AFRICAN CITIES JOURNAL

AFRICAN CITIES JOURNAL, VOL. 06, ISSUE 02, 2026

Original Research

Power and politics of Kampala informal sanitization infrastructures

Peter KASAIJA[1,c], Paul ISOLO MUKWAYA[2]

[1]Urban Action Lab (UAL), Department of Geography, Geo-informatics and Climatic Sciences, Makerere University, Kampala, Uganda

[2]Department of Geography, Geo-informatics and Climatic Sciences, Makerere University, Kampala, Uganda

[c]Corresponding author: ptkasaija@gmail.com / pmukwaya@gmail.com

Abstract

Research has drawn attention to the fragmented sanitation infrastructures and governing practices behind them, particularly in African cities. Informal sanitation infrastructures, which the majority of poor urban residents depend on, are underpinned by various social, spatial, technological and environmental challenges that substantially contribute to (re)producing sanitation inequalities. However, research into how the power relations and politics behind these infrastructures are implicated in these processes remains significantly underdeveloped. This paper employs Situated Urban Political Ecology (SUPE) theory to augment existing research into these power relational geometries through an in-depth examination of Kampala's informal sanitation infrastructures or Heterogeneous Sanitation Infrastructures (HSIs). Using mainly qualitative data, including in-depth key informant interviews (KIIs), participant observation, actor mapping and review of relevant documents, evidence reveals a polycentric power choreography underpinning these infrastructures. Power is diffuse and dispersed, operating through recursive asymmetric, informal-formal collaborative interactions among state, non-state and transnational actors, rather than formal structures. Entrenched socio-cultural patriarchy, transactional bargaining, collaboration, compliance-seeking operating in conjunction with selective and strict bureaucratic enforcement or outright evasion of regulations are implicated in reducing or exacerbating sanitation inequalities. Therefore, power and politics substantially influence sanitation access of the urban poor through HSIs. More holistic strategies that fully account for such complex HSI power choreographies are needed to better understand how we engage with the complex urbanisation processes unfolding in African cities and engender more effective solutions to reduce pervasive challenges such as sanitation inequalities.

CONTACTS

P. KASAIJA ptkasaija@gmail.com
P. I. MUKWAYA pmukwaya@gmail.com

ARTICLE HISTORY

Received: 23 / 10 / 2025
Accepted: 10 / 02 / 2026
Published: 06 / 04 / 2026

KEYWORDS

- Power
- Informal sanitization infrastructures
- Sanitation inequity
- Informal settlements
- Kampala
- Uganda

Résumé

Au cours des deux dernières décennies, la recherche a mis en lumière la fragmentation des infrastructures d'assainissement et des pratiques de gouvernance qui sous-tendent les géographies associées, en particulier dans les villes africaines. Les infrastructures d'assainissement informelles, dont dépend la majorité des citadins pauvres dans des villes telles que Kampala, en Ouganda, sont confrontées à divers défis sociaux, spatiaux, technologiques et environnementaux qui contribuent de manière significative à (re)produire les inégalités en matière d'assainissement. Cependant, les recherches sur la manière dont les relations de pouvoir et les politiques sous-jacentes à ces infrastructures sont impliquées dans ces processus sont largement insuffisantes. Cet article utilise la théorie de l'écologie politique urbaine située (SUPE) pour enrichir les recherches existantes sur ces géométries relationnelles de pouvoir à travers un examen approfondi des infrastructures d'assainissement informelles de Kampala, ou in-

DOI: 10.34915/acj.v6i2.216
ISSN 2673-4494
African Cities Journal 2026, Lausanne, Suisse

frastructures d'assainissement hétérogènes (HSI). À partir de données principalement qualitatives, notamment de-sentretiens approfondis avec des informateurs clés (KII), de l'observation participante, de la cartographie des acteurs et de l'analyse de documents pertinents, les résultats révèlent une chorégraphie du pouvoir polycentrique qui sous-tend ces infrastructures. Le pouvoir est diffus et dispersé ; il s'exerce par le biais d'interactions collaboratives récursives, asymétriques et à la fois informelles et formelles entre acteurs étatiques, non étatiques et transnationaux, plutôt que par le biais de structures formelles. Le patriarcat socioculturel profondément ancré, les négociations transactionnelles, la collaboration et la recherche de conformité, associés à une application bureaucratique sélective et stricte des réglementations ou à un contournement pur et simple de celles-ci, contribuent à réduire ou à exacerber les inégalités en matière d'assainissement. Par conséquent, le pouvoir et la politique influencent considérablement l'accès à l'assainissement des populations urbaines pauvres par le biais des HSI. Des stratégies plus holistiques, tenant pleinement compte de ces chorégraphies complexes du pouvoir au sein des HSI, sont nécessaires pour mieux comprendre comment nous nous engageons dans les processus complexes d'urbanisation qui se déroulent dans les villes africaines et pour générer des solutions plus efficaces visant à réduire les défis omniprésents tels que les inégalités en matière d'assainissement.

1. Introduction

The sanitation geographies of African cities like Kampala are characterized by diverse infrastructures, including a heterogeneous mix of "informal" options operating alongside centralized sewerage (Lawhon et al., 2018; Lawhon & Nakyagaba, 2023). As a result, complex and often fragmented sanitation infrastructure typologies across much of urban Africa have emerged. The majority of residents in Africa's cities, particularly the poor, heavily depend on informal infrastructures to meet their sanitation needs (Lawhon et al., 2018; Oates et al., 2023; Sseviiri et al., 2022). These "self-provisioning" options, described as "incremental infrastructures" (Silver, 2014), "invisible" (De Boeck, n.d.), or "socially networked infrastructures" (Simone, 2004), characterize the Southern "informal city" (Lwasa, 2016). Research into these infrastructures (herein referred to as HSIs) has largely focused on their functional shortcomings as seen through the lens of reductionist Western notions of "modernity" and "civility" (Lawhon et al., 2018). Some critical dynamics behind these infrastructures – particularly the power relations governing how state agencies, transnational bodies, NGOs, local leaders, entrepreneurs, households, and landlords, among others, negotiate, build trust and enforce or evade sanitation regulations to deliver and access services - have been largely overlooked.

Hence, Kampala's HSIs are not apolitical. They are deeply politicised media that embody complex social, economic, political and historical dynamics, mediating waste resource flows and circulations in the (re)production and contestation of urban space (Carse, 2017; McFarlane & Silver, 2017; Silver, 2023). Sanitation infrastructures are powerful symbols of policy decisions and their outcomes (McFarlane & Silver, 2018). These realities are reinforced in the everyday logics of sanitation inequality in other African cities, which are shaped by how power is constituted and enacted through multiple nodes across the HSI gradient (Lawhon et al., 2018; Lawhon & Nakyagaba, 2023; Nsangi et al., 2021; Silver, 2023). Different actors, operating at different scales, with different levels of legitimacy, leverage various forms of power to realise their respective interests, and inevitably influence the sanitation choices of the urban poor. These dynamics resonate with contemporary views of power as a multidimensional phenomenon, not merely a property of actors. Rather, it is diffuse, embodied, discursive and enacted (Gaventa, 2003; Lukes, 2005). It is constituted of tactics, strategies and manoeuvres that typify these

DOI: 10.34915/acj.v6i2.216
ISSN 2673-4494
African Cities Journal 2026, Lausanne, Suisse

interactions as they play out in time and space, either reducing or exacerbating sanitation inequalities. Therefore, HSIs offer valuable lenses for deeper engagement with the social and material aspects of the (re)production of unequal urban spaces in African cities such as Kampala.

