collection points being too close to their homes. She said,

It is really sad; you know sometimes we struggle with putting our porta potty on the road for collection because the M Section [a formally settlement area nearby] complain about the smell, as the porta potties will be near their houses. Because of such things, I have a lot of enemies. (...) Those porta potties are closed, and they do not stay there for long before they are collected, but those people don't want them.

In some cases, the shared perceptions implied the existence of a hygiene and dignity-related stigma against those who use PFTs. One example of this was what Nathi shared about her husband not using a PFT. "He does not use it. I think he doesn't have a problem [with it per se], but other people are going to say, 'You are sitting on this thing. You're using this thing'", she said. This shows that using a PFT is seen as shameful and undignified among some men.

Some of the residents who had adopted PFTs felt that the service that they were promised by the CoCT was not what they got. As one PFT user noted, some PFTs "are not in a good condition (...) but we are forced to continue using it, as we don't have a choice" (Ntando, 2021). Our research shows that there is variation in the quality of servicing depending on the private company contracted by the city to service PFTs. Although private companies service PFTs, when there are problems, residents are left with a perception that the city is not accountable for sanitation concerns. The city officials we interviewed conceded that the ISBS's monitoring of contractors was limited to ensuring that the hired companies had made the trips to the sites they serviced and were paid for work done. The city did not have enough staff to systematically monitor the quality of services rendered. It responded to direct complaints from PFT users, some communicated through public representatives, and was sometimes prompted by protests or queries from the media concerning incidents or patterns of poor servicing of PFTs (and other forms of sanitation) (City Official 4 and 5, 2021). The media regularly covers sanitation and other service delivery issues and events such as protests and community meetings in Cape Town's informal settlements. Residents and activists also utilise the media coverage to highlight challenges and call on the city to resolve problems (Notywala, 2016; Damba-Hendrik, 2022; Ntseku, 2022).

The contested political economy of CBS

Providing PFTs to residents of informal settlements in Cape Town comes with a host of governance challenges, from the point of view of both the COCT and residents. From the perspective of the COCT, the roll-out process of PFTs starts with problems of identifying legitimate leaders to facilitate the delivery of PFTs in each community – more so in instances where there are divisions. An official who facilitates the PFT roll-out process in BM Section and other informal settlements in Khayelitsha told us of situations where city officials had to halt the roll-out process midway after being threatened and chased by residents who felt that they had been left out of work opportunities linked to servicing PFTs (City Official 3, 2021). The private contractors who service PFTs must hire residents to clean and collect PFTs from the neighbourhoods where PFTs are provided. These casual workers are drawn from lists of community members who voluntarily register as job seekers under the City's Expanded Public Works Program (EPWP). These employees are called 'pullers' and they must live in the neighbourhood they service. Such a practice presumably guarantees both local knowledge and safety for the 'pullers' in settlements such as BM Section. EPWP workers are, however, paid low wages, resulting in high turnover. In any event, an EPWP worker is only a temporary position, for up to eighteen months, although several respondents stated EPWP staff were changed every six months. This also means that private companies servicing PFTs must employ and supervise casual workers who are not their direct employees and whom they have little say in choosing. The companies have limited control over staff; they cannot incentivise, discipline, or change certain conditions of work, as these are the city's EPWP workers.

Stakes are high, and protest can ensue if the PFT roll-out interferes with the informal settlement's labour market. There are many formal and informal institutions that compete for control in informal settlements such as BM Section. From our interviews with city officials, it is clear that the process of identifying legitimate community leaders to work with is a delicate one (City Official 2, 2021). Gatekeepers will try to maintain control of labour opportunities. In many instances, competing local leaders threaten not only the success of the roll-out process but the safety of the city officials responsible for the roll out and the safety of contractors hired to manage the servicing of PFTs (City Official 3, 2021).

The provision of PFTs is funded from public finances, i.e. grants from national government and revenue raised by the CoCT. The city has budgetary constraints which affect the scaling-up of PFTs and improved servicing. It has already put a cap on the number of PFTs to be distributed annually. "We have been distributing more than 3000 PFTs annually since 2014" (City Official 5, 2021). From the perspective of the CoCT, PFTs are not the most cost-effective form of sanitation; they are more expensive than other off-grid solutions. An ISBS official pointed out that this is because they "are provided per household. So, in effect for the same size of settlement, we would have five times more portable flush toilets in the settlement that need servicing than containerised toilets" (City Official 1, 2021). Among the range of off-grid solutions, the most expensive type is the chemical toilet, for the servicing of which the CoCT hires and pays private companies. The least expensive off-grid sanitation types are the ones shared by many households and owned by the city. However, City Official 1 shared that "sewered toilets are the most cost-effective type, because they've got a high capital component, but once installed, the operational costs are relatively low, or a lot lower compared to the other technologies" (City Official 1, 2021).

