

A Survey of Exhauster Trucks

Juba, South Sudan



USAID
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SUNWASA
Sustainable Water and Sanitation in Africa

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Implemented by:

Tetra Tech ARD
159 Bank Street, Third Floor
Burlington, VT 05402 USA
Tel: (802) 495-0282
Fax: (802) 658-4247

SUWASA Africa Regional Office
P.O. Box 38454 – 0623
Nairobi, Kenya
Tel: [254] (0) 202 352816/17
Email: info@usaid-suwasa.org,
Website: www.usaid-suwasa.org

Cover Photos: By SUWASA

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Acronyms

CPA	Comprehensive Peace Agreement
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
JICA	Japan International Cooperation Agency
MDTF	Multi- Donor Trust Fund
NBS	National Bureau of Statistics
RSS	Republic of South Sudan
SISP	Sudan Infrastructure Services Project
SUWASA	Sustainable Water and Sanitation in Africa Project
USAID	United States Agency for International Development

Executive Summary

The rapid growth of Juba South Sudan's capital, Juba over the past ten years presents municipal authorities with a multitude of challenges. One of these challenges is providing adequate sanitation facilities for a growing population. Presently, information that would ordinarily be available for planning purposes, including the operation and viability of the very active mechanized exhauster service sector is scarce or absent. As a result, there is a risk that future investments, based on unreliable evidence, will not target areas of the city that should be prioritized. The provision of accurate data regarding current sanitation conditions at both household and city level is a priority for the Government of South Sudan as it looks to make new investments in the city.

The Sustainable Water and Sanitation in Africa (SUWASA) project funded by the United States Agency for International Development (USAID) is supporting the water and sanitation sector of South Sudan and is working with the Juba City Council to plan and prioritize sanitation investments across the city. To fill the current information gaps on the transportation of sludge in Juba City, SUWASA staff developed and undertook a survey of exhauster businesses in December 2013 and July 2014.

The survey produced hitherto unknown information, key being the following:

1. There is demand and a viable market for Fecal Sludge Management in Juba:

The large number of trucks in the city together with the apparent preference for mechanical emptying compared to manual emptying shows that there is a demand for exhauster services in Juba. This demand which is from all categories of users but especially domestic and commercial, can only be expected to grow as the city expands. If properly harnessed, this demand translates into a viable fecal sludge transportation market which at estimated fecal sludge generation rates of only 11.55 liters per capita, and current emptying fees of US\$122 could amount to over US\$21 million per year.

2. There is an Overwhelming Private Sector Response:

The demand for exhauster services in Juba has been met by an overwhelming response from the private sector. The exhauster trucks are either owned and managed by individual entrepreneurs or registered companies that may also operate other business ventures. Based on the survey results there are a total of 150 exhauster trucks of which 94% are owned by the private sector while the rest are owned by either the Municipality or other government institutions. Part of the reason that the private sector has responded positively is not only due to the lack of a sewer network but also due to an enabling policy environment. Even though there is no standalone sanitation policy in South Sudan, the existing policy framework contained in the Local Government Act, the Water Policy and the WASH Strategic Framework provides for participation of relevant key actors in particular the private sector.

3. Public Sector Has Key Regulatory Role to Play:

The positive response of the private sector means that the role of the public sector should focus on regulation and providing an enabling environment for the private sector to bring in more investment and to operate according to required standards. Four areas are particularly important namely; provide and enforce health and safety standards for the exhauster operators both for occupational health as well as environmental standards including safe storage (Parking) of exhauster trucks; explore options to facilitate market improvements and support for the poor including support of discounts or subsidies for the service, improvements in the competitiveness of bidding, or credit services; and monitor conditions and deterioration of exhauster trucks and put in place greater regulation to ensure that they comply with environmental standards.

4. Securing Treatment and Disposal Facilities is Critical:

Juba is fortunate to have a relatively new lagoon at Roton. However, continued functionality of the Roton is not assured. The capacity of the lagoon will also soon be exceeded by the growth in fecal sludge volumes as the city continues to expand. In order to safeguard the progress made to date with both the private sector investment in exhauster trucks as well as the public investment in the lagoon, it will be necessary to complete construction of the lagoon and put in place measures for its operation and maintenance as a matter of priority.

5. Exhausters Offer a Key Revenue Potential for the Public Sector but there is need for Ring-fencing:

In order to safeguard the treatment and disposal of fecal sludge in Juba, it is necessary to re-examine and deal with ring-fencing of the US\$1.3m revenues currently being generated in the sector. A system of ring fencing finances generated from the exhauster trucks is therefore necessary for adequate operation and maintenance. In addition, it will also be important to regularize and streamline collection by other public agencies such as the health and safety department, fire brigade, payams, traffic police, etc. to make collection of these fees transparent and accountable.

Further research is required on ownership and operation of the informal exhauster businesses, fees collected by other public agencies but not properly defined, and why there is still some level of manual emptying.

I Introduction

I.1 Background

Following the conclusion of the 2005 Comprehensive Peace Agreement (CPA) interim period and independence for South Sudan in July 2011, the Republic of South Sudan (RSS) continues to face new challenges as it continues to promote peace, development and stability. Since the signing of the CPA, the Government of South Sudan has progressed, but it continues to struggle to meet increasing demand for basic services and to develop a broad economic base beyond the extractive industries. USAID and other development partners have proactively engaged in helping South Sudan meet the challenges of maintaining stability and supporting development while upholding the governance capacity development.

Shortly after the CPA in 2006, South Sudan suffered from significant cholera outbreaks across the country which left more than a thousand people dead. The outbreaks often centered on areas with relatively high population densities such as (peri-) urban and military barracks. At that time the population of the new capital Juba largely consumed untreated water from Nile River and the urban sanitation coverage was estimated to be below 10%, resulting in high mortality rates from water-borne diseases. During this time of emergency, USAID and other development partners invested in emergency responses to the sanitation disaster.

By 2009, it was estimated that urban sanitation coverage in South Sudan had increased to approximately 19% (WSP 2010). However, urban areas such as Juba continue to rapidly expand, whilst basic services such as sanitation have not kept up with this rapid growth. The exact population numbers for Juba remain contested, but in 2005 the population was estimated to be 163,000 while the current population of Juba is estimated to be approximately 500,000.

Despite the significant challenges around urban sanitation, only limited government or donor investments have been made in urban sanitation due to the many competing priorities. The main investment that has been made was by the World Bank managed Multi-Donor Trust Fund (MDTF) which invested in the construction of a wastewater lagoon for discharging septic exhauster trucks on the periphery of Juba.

At the same time, the private sector has stepped in to provide exhauster services throughout the city. At the household level, a survey undertaken by SUWASA in October 2013 revealed that about 40% of households have invested in toilets with septic tanks that can be emptied by vacuum tanker. Mechanical exhausting is therefore widely sought by those with septic tanks and lined pit latrines. In a SUWASA household survey, 20% of household respondents reported that they had exhausted their toilets in the previous 12 months. Of these, the majority (96%) had used a mechanical exhauster, while only 4% exhausted manually. According to the survey, the vast majority (78%) of the population in Juba is currently settled in formal or formalizing areas. The formality of these areas means that the majority of toilets that would be constructed would be at a standard that would either require a connection to a sewer line or to be emptied. Most of toilets however have to be emptied as a sewerage network is almost non-existent in the city. Juba City has two small sewerage systems, of a total five km sewer lines, serving 90 ministerial houses and government offices at the ministerial complex. In total, less than 2% of the city's population has access to this sewer network.

This, together with a very limited piped water network (estimated to serve approximately 25% of the population) means that onsite sanitation facilities will remain the norm in Juba for the foreseeable future. Consequently, sewage exhauster trucks will remain a key part of the sanitation solution in Juba.

Presently, there is little understanding of how the exhauster industry is organized, managed and regulated. What is the scale of the private exhauster industry in Juba? Is it affordable and financially

viable? Are there sufficient regulations to ensure safe collection, transportation and disposal of fecal sludge? These are the questions that this study seeks to address in order to provide a better understanding as a means of providing lessons for future replication and scale up.

1.2 Juba Exhauster Survey

With the above background the SUWASA program undertook this survey of exhauster tanker operations in Juba. The broad objective of the survey was to review operations of exhausters to determine functionality and areas for improvement, replication and scale up.

Through a collaborative process involving the Juba County, Juba City Council and USAID, SUWASA further refined this objective, into actionable research questions as follows:

- What is the size and condition of the exhauster fleet in Juba?
- How are the exhausters operating from a business and service provision point of view?
- What is the policy and institutional framework for the tankers and how are they regulated?
- What are the major financial transactions related to the operation of the tankers including fees paid and profitability?
- What is the potential for a fecal sludge market in Juba?
- What lessons can be drawn from the tanker businesses for future replication and scale up of fecal sludge management in Juba?

