SUSTAINABILITY OF FAECAL SLUDGE MANAGEMENT SERVICE MODELS IN PERI-URBAN AREAS OF LUSAKA DISTRICT POST DONOR FUNDING: A CASE STUDY OF LUSAKA WATER SUPPLY AND SANITATION COMPANY

By

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of the requirement for the award of the degree of

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DECLARATION

I, **Mutunda Malichi** do hereby declare that the work contained in this study is sorely my work and does not contain any work done by other people that has not dully been recognised. I have also not submitted this work to another university or institution for award of another degree.

Candidate: Mutunda Malichi Signed: _____Date: _____

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APPROVAL

This dissertation by **Mutunda Malichi** has been approved as fulfilling the requirements for award of **Master of Engineering** Degree in **Project Management** by the University of Zambia.

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ABSRACT

Lusaka has one of the fast-growing populations in Zambia with majority of these people residing in peri-urban areas. The efforts by the Lusaka Water Supply Sanitation Company (LWSC) to provide adequate and sustainable Faecal Sludge Management (FSM) services has been hampered by a lack of systems and inadequate sustainable financing. There are simply no self-financing mechanisms against a backlog for an urgent desire to continuously provide good FSM services that not only reduces the risk of disease outbreak but which are also financially sustainable long after donor funding is exhausted. The planning and design of a sustainable FSM service model requires an assessment of the current practices, the level of sustainability and adequate data on which future service models could be made. The lack of sufficient information that affects and impacts on the sustainability of FSM service models in Lusaka District triggered the conception of this research. This study assessed the current sanitation practices of the FSM service model in Peri-Urban Areas in order to bring out factors that affect and impact its sustainability thereby aiding the design of a model that is sustainable post-donor funding. Sanitation practices were assessed through a technical approach using household surveys, field observations, semi-structured questionnaires and Focus Group Discussions (FGDs). Determination of the technical, institutional and social factors were assessed through semi-structured interviews, technical assessment and field observations. There was a total of 150 households (HH) and technical experts purposively sampled for this research. Analysis of the data was done through a technical, institutional and social assessment. Firstly, the findings indicated that in the current sanitation practice, only one type of emptying called formal manual emptying and transportation were officially registered and dominant. Secondly, the financial transfers available included an emptying fee charged on households amounting to ZMW150 per 16 barrels representing 50 percent, a discharge fee paid to the utility by the Private Service Providers (PSPs) and the last financial transfer is the 50 percent subsidy paid to the PSPs by LWSC, money which was funded through donor. It was also found that the community was not adequately involved in the initiation of the FSM service projects. This created a feeling of no ownership hence triggering resistance to support the FSM project and subsequently affecting the willingness to sustain the system and later on had an implication on the sustainability of the FSM service model. Data analysis of the sustainability indicated an overall sustainability index of the FSM service model to be 6.09 indicating that the model was performing well in the 60.9 percent of its components and this was considered a potentially sustainable FSM project. The financial analysis showed that there was a general increase in the costs associated with managing the FSM service model of about 18 percent from 2018 to 2022 triggered mainly by the depreciated of the Zambian Kwacha against the US dollar which recorded a value of ZMW9.50/USD in 2018 to ZMW17.50/USD in 2022. These findings had a negative impact on the FSM service model thereby impacting on the sustainability. Considering these findings, a new FSM service model was designed which recommends increased demand responsiveness, the introduction of discharge licence fee paid directly by PSPs to the government. This if implemented would guarantee a safe environment and will trigger a reduction in emptying fees in the long run and hence replacing the donor funding component which will benefit both the PSPs, HHs and the utility company thereby achieving some level of sustainability of FSM service model resulting in improved sanitation in peri-urban areas of Lusaka District.

Key terms: Faecal Sludge, Demand Responsiveness, Sanitation, Sustainability, Peri-Urban Area

DEDICATION

I dedicate this dissertation to my parents Mr. James Malichi and Mary Sakapalu Malichi. My wife Elizabeth and my daughters Favour, Faith and Tengeso. They have been instrumental in my motivation to do this study.

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LIST OF ACRONYMS

BORDA	Brenen Oversees Research and Development Association
CBD	Central Business District
CLTS	Community Let – Total Sanitation
CSO	Central Statistics Office
CWT	Chazanga Water Trust
FS	Faecal Sludge
FSM	Faecal Sludge Management
FSTP	Faecal Sludge Treatment Plant
GoZ	Government of Zimbabwe
GTF	German Trust Fund
HH	Households
IWMI	International Water Management Institute
KWT	Kanyama Water Trust
LSP	Lusaka Sanitation Program
LWSC	Lusaka Water Supply and Sanitation Company Limited
MLGH	Ministry of Local Government and Housing
NWASCO	National Water and Sanitation Council
NASREC	Natural and Applied Sciences Research Ethical Committee
O & M	Operation and Maintenance
PSP	Private Service Provider
PUAs	Peri-Urban Areas
UN	United Nations
UNDP	United Nations Development Program
WARMA	Water Resources Management Authority
WASAZA	Water and Sanitation Association of Zambia
WSUP	Water and Sanitation for Urban Poor
ZMW	Zambian Kwacha

OPERATIONAL DEFINITIONS

Faecal Sludge: Excreta which comes from onsite facilities which has not been transported through the sewer (Strande et al.,2014)

Peri-urban areas: Areas within the jurisdiction of the Local Authority having high population density and low-cost housing units lacking basis services such as water, roads and sewerage (LWSC,2018).

Faecal Sludge Management: A management system that safely collects, transports and treats faecal sludge from pit latrines, septic tanks or other onsite sanitation facilities (Strande et al.,2014).

FSM Service Model: A term that describes the services offered within the five stages involved in the FSM which includes capture and containment, collection, transportation and treatment and disposal/reuse (WSUP,2018).

Sustainability: In terms of projects, sustainability is the capacity of a project to continue to deliver on its intended objectives over a long period of time (Martha, 2013). Also, in this study sustainability has been defined as the maintenance of an acceptable level of service throughout the design life of an FSM service model.

Sanitation: According to the World Health Organisation (WHO), the term sanitation is applied to a wide range of subjects. Sanitation is the hygienic means of promoting health through prevention of human contact with the hazards of waste as well as the treatment and proper disposal of sewerage wastewater (WHO, UNICEF, 2015).

CHAPTER 1: INTRODUTION

1.1 Background

Achieving lasting and sustainable impacts from projects is one of the major challenges for donors and agencies implementing or supporting water supply and sanitation projects in developing countries (Sanders and Fits, 2011). Sustainability is the amount of inheritance of the project after donor funding. It is the ability of authorities to take over programs that were earlier supported by donor funding mostly towards the final phase of the project and the continuation of such a project long after donor funding has been terminated (Mulur et.al., 2019).

The question of why projects fail as reported by Martha (2013) has consistently preoccupied scholars and project practitioners over the years. According to Muluh et.al, (2019), the idea of sustainability is one which encourages that projects be weaned off and the projects objectives and outcomes kept on courses after the donor funding has been withdrawn. Martha (2013), further contends that sustainability means the ability of any project to continue delivering on its purpose to achieve its objectives for the longest time possible long after donor withdraws support.

Sustainability is influenced by many factors, some of which are technical and others are non-technical. Effective community organisations, ability of the community to operate and maintain facilities, abilities of the community to raise adequate user fees for purchasing spare parts and strong backup support from external parties at the district level to solve major breakdown, contribute to the sustainability of sanitation systems (Musonda, 2004).

The global challenges facing the sustainability of Faecal Sludge Management (FSM) in developing countries include but not limited to; the lack of faecal sludge treatment, inadequate policies and specific regulations on as well as institutional framework arrangements (Kazora and Mourad, 2018). A mind set change is required for the implementation of sustainable sanitation projects which should include new models to select appropriate alternatives that guarantees long term operations (Mara and Alabaster, 2008).

The rates of success for FSM service models can be increased by a thorough understanding of reasons for failure by identifying areas that require increased

capacity and risk mitigation (IWMI, 2008). A number of authors such as Fernandes (2005), Nikiema (2013) and Lennartsson et.al., (2009) have all shown interest in understanding the reasons for success or failure regarding the sustainability of FSM service models in Peri-Urban Areas (PUAs) over the last ten years often citing among other reasons, inappropriate technology selection, lack of Operation and Maintenance (O&M) and lack of financial capacity.

In Zimbabwe, for example, progress in achieving sustainable water and sanitation targets is not going as planned (Sara & Katz, 1997). The experience of the water and sanitation sector development in Zimbabwe is considered the same as that of the African sector development failing to remain sustainable within a decade. This goes to the vulnerability that exists in this area service development anchored on state subsidies and donor funding, without sufficient focus on sustainability especially after the donor support begins to reduce (GoZ/UNDP, 2010). The Water and Sanitation for the Urban Poor (WSUP, 2019), observed that the provision of viable sanitation services to low-income households is fundamentally challenging as has been found from the Chazanga FSM (CFSM) project experience (WSUP, 2019).

Reality at the CFSM project indicate that donor support is still required if the Lusaka FSM service model is to remain sustainable. This finding is in line with Simwambi et al. (2018) who contend that providing a sustainable FSM service was a complex venture as majority of Zambians living in the slums or PUAs are generally poor and are either unwilling or cannot afford to fully pay for the FSM services hence the need for continued donor support/subsidies.

Despite the challenges faced, WSUP (2019) reported that since the establishment of the FSM service, the Chazanga Water Trust (CWT) has been recording a steady upward trend in sales with a compounded annual growth rate of 38 percent from 2014 to 2018. However, the number of jobs performed by CWT emptiers and paid for by the customers is not enough and does not cover the cost of the service supplied and the FSM service has been loss making since its inception. The average cost recovery per cubic meter of sludge removed in 2017/18 was below 50 percent. The largest cost in all this by far are salaries, which account for more than half of the total cost. Other costs include management and administrative overheads and fixed/variable operational costs. WSUP further reported that it continues to support CWT with

marketing and community engagements, business development and technical and operation support. However, it is important to note that in order for the FSM service model to remain sustainable beyond donor support, these costs will have to be met by CWT and not donor funding.

On the other hand, in another research conducted by Harvey (2011), it was found that using the Community-Led Total Sanitation (CLTS) approach, there was strong evidence suggesting that zero subsidies approach to sanitation services like FSM provision have the potential to deliver more rapid increases in service coverage and higher levels of sustainability than the conventional subsidies approach that predominate in low-income countries as concluded by Simwambi et al. (2018). However, this view is still contradicted by Dodane et al. (2012) who insists that to ensure a reliable and sustainable FSM service model, profitability of the faecal sludge (FS) service dealing companies need to be increased by subsidising or giving tax benefits to reduce capital investment of vacuum trucks, minimising transport distances and extending service hours.

It is against this background that this study was conceived to assess the current sanitation practices of the current FSM Service model in order to understand the nature and inadequacies of the factors that inhibit its sustainability thereby aiding the design of a new FSM service model that will continue to provide this critical service long after donor support is terminated.

In order to achieve the above aim, a comprehensive methodology has been presented in Chapter three of this study. This study used mixed method approach to collect and analyse data. Data collections tools and instruments included the semi-structured questionnaires, focussed group discussions guide and key informant interview guide. Stratified purposive sampling was used and a technical assessment were done to sample and analyse the data respectively.

1.2 Study Area and Population

The study area is Kanyama Township one of the PUAs of Lusaka District. It is located 15° 26’0” south of the equator and 28° 18’0” east of the green which meridian. It is on the west of the Lusaka central business district. Kanyama township, a low-income peri-urban community of Lusaka, where the majority of the residents live under the US$2 per capita per day rely mainly on pit-latrines for their sanitation (LWSC, 2018).

There is no central sewer near the community and the densely populated and informal structures of the area as well as the rocky ground conditions make the installation of a sewer system unfeasible (BORDA, 2019).

According to the CSO (2010), Kanyama township covers an area of about 30.03 square kilometres and a population density of 5,636 per square kilometre. The area is characterised by closely built houses with no proper road networks. Figure 1-1 presents the layout of the map of the study area showing cluster of households in unplanned settlement fashion.

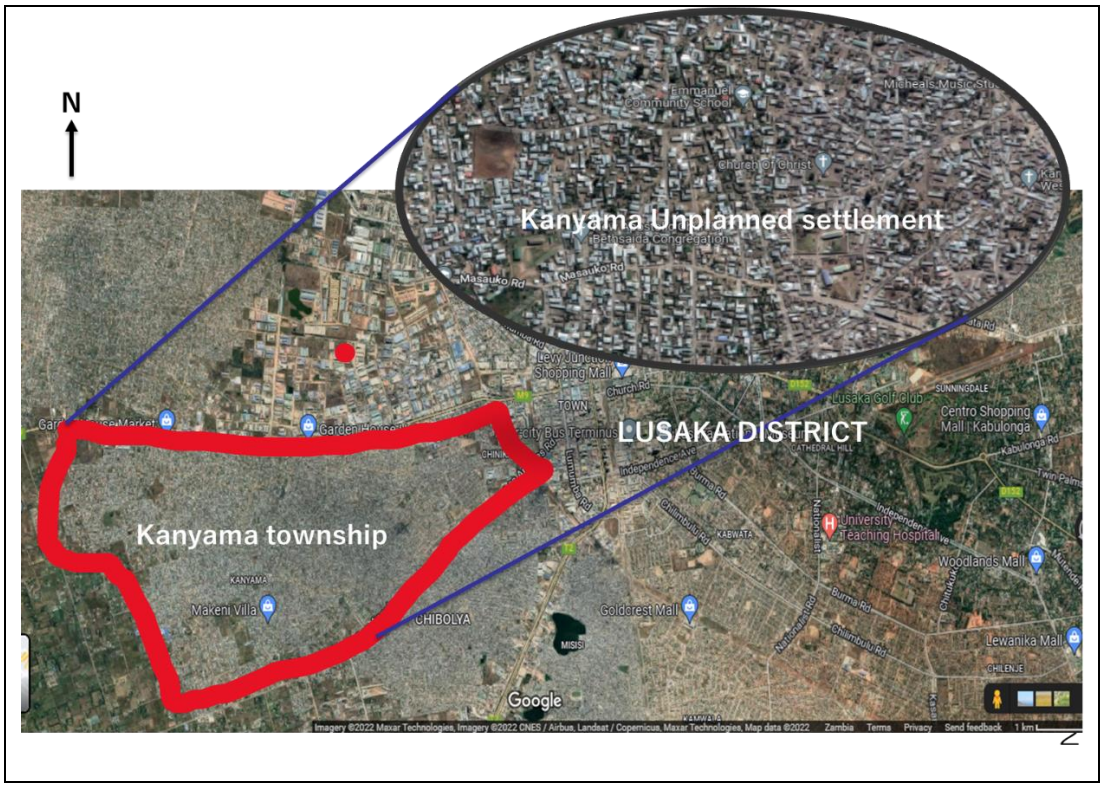

Figure 1-1: Map of Kanyama Township showing unplanned settlements (Source: Modified from Google Earth,2022).

Kanyama constituency has three wards with a total number of 78,995 households distributed across the wards as shown in Table 1-1.

Table 1-1: Kanyama Township Wards with the number of Households in each ward

Ward Name	No. of Households	Percentage Representation
Kanyama Ward 10	36,834	47
Harry Mwanga Nkumbula Ward 11	35,989	45
Mukolo Ward 12	6,172	8
Total	**78,995**	**100**

Source: (LWSC, 2018).

1.3 Statement of the problem

The continuity and upscaling FSM services PUAs presents a serious challenge in developing countries mainly because governments lack own funding and donor support funding is not sufficient to serve all communities and is decreasing. The Government, civil society and communities are equally struggling with issues of inadequate fund allocation to invest, operate and maintain and also cost recovery is equally still an issue. Few countries have realistic and operational policies and strategies to enable sustainable financing for improved FSM services particularly for PUAs (WASTE, 2018). The lack of faecal sludge treatment, inadequate policies and specific regulation on FSM are the emerging global challenges that face sustainable sanitation in developing countries. The provision of sustainable FSM services in PUAs of developing countries is challenging (Sangeeta and Chowdhry, 2012; Simwambi, et al. 2018). In addition, the future sustainability of FSM service models in developing cities seem to continue to depend on subsidies and incentives provided by government and its donors (Spinosa, 2011; Dodane, 2012).

Studies have shown that the current FSM Service model is heavily subsidised and requires a constant donor fund supply to continue operating (LWSC, 2018; Simwambi et al. 2018). This is one reason why the sustainability of FSM service models has remained a challenge. There is need to have a self-financing service mechanism to service models to achieve some level of sustainability. However, there is limited literature to highlight the factors that are affecting and impacting on the sustainability of FSM service models in PUAs. The statement of the problem can therefore be summarised as follows:

"There is lack of understanding of the factors impacting the sustainability of FSM service models under the LWSC to aid the design of a model that remains

operational post- donor funding thereby contributing to improved sanitation in peri-urban areas.

1.4 Research Aim

To evaluate the sustainability of FSM service models in PUAs of Lusaka District Post Donor Funding.

1.5 Specific Objectives

a) To establish the current sanitation practices in PUAs that impact on the sustainability of FSM service models;

b) To determine the factors that impact on sustainability of FSM Service models in PUAs; and

c) To design a sustainable FSM service model for peri-urban areas that reduces donor dependency.

1.6 Research Questions

a) What are the sanitation practices in PUAs that impact on the sustainability of the FSM Service models?

b) What are the factors impacting on the sustainability of FSM Service models in PUAs?

c) What would be the best FSM service model in peri-urban areas that reduces donor dependency?

1.7 Significance of the study

FSM is important because it is one way to provide some decent level of sanitation in PUAs. To be able to sustain it, the FSM service model must be run like a business but at the same time providing a critical service to the poor masses who live in the urban slums. Therefore, the sustainability of the FSM service model is not only critical to the residents of PUAs who directly benefit from it but also to those who will run FSM as a business. This study is significant because data from WSUP (2020) show that the current FSM service model is not sustainable as it depends on donor funding or cross subsidies to remain in operation. The findings presented in this study will help keep the FSM service afloat even after the donor funding is no longer available. A sustainability model will also ensure perpetuity of the improved sanitation

management systems thereby impacting positively on the environmental and socioeconomic status of the residents of PUAs.

1.8 Scope of Study

The study was conducted in Kanyama township which is one of the PUAs of Lusaka District having a population of about 200,000 according to the CSO, (2018). For the sake of this study, the research focused on the 167,000 households that are serviced by the FSM run under the Kanyama Water Trust (KWT) (WSUP, 2019).

1.9 Conceptual Framework

The research adapted and designed its conceptual framework from the UNDP World Bank Water Supply and Sanitation Analytical Framework as discussed by Sara and Katz (1997). In this framework, sustainability is divided into three aspects such as technical, institutional, social aspects. The sub-indicators for each aspect are that infrastructure condition for technical aspects, operation & maintenance and financial management for institutional aspects and finally customer satisfaction and willingness to pay as social aspects. The research used this framework to assess the sustainability of the FSM service model in PUAs of Lusaka District post donor funding as shown in the Figure1-2.

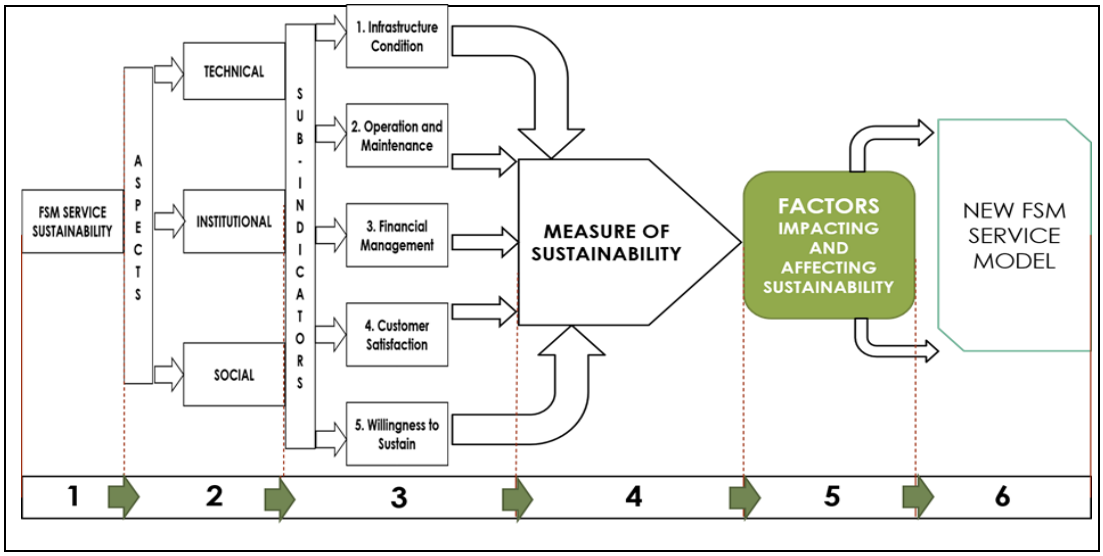

Figure 1-2: Conceptual Framework (Adapted from Sara and Katz, 1997)

The conceptual framework presented in Figure 1-2 highlights stages to the sustainability of FSM service model. The research identified three aspects of sustainability that brought out five sub-indicators that were each assessed for

sustainability and the factors that came out were used in the design of an FSM service model that does not depend on donor funding.

1.10 Ethical Consideration

The researcher endeavoured to engage the selected respondents and inform them that all information collected from them or their premises would be used for academic purposes only and that consent would always be sought from them should there be need to publicize any information that respondents may consider confidential. This research got get ethical clearance from the Natural and applied research ethics committee (NASREC) of the University of Zambia before proceeding. Respondents were made aware that some findings from the research could be used to inform policy formulation that would contribute to the improvement of sanitation in Lusaka District in general.

1.11 Layout of the dissertation

This dissertation comprises six chapters as follows:

Chapter 1 – Introduction: Introduces the research background, problem statement, research questions, aim and objectives, conceptual and frameworks, scope and ethical considerations.

Chapter 2 – Literature Review: Presents a detailed review of literature focusing on the various aspects of sanitation and FSM from the global and African perspectives and then from the local context. The Chapter also reviews literature on FSM service models that brings out research gaps relevant to the study.

Chapter 3 – Research Methodology: Brings out the research design, sample size, data sources and data analysis techniques. The Chapter also outlines the research instruments and tools and methods used to collect and analyse data.

Chapter 4 – Results: This Chapter presents the findings of the study in line with the outlined objectives.

Chapter 5 – Discussion: Discusses the findings of the study. Each finding is analysed relating it to existing literature where available and discusses possible reasons for results not in agreement or in agreement with existing literature.

Chapter 6 – Conclusions and Recommendations: This chapter presents the conclusions and recommendations arising from the key findings of the study.

1.12 Chapter Summary

This chapter set to highlight the background to the study, the study area, statement of the problem bringing out gaps that were relevant to the study. It further brings out the conceptual framework that explained how the factors impacting the sustainability of the FSM service models were arrived at. It then looked at the research objectives and research questions before looking at the scope, limitations and ethical considerations of the study. The chapter finally brings out the reason for this research as it builds up the literature in the chapter two.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The previous chapter presented the background, statement of the problem, research objectives and research questions of the study. This chapter presents literature reviewed in bringing out knowledge gaps that are relevant to this study. It begins by looking at the sustainability of FSM service models at a global and African perspectives. It then discusses the aspects of sustainability starting from demand-responsiveness approaches to sustainability sub-indicators that were used in determining and assessing the status of FSM service models in PUAs of Lusaka District thereby aiding the design of a model that will be sustainable beyond donor financing.