Civil society actors such as the Social Justice Coalition (SJC) and International Budget Partnership (IBP) have also concluded that off-grid sanitation options are more expensive than sewerred sanitation (IBP and SJC, 2016). Interpreting their cost model for sanitation upgrades in informal settlements over a ten-year period, SJC and IBP conclude that "the full-flush (sewer) toilet solution is substantially more affordable than any of the other toilet solutions". PFTs, on the other hand, "provided on a 1: 1 household ratio, are the most expensive option" (p. xi). However, the metrics of comparison for affordability need closer scrutiny, as studies elsewhere have shown CBS to be substantially more cost-effective than sewers and, in some cases, even other off-grid solutions (Delaire et al., 2020; EY, 2020). As noted previously, land tenure and settlement patterns are the major constraint against the provision of full flush toilets to individual households in informal settlements in Cape Town (Mels et al., 2009).

PFTs are also described as being similar to apartheid bucket toilets. Several of our respondents directly highlighted the links between PFTs and the apartheid 'bucket system'. Users, non-users, community leaders, and CoCT officials are in unison in the view that CBS is only a marginal improvement over the apartheid bucket system: "People don't like it because they say it looks more like your bucket system, which is a swear word. So, the communities hate [it]. They don't really like containers because of that comparison" (City Official 4, 2021). Another official said, "It's a historic thing as well that the government has always promised to eradicate buckets, and then people are seeing us now providing "buckets" still, so they don't like that" (City Official 2, 2021). Beyond BM Section, Khayelitsha more broadly has been a site of contestation over the provision of PFTs. In 2013 when PFTs were still relatively new, protesters from some informal settlements in Khayelitsha emptied human waste in public buildings and roads to protest the provision of PFTs, which they argued were not any better than buckets (Robins, 2014; Jackson and Robins, 2018).

The provision of PFTs has also been, in the past, described by the South African Communist Party (SACP) as the Democratic Alliance's (DA) "abhorrent and inhumane (...) subject[ion of] residents of poor Coloured and African communities to portable toilets which are no different to bucket system toilets" (Xaba, 2013). Such protests, led by African National Congress (ANC)-affiliated activists, were dismissed by the city and provincial government (both DA-led) as being sponsored by the ANC for political reasons rather than being genuine protests against PFTs (IOL News, August 6, 2013; Zille, 2013). While the politicisation of sanitation provision is primarily steeped in the history of Cape Town and South Africa, it also highlights a governance challenge relating to the political rivalry between the ANC, which runs the national government, and the DA, which governs the CoCT. That rivalry affects PFT provision and adoption in BM Section, and indeed in the City of Cape Town more broadly. "Party A members see the PFT as a party B toilet", said one of the city officials (City Official 3, 2021). City Official 3 also shared that consequently, the CoCT officials "have to wait on a request, because in some areas it's seen as a political toilet (...) some councillors don't want PFTs in their areas; that is also a political thing that is hanging there". Some protests against PFTs in parts of Khayelitsha in 2013 were said to have been led by ANC

activists and meant to force the DA-led city to provide full flush toilets (IOL News, August 6, 2013). This seems to reduce the rejection of PFTs to a mere manifestation of the enduring political rivalry between the DA and the ANC in the Western Cape and Cape Town (also see McFarlane and Silver, 2017). However, our findings show that, beyond such political rivalry, residents' attitudes towards PFTs are also informed by their experiences using the toilets and expectations from the post-apartheid state. We discuss these findings in the next section.

DISCUSSION

The city's provision of CBS is part of South Africa's broader post-apartheid vision to confer infrastructural citizenship rights and dignity on previously excluded informal settlement residents. However, the experiences and perceptions of PFTs shared by residents in BM Section show that PFTs potentially perpetuate indignity and limit users' realisation of infrastructural citizenship rights. This section of the paper shows how PFTs are a limited and temporary form of infrastructural citizenship, bordering on infrastructural violence in Cape Town. It also highlights the clashes in the imagination of citizenship between the city and residents, emanating from everyday engagement through sanitation infrastructure in BM Section.