This report presents the results of the survey highlighting current operations of exhauster tankers including their ownership, procurement, operation and maintenance, regulation and profitability. The study is one of five studies that SUWASA has undertaken in order to understand the sanitation situation in Juba fully. The other four studies which are also completed include:

- Sanitation mapping and household survey to determine sanitation and hygiene practices
- Survey of public pay per use toilets to determine operations and regulatory environment
- Assessment of the Roton Wastewater lagoon to determine functionality and areas for improvement
- Mapping of institutions involved in sanitation to determine operational effectiveness

The outcomes of this and all the other reports feed into the Juba City Sanitation Reform and Investment Plan.

The rest of this report is organized into four (4) chapters. Chapter 2 presents the methodology used for surveying the exhauster businesses; Chapter 3 presents the findings of the exhauster survey highlighting operations and regulatory framework. Chapter 4 draws some conclusions and recommendations and discusses areas for further research

2.0 Survey Methodology

2.1 Introduction

In order to collect information about the exhauster businesses, the different surveys were undertaken. Two of these targeted exhauster truck drivers at Roton lagoon and the third one survey targeted exhauster business owners and employees at their offices. The first survey of exhauster truck drivers was designed as a way of identifying participants and structuring the latter two surveys. To execute this methodology, the team worked with Juba County authorities and data enumerators. For the later, in some cases, two or more visits were made to ensure that the enumerators met these target respondents. The surveys were undertaken between December 2013 and July 2014.

2.2 Exhauster Survey Design

2.2.1 Definition of Research Questions

The broad objective of the public toilets survey was to understand exhauster tanker operations in Juba and identify areas for improvement. The key research questions were:

- How are the exhausters operating from a business and service provision point of view?
- Where are the tankers operating in the city and which type of customers are they serving?
- What is the policy framework for the tankers and how are they regulated?
- What are the major financial transactions related to the operation of the tankers including fees paid and profitability?
- What is the potential for a fecal sludge market in Juba?
- What lessons can be drawn from the tanker businesses for future replication and scale up of fecal sludge management in Juba?

2.2.2 Survey of Exhauster Trucks

This was done between December 2013 and July 2014 and had three components as follows:

(a) Administration of a questionnaire to exhauster truck drivers in December 2013:

The aim was to gather information on sources of the fecal sludge, management of the trucks at the lagoon including financial transactions related to the use of the lagoon for emptying sludge. The questionnaire was designed to be simple and brief so as not to disrupt the work of the truck drivers (Annex 1). The questionnaire was administered to 35 drivers. The resulting survey was structured based on four components:

- Demographic information including informed consent of the respondent
- Information about the exhauster business
- Information about the exhauster truck
- Information about the sources of the sludge

(b) Administration of an interview with Exhauster tanker business owners between December 2 to 12, 2013:

The aim was to gather information about the exhauster businesses including organizational and employment structure, linkages to other businesses in and outside South Sudan; information about the trucks including fleet size, sources of the trucks, cost and sources of financing; operational aspects including number of trips, fee structures, maintenance schedules, clients served, revenues generated, operating costs, as well as key challenges and opportunities for growth of the business. Potential participants for the exhauster business owners' survey were identified from the first survey of drivers which provided contact names and telephone numbers of business owners. The enumerator also identified other potential companies (particularly hotels) in town.

Table 1: Interviews for the Exhauster Business Owners

Status	Number
Interviewed	13
No Truck	6
Private Use	5
Refusals	7
	31

The survey was undertaken using an interview guide which is attached as Annex 2.

(c) A Count of Trucks Discharging into the Lagoon:

was undertaken between July 21 and July 25 2014. Due to security reasons, the count was undertaken from 08:00 to 16:00 hours daily, even though the lagoon operates from 07:00am to 17:00pm. This means that the total number of truck trips per day is higher than that obtained from the actual count and this discrepancy was factored in the analysis. The aim of this exercise was to assess the quantity of sludge being emptied into the lagoon. The exercise involved the use of a simple form with six entries only targeting time in, ownership of the truck, make of the truck, vehicle registration, truck capacity and amount paid for emptying for each trip. The form is attached as Annex 3.

The surveys also involved physical observation of different aspects of the exhauster trucks and workers.

The survey used results from the sanitation institutions mapping to determine the policy and regulatory framework under which the trucks operate, the Household Sanitation Mapping and Survey to address issues of demand and the market for fecal sludge in Juba, and the assessment of Roton Lagoon to address issues of fecal sludge disposal and treatment.

2.2.3 Enumeration: Training and Implementation

The survey management team conducted enumerator training before deploying enumeration teams to conduct the interviews. SUWASA staff identified six enumerators (3 males and 3 females) who had worked previously on the Juba household sanitation survey and the public toilets survey. The training involved ensuring that the enumerators had a clear understanding of the intention of each question including translation into Arabic to ensure correct meanings. The training included the following components:

- Introduction to SUWASA project
- Familiarization with exhauster tanker survey objectives
- Introduction to survey content using paper forms
- Group practice

It also involved providing basic skills in communications and people skills.

2.2.4 Data Transfer and Progress Monitoring

The survey management team seamlessly transferred interview data collected by enumeration teams from the paper based questionnaires to excel and SPSS based spreadsheet. The team entered all the data into excel / SPSS after completion of the survey. The total sample size for analysis consists of 35 interviews with truck drivers, 13 interviews with exhauster business owners and a count of 150 exhauster trucks.

3.0 Operation And Regulation Of Exhauster Businesses In Juba

3.1 Policy and Institutional Framework for Exhauster Truck Operations In Juba

3.1.1 Urban Sanitation Policy Framework

Urban sanitation in South Sudan is currently guided by two main pieces of government policy papers, namely, the Water Policy of 2007 and the (Water, Sanitation and Hygiene) WASH Strategic Framework of 2011. The policy is guided by a number of principles key amongst them: an integrated approach in the planning and development of piped water supply and waste disposal infrastructure; separation of regulatory from service delivery functions; and decentralization of regulation, delivery and management of Urban Water Supply and Sanitation (UWSS) to the lowest appropriate level in accordance with the principle of subsidiarity.

The WASH strategic framework on the other hand is intended to operationalize the Water Policy of 2007 and ensure its implementation through effective and technically sound strategic approaches, improved capacity and involvement of all stakeholders. The framework elaborates the UWSS function as one responsibility under the overall direction of the Ministry of Electricity, Dams, Irrigation and Water Resources (MEDIWR) with a central role in policy making, management and coordination. The framework proposes further that the SSUWC should have a mandate to manage urban sanitation (including sewerage systems). The framework also calls for promotion of private sector participation including regulating sludge management and exploring market based and fiscal modalities for incentivizing private actors. The existing policy framework therefore has the key building blocks to allow for a thriving fecal sludge exhauster business in Juba.

3.1.2 Institutional Framework for Exhauster Truck Operations

In terms of institutions, presently, exhauster trucks in Juba on a day to day basis interact with two main authorities namely Juba County and Juba City Council. Juba County is responsible for ensuring service delivery in Juba County of which Juba City is not a part. For sanitation activities, the county has a Department of Health which follows up sanitation and hygiene issues in the county and not in the city. However, because the Roton wastewater lagoon is located in Northern Bari Payam which is under the jurisdiction of the county and not the city, this department is currently responsible for management of the lagoon, where they interact directly with the exhauster businesses and indirectly with the city. The activities of the county include setting and collection of exhauster emptying charges, and day to day management of the lagoon.

Juba City Council is a body corporate headed by a Mayor and divided into 3 Block Councils / Payams (Juba, Munuki, and Kator and 55 Quarter Councils (Map 1). Under the Local Government Act of 2009, Juba City Council like all other local governments has many powers related to sanitation including provision of basic services, acquisition of land for use for service provision, and town and rural Planning (Local Government Act, Schedule I). The Act gives the mayor powers to organize the executive institutions of the city, execute policies and initiate and enforce by-laws passed by the legislative council. ,

Currently, Juba City Council has two departments with some possible role in sanitation namely, Department of Public Health and Department of Environment and Sanitation. The latter was created in 2014 and has since taken over responsibility for solid waste management in the city including garbage collection and public health inspections. These tasks were previously performed by the Department of Public Health. From October 2014, the Department of Environment and Sanitation also took over the function of registering and issuing sanitary licenses to exhauster tanker operators in the city. Prior to this, this function was undertaken by Juba County who used to direct the Blocks to register the trucks on an annual rotational basis. The take-over of this function by the

city therefore represents a significant shift in terms of centralizing this function and reducing the number of local government agencies with whom the truckers need to interact.

