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**SUSTAINABLE WATER AND SANITATION SERVICES
FOR ALL IN A FAST CHANGING WORLD**

**Tracking urban sanitation services: improving faecal
sludge management services through monitoring in
Lusaka, Zambia**

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In Zambia's capital Lusaka, safe faecal sludge management (FSM) services are essential for improving resident's health and living conditions. In this paper, Water and Sanitation for the Urban Poor (WSUP) and Lusaka Water and Sewage Company (LWSC) share preliminary learning from the implementation of a monitoring system for improved pit emptying services in Kanyama, one of Lusaka's low-income communities (LICs). The paper outlines the monitoring process, including challenges encountered during its implementation and solutions developed in response. Monitoring indicators such as service response time, volume of sludge emptied, and customer feedback are essential to improve the quality and economic viability of the service, as well as support its replication in other low-income areas. Overall, learning from the monitoring process could help support the establishment of similar FSM services in other cities.

Introduction

By 2020, Zambia is expected to have the 11th highest annual urban population growth in the world, with its capital Lusaka being one of the fastest growing cities in Southern Africa (United Nations, 2012). With around 2.5 million residents, planning for and providing affordable and reliable water and sanitation services is crucial, particularly for 65% of its population living in underserved LICs (CSO, 2011).

Kanyama is a 15 km² peri-urban area (PUA) of Lusaka, and home to nearly 250,000 low-income households. They are primarily migrant workers from Zambia's rural areas, coming to seek better economic opportunities in the city. Most of them rent a room in a compound – a multi-room dwelling typically around a central courtyard – usually sharing one latrine. In 2012, 95% of Kanyama's population had access to some type of toilet facility, most commonly a shared pit latrine (BCHOD, 2011).

Since 2000, Kanyama residents – as well as residents in other LICs – have been suffering near-annual outbreaks of cholera during the rainy season. In the 2009/2010 rainy season, Médecins Sans Frontières (MSF) reported over 1,000 cholera cases in Kanyama alone (MSF, 2010). Besides flooding (caused by poor drainage) and use of unsafe water sources, contamination of water sources by faecal matter from pit latrines was one of the main causes of cholera and other water-related diseases. To solve this issue and reduce the potential for cholera outbreaks, LWSC supported by WSUP – and with funding from the Stone Family Foundation – introduced safe faecal sludge management (FSM) services to Kanyama.

Responding to the demand for improved pit emptying services

In Kanyama, digging a new pit latrine when the used one is full can be very costly or even impossible, due to the hard and shallow dolomite bedrock. Instead, landlords typically hire a manual emptier to dig an adjacent and shallow hole and empty sludge into it. They prefer to do this during the rainy season because the additional water dilutes the sludge and washes it out of the pit more easily. However, this is an extremely unhygienic practise because the sludge contaminates the surrounding area and shallow groundwater sources and poses significant health hazards. Given this situation, it was obvious for LWSC and WSUP that pit emptying services in Kanyama need to be improved urgently.

The starting point for improving pit emptying services was a baseline assessment which found that landlords are responsible for hiring and paying for pit emptying services. On the one hand, landlords want to maintain an operational latrine to keep tenants happy, because they want to receive rent payments on time. On the other hand, they want an affordable pit emptying service. Furthermore, landlords consider emptying a full pit better value for money than constructing a new latrine. From the baseline's findings, it became clear that targeting landlords was essential for introducing a new pit emptying service.

In February 2013, the Kanyama FSM service was launched with the aim of providing 40,000 residents with access to a service comprising the following components:

1. safe manual emptying of faecal sludge from pit latrines using personal protective equipment and modified garden tools;
2. primary transport of sludge using sealed and cleaned 60-litre drums and hand-drawn carts (no spillage during transport);
3. aggregation, preliminary treatment (separation of non-biodegradable waste), and primary treatment (digestion and partial dewatering) of sludge at a fenced decentralised transfer stationⁱ (either a biogas digester or an underground holding tank);
4. secondary transport of partially treated sludge from the decentralised transfer station to a semi-centralised treatment site;
5. full treatment (dewatering) and pathogen removal of sludge on drying beds;
6. bagging and selling of biosolids, disposing of liquid effluent into the ground from the drying bed; and
7. burning biogas from the biodigester in a communal kitchen, and disposing of non-biodegradable waste at the municipal landfill.