This paper seeks to examine the power relations and politics behind the governance of the city's HSIs, how they are configured, to influence sanitation access and ultimately, inequality in Kampala. It is structured into six parts: the first part includes an introduction to the research. The second part presents a brief review of current debates about Kampala's sanitation geographies, to tease out the research gap. The third part outlines the research methods and the theoretical framework employed. In the fourth and fifth parts, the findings are presented and discussed, followed by concluding arguments based on a critical examination of the study's evidence.

2. Geographies of sanitation in Kampala: Between ideals and realities

Kampala, Uganda's capital, is an archetypal African city undergoing rapid socio-spatial and environmental transformation. The city's spatial character exhibits "fragmented patterns of growth" with "a mixture of modernist and traditionalist forms of housing development, services and infrastructure systems" (Lwasa, 2016). It has an estimated resident population of 1,797,722, growing at about 5.2 percent annually (Uganda Bureau of Statistics, 2024). This growth has presented multiple development challenges for the city government, KCCA. This is particularly evident in widening sanitation inequalities (Nkurunziza, Bateganya, Byansi, Rokob and Busingye, 2017; Murungi and van Dijk, 2014). With sewerage coverage at about 10 percent, the city is stratified into small enclaves of sanitation service privilege, and large swathes of deficits elsewhere (Lerebours et al., 2022; Lwasa & Owens, 2018; McConville et al., 2022). Over time, service fragmentation has amplified inequalities, especially for residents in informal settlements who lack access to safe and adequate sanitation (Dickson-Gomez et al., 2023; Lwasa and Owens, 2018). They have adopted a patchwork of heterogeneous sanitation infrastructures (HSIs) with differing levels of usage, access, service frequency and quality. As a result, the city has developed a varied infrastructure mosaic of HSIs and sewerage, reflecting a history of discontinuous and fragmented urban governance, attributed to non-uniform service provision from the colonial era (Lawhon et al., 2017; Lawhon & Nakyagaba, 2023).

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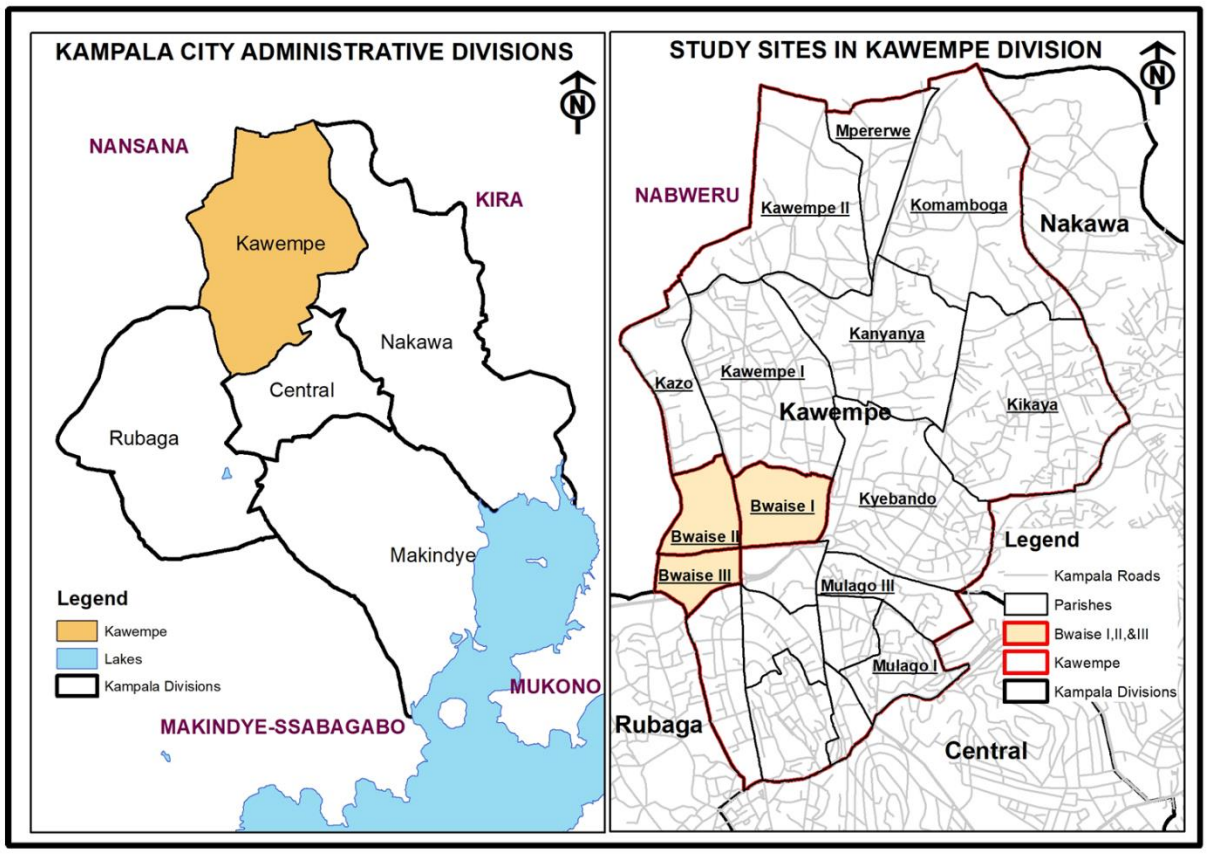

Figure 1. *Map of study sites in Kampala City (**Source:** Research data)*

Without a doubt, Kampala's contemporary sanitation geographies are closely linked to the prolonged lack of a coherent, integrated and inclusive urban sanitation strategy evident in successive city administrations' sanitation policies, governance and institutional modalities from the colonial to the post-colonial periods. This has been complicated by broader institutional malaise and dysfunctionality. Inadequate and ineffective urban development policies have contributed substantially to the growth of informal settlements, alongside associated sanitation infrastructure and service deficiencies. HSIs have emerged to meet needs where centralised sewerage remains inaccessible to the majority living in Kampala's informal settlements. These residents rely on these infrastructures to survive. They "…infuse their own praxis, values, moralities and temporal dynamics" into these infrastructures (Van Wolputte, Cassiman, & De Boeck, 2022). The emergence of a fragmented HSI motif has been accompanied by varied sanitation access levels, service frequency and quality. These dynamic and unpredictable infrastructures generate new forms of "…social interaction, coping strategies, and regimes of knowledge and power" (Silver, 2014). They symbolise the resilience of the urban poor through the ways they are managed, used, and sustained (Lawhon et al., 2017).

As pointed out before, HSIs are not a new phenomenon. They can be traced to the pre-colonial traditional sanitation practices of Kampala's indigenous community (Omolo-Okalebo et al., 2010; Brown, 2014; Nilsson, 2006; Roscoe, 1911). Sanitation self-provisioning and sufficiency prevailed in the Kibuga, an urban-like settlement around the Kabaka's palace, before the rise of the colonial city of Kampala. The chiefs played vital roles in ensuring households followed acceptable sanitation practices and standards. Brown (2014) argues that these infrastructures and arrangements, while not aligned with European ideas of "modernity", represent

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the civility of the indigenous community at the time. It dispels misconceptions that indigenous, pre-colonial communities were “primitive”. This negates the view of “civility” as exclusively European (Omolo, 2010). These “traditionalist” sanitation infrastructures were the main means of sanitation employed in the early colonial Kampala, controlled by the British administration, alongside the indigenous settlements around the Kibuga under Buganda Kingdom’s control.

