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Barriers and Enablers to the Regulation of Sanitation Services: A Framework for Emptying and Transport Services in Sub-Saharan African Cities

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Onsite sanitation is the dominant form of sanitation in Sub-Saharan African cities. Services for emptying the fecal sludge from these facilities and transporting it to safe disposal or treatment plants are crucial to public and environmental health. While these services are becoming increasingly regulated, implementation of the regulation remains a challenge. Through a multiple-case study anchored in the Contextual Interaction Theory, this research investigated the barriers and enablers to regulating emptying and transport services for fecal sludge. Looking at the cases of Kampala, Lusaka, and Freetown, this research found that both the content of the regulation and the regulatory process (initiation, creation or reform through to implementation) play a key role in the extent to which the regulation is or can be implemented. New elements relating to the knowledge, motivation, and resources of all stakeholders are identified as crucial to achieve regulated services. The findings have resulted in a framework that identifies the key elements to consider when regulating services. This framework would prove useful to practitioners and researchers engaged through all stages of creating, implementing, and evaluating regulatory practices.

Keywords: enabling environment, waste management, urban, onsite sanitation, faecal sludge management (FSM), policy implementation

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1 INTRODUCTION

In Sub-Saharan African cities, the majority of the population relies on onsite sanitation facilities, that typically generate fecal sludge (WHO/UNICEF, 2021). Services that operate to empty and transport fecal sludge from on-site sanitation containment systems (without which sludge would be left on-site, pits and septic tanks would overflow, and sludge would not reach treatment or safe disposal sites), are crucial to enable a safely managed sanitation chain[1] in cities, to protect public and environmental health (Ibid, 2021). When inaccessible, unhygienic, or inadequate, these services contribute to the negative impacts of poor sanitation (disease, environmental pollution, financial loss, lower quality of life, etc.), especially for those living in low-income urban settlements.

[1]The sanitation chain is composed of all the steps taken by the fecal sludge and wastewater produced by people, from generation to end disposal or reuse (user interface, collection, transport, treatment or disposal or reuse) (Strande et al., 2014).

To address the adverse impacts and the inadequacy of many such emptying and transport services, local governments and national entities have started organizing and regulating them (ESAWAS Regulators Association, 2019; Gero and Willetts, 2020). Regulation can be divided into three main approaches: command and control, support and incentivize, and leave to self-regulate (Baldwin and Cave, 1999; Vedung, 2017). Previous research shows that there are a variety of regulatory situations in sub-Saharan African cities. Many cities have at least some regulation in place for emptying and transport services, covering five categories of regulatory mechanisms: rules, sanctions, monitoring and control mechanisms, support and incentive mechanisms and pro-poor measures (Lerebours et al., 2021b).

The implementation of the regulation is often partial or non-existent (Weststrate et al., 2019; Lerebours et al., 2021b). Earlier research identified certain elements of the regulation that influence its implementation, either from the perspective of the regulated (Lerebours et al., 2021a; Lerebours et al., 2021b), financial constraints (Jenkins et al., 2015; Acey et al., 2019; Doe and Aboagye, 2020), or the enabling environment for sanitation (Mumssen et al., 2018; Sinharoy et al., 2019; Weststrate et al., 2019). There is, however, no overall analysis of what, both in the content of the regulation and in the regulatory process itself, influence its degree of implementation.

An investigation of specific cases was thus needed to understand better what contributes to and hinders the implementation of regulation of fecal sludge emptying and transport services. Through document analysis, an online survey and semi-structured interviews, this multiple-case study set out to identify barriers to and enablers of the implementation of regulation, using Contextual Interaction Theory as the conceptual lens for the design and analysis.

2 MATERIALS AND METHODS

For this research, investigating multiple cases was necessary to identify commonalities and differences regarding the barriers to and enablers of the implementation of regulation in different cities. As general patterns were sought, a single unit of analysis was chosen: a city in sub-Saharan Africa. Using the data collected and analyzed during previous research (Lerebours et al., 2021a; 2021b), three cities which have regulation in place were selected (Kampala, Lusaka, and Freetown) that provide insights into the contextual, process and regulatory elements regarding the creation of the regulation, the resulting content of the regulation, and the degree of implementation. While these three cities are not intended to be representative of all cities in sub-Saharan Africa, they share traits with many other cities, such as population growth and considerable unplanned settlements where access to basic services is limited. The knowledge generated through this study contains generalizable elements, as shown in the results and discussion sections.

2.1 Contextual Interaction Theory

As this study investigates the implementation of regulation in particular, implementation theories were explored. Building on the work from previous scholars, Contextual Interaction Theory (CIT) belongs to the third generation of implementation theories which combines both top-down and bottom-up approaches (O'Toole, 2004), recognizing that policymaking and policy implementation are interdependent, where all actors interact, exchange, and learn from each other (Bressers, 2004; Bressers and de Boer, 2013). CIT provides a lens with which to analyze the course and outcomes of a policy process, looking at three core characteristics of actors involved: motivation, knowledge, and resources (Bressers, 2004). It is based on the assumption that policy processes do not depend only on inputs, but are human-social interaction processes between actors, both individuals or collectives. CIT also assumes that many factors, including external factors, influence the activities and interactions of the actors, and that their characteristics influence the policy process but are also influenced by it (Bressers, 2004; Bressers and de Boer, 2013). The interactions between actors are analyzed within their own contexts, which also influence the resulting policy implementation. This theory has been applied to various policy processes, such as river management policy, health policy, and to sanitation campaign programs (Bressers and de Boer, 2013; Hueso and Bell, 2013).

CIT investigates the complexity of the implementation process while providing a lens for analysis, distinguishing actors' "core characteristics" from contextual factors. Contextual factors consist of 1) specific context (goals, instruments, resources, and timing); 2) structural context (governance elements); and 3) wider contexts (political, economic, cultural, and technological). The core characteristics of actors to be studied are 1) knowledge, or "cognitions" (information and interpretation of reality); 2) motives or motivation (drivers, values, and perceptions); and 3) resources (financial and non-financial capacity, skills, and decision-making power) (O'Toole, 2004; Bressers and de Boer, 2013). Contextual Interaction Theory is presented in **Figure 1**.

2.2 Data Collection and Analysis

This study used multiple sources of evidence for each city: 1) A document review, including legal documents (to develop a context summary). Documents selected were census surveys, legal documents, policies, and strategies developed by the country, region, and city studied. 2) Interviews with three regulators in each city. Interviewees were selected because they were working for the active regulators in their cities: i.e., the national or city utility and local authority in all three cities, plus the national regulator and policy maker in two cities. Interview guides were developed based on the CIT elements (Bressers, 2004; Bressers and de Boer, 2013). Interviews were held online, in English, and transcribed. Private emptiers were not interviewed for this study but their perspectives, collected in a previous study (Lerebours et al., 2021a), were used to triangulate and discuss the findings of this research. 3) A pre-interview online survey asking questions related to the governance in place in the interviewees' cities (structural context). This survey was administered in English and adapted from the Governance Assessment Tool developed as part of the CIT (Bressers, 2004). All interviewees completed the pre-interview survey. The context summaries were