2.2 The sustainability of FSM – the global and African perspective

The United Nations (UN) agenda 2030 revealed that the world is faced with problems related to poor FSM systems due to the extensive increase in population density and increase of urbanised cities (UN 2015). A study conducted by Mbequere et al. (2010), found that urban FSM systems in developing countries have increasingly shown failure due to lack of appropriate treatment of faecal sludge, lack of sustainable sanitation infrastructure in growing cities, increase in the number of households using pit latrines or septic tanks that are connected to sewer systems, inadequate policies, regulation and institutions that focus on FSM. Kazora et al. (2018), opines that FSM in cities like Kigali or indeed Lusaka, is a complex issue as there was no clear role and responsibilities of the institutions in charge for FSM which is a real threat facing human health and environment. The study concludes that FSM services were needed in order to achieve sustainable sanitation in developing cities like Kigali.

It was clear that these studies focused on the need to introduce FSM in developing cities and highlight the challenges that were being faced but they did not show what had to be done to make FSM service model to sustainably stand on its on without external financial support.

2.3 Running faecal sludge as a business in Lusaka Zambia

According to WSUP (2019), there had been a steady upward trend in sales with a compounded annual growth rate of 38 percent from 2014 to 2018. This report however acknowledges that despite this milestone, the number of jobs performed by the CWT emptier and paid for by customers was not enough to cover the cost of the service

supplied. As a result, the FSM service business both at CWT and the KWT has been loss making from inception and this from the perspective of Simwambi et al. (2018), is the reason for the continued subsidizing with donor funding. In addition, although WSUP (2019) suggest that upward adjustment of the tariff and a reduction in the cost of O&M could make the FSM a sustainable service in Lusaka, there is however, no information that provides strategies on how FSM could run sustainably without Donor Funding.

Tembo et al. (2017) ague that the cost of desludgng for most residents was high and that since the majority of the residents had incomes of less than US$1 per capita per day as reported by LWSC (2018), the FSM emptying services and other services therefore, were out of reach for many residents requiring subsidisation. Subsidisation as suggested by Tembo et al. (2017) is one way to support the FSM services. However, information on whether subsidization could sustain FSM service models for a long time is not available. Income generation activities through resource recovery from waste derived products such as biogas generation in the view of Murray and Ray (2010) could be a way begin to wean off FSM models from perpetually donor funding dependent.

Provision of financially sustainable sanitation services to low income households is fundamentally challenging and that the CWT experience underscores the reality that some form of subsidy is required (WSUP, 2018). Although WSUP recommends ways to help make the FSM service models financially sustainable such as increase in sales of biosolids, introduction of fully emptying services options at a fixed price, transitioning from commission to wages, there is no study to guarrantee that these measures if implemented would help in the sustainability of the FSM services models.

2.4 A brief review of FSM service model in Lusaka District

In the first FSM business plan running from January, 2020 to December, 2024, LWSC is implementing what is referred to as permitting partnership as shown in conceptual schematic diagram shown in Figure 2-1. Permitting is considered to be a ‘light touch’ approach helping LWSC establish its internal capacity and systems before it considers evolving into complex market structure-franchising under the second FSM business plan. The focus of the permitting partnership options will be on creating incentives which address market failures while keeping the ‘light touch’ approach in terms of the

LWSC's involvement in service delivery. The report further adds that financial and non-financial incentives would be designed to encourage a higher level of investment by the private sector in the technical and business skills to improve the quality and efficiency (LWSC,2018).

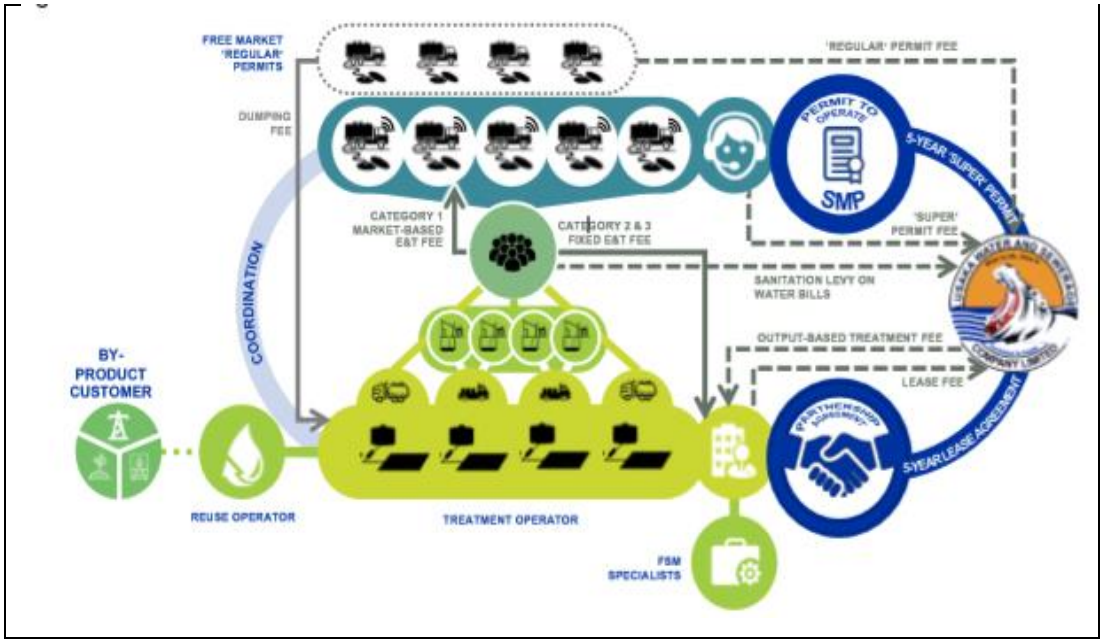

Figure 2-1: Conceptual Schematic diagram showing the permitting partnership option (Source: LWSC, 2018)

In this FSM service/business model, although the plan outlines four different major FSM business plans for improving FSM to be implemented in the period spanning from 2020 to 2029 in Lusaka, firstly, this advisory report to LWSC suggests that incentives cannot be done away with any time soon. Secondly, the report does not give information on how the FSM service business will be able to remain sustainable without donor funding especially considering that the majority of people targeted for the FSM service live on less than US$2 per day as observed by LWSC (LWSC, 2018).

2.5 The Lusaka FSM service model challenges and future innovations to improve sanitation provision.

According to the LWSC-LSP (2018) World Bank financing model, it was contended that pit latrines and septic tanks need to be emptied on a regular basis with frequency varying from 6 months to several years. The FSM services is a system that ensures safe collection, transportation, and treatment of faecal sludge from the OSS systems. LWSC has not previously been active in the FSM market outside the operation of waste water treatment plants (WWTPs) but plans to significantly expand its role in the emptying and transport part of the value chain. In this context LWSC management has

defined four objectives for the utility's expanded role in FSM: to improve quality of services at an affordable and predictable price; to enhance accountability and service monitoring; to maximize incentives for expansion of emptying services in currently unserved areas; and to test new and innovative partnerships with the private sector, which could be leveraged in other areas of LWSC's sanitation operation (LWSC-LSP ,2018).

To achieve these objectives, LWSC plans to enter formalized agreements with existing service providers, based on competitive selection of service providers who will be given rights to provide emptying services in specified zones on exclusivity or limited competition basis. Earlier analysis has shown that emptying and transport service, in particular in the pit latrine market, is unlikely to pay for itself in the short to medium term and will therefore need to be subsidized in a transitional phase until the market is more mature. Grant financing for such a subsidy is provided for under the World Bank/IDA financing for Lusaka Sanitation Project and LWSC plans to use this subsidy to incentivize operators in FSM market to increase coverage and quality of services, which will in turn increase willingness to pay and enable LWSC to gradually increase operating cost recovery through emptying fees. The key issues to consider in structuring of the formalized contracting of private service providers in the FSM market and designing a subsidy model to incentivize increased coverage and quality of FSM services are:

- The market structure (How should the zones be defined, should there be a degree of competition for the market within a zone, what will happen to incumbent less formalized providers, what are the designated disposal points for FSM operators, should there be horizontal integration in contracts between market segments, should there be vertical integration in contracts between value chain segments);
- The design of the subsidy (Which market segments should be eligible for subsidy, how is a pro-poor targeting ensured, how much should the households contribute, how is sustainability of the market after the end of the subsidy ensured, how is the level of the subsidy determined, what are the payment triggers, how are they verified);
- The viability of the private operators (What does it take to make service provision viable); and

- The nature and content of the formalized contracts for private operators (How to define service level specifications, payment mechanism, risk allocation, funds flow) (LWSC-LSP, 2018).

From the foregoing, it is clear that the need to find self-financing mechanisms for the FSM service model in Lusaka is critical. The sections have highlighted the need for the study to bring out other factors that impact on the sustainability of FSM service models in Lusaka district. This research will now focus on what else has to be done to close those gaps.

2.6 Donor support and subsidising of the FSM service model to attain sustainability

External donor funding has covered and will continue to cover some investment in sanitation and wastewater management (Anderson et al., 2020). The OECD-DAC, (2013) found that external aid to water and sanitation almost doubled during 2000 to 2011 reaching nearly US$ 8 billion annually. However, Anderson et al. (2020) argue that aid or donor financing is not a good stable basis for long term financing of a large system, not at least as aid commitments tend to be for much shorter periods than the lifetime of the system. Also, given the investment needed to achieve universal access to adequate sanitation like FSM services, donor financing is likely to be insufficient.

Sanders and Fitts, (2011) reported that the achievement of the lasting and sustainable impact from projects is a major challenge for donors and the agencies implementing or supporting sanitation project in the developing countries. This challenge is due to poor cost recovery strategies because sanitation consumers are not contributing to the cost of O&M of sanitation facilities (Nkiwane, 2007; Sharma, 2012; Kamurazzaman et al., 2013). In addition, regardless of how successful an intervention maybe in the short term, if its beneficial impacts are not sustained over long period, then that intervention cannot be deemed to be cost effective. These studies underline the reasons why subsidisation of the FSM service through donor funding remains criticised (Carter and Rwamwanja, 2006).

It has been observed by GIZ, (2019), one of the donor funders to the FSM service project that the initial funded contracting period will only cover the first two years. After that, the discount subsidy will become more difficult to sustain if no further funding becomes available. This is a direct threat to the sustainability of the FSM

service model currently being implemented in Lusaka District. Some of the initiatives being put in place include the following:

- First, LWSC is looking to introduce ring-fencing of all sanitation-related revenue to build up its own sanitation fund;
- Second, LWSC is in negotiation with National Water and Sanitation Council (NWASCO) over the reinstatement of the sanitation levy to cover at least part of the top up fee and plans to raise customer contributions for pit-emptying gradually; and
- Finally, the LWSC FSM unit is looking to explore marketing of sludge reuse as a potential source of revenue.

2.7 Sanitation Management in the City of Lusaka

Through the Water Supply and Sanitation Act No. 28 of 1997, NWASCO has given mandate to water utility companies to provide water and sanitation services to the Zambian people. Among the water utility company given this task, is the LWSC which has the role of providing water and sanitation services to all seven districts in Lusaka Province. Among the cities in the province is Lusaka the Capital of Zambia. Kanyama is one of the townships in the district. The provision of water and sanitation services in Kanyama township is done through the KWT with delegated authority from LWSC (LWSC, 2014).

2.8 The sustainability of FSM - challenges and opportunities in the city of Lusaka

The unfortunate reality is that revenues from waste re-use are very unlikely to cover the full cost of emptying, transportation and treatment. This means that LWSC will not make money out of the current FSM service model at least in the short to medium term future. Further, it is also unlikely that a sanitation levy which is high enough to trigger profit for LWSC will be allowed by the regulator. Although LWSC currently is supporting and subsidizing the FSM service model to make it reach some level of sustainability, there is a growing challenge of meeting the rising demand of the FSM services in Lusaka District sustainably especially when donor funding is pulled out LWSC, (2018).

For this reason, the sustainability of FSM services for the future are under threat and the need to find lasting solutions to this challenge is equally growing.

2.9 The aspects of sustainability

The first of this section presents a discussion of how sustainability was defined and measured for the study. This discussion will be followed by the presentation of sub-indicators of sustainability included in the analysis.

2.9.1 Definition of sustainability

The term sustainability is one that is used loosely as it covers a whole range of topics. The term is frequently used to refer to project sustainability, referring to the capacity of a project to continue to deliver its intended benefits over a long term (Bamberger and Cheema, 1990). This study focussed on FSM systems. Therefore, sustainability has been defined in this study as the maintenance of acceptable level of service throughout the design life of the FSM service model. A number of studies have identified various aspects of FSM service model sustainability. For the sake of this study, the aspects that were considered to determine the sustainability FSM service models include technical, institutional and social aspects. The aspects have been described below:

2.9.2 Technical aspects of sustainability

The technical aspects relating to the design and construction and most importantly O&M of the services are most obvious determinants of FSM service models' sustainability. Poor construction quality or the use of low-grade materials in construction of FS treatment plants and stations may lead to failure of FSM service models before end of their design life. These factors can be identified through examination of the system and interviews with treatment or system operators (Sara and Katz, 1997).

2.9.3 Institutional aspects of sustainability

Experience has shown that even a well-constructed and designed FSM system needs proper institutional arrangements to keep it functioning overtime. Most systems require some sort of preventive maintenance. Components of the FSM value chain such as transportation trucks, push carts, vacuum tankers and scooping shovels will all require repair and maintenance. Sara and Katz (1997), argue that because most of the onsite sanitation systems like toilets are shared by a number of families, providing these repair services require some sort of community management structures such as

faecal sludge committees to oversee the repairs and help collect money from members of the community to cover the cost of these services.

2.9.4 Social aspects of sustainability

The sustainability of FSM models depends on the willingness of users to provide the necessary time, money and labour to keep the system functioning. This willingness may be affected by social-economic factors such as income level ethnic homogeneity and the willingness of households to work together. More commonly, however, is that the willingness for households to work together will depend on their satisfaction with the service, usually compared to the previous satisfaction of the service in the community. When communities perceive a significant improvement in FSM services, they are usually more willing to pay for O&M. In addition, their willingness to pay is also affected by community perception of ownership or sense of entitlement to free services from the government (Sara and Katz, 1997).

2.9.5 Financial Aspects Sustainability

In order to fully understand the sustainability of FSM service models the financial aspect is key. The LWSC-LSP proposes to incentivize licensed operators to participate in the development of the pit latrine emptying market, with the objective of pit latrine emptying service being viable without subsidy after end of contract. Licensed operators will be invited to bid on multiyear service contracts, with fixed household payment, increasing over contract period (e.g., 150 ZMW/m^3 with inflation+5% annual increase) and declining government subsidy over contract period (e.g., 100%, 80%, 60%, 40%, 20%) to incentivize efficiency improvements. The first-year unit price (subsidy + household contribution) in ZMW/m^3 will be the key bid criteria. To ensure that operators have an incentive to stay for the duration of the contract there should be a max subsidy per year in the contract (e.g., 5,000 m^3/year per operator in case of 4 operators or 2,500 m^3/year per operator in case of 8 operators). Taking as the point of departure typical stated operating costs in the current pit latrine emptying market of 300 ZMW/m^3 and capital expenditures of around 50 ZMW/m^3. We assume that competitive bidding may lead to bid prices around 300 ZMW/m^3 (LWSC-LSP, 2018).

2.10 Models of sanitation

There are two sanitation models identified by Jenkins and Sugden (2006). These include:

- Supply-led Sanitation Model and
- Demand-led sanitation model

2.10.1 Supply-led Sanitation model

The supply-led models are models that are initiated and spearheaded by the supplier of the model, service or project. The supply-led sanitation model paid little if any attention to understanding and stimulating demand for sanitation improvements before building sanitation infrastructure. They have for decades been the standard approach used to address the lack of adequate sanitation among rural and urban households in developing countries. A well-established pattern of poor progress of the supply-led model includes repeated failure to generate demand for improved sanitation and behaviour change among project households, produce sanitation products and services that are sustainable beyond external donor support or generate replication at scale. This, according to Caircross (1992) and Wright (1997) has stipulated a gradual and growing shift in thinking about sanitation sector over the last decade.

2.10.2 Demand-led Sanitation Model

Demand-led Sanitation model is a model which is led and motivated by the customers that are in need of the service or project. In a demand-led sanitation model, a hardware subsidy was often used to induce sanitation changes at the household level but rarely worked to create willingness to pay for maintenance and use of new sanitation facilities.

2.11 Demand-responsiveness and Sustainability relationship in FSM

A study by Sara and Katz (1997) reported that there was a highly significant positive relationship between demand-responsiveness and sustainability at the community level. The report opines that as demand-responsiveness for sanitation and water increases, so is sustainability.

Although the report examined the demand-sustainability for water systems, this study tested this relationship on sanitation systems and in this case, we tested it on FSM service models. Figure 2-2 shows the depiction of the relationship between demand-

responsiveness and sustainability. This relationship formed part of this study's assessment of the sustainability of FSM service models in PUAs as it helped inform on the relationship that exists between the demand of FSM services and the willingness of the community to sustain the system.

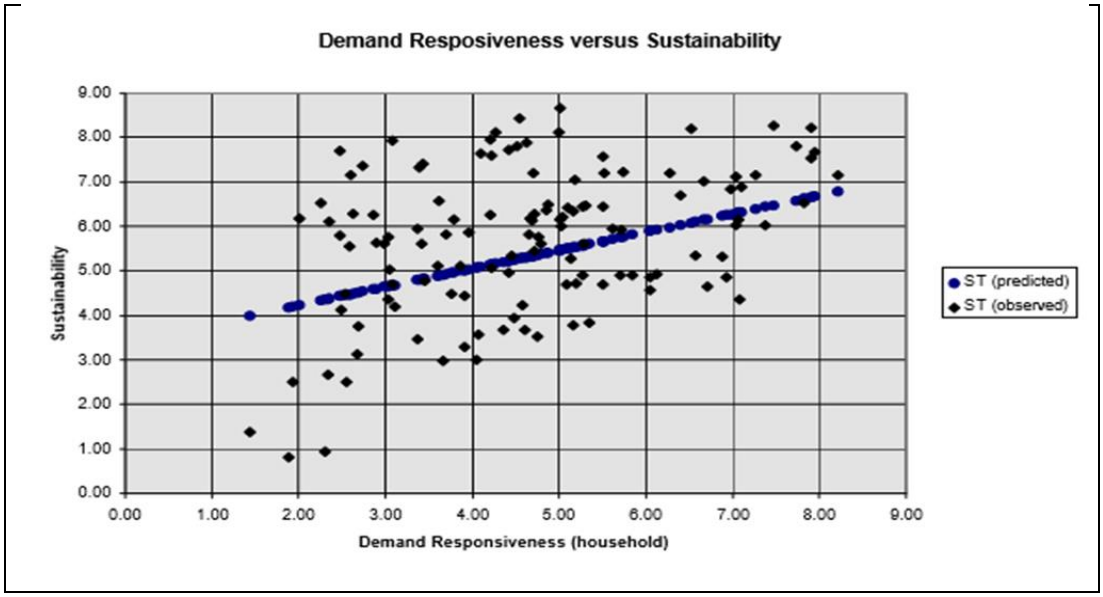

Figure 2-2: Demand-responsiveness and Sustainability graph (Source: Sara and Katz, 1997)

2.12 Financial flows of the service Models

According to Strande et al. (2014), there is no single FSM service model that has proven to be effective in all situations. Indeed, service models are constantly modified and restructured depending on the economic, legal and environmental conditions. Various financial models for the management of FS have been proposed and the extensive list of possible configurations as summarised by Steiner et al. (2003). This section presents two of the five different models based on case studies and theorical examples. The models differ in terms of stakeholders, stakeholder responsibilities and the type of financial transfers that take place (Figures 2-3 and 2-4).

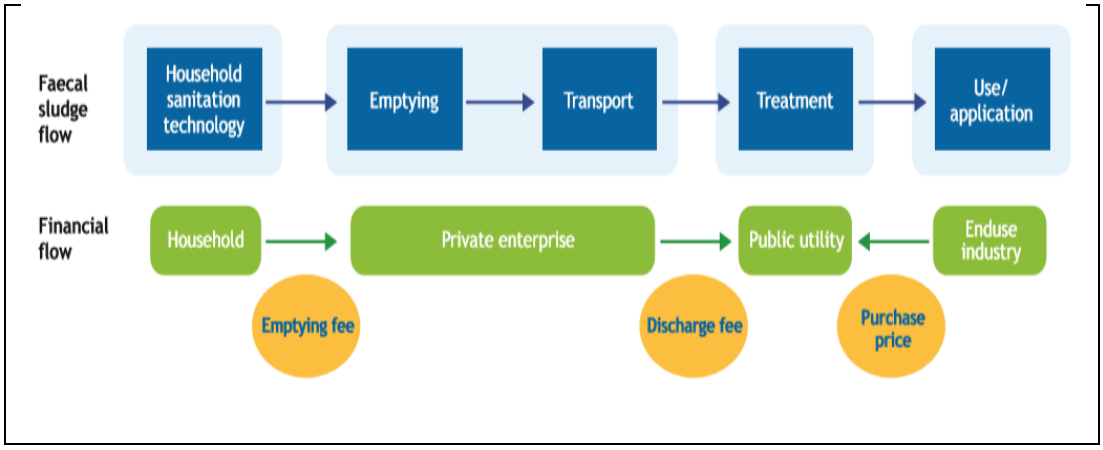

Figure 2-3: Model 1 of Discrete collection and treatment model (Source: Strande et al., 2014)

Figure 2-3 illustrates a simple model of the financial transfer. In this example, each of the stakeholders is responsible for a single technology in the FSM chain, and consequently, money is exchanged each time responsibility is handed over (emptying and transportation are considered here as a single technology). The Household (HH) level toilet user pays a private service provider (PSP) an emptying fee to remove sludge and the PSP is responsible for the emptying and transportation of the sludge. The PSP is then charged a discharged fee by the public utility for accepting and treating the sludge. The utility is also paid purchase price by an end-use industry in exchange for treated FS or sludge grown products. In this model, the government authority and must cover all costs by collecting sufficient discharge and purchase fees.

The negative consequence of this type of model as argued by Strande et al., (2014) is that the PSP are forced to pass the high discharge fee costs on their customers and this excludes the poorest who avoid paying the high discharge fee by illegally discharging free of charge on land that is not designated for discharge or treatment.

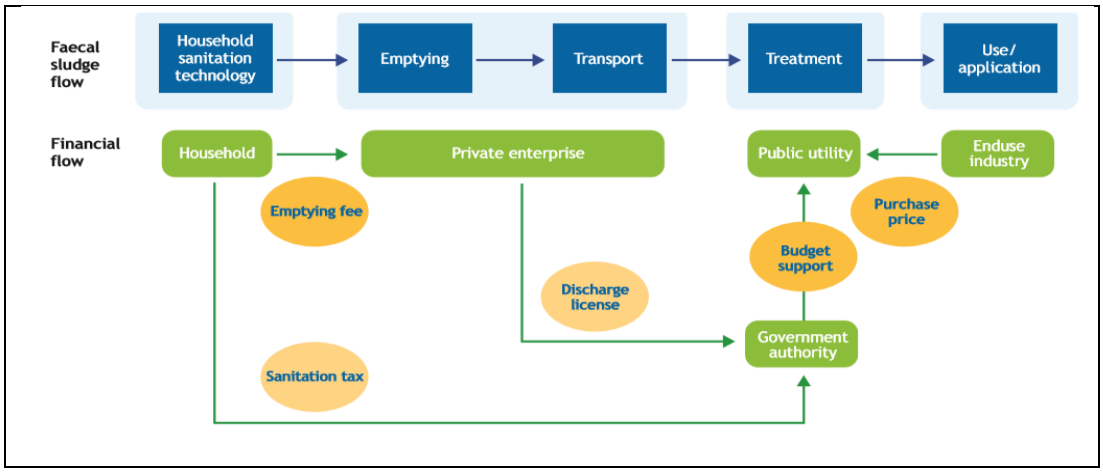

Figure 2-4: Model 2 of Incentivised discharged model (Source: Strande et al., 2014)

Unlike the situation in Figure 2-3, the case is different and a little advanced in Figure 2-4. As can be seen, an important feature of the model is the direction of the financial transfers from public utility to the private entrepreneur. In this model presented in Figure 2-4, the Faecal Sludge Treatment Plant (FSTP) pays the stakeholders responsible for collection and transportation a discharge incentive could take a variety of forms. The one used by LWSC is actually an amount to the transporter determined by the quantity of sludge delivered to the treatment plant. This is what the donor fund is utilized for. For this reason, discharge license and sanitation tax flows in Figure 2-3 may or may not exist in this model, depending on the context.