3.2 Demand for Fecal Sludge Emptying in Juba

According to a 2013 household sanitation survey conducted by SUWASA, 55% of households reported having access to a toilet, 40.7% share a toilet, 2.7% practice open defecation with the remainder using public toilets. Only 2% of those that have private toilets have access to this sewer connection. The majority (89.6%) have pit latrines and the remaining (7%) use pour-flush toilets. The high presence of onsite toilets together with the general practice of using water for anal cleansing means that mechanical toilet emptying is and will remain a big part of the sanitation solution in Juba (Plate 1).



Plate 1: Private Exhauster Emptying a Toilet in Juba

The household survey for instance showed that 20% of respondents had exhausted their toilets in the previous 12 months (17.7% of people with pit latrines, 25% of those with composting toilets and 48.1% of those with pour-flush toilets). Of these, the majority (96%) used mechanical exhausters and only 4% used manual emptying (Figure 1).

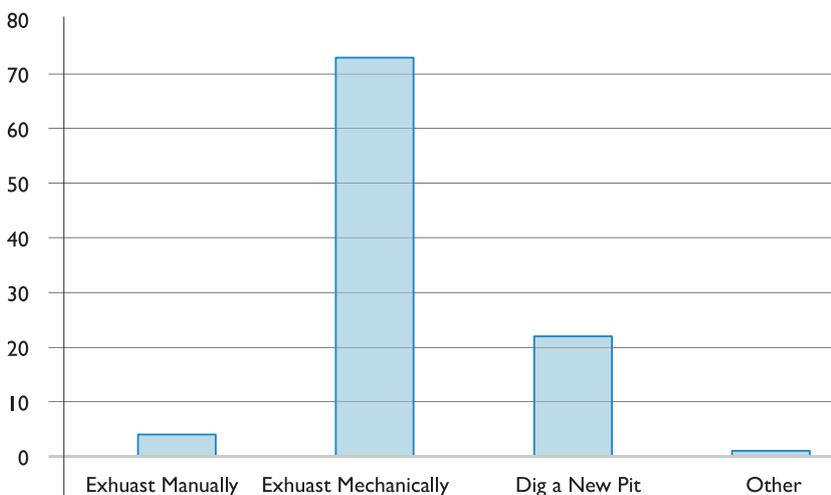


Figure 1: What do you do when Your Toilet Gets Full?

Compared to other countries where manual emptying was reported at 34%, the figure of 4% in Juba is very low. The study did not explore the reasons for this, but possible explanations could be linked to the fact that some of the households with pit latrines do not empty but rather just abandon the toilet and dig a new one (Figure 1) or there may be a cultural stigma attached to manual emptying. It is however also possible that many respondents did not know the answer to the question on emptying, as over 40% share toilets with their neighbors and if they are not the owners of that toilet, they may not know what happens to the toilet when it gets full.

Not only is there demand today, but it is expected to grow. Juba is one of the fastest growing cities in Africa, having grown rapidly between 2002 and 2012. In 2002, the city had an area of 21.55 km², in 2007 it was 27.44 km² and by 2012, the city covered 71.22 km². This represents 230% growth over a ten year timeframe. Similarly, the population of Juba City increased fourfold between 2005 and 2013, growing from 163,000 in 2005 to 500,000 in 2013. According to the household survey undertaken by SUWASA in 2013, the average household size in Juba was 9.36 people. There were also more adults than children in the households. The large household size and adult population is partly a result of displacement due to the conflicts in the country and also due to a cultural practice in which those who have the financial means or a plot in the urban area, tend to have many relatives from the extended family staying in their homes. For instance, out of a total of 1,032 respondents, 4% had more than 20 people in a household with the highest number in one home being 42 people. Therefore not only is the population growing but households also tend to be large in size.

The majority of this population, i.e. over 490,000 people relies on onsite sanitation facilities and will therefore continue to require emptying services.

Demand for exhauster services is also present from the public toilets that are scattered around Juba. The Survey of 21 public toilets conducted by SUWASA found that there has been an increase in the number of public toilets, mostly developed and managed by the private sector. These toilets which serve at least 8,500 people per day, seek exhauster emptying services at least twice a month. This and the fact that these toilets receive relatively large volumes of fecal sludge make them an important customer for the exhauster trucks.

3.3 Exhauster Truck Fleet in Juba

The institutional survey of 13 private exhauster businesses and the count of trucks revealed that there are at least 150 exhauster trucks in Juba, of which only nine belong to public sector institutions. The rest (94%) are owned and operated by private individuals and companies. The 150 trucks means that compared to other African cities, Juba has a very high number of trucks per household. Assuming a population of 500,000, and a mean household size of 9.36 persons, the ratio of households to trucks in Juba is 358 to 1. This makes the ratio of households to trucks in Juba to be one of, if not, the highest in Africa. According to previous studies of private mechanical tankers in Africa Chowdry and Kone (ibid) Dakar in Senegal which also has a fleet of 150 trucks, has the next highest prevalence of tankers with 1,118 households per truck, a figure almost quadruple that of Juba.

3.3.1 Management of Exhauster Trucks

Management of exhauster trucks in Juba can be categorized into three types:

- Category A: Private exhausters managed as part of another business;
- Category B: Private exhausters managed purely as exhauster businesses for profit;
- Category C: Public exhausters managed by government departments and the three Block/Payam Councils of Juba City Council.

Table 2: Exhauster Trucks by Business Category

Truck Ownership	Number of Trucks	Percentage	Category of Truck Business
Hotels	31	21	A
Other businesses	22	15	A
Private	88	58	B
Payams/ Government agencies	9	6	C
Total	150	100	

Category A: Exhausters Being Run as Part of Other Businesses

These are exhausters that often started as a means to empty the septic tanks associated with this other business. From the 150 exhausters counted at the lagoon, 36% were directly associated with other businesses (21% associated with hotels and 15% with other businesses mainly office complexes- Table 2). Most of these exhausters bear the same name as that of the business with which they are associated and operate under the same general license. These exhausters are further categorized into two as follows:

A1-Private and Non Profit Exhausters: Exhauster trucks used only for collecting sludge from their hotel/ business and are not in the exhauster industry as a business. These exhausters can therefore be classified as 'private and non-profit' as they do not offer their services to the general public.

A2-Private and for Profit Exhausters: Exhauster trucks serving both their businesses/ hotels and also operating as exhauster businesses serving other clients.

Category B: Private for Profit Exhausters

Private for profit exhausters are the majority of the exhauster businesses (60% of the 150) which have been set up purely to provide a service for profit.

Most of the exhausters operate throughout Juba County, while some only operate within the three city Blocks of Juba, Kator and Munuki. This is the category that has been analyzed together with sub category A2 to develop an understanding of how the exhauster business is operating in Juba. Currently, there is open competition in the city and exhausters are free to work anywhere as long as they have obtained and paid for a sanitary license. In general, the trucks operate on a call basis rather than roaming the city.

Category C: Public Sector Exhausters

A number of public institutions including the University of Juba, Juba Prison and the Juba Teaching Hospital have their own exhauster trucks which only serve these institutions and are therefore non-profit making. It was not possible to collect information about these trucks. However, what is clear is that their functionality is not assured. For example, during the cholera outbreak of May 2014, private tankers had to be brought in to empty the septic tanks in the hospital, and the prison to clear overflowing septic tanks. Similarly, during the one week of counting the tankers at the lagoon in July 2014, none of these trucks reported to the lagoon in that entire week, suggesting that they were probably non-functional.

Aside from these three trucks, within Juba City Council, each of the three Blocks (Payams) of Juba, Munuki and Kator has a Department of Health with a deputy director for public health in charge of liquid waste management. Currently each block owns and is managing two 7,500m³ capacity exhauster trucks which were procured by the MLHPP under the MDTF in 2010 (Plate 2).



Plate 2: Munuki Payam Exhauster Truck

The budget for managing the exhausters comes from the Block budget which is funded from local levies, taxes, licensing charges etc. Each Block is also responsible for maintenance of their two trucks. The exhauster trucks are used purely for business purposes and are therefore a source of revenue for the Blocks. Pricing for the exhauster services provided by the Block council is done by the Juba City Council through the leadership team which is comprised of the mayor, his two deputies, the directors of the three blocks and all heads of departments. Although their functionality seems to be much better than that of the three public agencies, these trucks can nonetheless be said to suffer from poor maintenance generally associated with public sector institutions. For example, at the time of both surveys in 2013 and 2014, each Payam had only one truck working. Furthermore, during the cholera outbreak of May 2014, SUWASA had to facilitate repair of the Munuki Block truck to enable them collect cholera waste safely. Therefore, as they only constitute 6% of the exhauster market in Juba, their constant non-functionality and also due to the fact that there is a thriving private sector market, there is a clear opportunity for government to leave this market to the private sector while providing appropriate regulation and oversight of the tankers and encouraging the construction of latrines that can be mechanically emptied.