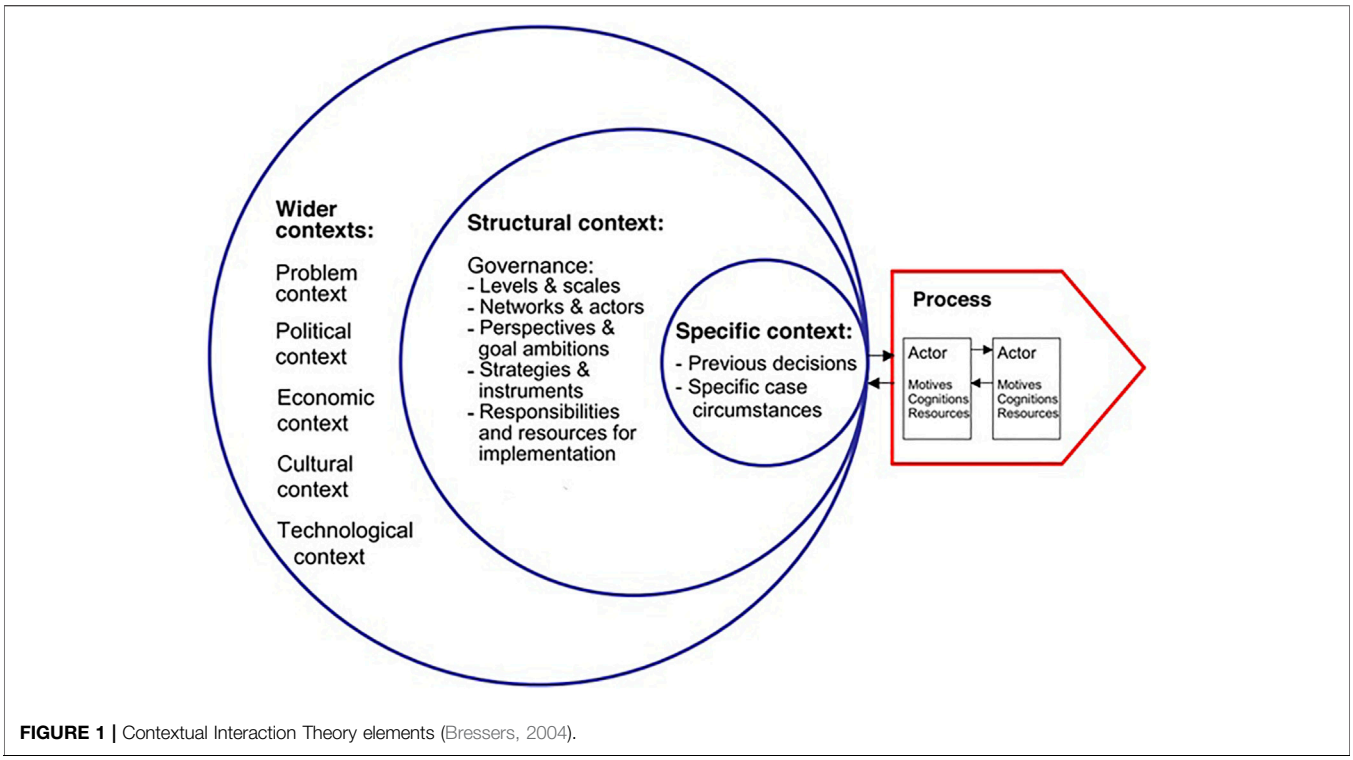

FIGURE 1 | Contextual Interaction Theory elements (Bressers, 2004).

also shared with the interviewees, so they could confirm, complement, or amend them; and emails were exchanged with interviewees to clarify or confirm information where required during the analysis. **Table 1** below summarizes the sources of evidence for this study.

The data analysis comprised multiple steps: 1) the initial document analysis and inputs from respondents led to case summaries (see above). 2) the transcribed semi-structured interviews were coded and thematically analyzed. An initial coding guide was developed before the analysis, based on CIT, and iteratively modified during the coding process. All interviews were then coded against this guide to ensure consistency across all interviews. 3) each case was analyzed individually against the CIT elements (contextual factors and core characteristics); and 4) a cross-case analysis was carried out. The cross-case analysis consisted of identifying commonalities and differences among the three cases, regarding the actors' core characteristics and the contextual factors, to identify barriers to and enablers of implementing regulation. The resulting analysis is presented below in the results section.

Based on the cross-case analysis, tables were developed (**Tables 2–6**) to summarize the findings for the contextual factors and the core characteristics. They present the key elements identified by the respondents as influencing the implementation of the regulation in their cities, either in a positive way (enabler +) or negative way (barrier −), or a mix of both (+/−). Using these findings and those from previous research, a new framework was developed that incorporates the key elements directly influencing regulation of emptying and transport services recommended to be taken into account through the regulatory process (**Figure 2**).

2.3 Ethical Considerations

Ethical approval for the study was obtained from Loughborough University (Reference: DT_10496). Participation was voluntary,

TABLE 1 | Sources of evidence for the study.

Sources	Contextual factors			Actors' core characteristics		
	Specific inputs or context	Structural context	Wider context	Knowledge	Motivations	Resources
Document review	x	X	X			
Pre-interview online survey		X				
Semi-structured interview	x			X	x	x

study participants provided prior written informed consent and all data was securely stored and fully anonymized to protect privacy.

3 RESULTS

The findings and discussions presented in this paper are structured following CIT: the contextual factors (wider, structural, and specific contexts) and the actors' core characteristics (knowledge, motivation, and resources). Applying the CIT lens for design and analysis provides a comprehensive and robust way to ensure all elements relevant to the practice of relevant actors and the broader context within which they interact are accounted for.

3.1 Contextual Factors

3.1.1 Wider Context: Description of the Cities

The three cities studied are the capital cities of their respective countries. Their populations are all over one million and growing fast. 60% or more of their residents live in low-income areas, with limited access to basic services. 85% or more of their residents use onsite sanitation facilities, which are typically emptied by vacuum tankers, Gulpers, and manual emptiers. While Kampala and Lusaka have treatment facilities in operation for fecal sludge, Freetown's facility was not operational at the time of the research. **Table 2** below summarizes the contexts of the three cities.

3.1.2 Structural Context: Governance of the Cities

Emptying and transport services for fecal sludge are regulated by the local governments, supported by their line ministries, in all three cities. The environmental regulator is also involved in Kampala and Lusaka, along with the water and sanitation regulator and the utility in Lusaka. **Table 3** below summarizes the main stakeholders involved in the regulation of emptying and transport services.

3.1.3 Specific Context: The Regulatory Process and the Regulation in Place

All three cities started their regulatory processes recently (post-2010), following regular disease outbreaks and the offer of support from donors and development partners. They all benefitted from external support to develop their regulation and implement it, as part of wider sanitation improvement projects. Lusaka and Kampala received substantial financial support from donors and development partners (including funding for fecal sludge treatment plant construction and rehabilitation, for toilet construction and rehabilitation, support to subsidized emptying, etc.). Indeed, the Lusaka Sanitation Program, led by LWSC and funded by the World Bank, the European Investment Bank, the African Development Bank, and the German Development Bank had a budget of US$350 million (2016–2021). In all three cities, the regulatory processes began with initial assessments of the sanitation market, stakeholders and specificities. This was followed by engagement of a wide range of stakeholders, including emptiers; sanitation marketing and other awareness-raising activities targeted at households; capacity building of all stakeholders, especially of the regulators and the emptiers; and the development of regulatory documents, some of which are yet to be approved.

The regulations developed in the three cities have some similarities. Emptiers in each city should register their businesses, obtain licenses to operate from the local government and/or the utility, and licenses for their trucks. They must follow standard operating procedures, key performance indicators or minimum operating standards, and report on their work. The bylaws developed by the three local governments (two pending approval) cover the entire sanitation chain and emphasize health and safety requirements, mandatory sites for disposal, and operational standards. All three cities have set up call centers, together with monitoring and information systems (under development in Lusaka and Freetown). They all gather customer feedback through their call centers and other complaint hotlines. Local government and other regulators monitor emptiers through this feedback and spot checks, including visits to emptying sites. However, mapping sanitation facilities (even if only partial), standards for sanitation facilities, licenses from the environmental regulator, self-reporting by emptiers, and regulation by contract, in which emptiers are under contract with the municipality or utility to provide a specific service with measurable performance indicators, can only be found in Kampala and Lusaka. Lusaka is the only city in which pit-emptiers are not allowed to operate without a contract and consequently charge a specific fee set by the utility. In Kampala, emptying prices are not fixed, except when the service is subsidized by KCCA.