2.13 Chapter Summary

This chapter established that most of the studies conducted on the sustainability of the FSM services still insists that subsidies or indeed donor support are still required in order for the FSM service/business to run sustainably. It was established that no detailed understanding exists to ascertain the current situation of the FSM service model in order to bring out factors that aid the design of a service model that is sustainable post-donor funding. This chapter has further established that there has been no evidence to show that an increase in the FSM tariff or a reduction in the cost of transportation and emptying would actually help the FSM service model to achieve some level of sustainability post donor support. This chapter therefore underpinned the need to highlight factors that inhibit the sustainability of FSM service models thereby aiding the design of a service model that is sustainable post donor funding. The ensuing chapter discusses the methodological approach that were designed to address the set objectives of the study. The following chapter presents the research methodology.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

A comprehensive literature review presented in the previous chapter helped highlight the knowlegde gaps which supported the significance of this research. This study sought to answer the research questions that would bring out factors that impact the sustainability of FSM service models thereby aiding the design of an FSM service model that will be sustainable and reduces donor dependency. This chapter now presents the methodology used in this research.

3.2 Research Design

The research used mixed method approach to collect and analyse data. As Dawson, (2009) opines, qualitative research explores attitudes, behavior and experiences through methods as interviews or focus group discussions. It attempts to get an indepth opinion from participants and quantitative research generates statistics through the use of large scale survey research using methods such as questionnaires or semi-structured interviews. It attempts to inquire the relationship between variables that the researcher wants to know. It is as stated in the above definitions that this research used both methods to collect and analyse data.

3.3 Data collection techniques

There were a number of techniques employed in the collection of the data required for this study. The ensuing sections discuss in detail these techniques. These include: types of data sources; sample size and sampling methods.

3.3.1 Types of data and sources

This research used both primary and secondary types of data. Primary data is data obtained through experiments, interviews and questionaires (Bryman, 2012). Secondary data is the type of data which is obtained from existing literature like journals, reports, statistics, newspapers and other official documents.The sources of data were as follows:

i). Primary data

Primary data was collected using semi-structured questionnaires, focused group discussions (FDGs) and Key informant interviews. A technical assessment and field observations were also carried out to collect primary data.

ii). Secondary data

In order to supplement the primary data, secondary data was obtained from reports and other releveant documents from the internet. Other secondary data sources where official reports, financial statements, advisory notes obtained from key institutions such as WSUP, LWSC, Brenen Overseas Research and Development Association (BORDA) and KWT.

3.3.2 Sample size

The total sample size calculated using the check market calculator found at [http//www.checkmarket-sample-size-calculator] using a marginal error of five percent and, confidence level of 95 percent and population of HHs of 78,997 gave a sample size of 383. This is the sample size required for that confidence level. However, this was not attainable and the sample size selected for this study was reduced to 150 respondents distributed across the three wards of Kanyama township. This yielded a confidence level of 80 percent and a margin of error of five percent.

Kanyama township as a constituency has three wards. The three wards are Kanyama Ward 10, Harry Mwanga Nkumbula Ward 11 and Mukolo Ward 12. The total number of 140 respondents participated in the sample some as HHs among the three wards using percentages as shown in Table 3-1 and the other 10 were key informants purposively sampled for this study.

Table 3-1: Sample size targeted HHs respondents (Source: This study)

Ward Name	No. of HHs	Percentage Distribution	Calculated Respondents	SELECTED RESPONDENTS
Kanyama Ward 10	36,836	47	180	66
Harry Mwanga Nkumbula Ward 11	35,989	45	172	64
Mukolo Ward 12	6,172	8	38	10
Totals	**78,997**	**100**	**390**	**140**

Source: This study

Out of the 140 HHs, 70 HH were those who had acquired the newly designed and constructed toilets purchased through an instalment arrangement from LWSC. The new toilets were constructed as part of the Lusaka Sanitation Program (LSP) being financed by the World Bank under the LWSC. The other 70 HHs are those with old toilets. The purpose of this segregation was in order to have a clear assessment of the FSM service model from both the old and new toilet's point of view.

3.3.3 Sampling methods

Data on the sustainability of the FSM service model in Lusaka District was gathered through stratified purposive sampling. Households, community members as well as key informants were purposively selected for the semi-structured interviews, focus group discussion (FDGs) and key informants interviews respectively.

3.4 Data collection methods and tools

The household semi-structured questionnaire presented in Appendix A was used to obtain primary data on the issues related to the type of sanitation technology being used. Assessments on the demand-responsiveness and the role of sanitation committees in the management of the community sanitation installations. Semi-structured inteview guide presented in Appendix B was administered to generate relevant data from Key Informants from institutions such as LWSC, Lusaka City Council (LLC), BORDA, GIZ, KWT, Water and Sanitation Association of Zambia (WASAZA) and CWT. Physical inspections during field obervations were carried out on the FS treatment plants, household toilets, vaccum tankers, transportation push carts, biogas digesters, FS transfer stations and FS disposal sites using a checklist presented in Appendix C. These were inspected in order to determine their quality and functionality and status in relation to sustainability. Data for the study was collected from four sources in the community as adapated from Sara and Katz, (1997) shown in the ensuing sub-sections (refer to Section 3.4.1 through to 3.4.3).

3.4.1 Household (HH) interviews

Semi-structured questionnaires were distributed to households who were literate and could answer most of the questions on their own. For some of the households who were unable to read and undertstand some of the questions, they were assisted by further explaining and interpreting the questions in a language they could easily understand and the researcher would tick or put down the answers.

3.4.2 Foccussed Group Discussion (FGD)

Two FGDs were held. One with community members purposively selected and the other one with FSM stakeholders that included some members of organizations in charge of or playing a role in the FSM service chain in Kanyama township. A FGD guide presented in Appendix D was used. (Refer to Figure 3-1).

Figure 3-1: Focus Group Discussion taking place with key stakeholders (Source:This Study)

3.4.3 A technical assessment

The determination of the demand-responsiveness and sustainability scores was asseesed through a technical assessment as suggested by Sara and Katz, (1997). To do this technical assessment, a set of questions covering all the five indicators for demand resposniveness and the other five for sustainability (sections 3.6.1 and 3.6.2) adjusted to suit the context of this study was done and presented in semi-structured questionnaire in Appendix A. In addition, a financial analysis w undertaken to determine the current cost of service, operation and maintenance of the FSM service model.

3.4.4 Key informant interview

A total of 11 key informant interviews were held with experts in the water and sanitation and FSM sub-sectors. These include four from LWSC, two from KWT, two from CWT, one from BORDA, one from WSUP and one from GIZ. The semi-structured interview guide for key informants has been presented in Appendix B.

3.5 Approach to data collection on sustainability

As shown in the sustainability matrix presented in Appendix E, there are three basic aspects that were used to examine the sustainability of FSM service model in Lusaka District. The first is technical aspect where the physical condition of infrastructure was given a technical assessment and observation through an observation checklist. The second aspect was the institutional aspect which included operational and maintenance and financial management. This was assessed through semi-structured interview guide

presented in Appendix B. The third aspect was the socio-economic aspect where consumer satisfaction and willingness to sustain the FSM service system were assessed through household semi-structured questionnaire shown in Appendix A.

3.6 Indicators on demand responsiveness and sustainability

The sections below detail the indicators used to measure demand responsiveness and sustainability (Sara and Katz, 1997).

3.6.1 Indicators for demand responsiveness

Five Sub-indicators for the establishment of the demand responsiveness were used and they are presented below: -

i) Project Initiative

This measured the degree to which community members felt responsible for initiating the project as opposed to being selected by the project team or government. Data sources were the HH and the FS committees.

ii) Informed Choice

This indicator measured the degree to which individuals felt involved in decision making processes surrounding the system and how well they were informed about the implications of their decisions in terms of costs and responsibilities for O&M.

iii) Community Contribution

This indicator measured how much people contributed to the initial capital investment: This includes cash, labour and in-kind contributions.

iv) Training of FSM committee

This indicator assessed whether the operators and committee members had received some training in FSM courses.

v) Legal Ownership

This indicator measured the degree to which the members of community owned the FSM service system.

3.6.2 Indicators for sustainability

The sustainability levels were assessed using five sub-indicators. These have been presented in the sections below:

i) Physical Condition

This measured the overall physical condition of the FSM system. It is based on factors such as construction quality, status of pit latrines, availability and status of FS treatment plants, transfer stations and FS drying beds.

ii) Consumer Satisfaction

This indicator measured overall consumer satisfaction with the FSM service model. It was based on expressed opinions on factors such as satisfaction with the quality of service delivered, the cost of service, response time to emptying services etc.

iii) Operation and Maintenance (O&M)

This examined factors such as whether the community had designated service operator, access tools and spare parts and information about follow up support.

iv) Financial Management

This assessment was based on a review of each community's financial records and interviews with the FSM committees and treasurer. The current FSM service financing mechanism was also be established.

v) Willingness to Sustain the system

This measured community support for sustaining the FSM service model. It assessed the degree to which community members felt responsible for the maintenance of their system.

3.7 Measuring sustainability of the FSM service model

This study based its sustainability analysis on indicators measuring the key technical, institutional and social determinants of sustainability at the community level as adapted from (Sara and Katz, 1997). The study employed different survey instruments as presented in the summary Table 3-4 below to measure each of these factors as will be seen in the different sections below. It collected information on the technical factors from the technical assessment of the faecal sludge management system, institutional factors from the technical assessment and semi-structured questionnaires with the faecal sludge committees or system managers (refer to Appendix A).

The sustainability sub-indicators were scored on a ten-point scale for all the respondents. Low sustainability score indicates that the system is performing poorly in most of the social, institutional and technical aspects that are considered to FSM system sustainability. A high score indicates that the system is performing well in most

of the aspects and likely to be sustained even if performance in a few key areas worsens (Sara and Katz, 1997).

To suit the context of this study, modifications were made to the questionnaires as adapted from the UNDP-World Bank Water and Sanitation program report (Sara and Katz, 1997) (refer to Appendix A). Each sub-indicator was based on a group of eight (8) to twenty (20) related questions designed and administered to the respondents by the researcher. Each question was scored on a scale of zero to two and the total score sub-indicator was calculated by combining these scores and converting them to a ten-point scale. Overall sustainability index in the area is the average of the five sub-indicators. It is adjusted to a ten-point scale with financial management comprising 25 percent of the overall sustainability score and each of the four other indicators comprising of 18.75 percent as shown in Table 3-2. The index of the area was grouped into three categories.

The financial management sub-indicator received a higher score because it is a very vital sub-indicator upon which all other sub-indicators depend where sustainability is concerned. There is no sustainability that could exist without prudent financial management. This study was therefore focussed more on the sustainability of the FSM service model post donor-funding. It was for that reason that the financial management sub-indicator received a higher score than the others because all of sub-indicators rely of the financial management sub-indicator to function properly. As shown in Table 3-3, the index that scored above 6.67 was categorised sustainable, the one below 5.00 as unsustainable and between 5.00 and 6.67 as potentially sustainable.

Table 3-2: Sustainability Score Table

ASPECT	SUB-INDICATORS	SCORE (%)
Technical	Physical Condition of infrastructure	18.75
Institutional	Operation and Maintenance	18.75

Table 3-2: Continued.

	Financial Management	25
Social	Consumer satisfaction	18.75
	Willing to Pay or sustain the system	18.75

Source: (Adapted from Sara and Katz, 1997).

Table 3-3: Sustainability Level and Category Score Table

SN	LEVEL OF SUSTAINABILITY	CATEGORY OF SUSTAINABILITY
1	>6.67	Sustainable
2	5.00 to 6.67	Potentially Sustainable
3	< 5.00	Unstainable

Source: Sara and Katz (1997)

The formular for the calculation of the level of demand responsiveness and sustainability is presented in the equation below:

$$\text{Required Score Demand Respo./Sustainability} = \frac{\textbf{Calculated Score}}{\textbf{TOTAL SCORE}} \text{ X10}$$

3.8 Data Analysis

Data analysis in this study was conducted for qualitative data and data for Demand - Responsiveness and Sustainability indicators as presented in the ensuing sections.

3.8.1 Analysis of qualitative data

To conduct the first data analysis, qualitative data collected during the research was transcribed and analysed using the thematic analysis method. Data collected through semi-structured questionnaires were first checked for accuracy and data entries coded. The data was then entered, edited and analysed using the Microsoft excel.

3.8.2 Analysis of data for sustainability analytical framework

This research adapted the Sustainability Analytical Framework from the United Nations Development Program (UNDP) – World Bank Water and Sanitation Program

Report for analysis of sub-indicators of sustainability (Sara and Katz, 1997). The five sub-indicators include the Financial Management, Operation and Maintenance practices, Consumer Satisfaction, Physical Condition of the FSM system and Willingness to Sustain the system (Refer to Section 3.8 to see how sustainability was measured). The following sections present the methods used in the analysis of demand-responsiveness and sustainability.

i) ***Analysis of demand-responsiveness and sustainability Indicators***

The analysis based on indicators developed specifically for this study as adapted from the UNDP-World Bank Water and Sanitation Program Report (Sara and Katz, 1997). Sub-indicators were used to measure the demand-responsiveness and sustainability of the community's FSM system. Demand responsiveness is considered from the perspective of household members and FSM committees (refer to Section 3.6.1). According to Sara and Katz (1997), strong evidence exists that suggests that a relationship exists between demand-responsiveness and the sustainability of a sanitation system. Seleman (2012), also examined this relationship and found a significant relationship exists between demand responsiveness and sustainability of sanitation systems using the three sustainability aspects. This methodology was used to establish the level of sustainability of the FSM service model in PUAs taking into consideration the technical, institutional and social aspects of sustainability (refer to Section 3.6.1 and Section 3.6.2 and Figure 2-2).

3.8.3 The concept of FSM service model sustainability

Taking into account the conceptual framework presented in Figure 1-2, the study identified stages that were used in coming up with model. The stages are explained below.

a) Stages 1

Stage one included a desk review of relevant literature from stakeholders, assessing of the current FSM practices in order to understand, establish conceptualize the current situation in Kanyama.

b) Stage 2

Stage two included the establishment of the aspects of sustainability which in this research are restricted to technical, institutional and social aspects as highlighted by Sara and Katz, (1997).

c) Stage 3

This stage included the identification of sub indicators that were assessed for sustainability to determine the level of sustainability of each one of them.

d) Stage 4

Stage four involved the measure of the level of sustainability using a methodology discussed in section 3.7.

e) Stage 5

This stage brought out the various factors that affect and impact on the sustainability of FSM service models.

f) Stage 6

This final stage involved the conceptualization and design of a new sustainable FSM service model that is sustainable to work even after donor support has stopped. The methods used in the measure of sustainability for the different aspects have been presented in the following sections.

3.9 Summary of methods with reference to the specific objectives

The methodology was designed to respond to the specific objectives and has been covered in the preceding sections. This section summarises the methods that were adopted for each respective objective. The main research instruments and tools that were used have also been highlighted (Table 3-4).

Table 3-4: Summary of the data collection and analysis tools and methods used in this study per objective

Sn	Objective	Tools And Methods of Data Collection	Methods Of Data Analysis
1	To establish the current sanitation practices in peri-urban areas that impact on the sustainability of FSM service models.	• Household Surveys through semi-structured questionnaires • Field observations • Semi-structured interviews • Focussed Group Discussion	• Microsoft Excel • Thematic analysis

Table 3-4: Continue

2	To determine the technical, institutional, social and environmental factors that impact on sustainability of FSM Service models in peri-urban areas;	• Semi-structured interviews • Field observation • Interviews with stakeholders	Technical assessment by a method suggested by Sara and Katz, (1997) and SPSS
3	Design an FSM service model that will be sustainable post donor funding.	• Analysis of existing literature • Analysis of the results from the study	N/A

(Source: Author)

3.10 Chapter Summary

The chapter has highlighted the study design and adopted the framework for the World Bank -UNDP Water and Sanitation report which helped in the technical assessment of the sustainability sub-indicators. The chapter also highlights the sample size, data collection tools, analysis methods and how data were presented. Each objective had separate methods of data collection and analysis. The chapter ends with a table summarising the way data was collected and analysed. The following chapter presents the study results.

CHAPTER 4: RESULTS

4.1 Introduction

A comprehensive methodology used in this study has been presented in the previous chapter. This chapter presents the results/findings of the research. It is important to remember that the aim of this study was to evaluate the sanitation practices of the FSM service model in order to establish factors that affect and impact on its sustainability thereby aiding the design of a sustainable FSM Service model in PUAs post donor funding. In order to achieve this aim, the research sought to address the set research questions. The following sections therefore, present the results addressing the research questions.

4.2 Sanitation practices impacting on FSM service models

Sanitation practices have a significant impact on the sustainability of the FSM service models. This section presents results to assist in answering the research question set out in section 1.6 which stated: "What sanitation practices impact the sustainability of the FSM Service models in PUAs?". In order to answer this question, two aspects were looked at. These include:

- Socioeconomic characteristics of the study area; and
- Current FSM service model for Kanyama Township.

4.2.1 Socioeconomic characteristics of the study area

The socioeconomic characteristics of the study area that may have an impact on the sustainability of the FSM service models included the following;

- Gender distribution and heads of the Household surveyed;
- Occupation of the Households;
- Income level of the Households;
- Affordability to pay for pit emptying; and
- Willingness to pay for the emptying service.

i) Gender Distribution and heads of Households surveyed

A total of 150 respondents, were sampled in the three wards of Kanyama township and key informants from different organisations in the water and sanitation sector. The age of the sample of respondents ranged between 18 to 77 years with a mean age of 42 years. The number of males and females were 53 percent and 47 percent respectively. The number of males and females especially in each ward however,

varied depending on the head of the household available at the time of the survey (refer to Figure 4-1).

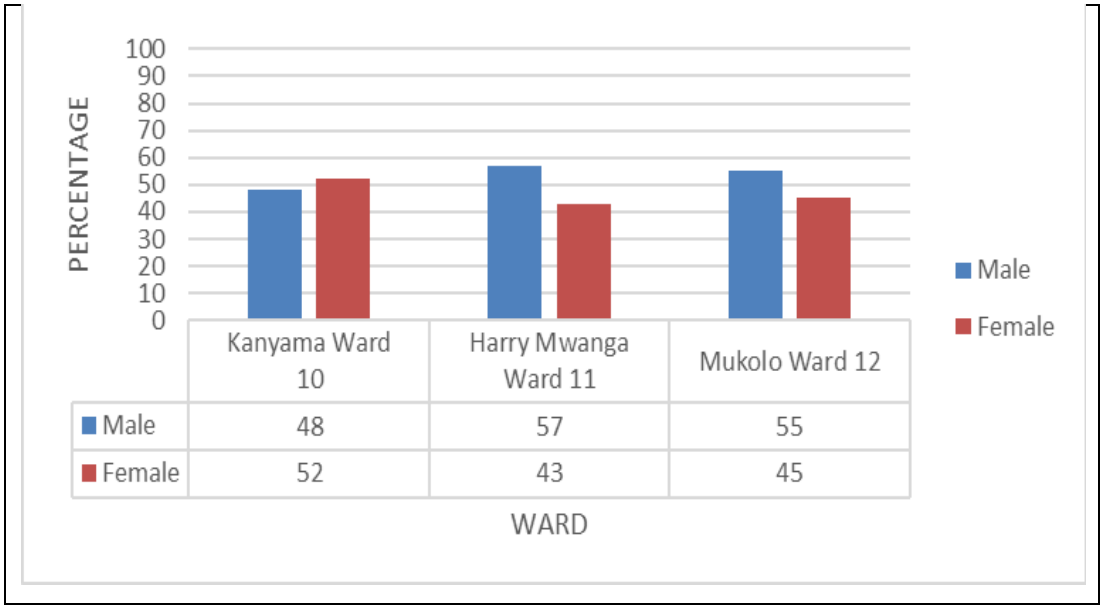

Figure 4-1: Gender Distribution of Households per ward surveyed (Source: This Study)

The highest number of male respondents were found in the Harry Mwanga ward 11 and Mukolo ward were 57 percent and 55 percent males were interviewed. In Kanyama Ward 10, female respondents were found to be higher at 52 percent.

ii) Occupation of Households

The results for the occupation and what households did for a living have been presented in Figure 4-2.

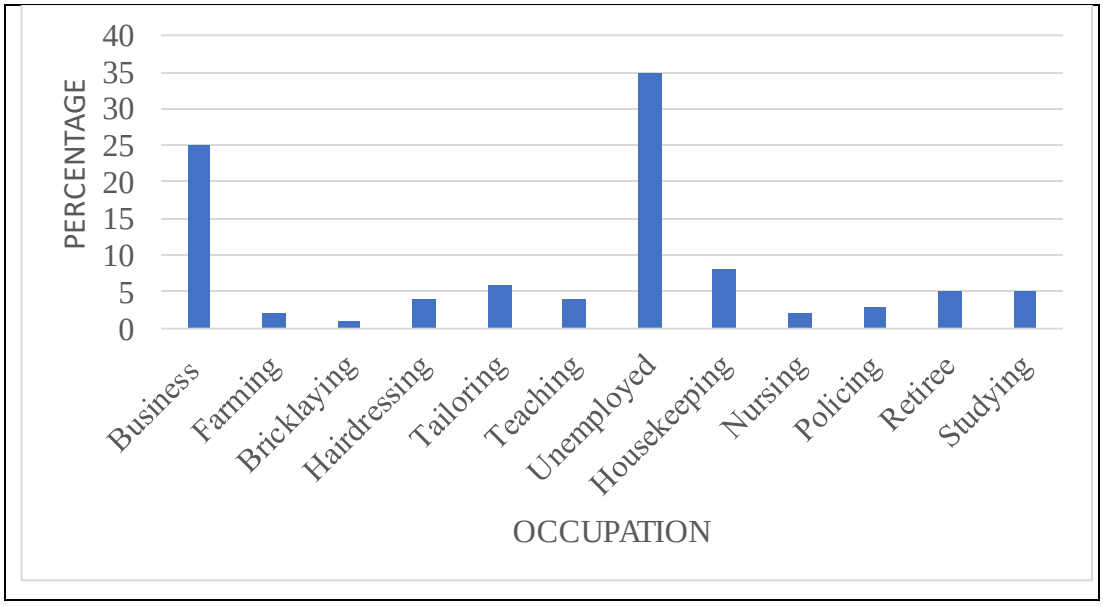

Figure 4-2: Occupation of Households surveyed (Source: This Study)

The highest number in terms of occupation were the unemployed at 35 percent followed by those who were doing business at 25 percent. Housekeeping came third with eight percent while those who were doing tailoring as an occupation were at six percent and followed by students and retirees at five percent. The rest of the occupations were below five percent which included hair dressing at four percent, policing at three percent and those doing nursing at two percent (refer to Figure 4-2).

iii) ***Incomes of Households***

Household incomes varied depending on what they were doing for a living or occupation (Figure 4-3).