3.4 Organizational Structure Of Private Exhauster Businesses

3.4.1 Ownership of Exhauster Trucks

Many different nationalities participate in the exhauster business as reported by both drivers and owners of the businesses, although it is also clear that Eritreans dominate this market, followed by Kenyans and South Sudanese (Table 3).

Table 3: Nationality of Private Exhauster Owners

	Reported by drivers		Reported by owners	
	Frequency	Percent	Frequency	Valid Percent
American	1	2.9		
British			1	
Chinese	2	5.7	1	
Eritrean	14	41.1	6	
Ethiopian	1	2.9		
Indian	2	5.8	1	
Kenyan	4	11.7	2	
Lebanese	1	2.9	1	
Somali	3	8.8		
South Sudanese	4	11.7	1	
Sudanese				
Ugandan	2	5.8		0
Total	34	100.0	13	100

It is even more interesting to note that the Eritreans and Kenyans also dominate amongst the exhauster truck drivers, a job that would have been expected to go to the local population (Figure 2).

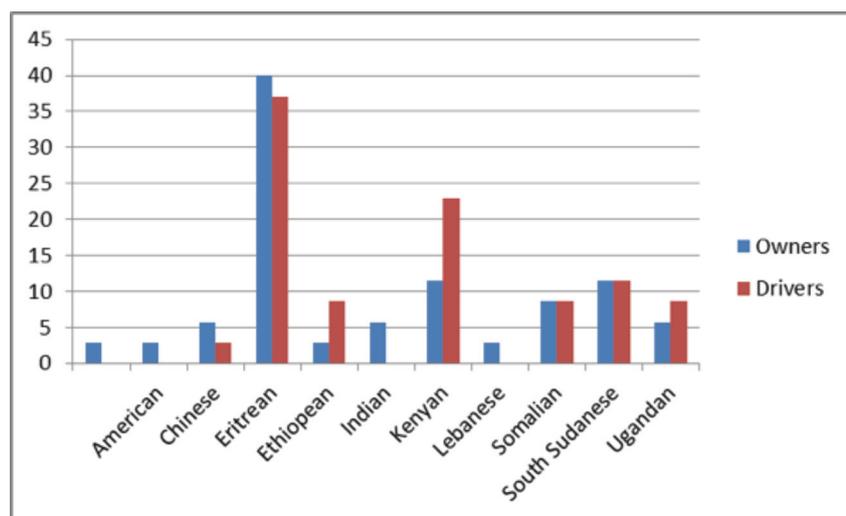


Figure 2: Nationality of Drivers and owners

This is reflective of much of the labor market in South Sudan where most manual jobs are done by foreigners. All the owners and drivers interviewed were male, making this a very gender imbalanced activity.

3.4.2 Organization

All exhauster trucks in Juba are required and do get licensed and issued with a sanitary license and sticker by the Department of Environment and Sanitation in Juba City Council (Plate 3).



Plate 3: Exhauster Truck with Juba City Council Sticker

The penalty for non-compliance is a fine twice the sanitary license which is dependent on the size of the truck but varies from (SSP15 to SSP50). Whilst all the trucks are registered with Juba City Council, organizationally the exhauster businesses in Juba can be categorized into two namely, the informal individually owned and the formal company owned businesses.

3.4.2.1 Individually Owned Exhauster Businesses:

These are the majority of the businesses accounting for 60% of the trucks counted at the Roton lagoon or Category B (Table 3). Only one among the 13 truck owners interviewed fell in this category as it was difficult to find them for the interview. Even though these businesses obtain a sanitary license from Juba City Council, for the purposes of this analysis, they are still classified as informal. This is because for businesses, formality has to do with official registration with the Registrar of Companies so that the enterprise is recognized as a separate entity that in law can be sued or held accountable for any violations. Obtaining a license from the council on the other hand, has to do only with being given access to provide the service within the city including being able to dispose the sludge at the Roton Lagoon and is not dependent on being formally registered. Another important aspect of informality has to do with the status of an enterprise in relation to taxation by the Ministry of Finance.

It can be concluded that the exhauster industry in Juba is made up largely of informal businesses. These businesses are reportedly owned by private individuals and typically have two employees forming the crew for each truck – the driver and an assistant (referred to as Turn boys). They tend not to have an office and advertise simply by having a telephone number on the exhauster truck (Plate 4).



Plate 4: Sewage tank with telephone number as advert

The idea that so many trucks are individually owned and managed however probably belies much more complex truck ownership patterns and relationships amongst the crews and other companies in the city. For example, informal discussions with the drivers suggested that some of these trucks are owned by groups of individuals with some groups owning as many as five trucks. Other trucks are also apparently 'hired' from individuals and companies. Due to time constraints, it was not possible to explore these relationships further during this study. However if regularization of the industry is to be pursued, it will be important to undertake more analysis to further unravel the ownership and relationship patterns in the sector especially amongst this group.

3.4.2.2 Formal Exhauster Businesses:

These are exhauster businesses owned by companies that are registered with the Registrar of Companies. They accounted for 36% of the trucks counted at the lagoon, 21% under hotels and 15% under other businesses or Category A (Table 3). 12 of the 13 owners/companies interviewed were in this category, for the simple reason that these companies are easily identifiable and were therefore easier to locate for the purposes of the survey. At the same time, their formality meant they were more willing to participate in the survey. These businesses tend to have an office either specific to the exhauster business or in conjunction with another business. Their staff complement is larger and can include a manager, an accountant, an office manager or field supervisors and a crew of drivers and turnboys. Almost all were linked to and involved in other businesses apart from the exhauster business, i.e. 11 out of the 13 businesses, meaning that only 2 were purely exhauster businesses or Category B.

The majority of these started mainly as a means of emptying their own septic tanks and then gradually expanded into the exhauster business upon realization of the potential market for fecal sludge emptying in Juba. This linkage to other businesses makes for a relatively high level of formality of the exhauster businesses in Juba compared to the other African countries studied by Chowdry. It also explains why only half of the owners (6 out of 13) reported having separate bank accounts for the exhauster business as banking from the exhauster business for most, is an integral part of the other businesses. Some owners indicated that they had business plans for the exhauster businesses. At the same time, even though this group also advertised by way of having their name and

telephone number on the exhauster trucks (Plate 5), some of the bigger ones also do have specific advertising activities Plate 6).



Plate 5: Hotel exhauster truck with name and telephone number

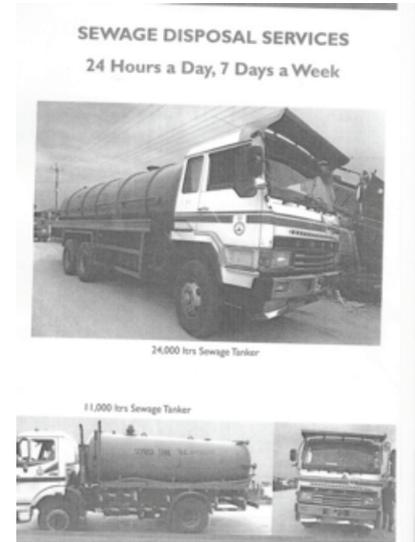


Plate 6: Flyer advert from an exhauster company

Even though 11 of the 13 companies indicated that they had other businesses, it is interesting to note that just under half of the exhauster owners indicated that they also had water tanker businesses in Juba. Given that the exhauster tanker business has grown in response to the lack of a sewer network in the city, this finding suggests that either the water tanker market which is also very active in Juba is already relatively saturated, or most likely that the exhauster tanker market/business is more lucrative. It should be pointed out that companies involved in sewage exhausting may deliberately choose not to engage in water tanking and vice versa, due to the fear of the perception that they may carry water in the sewage tankers and vice versa. At the same time, the water tanking business may be a bit less attractive commercially due to stringent regulation by government agencies for public health and affordability reasons. In addition, property owners have alternatives for sourcing water including boreholes and wells. Those with septic tanks however do not yet have an alternative to exhauster emptying. This therefore makes this business more attractive.

3.4.2.3 Employment Conditions

All owners volunteered information about the salaries of the drivers and turnboys and the mean monthly salary for exhauster drivers was reported as SSP1415 (US\$472), while that for turnboys was SSP838.50 (US\$279). Information provided on the salaries of other staff such as managers and accountants was too scanty to form meaningful analyses, but nonetheless, salaries for this group ranged from a low of SSP2000 (US\$667) to a high of SSP5000 (US\$1667). Given the international standard of a poverty datum line of US\$2/day, the exhauster businesses are clearly a small but significant contributor to the economy in Juba. Not only is the sector providing income for young men, but it is also a key provider of jobs. Taking the 150 trucks and considering only the drivers and turnboys, a minimum of 300 people are employed by the exhauster businesses in Juba. Given that sewerage is still a long way off, this sector therefore has potential to contribute even more in terms of jobs and household incomes.