Firstly, the provision of PFTs fails to confer full and dignified infrastructural citizenship rights on users because of some poor assumptions informing the CoCT's planning and delivery of PFTs. In the roll out of PFTs, the city does not seem to fully address some of the lived realities of informal settlement residents, particularly those of household sizes, socio-cultural dynamics, and the limited space they have in- and outside their shacks. Our findings show that the CoCT's assumption was that users could keep their PFTs inside their shacks. But this was rarely possible, leaving users with the responsibility for housing the infrastructure for it to be usable. PFTs are thus seen as an incomplete infrastructure, forcing those without space or materials to house them or to continue using shared sanitation despite the risks associated with this. Where PFTs are kept inside the shacks, users either only used them during the night, for urine only, or some household members did not use them at all. Their reasons included the small size of PFTs, the foul smell, and the shame from lack of privacy, among others. Such residents regard PFTs as undignified and continue to use the shared facilities which are both unsafe and often unclean. Therefore, there is a disjuncture between what the CoCT imagines and delivers as sanitation infrastructure and citizens' expectations. In the end, the residents' experiences show that PFTs do not fulfil citizens' sanitation infrastructural needs.

Both PFT users and non-users prefer full flush toilets to any other type of toilet. The design and servicing method of a PFT compounds and perpetuates perceptions of racial and historical injustice, as they are not perceived to be different from the bucket system. Sanitation provision in Cape Town (and South Africa) has a long political history of being used to deny infrastructural citizenship to non-whites and is inseparable from the question of race and social segregation (Swanson, 1977; McFarlane and Silver, 2017). Thus, the removal of the bucket system has been a major part of the post-apartheid sanitation vision (Dugard, 2016; Jackson and Robins, 2018). PFTs are perceived as representing a post-apartheid government that has not fulfilled its obligation to provide dignified sanitation (infrastructural citizenship) to mostly Black and Coloured informal settlement residents. In this context, where poverty, race, and informal settlement residency are historically intertwined and inadvertently determine the type of toilet that one uses, PFTs do not afford infrastructural citizenship rights to users but reinforce inequalities in Cape Town.

PFTs can also then be seen as a form of unintentional infrastructural violence as conceptualised by Rodgers and O'Neill (2012). The CoCT provides PFTs as the least worst practical sanitation solution for informal settlement residents, but we argue that when there is poor maintenance and servicing – as frequently occurred under the tenure of previous service providers – the safe management of sanitation is compromised and indignity is perpetuated. The post-apartheid CoCT delivers infrastructure to the

formerly excluded populations in informal settlements, but seemingly fails to ensure that PFT users can fully benefit from it. This goes against citizen expectations for the state "to be present in [their] lives (...) as gatekeeper of substantive material benefit, usually in the form of infrastructure provision" (Wafer, 2019: 65). Many informants had no or limited interface with CoCT officials regarding PFTs or other types of toilets. The poorly serviced sanitation infrastructure (PFTs in this case) provided by private companies hired by the CoCT embodies indignity and a broken line of infrastructural citizenship between citizen and state. While the city covers the high costs of providing and maintaining PFTs, when it is not seen as being accountable for the quality of the service of the toilets post-delivery, then that erodes infrastructural citizenship in practice.

Citizenship is enacted through continuous mediation of rights and duties between government and citizen. South African policies such as the National Sanitation Policy (2016) also emphasise this by foregrounding the engagement of citizens in the planning and provision of sanitation and other basic services (Department of Water and Sanitation, 2016). However, in the case of sanitation provision in informal settlements, there is no substantive, consistent, and long-term citizen engagement between the CoCT and residents. PFTs are provided to informal settlement residents who are often excluded from policy-making and have limited and rarely successful means to claim citizenship rights (Williams and Kihehere, 2022; Dube, 2022). CoCT officials only provide the informal settlement residents with reasons as to why certain sanitation infrastructure will be provided. From our interviews, those reasons are mostly based on the need for the city to adhere to fiscal prudence, zoning restrictions, and land ownership rights, among others. Thus, BM Section residents see themselves as being without an alternative but to use any type of sanitation the city delivers. As one PFT user said, "We have nothing; we will take whatever type of toilet they give us; we have no choice" (Bhunga, 2021).