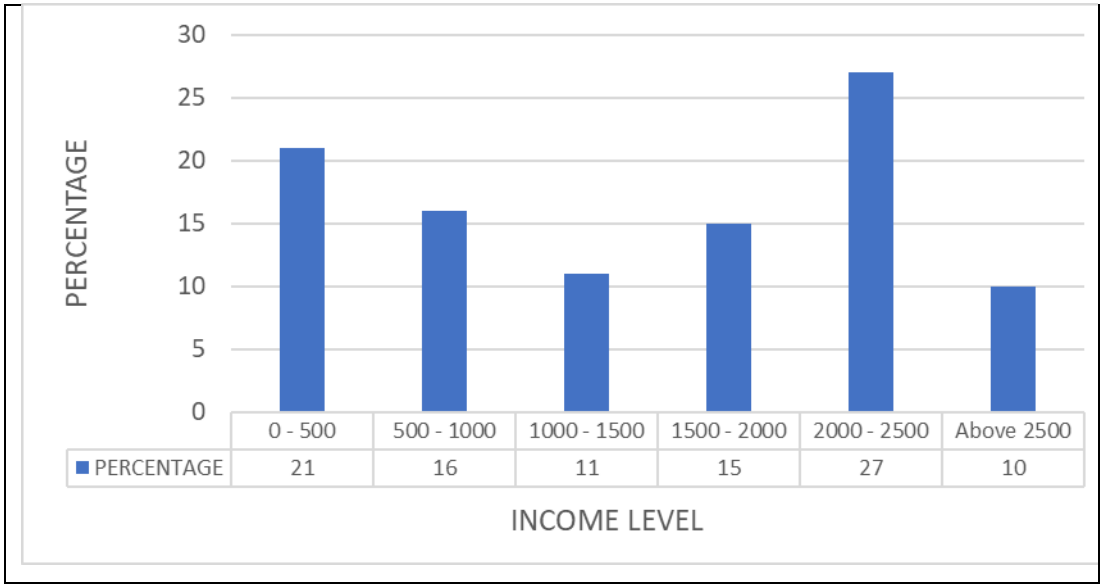

Figure 4-3: Household Incomes in ZMW (Source: This study)

With the currency in Zambian Kwacha (ZMW), It was found that 27 percent; (n = 140), of respondents had incomes between ZMW2000 to ZMW2500 per month representing the largest category. Majority of these emanated from the 35 percent respondents who were unemployed. However, it was found that the 14 percent among the unemployed had incomes from handouts from unknown sources which were above the ZMW 500. The second largest category were those who earned 0 to ZMW500 per month with a respondent's representing 21 percent. The next category were those respondents who earned incomes between ZMW500 to ZMW1000 and ZMW1500 to ZMW2000 and were found to be at 16 percent and 15 percent respectively. The highest earners were those who had incomes above ZMW2500 (US$ 113 per month or about US$3.8 per day) with their percentage at 10 percent. This category was basically above

the 2-dollar threshold considered as the poverty line according to the World Bank (2005).

iv) ***Households' affordability and willingness to pay for pit emptying***

Results on the affordability and willingness to pay for the emptying service are presented in Figure 4-4.

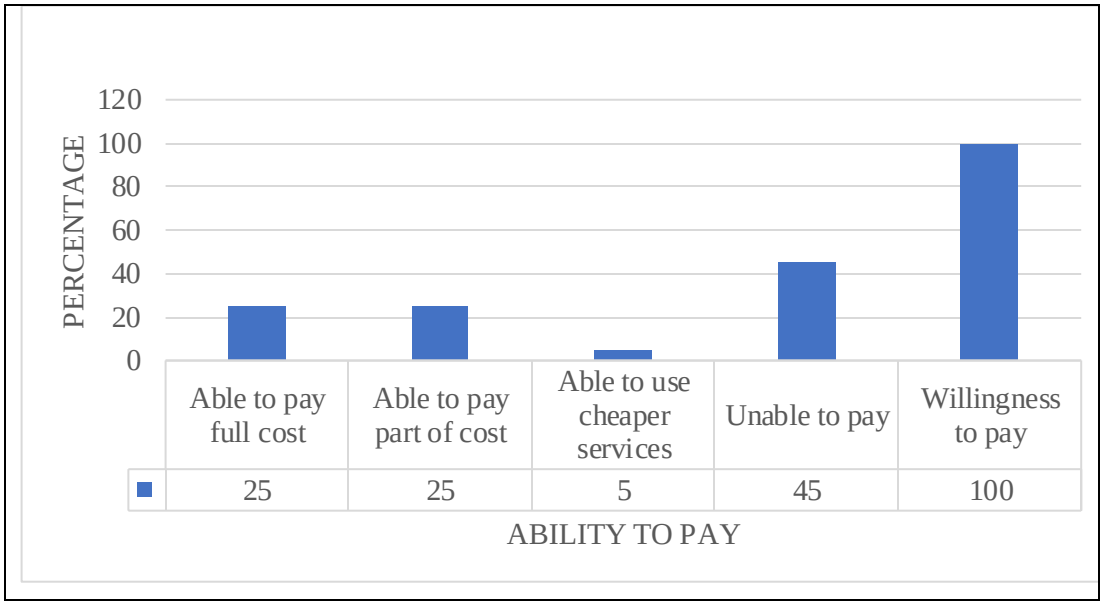

Figure 4-4: HH affordability to pay for cost of emptying (Source: This study)

It was also found that 45 percent of HH could not afford to pay for the minimum emptying service at a subsidised cost of ZMW 150 for the 16 barrels. Out of this number, 23 percent either buried the FS in the yard or dumped it in a nearby drainage system while the remainder decided to wait until they had the money to do so or dug up another pit latrine in a space available abandoning the previous one permanently. However, this was found to be challenging due to limited space available for this activity. Of all respondents; (n=140), 25 percent were able to pay for the full cost while 25 percent was only able to pay part of the cost. Out of the total number of respondents, five percent decided to use other cheaper services outside the established FSM service and could not use established emptying services in the area.

v) ***Willingness to pay for emptying service***

Willingness pay was found at 100 percent but only 50 percent could afford to pay for the emptying service as shown in Figure4-4. Of the 50 percent 25 percent were those who could afford to pay for full emptying and the other 25 percent who could not afford to pay in full but through instalments.

4.2.2 Current FSM service model in Kanyama Township

Based on the inspections, interviews and other findings, Figure 4-5 presents the FS flow and the financial transfers within the FSM service chain. The establishment of the FS flow and the financial transfers is essential in understanding the current sanitation practices thereby establishing the factors that impact on the sustainability of the FSM service model.

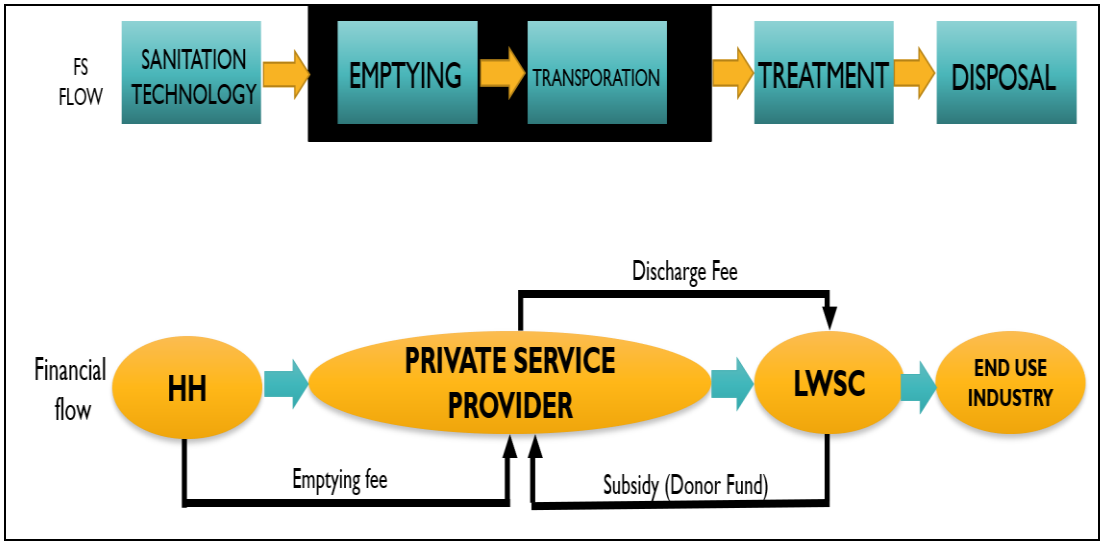

Figure 4-5: Current FSM Service chain with Financial Transfer model in Kanyama Township (Source: This study)

This section sought to establish the factors impacting on the sustainability of this FSM service model in order to answer the first research question in section 1.6. In order to do this, the aspects on the current service model were looked at. These have been elaborated in ensuing sections:

- Results on the current FSM service chain;
- Results on the financial transfers within the FSM service model;
- Results on the current donor funding supporting FSM service model.

i) ***Results on the current FSM Service Model***

Findings on the current FSM service model are presented in Figure 4-5. It was established that the FSM service chain starts with the HH who owns the sanitation technology in this case, a pit latrine. When the pit latrine gets full, the HH calls the Private Service Provider (PSP) who has capability to empty and transport the FS from site to the treatment plant. At the time of writing this report, there were six (6) registered and recognised PSPs providing the emptying and transportation service in

Lusaka District. The PSP then visits the site to estimate the quantity of FS in the pit and determine the means of emptying and transporting it from the HHs.

It was further found that Kanyama had three major categories of emptying, transportation and treatment found:

- Informal manual emptying;
- Formal manual emptying, transportation and treatment and
- Formal mechanical emptying, transportation and treatment.

a). Informal manual emptying

It was found that there were informal manual emptiers who were not registered but provided this service at a fee. The sludge collected by informal emptiers never made it to any treatment facility due to their inability to transport the FS over long distances and the FS was usually dumped within the residential environment. The emptying was usually done using empty backets and shovels or improvised scooping cans. Figure 4-6 shows barrels of faecal sludge being loaded into the truck after an emptying exercise in Kanayama township and also a truck discharging the sludge at the Manchinchi plant.

Figure 4-6: Kanyama Water Trust workers loading FS from one household on the left side and offloading at the Machinchi on the right side (Source: This Study, 2021)

b). Formal manual emptying, transportation and treatment

It was found that this category of emptiers were registered and running this business under the PSPs. These carried out both the emptying and transportation of the FS from households. They then transport the FS to the treatment plant at the Manchinchi treatment plant owned by the LWSC where the FS is treated and disposed of. It is these categories of emptiers that have entered into formal agreements with LWSC and beneficiaries of subsidies from the donor fund. This study found that the price of emptying and transportation of the FS from the HH is determined by the quantity of the FS and that these prices have been categorised as shown in Table 4-1.

Table 4-1: Level of Service against the price of emptying and transportation

LEVEL OF SERVICE	NUMBER OF BARRELS	AMOUNT IN ZMW
Small	16	**150**
Medium	32	**300**
Large	48	**450**

Source: (Adapted from LWSC, 2021)

Table 4-1 shows the level of service against the number of barrels and the price of each set of barrels. It was established that the level of service was categorised as low, medium and large for 16,32 and 48 barrels of sludge (16 barrels = $1m^3$) going for ZMW150, ZMW 300 and ZMW 450 respectively. Once the PSP collects the FS and is paid the emptying fee by the household which is the 50 percent of the total cost, the other 50 percent is claimed from the LWSC as a subsidy upon delivery of the sludge to the treatment plant. This price range gave a wider choice to the HHs to choose which models best suited them. They could pay according to the level of money they had. In fact, this model is so flexible that if the HH is unable to pay for the entire cost of emptying at a particular time, they had the option to pay for few barrels just to reduce the quantity in the pit and finish up the emptying later when they can afford to pay for full emptying.

After emptying the toilet, the FS is then transported to the only existing treatment plant owned by the LWSC in 60 litres barrels through an open light truck. At the treatment plant, the transporter offloads the FS at the treatment plant receiving bay where the

quantity brought in is verified and measured by the treatment plant operator. At this stage, solid waste is separated from the FS to ease the treatment process. It has been found that the presence of large quantities of solid waste in the FS have a bearing on the management of FS in general as found by (Tembo, 2019).

It was also found that the anaerobic digesters which were used to treat the FS are no longer functional and that the only treatment plant available at the time of writing this report was the Manchinchi treatment plant. Figure 4-7 depicts an emptying exercise taking place in Kanyama township.

Figure 4-7: Emptying taking place in Kanyama Township (Source: This study, 2021)

c). Formal mechanical emptying, transportation and treatment.

It was established that this category of emptiers concentrated mostly in residential and commercial areas. This is because the emptying and transportation was done through vacuum tankers and these could effectively be used where there were septic tanks and not pit latrines. However, this category of emptying was not common because of the absence of good road networks to facilitate for easy movements of the vacuum tankers. This category was only common in urban settlements with organised road networks, septic tanks etc.

Having looked at the categories of the emptying and transportation services, the ensuing paragraphs continues with the processes:

After determining the quantity of FS in the pit, the HH is informed about the quantity and price they will need to pay to clear off the FS from their pit. Currently there no marketing and selling of the FS bio-solids and hence the solids are being used as manure by LWSC.

ii) ***Results on the financial transfers within the FSM service model***

As discussed in the section above 4.3.1 (iii), Figure 4-5 above also presents the findings on the three financial transfers that are currently being done at the FSM service model in Kanyama. It was established that the first financial transfer occurred between the HH and PSP where the HH is charged the emptying fee which varies depending on the quantity of FS found in the pit. Currently the official charge for emptying 12 barrels stands at a 50 percent subsidised price of ZMW 150, ZMW 300 and ZMW 450 for a 16, 32 and 48 barrels respectively. Once the HHs pays for the emptying service, the PSP transports the FS to the LWSC treatment plant where he pays a discharge fee and that is the second financial transfer in the chain. The PSP subsequently claims the other 50 percent of the emptying and transportation cost from LWSC which is a subsidy. It was further established that the 50 percent subsidy was financed through the World Bank program on the Lusaka Sanitation Program support to LWSC. The second financial transfer occurred between the LWSC and the PSP. According to LWSC (2020), the total cost of full emptying and transportation of FS from HH currently stands at ZMW300, ZMW600 and ZMW 900 for the 16, 32 and 48 barrels respectively as has been presented below (Figure 4-8).

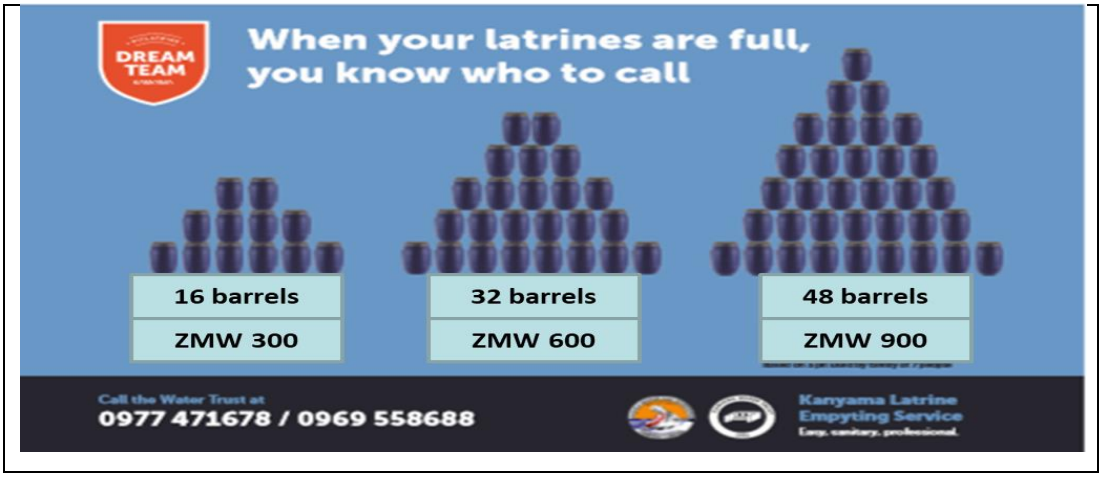

Figure 4-8: Official prices for full Emptying service (Source: LWSC, 2022).

It was found that apart from the two financial transfers explained above, the current FSM service model has no other financial transfers that this study could establish.

iii) Donor funding in the current FSM service model

From the Key informant interviews it was found that the current FSM service model herein called Permitting Option (PO), was heavily being incentivised by donors. The World Bank through the LSP had given technical and financial support to LWSC in order to support the PO of the FSM service model through incentives given to Formal Manual Emptier as top up to meet the total cost of emptying and transportation. Under this option, LWSC is playing a light touch role whereby the total cost of emptying and transportation is shared between the HHs fees collected at emptying time and the incentives supplied by the donor through LWSC.

It was found that after the PSP delivers the FS to the treatment plant, the quantity offloaded is measured and recorded in a site receiving log book and it was upon this quantity delivered to the treatment plant that the PSP was paid the balance of the emptying service. The Households only pay 50 percent of the cost of emptying and the other 50 percent is paid directly to the PSP as a top up by LWSC through the subsidy fund. This is the incentive being supported by donors through the LSP.

4.2.3 The impact of current sanitation practices on sustainability

In order to answer the research question: "How the current sanitation practices impact on the sustainability of FSM services in PUAs", the research looked at the ensuing factors:

The number of unemployed people: The number of unemployed people which was high at 35 percent in the study area compared to those employed. This resulted in very few households managing to pay for full emptying services;

Poor socioeconomic status: The socioeconomic status of most of the residents which was categorised as poor living at less than USD2 per day resulted in them being unable to meet the escalated high standards of living leaving very low support for the FSM service contributing to the lack of sustainability;

Low-income levels: The income levels of the residents which were too low at less than ZMW2,500 a month and where the majority of residents used the little earned incomes on food and had nothing left for the FS emptying services. This resulted in few customers to support for the FSM service negatively affecting sustainability;

Higher number of those unable to pay: The higher number of residents who were unable to pay standing at more than 50 percent for the emptying service and this impacted negatively on the FSM service sustainability;

Higher emptying fees: The current emptying fees of ZMW150 are beyond the reach of most of the households and this resulted in many being discouraged to have their toilets emptied on time;

Donor Fund not helping: The donor funding currently in place paid as a performance-based subsidy of ZMW150 per cubic meter of FS is not helping in building up or encourage self-reliance for future management of FSM in peri-urban areas impacted negatively on the sustainability of the FSM service model.

Insufficient marketing: There was insufficient marketing of the biosolids and biogas resulting in no selling of the FSM products because some residents did not know about the FSM services;

In availability of Suitable FSTP: The unavailability of suitable FSTP which was not resulting in the PSPs using the conventional sewage treatment plant owned by the LWSC not meant for Faecal sludge treatment; and

Presence of Cheaper and unregistered emptying groups: The presence of cheaper and unregistered informal emptying groups in the area which resulting in many residents preferring to use them and not the registered PSPs.

4.3 Technical, institutional, social factors and financial factors that impact on the sustainability of FSM service models in peri-urban areas

The second objective was to determine the technical, institutional and social factors that impact on the sustainability of FSM service models. These have been presented in the sections below. In this research, it was established that there are many aspects that define the sustainability of sanitation projects. However, the five sub-indicators of sustainability that measure key technical, institutional, social and financial sustainability at the HH and community level were considered and used as outlined in the ensuing sub-sections. In order to establish some of the factors that impacted on the sustainability of the current FSM service model being implemented by the LWSC, this section looked at the three main aspects. They include:

- Demand responsiveness factors;

- Sustainability of factors;
- Relationship between demand responsiveness and sustainability;
- Overall sustainability index for the FSM service models; and

4.3.1 Demand responsiveness factors

The demand responsiveness of the FSM service model currently being implemented by the LWSC in Kanyama township was technically assessed and results presented in Table 4-2. As can be seen from Table 4-2, five (5) sub-indicators were assessed. These include the following:

- Project Initiation;
- Informed Choice;
- Contributions to the Project;
- Training of Service Operators; and
- Legal Ownership.

Table 4-2: Scores for Demand Responsiveness of the FSM Service Models per Ward

Ward Number	*Project Initiation*	*Informed Choice*	*Contributions to Project*	*Training of Service Operators*	*Legal Ownership*
KW Ward 10	2.55	4.25	4.23	6.88	5.45
HMK Ward 11	4.76	3.44	2.88	8.34	3.23
MW Ward 12	3.00	5.23	5.12	7.23	3.67
Average Scores	***3.43***	***4.33***	***4.07***	***7.48***	***4.11***

Source: This Study

The score results of the measured sub-indicators have now been presented in the sub-sections below:

i) ***Project Initiation***

This indicator determined the perception on whether the HHs and the community played any role in the FSM project initiation. From Table 4-2, project initiation got an overall low score of 3.43 representing only about 34.3 percent of HH and community participation in the initiation of the FSM projects. These projects include the construction of toilets, FSTP, purchase and buying of emptying equipment. Project

initiation also includes the level of HH and community participation in the initiation of any FSM initiatives where HHs and community are expected to be beneficiaries. What is worth noting is that from the three wards where this project initiation was assessed, Harry Mwanga Nkumbula (HMN) ward 11 scored the highest in project initiation of 4.76 representing 47.6 percent while Kanyama Ward 10 and Mukolo ward 12 scored 2.55 and 3.00 representing 25.5 percent and 30 percent respectively.

ii) ***Informed Choice***

This indicator assessed whether HHs and Community made decisions based on understanding of the cost or whether they had any other priorities besides FSM issues. As can be seen from the table 4-2, informed choice scored 4.33 representing 43.3 percent. Mukolo ward 12 scored highest at 5.23 representing 52.3 percent followed by Kanyama Ward 10 which scored 4.25 representing 42.5 percent and then HMN ward 11 with a score of 3.44 representing 34.4 percent.

iii) ***Contributions to the Project***

This indicator measured how much cash money and labour the community contributed towards the FSM service model in terms of maintenance, repair and operation of the system. Table 4-2 presents an overall score of 4.07 representing 40.7 percent contributions that went towards the FSM service model. Mukolo ward 12 score the highest at 5.12 representing 51.2 percent followed by Kanyama ward 10 at 4.23 representing 42.3 percent and then Harry Mwanga Nkumbula ward 11 at 2.88 representing 28.8 percent respectively.

iv) ***Training of Service Operators***

Training of service operators as an indicator was used to assess whether those who operate the system like the emptiers, transporters and FSTP operators underwent any training in FSM and any other work they do concerning FSM value chain. The results presented in Table 4-2 show a very impressive score of 7.48 representing 74.8 percent. This score represented the highest for demand responsiveness aspect. Among the three wards where this sub-indicator was assessed, HMN ward 11 recorded the highest score of 8.34 representing 83.4 percent followed by Mukolo ward 12 with a score of 7.23 representing 72.3 percent and followed by Kanyama ward 10 with a score of 6.88 representing 68.8 percent.

v) ***Legal Ownership***

This indicator was used to assess who the legal owner was of the different stages of the FSM service chain. Results on the legal ownership of the equipment and systems used in the FSM service model presented in Table 4-2 show that the overall score for this indicator was 4.11 representing 41.1 percent of ownership claimed by either the community or HHs. Kanyama ward 10 had the highest score of 5.45 representing 54.5 percent followed by Mukolo ward 12 with 3.67 representing 36.7 percent. HMK ward 11 had 3.23 representing 32.3 percent. The section below presents the summary of demand responsiveness.