3.4.2.4 Health and Safety

Both the public agencies and the private exhauster businesses do not follow health and safety practices. Use of protective clothing is all but non-existent leading to un-necessary exposure of staff to water related diseases.

Aside from the workers, there is presently no requirement for the trucks to be parked in a designated area when not on an emptying call, for example at night. This means that the trucks are parked all over the city including residential areas, thereby posing potential public health and environmental risks.

3.5 Size of Exhauster Businesses

As in other countries in Africa and Asia, exhauster businesses in Juba can be categorized into three sub-groups namely, small, medium sized and large companies. It was not possible to analyze the size of companies based on staffing due to the scanty nature of data provided on staffing levels. However based on the number of exhauster trucks owned, the majority of the businesses in Juba can be classified as small, whilst the second category would be the medium sized firms and the smallest proportion belonging to the large companies (Table 4).

Table 4: Type of Private Exhauster business by Size

	Exhauster Fleet Size	Number of companies in survey	
		Reported by truck Owners	Reported by Truck Drivers
Small companies	1	5	20
Medium sized companies	2-4	6	7
Large companies	5+	2	6*

*2 of the drivers did not provide an answer

However, when analyzed on the basis of estimated annual revenue, the majority were classified as medium, followed by small companies and the smallest proportion again belonging to the large companies (Table 5).

Table 5: Size of Business by Estimated Annual Revenue

Size of Business	Number of businesses	Estimated Annual Revenue (USD)
Small	4	Less than 500,000
Medium	6	Between 500,000 -1,000,000
Large	3	Over 1,000,000

This result is similar to that in the Chowdry study, in which out of 112 companies, 50% were small, 44% medium and 6% large. However, it is noted that the companies in Juba tend to have a larger number of trucks compared to the other African and Asian countries. For instance, in the Chowdry study, the ratio of trucks per operator (company) was 2.2 trucks per operator whilst for Juba the ratio is 3.8 trucks per operator. In the survey of owners, one reported having 10 trucks, whilst the highest reported 20 trucks.

3.6 Sources Of Exhauster Trucks

The trucks in Juba are purchased from a range of countries outside South Sudan, with Dubai, Germany and Kenya as the primary sources (Figure 3) while those individually owned are normally financed from family contributions.

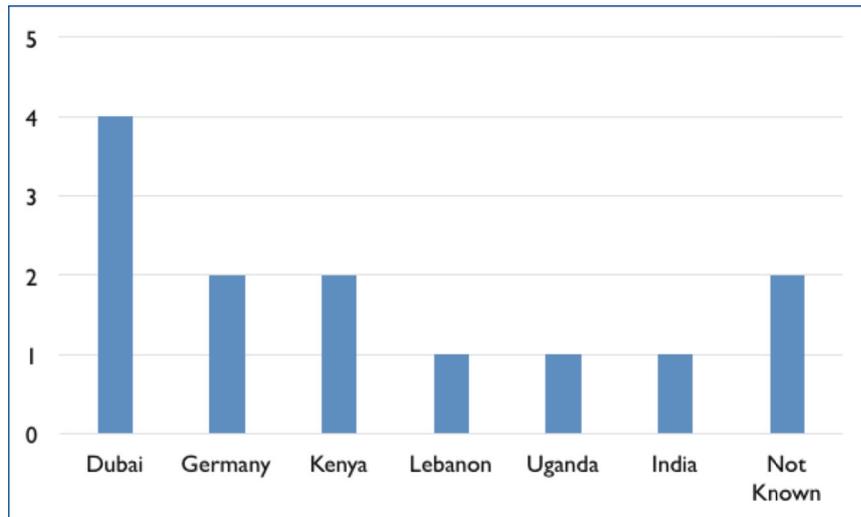


Figure 3: Sources of Exhauster Trucks in Juba

The majority of trucks in Juba are procured secondhand with only 3 of the 13 owners indicating that they had bought some of their trucks brand new. The trucks were purchased between 2006 and 2013, with the majority being purchased after 2011 coinciding with both the independence of South Sudan and more importantly, the commissioning of the Roton lagoon. Eight out of the 13 business owners reported purchasing their trucks between 2011 and 2013 emphasizing the fact that the exhauster business is new but growing rapidly.

3.6.1 Financing for Purchase of Exhauster Trucks

The exhauster truck business in Juba is financed mostly with private capital from other businesses including hotels, construction and hardware and water tanker businesses (Figure 4).

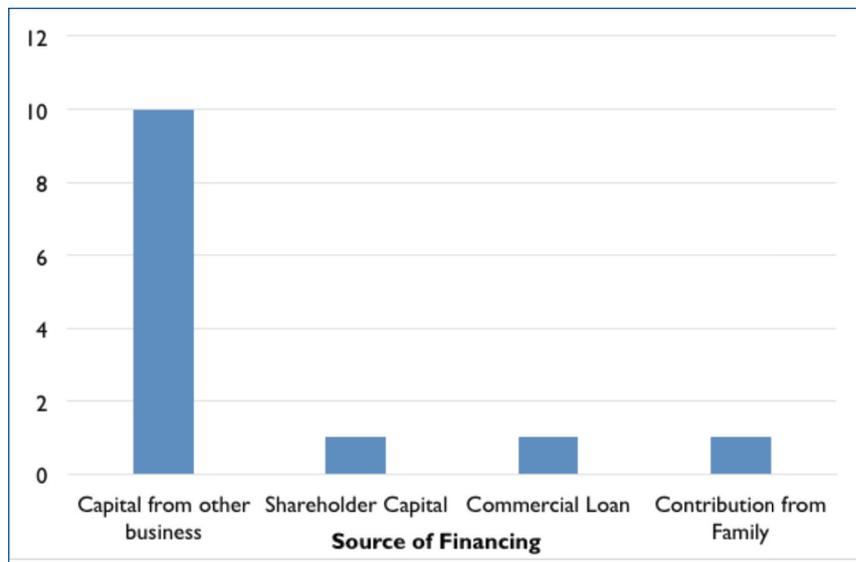


Figure 4: Sources of Financing for Purchase of Trucks

As the figure shows, commercial loan financing is not common for any of the different categories of exhauster businesses. While familiar reasons including high interest rates and lack of collateral would explain this, it is also possible that this maybe be linked to the fact that the banking sector is still very underdeveloped in South Sudan. It is however noted that the result is similar to other countries in Asia and Africa where only 20% of 112 exhauster companies obtained commercial loans. Despite the lack of commercial loans, Juba still has one of the largest private exhauster/capita fleets in Africa. Clearly, lack of financing does not seem to be an issue for the investors in Juba, even though the average cost of a truck is US\$60,000, not an insignificant amount. The minimum cost was reported as US\$12,000 and the maximum US145,000.



Plate 7: Different sized exhauster trucks at Roton Lagoon

3.6.2 Capacity of Exhauster Trucks in Juba

Exhauster trucks in Juba tend to be rather large in capacity. Information provided by the business owners on the 50 trucks suggest average truck to be 18,000 liters (18m³), the smallest about 3600 liters, and the largest 55,000 liters (Plate 7).

It is worth noting that from the count of trucks the majority (61%) had capacity of 10,000 liters and bigger. The large capacity trucks in Juba is similar to other African cities where the average size of trucks according to Chowdry and Kone (2012) is above 10m³, compared to Asia where average truck size is just over 3m³. This preference for larger trucks in Juba could be due to a number of factors including; the fact that the business owners are targeting large housing complexes accommodating international development workers who constitute a significant portion of those that have mechanized exhaustion toilets, government departments and office complexes most of which accommodate relatively large numbers of inhabitants and hence have large or frequent to empty septic tanks; bigger trucks can manage the poor roads in the city better; suppliers can exhaust more toilets in one trip and hence benefit from the associated economies of scale; suppliers anticipating bigger growth in their businesses as the city is expected to grow rapidly. It is however most likely that the bigger trucks make sense on the supply side as they are able to cover their costs and make a profit due to the high emptying fees charged to the consumer.

3.6.3 Exhauster Supply Chain

Even though most of the trucks are second hand, physical observation suggests that most are in reasonably good condition.

