TAF ASSESSMENT OF THE FAECAL SLUDGE TRANSFER STATION

Report

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Abbreviations

ATC	- Appropriate Technology Centre for Water & Sanitation
CapEx	- Capital Expenditure
CapManEx	- Capital Maintenance Expenditure
ENGSOL	- Engineering Solutions
FGD	- Focus Group Discussion
FS	- Faecal Sludge
FSTS	- Faecal Sludge Transfer Station
GIZ RUWASS	- GIZ Reform of the Urban Water and Sanitation Sector
KCCA	- Kampala Capital City Authority
LC	- Local Council
MWE	- Ministry of Water and Environment
NWSC	- National Water & Sewerage Corporation
O&M	- Operation & Maintenance
OpEx	- Operational Expenditure
TAF	- Technology Applicability Framework
UGX	- Uganda Shillings
USD	- United States Dollar
VHT	- Village Health Team
WASH	- Water, Sanitation and Hygiene
WASHtech	- Water, Sanitation and Hygiene technologies
WfP	- Water for People

Content

1.0 Introduction

Under the Resource Recovery and Safe Reuse (RRR) Project Phase II, two mobile Faecal Sludge Transfer Stations have been piloted from April to June 2017 within informal urban settlements in Kampala.

1.1 Overview of the Faecal Sludge Transfer Station (FSTS)

The piloted mobile FSTS consists of a 5,000 ltr tank made from a modified grounded Kampala Capital City Authority (KCCA) cesspool truck, whereby the tank has been detached from the rest of the truck and placed on a chassis with wheels that can be pulled by a tractor. Two FSTS have been built for the pilot and the cost of one modified FSTS was USD 7,000 - 8,000 (25,340,000 – 28,960,000 UGX). The mobile FSTS are managed by a private entrepreneur, who has employed an operator to manage the FSTS on his behalf. A tractor driver is employed as well to move the FSTS from place to place. Hence the FSTS are also referred to as “mobile” FSTS because they allow for easy movement from one point to another to provide the required service.

The FSTS are hauled by one tractor to the respective pilot areas (one ward in each of Kampala’s five divisions), where they operate rotationally according to a schedule to serve the users. The gulpers (operators of a semi-mechanical pumping system for pit emptying) pay a fee of 3,000 UGX to the operator for emptying a barrel of 200 ltr. into the FSTS. In total, it takes 25 barrels to fill the tank of the FSTS. The faecal waste (FS mixed with solid waste) from latrines is loaded by the gulpers into a holding container attached to the side of the tank. The FSTS operator or the gulper then uses a pulley system with rails to move the holding container up on one side of the tank to the top and empties the faecal waste into the tank via an opening at the top of the tank. The operator/gulper then lowers the holding container back into a low position where it can receive fresh waste.

On filling the FSTS, the operator of the FSTS then hauls it using a tractor to the treatment plant. There are two dumping site options for emptying the FSTS: the NWSC Bugolobi treatment plant; and NWSC Lubigi treatment plant. However, the Bugolobi plant is preferred by the operator because it has capabilities to screen out solid waste that is commonly disposed of in latrines by their users. The Lubigi treatment plant uses inlet pipes instead of screens which may be blocked by the solid waste.

The tank sits on a chassis and has a hydraulic system that enables it to tip and pour faecal waste into the receiving chamber at the treatment plant. While the tank has a valve that is operated manually to remove waste through a spout at the back end of the tank, the back end of the tank also has a lid that can be fully opened to remove the waste. This lid is frequently used due to the high composition of solid waste including polythene bags in the FS.

The FSTS model operates on the premise that gulpers will find it more financially viable to empty the faecal waste into a nearby FSTS than to haul the waste directly to a treatment plant. It is also necessary that the FSTS entrepreneur will generate enough revenue from the fees collected from the gulpers to cover fuel, FSTS operator’s wages, and other related costs and realize a profit. Typically, a filled tank generates revenue of 75,000 UGX. Typically, it takes one to three days to fill. This rate is expected to reduce to one day when the schedules of the FSTS are better known to the communities as a result of ongoing campaigns to market the FSTS services.

The FSTS design is an innovation of Water for People (WfP) supported by GIZ RUWASS under a co-funding arrangement with the Swiss Development Cooperation (SDC). The technical details of the design have been implemented by Engineering Solutions (ENGSOL).

Fig.1: Mobile Faecal Sludge Transfer Station in Kibuye 1, Source: Kimera (2017)

1.2 Current Experiences with the Technology

The FSTS technology will ultimately be piloted in 5 wards, namely Kamwokya II, Kanyanya, Kibuye I, Mutungo II and Natete. At the time when the assessment was carried out, the FSTS system had been tested and in operation in Kibuye for a total of three months, with a short service period in Kanyanya. During this operation time, active promotion of the transfer station has been ongoing with a brand name 'wetaase'[1] developed and flyers utilized. Some gulpers within Kampala have been engaged to utilize the FSTS as an alternative to dumping directly at the treatment plant. Residents have responded positively when mobilized through the Local Council 1 [2] and heeded the call to utilize the lower emptying fees associated with the FSTS. The FSTS has also been found capable of handling solid waste disposed of in toilets that cesspool trucks are unable to deal with.