4.3.2 Summary of demand-responsiveness factors of the Lusaka FSM Service model

A graphical presentation of the summary of demand-responsiveness of FSM service models in the three wards of the study area has been presented in Figure 4-9 below. The result of the sub-demand responsiveness sub-indicator show that Mukolo ward 12 had the highest score of 4.85 representing 48.5 percent followed by Kanyama ward 10 with a score value of 4.67 representing 46.7 percent and then Harry Mwanga Nkumbula ward 11 with a score of 4.53 representing 45.3 percent. The average score for the entire study area in terms of the demand responsiveness to the FSM service model is an average of the three wards which is a score of 4.68 representing 46.8 percent demand responsiveness.

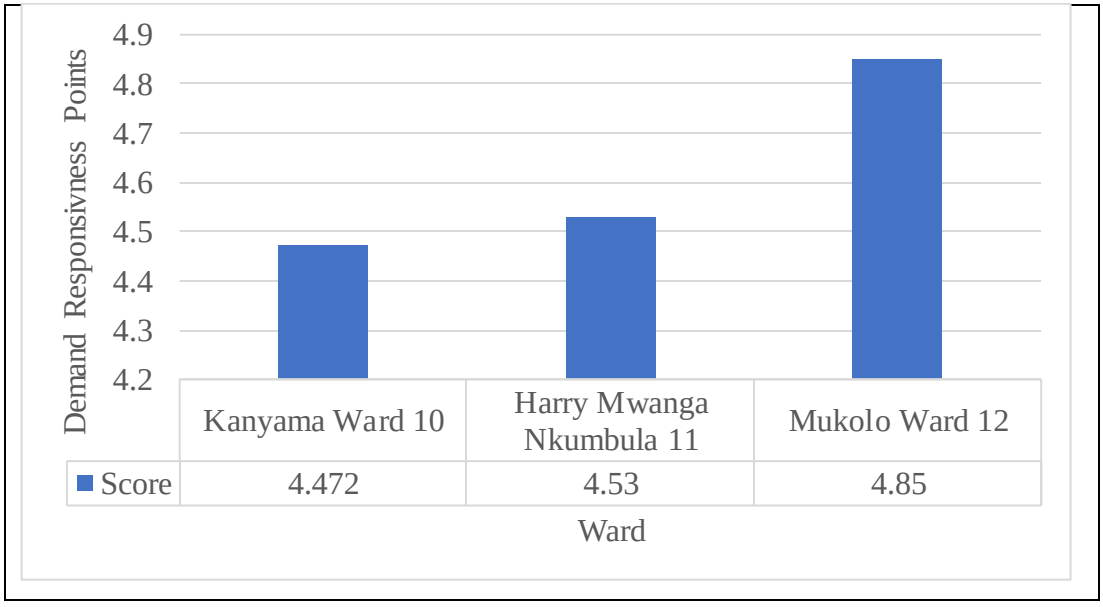

Figure 4-9: Summary of the Demand Responsiveness of FSM service Model (Source: This Study)

4.3.3 Sustainability factors

Findings on the sustainability factors established through the five sub-indicators have been presented in Table 4-3 and included the following:

- Financial Management;
- Operation and maintenance;
- Physical condition;
- Customer satisfaction;
- Willingness to pay.

Table 4-3: Scores of each sub-indicator of sustainability

Ward Number	*Financial Management*	*Operation and Maintenance*	*Physical Condition*	*Customer Satisfaction*	*Willingness to sustain*
KW 10	3.54	6.6	6.36	6.52	5.43
HK 12	3.69	6.93	6.84	6.77	5.67
MW 12	4.65	6.72	7.74	7.44	4.92
Scores	***3.96***	***6.75***	***6.98***	***6.91***	***5.34***

Source: This Study

i) ***Financial management***

Table 4-3 shows that the lowest average score was that of the financial management which scored 3.96 representing 39.6 percent way below the other scores. For example, Mukolo ward 12 scored the highest with 4.65 representing 46.5 percent followed Kanyama ward 10 with 3.54 representing 35.4 percent and Harry Mwanga Nkumbula ward with 3.69 representing 36.9 percent respectively.

ii) ***Operation and Maintenance***

The average score for operation and maintenance was 6.75 representing a 67.5 percent with the highest score being recorded in Harry Mwanga Nkumbula ward 11 at 6.93 representing 69.3 percent followed by Mukolo ward 12 with a score of 6.72 representing 67.2 percent and Kanyama ward 10 with a score of 6.60 representing 66 percent (refer to Table 4-3).

iii) ***Physical Condition***

Mukolo ward 12 scored the highest score for physical condition at 7.74 representing 77.4 percent followed by Harry Mwanga Nkumbula ward 11 with 6.84 representing 68.4 percent and then Kanyama ward 10 recorded a score of 6.34 representing a score

of 63.4 percent. The average score on physical condition of FSM service chain including equipment used for emptying, transportation, transfer stations and FSTP were recorded at 6.98 representing 69.8 percent (Table 4-3).

iv) ***Customer satisfaction***

The average score of the customer satisfaction was 6.91 representing 69.1 percent and scores per ward showed that Mukolo ward 12 recoded the highest at 7.44 representing 74.4 percent followed by Harry Mwanga Nkumbula with a score of 6.77 representing 67.7 percent and Kanyama Ward 10 with a score of 6.52 representing 65.2 percent respectively (Table 4-3).

v) ***Willingness to sustain the system***

The score for willingness to sustain of the system was recorded at 5.34 representing 53.4 percent. It is worth noting that the highest score was found at Mukolo ward 12 with 7.48 representing 74.8 percent followed by Harry Mwanga Nkumbula Ward 11 with a score of 5.78 representing 57.8 and then in Kanyama ward 10, a score of 5.33 representing 53.3 percent (Table 4-3).

4.3.4 Summary of the sustainability score for the FSM service model

Figure 4-10 presents the summary of the results for the sustainability of the FSM service model measured from all the three wards of the study area.

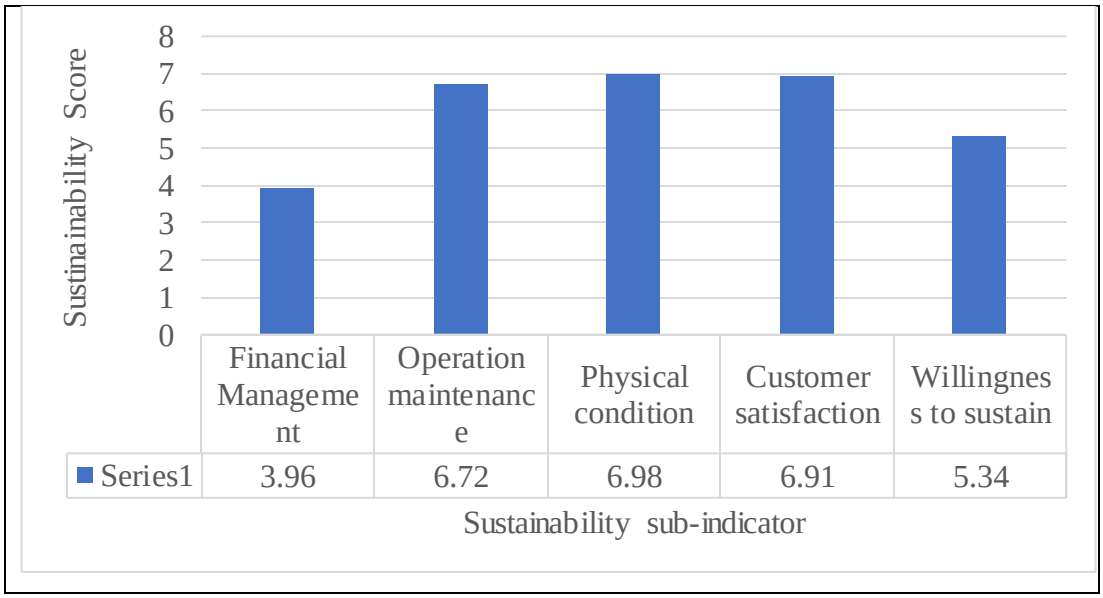

Figure 4-10: Summary of the Sustainability Scores for each sub-indicator for the study area (Source: This Study).

The highest sustainability sub-indicator measured was the physical condition which scored 6.98 representing 69.8 percent followed by customer satisfaction which scored

6.91 representing 69.1 percent and then operation and maintenance which measured 6.75 representing 67.5 percent and willingness to sustain which measured 5.34 representing 53.4 percent. Financial management scored 3.96 representing 39.6 percent which was the lowest score. A breakdown of the scores per ward have been graphically been presented in Figure 4-11 below.

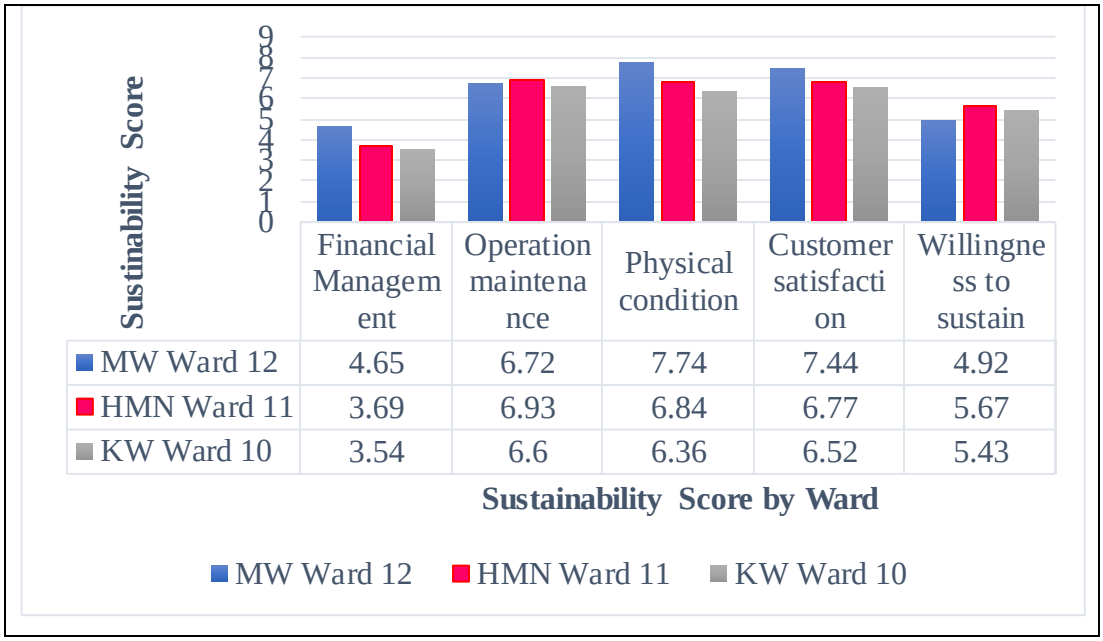

Figure 4-11: Sustainability of the existing FSM service models Scores per Ward (Source: This Study)

Mukolo ward 12 scored the highest in the physical condition and customer satisfaction where it measured 7.74 representing 77.4 percent and 7.44 representing 74.4 percent respectively. For all the sub-indicators, financial management scored the lowest in all three wards (Figure 4-11).

4.3.5 Relationship between demand responsiveness and sustainability of FSM service models

A relationship between demand responsiveness and sustainability of the FSM service models was established by separately measuring the score of the demand responsiveness and sustainability. As Figure 4-12 would show, this study confirmed the relationship between demand responsiveness and sustainability as proved by Sara and Katz, (1997). It was found that in Kanyama ward 10, demand responsiveness scored 4.85 representing 48.5 percent while sustainability scored 6.99 representing 69.9 percent. Harry Mwaanga Nkumbula ward 11 scored 4.53 for demand responsiveness representing 45.3 percent and 5.96 for sustainability representing 59.6

percent. Mukolo Ward 12 scored 4.67 for demand responsiveness represent 46.7 percent and sustainability scored 5.34 representing 53.4 percent.

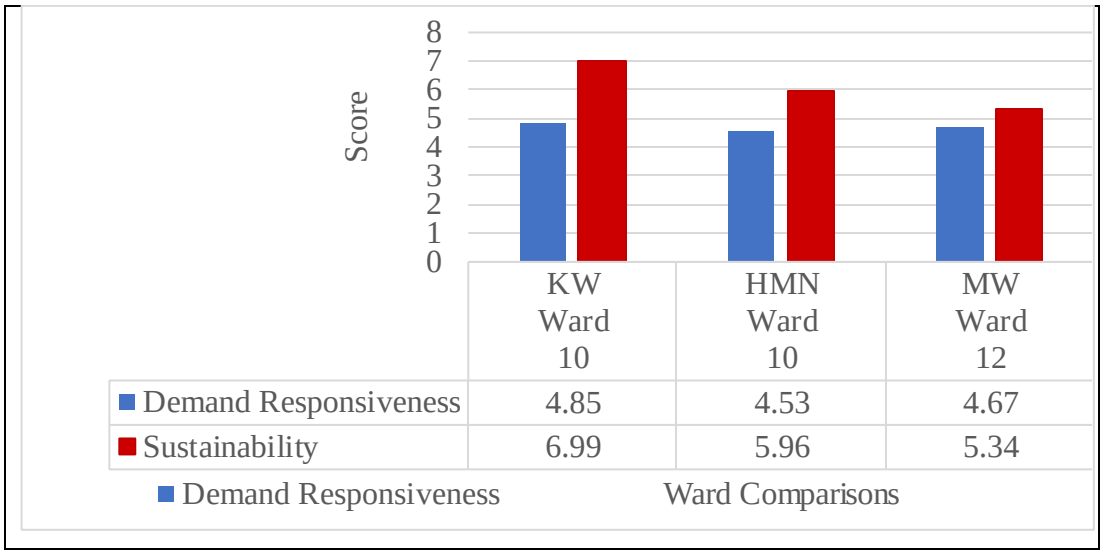

Figure 4-12: Summary of the Demand Responsiveness Against Sustainability of FSM service model (Source: This Study)

4.3.6 Overall sustainability index for the current FSM Service model

The average sustainability index calculated from the three wards presented in Figure 4-12 i.e., Kanyama Ward 10, Harry Mwanga Nkumbula Ward 11 and Mukolo Ward 12 with index of 6.99, 5.96 and 5.34 was 6.09. This indicates that the level of sustainability of FSM service models in Kanyama township stands at 6.09 representing 60.9 or 61 percent sustainability. This sustainability score of 6.09 falls within the range of 5.00 to 6.67 which is categorised as potentially sustainable.

4.4 Technical, institutional, social and financial factors that impact on sustainability of FSM service models.

The study sought to determine technical, institutional and social factors that impact on sustainability of FSM service models in peri-urban areas. A number of technical factors impacting on sustainability of FSM service models were identified. These have been elaborated in the sections below:

i) **Unsafe and unhygienic emptying process:** The emptying process identified as not being very safe as it should be. It was found that most of the toilet structures were old and cracked and also that the opening up of the side of the toilet in order to access the pit made the structure weaker each time. The loading of the sludge into the containers resulted in the contamination of the

environment around the toilet subsequently contaminating the households around.

ii) **Very old toilets**: The toilets which were not in very good condition as most of them had been in existence for a long time this resulted in a challenge in the emptying process.

iii) **Well trained service operators:** The service operators who were well trained in operation and maintenance of the FSM system. This resulted in them having a professional tough when conducting emptying exercise.

iv) **Unavailable transfer stations:** The transfer stations which were not available resulted in the PSPs transport the FS direct to the treatment plants. Although the system was found to be operational, the lack of transfer stations contributed to inefficiencies in the system.

v) **Limited repair and maintenance of equipment:** The absence of a good repair and maintenance system for the equipment and personnel resulted in breakdowns that affected on the service delivery. This caused operational losses to the PSPs. It was found that the finances raised from FSM business were spent to cover mostly operations and very little went towards repairs and maintenance

Under the institutional factors, the demand responsiveness, operation and maintenance and financial management factors were identified. These have been elaborated below:

i) **Low demand responsiveness:** The demand responsiveness which was low triggered lack of ownership and the residents did not buy into the idea to support the FSM initiatives in the area;

ii) **Uninformed community**: The community felt that the FSM project team did not inform them adequately so that they make informed decisions in connection with the FSM services. This resulted in them having to think they were not part of the FSM service project in the area.

iii) **Low financial management score:** The financial management score was low and resulted into the FSM service model being unable make enough profit to sustain its operations.

iv) **Low contributions from community:** The community did not contribute sufficient man power and other resources to the FSM service model implementation.

The social factors identified to impact on the sustainability of FSM service models have been elaborated in the sections below:

i) **Customer Satisfaction**: Some customers who got a service from the FSM service were generally satisfied with the service. A large section of the community felt satisfied with the FSM services and this resulted into an increased demand of the services from the residents who could afford and were willing to use the established FSM services.

ii) **Legal ownership of the system:** The community felt that they did not legally own the FSM service model and felt side-lined. Many felt like the model was owned by the council, LWSC or the government not by the community;

iii) **Unclear tariff adjustment:** The criterion for adjusting the tariff was not well established. This because the decision to increase the tariff was determined sorely the LWSC through the regulator NWASCO. In most cases the structure was usually not communicated to the residents clearly and on time and resulted resistance in accepting the tariff adjustments;

iv) **Inability to participate in repairs:** The community did not have the capacity to repair or replace the FSM system if it broke down. They had no capacity to repair or replace any of the equipment meant to be used in the FSM flow; and

v) **Willingness to sustain:** The willingness to sustain the system was generally low due to the highlighted challenges of lack of community engagement and low demand responsiveness.

4.5 Results from the financial management Analysis

The financial management analysis was carried out to give a detailed understanding of the financial management of FSM service model in Lusaka so as to help generate its relationship to the sustainability of the model post-donor funding. The analysis was categorised into three main categories. These are presented in ensuing sub-sections;

- The current operation, maintenance and treatment costs of one cubic meter of FS;
- The current operation expenditure (OPEX) and capital expenditures CAPEX) of the FSM service model; and
- The current HH contributions, subsidy and cost of service and efficiency improvements.

a) The current operation, maintenance and treatment costs of one cubic meter of FS

Results on the financial analysis of the FSM service model have been presented in tables 4-4. From table 4-4, the miracle team was used as a yard stick to represent other pit emptying entities in Kanyama township. It had the capacity of 30 percent and spending about ZMW247 on operation and maintenance for a cubic meter of FS emptied. The total cost as can be seen from the table 4-4 was at ZMW509 with disposal charge at ZMW154 bringing the total price per cubic meter to ZMW303.

In addition, treatment of the FS was through the Chazanga FSTP which had the capacity of 38 percent, the operation and maintenance of ZMW168, bringing the total cost to ZMW344 and the total price to ZMW177. Further, the Machninchi waste water treatment plant had the capacity of 31 percent and the cost of operation and maintenance per cubic meter was a ZMW42 bringing the total cost per cubic meter to ZMW49. This showed a total price of treatment of a cubic meter of FS at the Manchinchi waste water treatment plant to ZMW44.

Table 4-4: Table showing current operation, maintenance and treatment of FS per cubic meter

Market Segment	Reference	Current Capacity utilization	Operation and maintenance	Total Cost (ZMW/m3	Disposal Charge	Total Price ZMW/M3
Formal Pit Emptying	Miracle Team	30%	247	509	154	303
FSTP	Chazanga	38%	168	344	0	177
WWTP	Manchinchi	31%	42	49	0	44

Source: This Study

b) Current Operation (OPEX) and Capital Expenditures CAPEX) of the FSM service model

Table 4-4 shows the operation expenditure (OPEX) and the Capital expenditure (CAPEX) of treating one cubic meter of FS. As can be seen from the table, it was found that there were two categories of pit latrine accessibility. The first were those pit latrines that were inaccessible which had operations expenditure (OPEX) of ZMW360 per cubic meter of FS, ZM85 per cubic meter on the capital expenditure CAPEX) bring the total cost of both the OPEX and CAPEX to ZMW445 per cubic

meter of FS. The second category was those pit latrines which were accessible and these had ZMW352 of OPEX per cubic meter and ZMW81 of CAPEX per cubic meter bringing the total to ZMW433.

Tables 4-5 and 4-6 present the OPEX for the inaccessible pit latrines and accessible pit latrines. The tables summarise a breakdown of these expenditures as fuel, salaries, insurance, personal protective equipment (PPE) and discharge fee as shown.

Table 4-5:Innaccessible Pit Latrine

Operational Expenditure (OPEX)	ZMW/ Year
Fuel	114
Salry (Operator and Driver)	176
Insurance	15
PPE	20
Discharge fee	35
Total OPEX	**360**

Table 4-6: Accessible Pit latrines

Operational Expenditure (OPEX)	ZMW/ Year
Fuel	126
Salry (Operator and Driver)	176
Insurance	15
PPE	-
Discharge fee	35
Total OPEX	**352**

Source: This Study

The CAPEX as shown in Table 4-5 was basically the cost of the motor vehicle per year per cubic meters of FS processed.

Table 4-7: Summary table showing the current OPEX and CAPEX of the FSM service model

	OPEX (Zmw/m3)	CAPEX (Zmw/m3)	Total (Zmw/m3)
Innaccessible Pit Latrine	360	85	445
Accessible Pit Latrine	352	81	433

Source: This study

c) Current HH contributions, subsidy and Cost of service and efficiency improvements.

In the current FSM service model, the initial HH contributions towards the FS service is at ZMW150 with performance-based subsidy of another ZMW150 bringing the total of emptying to ZMK300 as stated in the above section 4.2.2.2 above. However, table 4-7 gives details of projections done by LWSC, 2018 in which they project that from year 1, HH will contribute the ZMW150, then ZMW158 in year 2, ZMW165 in year 3, ZMW174 in year 4, ZMW182 in year 5 and finally ZMW191 in year 6. It was found that this projection was highlighting a steady increase in the HH contributions taking into account exchange rates and other economic fundamentals. Further, table 4-6 also highlights the performance-based subsidy which has been projected to be reducing from year 1 at ZMW150 to 0 subsidy in year 6 of the project. In addition, the cost of

service which includes overheads was projected to also reduce steadily from ZMW300 in year 1 to ZMW191 in year 6 bring it to efficient improvement of -10 percent from 0 percent in year 1.

Table 4-8:Table showing HH contributions, Subsidies and the cost of service

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
HH Contributions	150	158	165	174	182	191
Performance based subsidy	150	120	90	60	30	0
Subsidy phase out schedule	100%	80%	60%	40%	20%	0%
Total Revenue	300	278	255	234	212	191
Cost of Service incl. overheads	300	278	255	234	212	191
Efficient Improvements	0%	-8%	-8%	-9%	-9%	-10%

Source: (LWSC-LSP, 2018)

4.6 Designed sustainable FSM Service model for peri-urban areas

The last objective of the study was to design an FSM service model that will be sustainable post donor funding. Therefore, as an output of this objective and based on the findings of this study, Figure 4-13 presents a proposed FSM service and financial flow model that addresses the need to ensure that FSM service models are sustainable and independent of donor funding. This model is anchored on four major aspects namely:

- Demand responsiveness creation;
- Introduction of discharge licence in the FSM service model; and
- Promotion of the sale of FS products.