Penalties in place when emptiers break the rules cited above include fines, arrest, loss of license, loss of contract, loss of access to disposal site(s) and suspension from the call center registry. In Freetown for example, the FCC draft bylaws specify that emptiers who do not abide by standard operating procedures or use the mandatory disposal site can be fined up to 500,000 SLL[2] and given a prison sentence of up to 6 months.

All three cities have taken steps to support emptiers and incentivize them to operate in a formal and regulated manner. They were engaged early in the regulatory process, to ensure the acceptability of the regulation and buy-in of emptiers. Initiatives to increase demand for services included marketing of safe services, call centers, and in Kampala and Lusaka, subsidies to empty pits and tanks and to build or upgrade toilets that are emptiable. Support to formalize businesses took the form of training, and the supply of PPE and tools in the three cities. Business clinics or equivalent were provided in Kampala and Lusaka and mobile transfer stations occasionally provided in Kampala.

The implementation status of these somewhat similar regulations varies widely. In Kampala and Lusaka, while not fully implemented, according to the regulators the rules described above are known and followed by the majority of the emptiers. Kampala's compliance approach (handholding of emptiers, incentives and support to be regulated) has led to delaying full enforcement of the rules in place on paper, but a number of

[2]500,000 Sierra Leonean Leone = US$45 (March 2022).

TABLE 2 | Cities' wider context (source: document analysis and respondents).

	Kampala	Lusaka	Freetown
Location	Capital of Uganda. Bordering Lake Victoria, at an altitude of 1,140 m; total area 178 km^2	Capital of Zambia. Altitude 1269m; total area 360 km^2	Capital of Sierra Leone On the coast of the Atlantic Ocean at sea level; total area 82 km^2
Climate	Tropical, two rainy seasons	Subtropical, three seasons	Tropical, one rainy season
Administration	Kampala Capital City Authority (KCCA)	Lusaka City Council (LCC)	Freetown City Council (FCC)
Population	1.5 million that doubles during the day due to commuting. Projected to grow to 1.9 million by 2025	2.3 million inhabitants. Average population growth of 4% pa	1.2 million people. Growth rate of 4.2% pa. Expected to double by 2028
Low-income settlements	60% of the population live in the 72 informal low-income settlements that cover almost 11% of the city area	Approximately 70% of Lusaka's residents live in the 35 informal and unplanned peri-urban areas	60% of the residents live in low-income areas, the majority located on the hills and floodplains
Access to sanitation	99% of Kampala's residents have access to sanitation facilities, with 92.5% of the inhabitants using onsite sanitation facilities, mostly pit latrines, septic tanks and VIP latrines. 60% of Kampala's population had access to safely managed sanitation in 2019	85% of Lusaka's residents have access to onsite sanitation facilities (partially lined or lined pit latrines and septic tanks), 14% are connected to sewers and 1%–4% practice open defecation. 17% of the population has access to safe sanitation	90% of Freetown's residents use onsite sanitation facilities (pits and septic tanks), 6% are connected to sewers, 4%–5% practice open defecation or use hanging toilets (toilets located directly over bodies of water)
Type of fecal sludge emptying and transport	Vacuum truck in high- and mid-income areas and some low-income areas. Gulper and manual emptiers in low-income areas	Vacuum trucks mostly operating in planned urban areas. Manual pit emptiers in peri-urban areas	Vacuum trucks, Gulper operators and manual emptiers. Some facilities empty directly into drains and waterways
Treatment facilities	Bugolobi and Lubigi wastewater and fecal sludge treatment plants	Manchinchi wastewater treatment plant, or Chazanga and Kanyama fecal sludge treatment plant	Disposal at Kingtom dumpsite (not a treatment facility). A treatment facility has been built (2021) and will start operating shortly

emptiers are already registered, licensed, and operating under the existing regulations. Lusaka's implementation of the regulation has focused so far on pit-emptiers, and while they are waiting for the final approval of the bylaws before enforcing all the rules with all emptiers (to include septic tanks emptiers), pit-emptiers are already operating under the new regulations. In Freetown, however, the standard operating procedures are only followed by emptiers hired by development partners. The new bylaws, once approved by parliament, will need time to be rolled out to all service providers.

3.2 Actors' Core Characteristics

3.2.1 Knowledge

All interviewees reported experience and knowledge of the sanitation sector in general, including fecal sludge management services. They assessed the knowledge and technical skills of their institutions as sufficient to do their work, in Kampala and Lusaka, while additional capacity building is needed in Freetown. Respondents found the regulation to be clear and consistent across regulatory documents.

In all three cities, emptiers were involved in the development of and trained on the regulatory process. However, all respondents agree that additional training and outreach is needed. Similarly, there have been outreach efforts in the three cities studied to ensure households are aware of the regulation in place, although respondents said that further awareness campaigns were needed. In Freetown, respondents shared that many were still not aware of the regulations. Outreach efforts, both towards emptiers and households, have not focused on what the rules and sanctions are, but rather on why they are needed (with emphasis on the negative impact of unsafe services), and how they can be implemented.

The availability of data was in general deemed good enough by respondents in Kampala and Lusaka, thanks to previous scoping studies, surveys, and systematic data collection. In these two cities, the majority of emptiers are known by at least one of the regulators, except for some informal manual emptiers, especially in Kampala. Specific data are still lacking, such as a hydrogeological survey in Lusaka. In Freetown, however, more extensive data are still lacking about sanitation facilities and services. In all three cities, monitoring and evaluation (M&E) systems are being developed. Respondents highlighted the need for a sound understanding of the baseline situation when starting the regulatory process, including identifying existing sanitation facilities and infrastructures, stakeholders, the state of the sanitation market and services, assessing the whole sanitation chain to identify gaps, existing solutions and acceptable minimums. Sharing of data seem to be done easily and routinely in the three cities among sanitation regulators, and upon request with others.

Table 4 summarizes the findings of barriers and enables across the elements under the Knowledge theme.

3.2.2 Motivation

In all three cities, respondents shared their personal commitment to implementing the regulation in place, along with their pride in

TABLE 3 | Main stakeholders involved in provision and regulation of emptying and transport services.

	Kampala	Lusaka	Freetown
Local government	Kampala Capital City Authority (KCCA) is responsible for sanitation and public health; licenses service providers; and can make and enforce bylaws	Lusaka City Council (LCC) is responsible for sanitation and drainage; conserving water supplies and preventing pollution; and can make bylaws	Freetown City Council (FCC) is responsible for regulation and delivery of sanitation services; can raise local taxes; and can make and enforce bylaws
National government	The Ministry of Water and Environment formulates policies, long-term objectives, mobilizes financial resources and oversees the sector	The Ministry of Water Development, Sanitation and Environmental Protection (MWDSEP) provides oversight and coordination	The Ministry of Health and Sanitation (MoHS) and the Ministry of Internal Affairs, Local Government and Rural Development are responsible for sanitation
Utility	National Water and Sewerage Corporation (NWSC) is responsible for water and sewerage, including the operation of wastewater and fecal sludge treatment plants	Lusaka Water and Sanitation Company (LWSC) provides water and sanitation services. It delegates emptying services to private operators	Guma Valley Water Company is responsible for water supply and sewerage in Freetown, but has no responsibility for onsite sanitation
Independent regulator for water and sanitation	None dedicated	The National Water Supply and Sanitation Council (NWASCO, since 1997) sets and enforces standards and guidelines, licenses and advises institutions and service providers	None dedicated
Independent environmental regulator	National Environmental Management Agency (NEMA) sets waste disposal and transportation standards, and licenses environmentally hazardous practices	Zambia Environmental Management Agency (ZEMA) sets waste disposal and waste management standards, enforces them, licenses and advises institutions	The Environmental Protection Agency (EPA) sets standards and guidelines to protect the environment, but until now, is not active for onsite sanitation
Emptying and transport service providers	• KCCA (mechanical) • Formal and informal private mechanical and semi-mechanical (Gulper) emptiers • Informal manual emptiers	• Formal private mechanical emptiers • Formal manual emptiers, subcontracted by LWSC • Informal manual emptiers	• FCC (mechanical) • Formal private mechanical and Gulper emptiers • Informal mechanical and manual emptiers
Emptiers' association	• The Private Emptiers Association Uganda (PEAU) • Kampala Emptiers Association Limited (KEALtd) • The Gulpers Association of Uganda	Mechanical and formal manual emptiers are represented by the Zambia Emptiers Association	Private emptiers are represented by an emptiers' association

TABLE 4 | Barriers and enablers for knowledge from interviews.