1.3 Geographical and Socio-economic Context

The FSTS is being piloted in Kampala under the regulation of KCCA. The technology is the brain child of WfP and draws from challenges when working with gulpers in past projects. It was designed to primarily serve unplanned (informal) settlements in Kampala that are typically densely populated, feature unlined pit latrines and are inhabited by majorly poor residents that generally cannot afford the costs of cesspool trucks to empty their latrines. This is compounded by the fact that these areas have generally poor accessibility to individual households including narrow alleyways.

It is also a common practice for household users to dispose solid waste into the latrines as well as for soil from the unlined pit latrines to mix with the sludge reducing its fluidity and thereby rendering cesspool trucks useless to empty such latrines.

[1] "Weetase" is Luganda and means "Help yourself".
[2] Local Council 1 is a form of local elected government at the village level

In the absence of affordable emptying services, some residents have been known to illegally release FS into storm water drains during heavy rainfalls, therefore raising the risk of disease outbreaks. GIZ RUWASS, KCCA and WfP have therefore been keen to make the costs of pit emptying more affordable for households to help minimize such practices.

1.4 Technology Applicability Framework Application

The Technology Applicability Framework (TAF) was applied to the FSTS to understand if it will be sustainable and scalable, if it will meet users' needs and to generally capture experiences related to the technology drawing together the various actors involved in its introduction. This report captures the findings of an evaluation of the FSTS in Kampala after nearly three months of operation. The objectives of the TAF application are listed below:

- To share experiences about the FSTS, including potential challenges and necessary improvements;
- To assess the uptake of the services provided by the FSTS;
- To assess the potential of the FSTS to address bottlenecks in FS management in Kampala;
- To assess the readiness of the sector to take up this technology.

2.0 Methodology

2.1 Training of the Study Team

The training of the study team on the use of the TAF took place on the 29th of June 2017 at the GIZ RUWASS office. The study team comprised of seven resource persons from the Appropriate Technology Centre for Water & Sanitation (ATC), GIZ RUWASS, WfP, KCCA, Makerere University's School of Public Health and WaterAid. The training gave an overview of the project by GIZ RUWASS, followed by a presentation on the FSTS by WfP. The presentation revealed that the FSTS has been in use for three months that it offers lower costs to households for pit emptying services and that two gulpers have been engaged to actively support the FSTS. The FSTS are currently managed by an entrepreneur employing a person in the field to operate the FSTS.

The study team viewed a five-minute video developed by the WASHtech project. It provided a concise summary of the TAF and the different steps involved and therefore provided a useful introduction of the upcoming work to be implemented by the study team over the course of the next two days, and later during the scoring workshop.

This was followed by a presentation explaining the rationale behind the TAF, the technology introduction process, the target users of the TAF and the different steps in the TAF, summarizing the TAF manual. All participants received a copy of the manual for further reading.

After understanding the TAF process, the participants were introduced to the specific questionnaire developed for application to the FSTS, in particular questions related to the users. For the purposes of this TAF application, the user groups comprised of: end users (households); and primary users (gulpers) who have a direct interface with the FSTS. The user guiding questions were examined for the social, economic, environmental, legal/institutional, skills/knowhow and technology dimensions. The relevance of each indicator was explained as well as the usage of the tool in the field. Furthermore, the additional two key perspectives apart from the users were presented, namely the perspectives of the producer/provider, in this case the entrepreneur/operator of the FSTS and WfP, and the regulators, KCCA and NWSC.

2.2 Field Assessments

The field assessment started on 29th June 2017 with a visit to Kibuye 1 by the entire study team to get an idea for the FSTS. The entrepreneur explained and demonstrated the operation of the transfer station. The team appreciated the sophisticated loading mechanism of the transfer station and the fact that there was no odour around it. However, it was noted that there was some spillage of sludge from the outlet valve of the tank to the ground. The team split into two groups with WaterAid, ATC and WfP forming the first team and interacting with the household representatives in Kibuye 1 while the second team comprising of ATC, Makerere University School of Public Health, KCCA and GIZ RUWASS interacted with household representatives in Kanyanya. In both cases, Focus Group Discussions (FGD) were used to capture the users' perspectives. In Kanyanya, six participants attended the FGD and eight participated in

Kibuye 1. The participants in both groups included residents, the Chairpersons of the villages and members of the Village Health Teams (VHTs)[3].

The second day of the field assessment, 30th June 2017, the two teams collected the perspectives of other stakeholders. One team interviewed the Program Manager of WfP at the WfP offices and the FSTS entrepreneur at the GIZ-RUWASS offices for a collective perspective of the producer. The other team interviewed the Project Manager of the Kampala Faecal Sludge Management (KFSM) Programme at the KCCA offices and a Sanitation Engineer of NWSC at the NWSC treatment plant in Lubigi.