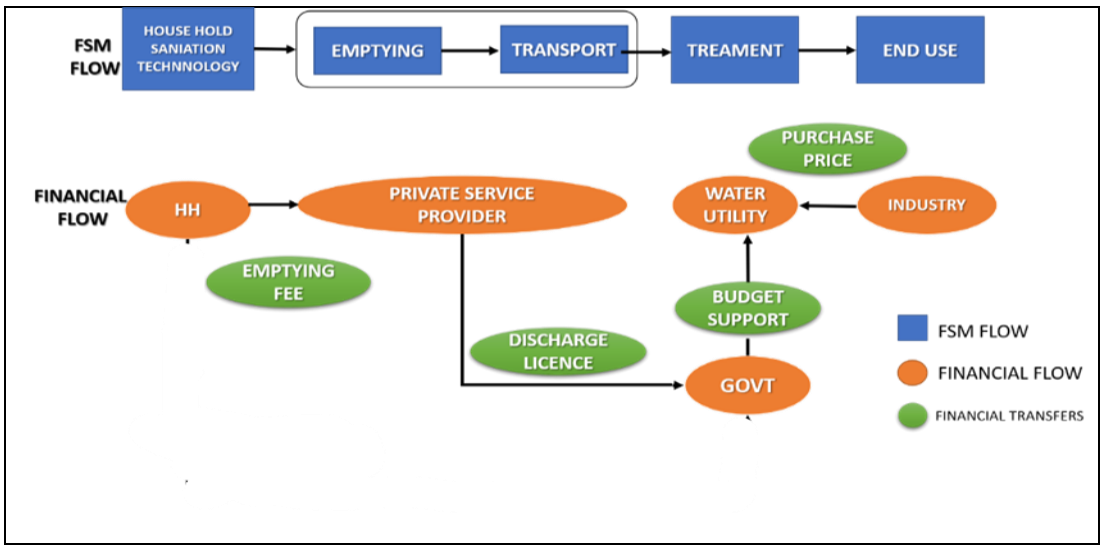

Figure 4-13: Proposed FSM service model for Kanyama township (Source: This Study)

4.6.1 Demand responsiveness Creation

It was found that there was no much demand created at the initiation of the FSM service model to create the willingness of the households to pay for and support the FSM services. This created a sense of lack of ownership and an immediate disinterest to support the whole value chain. This had subsequently created some form of resistance. It was found that without demand responsiveness, support of the FSM service remained a challenge and there was no prerequisite for the introduction of the Sanitation tax to the household and also the discharge licence to the private service providers.

4.6.2 Introduction of the discharge licence in the FSM service model

From the findings, there was no existence of a licence charged on the PSPs which ensures that the collection of the FS from the households and discharge are regulated in a manner that does not attract indiscriminate discharge into the environment. The inexistence of the discharge licence caused some of the unregistered PSPs to discharge the FS in the open environment. It was found that if the discharge licence was to be introduced, FS would be discharged at the plant as many times as possible without having to pay for the service each time a discharge is done like the situation was at the time of this study. This discharge licence fee will be paid directly to the government by the PSPs and this will guarantee them discharge of the FS without having to pay each time they discharge the FS at the plant like the current situation is.

4.6.3 Promote the sale of FS end products

The main end products of treated FS are bio-gas and manure. Bio-gas could be used to generation energy for cooking in homes and the manure could be used for agriculture. It was found that at the current FSM service chain, there was no promotion and sell of the two products hence the treated FS is just either stolen or used on the LWSC lawns. The bio-gas digestor that was initially used to produce cooking gas cook for the KWT kitchen was no longer in use.

It was found that the revenue is given to the water utility to help in the operation and maintenance of the treatment plant. Although it was found that the current FS is not sold to raise revenue at the current FSM service model, it is important that this revenue base was explored further as it had serious potential to add value to the entire chain. It

was found that the current treated FS was left and then stolen by people who had found use for it. Some of it was used by LWSC on their lawns.

4.6.4 Use of faecal sludge dry solids to generate electricity

Results from the inspection on the current use of the FS dry solids showed that there was no current program or use for the by-products as the treatment plant had no capacity to produce quality FS solids that would result in generation of electricity. LWSC have put plans in their sanitation master plan to make use of the FS from the new FS treatment plants to be able to engage in partnerships that will begin to generate electricity from the generated sludge.

4.7 Chapter Summary

This chapter presented the findings of the study in line with the set objectives. An assessment of the sanitation practices with regards the FSM service model was done that highlighted the various factors that have affected and have had an impact on the sustainability of the FSM service model in PUAs. These factors emerged from the assessment of the sub-indicators of demand-responsiveness and sub-indicators of sustainability from the technical, institutional and social aspects. As a larger approach to the financial management, a financial analysis was done to try and find out other costs and how these would impact on the overall sustainability of the model. Overall sustainability was measured at 6.09 showing that most of the components were performing well at 60.9 percent. It was found that this score showed that the FSM service model was potentially sustainable using the criteria adapted from Sara and Katz (1997).

CHAPTER 5: DISCUSSIONS

5.1 Introduction

The previous chapter presented the results based on the research questions emanating from the set objectives. The aim of the study was to evaluate the sustainability of FSM service model post donor funding. To achieve this, the previous chapter presented results for the sanitation practices of the service chain, including the household's affordability and willingness to pay, financial transfers within the FSM service chain, donor financing within the service chain, determined the level of demand responsiveness and the level of sustainability of the FSM service model and finally assessed the relationship between demand responsiveness and sustainability and the overall sustainability index. This chapter presents the discussions of the results as presented in the previous chapter.

5.2 The impact of current sanitation practices on the sustainability FSM service models

Results on the current sanitation practices were presented under two headlines which included: socioeconomic characteristics of the study area and the current FSM service model and its implications on its sustainability.

5.2.1 Socioeconomic characteristics of the study area and its implication on the FSM service model

Results on the socioeconomic characteristics were presented in four sub-headings which included: Gender distribution and heads of households surveyed, occupation of the households, income levels of the households and affordability and willing to pay for the emptying service.

i) Gender distribution and head of households surveyed

The results of the gender distribution survey revealed that the average age of the respondents was 47.5 years old and the majority of these were female respondents. The effect of having females as majority of the households had an impact on their ability to fully participate in the initiation and implementation of the FSM service because of their commitment to other household responsibilities. This explains why the demand responsiveness was found very low as explained in section 4.3.1. Their generally low support and contribution in terms of manpower and financial support towards the implementation of the FSM service model. Woman find it generally

difficult to fully participate and support projects that are perceived to be for men in most of these PUAs. The findings of the study are in contradiction with Mukherjee and Wijik (2003) who contend that there was ample evidence to indicate that more involvement of women in sanitation projects can optimise the attainment of sustainability results and impact. In a study by Kwangware et. al. (2014), it was found that the low participation of women in sanitation projects was attributed to strong culture views towards women.

ii) Occupation of the households

Results on the occupation of the households revealed that the number of residents with formal employment was low and the number for the unemployed was higher. This left majority doing other income generating activity for a living. The revelation alone meant that majority of the residents in PUAs are classified as generally poor living on less than a $2 a day as echoed by LWSC (2020). This reality makes the majority to live hand to mouth with no sufficient disposable income to be spent on emptying services. Only a handful of residents (Figure 4-2) have formal employment giving them stability to fully support the FSM service model while the majority of the residents do not have occupations that can help them support and support the FSM service model.

iii) Income levels of households

Results on the income levels of households revealed that majority of residents had incomes less than ZMW2,000 per month. This is in agreement with the LWSC (2020) who report that 86 percent of household stated that a monthly payment of ZMW50 would be affordable. This income level was low and had an effect on the ability of the household to help the FSM service to be supported fully because the level of income meant that most of the income would be spent on food and other household essentials. The rest of the residents with incomes above ZMW2,500 per month were not majority to impact on the sustainability of the FSM service model. The level of income of residents in a particular area has an effect on the sustainability of the FSM service model (WSUP, 2018).

iv) Affordability and willingness to pay for the emptying service.

Results on the household's affordability to pay emptying service revealed that out of the 50 percent residents, only half of them were able to pay for full emptying while

the other half would afford and were willing to pay only half of the cost of emptying. This finding is in agreement with LWSC (2020) who reported that out of the total number of households evaluated only 50 percent could afford to pay for the emptying services. This had an effect on the running of FSM service model as a business. The other 45 percent of the residents were unable to pay completely with the five percent revealing that they would rather source for other cheaper services from informal emptiers. This scenario had serious financial consequences on the FSM service as a business. The willingness to pay for the service was found at 100 percent but only 50 percent could afford to pay for the service. The affordability and willingness to pay for the emptying services has an effect on the overall sustainability of the FSM service model. This finding is in agreement with WSUP (2018) who contend that the affordability and willingness of households to pay for the FSM services had an impact on the sustainability of the service models. In a study by LWSC (2020) it was found that for monthly instalments over a period of one year, 57 percent of households stated that they could afford to pay ZMW100 per month while 29 percent stated that they could afford ZMW250 while the rest of the household's 14 percent could afford between ZMW250 and ZMW500. For the monthly fee which can be in form of Sanitation Tax, 86 percent of households stated that a fee of ZMW50 per month would be affordable.

5.2.2 Current FSM service model and its implication on its sustainability.

The sustainability of FSM service models in PUAs does not only depend on the prevailing sanitation practices but also on the technical, institutional and social factors (Sara and Katz, 1997). Results on the current FSM service model for Kanyama have been presented and discussed under the following sub-headings:

- The implication of current FSM service chain on its sustainability;
- The implication of financial transfers on the sustainability of FSM service model;
- The implication of donor funding support on the sustainability to FSM service model.

a) The implication of current FSM service chain on its sustainability.

Findings on the current FSM service chain revealed that the system has a number of shortcoming and incomplete processes (flow). It was discovered that the study area had no proper road network for easy access to the households to aid emptying. Emptiers were forced to make carts where barrels filled with faecal sludge were put and transported to the nearest central place for further transportation to the treatment plant. Another similar study by WSUP (2019) found that study area had no access roads for larger trucks like 4 tonnes one. This finding agrees with LWSC (2020) who report that a 2-tonne light truck would do for the easy access to the emptying sites. This had an effect on the efficiency and effectiveness on this emptying process resulting in impacting negatively on the sustainability.

Transportation of the FS to the treatment plant was mainly done through open vans or light tracks and had high initial purchase cost and expensive to repair and maintain. This is in agreement with Strande et.al. (2014) who contend that the cost of purchase and maintenance of light trucks used in the transportation of FS are usually beyond the capacity of the private service providers to manage. The impact of this was that FSM service business was not profitable to run in PUAs. This is one of the reasons why the current model is struggling to reach sustainable levels.

Findings reveal that the city of Lusaka does not have a FSTP to aid the treatment of the FS generated in daily. The prevailing situation is that the FS from the households is transported to the LWSC sewage treatment plant which was not essentially designed to treat and handle the volumes FS received at the plant. This alone has put pressure on the city's FS treatment process and strategies. As a result of this situation, the FS is not treated adequately and hence having an effect on the final products like bio-solids and biogas. These two products are potential sources of income for the FSM service model as also found (WSUP, 2019). In a study by Phiri et al. (2014) it was found that the untreated LWSC bio-solids contained pathogen levels with potential to cause environmental and public hazards if used for lawns or agricultural use. This could be the reason why the FS bio-solids are shunned by the public for health reasons.

Results from the KWT revealed that the biogas digestor which was initially used to produce biogas for the trust's kitchen was not in use contradicting Tembo (2019) who reported that the biogas digester was fully functional and the gas was being used for cooking in the KWT canteen at the time of his report. The intended purpose of the

digestor was to produce biogas that could be sold to members of the public to raise funds to support the sustainability the FSM service model but was not achieved. This had a financial implication on the model.

Findings on the status of the biosolids also known commonly as manure at the drying chamber revealed that the solids were not being marketed or sold. It was revealed that LWSC uses the dried solids as manure for their lawns and flowers and the rest of the manure was being stolen by members of the public because no system existed to manage this by-product for financial gain to the system. This also had an effect on the sustainability of the service model as these were potential sources of finance to help sustain the FSM service system. In Uganda for example, NETWAS (2011) found that there was a lot of untapped potential for using the sludge to improve agricultural production among urban and PUAs farmers. Further, findings showed that most of the waste from on-site sanitation facilitates and industrial wastewater in Uganda is not disposed of properly and therefore not available in the form of sludge and has led to environmental degradation. This explains why residents of PUAs of Lusaka are not interested to support the by-products of FSM service model to bring about financial **sustainability to the model.**

b) The implication of financial transfers on the sustainability of FSM service model.

Findings on the financial transfers within the FSM service model revealed that there were only three financial transfers in the current FSM service model (Section 4.2.2.2 and Figure 4-5). These include:

- The emptying fee and its implication on the sustainability of the service model;
- The discharge fee and its implication on the sustainability of the service model; and
- The subsidy and its implication on the sustainability of the service model.

The financial transfers and their implications have been explained in detail in the ensuing paragraphs;

i) The emptying fee and its implication on the sustainability of the service model.

The findings of the emptying fee at the minimum price of ZMK300 per set of 16 barrels equivalent to one cubic meter was found to be high for most households. This

had an effect on households not affording to pay for cost of emptying because it was beyond the reach of most households in the study area. There was no indication that LWSC would adjust the emptying fees downwards. There were indications and an eminent increment of the emptying fees according to key informants at the institution. In Dhaka, WSUP (2018) reported that customers living in PUAs are charged a tariff of US$6 – 7.50 per cubic meter, compared to US$10 – 15 for middle income/high income and institutional customers. On the contrary, in Bamako, reports by (Collingnon, 2002; Bolomey et al., 2003 and Jueland, 2004) reported in Strande et. al. (2014) argue that the emptying fees required to cover the cost of emptying and transportation were too high for many households and more cost recovery measures were needed to ensure the sustainability of the system.

ii) The discharge fee and its implication on the service model

The second financial transfer in the service model was the discharge fee. Results about the discharge fee revealed that the PSP have to pay a discharge amount to the utility company for every discharge although the discharge cost was lower than the cost of emptying to enable them make some profit. The effect of this discharge fee paid at every discharge was that it increased the operational cost and reduced the profit of the PSPs and this had a long-term effect of making the FSM service model unsustainable to manage. It was also not clear what role this discharge fee played in the FSM service chain or what it was used for at LWSC. A study by Strande et al. (2014) argue that a model with a discharge fee is where the PSP is responsible for emptying, transportation and treatment of the FS. The PSP is responsible for collecting the emptying fees from the households-level toilet users. The PSP receives no income from discharge fees but because the PSP itself is not being charged the discharge fee, there is no need for cost recovery in the form of extra charges to the households and the household may benefit from reduced emptying fees. Therefore, the discharge fee administration would need to be revised so that it gives a win win situation to both the households, the PSPs and the utility company.

iii) The subsidy and its implication on the service model

It was revealed that the subsidy that was being given to the PSPs was being financed by the World Bank support to the Lusaka Sanitation Program was the last financial transfer and there were basically no answers to what would happen if the subsidy source ran dry in future. It was revealed that the sustainability of the FSM service

model depended on this subsidy as also found by Simwambi et. al, (2018). This finding contradicts LWSC (2020) who hold the view the continuous provision of the subsidy to the system is not sustainable in the long run and that the need to find other sources of support other the donor funding is important to achieve long term sustainability of the FSM service model in PUAs.

c) The implication of donor Funding support on the sustainability of FSM service model.

Findings on the donor funding support to LWSC through the Lusaka Sanitation Program revealed that the support would only go up to 2024 when the permitting option phase of the FSM service project would be upgraded to a self-reliant option where it is expected that the FSM service model will be independent of donor funding. The impact of the donor funding on the sustainability of FSM service model is that it brings about relaxation in terms of finding alternative funding or solutions to the future sustainability of FSM service models. This relaxation is casting fears on the future sustainability of the FSM service model. In a similar study by Muluh et al. (2019), it was stated that the sustainability of donor funded projects were defined by the beneficiary's socioeconomic factors. In other words, a donor funded project was only sustainable if there was some improvement on the socioeconomic status of the targeted group. This implied that without any meaningful benefits accrued to the targeted group, the donor funded project would not be said to be sustainable. This however is contrary to the definition of what it means by the term sustainability of projects which has been defined by Martha et al. (2014) as the ability of a project to continue meeting the objectives of a project long after donor funding has been weaned off.

5.3 Technical, institutional, social and financial factors and their implications on the sustainability of FSM service models.

Results on the implication of the technical, institutional and social factors have been presented in the ensuing sections which include:

5.3.1 Implication of the technical factors

Results on the technical factors revealed that the emptying process was not done very safely for the operators who conducted it as they kept digging on the side of the toilet each time, they carried out emptying and this weakened the structure and endangered their lives and this has weakened the integrity and life-span of the structure . It was

also found that the spillages from the FS were washed out on site or buried right on site endangering the environment. This finding is similar to the one reported by LWSC (2018) which stated that this impacted on the health of the households who could contract some diseases which will subsequently impact negatively on the household ability to raise funds to pay for emptying service if they got sick and bed ridden.

The transfer stations which were widely reported by Tembo (2019) and WSUP (2018) were not in use and this had an implication on the FS contaminating the environment due to the fact that the distance between the household where the emptying took place and the treatment plant was long and would prompt some of the emptiers to discharge the FS in the open environment as reported by WSUP (2018). This affected general operation of the FSM as a business as this was potential business for the PSPs. On the other hand, a study by LWSC (2018) and WSUP (2014) revealed that the service operators received adequate training and were competent to manage the operation and maintenance of the equipment used in the value chain. This helped the repair and maintenance to be done by competent people thereby contributing to the sustainability of FSM service model.

5.3.2 Implications of the institutional factors

The institutional factors were derived from the financial management and physical condition sub-indicators. Under the financial management factors, it was revealed that the criteria used for the adjustment of the tariff was something else and not due to operational costs. This brought about conflict on the reasons for tariff adjustment which impacted on the ability of the tariff adjustment would be approved or not. This is in agreement with WSUP (2018) who observed that the tariff adjustment of the FSM service model was subject to political scrutiny as politicians sought to sympathise with the residents of the PUAs to gain political support. The operational costs were too high and using these to aide a tariff adjustment meant that the real tariff would be higher and way beyond the reach of the residents. A study by Strande et al. (2014) agreed that tariff adjustment was motivated by other factors (including political factors) and this made the financial management impact the overall sustainability of the FSM business model. There were rare tariff adjustments made to meet the cost of operation due to government regulations restricting upward adjustment of the tariff that meets the operational and maintenance of the system (WSUP 2018). This meant that the cost of repairs and maintenance of the system were not being met because the community

was unable to pay for the full emptying service because of the high cost (Strande et al. 2014).

5.3.3 Implication of the social factors

The results on the social factors that had an implication on the sustainability of FSM service models were presented in two folds. They included: the customer satisfaction and willingness to sustain the system. It was revealed that customers who were served by the FSM service model were satisfied and this implied they would continue to support the service thereby contributing to its sustainability. It was also revealed that such customers had no other alternative outside the FSM service in their area. It was revealed also that response from the PSPs whenever they were called upon to provide the service was somewhat quickly as observed by LWSC (2020) and this implied that the customers of the FSM service model trusted the service and this had a positive implication on the overall sustainability of the FSM service model. In Kenya, WSUP (2018) reported that a survey on the willingness to pay revealed that 75 percent Kenyans were willing to pay a certain amount of sanitation surcharge on the water bill like has been happening in Zambia where a water charge includes a sanitation levy.

5.3.4 Implication of the Financial Analysis results

Results on the financial management analysis revealed three main categories and had therefore three forms of implications as shown below:

i) Operation, maintenance and treatment costs

The formal emptying done the PSPs with a capacity of 30 percent which was found at ZMW247 per cubic meter of FS resulting in a total price of ZMW303 was in contradiction and higher compared to the one found by LWSC-LSP in a study in 2018. This finding implies that there has been steady increase in the operational, maintenance and treatment costs of FS of about 16 percent in the last four years. This increment maybe due to the fact that at the time of the study by LWSC-LSP, the exchange rate was at ZMW9.50 per US dollar and yet today in 2022, the exchange rate is now at ZMW17.50/ US dollar. The implication of this rise in the cost of operation, maintenance and treatment of FS on the PSPs is that while there has been a rise in the cost, the emptying fees have remained at ZMW150 per cubic meter of FS. This has a negative effect on the business of the PSPs thereby affecting the overall sustainability of the FSM service model.

ii) Operation expenditure (OPEX) and capital expenditures CAPEX):

Findings on the operation expenditure (OPEX) and capital expenditure (CAPEX) show that there has equally been a rise in the OPEX and CAPEX for both the inaccessible pit latrines from ZMW376 per cubic meter of sludge to now ZMW445 per cubic meter for both the OPEX at ZMW360 and CAPEX and ZMW85 respectively. This is a rise of about 15.5 percent in the space of four years. Similarly, for the accessible pit latrines, there has been a general rise in both the OPEX and CAPEX FROM ZMW343 found by LWSC-LSP in 2018 to ZMW433 found by this study in 2022. This represents a rise of 20.7 percent in the last four years. The average increase in the OPEX and the CAPEX for both the inaccessible and accessible pit latrines has been around 18.1 percent. The depreciation of the kwacha as discussed in the previous section could be one of the economic fundamentals that caused the increase. The increase in the OPEX and CAPEX has negative impact on the sustainability of the FSM service models as the PSPs would want to recover all these costs by lamping it on the HH who already is stressed and is unable or struggling to pay at the current price.

iii) HH contributions, subsidy and cost of service and efficiency improvements.

Findings on the HH contributions revealed a small increment from ZMW125 in 2018 as revealed by LWSC (2020) to currently a contribution of ZMW150. Although the LWSC-LSP report predicts that in year 5 from 2018 as base, the HH contribution would increase to ZMW182, the study found that the HH contributions have just risen by a ZMW25 which is about 16 percent. This is consistent with the increase in the cost of operation, maintenance , OPEX and CAPEX as discussed above. The implication of this increment on the FSM service model is that HHs are constantly struggling to pay for the service due to their poor status and so it a continuous increment triggers the desire to seek for other alternative means to empty which negatively affects the FSM model financially.

Furthermore, subsidies were performance based and it was found that the current subsidy amount is ZMW 150 given to the PSPs. The LWSC-LSP program projected that by 2022 in year 5, the subsidy would have reduced to ZMW30 this has not been feasible because there have not been other sources of financial transfers to replace the subsidy and hence it has remained the same for the past few years. The subsidy is still being funded by donor funds.

5.4 The implication of demand responsiveness on the sustainability of FSM service model.

Results from the demand responsiveness were presented through the five sub-indicators that were assessed to determine the demand responsiveness of the FSM service models, the average demand responsiveness which measured at 4.686 points representing 46.67 percent was lower than the threshold recommended by Sara and Katz (997) and presented in Table 3-3. This score was insignificant and therefore unsustainable. This simply showed that there was no sufficient demand from the households and the community in participating in the initiation and implementation of the FSM service models in the area. This was because the initiators of the project were not the community themselves but the water utility companies and other stakeholders. In most cases the households and the community were not aware about the implementation of an FSM service models in their communities. Although there were a few households who participated in the project in terms contributing labours and some service through informal emptying, cash and labour during construction of the FSM installations, the number was still low to make a positive impact on the demand responsiveness. This finding consolidates what Kwangware et al. (2014) elaborated when he they found that community participation in terms of the labour, cash and other materials to the project impacts positively to the sustainability of a sanitation project.