Knowledge elements	Kampala	Lusaka	Freetown
Knowledge and technical skills of the regulator(s)	+	+	+/–
Clear regulation on paper	+	+	+
Knowledge of the regulation by emptiers	+	+	+
Knowledge of the regulation by households	+/–	+/–	–
Understanding of the need for regulation by the regulated	+	+	+/–
Knowledge of the emptiers by the regulators	+/–	+	+
Availability of data	+	+	–
Sharing of data	+	+	+

Note: this table assesses the different elements of CIT's knowledge with three potential outcomes: enablers (+), barriers (–), or a mix of enablers and barriers (+/–).

seeing the positive outcomes. In Kampala and Lusaka, interviewees also appreciated the national and international recognition their institutions are receiving. Respondents expressed that regulators should be champions of the reform and vision they are pursuing and advocate for these with all other stakeholders.

The regulators' decision to start regulating in the cities studied was driven by several reasons. First, the respondents all agreed that it was part of the mandate of their respective institutions. Second, they shared a will to address public health issues and disease outbreaks. The support received from development partners also drove them to lead reforms, especially in Freetown where it was reported to be the main reason for regulating services. Finally, respondents wanted to address the lack, or inadequacy of previous regulations, roles, and responsibilities. Indeed, Lusaka had almost no regulation for

emptying and transport services for fecal sludge, while in Kampala and Freetown the previous rules were seen as confusing and too vague to be enforced. In the three cities, regulators received support from higher authorities to enact the regulation. Respondents highlighted the need to engage politicians early to gain their support, which is seen as critical.

The households' motivation to implement regulation was built through education in all three cities, explaining the need for safe services, how to access them, and how to report issues. In Kampala and Lusaka, a compliance approach with light enforcement has been used, while in Freetown, offenders are first warned and given the opportunity to comply, before being fined and prosecuted. Respondents emphasized the importance of making the steps of hiring safe services clear, easy, and well-known.

In the three cities, emptiers were engaged early to help them understand the regulation and why it was needed. They contributed to the content of the regulation, as it was seen to make the regulation more acceptable to them and more context specific. The three cities host emptiers' associations, which were consulted throughout the regulatory process, enabling regular communication and feedback between regulators and those to be regulated. Building trust between the regulators and the regulated was mentioned by respondents in Kampala and Lusaka as a key component of regulating. The requirements and bidding processes practiced in both cities are said to be transparent, so that any decision from the regulators would be accepted. In Freetown, however, emptiers find the bidding process unfair as public and private operators have different rules. In Freetown, emptiers are required to pay an unfixed registration fee, which is not less than SLL 200,000 (US$17) annually, plus at least SLL 100,000 (US$ 8.50) every dumping trip at the Kingtom disposal plant. The emptiers complained not only about the high fees, but also about the fact that the fees vary from one client to another, and that they continually go up. They also find the requirements to dispose of sludge at a disposal site and pay disposal fees illogical when the disposed sludge remains untreated.

Emptiers have also received support to help implement the new regulation (support and incentive mechanisms). This is in the form of training (technical, health and safety, business management, regulation), provision of tools and PPE, and building demand for services through awareness campaigns. These support mechanisms were mostly provided by or with financial support from development partners. Respondents shared the will of their institution to favor compliant emptiers. The call centers established in the three cities link potential customers with emptiers practicing safe emptying. Contracts given by the utility in Lusaka, the municipality in Kampala, and development partners in Freetown are restricted to registered and compliant emptiers. The goal is then to convince other emptiers that they would benefit from becoming formal and following the regulation. In the three cities, there are monitoring and reporting mechanisms in place to help regulators identify compliant and non-compliant emptiers, including self-reporting tools for emptiers and opportunities for communities to report issues, for example through mobile apps and call centers. The threat of being penalized when caught breaking the rules (see earlier examples in **Section 3.1.3**) was mentioned in all three cities as a motivation to compliance, although enforcement is still limited.

Finally, other stakeholders' motivation to implement the new regulation has been built through clearer roles and responsibilities in the three cities, strong relationships among the regulators, and involvement of all. In Kampala and Lusaka, regulators all shared the supportive relationships between the institutions involved in fecal sludge management (FSM), and between the institutions and development partners, while in Freetown, coordination between institutions and development partners remained difficult. Respondents recommended to create a roadmap towards change and agree on a shared vision with other institutional stakeholders, and to seek opportunities to support each other, while ensuring external partners are on board and target their resources to the priorities identified.

Table 5 summarizes the findings across the elements under the Motivation theme.

3.2.3 Resources

All three cities have the legal power to enact and implement the regulation for sanitation services. Local government can make and enforce bylaws, following their respective procedures. While the final approval of sanitation bylaws is pending in Lusaka and Freetown, once they are approved local officers will have the legal power to enforce them, impose sanctions or take offenders to courts. The roles and responsibilities of each stakeholder in implementing the regulation are reported by the interviewees to be clear, at least on paper. In Lusaka, LWSC has the right to subcontract emptiers with NWASCO approval and is held accountable by NWASCO. In Kampala, NWSC is responsible for managing its treatment plants and therefore can bar emptiers if necessary. In Freetown, respondents shared that in practice, there is some confusion in who does what, as interventions are led by funding opportunities. The enactment and implementation of the new regulation has received political support in the three cities studied. However, respondents were mindful that their institutions are operating in a sensitive political environment and were careful to avoid sanitation becoming politicized.

In the three cities, resources were provided to the regulators to help establish the new regulation and then implement it, as part of larger enabling environment-strengthening projects or program components. This included technical support, through hiring consultants and providing training for staff; financial support to enable stakeholder engagement meetings, council meetings, and communication campaigns; and development of sanitation infrastructure and equipment, such as treatment plants, vacuum trucks and toilet facilities. Support and incentive mechanisms for emptiers and households discussed above were mostly provided through funding from development partners. This is especially the case in Lusaka and Kampala where the sanitation sector still receives substantial support, as highlighted in **Section 3.1.3**. However, while in the three cities new institutional arrangements have been put in place, the staff incorporated into the utility or local government structures, and new M&E tools institutionalized, according to the interviewees additional human resources are needed to enable adequate monitoring and smooth running. In Kampala and Lusaka, day-to-day operations

TABLE 5 | Barriers to and enablers for motivation from interviews.