Later, in the 1920s, a centralised sewerage system was established. According to Brown (2014), this led to two critical moments. First, sanitation services became a “public good”, with a framework of standards and enforcement for public health promotion and protection. Sanitation was removed from the private domain, as it was in the pre-colonial period, when it was largely left to individual households with little interference from centralised authority. Secondly, the “modern infrastructure ideal” was implanted into the city’s planning processes, institutionalised through a process of “…technicalisation, ‘expertisation’ and depoliticisation…”, according to Kamete (2013). Inevitably, this rendered HSIs the “antithesis” of the new centralised sewerage system (Brown, 2014). The above developments laid the foundation for the subsequent systematic devaluation of HSIs, which were associated with “backwardness”.

The colonial administration’s introduction of centralised sewerage and sanitation services in Kampala was framed as “development pragmatism” for “health and sanitary reasons” (Omolo-Okalebo et al., 2010). However, this obscures certain critical issues. This technical project, implemented on an unprecedented scale, was more than about reproducing a “European type space”. It was not a neutral, technical undertaking, but a highly power-laden and political undertaking with serious long-term socio-political, economic and environmental ramifications. Centralised sewerage and sanitation services were used to undermine the civility and spatiality of the indigenous community. The planning and implementation of these services legitimised the perceived “superiority” of British ideals over the traditional sanitation practices and infrastructures of Africans. This contributed to the systematic disempowerment of the indigenous community, and thus aided the imperialistic aims of subjugation and control, disguised as the “delivery of civilisation and modernisation” to an “uncivilised” and “backward” realm.

Nonetheless, HSIs remain the dominant means for meeting the sanitation needs of contemporary Kampala’s fast-growing population because little progress has been made to expand the more “desirable” centralised sewerage (Lwasa & Owens, 2018). Between 2010 and 2018, KCCA and NWSC attempted to integrate HSIs into sanitation planning and service delivery under the KFSM (Lwasa & Owens, 2018). However, sewerage remains strongly entrenched in the mind-sets of the majority of city planners as the main solution to the city’s sanitation challenge. HSIs are largely considered as “stop-gaps” to an existential crisis, at best. For most city planners, HSIs do not resonate with their imaginaries of “modernity and civility,” (Brown, 2014). They are “incompatible” with the urban environment (Ignacio et al., 2018; Musingafi, 2018). Such negation has relegated HSIs to a “pathological space” (Brown, 2014). Current scholarship, which remains overwhelmingly deconstructive (Lwasa, 2016) and “performative” (Lawhon et al., 2016), has contributed to reinforcing this perspective. This has closed down space for their successful incorporation into city-wide strategic sanitation planning. More importantly, other critical facets of HSIs such as their complex power relational dynamics and how they shape sanitation inequality have been overlooked. And yet, as Simone (2001) and McFarlane and Silver (2017) show, HSIs are ostensibly important sites for the (re)making of social identities, beliefs and practices. More still, they are the locus for multi-actor power relationships that

DOI: 10.34915/acj.v6i2.216
ISSN 2673-4494
African Cities Journal 2026, Lausanne, Suisse

influence the city's socio-spatial order, pointing to a serious knowledge deficit which this research seeks to address.

3. Methods and Theory

3.1. Research methods

This research employed a mixed-methods approach (Cresswell & Clark, 2018). Quantitative and qualitative data were generated to decode how actor power relations were configured behind Kampala's HSI gradient. Quantitative data were used to provide context and a broader perspective of the research problem, followed by the analysis of qualitative data to provide an in-depth understanding of how power relations and associated politics were configured around HSIs. The qualitative and quantitative techniques used to generate the required data involved participant observation, in-depth interviews, Focus Group Discussions (FGDs), actor mapping, critical observation and a 150-household survey to inform the research. Bwaise I, Bwaise II and Bwaise III informal settlements in Kampala's Kawempe Division, were selected as the sites for this research. They served as nodes for in-depth examination of how different actors positioned at the local and city levels actualised their respective different interests to impact how the urban poor navigate and negotiate a highly contested space for their survival. These findings, extrapolated onto the broader city, provide valuable insights into how sanitation inequality unfolds. A team of eleven (11) data collectors from the NSDFU, four (04) staff from ACTogether and four (04) researchers from the UAL, Department of Geography, Geoinformatics and Climatic Sciences, Makerere University was constituted to generate data for the research.

3.2. Theoretical framework

Situated Urban Political Ecology – SUPE (Lawhon et al., 2013) closely shares the theoretical foundations of UPE. SUPE takes a more radical and critical examination of urban geographies, particularly in the global South. It emphasizes a situated theoretical approach that is more contextually grounded, "bottom-up" or the "place-situated approach" (See Fig.2). It provides deeper insights into the spatiotemporal dynamics that characterise urban environments of Southern cities. SUPE acknowledges and engages with the contextual socio-cultural, political and physical differences that energise human-nature interactions across different levels.

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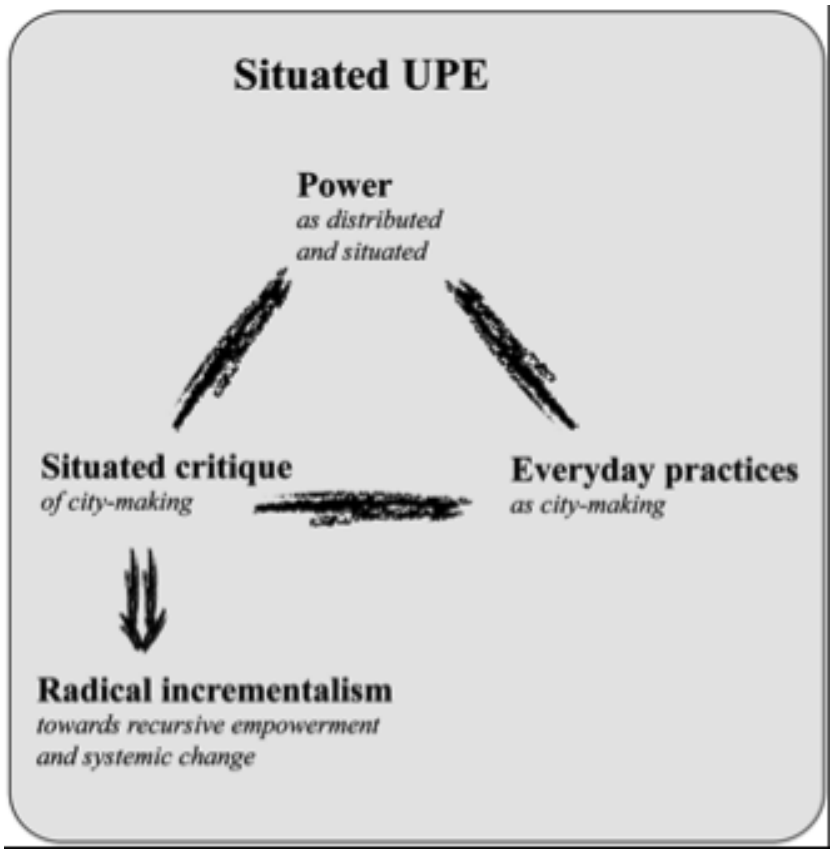

Figure 2. *SUPE theoretical framework (**Source:** Lawhon et. (2013))*

In this way, SUPE provides vital insights into granular elements of power relations using empirics to provide an alternative lens into how such interactions perpetuate inequality, exclusion and conflict. Power is theorised as a pervasive element that penetrates and opens up every aspect of city life, whether through formal or informal spaces. SUPE also enables a critique of urbanization processes shaped by neo-liberalism and constitutive power relations. It helps to examine how different actors exercise power, while negotiating conflicts to fulfil their interests. Using SUPE, the paper enables a different way of thinking about the nature of urbanism unfolding in the global South, responding to calls for theorising urban Africa as a legitimate and valuable epistemological site to provide more in-depth insights into the unstructured power geometries that characterise cities such as Kampala in the global South.