In addition, the study revealed that the training component of demand responsiveness was high at 74.8 percent of service operators trained to manage the FSM service chain. A study by Straus and Montagero (2003) insists that the personnel working for FSM system must receive specialized training in sanitation related areas like FSM so that it enhances their ability to operate, repair and maintain the system for sustainability. This was attributed to the fact that some donors had proposed to train some of the service operators through the Lusaka Sanitation Program (WSUP, 2018). At the time of writing this report, WSUP (2020) reported that about 20 service operators had since been trained through the program. Those who were trained received specialised training in different components of the FSM value including pit emptying, inspection, vacuum tanker operations and other short courses. WSUP further stated that training of service operators was a motivation to them as training not only empowered them with knowledge to manage the system sustainably but also create a sense of ownership

thereby spreading the knowledge to other members of the community on the importance of keeping the FSM service running.

Finally, the demand responsiveness determined who the legal owner of each component of the FSM service value chain was. It was revealed that most of the residents did not have ownership on the components of the FSM service models. The average legal ownership of the FSM services components was scored at 4.11 representing 41.1 percent which was low and the reason for this was because the implementors of the FSM service model did not create ownership within the community as observed by Bates (2007) who observes that without involvement of the community in the project, they will not feel that they are part of the project and this will affect its sustainability agenda. Other views by Schetenleib and Morel (2003) reported in Tembo (2019) both echoed that for any sanitation project to succeed, it should be accepted and received by the beneficiary community within which it is being implemented.

5.5 The current level of sustainability and its implication on the FSM service model.

Results on the sustainability of the FSM service model were revealed through the five sub-indicators which are shown in Table 4-3. These include: Financial Management, Operational and Maintenance, Physical Condition, Customer Satisfaction and Willingness to Sustain. These have been presented in ensuing sections.

5.5.1 Financial Management

As discussed in section 4.3.5 (i), the average score for Financial Management was found to be at 3.96 points showing that it was below the potentially sustainable threshold presented in Table 3-3 and represented 39.6 percent. There were several factors impacting on the financial management of the FSM service models. The poor cost recovery led to the poor Financial Management leading to failures of the FSM service models. This was in agreement with Sanders and Fitts (2010) who reported that for any project to be financially sustainable, there should be good mechanism to collect revenue from the project and fully recover the cost. However, it was found that the payment status (ability to pay) was at about than 50 percent and the current criterial for tariff adjustment was waiting for a go ahead from the government and its regulators owing to the political sensitivities that surrounded the areas under study. This view

was echoed in a study by WSUP (2018) where it was observed that a higher tariff adjustment was perceived to be a political issue.

5.5.2 Operation and Maintenance

Results on the operation and maintenance revealed that the average score for operations and maintenance was 6.75 representing 67.5 percent with Kanyama ward 10 scoring 6.60 representing 66.0 percent, Harry Mwanga Nkumbula ward 11 scoring 6.93 representing 69.3 percent and Mukolo ward 12 scoring 6.72 representing 67.2 percent. The average of 6.75 representing 67.5 percent for in all the three wards showed that the operation and maintenance was performing well on all the measured components of the FSM service model. The contributing factors to the high score are because most of the system operators had received training in the operation and maintenance of the system components and hence had sufficient capacity to management and repair the system. It was contended in another study by Seleman (2012), that for the sanitation systems to operate sustainably, there is need to adequately train the system operators so that they help in the operation and maintenance of the system for the sake of sustainability. Considering that most of the system operators at the KWT had received some training, this component of operation and maintenance received the highest score showing some high level of sustainability.

5.5.3 Physical Condition

Results of the physical condition of the FSM service system revealed that the average score for physical condition was 6.98 with the highest found in Mukolo ward 12 at 7.74, with Harry Mwanga Nkumbula ward 11 scoring 6.84 and Kanyama ward scoring 6.36. Mukolo ward was found with the highest physical condition score because it had access roads and the emptying process was made easier and safe. It was also found that most toilets were rehabilitated and hence this gave a higher score. It was also found that all the PSPs had received brand new transportation vehicles given to them through the LSP with flexible payment terms. The LWSC (2020) reported that they had handed over vehicle to the PSPs on a flexible payment term to aid the emptying and management of FSM in PUAs. The vehicles were still in good physical conditions at the time of assessment. In addition, it was found that the Lusaka Sanitation Program had started building new toilets (Appendix H) which were specially designed to meet the emptying challenges being faced by the service providers. These toilets were equally in good physical condition and hence the physical condition part of

sustainability performed well. Although there were defects on the treatment plant, defective push carts and under or non performing transfer stations and biogas digesters, the average score showed a well performing physical condition of the FSM service model.

5.5.4 Consumer Satisfaction

The findings on consumer satisfaction revealed the average score of 6.91 which showed a good performance mainly attributed to the fact that most households used the FSM services available and had no good alternative to give them a good level of satisfaction. This is in agreement with Sara and Katz (1997) who report that since the indicators where a measure of perception, people would end up reporting positively about a malfunctioning FSM system because when they compared it to what they had before, they find it satisfactory. The satisfaction was also attributed to the ability of the service providers to timely respond to the call for a service. It was found that the emptiers responded quickly whenever called upon. Most households were satisfied with service provided so far at the time of writing this report. A study by Bandari and Grant (2007) observed that the level of customer satisfaction is one of the major factors that influence the level of willingness to pay for the sanitation service. This statement explains why the willingness to pay was found at 100 percent although only 50 percent could afford to actually pay for the service. Although, some households showed some dissatisfaction and hired alternative emptiers due to the higher cost of emptying, most residents who managed to pay for the service expressed satisfaction (refer to Figure 4-4).

5.5.5 Willingness to sustain the FSM service system

The results on the willingness to sustain the FSM service system was assessed and revealed that the average score was at 5.34 points representing 53.4 percent. These scores are explained and summarised in section 3.7. This score according to Sara and Katz (1997) is already potentially sustainable (Table 3-3). This was attributed to the fact that the tariff was perceived to be high and this prompted some residents to prefer unregistered informal emptiers. This finding is in line with Strande et at. (2014) who agree that whenever the tariff was beyond their reach, households will prefer to get the emptying service elsewhere cheaper. An assessment of the incomes of the community showed that the income levels were low and the households did not have capacity to financially sustain the FSM system. The community also did not have

capacity to replace, repair broken down equipment in the FSM service chain such as vehicles, push carts. Although the households had the capacity to construct new toilets or empty and reuse the existing, this alone was not sufficient to guarantee sustainability. It was also found that the community did not own the FSM service system something that caused the community not be willing to fully support the services (Bates, 2007).

5.6 Designed sustainable FSM service model

A sustainable FSM service model was designed based on the findings of this study presented in figure 4-13. The new model has a discharge fee introduced to it. The discharge licence paid by the PSPs directly to government will also motivate the service providers to ensure that empty as often as possible without them having to pay for the discharge fees and this will also stop them dumping the FS in open environment. The new FSM service model proposes to scrap off the subsidy as government will now be required to give budgetary support to the utility to from the collected discharge license and sanitation taxes so that the utility can treat the FS and dispose it off without having to risk the environment (refer to section 5.2.2.2).

The proposed model proposes an enhanced marketing strategy for the bio-products such as bio-gas and bio-solids so that they begin to bring in revenue to the utility thereby further reducing the charges down the chain and making the system sustainable beyond donor funding. A study by LWSC (2018) indicate that a good marketing framework for the FS end-products will enhance interest for the public and trigger an increase in the sales that brings in extra income to support the sustainability of the service model long after donor funding is withdrawn.

The new FSM service model has proposed the introduction of the discharge licence. In a study conducted by Strande et al. (2014), it is stated that the discharge licence helps government to have among other things; administrative control, obtain data on the number of PSPs, know about the operational schedules and the funds raised will be known by authorities for policy advise and formulation. They further contend that discharge licence model has been widely used in Kumasi, Ghana through a report by Mensah (2003) and SANDEC (2006). Both of these reports have argued that the discharge licence model has been very effective in ensuring that the households in the long run pays reduced emptying fees as the PSP will no longer be paying discharge

fees directly to the utility company as the case is for the current FSM service model in Lusaka. The payment of the discharge fees according to Strande et al. (2014), ensures that the PSPs have an obligation to discharge the FS at designated places and not in open environments. This will enhance the safety of households and accrue direct benefits to the government.

In addition, the Water and Sanitation Program Africa (2005) reported that the discharge licence has also been implemented in Nairobi Kenya and Da Nang in Vietnam according to Steiner et al. (2003). These reports have indicated that a yearly or monthly payment schedule could be adopted for the PSPs to pay (Strande et al.2014).

5.7 Implication of the study findings.

The findings study has revealed that the overall sustainability index of the FSM service model of 6.09 indicate that the FSM service model is performing well only on 60.9 percent of the technical, institutional and social aspects. Using the criteria given by Sara and Katz, (1997) as summarised in Table 3-3, the FSM service model can be said to be potentially sustainable. This implies that there are a number of areas that require attention in order for the service model to reach a level of sustainability and be able to stand on its own post-donor funding. The proposals highlighted in section 5.6 above would help in ensuring that the FSM service is sustainable post donor funding.

5.8 Chapter Summary

This chapter discussed the findings of the research focussing on the current sanitation practices, the demand responsiveness and sustainability. It was found that the current practices of having only three financial transfers is not sufficient to sustain the FSM service model. It was also revealed that the higher the demand created at the initiation of the project, the higher the sustainability index as HHs get to have some ownership that triggers the willingness to pay for and sustain the FSM system. Although both the demand responsiveness and sustainability were low at 4.98 representing that only 49.8 percent demand was employed, and 6.09 showing that the FSM service model was 60.9 percent respectively indicating that the project is potentially sustainable, the factors identified have to be considered to ensure sustainability beyond donor funding. The following chapter presents the conclusions and recommendations.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This study was conceived to evaluate the sustainability of FSM service model in PUAs of Lusaka District post donor funding. This was done with a view to establish sanitation practices that brought out factors that are affecting and impacting on the sustainability of the models thereby aiding the design of a service model that is sustainable post donor funding. There were three specific objectives in this study presented in section 1.4 namely;

i. To establish the current sanitation practices in PUAs that impact on the sustainability of FSM service models;
ii. To determine the factors that impact on sustainability of FSM Service models in PUAs; and
iii. To design a sustainable FSM service model for peri-urban areas that reduces donor dependency.

This chapter draws general conclusions on each of the three objectives, it then presents the generalisation of the results and the validity and reliability of the findings. These are followed by a summary of the contribution to the body of knowledge. The chapter finally draws general recommendations of the study including the proposed designed sustainable FSM service model and recommendations for future research.

6.2 Conclusions

On the aspect of establishing the current sanitation practices in PUAs that impact on the sustainability of FSM service models, the following are the conclusions:

1. The socioeconomic status in PUAs has great impacts on sustainability of the system mainly because of the low disposable incomes among residents which make it difficult for them to afford the service.
2. The current FSM service models which require that the payment of the emptying is made as one-off at the time the customer is seeking the services impacts negatively on sustainability as most customers do not have the ability to raise the required desludging fees at one goal;
3. The current FSM service model (flow) which was expected to be self-financing had missing in it major components of the service chain such as; the transfer

stations, FSTP and the access road to the households and good quality. These missing components had great impact on the sustainability of the FSM model;

4. The lack of involvement of the community in the initiation and implementation of the FSM service project impacted negatively on the model because members of the community felt like they did not own and be part of the project hence reduced their support for the model;
5. The increase in the operation and maintenance, OPEX and CAPEX mainly due to economic fundamentals among them the depreciation of the Zambian Kwacha against the US dollar, has negatively impacted on the ability of the PSPs to make profit from FSM as a business hence impacting the HHs in the long run;
6. The inability by LWSC to introduce other financial transfers in the model to replace the subsidy has made the model donor dependent and is at risk of collapsing should donor funds be withdrawn as the current plan is;
7. The continuous administration of the of the donor funding on the service chain negatively impacted on the future sustainability because the utility company was relaxed in finding new self-funding mechanisms within the FSM service chain which could help the sustainability of the model beyond donor funding.

On determination of the technical, institutional, social and financial factors that impact on the sustainability of the FSM service models, the following are the conclusions;

1. The demand responsiveness was assessed using the technical assessment. The result of 4.68 points revealed that the demand responsiveness was very low because of the community was not fully engaged during the initiation and implementation of the FSM service model. This impacted negatively on the sustainability of the service model; and
2. The sustainability of the FSM service model was assessed using sustainability sub-indicators and the results revealed that the sustainability was 6.09 points which was categorised as potentially sustainable. This showed that the FSM service model was performing well in 60.9 percent of the technical, institutional and social aspects.

On the proposed and designed FSM service model, the following were the conclusions;

a) The introduction of the discharge licence will encourage the PSPs to discharge as much FS as they can without having to pay per discharge. This will help protect the environment from indiscriminate disposal of FS in the open environment thereby promoting environmental sustainability.
b) The new discharge licence to be paid once off will reduce the cost of operation for the PSPs and this will eventually help reduce the emptying fee which will encourage many households to use this FSM service model thereby increasing the customer base subsequently impacting positively on the sustainability of the FSM service model.
c) The increased promotion and marketing of the FSM by-products such as bio-gas and biosolids will help increase revenue for the model hence improving on the financial sustainability of the model.
d) The construction of two FSTPs in Lusaka will enhance the quality of the FS that could be used for electricity generation a major source of income for the FSM business model.

6.3 Contribution to the body of knowledge

This research sought to assess the FSM service models in order to bring out factors that affect and impact on its sustainability thereby aiding the designing of a sustainable service model post donor funding. As a result, the research has accomplished the following:

a) Up to date there has not been research to establish factors that impact on the sustainability of FSM service models in peri-urban areas of Lusaka. This research has unearthed a number of factors and new knowledge that will be critical to improving the sustainable management of FSM post donor funding.

b) Sustainability data has been generated that will act as a valuable source to future research; and

c) The research has highlighted the gaps that exist in the management of FSM service models in PUAs and this has aided the design of a sustainable FSM service model that can work post donor funding.

6.4 Generalisation

The research used Kanyama township as a selected case study area because of the socioeconomic characteristics that it has that are similar to other PUAs of the city of Lusaka. The characteristics and sanitation practices of this area are similar to other PUAs hence the findings of the study could be generalised to represent other similar areas. The study findings can therefore be used in other PUAs of Lusaka city and other similar cities in the country.

6.5 Validity

This study used 150 respondents including HHs and some key informants from key water and sanitation sectors such as LWSC, BORDA, LCC, WSUP and GIZ. A large sample size is key to the validation of the nature of the data and the findings. The collection and analysis of the data was done using standard software hence validating the findings. In addition, key stakeholders in the sanitation sector especially those involved in the management of FSM service provision in the city and beyond were extensively consulted.

6.6 Study Limitations

The study was carried in Kanyama township where the population according to CSO (2018) is about 200,000 This posed the following challenges;

a) The area was too huge to cover it and hence the study was restricted to the 167,000 residents covered by the KWT due to limited resources.

b) This study involved issues of FS and specifically about toilets which are highly sensitive and hence some respondents did not feel comfortable to freely talk about these issues.

6.7 Recommendations

Based on the study findings, the following are the recommendations:

i. An assessment of the sanitation practices revealed that there were socioeconomic characteristics and sanitation practices within the study area and the FSM service chain that are negatively impacting on the sustainability of the FSM service model. For example, majority of the residents were poor and unable to have sufficient income or occupations that could help them support the FSM as a business. Further, there were sanitation practices such as the lack of transfer stations, biogas

digesters, the lack of FS treatment plant and the lack of marketing and sell of the final biosolids and these impacted negatively on the overall financial performance of the FSM service model. It is therefore recommended that LWSC puts up a system is devised to address these shortcomings if the FSM service is to be sustainable post donor funding;

ii. The technical assessment of the sustainability sub-indicators revealed a lot of factors that are impacting the sustainability of the FSM service and that even if the findings indicate that the current FSM service has potential to be sustainable, it is important that these factors are isolated and tackled in detail;

iii. The donor funding given as subsidy is winding up in the near future, there is therefore need to introduce the sanitation surcharge fee from the urban areas that can go towards supporting the FSM service model in peri-urban areas;

iv. The inability by LSP to implement the plan to reduce the subsidy gradually as planned by LWSC-LSP in 2018 is raising many risks in so far as the FSM service model sustainability is concerned. There is therefore need to implement the plan so that the system begins to prepare itself for self-sustenance post donor funding.

v. Finally, there is need for the to enhance the sustainability of the FSM service models which should be done through the following;

a) LWSC should introduce the discharge licence paid to government monthly or yearly so that the PSPs do not have to pay the discharge fee each time they deliver the FS to the treatment plant. This will eventually help in the reduction of the emptying fee benefitting the household and protecting the environment from contamination. thereby eliminating the donor funding from the chain;

b) Further studies must be undertaken to establish the impact the two FSTPs would have on the sustainability of FSM service models especially where FS solids and biogas are concerned;

c) LWSC must introduce a deliberate demand responsive mechanism that engages the community from the initiation to the implementation of the project so that they become part and parcel of the entire project. This creates a sense of ownership to the project and buy in that brings about the desire to support and the willingness to sustain the FSM system; and

d) Commissioning research to investigate the relationship between demand-responsiveness and sustainability of FSM service models.

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APPENDICES

APPENDIX A: RESEARCH TOOLS

APPENDIX A: HOUSEHOLD SEMI-STRUCTURED QUESTIONNAIRE

Table A: Household Questionnaire

SECTION I: QUESTIONNAIRE IDENTIFICATION			
Questionnaire Number *(counting from 001)*		Name of Interviewer *(initials of enumerator)*	
District		Date of Survey	
Township		Ward	

The interviewer must first introduce himself/herself.

Explain importance of this survey : I am a student studying a Masters program with a dissertation topic entitled (Sustainanbility of FSM service models in Peri-Urban Areas of Lusaka District) at the University of Zambia. I have come to ask some questions about the state of the FSM service model and understand how community contributions towards sustainability of the FSM that is being done in this area. This is important because it will help the government and LWSC to know how best they can increase people's access to good sanitation services in Peri-Urban Areas. The information will also help me produce a report that will go towards the requirements for my academic dissertation. All your answers will be in strict confidence.

SECTION II: HOUSEHOLD SANITATION CHARACTERISTICS		
1.	Sex of respondent *(Don't ask, just note)*	☐ 1. Male ☐ 2. Female
2.	Name of interviewee	.....
3.	Age of respondent	☐ 1. Below 16 years ☐ 2. 16 – 20 ☐ 3. 21 – 30 ☐ 4. 31 – 40

		☐ 5. 41 – 50 ☐ 6. Over 50
4.	What type of Sanitation Technology do you use?	☐ 1. Flushable toilet ☐ 2. Pour flush toilet ☐ 3. Pit latrine ☐ 4. Open defecation ☐ 5. 6. Other, please specify ..... *Tick more options if applicable*
5.	Explain how you get to empty the toilet once it is full	....
6.	Who owns the toilet?	☐ 1. Community ☐ 2. Government/LWSC ☐ 3. Private owner ☐ 4. I dont know ☐ 5. Other, please specify .....
7.	Who does the emptying of your toilet?	☐ 1. Private Service Provider ☐ 2. Informal emptiers ☐ 3. I dont know

		☐ 4. Other, please specify .....
8.	Are you satisfied with the emptying services?	☐ 1. Yes ☐ 2. No ☐ 3. I dont know ☐ 4. Other, please specify .....
9.	How do you rate the emptying services?	☐ 1. Good ☐ 2. poor ☐ 3. Takes long ☐ 6. I dont know ☐ 7. Other, please specify .....
10.	Is your emptying service provider reacheable whenever you want to contact them?	☐ 1. Yes ☐ 2. No ☐ 3. I dont know ☐ 4. Other, please specify .....
SECTION III: COMMUNITY SUPPORT TOWARDS FSM SERVICE DEVELOPMENT AND SUSTAINABILITY		
11.	Did you pay community monetary contributions towards implementation of the FSM service chain? If no, proceed to question 20.	☐ 1. Yes ☐ 2. No. ☐ 3. I dont know

12.	If yes, how much did you pay as a household?	☐ 1. ZMK ..... ☐ 2. I paid but do not remember ☐ 3. I dont know
13.	If yes to 11 above, why did you have to pay community contributions?	....
14.	From your assessment, is the community still willing to contribute or pay higher than they currently doing for the FSM service?	☐ 1. They like it ☐ 2. They dont like it ☐ 3. I dont know ☐ 4. Other, please specify .....
15.	How long has the FSM service model been working since its commisioning?	☐ 1. Less than 1 year ☐ 2. 1 to 2 years ☐ 3. 2 to 3 years ☐ 4. 4 to 5 years ☐ 6. More than 5 years ☐ 7. I dont know ☐ 8. Other, please specify .....
16.	Did you pay any maintenace & operation fees for the FSM service? If yes, How Often did you do this?	☐ 1. Did not pay anything ☐ 2. Weekly ☐ 3. Monthly ☐ 6. When emptying per year

		☐ 8. Other, please specify .....
17.	Who is responsible for providing the FSM service in the community?	☐ 1. Community ☐ 2. Government ☐ 3. Water Trust/LWSC ☐ 3. I dont know ☐ 4. Other, please specify .....
SECTION IV: DEMAND RESPONSIVENESS		
18.	Who initiated the FSM service model project?	☐ 1. Community ☐ Project Team ☐ LWSC ☐ Others ☐ I dont know
19.	Do you know how much assistance you need as far as FSM service is concerned? If yes specify what assistance you need.	☐ 1. Yes ☐ 2. No ....
20.	Do you know the source of Funding for the FSM project? If yes, please specify.	☐ 1. Yes ☐ 2. No ☐ 3. .....
21.	Did you have any priorities besides FSM issues?	☐ 1. FSM issues had the first priority ☐ 2. Had some other priority

		☐ 3. We had two priorties one being FSM issues ☐ 4. I dont know
22.	Where you offered other options or choices other than FSM issues	☐ 1. Yes ☐ 2. No ☐ 3. I dont know ☐ 5. Other, please specify .....
23.	Did people outside the community contribute towards construction?	☐ 1. Yes ☐ 2. No
24.	Did you know what was needed for the FSM project? If yes, then name 50% of what is required for the project.	☐ 1. Yes ☐ 2. No ....
25.	Do you have any responsibility on the operation and maintenance of FSM system	☐ 1. Yes ☐ 2. No ☐ 3. I dont know
26.	Who made the final decision on the impelementation of the FSM project?	☐ 1. The community ☐ 2. The FSM committee ☐ 3. Local Government ☐ 4. I don't know ☐ 7. Joint decision
27.	How much labor in terms of days did the HHs contribute	☐ 1. 1-7 days ☐ 2. 8-14 days

	towards construction of FSM infrastructure?	☐ 3. 15-30 days ☐ 4. More than 30 days ☐ 5. Other, please specify …….
28.	Did you undergo any training in FSM issues?	☐ 1. Yes ☐ 2. No
29.	Who owns the sanitation technology (Toilet) you are using?	☐ 1. Community ☐ 2. Private, permission required ☐ 3. Private, no permission required
30.	Who owns the FSM service model?	☐ 1. COMMUNITY ☐ 2. LWSC ☐ 3. I DONT KNOW ☐ 4. OTHER, PLEASE SPECIFY .....
SECTION V: SUSTAINABILITY (FOR FSM COMMITTEE AND EXPERTS)		
32.	What criteria do you use for adjusting the FSM tariff?	☐ 1. Operational Costs ☐ 2. Other criteria
33.	Is the tariff adjustment required to meet the costs?	☐ 1. Yes ☐ 2. No ☐ 3. Not required
34.	Which costs are or can be covered by the tariff?	☐ 1. O& M+ replacements ☐ 2. O&M + repairs ☐ 3. O&M no savings ☐ 4. No tariff