While BM Section residents prefer unshared, full flush toilets, they have limited power to claim those. Research (e.g. Williams and Kihehere, 2022) has shown that informal settlement residents are mostly excluded from policy-making. Where they are included, it is through tokenistic forums such as ward committee meetings and others. Other methods of direct-action participation, like protests or sustained pressure by social movements, do yield results in some instances but remain largely limited in terms of influencing policy (Piper and von Lieres, 2016; Anciano and Piper, 2019; Dube, 2022). Thus, PFT provision puts residents in a dilemma: either choosing the least worst sanitation solution from a range of CBS options or remaining with none. The adoption of PFTs by some, albeit from a range of undesirable forms of sanitation, also potentially divides BM residents and depoliticises the collective struggle for dignified sanitation. As Khula puts it, "other people have PFTs, and they do not have any time for issues to do with the public toilets" (Khula, 2021). Both Khula and Bhunga's views show that the adoption and further demand for PFTs in settlements like BM is a sign of limits in the realisation of infrastructural citizenship rights.

One of the challenges that the CoCT faces in its engagement with citizens is the political nature of PFT provision in a city governed by the opposition party, DA. The city's participatory approach to the distribution of PFTs, albeit limited to the early stages of provision, seems to navigate the negative effects of political rivalry between political parties like the DA and ANC. Such engagements, if expanded and consistent, have the potential to shift citizens from receiving PFTs as mere users to being active participants who engage with and shape the delivery of CBS solutions, thus claiming civic and material citizenship rights (Cornwall and Gaventa, 2000).

CONCLUSION

In Cape Town, CBS is seen as a solution for residents of informal settlements that are not connected to cities' sewer grids, but the findings discussed in this paper show that CBS offers the illusion of a solution to dignified sanitation. This paper does not discount the significance of the scale of the PFT roll-out. 26,000 PFTs have been provided to residents for free, far beyond other sites of CBS roll-out we have

studied. The CoCT has successfully provided PFTs to residents who would have struggled to access any form of sanitation or who use unsafe, less clean, and shared sanitation lacking privacy. However, the residents' preferred form of sanitation, and indeed a form that is also financially sustainable for the city, is sewerage, full-flush toilets in each household. PFTs may increase access to sanitation for informal settlement residents and enhance the safety and privacy for users, but they are only adopted by the residents because they are the least worst form of CBS in Cape Town. The inadequate servicing of the PFT cartridges, residents' lack of space for the toilet in their shacks, and similarities with the provision of the bucket system from the apartheid era in South Africa are significant infrastructural concerns. When poorly serviced PFTs leave foul smells from leaks and force users to use unsafe alternatives, PFTs inflict infrastructural violence. What further compounds this is that the CoCT does not effectively monitor the private companies that it hires to provide PFTs and other forms of CBS. The citizen-state accountability chain is fractured through the brokers of the private sector. Thus, our findings show that PFTs, and indeed other forms of CBS, are only useful as a temporary stop-gap to address the lack of adequate sanitation in the informal settlements of Cape Town.

The provision of PFTs and other forms of CBS is also seen as perpetuating the marginalisation of poor informal settlement residents. Most PFT users are from previously marginalised groups who used the bucket system under the apartheid regime. In this context, the provision of CBS presents as evidence for the post-apartheid state's broken promises. This goes against the city of Cape Town's logic that CBS toilets such as PFTs were meant to eliminate the undignified bucket system and extend infrastructural citizenship rights to informal settlement residents. These are important findings to take back to the broader literature and research on CBS. They raise questions as to whether CBS is a long-term, dignified sanitation solution or is perpetuating a perception that the poor can never expect the sanitation standards the wealthy live by. Further research is needed on whether CBS and other off-grid sanitation solutions are long-term and dignified sanitation solutions.

Our research has demonstrated that, when poorly run, a CBS service will not be appreciated and can in fact create animosity towards the provider – in this case the local government. Furthermore, a public-private partnership service model, with government financing, can result in problematic outcomes if the service is fully financed by the city but privately run. Private service providers have no accountability to the households they service, while the government breaks its citizenship-state accountability chain. If the provision of CBS is to effectively contribute to solving the sanitation crisis in cities like Cape Town, there is a need, for a positive enabling environment for CBS service providers. This should entail clear technical guidance and standards, with provisions for funding and for accountability and monitoring, to ensure high-quality services. It is also important to recognise that choice and agency are important for CBS user satisfaction. For many, if not all, users in our study, CBS is a transitional sanitation solution. Thus, providers of CBS must be mindful of this when presenting CBS to would-be users. The Cape Town situation shows the backlash that comes with mandating technologies to those living in informal settlements.