On 1st July 2017, an interview was held with a gulper representative to round off the user perspective with regard to the FSTS. This was conducted on-site in Kitintale where he and his team were emptying an unlined pit latrine. This interaction provided a deeper understanding of pit emptying for unlined pits, in particular with regards to the menace of solid waste, especially plastics, disposed of in latrines and the limitations of the gulper in such situations. He revealed that the gulper is not effective for dense latrine situations that are littered with solid waste and yet this is the status of most of the latrines in the pilot areas. Indeed, during this site visit, the team witnessed the gulper using a 10 ltr. jerrycan attached to a rope to remove FS from the latrines.

2.3 Validation of Field Data

On 30th June 2017, the study team reviewed the field data at the GIZ RUWASS offices. The respective team that collected the data presented it to the entire study team. In particular, the two groups shared data from the field for documentation and to gauge similarities and differences within a particular but also across the different perspectives. This data was compiled for the presentation to a larger group of stakeholders during the upcoming scoring workshop.

2.4 Scoring

A scoring workshop was held on 5th July 2017, which was attended by the study team members, representatives from the different key stakeholder perspectives (users, producer/provider, and regulator) as well as public and private sector representatives and organizations working in the area of FS management in Kampala[4].

[3] The participant lists are available in the annex.
[4] The participant list is attached in the annex.

Fig.2: Proceedings of the scoring workshop, Source: Redlich (2017)

The purpose of the scoring workshop was to stimulate discussion and debate with regard to the assessment findings, especially to identify blockages to sustainability and the scaling up of the FSTS as well as to score using a standard traffic lights system, representing the eighteen indicators of the technology aligned to the three key perspectives of the user, producer/provider and regulator.

3.0 Results

The following chapter will present the main findings according to the different key perspectives and sustainability dimensions. The sustainability dimensions include social, economic, environmental, institutional & legal, skills & knowhow and technology. The key perspectives includes the user/buyer perspectives. In this case, they refer to both the household users and gulpers who ultimately utilize the FSTS and provide a service to the communities. The producer/provider perspective is representing the service provider related to the technology, in this case WfP and the FSTS entrepreneur. The regulators were identified as KCCA and NWSC. MWE, the overall regulator of the WASH sector, was involved in the scoring workshop.

The assessment was based on a questionnaire considering 18 indicators. The graphical representation below (Fig. 3) shows how each indicator was scored, while the meaning of the scores is shown in Fig. 4.

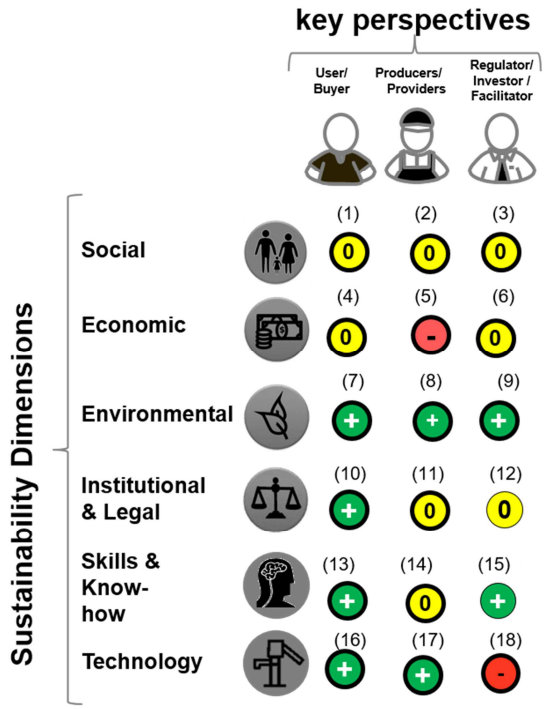

Fig.3: Graphical presentation of TAF scoring for FSTS

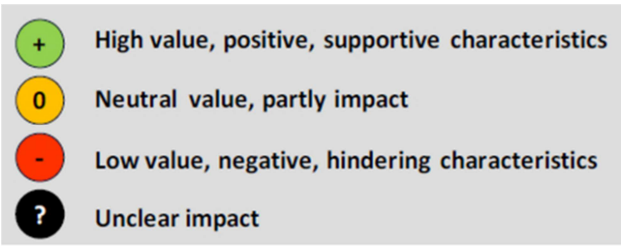

Fig.4: Meaning of TAF scores

3.1 Social

3.1.1 User

Communities expressed a demand for lower cost options for pit emptying with a reported 60% of the latrines in the study area full but emptying costs considered prohibitive. The lower costs associated with emptying using the FSTS have the potential to reduce on the practice of emptying FS into storm water drains which is common.