Motivation elements	Kampala	Lusaka	Freetown
Personal motivation/pride of regulators	+	+	+
Motives of regulators to start regulating			
Mandate of the institution	+	+	+
Address public health issues	+	+	+
External support	+	+	+
Inadequate previous regulation	+	+	+
Government support or directive	+	+	+
Motives of regulators to implement regulation			
Public health issues	+	+	+/–
External support	+	+	+
Government support	+	+	+
Support among the regulators	+	+	–
Households' motivation to abide by the regulation			
Awareness of the need for safe services	+	+/–	–
Handholding approach to enforcement	+	+	+/–
Emptiers' motivation to abide by the regulation			
Early engagement in the regulatory process	+	+	+
Regular communication and feedback	+	+	+/–
Support for emptiers to enable them to implement regulation	+	+	+
System favoring compliant emptiers	+	+	+/–
Trust between regulators and regulated	+	+	–
Threat of punishment by regulator/police	+/–	+/–	+
Shaming of unsafe practices and reporting of issues	+	+/–	–
Other stakeholders' motivation to implement			
Clarity of the new regulation, roles and responsibilities	+	+	+
Coordination among all stakeholders	+	+	–

Note: this table assesses the different elements of CIT's motivation with three potential outcomes: enablers (+), barriers (–), or a mix of enablers and barriers (+/–).

are now financially sustainable; however, subsidies and infrastructure investment still depend on development partners. The hand-holding approach taken with households and emptiers requires time and resources. In Freetown, the fecal sludge management unit, set up within FCC, and other FCC officers lack basic fuel, car repairs, stationery, and other essential funds to monitor services and engage communities.

In the three cities studied, households' own resources to access safe emptying and transport services for fecal sludge are limited. Indeed, according to the interviewees, the service, at its full cost, is not affordable for many poor households. The COVID-19 outbreak and its financial impact on households' finances have exacerbated this. Through targeted subsidies, Kampala and Lusaka have boosted demand for safe services. In Kampala, subsidized emptying campaigns have allowed households who were previously hiring manual emptiers, to hire formal emptiers. Similarly in Lusaka, through partial subsidies, the price for formal pit emptying is similar to that for manual informal emptying. In Freetown, however, no subsidies are available beyond specific development partners' programs. FCC is planning to provide services on a cost-recovery basis in due course. The option of cross-subsidies has been explored by two cities. In Kampala, KCCA explored the possibility of attaching a sanitation tax to the property tax, but an outcry against taxation prevented this. In Lusaka, a sanitation surtax added to the water bill is under consideration.

The emptiers' resources to implement the new regulation vary according to the types of emptiers and across cities. Indeed, in all three cities, respondents reported that many small-scale emptiers have low administrative and mechanical skills and/or are illiterate, and therefore need further education and training to understand and abide by the regulation. Likewise, they are limited by poor access to financing, high-quality trucks, spare parts, etc. Moreover, emptiers experience external challenges that hinder their capacity to implement regulation. Traffic congestion, remote emptying locations and poor-quality roads were identified in the three cities. To address the transportation challenge, in Kampala mobile transfer stations are set up regularly for emptying events organized by the municipality, and in Lusaka, new treatment plants are being strategically located. Other steps of the sanitation chain also limit the capacity of emptiers to implement new regulations, over which they have no power. Indeed, in all three cities, pits and septic tanks are not all accessible and/or safe to empty and the treatment capacity does not meet the potential demand. To address this issue, in Kampala and Lusaka, minimum standards for containment have been created, and communities and masons

engaged to improve facilities. All three cities are also increasing their fecal sludge treatment capacities.

Table 6 summarizes the findings across the elements under the Resources theme.

4 DISCUSSION

4.1 Contextual Factors

4.1.1 Wider Context: The Three Cities

Kampala, Lusaka, and Freetown are all capital cities, with over a million residents each and undergoing rapid growth. They have large unplanned settlements, hosting over 60% of their population. These three cities illustrate well the situation in many sub-Saharan African countries, which are experiencing high rates of urbanization and population growth (United Nations Department of Economic and Social Affairs Population Division, 2019). Sierra Leone and Uganda are among the most urbanized countries in the region (United Nations Department of Economic and Social Affairs Population Division, 2019). It is estimated that sub-Saharan African cities commonly have between one-third and two-thirds of their population living in poor-quality housing (AfDB, UNEP, and GRID-Arendal, 2020). City planners, city infrastructure and service providers struggle to meet the demand for basic services, which keeps increasing due to the high urbanization rates and population growth (Mitlin and Satterthwaite, 2012; AfDB, UNEP, and GRID-Arendal, 2020).

In the three cities studied, a large majority of residents use onsite sanitation facilities and services, with sewerage limited to central and formal areas. Access to safe sanitation is low, reflecting the region's situation, where it is estimated that only 21% of the population had access to safely managed sanitation in 2020, a very limited increase since 2015 (19%), showing that the region is not on track to achieve universal access to safely managed sanitation by 2030, despite progress (WHO/UNICEF, 2021). As in Kampala, Lusaka and Freetown, onsite sanitation is predominant in urban sub-Saharan Africa (62% of the urban population uses onsite sanitation, 16% sewered sanitation) (WHO/UNICEF, 2021).

The treatment capacity of fecal sludge is limited in the three cities, with no treatment facility operating in Freetown, and insufficient capacity to treat all the sludge generated in both Kampala and Lusaka. The three cities studied are, however, addressing this issue, at least partially. While there are overall very limited data available on fecal sludge and wastewater treatment in sub-Saharan Africa (SSA) (AfDB, UNEP, and GRID-Arendal, 2020; WHO/UNICEF, 2021), it has been estimated that only 8% of the wastewater generated is treated in low-income countries in general (AfDB, UNEP, and GRID-Arendal, 2020) and 1% in SSA (WHO/UNICEF, 2021).

TABLE 6 | Barriers to and enablers for resources from interviews.

Resources elements	Kampala	Lusaka	Freetown
External support to create regulation	+	+	+
External support to implement regulation	+	+	+/–
Legal power to enact regulation	+	+	+
Legal power to implement regulation			
Regulatory documents finalized and approved	+	+/–	–
Threat of sanction in regulatory documents	+	+	+
Clear roles and responsibilities to implement regulation	+	+	+/-
Regulators' resources to implement over time			
FSM staff and units incorporated into structures	+	+	+
M&E tools institutionalized	+	+	+
M&E tools in place	+/–	+/–	+/–
Human resources to monitor	+/–	+/–	–
Financial resources to monitor	+/–	+	–
Subsidies and infrastructure developments dependent on external partners	–	–	–
Political interferences in implementation	+/–	+	–
Households' ability to abide by regulation			
Capacity to pay for safe services without subsidy	–	–	–
Subsidies availability	+/–	+/–	–
Emptiers' ability to abide by regulation			
Emptiers' resources to implement	+/–	+/–	–
Influence of containment step of the chain	+/–	+/–	–
Influence of treatment step of the chain	+/–	+/–	–

Note: this table assesses the different elements of CIT's resources with three potential outcomes: enablers (+), barriers (–), or a mix of enablers and barriers (+/–).