While the CoCT provides free, scaled-up CBS to informal settlement residents, which is a useful, temporary stopgap to address the lack of adequate sanitation, it does not fulfil the infrastructural citizenship expectations of residents that they have derived from political and legal promises of the post-apartheid state. Not only does it not meet infrastructural citizenship expectations, but CBS and other off-grid options inflict infrastructural violence when poorly serviced. This paper matters, because it foregrounds the voices and experiences of CBS users, not as 'consumers' or 'clients' but as citizens of a state. The acceptance and impact of CBS in CoCT is as much a political economy issue as it is a planning and engineering concern. If citizens believe their social contract with the state promised dignified sanitation and CBS does not meet this expectation, then no amount of technical innovation will allow CBS to fulfil the political (and practical) role of full flush sewerage sanitation.

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REFERENCES

- Anciano, F. and Piper, L. 2019. *Democracy disconnected: Participation and governance in a city of the South*. United Kingdom: Routledge.
- Andersson, K. 2016. Sanitation, wastewater management and sustainability: From waste disposal to resource recovery. UN Environmental Programme Global Programme of Action for the protection of the Marine Environment from Land Based activities and Stockholm Environment Institute (SEI).
- City of Cape Town. N.d. Water and sanitation services in informal settlements. <https://www.capetown.gov.za/Family%20and%20home/Residential-utility-services/Residential-water-and-sanitation-services/Water-and-sanitation-services-in-informal-settlements> (accessed 7 September 2022)
- City of Cape Town. 2021. Human settlements strategy council, May 2021. https://resource.capetown.gov.za/documentcentre/Documents/City%20strategies,%20plans%20and%20frameworks/Human_Settlements_Strategy.pdf (accessed 13 April 2023)
- City Official 1. 2023. Personal communication. By email. 12 May 2023. City of Cape Town. 2020. State of Cape Town Report. https://resource.capetown.gov.za/documentcentre/Documents/City%20research%20reports%20and%20review/State_of_Cape_Town_2020_Visual_Summary.pdf (accessed 18 May 2023)
- City of Cape Town. 2022. Water Services Development Plan FY 2022/23-2026/27. https://resource.capetown.gov.za/documentcentre/Documents/City%20strategies%2C%20plans%20and%20frameworks/Water_Services_Development_Plan_2022-27.pdf (accessed 17 May 2023)
- City of Cape Town. 2021. Voluntary Local Review 2021 City of Cape Town: A review of the implementation of the Sustainable Development Goals. https://unhabitat.org/sites/default/files/2022-07/cape_town_2021_en.pdf
- Constitution of the Republic of South Africa, 1996. <https://www.gov.za/documents/constitution/constitution-republic-south-africa-1996-1> (accessed 7 July 2022).
- Cornwall, A. and Gaventa, J. 2000. From users and choosers to makers and shapers repositioning participation in social policy. *IDS Bulletin* 31(4): 50-62.
- Couder, L. and Kibuthu, S. 2020. Unlocking the circular economy potential to tackle the sanitation challenge. *Field Actions Science Reports. The Journal of Field Actions* (Special Issue 22): 72-77.
- Damba-Hendrik, N. 2022. Broken toilets, overflowing sewage problems persist in many Cape Town informal settlements. *Daily Maverick* 27 Jun 2022. <https://www.dailymaverick.co.za/article/2022-06-27-broken-toilets-overflowing-sewage-problems-persist-in-many-cape-town-informal-settlements/> (accessed 26 May 2023)
- Delaire, C.; Peletz, R.; Haji, S.; Kones, J.; Samuel, E.; Easthope-Frazer, A.; Charreyron, E.; Wang, T.; Feng, A.; Mustafiz, R.; Faria, I.J.; Antwi-Agyei, P.; Donkor, E.; Adjei, K.; Monney, I.; Kisiangani, J.; MacLeod, C.; Mwangi, B. and Khush, R. 2020. How much will safe sanitation for all cost? Evidence from five cities. *Environmental Science & Technology* 55(1): 767-777.
- Department of Water and Sanitation. 2016. National sanitation policy. https://www.gov.za/sites/default/files/gcis_document/201706/national-sanitation-policy.pdf
- Dube, M. 2022. Voluntary associations, democracy and citizenship in the cities of Bulawayo and Cape Town. Ph.D. thesis, University of the Western Cape, <https://etd.uwc.ac.za/handle/11394/5260> (accessed 13 January 2023)
- Dugard, J. 2016. *The right to sanitation in South Africa*. The Foundation for Human Rights.
- Enqvist, J.P. and Ziervogel, G. 2019. Water governance and justice in Cape Town: An overview. *Wiley Interdisciplinary Reviews: Water* 6(4): e1354.