Before the use of the FSTS, emptying services costs were in the range of 70,000 – 120,000 UGX for a cesspool truck, while gulper emptying services cost 30,000-40,000 UGX for a 200 ltr. barrel. The costs for the households reduced to 20,000 UGX per barrel when the FSTS is used by the gulper[5]. In this regard, the FSTS is a suitable solution for the urban poor, which can solve some of the current sanitation challenges in informal settlements. The gulpers however expressed the fact that even with the FSTS, they still require a means of transportation for their equipment and barrels to the households, making it unprofitable for them to operate in this model of the FSTS.

The technology is not hindered by any cultural or religious taboos. However, there is need to mobilize the community to use the services, including the community of gulpers on whom the FSTS relies. A suggestion during the scoring workshop was to identify a contact person within the respective communities who is tasked with the mobilization of the communities to make use of the FSTS and with the identification of a location for siting the FSTS. He/she would be in contact with the communities and the FSTS entrepreneur to provide information on the respective demand level. However, the person would need to be paid for their services and therefore this cost would need to be factored into the business model.

Due to the imbalance with regard to meeting the needs of the gulpers, representing a critical user group for the FSTS, this indicator was scored neutral. This is because the households were happy with the reduced emptying costs, but the gulper operators were unhappy and some of them preferred to dump their waste directly at the treatment plant than at the FSTS. It was revealed that the model only works profitably for gulpers who own a (cheap) means of transportation (tricycle) for carrying the full barrels from the household to the location of the FSTS.

Fig.5: Gulper/ Emptier disembarks from truck after filling barrels with sludge, Source: Kimera (2017)

[5] More details on costs under the economic section

3.1.2 Producer/Provider

The technology provider (WfP) observed that gulpers were aware about the FSTS although not all were on board yet. WfP singled out two gulpers as being on board with the FSTS and noted that some were still skeptical.

The FSTS operator had a positive outlook and cited the fact that many users cannot afford 100,000 UGX for a cesspool truck. The Capital Expenditures (CapEx) were not met by the users nor the entrepreneurs. The technology provider (WfP) assessed that subsidizing CapEx for this technology is necessary and issues regarding demand and expectations for the technology may be discovered through alignment with the KCCA call centre that disaggregates data to include statistics on emptying services. An advertising agency, NOMAD, is running a campaign to promote the FSTS in the five pilot wards. This campaign frequents KCCA bazaars and uses staff on the ground to attract the attention of communities. Schedules for the FSTS have been developed and are being marketed so that communities are aware when the FSTS will be in a particular ward to give them opportunity to mobilize funds ahead of time for emptying. The entrepreneur however believes that advertising on television, especially on popular (local) news shows such as 'Agataliko nfuufu' and 'NTV akawungezi' would have more impact.

The workshop scored this indicator neutral. Although it was agreed that the resources for technology promotion and market research are available presently, WfP indicated that this is for the interim period. If substantial resources are not available to the entrepreneur in future, it may disrupt the momentum for penetrating the market.

3.1.3 Regulator

The regulators (NWSC, KCCA) noted that communities relied on private operators for pit emptying services including gulpers and cesspool trucks. KCCA further noted that some people use illegal methods such as manual emptying and dumping the sludge into the nearby drains at night. Both regulators use call centres for demand creation and feedback to users. KCCA also utilizes this channel to connect communities to pit emptying service providers. The regulators lamented the practice of dumping solid waste into latrines, as well as the high dense nature of sludge from unlined latrines as it requires more sewerage/extra water to make it less dense for treatment. NWSC has also observed chemical and petroleum pollutants to be a part of the sludge delivered to the treatment plant. The costs of handling such pollutants are not charged to the polluter. KCCA has established minimum standards for onsite sanitation facilities in Kampala, which require lining of latrines for new structures. It is using enforcement measures to create demand with positive results in Kamwokya for emptying services, although the gulping services lag behind cesspool emptying. This shows a need for more marketing of gulping services and therefore also the FSTS. NWSC's mandate does not allow them to go to the source of the sludge, but they have sensitized operators about the kind of sludge their facilities can handle. They also sensitize communities through their in-house programmes.

Considering the fact that there is a need for behavioral change amongst community members, in particular with regard to the need for sensitization of communities not to dispose solid waste into latrines, there wasn't enough impetus to score this indicator positive, completing a trilogy of neutral scores across all perspectives for the social indicators.

3.2 Economic

3.2.1 Users

The household users thought that the 20,000 UGX charged per barrel in the FSTS model was reasonable, although still not affordable for all. In contrast, one of the gulpers, present at the scoring workshop, demonstrated that the cost of 20,000 UGX per barrel while requiring the gulpers to pay 3,000 UGX per barrel at the FSTS made using the FSTS less attractive and more costly than dumping the FS directly at the treatment plant where a single fee of 10,000 UGX is charged, regardless of the number of barrels delivered by the truck. During the scoring workshop, it was outlined that this calculation was highly dependent on the type of transport used by a gulper. The usage of an (ideally gulper owned) tricycle would be the best option for transportation while dumping at the FSTS as the fuel costs are lower than the costs of fueling and/or hiring a pick-up truck.