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4. Results

4.1. Kampala's HSI typologies

Residents of Kampala's informal settlement employed diverse HSIs, supported by varied arrangements, to meet their needs. Pit-latrines were the primary means of containing faecal waste, emptied via manual methods, vacuum trucks, or low-capacity Gulpers. Waste was transported by vacuum trucks or three-wheel motorcycles to treatment plants before disposal. Managed by state, non-state and transnational actors, this system created unequal sanitation access, especially for the urban poor.

DOI: 10.34915/acj.v6i2.216
ISSN 2673-4494
African Cities Journal 2026, Lausanne, Suisse

4.1.1. Containment

The dominant toilet typologies for faecal waste containment employed by residents in Bwaise I, II, and III mainly include the private, shared household and shared communal/public sanitation facilities. These HSI options underpin how residents access services for faecal sludge containment, extraction, transport, disposal and treatment in informal settlements. Over two thirds of informal settlement residents depended on shared or communal sanitation facilities built by landlords, KCCA, NGOs and churches (See Fig.3). More households in Bwaise II used communal sanitation facilities than the other two sites. Over half of the survey respondents across the three settlements used shared sanitation facilities. These sanitation options entail highly elaborate working arrangements where users have to cooperate for their mutual benefit.

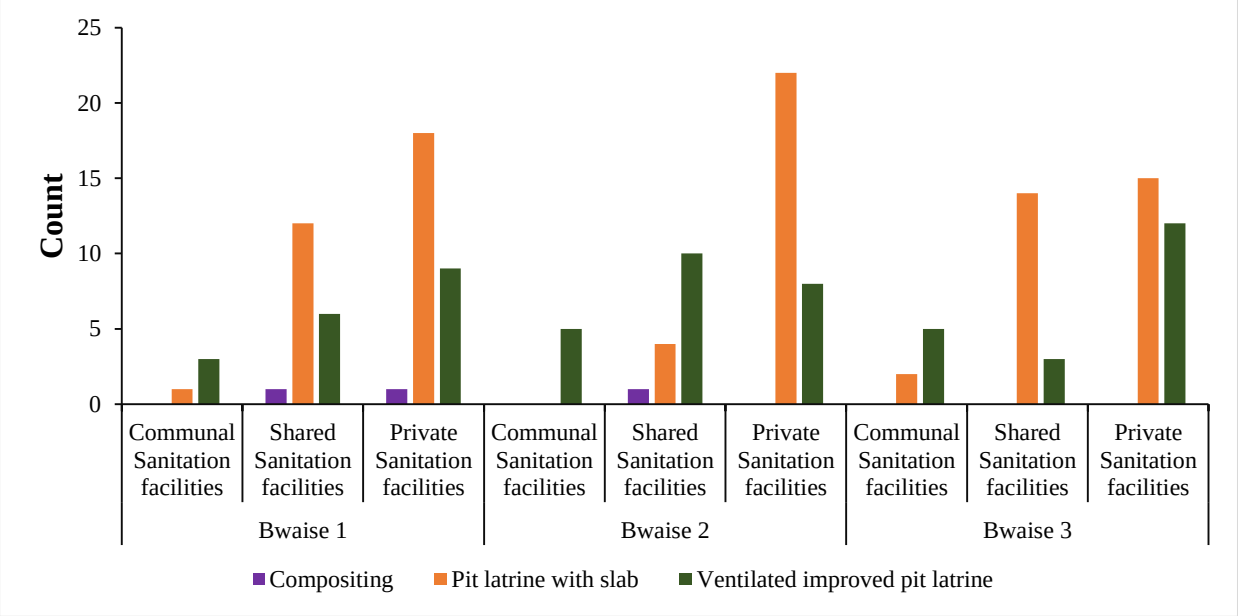

Figure 3. *Cluster of sanitation ownership and sanitation technologies (**Source:** Research data)*

4.1.2. Extraction and transportation

Excreta removal from toilets to treatment and disposal plants primarily used mechanical and manual methods. Landlords/ladies, households, and community toilet managers hired MSMEs with vacuum trucks for this service. Emptying frequency ranged from monthly to every three months or longer, depending on need and available funding. The average cost per vacuum truck service was about UGX 180, 000 (approx. USD 49.15). Typically, this involved deploying a truck and team to a site, connecting a hose to the pump, and lowering it into the pit-latrine to extract faecal sludge mechanically. Cheaper manual alternatives, such as “frogmen” using buckets and containers, were also common. Extracted sludge was typically discharged into surface drains or nearby wetlands. Innovations like the Gulper enabled extraction and transport via motorized tri-cycles for treatment and disposal. Consequently, many poor households opt for partial emptying to afford these services. The Gulper is a small-scale, manual pumping device developed by Water For People (WFP) in partnership with KCCA (See Fig.4). It is particularly suited for emptying non-lined pit-latrines less than 10m deep (Lwasa & Owens, 2018). The extracted sludge is collected in drums and transported for treatment and disposal using three-wheeled motorcycles. Emptying a 200-litre drum costs around UGX 30,000 (approx. USD 8.19) with a Gulper, compared to an average of UGX 300, 000 (approx. USD 81.92 –

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African Cities Journal 2026, Lausanne, Suisse

about ten 200-litre drums) for fully emptying a single pit-latrine. In contrast, hauling large volumes of sludge from Kampala's informal settlements by motorised means inevitably incorporates the city's road network into the HSI chain.

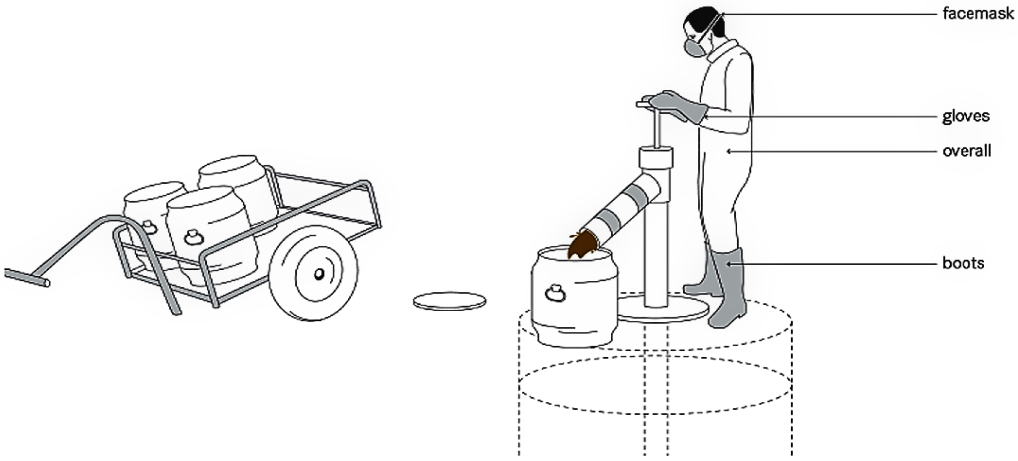

Figure 4. *Gulper technology for faecal sludge extraction (**Source:** Tilley et al. (2014))*

4.1.3. Treatment and disposal

NWSC operates four wastewater treatment plants: Bugolobi, Lubigi, Kinawataka, and Nalukolongo (See Fig.5). The upgraded Bugolobi plant was previously the main facility for treating faecal sludge from sewered and non-sewered areas. In 2014, the Lubigi plant opened to treat sludge from non-sewered areas. This was followed by the Kinawataka pre-treatment plant in 2018 to supplement the others. NWSC recently commissioned Nalukolongo and plans additional decentralised plants. Treated effluent discharges into the Nakivubo, Lubigi and Kinawataka wetlands, which filter organic by-products and integrate them into the natural nutrient cycle.