- EY. 2020. How cost analysis dispels myths about container-based sanitation. London, UK.
https://www.ey.com/en_gl/corporate-responsibility/how-cost-analysis-dispels-myths-about-container-based-sanitation
- Gambrill, M.; Gilsdorf, R.J. and Kotwal, N. 2020. Citywide inclusive sanitation – Business as unusual: Shifting the paradigm by shifting minds. *Frontiers in Environmental Science* 201.
- Government of South Africa. 1997. Water Services Act (Act No. 108 of 1997).
https://www.gov.za/sites/default/files/gcis_document/201409/a108-97.pdf (accessed 13 June 2022)
- Government of South Africa. 2016. National Sanitation Policy 2016.
https://www.gov.za/sites/default/files/gcis_document/201706/national-sanitation-policy.pdf (accessed 4 March 2022)
- GreenCape. N.d. Opportunities for container-based sanitation in Cape Town.
<https://www.greencape.co.za/assets/Container-based-Sanitation-Case-Study-.pdf> (accessed 3 September 2022)
- Groenewald, L.; Huchzermeyer, M.; Kornienko, K.; Tredoux, M.J.; Rubin, M. and Raposo, I. 2013. Breaking down the binary: Meanings of informal settlement in southern African cities,
<http://scholar.sun.ac.za/handle/10019.1/90428> (accessed 8 August 2022)
- Hadenius, A. 2001. *Institutions and democratic citizenship*. Oxford University Press on Demand.
- Haller, L.; Hutton, G. and Bartram, J. 2007. Estimating the costs and health benefits of water and sanitation improvements at global level. *Journal of Water and Health* 5(4): 467-480.
- Hennink, M. and Kaiser, B.N. 2022. Sample sizes for saturation in qualitative research: A systematic review of empirical tests. *Social Science & Medicine* 292, 114523.
- Huchzermeyer, M. 2006. The new instrument for upgrading informal settlements in South Africa: Contributions and constraints. In Huchzermeyer, M. and Karam, A. (Eds), *Informal settlements: A perpetual challenge?*, pp. 41e61. Cape Town: UCT Press.
- Hutton, G. and Bartram, J. 2008. Global costs of attaining the Millennium Development Goal for water supply and sanitation. *Bulletin of the World Health Organization* 86(1): 13-19.
- International Budget Partnership (IBP) and Social Justice Coalition (SJC). 2016. Estimating the cost of sanitation infrastructure for selected sites in Khayelitsha in City of Cape Town. <https://www.internationalbudget.org/wp-content/uploads/ibp-south-africa-2016-khayelitsha-sanitation-costing-report.pdf> (accessed 2 October 2022)
- IOL News, 2013. Poo war flares again in Cape Town. 6 August 2013.
- Insin, E.F. 2009. Citizenship in flux: The figure of the activist citizen. *Subjectivity* 29(1): 367- 388,
<https://link.springer.com/article/10.1057/sub.2009.25>
- Insin, E.F. and Nielsen, G.M. (Eds). 2008. *Acts of citizenship*. Zed Books, London.
- Jackson, S. and Robins, S. 2018. Making sense of the politics of sanitation in Cape Town. *Social Dynamics* 44(1): 69-87, <https://doi.org/10.1080/02533952.2018.1437879>
- Ki-moon, Ban and UN Secretary General. 2010. "The human right to water and sanitation". Media Brief at the United Nations General Assembly-28 July (2010).
- Kumar, A.; Singh, N.; Cooper, S.; Mdee, A. and Singhal, S. 2021. Infrastructural violence: Five axes of inequities in water supply in Delhi, India. *Frontiers in Water* 3, 727368.
- Lemanski, C. 2018. Infrastructural citizenship: Spaces of living in Cape Town, South Africa. In *The Routledge handbook on spaces of urban politics*, pp. 350-360). Routledge.
- Lemanski, C. (Ed). 2019. *Citizenship and infrastructure: Practices and identities of citizens and the state*. Routledge.
- Lemanski, C. 2020. Infrastructural citizenship: The everyday citizenships of adapting and/or destroying public infrastructure in Cape Town, South Africa. *Transactions of the Institute of British Geographers* 45(3): 589-605.
- Lemanski, C. 2020. Infrastructural citizenship (de)constructing state-society relations. *International Development Planning Review* 42(2): 115-126.
- Mallory, A.; Mdee, A.; Agol, D.; Hyde-Smith, L.; Kiogora, D.; Riungu, J. and Parker, A. 2022. The potential for scaling up container-based sanitation in informal settlements in Kenya. *Journal of International Development* 34(7): 1347-1361, <https://onlinelibrary.wiley.com/doi/10.1002/jid.3639>