This indicator was scored neutral. While the household users considered the cost positively, the gulpers found it highly punitive and some preferred to continue charging 30,000 UGX and dump directly at the NWSC treatment plant.

Table 1: WfP Gulper cost model

Item	Cost in UGX
Price per barrel	20,000
12 barrels (2 day average)	*240,000*
Total cash inflow	**240,000**
Dumping fees	36,000
Fuel	10,000
Disinfectant	5000
Labour	40,000
Projected Expenses	**91,000**
Net profit	**149,000**

Table 2: Gulper's cost scenario with FSTS

Item	Cost in UGX
Price per barrel	20,000
10 barrels	200,000
Total cash inflow	**200,000**
Vehicle hire	100,000
Labour (2 people)	60,000
Dumping fee at FSTS	30,000
Net Profit	**10,000**

Table 3: Gulper's cost scenario without FSTS

Item	Cost in UGX
Price per barrel	30,000
10 barrels	300,000
Total cash inflow	**300,000**
Vehicle hire	100,000
Labour (2 people)	60,000
Dumping fee at treatment plant	10,000
Net Profit	**130,000**

WfP's cost model (table 1) takes into account fuel costs of 10,000 UGX, while the Gulper (table 2) takes into account hiring a truck at 100,000 UGX. In WfP's cost model, it is assumed that the Gulper owns tricycle. Without the lower transportation costs offered by the tricycle, the Gulper sees no incentive to use the FSTS to get a marginal profit of 10,000 UGX. As table 3 shows the Gulper makes a remarkable profit when charging 30,000 UGX per barrel while having to hire a pick-up.

3.2.2 Producer/Provider

The table below shows the FSTS entrepreneur makes a profit of 5,000 UGX with the assumption that the FSTS fills up in one day, the tractor waits for it to fill and tows it away immediately to the NWSC treatment plant after filling. Otherwise, the fuel would cost 30,000 UGX and the entrepreneur would make a loss.

Table 4: FSTS entrepreneur cost scenario

Item	Cost in UGX
Price per barrel	3,000
25 barrels (per day, also current TS capacity)	75,000
Total cash inflow	**75,000**
Dumping fees	10,000
Disinfectant	5,000
Operator	15,000
Fuel	20,000
Driver	20,000
Total expenses	**50,000**
Net profit	**5,000**

The cost of the modified FSTS for this pilot was USD 7,000 - 8,000 (25,340,000 – 28,960,000 UGX). One tractor serves the two FSTS under the project design. The provider of the technology believes it was profitable if it would fill up 4-5 days a week. The entrepreneur hopes to leverage on a reduction on the driver's costs through operating more FSTS simultaneously. He could pay the driver a flat rate of 40,000/- for towing up to five transfer stations a day. WfP envisages that the technology will be fully developed by the end of the year. There are potential funding options for the FSTS entrepreneurs from banks, notably Centenary Bank and Post Bank.

Given the slim to no profit margin for the entrepreneur, this indicator, on whether there is a likely chance that the FSTS entrepreneur can generate sufficient revenues to cover product development and promotion, was scored negative as it was considered to have hindering characteristics. Contributory to this negative score was the appreciation of the fact that the provider has a project timeframe in which to operate and may not provide the same level of support to the entrepreneur after the end of the project.

3.2.3 Regulator

In NWSC's view, subsidies are helpful but it would be advisable to research about subsidization within other sectors for learning purposes. The technology is still new and therefore no guidelines exist on how it may be subsidized. KCCA would consider subsidizing this technology especially if it proves to meet a need.

This indicator was scored neutral. Funding would be possible particularly because it would solve a menacing problem. However, the nature and form of such a subsidy needs to be addressed thoroughly. It is considered possible that such subsidies may be in-kind and not necessarily monetary.

3.3 Environmental

Users, namely the gulpers, know how to use the technology. The technology reduces the risks of spillage by reducing the haulage distance of the barrels filled with FS. There is also an indirect benefit to the environment due to the reduction in illegal dumping of FS resulting from an affordable pit emptying option. The transfer station was produced locally and ENGSOL believes that although a grounded cesspool truck was used this time to provide the tank, all parts may be fabricated locally, repaired locally and spares are available.

The environmental indicators were all considered positive across the 3 key perspectives because of the potential to reduce pollution and the potential for local production without negative environmental impacts. Furthermore, an environmental impact assessment cleared the operation of the technology. Besides the overwhelming positive feedback for the technology on the environmental indicators, a few points of concern need to be addressed for further use (e.g. the need for a locking mechanism of the valve to avoid spillage caused by curious residents through opening the valve when the FSTS is left unattended as well as weak enforcement of laws and regulations by the regulators).