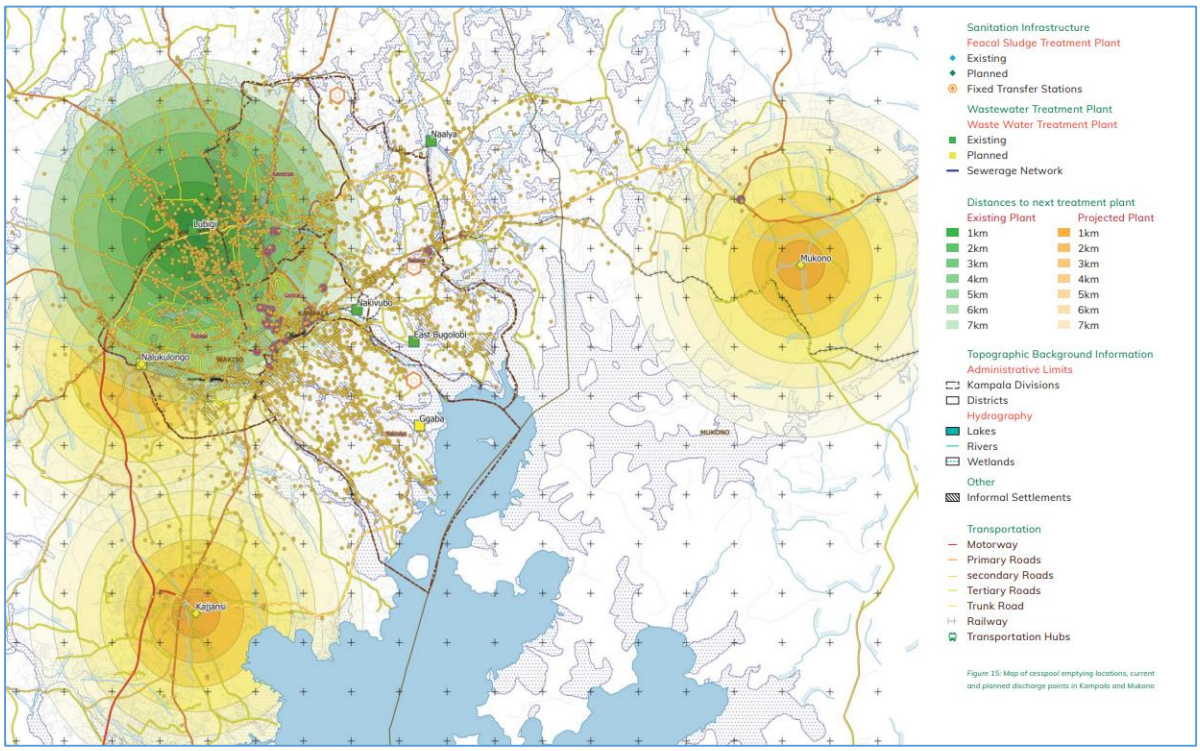

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Figure 5. *Existing and planned sewage treatment plants for GKMA (Source: Kampala Sanitation Improvement and Financing Strategy (KCCA, 2020))*

4.2. Actors and interests behind the governance and management of Kampala's HSIs

Across the city's HSI gradient – from excreta containment to treatment and disposal – it is evident that these infrastructures were circumscribed by multiple micro and city-scale actors operating at the local and citywide levels (See Table 1). These various actors embodied equally multiple interests, which motivated and compelled them to make decisions and/or undertake/support certain actions in line with their respective rationalities and logics (See Fig.6).

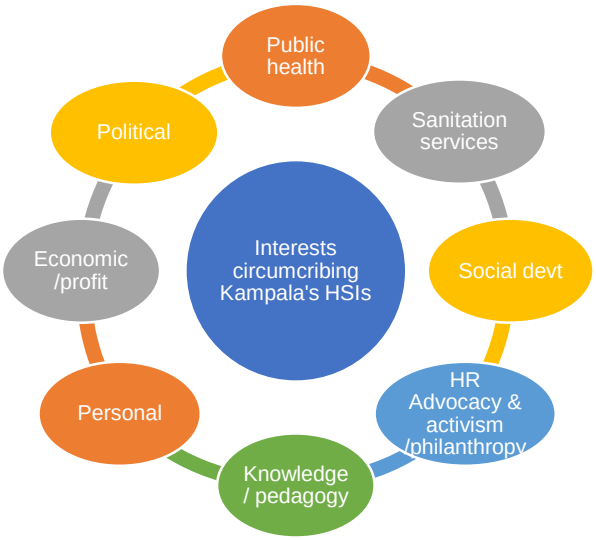

Figure 6. *The multiple interests circumscribing Kampala's HSIs (**Source:** Research data)*

Table 1. *Key actors behind Kampala's HSIs (**Source:** Research data)*

	Actors	**Scale of operation**	
		Micro	**Meso (City-wide)**
1.	Individual households		
2.	Multiple tenant households		
3.	Multiple tenant households, their landlords/landladies, property-owners and non-residents		
4.	• State policy actors (KCCA/KCC, NWSC, NEMA etc.) • Non-state actors (CSOs/NGOs and transnational bodies)		

The convergence of these interests shaped the everyday sanitation choices among the city's poor majority. Micro-level actors included sanitation service users – households, individual toilet users, caretakers and managers of communal/public sanitation facilities, landlords/ladies, property – owners, social deviants – and MSMEs, manual toilet – emptying labourers. Households were primary recipients of HSI services. For private facilities, gender and social status influenced everyday toilet use and maintenance. Tenants using shared or communal sanitation facilities negotiated daily toilet use, cleaning and maintenance, while landlords/ladies and property-owners provided toilets and approved maintenance.

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Managers and caretakers of communal/public sanitation facilities – sometimes supported by management committees - were mandated, either contractually or informally by KCCA, local leaders or communities, to maintain the toilets. They decided who could use these facilities. Local leaders (LC I) enforced sanitation policy at the neighbourhood level by ensuring compliance with public health standards and bye-laws among households, landlords/ladies, property-owners and MSMEs. They also contributed to decisions on siting, maintenance, and who was included in these decision-making processes. In addition, they mediated disputes over shared or community sanitation facilities. MSMEs provided key sanitation services for onsite sanitation. MSMEs were integrated into a multi-pronged FSM market-based approach to address sanitation deficits (See Figs.7 & 8). Over 100 registered firms operate second-hand vacuum trucks of varying capacities alongside public vehicles (Lerebours et al., 2022; Mcconville et al., 2019; Singh et al., 2022; Ssekamatte et al., 2022). Client fees depend on distance, capacity, and sludge characteristics. The Gulper technology greatly expanded MSMEs' reach to the city's informal settlements (Shankar & Singh, 2020; Karabegovic & Selman, 2018).