Part of this could be due to the fact that this is still a new industry with a maximum nine years and the majority of trucks having been imported only in the last four years. Another reason however, could be linked to the fact that truck owners in Juba seem to take good care of their trucks. For example the majority of both the owners and drivers indicated that the trucks are serviced fully on a monthly basis, with some servicing them as frequently as every two weeks. It is not clear from the study whether there are mechanics providing a specialized service for exhauster trucks, or whether the owners simply use the general vehicle mechanics. Whichever the case might be, maintenance and servicing of exhauster trucks is clear potential niche market. At least 23 drivers reported that their truck had been serviced fully between October and November 2013. It is also worth noting that both the owners and drivers reported relatively frequent maintenance of the trucks due to regularity of breakdowns associated with the poor state of roads in Juba. A quarter of drivers reported that their truck had broken down in October 2013 (Table 6).

Table 6: Breakdown and Full Service of Trucks

Months	Last time truck broke down		Last time truck went for Full Service	
	Frequency	Percent	Frequency	Percent
Not Applicable	16	45.7	7	20
Jul 2012			1	2.9
Oct 2012	1	2.9		
Nov 2012			1	2.9
Dec 2012			1	2.9
Feb 2013	1	2.9		
Apr 2013	1	2.9	1	2.9
May 2013	1	2.9		
Jul 2013	2	5.7	1	2.9
Aug 2013	1	2.9		
Oct 2013	9	25.7	11	31.4
Nov 2013	3	8.6	12	34.3
Total	35	100.0	35	100

Major breakdowns are what would be expected for this type of vehicle and included springs, sewage pumps and service parts. The owners carry out maintenance works promptly despite the fact that most spare parts are imported into Juba. Both owners and drivers indicated that the main spare parts for the trucks are imported from Uganda and some from Dubai and Kenya.

A few reported getting spares from within Juba, although the majority indicated that these would generally be spares for minor repairs. Although there were a few cases in which repairs took long due to lack of spare parts, on average both drivers and owners reported two days as a mean length of time taken to repair the trucks. This apparent willingness to have the vehicles repaired quickly may be indicative of the fact that the exhausters are in high demand and it therefore makes good business sense to have the trucks operational as much as possible.

3.7 Profitability Of Exhauster Business

Based on financial figures reported by the truck owners and drivers, the exhauster business in Juba is quite profitable. On average, operating cost per truck per trip is calculated to be at about US\$100.31, as shown in Table 7. On average, trucks make 2.3 trips per day, which means that the daily cost of running one truck is US\$231 or US\$55,371 annually. The average purchase price of a truck is US\$60,240 (without a cost of capital as most are privately financed).

Table 7: Typical per Trip Cost of Operating one Exhauster Truck

Item	Parameter	Unit	Quantity
Fuel	Distance to and from Roton Lagoon	Km	20.00
	Consumption of fuel per trip	Liters	6.67
	Operating truck per trip	Liters	10.00
	Total fuel per trip	Liters	16.67
	Total fuel cost	US\$	33.33
Emptying Fee	Cost of emptying at lagoon per trip (dumping and toll fee)	US\$	23.33
Labor	Labor for 4 hours for one trip per day	US\$	16.00
	Sub -total operating cost	US\$	72.66
O&M	Maintenance costs at 10%		7.27
	Total Operating Cost		79.93
	Add profit mark up of 5%		4.00
			83.93
	Depreciation at 80% spread over 5 years converted per trip		3.30
	Total cost including depreciation		87.23
	Add 15% administrative costs ¹		13.08
	Total average cost per trip		100.31

Source: SUWASA Survey of Exhauster Businesses in Juba, 2013

¹Built in to provide for other costs such as managerial staff salaries, license fees, etc. which the study was not able to collect

There are other costs reported by truck owners which due to inconsistencies in the way they were reported have not been built into the cost structure.

The average emptying fees charged to consumers of between US\$122 and US\$83 per emptying event for septic tanks and pit latrines respectively are much higher than in any of the other cities in the Chowdry and Kone study. Other African cities had an average fee of US\$60 which is less than half that charged in Juba for septic tanks.

Even if operating costs escalated by 20% each year, without changing the price charged for emptying, a typical truck would still recover all costs and make a profit of US\$873,599 by the time the truck is fully depreciated at 80% over five years. This level of profitability is likely responsible for the extremely high number of trucks per person in Juba. For instance, Chowdry and Kone found average profit per truck of only US\$12,000 per year in Africa and US\$5,600 for Asia. This report however suggests an annual profit per truck in Juba of US\$174,720. It should be noted that even though fuel is a third of the cost of operating a truck and therefore a significant cost, the emptying charges are substantive enough. It would require a relatively high change in fuel price before the operators would really need a tariff adjustment. In addition, emptying charges are not fixed, but negotiable, which means that the operators are largely able to cover their costs. These two factors contribute to dampening the sensitivity of the cost of fuel on the overall cost structure.

3.8 Market Potential for Fecal Sludge Management

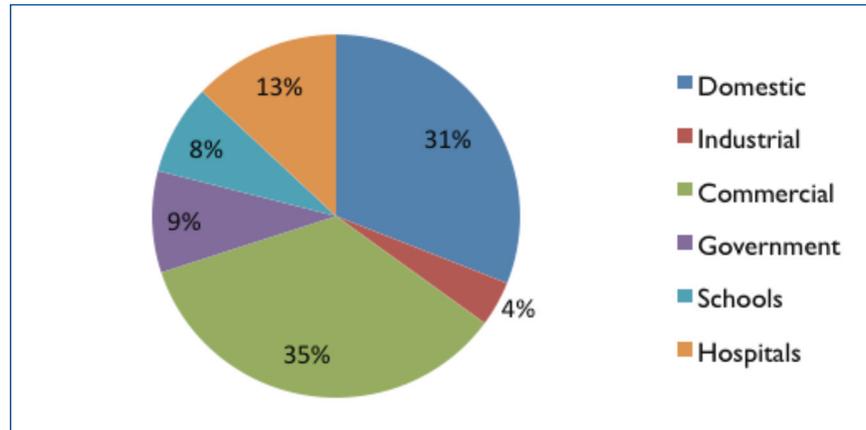


Figure 5: Sources of Sludge in Juba by Type of Property

It is noteworthy that there is very little industrial waste going into the lagoon - a reflection of the fact that currently, there are very few industries in Juba.

The survey also revealed that the main source of the sludge is from septic tanks, with almost all drivers reporting that they collect from septic tanks, whilst only 32% collect sludge from pit latrines (Figure 6).

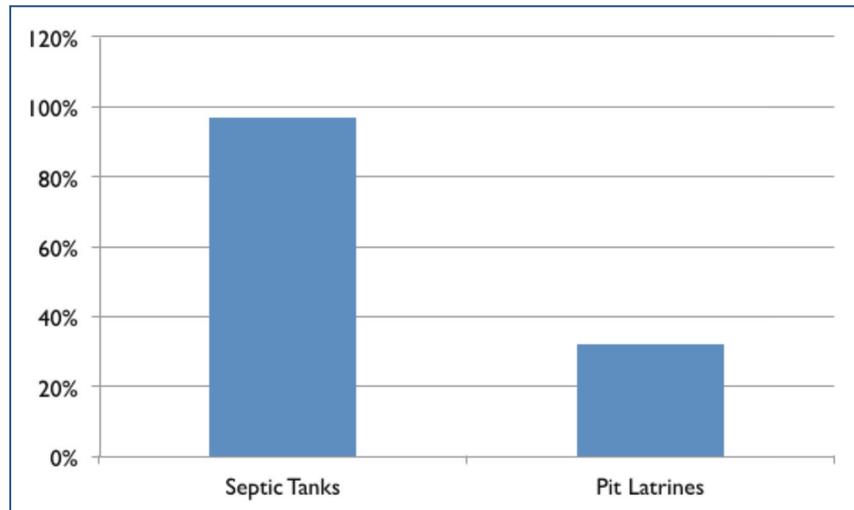


Figure 6: Percentage of Trucks Collecting Sludge from Septic Tanks and Pit Latrines

This might be a reflection of the fact that pit latrines are generally not lined and cannot therefore be emptied by vacuum tanker. It may also point to the fact that most pit latrines are in informal settlements with poor road accessibility. On the other hand, the result could also be a reflection of the high price of emptying which may limit the practice to those households with septic tanks, who would ordinarily probably be in the higher income bracket.

The study has worked out the market potential for fecal sludge in Juba, using two methodologies. The first borrows from the Chowdry and Kone (2012) study which found fecal sludge generation rates in African countries ranging from a low of 0.1 liters per capita for pit latrines to a high of 2.6 liters per capita for septic tanks. Other sources cite 0.164 to 0.220 l/cap/day as reasonable design criteria for latrine and septic systems, respectively. Specific figures used are those for Kenya which is a neighbor to South Sudan and therefore has some similarities in social cultural practices. Based on these figures, the Juba population of 500,000 would generate a total of over 45.6 million liters of fecal sludge per year distributed between septic tanks and pit latrines. Using the average exhauster truck size in Juba of 18,000 liters, this translates into 2,523 truck trips per year. The study assumes that no truck is taken to the lagoon for emptying until it is full. This means that each truck trip either empties 6.9 pit latrines or 3.6 septic tanks. With average emptying charges of US\$83 and US\$122 for latrines and septic tanks respectively, each truck making 2.3 trips per day as reported by the truck drivers would therefore be making at least US\$1,122 per day or US\$269,177 per year. 2,523 truck trips therefore means that the market potential for sludge in Juba is currently US\$1,230,100 per year (see Table 8).