3.4 Legal/ Institutional

3.4.1 User

Operation & maintenance (O&M) is currently still handled by ENGSOL under a warranty period. It is likely that the entrepreneur will take greater responsibility for this in future. The level of O&M carried out currently on the FSTS is sufficient as it is still under warranty by ENSOL. The entrepreneur is expected to take over this responsibility in future. It is not clear how O&M may be managed over the long term though particularly without the support of the provider and KCCA. Users in Kibuye 1 suggested that KCCA could employ staff for operating the FSTS.

This indicator has a positive score because KCCA has the will and ability to provide technical, management and financial support for O&M over the long term. Despite the positive scores, enforcement capabilities of KCCA are considered weak.

3.4.2 Producer/Provider

Ultimately, the entrepreneur will need an operating license in future but in the meantime KCCA has created an enabling environment for the pilot that has allowed the FSTS entrepreneur to operate legally. Since the technology is new and it deals with a problem that has hitherto not been effectively dealt with, specific guidelines and regulations need to be developed.

The initial expectation of using KCCA's garbage skips areas for parking the FSTS was not fulfilled and therefore there has been reliance on the LC 1 chairpersons with regard to where to station the FSTS.

This indicator was scored neutral. Although regulation is conducted by KCCA, its enforcement is weak. Furthermore, the absence of land for the transfer stations presents some risks as it is currently at the mercy of people who accept to have the transfer station parked on their land.

3.4.3 Regulator

KCCA has the mandate to regulate this technology and the services it provides. On alignment and compliance of the technology with national quality standards, the score was neutral since the

technology is new and standards are yet to be developed. In addition, strengthening capacity for quality control of the FSTS is required. The technology scores well on alignment with guidelines but this is counter balanced by weak enforcement and quality control.

3.5 Skills & Knowledge

3.5.1 User

From the gulpers' perspective, the technology is slightly more complex to use than other technologies although the complexity does not inhibit its use. The pulley system for dumping the FS in the tank is slower than pouring the waste into barrels which decreases the work rate for the gulpers and therefore the number of barrels that can be collected a day. However in fronting this argument, the gulpers did not take into account the travel time to the treatment plants in Bugolobi/Lubigi and the fact that they would have to offload and empty each barrel at the treatment plant. A cross-section of gulpers have the capacity to use the FSTS though this is not critical since the station has an operator. Still, follow-up trainings are planned to reach more gulpers.

The operator has a good level of skills and capacity to manage the new technology, therefore the indicator was considered to have positive supporting characteristics.

3.5.2 Producer/Provider

The entrepreneur understands the business well and has sufficient business and technical skills as an owner of a cesspool truck. He was involved in the cesspool emptying business before being introduced to the FSTS. He may require external support with the promotion and development of a business model. WfP currently provides business and technical support. The entrepreneur does not have enough resources for after sales services although the KCCA call centre provides means to follow up with customers to an extent.

The indicator was scored neutral because whereas there are capacities within KCCA to provide technical advice and support for the introduction of the new technology, a cost model that ensures competitive affordable rates and a viable business is not yet in place.

3.5.3 Regulator

National and local water and sanitation sector actors are now coordinated under the Kampala WASH Forum. This forum can be used to coordinate the activities of different actors who may be involved in the process of technology introduction. KCCA may not be able to allocate adequate resources to follow-up the introduction of the FSTS over the long term. Its preference would be to play a regulatory role, as the entrepreneur develops capacity to follow up on technology introduction. Potential clients may get non-biased information on sanitation technologies and services through the KCCA call centre. It will be fully developed by the end of 2018.

Capacities and financial resources exist at both national and city level to provide adequate technical advice and support for the new technology. Therefore, this indicator was scored positive.

3.6 Technological

3.6.1 User

Other sanitation technologies such as the cesspool trucks are limited in their capacity to handle dense FS. Users at the household level expect this technology to be more affordable and address the technical limitations of existing technologies. The new technology has been designed to address the end user's cost needs and has better capacity to handle solid waste disposed in latrines.

The indicator was scored positive because there is a likely chance that the technology might exceed user expectations particularly because it can handle the high densities of sludge and solid waste in the latrines. However, lighting at night around/on the transfer station is a necessary addition to ward off the risk of spillage when working in the late evenings.

3.6.2 Producer/Provider

There are many stores and workshops that may be used to deliver spare parts or related services to the entrepreneur. Furthermore, there is a supply chain for other technologies that can be used to supply spares for this technology. User feedback needs to be properly documented through customer surveys, through the councilors, residents or LC 1 chairpersons and through making better use of the KCCA call centre in order to improve the technology constantly.

ENGSOL floated the idea that the tank capacity for the FSTS could be increased up to 10,000 litres since the chassis is strong enough to hold the double capacity, allowing the FSTS to serve more households and generate more revenue from a single location. This would keep transportation costs the same and improve profitability for the entrepreneur. Furthermore, it was suggested to involve the FSTS entrepreneur in the current maintenance repairs by ENGSOL to enhance his skills in identifying and supervising minor repairs at other garages in future. If possible, contacts of mechanics could be shared by ENGSOL with the FSTS entrepreneur so that once the warranty has expired, the entrepreneur has direct contacts of qualified mechanics if repairs are necessary.