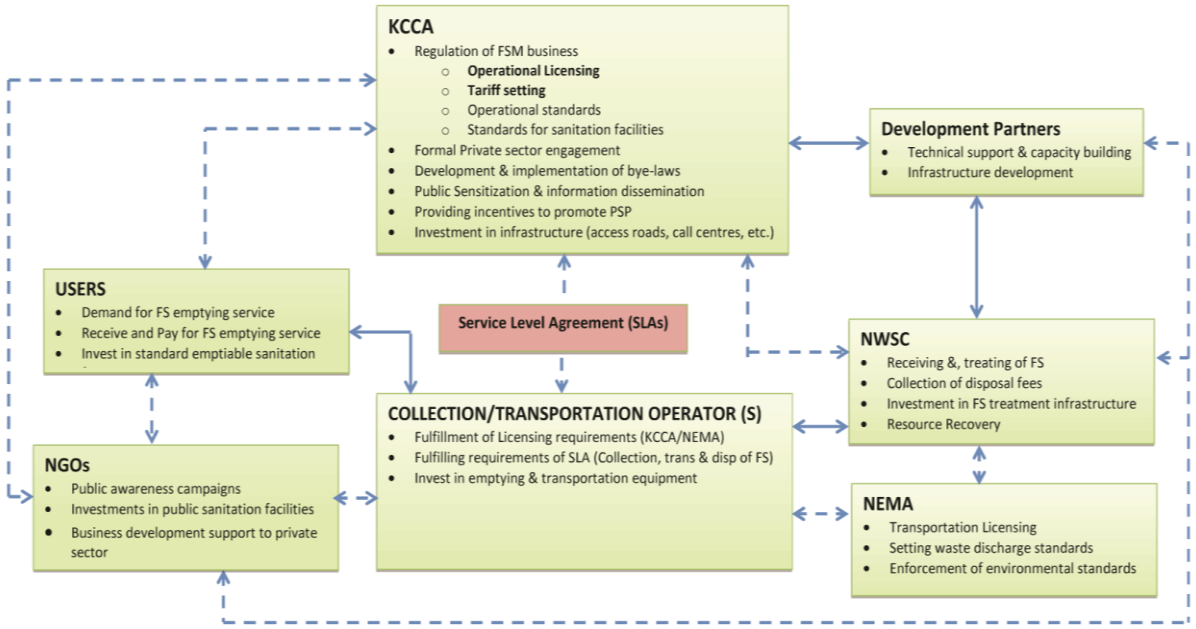

Figure 7. *Key actors engaged in Kampala's sanitation service governance (**Source:** KCCA (2014))*

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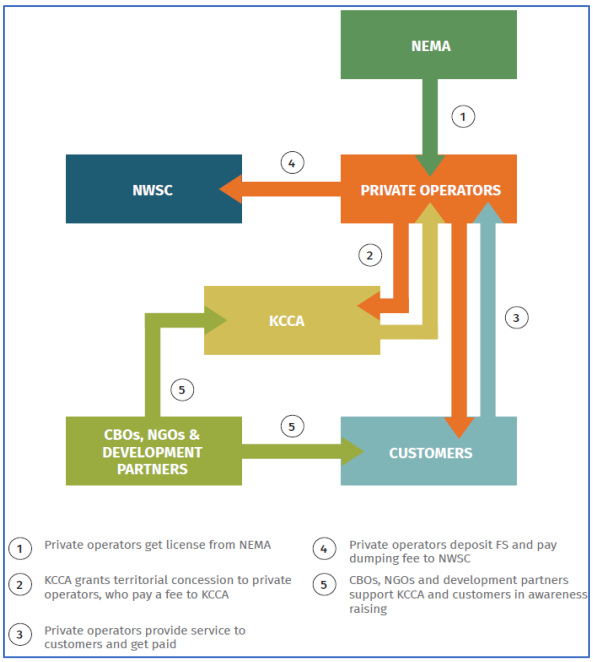

Figure 8. *FSM business model adopted by KCCA to close sanitation deficits (**Source:** Nkurunziza et.al (2017))*

At city level, key actors included state regulators (e.g., Directorate of Public Health Services and Environment – KCCA, NWSC, NEMA, and institutional insiders) and non-state organizations (e.g., NSDFU/ACTogether, CIDI, academic institutions, and transnational bodies such as WB/IDA, GIZ, Water for People, AfDB, AFD, and the Bill and Melinda Gates Foundation - BMGF). NSDFU and partner NGO ACTogether mobilize urban poor communities across over 20 urban centres, including Kampala, to advocate for equitable services; they have influenced KCCA toward inclusive sanitation approaches. Community Integrated Development Initiatives (CIDI), a non-profit, provides FSM services and promotes inclusive sanitation/hygiene for the urban poor via health advocacy, partnering with NWSC, KCCA and others under the Uganda Water and Sanitation NGO Network. NWSC, a public utility serving 258 urban areas in Uganda including Kampala, works with KCCA on the city's wastewater treatment and disposal (NWSC, 2022). NWSC plans to expand sewerage coverage by building additional plants; it has developed several via the Kampala Sanitation Programme (KSP) and is improving informal settlement sanitation under the Kampala Water Lake Victoria Water and Sanitation Project (KW-LVWATSAN), according to Fig.5 (NWSC, 2022). NWSC and KCCA collaborate with NEMA–Uganda's agency for coordinating, monitoring, regulating and supervising environmental management – which supports safe excreta disposal policies and MSME occupational safety compliance. However, individuals in these public organisations have diverted cesspool emptying trucks for private services in certain neighbourhoods, contravening policy restricting use to public institutions.

Research institutions like Makerere University shaped HSIs through knowledge exchange, policy development, and collaboration on technologies such as ECOSAN latrines and faecal sludge briquettes. KCCA's Directorate of Public Health Services and Environment implements sanitation policies, standards, and regulations. Over the past decade, it has adopted a collaborative, market-based approach – via the Weyonje Campaign and the KFSM – to address the city's pervasive sanitation inequalities (KCCA, 2017). Under KFSM, KCCA partnered with NWSC to build 50 free public toilets, increase sewerage access, and enforce sanitation standards (KCCA, 2014).

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Over the past two decades, international organisations such as the World Bank (WB/IDA), African Development Bank (AfDB), GIZ, Korea International Cooperation Agency (KOICA) and French Development Agency (AFD), alongside international NGOs like Water for People (WFP) and the Bill and Melinda Gates Foundation (BMGF), have significantly influenced Kampala's sanitation geographies (See Fig.6). These actors have mobilised financial resources for various sanitation interventions.

4.3. Emerging power and political dynamics behind Kampala's HSIs

The research findings indicate that the daily governance, management and user experiences of Kampala's HSIs are shaped by complex power dynamics among multiple actors – including landlords/ladies, property-owners, community toilet managers and caretakers, local entrepreneurs, CSOs, and government agencies, and transnational bodies. These actors compete for, or exercise varying influence and control over sanitation services, particularly in informal settlements. Their interactions, especially around excreta containment infrastructures with diverse usage (free, on-credit or pay-per-use), ownership (private, shared, communal/public) and maintenance practices (cleaning, excreta extraction, transportation, treatment and disposal) modalities, triggered various forms of power (e.g. institutional, social, economic etc.), exercised through different mechanisms (e.g. coercion, threats, fines, detention, persuasion, education, patriarchy, compliance, evasion, defiance, bargaining and negotiation etc.).