The entire service chain is now managed by the well-established Kanyama Water Trust (KWT). To do so, KWT had to expand its initial area of responsibility from only water supply to also include FSMⁱⁱ. KWT hired two (2) teams of five (5) labourers on a commission basis (currently 60% of the service fee) to provide the service. Each emptier had previous experience in informal pit emptying, and were as such provided with training on improved and safer emptying methods. The teams are now responsible for emptying, transporting sludge from latrine to transfer station (primary transport), and operating the transfer station (activities 1 to 3 in Figure 1). Thus far, KWT has been able to safely empty and treat over 280 m³ of faecal sludge from over 320 toilets (Figure 2).

Interested customers would first come to the KWT office or call to request and pay for the service. They can choose from three (3) standard volume-based service categories to suit their purchasing ability: 12 drums (at 60 litres each) at ZMW 250 (USD 45), 24 drums at ZMW 380 (USD 68), or 32 drums at ZMW 450 (USD 80). At maximum capacity and efficiency, usually six (6) are transported per trip in the hand-drawn carts. The volumes emptied are fixed to promote a more affordable service through smaller and more frequent emptying events. Although initially target customers expressed their desire for completely emptying their pits, they found this service model to be more desirable and thus avoided the need for more specialist and expensive emptying equipment.

A preliminary financial analysis was undertaken prior to implementation using a WSUP-developed model to propose fees for full cost-recovery. Estimated financial, operational and geographic data was used to determine the approximate cost of the entire FSM chain, including but not limited to, capital maintenance expenditure, inflation (8.5% annually) and a periodically increasing tariff schedule. KWT however decided to set the service fee at a lower rate than estimated in the financial analysis due to the lack of actual data on cost and operations – and to encourage uptake of the new service.

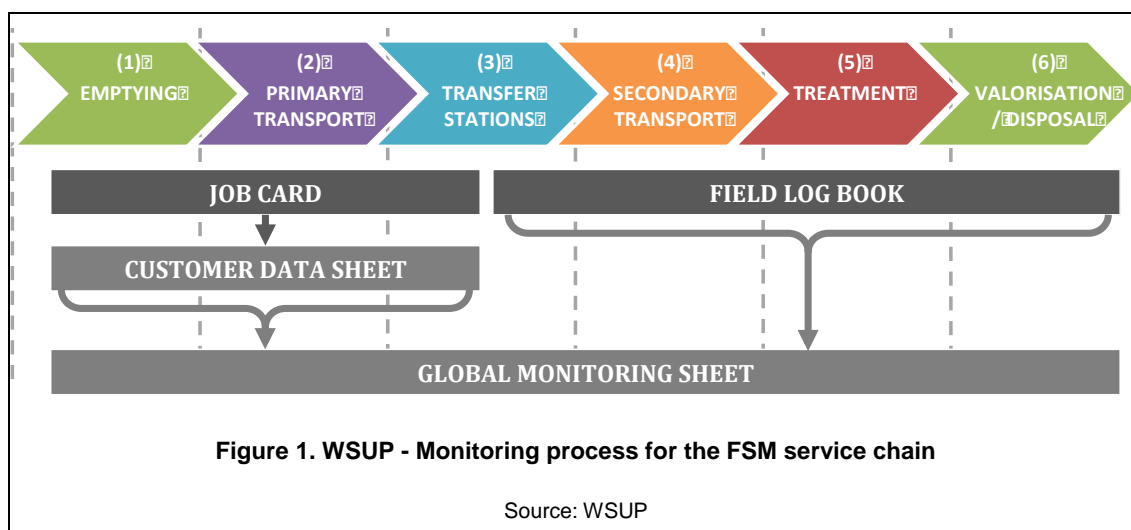
The financial analysis also suggested the minimum level of demand required to make the service financially viable. To meet this target, the service is supported through marketing and awareness raising by part-time KWT staff and the Ministry of Health's Public Health Officers. Promotion campaigns also include behaviour change messages to reduce the disposal of non-biodegradable solid waste in pits, which negatively impact the efficiency of the emptying service.

Establishing a monitoring system for the pit emptying service

The entire service chain has been monitored on a daily basis – both, in the commissioning phase and during regular operation. The overall objective of monitoring is to ensure customer satisfaction, efficiency and financial viability. A KWT-led monitoring process (Figure 1) was established shortly after the FSM service was launched with the aim of:

1. evaluating the financial viability and profitability of the service;
2. assessing capacity and efficiency of pit emptying teams;

3. identifying bottlenecks in the service provision; and
4. assessing customer satisfaction.