This indicator was scored positive because there is potential to set up a viable supply chain for this technology and spare parts in the target region as well as a mechanism for follow-up with users after technology introduction. However, it was noted that the OpEx and CapManEx costs of the components of the FSTS need to be established.

3.6.3 Regulator

There are entrepreneurs interested in the development, implementation and scaling-up of this technology if it can be demonstrated to be profitable. KCCA is willing to partner with the private sector to fill this gap for the urban poor and maintain a regulatory role in the future and disengage from direct support to the business which it believes should stand on its own. The research department of NWSC is also willing in principle to support the producer in development and implementation of a sanitation technology similar to the FSTS. However no direct support to the FSTS is currently available from NWSC. Support from third parties, e.g. development partners, is usually time bound and therefore may not be relied upon for sufficient long term funding to take up and support further development and introduction of this technology.

The final indicator was scored negative because it was judged that the level of supportive structures for new sanitation technologies, especially for funding further innovation and development, is not highly developed in the country. Reliance on donor financing for research and development was seen as undesirable if the government does not prioritize this in its budget and plans.

3.7 Risks

From the presentation of the graphical profile from the scoring workshop above, two indicators were scored negative due to hindering characteristics. The first indicator with a negative score was on profitability. There is a risk that the entrepreneur may not generate sufficient revenues from sales to not only cover product development and promotion, but also to cover important business costs such as operational costs (OpEx) and capital maintenance costs (CapManEx), therefore putting sustainability at risk. Moreover, the FSTS entrepreneur presently relies on only one gulper to utilize the transfer stations. He believes that he will have better profitability if he can access and operate more transfer stations, such as five. It is however unlikely that he will be able to fill five transfer stations relying on one gulper only.

The second indicator with a negative score was related to the inadequacy of support mechanisms to scale up the technology. While this mechanism appears to be strong within the project framework, concern is on the long-term perspective, especially in a model that expects an entrepreneur to make sound business sense out of the FSTS while having marginal profit.

Along the way, it is necessary that a decision is made on what cost model will be used for the introduction, including subsidies or not. If there would be subsidies, the model must show clearly what may be subsidized, whether capital costs, operational costs or replacement costs or whether the entrepreneur or households would receive a subsidy. The role of the FSTS entrepreneur and their responsibility over the FSTS equipment and the tractor must be clearly defined.

3.8 Key Issues for Introduction

The introduction of the FSTS progressed well in the first three months of implementation. The FSTS has been technologically successful as it makes it possible to empty latrines that cannot be emptied by cesspool trucks and households appreciate the lower costs it provides for emptying. The FSTS has also been noted to reduce environmental risks as it improved the procedure from transporting the sludge in barrels with the inherent risk of the barrels tipping and therefore polluting the environment.

In order to scale up, the buy-in of gulpers needs to be enhanced to support the use of FSTS. Improved dialogue between the providers, the entrepreneur and the gulpers has to take place to identify and address the current challenges faced by the gulpers. Furthermore, an improved marketing strategy for the gulpers in the communities has to be implemented simultaneously with marketing the FSTS among the gulpers to ensure an increase of the FSTS usage.

In addition to that, enforcement on illegal emptying practices needs to be enhanced to expand the market for the FSTS. The roles of stakeholders throughout the entire introduction process must be identified and a process to support the technology introduction and scale up must be developed, with clearly defined and accepted roles by the stakeholders to ensure sustainable services.

It is clear that emptying unlined toilets with solid waste dumped in them, make the emptying process with the gulper technology almost impossible. Pit emptying operators instead have to use 5 or 10 ltr. jerrycans to manually remove sludge from the latrines, exposing them to dangerous biological waste often without adequate protective clothing. While minimum standards and behavior change campaigns are underway to improve the standard of toilets and sensitize people not to dump solid waste in latrines, more innovation is necessary in the interim to handle waste from these poorly managed toilet facilities. Furthermore the use of wide open containers when transporting sludge from the toilet to the transfer station needs to be minimized and alternative solutions need to be found.

4.0 Conclusion & Recommendations

There is a potential for the FSTS to be introduced and scaled-up in Kampala to provide lasting, pro poor services. It addresses the issue of inaccessible latrines in a way that cesspool trucks have not been able to. It must be appreciated that behavior change must be an integral part of the change process, addressing issues such as the dumping of solid waste in toilets as it complicates the emptying, treatment and handling of FS. Furthermore, the issue of illegal dumping of FS in the drainages (at night, during rains) has to be emphasized and addressed within the communities through KCCA and the local leaders in the villages. Therefore, sustained behavior change campaigns over the long term are necessary.