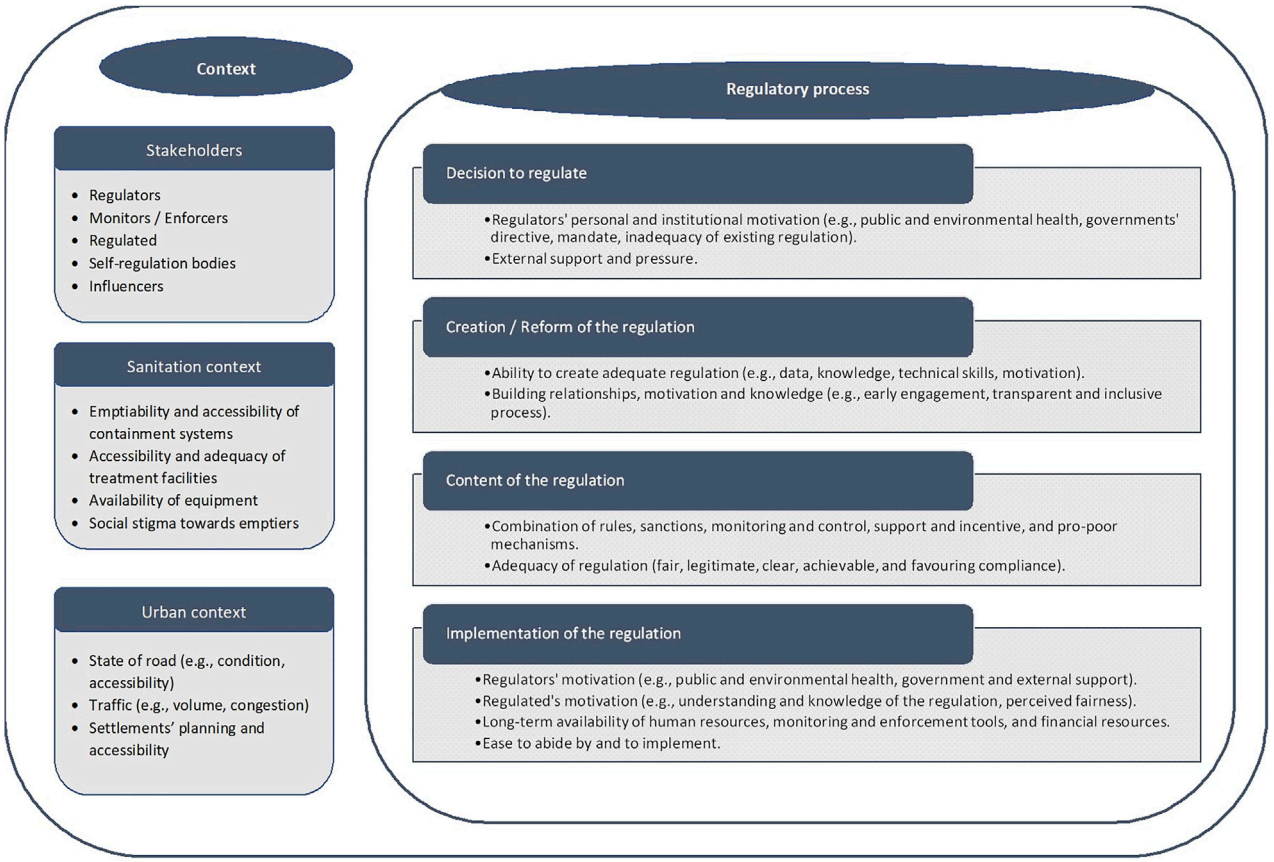

FIGURE 2 | Elements influencing the regulation of emptying and transport services for fecal sludge.

Kampala, Lusaka and Freetown, while not representative of the whole region, do reflect the situation of many sub-Saharan African cities. They are capital cities, large urban centers experiencing rapid growth (over 4% of annual population growth), with an important proportion of their residents living in unplanned settlements and, notably in the case of Kampala, a substantial number of daily commuters. Access to sanitation is low, especially to safely managed sanitation. The increase in access to basic sanitation facilities, along with the ongoing urbanization, is likely to put more pressure on the other steps of the sanitation chain in the future, as pits and tanks will need to be emptied, and the removed fecal sludge treated. Sanitation being only one of many basic services requiring improvement in these cities (Mitlin and Satterthwaite, 2012; Scott et al., 2019), city planners and service providers are thus faced with the challenge of providing safe services to both a growing and fluctuating population in an environment of competing priorities.

4.1.2 Structural Context: The Governance of Sanitation Services

In the three cities studied, responsibility for sanitation lies with local government, who can provide or organize services, license service providers, make and enforce bylaws. National governments are responsible for policies, national laws, technical guidance, coordination of the sector, and approval of bylaws made by local governments. Only Zambia has a national water and sanitation regulator. Thus, the number of regulators involved in FSM services varies: two in Kampala (KCCA and NEMA), four in Lusaka (LCC, LWSC, ZEMA and NWASCO), and two in Freetown (MoHS and FCC). Independent national regulators have been recommended previously (ESAWAS Regulators Association, 2019; Franceys, 2020), or at least a clear division of roles between service provision and regulation (African Ministers' Council on Water, 2021), which does not seem to be the case in Freetown and Kampala. Environmental regulators have become common in sub-Saharan Africa over the past 20 years (Sommerer and Lim, 2016); however, as in the case of Sierra Leone, not all are involved in sanitation services (ESAWAS Regulators Association, 2019). In Uganda, the involvement of NEMA in fecal sludge management is also recent. These three cities confirm the critical role of both local and national government in the regulation of sanitation services (Mulenga, 2011; AfDB, UNEP, and GRID-Arendal, 2020).

Emptying and transport services for fecal sludge is mostly provided in the three cities by a range of private emptiers (manual, semi-mechanical or mechanical). In Kampala and Freetown, the local government provides limited services as well, making KCCA and FCC both service providers and

regulators. Kampala and Lusaka have utilities providing onsite sanitation services: NWSC (Kampala) only provides treatment of the fecal sludge, LWSC (Lusaka) provides treatment of the fecal sludge and contracts pit-emptiers to provide emptying services. These three service delivery models correspond to those previously identified in the literature: a mix of public and private service provision, as in Kampala and Freetown, where the private sector is the main provider; and a fully private service provision, as in Lusaka (Mbéguéré et al., 2010; Rao et al., 2016). Yet, Lusaka is an unusual case for the region, with a contract-based service delivery model for emptying pit latrines. The only similar case in the literature is the South African franchising model of emptying services to schools and households (Rao et al., 2016). The approach can support innovation and greater efficiencies in arrangements, with a clear division of roles and responsibilities for stakeholders within well-defined rules and penalties. It also requires additional supervision and management for the contracting authority and has not yet been sufficiently tested to analyze sustainability of the model at scale.

There are active private emptiers' associations in the three cities. The prevalence and roles of these associations have not yet been explored in depth by researchers, although recent literature suggests that they are important stakeholders in the FSM sector (Gero and Willetts, 2020; Peletz et al., 2020). This study shows that these associations are indeed playing a role in the coordination of emptiers among themselves and alongside the regulators.

4.1.3 Specific Context: The Regulatory Process and the Regulation in Place

The three cities have all started their regulatory processes recently and received external support. Urban sanitation and its enabling environment have indeed received more attention in recent years, with development banks increasing their focus on institutional capacity building and policy changes (Hutchings et al., 2018). The cities studied are examples of cities following the citywide inclusive sanitation (CWIS) approach, supported by their donors. With the approach focusing on (Gambrill et al., 2020), this may explain the similarities, may explain the similarities identified between the regulations set up. The influence of donors on the regulations enacted has been little studied.

The steps taken in the three cities of assessing the situation, engaging the stakeholders, and building their capacities have all been previously recommended by the literature as pre-requisite to planning and reform in the sanitation sector, and thus to enacting adequate regulation. Similarly, the need for support mechanisms to enable service providers to provide safe services while remaining financially viable has been recommended previously (Sinharoy et al., 2019; Weststrate et al., 2019; African Ministers' Council on Water, 2021). The CWIS approach, adopted by the three cities studied, also encourages supporting service providers to enable services to reach all residents (Gambrill et al., 2020; Spuhler and Lüthi, 2020). The variety in implementation across the three cities studied confirms previous findings: much of the regulation is not fully implemented (Weststrate et al., 2019; Lerebours et al., 2021b); implementation takes time and effort (Sinharoy et al., 2019; Franceys, 2020).

4.2 Actors' Core Characteristics

4.2.1 Knowledge

This study's findings confirm existing literature on both sanitation planning and regulation, which identified skills and capacity as key to planning and delivering sanitation services (Strande et al., 2014; Franceys, 2020). The capacity of the regulators and not just of those providing services must be considered. The importance of the availability of data was shown in the findings. The need for data for sound sanitation planning was previously identified in the literature (Schoebitz et al., 2017; Mumssen et al., 2018), but the detail of what this entails has been less discussed. The findings of this study thus highlight the variety of data needed by regulators when creating, reforming, and implementing the regulation.