The pit emptiers were tasked with the day-to-day collection of primary data using a one-page, easy to complete **Job Card**. They collect data such as date of the service request and delivery, date payment made, location of customer's latrine, gender-disaggregated number of persons using the latrine, volume of sludge emptied, time required for emptying, and customer feedback. To allow for automated analysis of the front-end of the service, KWT staff then manually transfer the data from the Job Card into an Excel-based database referred to as the **Customer Data Sheet**.

As for the back-end of the service, KWT record daily operational and financial data on emptying and maintaining the transfer station, loading and unloading of the drying beds, as well as sales of biosolids in a **Field Log Book**. On a monthly basis, data from Field Log Book and Customer Data Sheet is being aggregated and put into another simple Excel-based **Global Monitoring Sheet**. By doing so, and with training support by WSUP, KWT is able to regularly document and track the entire FSM service chain in real time – and in a centralised database.

Furthermore, a monitoring plan was put in place for the transfer stations and drying beds. This was primarily to evaluate treatment capacity and proper operation of the back-end of the service. The monitoring plan is being implemented by the Water and Sanitation Association of Zambia (WASAZA) supported by Bremen Overseas Research and Development Association (BORDA), and the Institute for Eco-Development Strategies and Toxicology (IESTO) since the commissioning phase of the transfer stations and drying beds.

To complete the monitoring system with qualitative data, both LWSC and WSUP conducted rapid household surveys to assess customer satisfaction and 'brand awareness' among customers and non-customers. WSUP also held focus group discussion with the pit emptying teams to understand their needs, challenges and perspectives.

Monitoring results: analysing data to improve services

Thus far, the analysis of collected data provided some of the following insights about the introduced FSM service:

1. **Customers desire and are able to afford the new service:** In the past, pit emptying service providers have usually emptied the entire volume of sludge in a pit. Customers perceived partial emptying as low value for money. However, customer preference has now changed to partial emptying, because the new service offers significantly better quality and because customers can choose how much sludge is being removed – and, hence, how much they pay. In this way, the emptying service becomes more affordable. As a result, customers can have the pit emptied more regularly which, in turn, reduces health hazards.
2. **Marketing needs to target 'profitable' locations:** The closer customers live to the transfer station the more efficient and profitable the service is. However, monitoring revealed that the pit emptiers currently serve many customers who live more than 1 km away from the transfer station (Figure 3), thus making transport a bottleneck for expansion of service provision. To address this, KWT and the Ministry of

Health have focused marketing efforts in the most profitable areas. Furthermore, they have identified appropriate areas for siting of additional transfer stations. Within a year of starting the service, intensified marketing and awareness raising has made KWT’s pit emptying service well known and the preferred option for Kanyama’s residents.

3. **Monitoring response times to increase efficiency:** The time between request and delivery of the service is a key performance indicator. Monitoring data indicates that nearly 75% of services were delivered within 48 hours of receiving the request. To ensure continuous demand, it is important that response times satisfy customers. Moreover, by monitoring response times, KWT is able to better predict flux in customer demand and, for instance, hire additional emptiers during peak times. Finally, the data has also enabled KWT to re-evaluate appropriate levels of remuneration to the pit emptiers that guarantee them a minimum living wage when demand is low or during downtimes.
4. **Customer feedback helps to enhance service quality:** Collecting customer feedback has already proven vital for service improvements. Overall, collected customer feedback has not revealed major complaints, suggesting a strong level of customer satisfaction with the service.
5. **Set a financially viable service fee:** As previously mentioned KWT strategically set the service fee at a lower rate than initially calculated to be financially viable. Based on data collected from the service six (6) months after it had been established, it was recommended that the fee be increased by 25%ⁱⁱⁱ. Some consideration is being given to mechanising the transport of the faecal sludge, however this will only be done if it proves to increase the financial viability of the service. Alternatively, LWSC could invest the accrued sanitation tariff collected from their customers outside of the low-income areas in order to ensure adequate maintenance of FSM infrastructure and equipment in Kanyama.