In this context, factors such as technology (e.g., GIS-phone tracking of MSMEs, specialist sanitation service call-centre desk), actors' control mechanisms (i.e. covert or overt), their legitimacy (by legislation i.e. formal, social consensus and cultural norms i.e. informal or a combination of any of these i.e. formal-informal), and time (i.e. daily, weekly or monthly) crucially shaped how power and politics along the HSI gradient affected sanitation access – either exacerbating it or exacerbating inequalities for the city's poor residents. These actors mobilized diverse resources (such as financial, knowledge, technical skills, social networks etc.), while navigating dependencies, tensions, conflicts, and contestations to shape sanitation outcomes. Informal bargaining and negotiation were ubiquitous features of these interactions. Actors strategically maneuvered formal structures and processes that were routinely subverted, circumvented, or openly defied (Goodfellow, 2019). This was especially evident among micro-level actors – such as households, landlords/ladies, property-owners, community toilet managers and caretakers seeking services from MSMEs - engaged in negotiation and bargaining as normalised practices to actualise their interests.

The vignette (See Text box 1) exemplifies the often obscured yet particularly pronounced daily interactions that characterize sanitation access underpinning HSIs such as the NSDFU Community Water and Sanitation Project in Kalimali, in Bwaise III. The NSDFU communal sanitation facility involves a relatively large constellation of visible and invisible actors. This results in complex decisions and choices about how to meet the demands of different users – issues that preoccupied the caretaker with questions of whom to allow access to, whom to deny, and how frequently to clean the toilets. The facility's manager also faced difficult dilemmas. First, how to strike a delicate balance between social benevolence, advocacy and activism – such as stepping in to resolve routine conflicts between users like the youth and the caretaker – and economic profitability. Second, when and how to negotiate fees for periodic sludge extraction with MSMEs, along with handling occasional confrontations with local health officials about the toilet's condition. The communal sanitation facility is therefore, a microcosm

DOI: 10.34915/acj.v6i2.216
ISSN 2673-4494
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of the everyday practices of poor residents as they navigate, negotiate, adjust, or cope with inadequate sanitation services. Consequently, sanitation access is not a fixed state in itself but rather a dynamic outcome influenced by an array of contextual factors and the availability of alternative options (Lawhon et al., 2016).

At the city-level, KCCA and NWSC – the main public agencies responsible for implementing sanitation policy in Kampala – increasingly collaborated with clearly defined roles. A senior KCCA official confirmed this in an interview, stating that:

> The responsibility of sanitation lies with the local urban authority and in this case it is 100% KCCA. But along the sanitation chain, the downstream component of treatment where you have safety for sewerage that's mainly NWSC…. sanitation has two components, the sewerage component and then the onsite component. Where there is sewerage that is NWSC, all through the sewerage network down to the treatment plant. But where you are dealing with toilets, septic tanks, collection of the sludge and transportation that is the role of the local authority, and in this case that's KCCA. Disposal and treatment is strictly NWSC. The Public Health Act is the main piece of legislation that empowers us as KCCA in our role…

KCCA and NWSC similarly collaborated with landlords/ladies, MSMEs, CSOs (including CIDI, Rotary International, ACTogether/NSDFU etc.) to champion public health under the KFSM initiative (Lwasa and Owens, 2018). This was evident in the Kampala Water and Sanitation Forum, which united state and non-state actors to pursue shared interests. It was also shown through local activities, such as home visits by KCCA public health teams, community leaders, and informal settlement residents, which gathered qualitative and quantitative data to inform decisions under the Weyonje Campaign.

DOI: 10.34915/acj.v6i2.216
ISSN 2673-4494
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Similarly, partnerships among local communities, KCCA, NWSC, and research institutions like Makerere University – through live studio sessions and co-produced research – helped recalibrate entrenched power hierarchies. This created better opportunities to understand everyday realities, supporting more informed and inclusive decision-making. Overall, KCCA and NWSC recognized that public resources and legal mandate alone were insufficient to cultivate and sustain institutional legitimacy and policy compliance for long-term change. Their willingness to collaborate closely with non-state actors marked a major shift from past practices. Using this "collaborative" form of power required these agencies to diversify their power craft "toolbox" beyond traditional coercive and punitive tactics. These collaborations included both formal and informal engagements. They showed that bureaucratic entities like KCCA, NWSC, and transnational actors were ready to adapt and become more flexible, avoiding rigid rules that could otherwise hinder efforts to substantially reduce sanitation inequality.

Text Box 1. *Snapshot of everyday power relations and politics around HSI sanitation access*

The previous night brought heavy rainfall. Plastic waste blocked the channel beside the NSDFU community toilet in Kalimali, hindering drainage of thick, muddy storm water into the main drain along the Kampala Northern Bypass (KNBP). The caretaker carried out routine tasks, including laundry and assisting users. During the wet season, she cleaned the toilets hourly due to muddy footprints. That morning, men, women and children used the facility. A woman inspected the women's toilets but deemed them unusable. She fetched water from a drum at the entrance and used the men's toilets. Afterwards, when asked why, she replied that the women's side was often dirty, risking illness. She appeared wary of the question, paid UGX 200 and left. Minutes later, a youth entered the facility, took water and used a men's stall. He then tried to leave without paying, sparking a scuffle with the caretaker and her sister. A crowd gathered. The youth claimed he had no money, but the caretaker insisted on payment. The NSDFU chairperson – toilet manager – arrived, heard the explanation, and let the youth go. He justified this by saying, "Those are our people…we don't need to harass them for payment yet the facility was [built] for them and for the welfare of the wider local community…".

DOI: 10.34915/acj.v6i2.216
ISSN 2673-4494
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To a greater extent, the above reflect the more productive dynamics of the emerging power relations and politics circumscribing Kampala's HSIs. However, evidence also suggests that HSIs were sites of predatory and opportunistic interactions, as illustrated by three scenarios. In the first, respondents pointed out that NWSC's cesspool trucks were routinely deployed by "institutional insiders" for private services – violating official policy that these trucks could only serve public institutions like the Uganda Police Force, public hospitals or schools. In the second scenario, one respondent – who managed a communal sanitation facility – complained about local public health officials who extracted bribes when they visited, claimed that:

> Yet another challenge is corruption…for example the [overflow from] the soak pit [next to] the septic tank makes health officers think that its faecal sludge from the toilet that ends up in the drainage…in the end [they ask for] money. And they don't take UGX 50,000, they want UGX 100,000 or else they close the toilet and remember it gets full quickly because if you empty it today, within four days its full again. So every time they open the soak pit, they argue that we don't empty it yet we have just emptied…So we give them money not to close [the toilet] and there is no way we can report such money in our [records]... (KII – Anonymous, 07/06/2018).

The third scenario demonstrated how the city's HSIs had increasingly drawn in the political elites, who sought to exploit public sanitation projects for political capital. This trend was attributed to the intensifying contestation between the NRM-led executive and the opposition that typified Kampala's political landscape after the city's re-centralisation in 2011. In 2017, the NWSC built and commissioned several public toilet blocks under KUPSIP (Daily Monitor, 2017). The project aimed "to provide affordable and sustainable sanitation services to the urban poor in Kawempe Municipality", aiming to benefit up to 200,000 people. A senior government official, speaking at the commissioning event alongside NWSC officials, remarked:

> Since the President made the pledge during presidential campaigns, the toilets were delivered and now the residents want the president to buy them toilet paper and the water to clean the toilets also […]. How do you expect government to start buying you toilet paper and cleaning for your toilets even after delivering them to you freely?