In order to realize the full potential of the FSTS, an honest discussion has to be launched between the main stakeholders involved in the FSTS with a focus on enhancing the understanding of their (economic/financial) needs and ensuring a viable business model that works for everyone. This includes the users (households and gulpers), the provider (WfP), the producer (FSTS entrepreneur) and the regulators (KCCA and NWSC). The discussion of results stimulated by this TAF application must be fostered and encouraged in order to identify blockages and to deal with those accordingly. Alongside this, the gulper system needs to be more and better promoted in the communities to increase the usage of the FSTS and with this the business and environmental potentials of the approach.

The enforcement by KCCA has been evaluated as too weak and susceptible to corruption by wrong doers when caught in the act. Whereas strides are being made to minimize this, the campaign against corrupt tendencies should be enhanced as KCCA needs to be viewed as an actor against illegal emptying activities.

A clear technology introduction process needs to be defined with clear identification of stakeholders involved, including their roles and responsibilities at each stage of the introduction process. Champions for the technology need to be identified within the key organizations involved. There is need for an organizational set-up to steer the process of introducing and implementing the technology that will make key decisions on the cost model to be used and ensure planning for financial and human resources to support the introduction process. Furthermore, regulators such as KCCA, NEMA and the MWE must be involved to support and guide the implementation of the technology.

This steering set-up may consider the need to integrate the gulpers as part of the business or whether re-orienting gulpers within Kampala and making the use of the FSTS more attractive to them would suffice.

Generally, the technology is valued good and has shown an ability to overcome barriers such as unaffordable emptying service prices, handling solid waste to a certain extent and handling dense sludge compared to cesspool trucks; whereas practices leading to such problems should in any case be counteracted by enforcing improved latrine designs and behavior change. The technology designer ENGSOL also suggested that the FSTS may be simplified by installing the tank with a tilt for easy emptying rather than the costly hydraulic system for tipping the truck, especially if costs for capital expenditure could be borne by the entrepreneur. It was also suggested that since the current chassis design can hold a larger tank, the tank size should be increased to 10,000 ltr. to improve revenues without increasing the unit cost.

5. 0 Annex

5.1 List of Participants for Training on TAF and Field Assessment (Study Team)

No.	Name	Designation	Organization
1	Claire Namanda	Supervisor Environment Management	KCCA
2	Charles Ssemugabo	Research Associate	School of Public Health, Makerere
3	Helen Mwase	Consultant	ATC
4	Faithful Atusinguza	TA FSM & RRR	GIZ
5	Solomon Kyeyune		WaterAid
6	Paul Kimera	Consultant	ATC
7	Martin Mawejje	Sanitation Engineer	Water for People

5.2 Focus Group Discussion Participants – Kanyanya Lutunda Zone

No.	Name	Designation	Village/Ward
1	Solomon Ndaaka	L.C.1/VHT	Kanyanya
2	Ason Mukasa	L.C.1./VHT	Kanyanya
3	Priscilla Kobusingye	L.C.1/ VHT	Kanyanya
4	Godfrey Muyira	Vice chairman/ VHT	Kanyanya
5	Meddy Kawooya	Household member	
6	Joel Kawwule	L.C.1 General Secretary	Kanyanya

5.3 Focus Group Discussion Participants – Kibuye 1

No.	Name	Designation	Village/Ward
1	Samuel Sebuguzi	L.C.	Kibuye 1
2	Sula Nyanzi	Household member	Kanakulya
3	Musa Busulwa	Household member	Kanakulya
4	Margaret Sserwada	Household member	Kapeke
5	Muwonge	Household member	NA
6	Aisha Kitalikikyo	Household member	Kapeke
7	Halima Nakatta	Household member	Kapeke
8	Jallia Galiwango	Chairperson	Kapeke

5.4 Scoring Workshop Participants

No.	Name	Designation	Organization
1.	Sebuguzi Samuel	L.C. II Chairperson	Kibuye 1
2.	Paul Kimera	Senior Research & Development Officer	ATC
3.	Ramona Redlich	Consultant	GIZ RUWASS
4.	Janka Rokob	Head of Component	GIZ RUWASS
5.	Raymond Tumuhairwe	Program Assistant	UWASNET
6.	Peter Otim	Production Manager	ENGSOL
7.	Isaac Turinawe	Gulper	Teri Kigana

8.	George William Kibuuka	FSTS Entrepreneur	
9.	Allan Nkrunziza	Project Manager	KCCA
10.	Charles Ssemugabo	Research Associate	Makerere School of Public Health
11.	Godfrey Mutira	VHT	Kanyanya
12.	Charles B. Niwagaba	Associate Professor	Makerere University
13.	Stephen Tusingwire	Senior Engineer & Sanitation Officer	MWE/WSDF-C
14.	Martin Owiny	Engineer	NWSC
15.	Clare Namanda	Supervisor, Environmental Management	KCCA-DPHE
16.	Martin Mawejje	Sanitation Engineer	WfP
17.	Brenda Achiro	PM	WfP
18.	Faithful Atusinguza	TA FSM & RRR	GIZ RUWASS
19.	Trinah Kyomugisha	EHO	MWE
20.	Naluwagga Priscilla	FAA	WfP