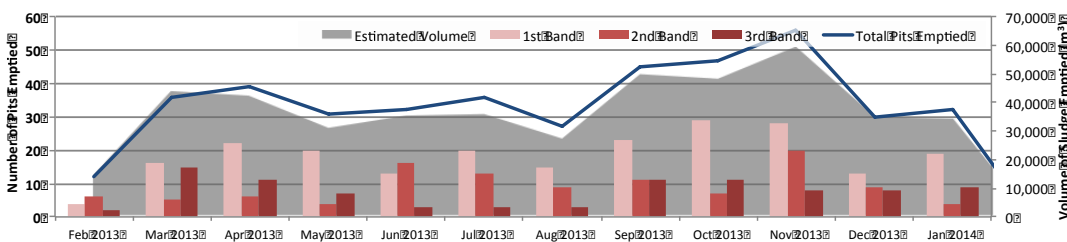


Figure 2. WSUP - Operational data on pits emptied in Kanyama

Source: WSUP

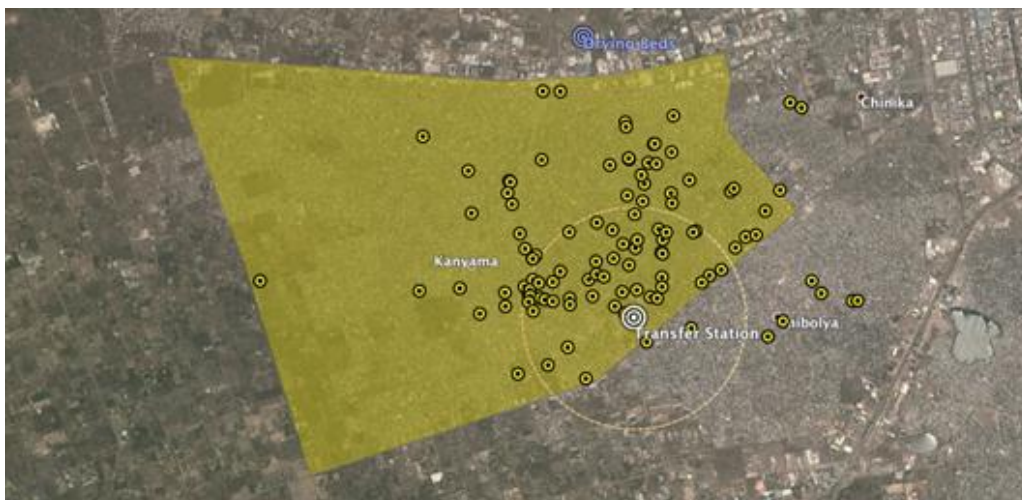


Figure 3. WSUP - Mapping of customers served in Kanyama (yellow area) during February to April 2013

Source: WSUP

Challenges and potential solutions to monitoring

Implementing the monitoring system itself was challenging and required numerous iterations to enhance its acceptability among the users and applicability to the local context. Overall, the main challenges faced during the implementation were:

1. **Appreciation of the need for monitoring:** As the emptiers were more focused on the technical aspects of emptying pits, they were less included to appreciate the value of monitoring. As a result, some inconsistencies and missing information was reported in the data they collected. KWT however was eager to and aware of the need for monitoring a new service and as mentioned previously, hired two (2) field-based monitoring personnel to take over this responsibility.
2. **Laborious manual data entry:** Data entry of field data into digital Excel-based databases is time consuming and can be even more so once services are scaled up. To address this challenge, mobile data collection has been introduced and the field-based monitoring personnel have been trained on using the equipment. Now, field data is being uploaded on a daily basis to a web-based database using internet connection available at KWT. This has not only reduced the time KWT staff spend on data entry, but it has also enabled real-time and regular evaluation of the service.

Conclusion

Improving household sanitation systems in Kanyama is necessary to ending the "recurring disaster" of diarrhoeal diseases during the rainy season. As this is a long-term undertaking, Kanyama – and other LICs – require a safe, affordable, and financially viable pit emptying service in order to mitigate these outbreaks. The service established by LWSC is a good starting point. Yet, it needs to expand and increase the scale of services in order to reach more of Kanyama's residents and to respond to growing demand. Doing so requires strong learning from the currently implemented model through an effective monitoring system championed by its operators. With funding from the Stone Family Foundation, one more transfer station is currently being commissioned in Kanyama and another one in Chazanga – another LIC – to provide improved pit emptying services with a capacity to serve 120,000 people. The established monitoring system will extend to include all transfer stations in all areas served.

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Note/s

ⁱ As the sludge is initially digested and stabilized, no odours are emitted during normal operation of the transfer station, even when placing sludge on the drying beds. Removal and drying of solid waste at the transfer station has however been an issue with some odours being emitted; solutions are currently being explored to deal with this.

ⁱⁱ KWT was established to represent LWSC in Kanyama as part of a delegated management model that was piloted by CARE Zambia in 2001. KWT is responsible for day-to-day management of water services in Kanyama. Overall, 11 Water Trusts have been established in 11 peri-urban areas of Lusaka providing water services to over 700,000 peri-urban residents (BCHOD, 2011).

ⁱⁱⁱ It is assumed that KWT will account for inflation and accordingly increase fees on an annual basis.

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