		☐ 5. Does not cover operations
35.	Do you provide emptying service even when HHs have no money or if they can pay later?	☐ 1. Yes ☐ 2. No
36.	Do you have an accountant managing the finances from FSM services	☐ 1. Yes ☐ 2. no
37.	Is the accountant competent enough to manage the finances of the FSM service?	☐ 1. Yes ☐ 2. No ☐ 3. I dont know
38.	Do you have a community bank account?	☐ 1. Yes ☐ 2. No
39.	What is the current willingness to pay status	☐ 1. More than 90% pays ☐ 2. 50 to 90% pays ☐ 3. Less than 50% pays
40.	Is the current charge for emptying meeting the cost of O & M. If not explain reason why?	☐ 1. Yes ☐ 2. No
41.	Can the community Help contribute to the expansion or sustenance of the FSM service chain	☐ 1. Yes ☐ 4. No
42.	Is the FSM system operational	☐ 1. Yes ☐ 2. No

43.	What are the number of breakdowns you have per year?	☐ 1. 0 - 2 ☐ 2. 1 - 3 ☐ 3. More than 4
44.	Does the community help in repairing the system whenever it is down?	☐ 1. Yes ☐ 2. No
45.	How many days are required to repair system?	☐ 1. 1 ☐ 2. 2 – 5 ☐ 6
46.	Did the frequency of the repairs decrease	☐ 1. Yes ☐ 2. No
47.	Are you hired based on your ability to do the job?	☐ 1. Yes ☐ 2. No
48.	Are you trained in the FSM value chain or this your operation? If yes state the nature of training.	☐ 1. Yes ☐ 2. No ☐ ....
49.	Do you have capacity to operate the system?	☐ 1. Yes ☐ 2. No
50.	Does operator have access to repair tools?	☐ 1. Yes ☐ 2. No
51.	How often do you use the FSM service like emptying?	☐ 1. More ☐ 2. Less ☐ 3. Some

SECTION VI: HOUSEHOLD QUESTIONNARE		
52.	Which FSM service provider do you use?	☐ 1. Informal Manual Emptiers ☐ 2. Formal Manual Emptiers ☐ 3. I dont use any
53.	Are you satisfied with the service Formal Manual Emptiers provide?	☐ 1. Yes ☐ 2. No ☐ 3. Somewhat
54.	Are you satisfied with the frequency of emptying?	☐ 1. Yes ☐ 2. No ☐ 3. Some what
55.	How quickly do the emptiers respond whenever you want a service?	☐ 1. Very quickly ☐ 2. Somewhat quickly ☐ 3. Slow
56.	How safe is the emptying process?	☐ 1. Very ☐ 2. Somewhat ☐ Not sale
57	Is there a possibility of contaminating the environment during emptying, transportation and treatment of FS?	☐ 1. Yes ☐ 2. No ☐ 3. Somewhat
58	What is the condition of your toilet?	☐ 1. Very good ☐ 2. Good ☐ 3. Poor
59	Is the FSM service fucntioning well?	☐ 1. Yes

		☐ 2. No
61	Is the FS committee satisfied with the FSM services?	☐ 1. Yes ☐ 2. No
62	What is your perception on the price of emptying?	☐ 1. Expensive ☐ 2. Fair ☐ 3. Inexpensive
63	Do you have any problem with paying for the FSM service	☐ 1. Yes ☐ 2. No ☐ 3. Somewhat
64	What is your perception about where operators would get money for repairs should they face a breakdown?	☐ 1. Tariff ☐ 2. Additional contrbutions ☐ 3. LWSC ☐ 4. Outside community ☐ 5. Others
65	Can the community help with funds to replace any equipment in the FSM value chain?	☐ 1. Yes ☐ 2. No ☐ I dont know
66	Does the community have financial capacity to sustain system?	☐ 1. Yes ☐ 2. No ☐ 3. I dont know
67	Who owns the FSM service provision in Kanyama	☐ 1. Community ☐ 2. LWSC ☐ 3. GRZ ☐ 4. Others

68	Are you willing to pay more than the current cost of emptying?	☐ 1. Yes ☐ 2. No
69	Are willing to pay for any improvements to the FSM service model?	☐ 1. Yes ☐ 2. No ☐ 3. Dont Know
70	Do you think your sanitation situation has improved your health status?	☐ 1. Yes ☐ 2. No ☐ Dont know
56.	Any additional comments?	
END OF INTERVIEW		
Thank you for your time and for all the information you have given us!		

APPENDIX B: SEMI STRUCTURED INTERVIEW GUIDE

Appendix B: Semi-Structured Interview Guide for Key Informants

THE UNVERSITY OF ZAMBIA

SCHOOL OF ENGINEERING

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

Dear Respondent,

You have been chosen to help respond to a few questions herein that will help in the research being conducted by Mutunda Malichi a student at the University of Zambia pursuing a Master of Engineering in Project Management. He is doing a resarch entitled" Sustainability of FSM service models in Peri-urban areas of Lusaka District post donor funding". You have been selected to help provide information that will help the student produce his report towards this research. The information you will provide will be treated with high levels of confidentiality and will only used for academic purposes.

Name of Respondent	
Job Title	
Organisation Name	
Area of Interview	
Date	

1. Would you briefly describe the FSM service chain as you know it?

---

2. What role do you play in the FSM service/value chain?

---

3. Do you offer any support in the Value Chain?

a)Yes

b) No

If yes, give a detailed description of the value chain

---

4. What are you doing to overcome the challenges?

---

5. Do you think the current FSM service model can stand on its own without donor subsidies or support?

---

6. What factors do you think are inhibiting sustability of the FSM service model?

---

7. What is your organisation doing to help FSM be sustainable if donor funding is terminated?

---

8. How do you rank the FSM service model in terms of performance on a scale of 0 to 10?

---

9. Mention 5 things being done by your organisation to prepare in case the donors stop subsidising FSM business model in Lusaka?

---

10. Any other remarks?

Thank you for your time.

End of Interview.

APPENDIX C: CHECKLIST

Table C: Checklist for Field Observations and Physical Inspection

SN	ITEM	1	2	3
		Poor	**Good**	**Very good**
1	Physical Condition of Toilet			
3	Physical Condition of Cart			
4	Physical condition of FS transporting vehicle			
5	Emptying Process			
6	Transportation process			
7	Disposal			

Note that:

- Poor is the condition where the toilet, cart, emptying equipment and vehicle cannot be long enough or is in bad working condition
- Good is when the toilet, cart, vehicle and emptying tools are good to be used without challenges
- Very good means the toilet is user friendly, the cart is almost new, the vehicle is also almost new and good working condition.

APPENDIX D: FOCUS GROUP DISCUSSIONS GUIDE

Province: _____

District: _____

Ward: _____

Name of Facilitators: _____

Number of Participants: _____

Sex of Participants: _____

Date of FGD: _____

Explain importance of the FGD: We have come to find out about the state of the FSM service models and its current practices and understand how the Households and community contributed towards the sustainability of the FSM service model. This is important because it will help the government through the LWSC to improve people's access to sanitation in PUAs. Please assist us with information as bests as you can.

General

- How do you ensure that your toilet is emptied whenever it gets full?
- Do you know what is the form of support you gave towards the management of FSM?
- Do you have an old or new toilet?
- Do you know who initiated the construction of the new toilets in the area?

Frequency and care of toilets

- How often do you empty your toilet?
- Do you think the old toilet or the new toilet is better?
- Do you think it is your responsibility as a community to look after the new toilets?

- What are the views on community contributions towards the FSM service model?

Motivation for contribution

- Does the community know the requirements of community contributions? (How much should be paid, paid upfront or not and why)
- What is contained in the district agreement concerning community contributions?
- Is the community willing to pay for improved FSM services?
- How much are you willing to pay for the full FSM service like emptying?

APPENDIX E: SUSTAINABILITY MATRIX

Table E: Sustainability matrix

ASPECT	SUB INDICATOR	SOURCES OF DATA
Technical	Physical Condition of Infrastructure	Technical Assessment and Observation
Institutional	Operation and Maintenance	FSM Committee interview, literature review and stakeholder interviews (Key Informants)
	Financial Management	Technical Assessment and FSM committee interview and literature review.
Social	Consumer satisfaction	Household survey
	Willing to pay/sustain	Household survey

Source: Sara and Katz, (1997)

APPENDIX F: DEMAND RESPONSIVENESS WEGHT GUIDE

Table F1&F2 Project Initiation, House Hold and Faecal Sludge Committee (HH & FSMC)

SN	QUESTION	ANSWER CODE	ANSWER	WEIGHT
1	Who Initiated the FSM Project and who made the Final decision	a	Inside Community	2
		b	Project Team	0
		c	LWSC	1
		d	Others	0
		e	I don't Know	0
2	Do you know the source of Funding for the FSM project	a	yes	2
		b	no	0
3	Did you participate in the decision making	a	Yes	2
		b	No	0
		c	I don't know	0
4	Did you have any other priorities other than FSM issues?	a	Preferred something else	0
		b	FSM was a priority	2
		c	We had two priorities	2
		d	I don't Know	0
5		a	yes	2

	Were you offered many other choices other than FSM	b	no	0
6	Did you know what requirements were needed for the FSM	a	Name 50%	2
		b	Can't name	0
7	Do you have a responsibility on the O&M of the FSM system	a	Yes	2
		b	No	0
		c	I don't Know	0

Source: This study

Table F3: Informed Choice, FSM Committee (FSMC)

SN	QUESTION	ANSWER CODE	ANSWER	WEIGHT
1	Did you have any other priorities other than FSM issues?	a	Preferred something else	0
		b	FSM was a priority	2
		c	We had two priorities	2
		d	I don't Know	0
2	Were you offered many other choices other than FSM?	a	yes	2
		b	no	0

3	Did you know what requirements were needed for the FSM?	a	Name 50%	2
		b	Can't name	0
4	Do you have a responsibility on the O&M of the FSM system?	a	Yes	2
		b	No	0
		c	I don't Know	0
5	Who made the final decision?	a	Inside Community	2
		b	FSM Committee	1
		c	LWSC	1
		d	Don't Know	0

Source: This study

Table F4: Contribution by Cash

SN	QUESTION	ANSWER CODE	ANSWER	WEIGHT
1	How much cash did you contribute to the project	a	0 – ZMW50	0
		b	ZM51 – ZMW100	1
		c	ZMW101 – ZMW500	2
		d	Above ZMW 500	3
2		a	0 – ZMW 20	0

	What is your monthly contribution towards M&O	b	ZMW 21 – ZMW 50	1
		C	ZMW 51 – ZMW 100	2
		d	Above ZMW 100	3

Table F5: Contribution towards Labour (COL)

SN	QUESTION	ANSWER CODE	ANSWER	WEIGHT
1	How much labour in terms days did you contribute to the project	a	1 – 7days	1
		b	8 – 14 days	2
		c	15 – 30 days	3
		d	More than 30 days	4
		e	0	0
2	What is your monthly contribution towards O&M	a	0 – ZMW 20	0
		b	ZMW 21 – ZMW 50	1
		C	ZMW 51 – ZMW 100	2
		d	Above ZMW 100	3

Table F6: Training of FSM Committee

SN	QUESTION	ANSWER CODE	ANSWER	WEIGHT
1	Has the committee been trained in any component of FSM?	a	Yes	2
		b	No	0
		c	Not sure	1
2	Have individuals been trained in any FSM component?	a	Yes	2
		b	No	0
		c	Not sure	1

APPENDIX G: SUSTAINABILITY WEIGHTS GUIDE

Table G1: Financial Management

SN	QUESTION	ANSWER CODE	ANSWER	WEIGHT
1	What was the criteria used when adjusting tariff?	a	Operational Costs	2
		b	Other	0
2	Is the tariff required to meet the operational costs?	a	yes	2
		b	no	0
		c	Not required	2
4	Which costs are covered by the tariff?	a	O&M + replacement	2
		b	O&M + repair	2
		c	O&M, no savings	1
		d	Operations only	
5	Do you provide service without payment?	e	**Yes**	0
		b	No	2
		c	Sometimes	0
6	Do you have a good financial management system for the FSM service?	a	Yes	2
		b	No	0
7	Do you a community Bank Account?	a	Yes	
		b	No	

8	What is the current request for service status?	a	More than 90% requests for service	2
		b	Only 50 to 90% request for service	1
		c	Less than 50% request for service	0
9	Is the current tariff covering the O & M of FSM?	a	Yes	2
		b	No	0
10	Can the community manage to replace the FSM system if it breaks down?	a	Yes	2
		b	No	0

Table G2: Operation and Maintenance (O&M)

SN	QUESTION	ANSWER CODE	ANSWER	WEIGHT
1	Is the FSM service operational?	a	Yes	2
		b	No	0
2	What are the numbers of breakdowns in the entire system per year?	a	0	2
		b	1 - 3	1
		c	4 +	0
3		a	Yes	2
		b	No	0

	Is the community able to carry out all repairs when the system breaks down?	c	No repairs are required	2
4	How many days are required to carry out repairs of system?	a	1	2
		b	2 – 5 days	1
		c	6 or more days	0
5	Did the frequency of repairs decrease?	a	Yes	2
		b	No	0
6	Are you hired based on your ability to do the job?	a	Yes	2
		b	No	0
7	Are you trained for this operation or the work you do in FSM?	a	Yes	2
		b	No	0
9	Have you an operator done major repairs or do you have capacity to carry out major repairs?	a	Yes	2
		b	No	0
10	Can you as an operator get help or do you use manuals when doing your repairs or operations?	a	Yes	2
		b	No	0

Table G3: Consumer Satisfaction (CS)

SN	QUESTION	ANSWER CODE	ANSWER	WEIGHT
1		a	Very Often used	2
		b	Rarely used	1

	How often do you use the FSM service available in your area?		Never Used Before	0
2	Do you have an alternative service to FSM?	a	1 or more regularly	0
		b	1 or more seasonally	0
		c	No alternative	2
3	Are you satisfied with the FSM service?	a	Very satisfied	2
		b	Somewhat satisfied	1
		c	Not satisfied	0
4	Are you satisfied with the response time to provide service or the frequency of emptying?	a	Very satisfied	2
		b	Somewhat satisfied	1
		c	Not satisfied	0

Table G4: Physical Condition

SN	QUESTION	ANSWER CODE	ANSWER	WEIGHT
1	Ho safe is the emptying process?	a	Very safe	2
		b	Somewhat safe	1
		c	Not safe	0
2	Is there a possibility of contamination of the environment during	a	Yes	0
		b	Somewhat	1

	emptying, transportation and treatment of FS?			
		c	No	2
3	What is the physical condition of your pit latrine?	a	Very good	2
		b	good	1
		c	poor	0
4	Are there any defects in the pit latrine, buildings and treatment facilities for FS?	a	Yes	0
		b	Minor	1
		c	no	2

Table G5: Willingness to sustain the FSM System

SN	QUESTION	ANSWER CODE	ANSWER	WEIGHT
1	Is the FSM service committee satisfied?	a	Yes	2
		b	No	0
2	What do you think about the prices of the FSM service?	a	Expensive	0
		b	Fair	1
		c	Inexpensive	2
3	Do you face any challenges with regards payment of FSM services?	a	Yes	0
		b	No	2
		c	Sometimes	1
4	Where do you think the money for repairs come from? In case of break downs	a	Tariff	2
		b	Additional contributions	2
		c	LWSC	1

		d	Donor support	0
5	Are able to replace damaged equipment with funds from community?	a	Yes	2
		b	No	0
6	Does the community have financial capacity to sustain FSM system without donor support or subsidies?	a	Yes	2
		b	No	0
7	Who owns the FSM system in Kanyama?	a	Community	2
		b	LWSC	1
		c	GRZ	0
		d	Others	0
8	Do you think your life is better off now than before the installation or introduction of the FSM services?	a	Yes	2
		b	No	0
		c	I don't know	0

Source: This study

APPENDIX H: PICTURE OF NEWLY CONTRCTRUCTED TOILETS SOLD TO RESIDENTS AT AN INSTALLMENT ARRANGEMENT

Figure H: Newly Constructed Toilets

Source: (LWSC, 2019)

APPENDIX I: ETHICAL CLEARANCE CERTIFICATE APRROVAL

THE UNIVERSITY OF ZAMBIA
DIRECTORATE OF RESEARCH AND GRADUATE STUDIES

Great East Road Campus | P.O. Box 32379 | Lusaka10101 | Tel: +260-211-290 258/291 777
Fax: (+260)-211-290 258/253 952 | E-**mail**: director.drgs@unza.zm | Website: www.unza.zm

APPROVAL OF STUDY

IORG No. 0005376
NASREC IRB No. 00006465

7th November, 2022

REF NO. NASREC-2022-SEPT.010

Mr. Mutunda Malichi,
The University of Zambia,
School of Engineering,
P.O. Box 32379
LUSAKA

Dear Mr. Malichi,

RE: "SUSTAINABILITY OF FSM SERVICES MODELS IN PERI –URBAN AREAS OF LUSAKA DISTRICT POST DONOR FUNDING: THE CASE STUDY OF LUSAKA WATER SUPPLY AND SANITATION COMPANY LIMITED."

Reference is made to your protocol dated as captioned above. NASREC resolved to approve this study and your participation as Principal Investigator for a period of one year.

REVIEW TYPE	**ORDINARY REVIEW**	**APPROVAL NO. NASREC-2022-SEPT. 010**
Approval and Expiry Date	Approval Date: 7th November,, 2022	Expiry Date: 6th November, 2023
Protocol Version and Date	Version - Nil.	6th November, , 2023

Information Sheet, Consent Forms and Dates	• English.	To be provided
Consent form ID and Date	Version - Nil	To be provided
Recruitment Materials	Nil	Nil
Other Study Documents	Questionnaire.	

Specific conditions will apply to this approval. As Principal Investigator it is your responsibility to ensure that the contents of this letter are adhered to. If these are not adhered to, the approval may be suspended. Should the study be suspended, study sponsors and other regulatory authorities will be informed.

CONDITIONS OF APPROVAL

- No participant may be involved in any study procedure prior to the study approval or after the expiration date.

- All unanticipated or Serious Adverse Events (SAEs) must be reported to NASREC within 5 days.

- All protocol modifications must be approved by NASREC prior to implementation unless they are intended to reduce risk (but must still be reported for approval). Modifications will include any change of investigator/s or site address.

- All protocol deviations must be reported to NASREC within 5 working days.
- All recruitment materials must be approved by NASREC prior to being used.

- Principal investigators are responsible for initiating Continuing Review proceedings. NASREC will only approve a study for a period of 12 months.

- It is the responsibility of the PI to renew his/her ethics approval through a renewal application to NASREC.

- Where the PI desires to extend the study after expiry of the study period, documents for study extension must be received by NASREC at least 30 days before the expiry date. This is for the purpose of facilitating the review process. Documents received within 30 days after expiry will be labelled "late submissions" and will incur a penalty fee of K500.00. No study shall be renewed whose documents are submitted for renewal 30 days after expiry of the certificate.

- Every 6 (six) months a progress report form supplied by The University of Zambia Natural and Applied Sciences Research Ethics Committee as an IRB must be filled in and submitted to us. There is a penalty of K500.00 for failure to submit the report.

- When closing a project, the PI is responsible for notifying, in writing or using the Research Ethics and Management Online (REMO),both NASREC

- and the National Health Research Authority (NHRA) when ethics certification is no longer required for a project.

- In order to close an approved study, a Closing Report must be submitted in writing or through the REMO system. A Closing Report should be filed when data

collection has ended and the study team will no longer be using human participants or animals or secondary data or have any direct or indirect contact with the research participants or animals for the study.

- Filing a closing report (rather than just letting your approval lapse) is important as it assists NASREC in efficiently tracking and reporting on projects. Note that some funding agencies and sponsors require a notice of closure from the IRB which had approved the study and can only be generated after the Closing Report has been filed.

- A reprint of this letter shall be done at a fee.

- All protocol modifications must be approved by NASREC by way of an application for an amendment prior to implementation unless they are intended to reduce risk (but must still be reported for approval). Modifications will include any change of investigator/s or site address or methodology and methods. Many modifications entail minimal risk adjustments to a protocol and/or consent form and can be made on an Expedited basis (via the IRB Chair). Some examples are: format changes, correcting spelling errors, adding key personnel, minor changes to questionnaires, recruiting and changes, and so forth. Other, more substantive changes, especially those that may alter the risk-benefit ratio, may require Full Board review. In all cases, except where noted above regarding subject safety, any changes to any protocol document or procedure must first be approved by NASREC before they can be implemented.

Should you have any questions regarding anything indicated in this letter, please do not hesitate to get in touch with us at the above indicated address.

On behalf of NASREC, we would like to wish you all the success as you carry out your study.

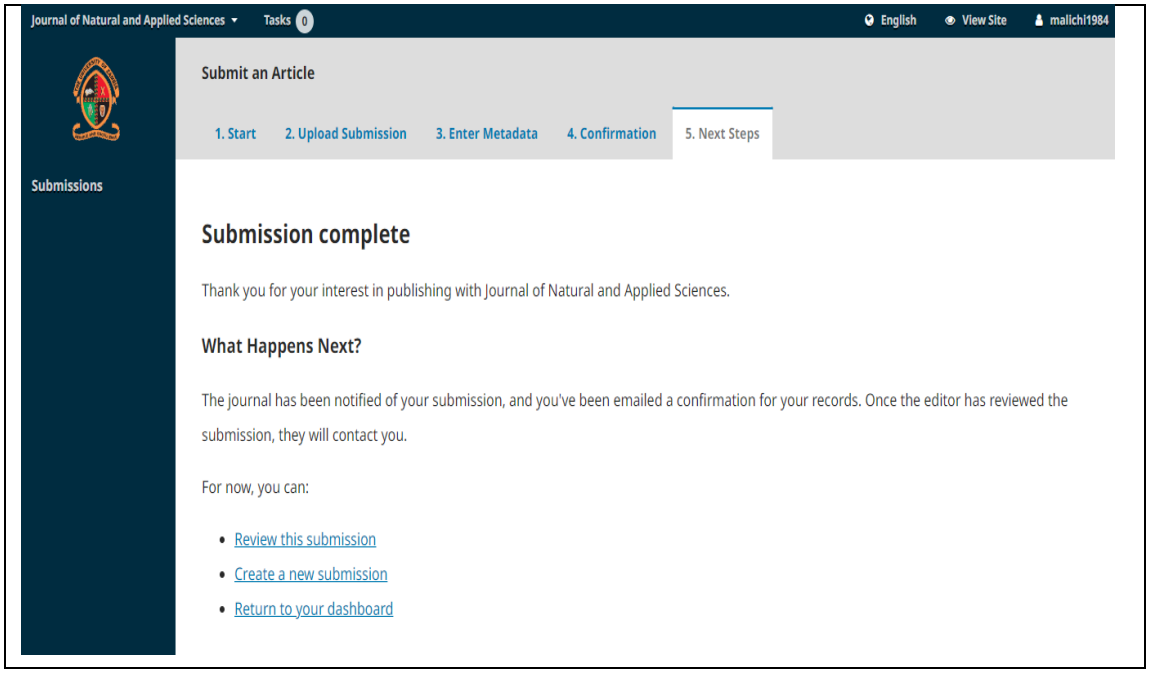
Yours faithfully,

Dr. Mususu Kaonda

VICE-CHAIRPERSON
THE UNIVERSITY OF ZAMBIA NATURAL AND APPLIED SCIENCES
RESEARCH ETHICS COMMITTEE - IRB

CC: Director, Directorate of Research and Graduate Studies
Assistant Director (Research), Directorate of Research and Graduate Studies
Assistant Registrar (Research), Directorate of Research and Graduate Studies

APPENDIX J: PROOF OF SUBMISSION OF TRANSCRIPT FOR PUBLICATION



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