The rates used in this first projection for pit latrines and septic tanks, assume significant sludge digestion occurring in the latrine pit over time which for un-lined latrines in Juba may be the case. However, with lined latrines that are routinely pumped there is little opportunity for digestion. In addition it has been reported that lined latrines are open to the soil at the bottom. In areas of high water table, groundwater is entering the pit, increasing the volume of sewerage to be pumped and decreasing the waste residence time in the pit.

Table 9: Sewerage Generation Based on Access to Water

Extent of Water Service	Water Demand (l/cap/day)	Sewerage Demand (l/cap/day)
House connection with full plumbing	120	96
Single tap on plot	50	40
Communal water (point per 23 plots)	50	40
Less accessible communal water	30	24

Notes: Sewerage generation based upon 80% of water demand.

Existing data from the survey at the Roton Lagoon provide a basis for a reasonable generation estimate for lined latrines and septic tanks that are regularly serviced by exhauster trucks. Previous studies indicate 82% of the population has access to toilets and 40% of these toilet facilities are regularly serviced by exhauster trucks and contribute to the sewerage flow at the Roton Lagoon. These elements give a sewerage generation rate of 11.55 l/cap/ day (Table 10).

Table 10: Juba Sewerage and Fecal Sludge Generation Rate Calculation

Parameter	Value
Roton Lagoon Inflow (l/day)	2,309,566
Juba Population	500,000
Ratio of population contributing to Roton Lagoon	0.4
Juba Population contributing to Roton Lagoon	200,000
Sewerage Generation Rate (l/cap/day)	11.55 l/cap/day

Table 8: Market Potential for Mechanical Exhausters in Juba based on Fecal Sludge Generation

	Fecal Sludge generation based on Typical Septic tank/ pit latrine Design Standard			Fecal Sludge Generation based on water demand
	Pit Latrine	Septic Tank	Total	
Population of Juba served (%)	89%	9%	98%	40%
Population of Juba served (#)	445,000	47,000	492,000	211,420
HH served by type				47,849
Sludge accumulation liters/per capita/day ^a	0.1	1.7	1.55	11.55
Sludge accumulation total liters/day	44,500	79,900	124,400	2,441,901
Sludge accumulation total liters/year	16,242,500	29,163,500	45,406,000	891,293,865
Fees per trip (US\$)	83	122		122
Total truck Trips /year (based on size of tankers) ^b	902.36	1620.19	2,523	49516.33
Total Septic tank emptied per trip ^c	6.92	3.6		3.6
Revenue / truck/ trip (US\$) ^d	574.62	439.2	488	439.20
Total revenue/ year (US\$)				21,747,570.31
Number trips per day	2.3		2.3	2.3
Revenue per truck per day (US\$) ^e			1,122	1010.16
Revenue per truck per year (US\$) ^f	518510.58	711589.40	269,177	242,438.4
			1,230,100	

^a Fecal sludge accumulation rates worked out as 11.55 based on water and sewerage

^b Average size of exhauster tanker in Juba is calculated as 18000 liters based on data provided by the exhauster business owners

^c Septic tank volumes borrowed from Kenya where they are given as 5000liters

^d Calculated on the basis of each tanker being 18000 liters, assuming that each truck is only emptied when full, and an average 2.3 trips per day

^e A year is taken as 240 days or 20 working days in each month to allow for breakdowns, weekends and holidays

^f Based on 240 days and 2523 truck trips

The 11.55 l/cap/day value lies between the reviewed latrine generation rate and the water access generation rates and seems to reflect the mix of latrines and pour/flush toilets present in Juba.

As most of the trucks collect from septic tanks, the second methodology uses the average 3.6 septic tanks emptied per trip, together with the US\$122 charged for emptying septic tanks and the 2.3 trips per day and the 40% of Juba population that have toilets that can be emptied for the projections.

Based on these figures and as shown in Table 8, sludge generation in Juba ranges from a low of 124million liters/ day to a high of 891 million liters per day. This translates into a total of between 2,532 and 49,516 truck trips per year. Each truck has the potential to make between US\$242,438 and US\$269,177 per year. At the same time, the total fecal sludge market potential lies between US\$1,230,100 and US\$21,747,570.31.

3.9 Fecal Sludge Disposal and Treatment

The exhauster trucks in Juba transport and dispose of the fecal sludge at the Roton wastewater Lagoon which is located in Northern Bari Payam in the northern portion of the city. A detailed description of the Roton is available in the Report on Assessment of Roton Lagoon prepared by SUWASA in 2015.

The lagoon is conveniently located within 10km of the furthest point in the city making it easily accessible to the truckers. However, it should be noted too that the lagoon was partially completed and even if it is fully built, its full capacity is estimated to be reached by 2020.

3.10 Regulation of Exhauster Trucks in Juba

Although there is currently no sanitation policy or sanitation law guiding the sub sector, local regulations for exhausters do exist.

Firstly, the regulation requires all tankers operating in the city to be registered and issued a sanitary license (which allows them to collect fecal waste) and a sticker by the Department of Environment and Sanitation in Juba City Council. All 13 business owners indicated that they were registered with Juba City Council, emphasizing that the council takes the issue of registering the tankers seriously and that the local authority does actually collect revenues from the tankers. The average fee paid for the registration of each truck was SSP1,775 (US\$573) with minimum SSP700 (US\$226) and maximum SSP5,000 (US\$1,613).

Secondly, the regulation requires every exhauster truck to be painted red in order to distinguish them from water tankers which are supposed to be painted blue. Physical observation of the trucks shows that to a very high degree this regulation is complied with (Plate 8).

Thirdly, the regulation for the use of the wastewater lagoon where tankers discharge the fecal sludge. Tankers pay two types of fees related to lagoon access; the first is payment of a SSP20 toll fee designed as a form of compensation to Northern Bari Block/Payam for hosting the lagoon. The second is payment of an emptying charge for each load discharged at the lagoon. The charges per truck vary from SSP10 (USD3) to SSP50 (USD16) from the smallest to the largest truck. Finally, use of the lagoon is regulated by controlling operational hours (opening and closing times).

3.11 Revenue Potential for the Public Sector from the Exhauster Trucks

The exhauster business in Juba constitutes a potentially reliable income stream for the public sector which can, and should, be directed toward reinvestment in the sector, allowing the public sector to more effectively expand and regulate the sanitation sector in Juba City.

Table 11 shows revenue from the tankers collected by different government agencies based on fees applied in 2014.

Table 11: Revenue Collected from Exhausters by Public Agencies

	Item	Revenue per Week (SSP)	Revenue per year (SSP)	Revenue per year (USD)	Agency Collecting Revenue
Calculations based on data from 13 exhauster owners	Sanitary License Fee		206,250	66,532	Juba City Council
	Toll Fee	41,541	2,160,000	696,774	Northern Bari Payam
	Lagoon Emptying Fee	33,108	1,721,629	555,364	Juba County
	Grand Total		4,087,879	1,318,671	
Calculations based on count of exhauster trucks at Roton Lagoon	Sanitary License Fee		230,750	74,435	Juba City Council
	Toll Fee		2,033,200	655,871	Northern Bari Payam
	Lagoon Emptying Fee		3,112,360	1,003,987	Juba County
	Grand Total		5,376,310	1,734,293	

Source: SUWASA Survey of Exhauster Businesses in Juba, 2013/14

As the table shows, the three public agencies jointly collect between SSP4million (USD1.3m) and SSP (USD1.7m) which could potentially be sufficient to operate and maintain the lagoon effectively and even carry out limited infrastructure improvements. However, the revenue is distributed among the three agencies without any commitment or clarity on how to use those funds to either maintain or expand operations of the lagoon or any other sanitation infrastructure. Furthermore, there is a high risk of loss of the funds collected at the lagoon as the person collecting is allowed to keep the funds for a whole week and to deposit them either on Friday or the following week in a special sanitation account held by the county. This risk is further heightened by the fact that the whole system is cash based.

It should also be noted that even though the county has a Special Sanitation Account, the funds deposited therein are not protected for reuse in maintenance of the lagoon but are used for general purposes of the county. These funds are therefore not ring-fenced. Finally, the basis on which the different charges are developed is not clear meaning that their linkage to cost recovery is not known. All these elements suggest that there is need to re-examine these financial transactions in order to build in systems for the long term financial sustainability of the lagoon specifically and the sector more broadly.