Before the project's 2015 unveiling and 2016 elections, President Yoweri Museveni pledged to provide toilets to address local sanitation challenges during campaigning. This pledge coincided with KUPSIP implementation. As shown above, the official message was clear: the president had fulfilled his promise and expected gratitude via votes for NRM candidates. The official thus prioritised political interests over inclusive urban services.

5. Discussion

Analysis of interactions underpinning Kampala's HSIs using SUPE reveals complex, dynamic power relations and politics that can reduce or exacerbate sanitation inequalities. Informal settlement residents and other micro-level actors mobilized their knowledge, energy, and social networks to create diverse, interdependent, multi-functional socio-technological solutions to meet their sanitation needs. These infrastructures were sustained by decisions from both visible and invisible actors. HSIs resulted from residents' incremental, unstructured actions over years, arising from the illegalization of informal settlement habitation. This had relegated informal settlement residents to a "pathological space" conflicting with formal urban policies that promote a highly ordered, functional, "European-type" urban space.

DOI: 10.34915/acj.v6i2.216
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Through the interplay of decisions and actions around the city's HSIs, informal settlement residents and other micro- and meso-level actors shaped key outcomes: who participated in decision-making, which socio-technologies met local needs, access modalities (free or paid, and how much), ownership, repair and maintenance demands, usage rights, and regulatory legitimacy, among others. Through negotiated collaboration with city-level actors like KCCA, NWSC, CSOs and other meso-level actors, residents applied their ingenuity, intuition, and environmental understanding to anticipate, experiment, improvise and (re)calibrate HSIs – such as the communal sanitation facility – in response to changing conditions, rather than normative logics of how the city ought to be inhabited and used. This emerged organically through practical know-how addressing scarcity, precarity, and uncertainty, against a backdrop of institutional crisis, accelerated urban informality, and the partial institutionalisation of collaborative service provision (Id et al., 2021; Lwasa & Owens, 2018; Musana & Kyosimire, 2022).

These interactions reveal four key aspects of power: it is diffuse and dispersed among human actors; it functions through polycentric social networks; a "collaborative" form of power drives state and non-state actor interactions around the city's HSIs; and non-sentient power is fundamental for rethinking urban waste flows and metabolic processes. Power is evident through the everyday interactions among multiple actors in dense polycentric social networks, not solely structural systems. In Kampala's HSIs, power shapes everyday life, empowering or disempowering actors in asymmetrical, formal-informal relational networks. This dispersed power geometry reduces or reinforces sanitation inequality. Sanitation inequality is therefore a produced condition deeply rooted in such a power geometry, perpetuating exclusion from centralised sewerage or unjust urban environments. Moreover, power's dispersed nature challenges planning and governance by involving highly dynamic variables.

This power geometry has fostered greater collaboration among sanitation actors operating at different scales. It underscores the need for pragmatism – particularly for state agencies – by shifting from traditional, bureaucratic, top-down approaches that have proven ineffective against pervasive issues like sanitation inequality. HSIs extend beyond mere infrastructures posing public and environmental health risks; they are potent media shaping socio-ecological urban transformation. The above evidence calls for rethinking approaches to HSIs and broader urban challenges such as sanitation inequality. Recognising such complex everyday interactions around sanitation infrastructures in African cities like Kampala yields a more nuanced understanding of urban development, transcending Eurocentric ideals of infrastructure (Sseviiri et al., 2020). This demands a departure from universal networked service models in favour of deeper engagement – through innovative, radical research – with the localised power relations and politics behind heterogeneous infrastructures configurations in these contexts (Lawhon et al., 2018; Nsangi et al., 2021; Sseviiri et al., 2020, 2022).

5. Conclusion

HSIs are important for understanding complex issues like power, which underlie pervasive issues in the global South such as urban sanitation inequality. As illustrated in this paper, Kampala's HSIs have attracted various actors who interact to influence the unfolding, uneven contours of sanitation access. These actors' unilateral, bilateral or collective decisions and actions influence various dimensions of the city's HSIs – such as the types of sanitation technologies adopted, their optimal locations, how financial resources are mobilised, distributed

DOI: 10.34915/acj.v6i2.216
ISSN 2673-4494
African Cities Journal 2026, Lausanne, Suisse

and accounted for, decision-making processes (whether collectively through participatory processes or otherwise), responsibilities for operational maintenance, and access rights to use HSIs (like the private or public toilets) – have shaped the sanitation choices available to the urban poor. Such a complex social network of multiple actors demands rethinking how we engage and approach these infrastructures, beyond seeing them as isolated artefacts. HSIs are highly power-laden spaces, and their power dynamics shape unequal sanitation access in cities like Kampala. This power is dispersed and asymmetrical, manifesting subtly or overtly through the spaces between formal and informal. Power is exercised and shapes everyday life (either empowering or disempowering) in asymmetrical, informal-formal relational interactions among multiple actors. Power goes beyond just rules and enforcement, and its productive aspects have triggered unexpected social and material changes. It unfolds through recursive, situated and subjective practices around how faecal waste material value is negotiated. Subsequently, this paper demonstrates that HSIs, its public and environmental health risks notwithstanding, are powerful media impacting socio-ecological urban transformation. Therefore, these infrastructures need to be better understood through in-depth engagement to enrich scholarship on how cities in the global South are organised and function. Such alternative understandings of everyday power dynamics are also crucial for unlocking their potential to address pervasive challenges such as urban sanitation inequality whilst also substantially improving urban socio-environmental conditions.

Author contributions

- **Peter Kasaija:** Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing
- **Paul Isolo Mukwaya:** Conceptualization, Formal Analysis, Resources, Supervision, Validation, Writing – review & editing

Acknowledgments

This section serves to recognize contributions and support of the Heterogeneous Infrastructure Configurations of Cities in Uganda Project (HICCUP) research team, the staff of the Department of Geography, Geoinformatics and Climatic Sciences (DGGCS) and colleagues from the Urban Action Lab (UAL), the National Slum Dwellers Federation of Uganda, ACTogether, Community Integrated Development Initiatives (CIDI), Kampala Capital City Authority (KCCA) and the Ministry of Lands, Housing and Urban Development (MoLHUD).

Use of generative AI

The authors declare that they responsibly referred to POE and JENNI.AI generative platforms to augment some text content in this manuscript.

Source of funding

This paper is based on research that was supported by the HICCUP project funded by: The Swedish Research Council (VR, Vetenskapsrådet) as a development research grant previously administered by Swedish foreign aid agency SIDA. The project was based at the Urban

DOI: 10.34915/acj.v6i2.216
ISSN 2673-4494
African Cities Journal 2026, Lausanne, Suisse

Action Lab (UAL), Department of Geography, Geoinformatics and Climatic Sciences, Makerere University and supported by University of Oklahoma, University of Manchester, University of Sheffield and KTH Royal Institute of Technology.

Conflicts of interest

The authors declare no conflicts of interest for this work.

Data Availability Statement

The data is available from the corresponding author upon reasonable request.

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DOI: **10.34915/acj.v6i2.216**
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