Previous research showed the importance of clear and coherent sanitation policies (Hueso and Bell, 2013; Mulumba et al., 2015). It highlights that knowledge of the regulation by the regulated is crucial to its implementation: they cannot be expected to respect rules, understand sanctions, or benefit from support and incentive mechanisms if they are not aware of them (Bressers and de Boer, 2013; Weststrate et al., 2019). Findings from this research show that the regulation or how to access safe services is not well known in Freetown. This may partly explain the difference between the cities regarding the hiring of safe emptiers by households, which is common in Kampala and Lusaka but rare in Freetown.

4.2.2 Motivation

The importance of personal commitment to the reforms was highlighted by respondents. While the institutional commitment to change has been previously advocated for by researchers (Parkinson et al., 2014; Sinharoy et al., 2019), the personal commitment and pride of those responsible for enacting the regulation was not identified as an enabling element in the literature review.

The drivers to create and implement regulation on the regulators' side can be summarized as 1) the protection of public health and the environment; 2) ongoing external support; and 3) ongoing government support. The will to protect public health and the environment corresponds to the traditional rationale for regulation: unjust or undesirable market results (market failure) and protection of the interest of the current and future population (external effect) (Baldwin and Cave, 1999); and to the sanitation sectors' commonly cited regulatory objectives (Mumssen et al., 2018; Weststrate et al., 2019). However, the role of the development partners as initiators of regulation has been little researched. Political will has long been seen as crucial for reform in the sanitation sector (Sinharoy et al., 2019; Weststrate et al., 2019) and this study confirms this is also the case for regulation of services.

Respondents emphasized the need for an education-focused approach to implementing regulation and the importance of making the steps of hiring safe services clear, easy, and well-known. The literature shows the importance of educating the population to increase demand for safe services (Jenkins et al., 2015; Peletz et al., 2020). This study illustrates how these recommendations have now been included in practice. A new point identified, beyond clear, well-known regulation, is the need

for a simple process for households to hire safe services. Call centers and mobile apps present in the three cities studied show signs of being useful tools, as they facilitate access for customers to providers of safe services, while making reporting processes easier for the service providers. While a call center has proved useful in Dakar (Spuhler and Lüthi, 2020), those in the cities studied are too recently established to assess their effectiveness and sustainability.

The emptiers' motivation to implement the regulation has been addressed by the regulators in the cities studied through 1) engaging them early and continuously to convince them of the need and adequacy of the regulation; 2) support and incentives to help them comply; and 3) monitoring and reporting of their practices. While the value of engaging the regulated was already discussed as an enabler to enacting implementable regulation and to ensure the buy-in of the regulated (Sinharoy et al., 2019; Spuhler and Lüthi, 2020; African Ministers' Council on Water, 2021), these results show how this advice has now been integrated into practice. The role of the emptiers' association seems to be growing, both in the creation and implementation of regulation, despite not being documented yet.

The importance of fair and predictable rules, incentives and penalties, and of trust between regulators and regulated was shown previously in the literature (Mbéguéré et al., 2010; Acey et al., 2019; Eales and Blackett, 2019). In the three cities studied, respondents confirmed this by sharing that resistance to change has been overcome at least partially in Lusaka and Kampala through continuous engagement and transparency, while it is said to be still high in Freetown, where a lower level of engagement and trust exists between emptiers and authorities.

In this study, the threat of fines and courts is seen by the respondents as a useful deterrent for offenders, although all want to focus on educating households and emptiers first. The approach taken by regulators to favor compliant emptiers corresponds to the "support and incentivize" regulatory approach (Baldwin and Cave, 1999; Vedung, 2017) and goes beyond enabling emptiers. While the review of literature identified examples of support mechanisms (Doe and Aboagye, 2020; Gero and Willetts, 2020), incentive mechanisms are rarely documented and correspond to the "advise and persuade" enforcement style (Ayres and Braithwaite, 1992; Baldwin and Cave, 1999). The threat of sanction is a tool included in the "command and control" regulatory approach and the "punish" enforcement style. Although only light enforcement is pursued, it may be enough to discourage offences if non-compliance is seen as more costly than compliance (Baldwin and Cave, 1999; Vedung, 2017). In this study, the cost identified by service providers may go beyond the fines offenders are charged. Indeed, the sensitization among the population made communities aware of good and bad practices and willing to report them, especially in Kampala, where online shaming happens regularly. In Freetown, however, where the population is less aware of the need for safe services, the local authorities say they do not receive many complaints about unsafe practices. The social cost of being identified as a "bad" service provider and the potential loss of future customers may also be acting as deterrents for emptiers.

4.2.3 Resources

This study shows that, while regulators need to have the legal power to use such instruments to deter multiple offenders, they prefer combining different regulatory approaches and tools, and to focus on the "advise and persuade" enforcement style (Ayres and Braithwaite, 1992; Baldwin and Cave, 1999). This strategy corresponds to what Ayres and Braithwaite called for: "responsive regulation" (Ayres and Braithwaite, 1992), which requires the regulator to be legally empowered, flexible, and predictable.

As discussed above, clarity of roles and official responsibilities is necessary to implement the regulation. Findings of this research illustrate the interdependence of regulators (operating collectively in one context), and with the other stakeholders (Parkinson et al., 2014; Spuhler and Lüthi, 2020). It thus shows that, beyond ad hoc support and collaboration, the institutionalization of lines of accountability between stakeholders and/or supporting systems between the various regulators contribute to effective and clear regulation.

Interference and resistance to change were experienced at the local councilors' level in both cities, in Kampala and Freetown, and with some development partners in all cities. Knowledge of the influence of political turnover and interference in sanitation planning and regulating is still limited; however, protection from political interference is one of the rationales for regulation (Baldwin and Cave, 1999; Mulenga, 2011). Regulation protects the sector from short-term change for political gain and provides a stable environment where service providers can flourish (Eales and Blackett, 2019). The process of creating regulation, however, is politically sensitive, emphasizing within this research the need to gain buy-in from politicians, especially local ones.

This study's findings show the importance of the availability of resources to create and implement the regulation, highlighting the cost of regulation for the regulator. While there has been research on the cost-benefits and cost-effectiveness of regulation in high-income countries, there is little literature looking at the costs of enacting and implementing regulation for sanitation services in low- and middle-income countries (one example being Guasch and Hahn, 1999). The three cities studied here show that development partners are taking these costs into account and are providing at least some of the resources required. This study thus raises the question of sustainability once development projects finish and the importance of sound exit strategies.

In the three cities studied, households' resources to access safe emptying and transport services for fecal sludge are limited. The limited capacity to pay for safe sanitation services of poor households has been well demonstrated by researchers (Jenkins et al., 2015; Peletz et al., 2020). While cross-subsidies across services, or from higher-income to lower-income customers, is common for water and sewerage services, they are rarely reported at-scale for FSM services, despite being seen as potentially effective tools to enable universal access to safe sanitation (Acey et al., 2019; Doe and Aboagye, 2020; Gambrill et al., 2020). This study illustrates both the attractiveness and the complexity of cross-subsidies for emptying and transport services for fecal sludge. Indeed, the additional charge on property tax was not pursued in Kampala due to political reasons, and the sanitation surcharge on the water

bill in Lusaka has taken time to be approved by the economic regulator.

Findings also point to the cost of regulation for the emptiers. Previous literature identified that emptiers providing unhygienic services usually operate at a lower cost than compliant service providers, thus favoring unsafe practices (Mbéguéré et al., 2010; Peletz et al., 2020). Addressing each of the operational and administrative costs, financial and non-financial, would aid implementing the regulation.