- Mallory, A.; Akrofi, D.; Dizon, J.; Mohanty, S.; Parker, A.; Vicario, D.R.; Prasad, S.; Welivita, I.; Brewer, T.; Mekala, S. and Bundhoo, D.; 2020. Evaluating the circular economy for sanitation: Findings from a multi-case approach. *Science of the Total Environment* 744, 140871.
- Mara, D. and Evans, B. 2018. The sanitation and hygiene targets of the sustainable development goals: Scope and challenges. *Journal of Water, Sanitation and Hygiene for Development* 8(1): 1-16.
- Massoud, M.A.; Tarhini, A. and Nasr, J.A. 2009. Decentralized approaches to wastewater treatment and management: Applicability in developing countries. *Journal of Environmental Management* 90(1): 652-659.
- McFarlane, C. 2008. Sanitation in Mumbai's informal settlements: State, 'slum', and infrastructure. *Environment and Planning A* 40(1): 88-107.
- McFarlane, C. and Silver, J. 2017. The poolitical city: "Seeing sanitation" and making the urban political in Cape Town. *Antipode* 49(1): 125-148.
- McGranahan, G. 2015. Realizing the right to sanitation in deprived urban communities: Meeting the challenges of collective action, coproduction, affordability, and housing tenure. *World Development* 68: 242-253.
- Medem, I. 2021 Mobile toilets and the urgent need for reflexivity in Social Entrepreneurship, Engenderings. <https://blogs.lse.ac.uk/gender/2021/03/01/mobile-toilets-and-the-urgent-need-for-reflexivity-in-social-entrepreneurship/> (accessed 1 October 2022)
- Meeks, R.C. 2018. Property rights and water access: Evidence from land titling in rural Peru. *World Development* 102: 345-357.
- Mels, A.; Castellano, D.; Braadbaart, O.; Veenstra, S.; Dijkstra, I.; Meulman, B.; Singels, A. and Wilsenach, J.A. 2009. Sanitation services for the informal settlements of Cape Town, South Africa. *Desalination* 248(1-3): 330-337.
- Millington, N. and Scheba, S. 2021. Day zero and the infrastructures of climate change: Water governance, inequality, and infrastructural politics in Cape Town's water crisis. *International Journal of Urban and Regional Research* 45(1): 116-132, <https://onlinelibrary.wiley.com/doi/full/10.1111/1468-2427.12899>
- Muanda, C.; Goldin, J. and Haldenwang, R. 2020. Factors and impacts of informal settlements residents' sanitation practices on access and sustainability of sanitation services in the policy context of Free Basic Sanitation. *Journal of Water, Sanitation and Hygiene for Development* 10(2): 238-248, <https://iwaponline.com/washdev/issue/10/2>
- Muller, M. 2018. Lessons from Cape Town's drought. *Nature* 559(7713): 174-176.
- Notywala, A. 2016. The struggle for decent sanitation and a fair budget in Cape Town. Daily Maverick 29 July 2016. <https://www.dailymaverick.co.za/opinionista/2016-04-29-the-struggle-for-decent-sanitation-and-a-fair-budget-in-cape-town/> (accessed 24 May, 2023)
- Ntseku, M. 2022. Informal settlement residents balk at City of Cape Town's claim of ending the bucket system. Cape Argus 1 September 2022, <https://rb.gy/puxqu> (accessed 29 May 2023)
- Paustian, K.; Lehmann, J.; Ogle, S.; Reay, D.; Robertson, G.P. and Smith, P. 2016. Climate-smart soils. *Nature* 532(7597): 49-57.
- Piper, L. and von Lieres, B. 2016. The limits of participatory democracy and the rise of the informal politics of mediated representation in South Africa. *Journal of Civil Society* 12(3): 314-327.
- Robins, S. 2014. Poo wars as matter out of place: 'Toilets for Africa' in Cape Town. *Anthropology Today* 30(1): 1-3.
- Rodgers, D. and O'Neill, B. 2012. Infrastructural violence: Introduction to the special issue. *Ethnography* 13(4): 401-412, doi/full/10.1177/1466138111435738
- Russel, K.C.; Hughes, K.; Roach, M.; Auerbach, D.; Foote, A.; Kramer, S. and Briceño, R. 2019. Taking container-based sanitation to scale: Opportunities and challenges. *Frontiers in Environmental Science* 7: 190.
- Ryals, R. and Silver, W.L. 2013. Effects of organic matter amendments on net primary productivity and greenhouse gas emissions in annual grasslands. *Ecological Applications* 23(1): 46-59.
- Sinharoy, S.S.; Pittluck, R. and Clasen, T. 2019. Review of drivers and barriers of water and sanitation policies for urban informal settlements in low-income and middle-income countries. *Utilities Policy* 60: 100957.
- Sobantu, M.; Zulu, N. and Maphosa, N. 2019. Housing as a basic human right: A reflection on South Africa. *Southern African Journal of Social Work and Social Development* 31(1): 1-18, <https://doi.org/10.25159/2415-5829/4177>
- Staeheli, L.A.; Ehrkamp, P.; Leitner, H. and Nagel, C.R. 2012. Dreaming the ordinary: Daily life and the complex geographies of citizenship. *Progress in Human Geography* 36(5): 628-644.