The capacity of emptiers to abide by the regulation is also limited. This was highlighted in the respondents' recommendations, as they have enjoined other regulators to accommodate all education and literacy levels in their engagement of emptiers. Likewise, results emphasize the interdependencies between the steps of the sanitation chain, and the need to consider its entirety when regulating emptying and transport services for fecal sludge (Parkinson et al., 2014; Doe and Aboagye, 2020).

4.3 The Barriers and Facilitators to Regulating Emptying and Transport Services: A Framework

Using CIT as a theoretical lens through which to explore the regulation of emptying and transport services, this research identified a number of factors enabling and hindering the regulation and its implementation. The elements presented in **Tables 4–6**, and the ones identified in the discussion section above have been grouped along the different stages of the regulatory process: its initiation, the creation or reform of the regulation, and its implementation. The identification and analysis of these elements have led to the development of a framework (**Figure 2**) incorporating the key elements to be considered to enable effective regulation for safe emptying services that are accessible to all. The components of the framework are described below.

4.3.1 Initiation

The decision to start regulating or reforming emptying and transport services, and what is driving that decision, was shown to influence the implementation of the regulation. Indeed, when the drive to regulate comes only from external partners, the motivation and future efforts to implement from the regulators and enforcers may be limited, as in Freetown. This research shows the importance of considering the personal and institutional motivations of the regulator at this early stage, to ensure their commitment and leadership in the next stages of the regulatory process. The rationale to regulate identified in this research aligns with the rationale present in the literature: improving the access, quality, and efficiency of the services, protecting public health and preventing environmental pollution (Strande et al., 2014; Mumssen et al., 2018). However, the presence of external partners and their commitment to the regulatory process and the sanitation sector in general, also contributes to the drive to regulate. Other specific motives to regulate for the regulator include their belief that it is the responsibility of their institutions, the inadequacy of existing regulation, and government directives.

4.3.2 Creation/Reform

Once the decision to regulate has been made, the process of creating or reforming the regulation can start. The effect of this on future implementation is twofold: the content of the regulation influences the implementation; and its characteristics impact the relationships, motivations, and knowledge of the regulators and the regulated. All of these are crucial to its implementation. Indeed, inadequate regulation was identified as a crucial barrier to implementation. Previous research highlights the interdependency among categories of regulatory mechanisms (rules, sanctions, monitoring and control mechanisms, support and incentive mechanisms, and pro-poor measures), both in their existence and in their implementation, and the influence of the extent of regulation on its implementation (Lerebours et al., 2021b). The different categories of regulatory mechanisms should all be included in regulation, confirming the recommendations of previous research to provide support and incentives to emptiers and subsidies to households (Mulumba et al., 2015; Lerebours et al., 2021a, 2021b). The perception of regulation also influences its implementation. It must be fair, legitimate, clear, achievable, and favoring compliance, as well as perceived as such. These requirements have been discussed individually in the sanitation literature before (Mbéguéré et al., 2010; Mulumba et al., 2015; Mumssen et al., 2018; African Ministers' Council on Water, 2021).

4.3.3 Implementation

At the implementation stage, some of the elements presented in the results enhance points identified in the literature: lack of capacity, inadequate regulation, unclear roles and responsibilities, limited monitoring and enforcement capacities, lack of autonomy for the regulator and lack of data (Strande et al., 2014; Schoebitz et al., 2017; Weststrate et al., 2019). This research adds to this list the understanding and knowledge of regulation by the regulated; the support available to regulators and regulated; the costs, financial and non-financial, and the ease of implementing the regulation for all stakeholders; together with the relationships and trust among the stakeholders.

4.3.4 Context-Related Factors

Finally, this study shows how context-related factors have an impact on the implementation of the regulation. The sanitation-related factors identified through this research are linked to the containment and treatment stages of the sanitation chain, the accessibility of emptying and transport equipment and the social stigma around sanitation work. These factors emphasize the need to look at the entire sanitation chain when planning and regulating emptying and transport services, in line with the recent sanitation literature (Franceys, 2020; Gambrill et al., 2020; African Ministers' Council on Water, 2021). Sanitation services operate in a wider urban context and are thus affected by urban issues. Most cities in sub-Saharan Africa are home to many residents living in poor-quality housing and are experiencing high urbanization rates and population growth (Mitlin and Satterthwaite, 2012). As a result, cities' planners and service providers are faced with the challenge of providing safe services to a growing population in an increasingly competitive

environment. While research has already shown the importance of integrating sanitation planning to other essential services planning, due to funding and institutional constraints, it is not always done (Scott et al., 2019). This study confirms that regulation of emptying and transport services for fecal sludge must form a core aspect of all stages of initiating, creating, and implementing service legislation, firmly grounded in the context and integral to the planning of other services.

4.4 Limitations

Due to COVID-19 travel restrictions, this study was conducted fully online, and thus relied on the documents accessible online and through respondents, and on the respondents' accounts. However, the research design facilitated the collection of diverse types of data, triangulating findings and enhancing their validity and credibility. This research did not seek a representative sample of respondents for two of the sources of evidence, but rather to consult relevant working professionals corresponding to specific criteria. It is possible that certain perspectives were not included due to an inability of some professionals to answer online surveys, their limited availability, or unwillingness to participate.

To address potential biases in the data analysis, the qualitative analysis followed a theory-informed coding guide, and the interviews were re-coded after the final coding guide was developed iteratively. It was checked by the researcher at the end of the overall analysis and when writing up the results.

5 CONCLUSION

Through multiple-case analysis using Contextual Interaction Theory, this study investigated the barriers to and enablers of implementing regulation of emptying and transport services for fecal sludge in sub-Saharan African cities. This research has identified several new factors of significance, such as the motivation, capacity, resources and relationships of all stakeholders, the external support available, the adequacy of the regulation, and how easy it is to abide by and implement the regulation. The cities studied illustrate the variety of governance arrangement and regulatory processes in sub-Saharan Africa. They demonstrate the crucial role of local government in the organization and regulation of emptying and transport services, highlight the complexity of FSM services and their regulation, and the importance of contextualized solutions. This study also points to the costs, financial and non-financial, of regulating emptying and transport services, both for regulators and the regulated.

When analyzing the regulation of fecal sludge emptying and transport services, both the content of the regulation and the regulatory process (initiation, creation/reform, implementation) must be considered. Content and process influence one another, while the desired outputs of safe services for all can be enabled or hindered by both contextual and regulatory factors. The motivation, capacity, knowledge, and resources of all stakeholders are crucial to achieve regulated services. These can be enhanced through early and continuous engagement and support. Barriers to and enablers of implementing the regulation identified in this research can be found at different stages of the regulatory process and have led to the creation of a framework describing the key elements and stages to take into consideration when regulating emptying and transport services.

Any city contemplating improving the regulation of sanitation should consider comparisons with other similar cities, where improvements have been made, as has been done in this paper, using a consistent methodology. This study and the resulting frameworks would prove useful to regulators, sanitation planners and their development partners 1) when starting to initiate regulating services, ensuring the consideration of key elements in the regulatory process from the start, enabling regulation to be successfully enacted and implemented; and 2) when wanting to understand why the enacted regulation is not being implemented as planned, providing suggestions of additional elements to consider, activities to lead, and stakeholders to engage to offset the issues being faced. It would also be useful for researchers analyzing regulatory processes in low- and middle-income country cities, as a framework to identify the key contextual and regulatory process-related elements to include in their analysis.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusion of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical clearance was obtained from Loughborough University for the online survey and interviews (Reference: DT_10496). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

Conceptualization, AL, RS, KS and SK. Data curation and formal analysis, AL. Methodology, AL, RS, KS and SK. Validation, AL, RS, KS and SK. Writing—original draft, AL. Writing—review and editing, RS, KS and SK.

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