- Star, S.L. 1999. The ethnography of infrastructure. *American Behavioral Scientist* 43(3): 377-391.
- Statistics South Africa. 2019. General Household Survey 2018. www.statssa.gov.za/publications/P0318/P03182018.pdf (accessed 3 August 2022)
- Swanson, M.W. 1977. The sanitation syndrome: Bubonic plague and urban native policy in the Cape colony, 1900-19091. *The Journal of African History* 18(3): 387-410.
- Totaro, P. 2016. Dying for a pee: Cape Town's slum residents battle for sanitation, Reuters: World News. <https://www.reuters.com/article/us-safrica-slums-sanitation/dying-for-a-pee-cape-towns-slum-residents-battle-for-sanitation-idUSKCN12C1WA>
- United Nations. 2010. General Assembly Adopts Resolution Recognizing Access to Clean Water, Sanitation as Human Right, by Recorded Vote of 122 in Favour, None against, 41 Abstentions. UN.org. 28 July 2010. [online access 2022-08-03]. www.un.org/press/en/2010/ga10967.doc.htm
- VanRiper, F.; Russel, K.; Cramer, L.; Tillias, D.; Laporte, J.; Lloyd, E. and Kramer, S. 2022. Container-based sanitation services and attrition: An examination of drivers and implications. *Frontiers in Environmental Science* 9.
- Wafer, A. 2019. Enframing citizenship: Social housing and ontological orientations in Johannesburg. In Lemanski, C. (Ed), *Citizenship and infrastructure: Practices and identities of citizens and the state*, pp. 64-83. Routledge.
- Western Cape Government. 2016. From precarious settlements to dignified communities: Western Cape Informal Settlement Strategic Framework (ISSF).
- WHO, UNICEF. 2019. Progress on household drinking water, sanitation and hygiene 2000-2017: Special focus on inequalities. WHO and UNICEF. New York, NY: UNICEF.
- Williams, J.J. and Kihehere, M. 2022. South African community activism and the urban poor in the post-apartheid city: Towards sustainable sanitation in Cape Town's ghetto settlements, SSRN, <https://dx.doi.org/10.2139/ssrn.4103016>
- World Bank. 2019. *Evaluating the potential of container-based sanitation*. World Bank.
- Xaba, K. 2013. SACP Statement on the Deplorable Makaza Toilet Situation. <https://rb.gy/puxqu>
- Zille, H. 2013. The politics behind the "toilet wars" – Helen Zille. <https://www.politicsweb.co.za/news-and-analysis/the-politics-behind-the-toilet-wars--helen-zille> (accessed 16 May 2023)
- Bhunga. 2021. Personal communication. 30 March 2021.
- Bonga. 2021. Personal communication. 08 March 2021.
- Buhle. 2023. Personal communication. 08 March 2023.
- Khula. 2021. Personal communication. 31 March 2021.
- Ntando. 2021. Personal communication. 30 March 2021.
- Phila. 2021. Personal communication. 30 March 2021.
- Nathi. 2021. Personal communication. 29 March 2021.
- Sinda. 2021. Personal communication. 31 March 2021.
- City Official 1. 2021. Personal communication. Virtual Interview on Zoom, 5 August 2021.
- City Official 2. 2021. Personal communication. Virtual Interview on Zoom. 12 August 2021.
- City Official 3. 2021. Personal communication. Virtual Interview on Zoom. 26 July 2021 and 02 November 2021.
- City Official 4. 2021. Personal Communication. 29 October 2021.
- City Official 5. 2021. Personal communication. Virtual Interview on Zoom. 30 June 2021.
- Zenzo and Pat. Personal communication. 02 March 2022.
- Zintle. 2021. Personal communication. 30 March 2021.
- Zonke. 2021. Personal communication. 29 March 2021.

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