Truck owners also pay other statutory fees including company registration fees to the Registrar of Companies which was given as average SSP1345, minimum SSP665 and maximum SSP3000. Although only two owners reported paying income tax to the Ministry of Finance, it is highly likely that more of them do pay but as part of the other businesses and not exclusively for the exhauster businesses.

Whilst the fees described above are relatively clear and their purpose known by all actors, it was also apparent from the survey of owners that there are other fees which are less clear in their purpose and application. For example, a few of the truck owners reported that they pay for health and safety, to the fire brigade and to the Payam/Block.

Among their major challenges, truck owners were consistent about charges levied by the traffic police on each truck SSP40 (USD13) per day - no one knows what this is for.

All these fees have the possibility of impacting either negatively on the businesses and the sector more broadly if for instance they are not legal, or positively if they can be justified, accounted for and reused in the sector or for development purposes more broadly.

4.0 Discussion of Main Findings and Recommendations

4.1 There is Demand and a Viable Market for Fecal Sludge Management in Juba

The large number of trucks in the city together with the apparent preference for mechanical emptying compared to manual emptying shows that there is a demand for exhauster services in Juba. This demand which is from all categories of users but especially domestic and commercial, can only be expected to grow as the city expands. This is particularly so because the city lacks a sewer network and 45% of the population or over 23,504 households do not have access to an adequate household toilet. The bulk of the population will continue to rely on onsite sanitation facilities which will require emptying. Demand is also expected to continue to grow from public toilets.

This demand can be strengthened with promotion of construction of emptiable latrines as well as measures to make the emptying services more affordable especially for the poorer households. Properly harnessed, this demand translates into a viable fecal sludge transportation market which at estimated fecal sludge generation rates of only 11.55 liters per capita, and current emptying fees of US\$122 could amount to over US\$21 million per year. It is therefore clear that there is a huge potential for a fecal sludge management market in Juba, not just at present but for the foreseeable future.

4.2 There is an Overwhelming Private Sector Response

The demand for exhauster services in Juba has been met by an overwhelming response from the private sector. The private sector works both informally and formally with the majority of trucks being managed informally and the majority of trucks that are managed formally being linked to other businesses. Ninety seven percent of these trucks in the city are owned by the private sector. This positive response resulted from private sector initiatives to empty their own septic tanks, but then took advantage of the existing potential in the market to grow. It could be said therefore that the exhauster business in Juba has developed largely due to lack of public sector alternatives. However it is also indicative of a relatively well functioning market where demand spurs supply and those who are able to, find the space to supply and meet that demand. The remarkable part of the Juba exhauster business is that it has all happened in a matter of no more than five years since the Roton Lagoon was commissioned.

4.3 The Policy Framework is Supportive of Continued Engagement of the Private Sector

Part of the reason that the private sector has responded positively is not only due to the lack of a sewer network but also due to an enabling policy environment. Even though there is no standalone sanitation policy in South Sudan, the existing policy framework contained in the Local Government Act, the Water Policy and the WASH Strategic Framework provides for participation of relevant key actors in particular the private sector. This is crucial in the case of Juba where, the lack of a sewer network means, that the city will, for the foreseeable future, continue to rely on onsite sanitation facilities and related mechanized emptying. Ability of the private sector to continue operating in this market is therefore important. Furthermore, apart from the fact that it also saves the government money, the long term viability of this service is probably much more assured with the private sector and should therefore continue.

It is however noted that the Urban WASH Subsector Investment and Implementation Plan, (2013-2018) proposes purchase of exhauster tankers by the public sector. Whilst this may be necessary for other urban areas in South Sudan with limited private sector participation, it is proposed here that

the exhauster service business in Juba be left to the private sector which has already responded favorably. The role of the public sector should be to regulate and ensure proper operation of the private sector.

4.4 Public Sector has Key Regulatory Role to Play

The role of the public sector should focus on regulation and providing an enabling environment for the private sector to bring in more investment and to operate according to required standards.

In particular, there is need for the public sector to provide and enforce health and safety standards for the exhauster operators. The fact that no one on either the public or private sector side uses protective clothing, leads to unnecessary exposure of staff to water related diseases. It is worth noting that less than half of the owners reported providing any such clothing. There is therefore need for the regulatory agencies to pay more attention to the occupational safety aspects of this business, targeting both owners and employees.

While it is encouraging that there is a regulatory system in place, there is room for improvement. Although, the high emptying fees reflect a thriving market, it is also indicative of little competition in the sector. The resulting price, which ranges between US\$83-US\$122, is high, and could have the potential of discouraging households (particularly poorer ones) from mechanical emptying, thereby leading to increased manual exhaustion and other unsanitary and environmentally unacceptable practices. Where the poor cannot afford the service, regulators could look to facilitate market improvements and support for the poor including support of discounts or subsidies for the service, improvements in the competitiveness of bidding, or credit services. It is important that any external regulation does not result in a pricing regime that stifles competition or keeps the price too low to attract the private sector.

The fact that the trucks are mainly second hand means that they are old (average age of similar imported trucks in Africa is about 25 years) and have a shorter life span. There is therefore need to monitor their deterioration and put in place greater regulation to ensure that they comply with environmental standards.

Lastly, there is no requirement for the trucks to be parked in a designated area when not on an emptying call, for example at night. This means that the trucks are parked anywhere in the city including residential areas, thereby posing potential public health and environmental risks. These risks are associated with potential leaks from the trucks especially since most of these trucks are secondhand; depositing fecal matter from cleaning processes and the fact that children are likely to play around or near the trucks. The challenge however is to ensure that wherever any such parking area is designated, it is located in such a way that it does not impose unnecessary extra costs for the truckers and does not reduce competitiveness.

4.5 Securing Treatment and Disposal Facilities is Critical

Unlike other cities where the sanitation service supply chain is weak at the treatment and disposal stage, Juba is fortunate to have a relatively new lagoon at Roton. The location of the lagoon within 10 kilometers of the furthest point in the city means that there is little incentive for the truckers to dispose of their waste in illegal dumping sites. However, continued functionality of the Roton is not assured. Although the Roton Lagoon is operating at 70% of its constructed capacity, it is not producing the quality of effluent that would be expected from a properly operated and maintained facility. While it seems that there are attempts at cleaning the anaerobic pond, the current condition of the lagoon is indicative of little to no maintenance that has led to accumulation of debris and large solids in the anaerobic pond. It is also likely that the accumulation of grit in the ponds is limiting the available treatment volume and reducing the effectiveness of the pond.

The capacity of the lagoon will also soon be exceeded by the growth in fecal sludge volumes as the city continues to expand. In order to safeguard the progress made to date with both the private sector investment in exhauster trucks as well as the public investment in the lagoon, it will be

necessary to complete construction of the lagoon and put in place measures for its operation and maintenance as a matter of priority.

4.6 Exhausters Offer a Key Revenue Potential for the Public Sector but there is Need for Ring-Fencing

In order to safeguard the treatment and disposal of fecal sludge in Juba, it is necessary to reexamine and deal with ring-fencing of revenues being generated in the sector. As shown in the analysis, the public sector generates a significant amount of revenue from the exhauster trucks estimated at about 1.2 million dollars per year, excluding charges paid to traffic police. These revenues could potentially be used for operation and maintenance and possibly some limited works in the sector, especially at Roton Lagoon. However, it is unclear how these funds are used to cover the expenses of operating the lagoon. Through the construction and commissioning of the lagoon, the city has addressed a key piece in the sanitation services supply chain namely treatment and disposal. However sewerage treatment facilities by nature require significant capital investment and often require third party financing as a precondition to construction. A system of ring fencing finances generated from the exhauster trucks is therefore necessary for adequate operation and maintenance. In this regard, a number of actions are recommended.

The City Council should come up with a clear tariff guideline based on cost recovery principles for the exhausters, develop a system on the use of the funds and ensuring that whatever is collected is deposited in the bank on the same day and how it is to be accounted for. The charge for dumping at the lagoon (lagoon revenue) should be set so that it is sufficient to cover all operating costs - labor, equipment, maintenance, and depreciation. It should also include costs to regulate the exhauster trucks and perhaps a small amount to cover other related costs, such as education. However, it is important to balance the cost of dumping at the lagoon with the ultimate charge to users, as increasing costs to users will price a percent of the population out of the ability to afford toilets. This charge should also not be higher than the penalty for the exhausters depositing in open land thereby polluting the environment. Secondly, there should be procedures for proper documentation of revenue collected as well as agreement on the purposes for which the revenue should be utilized including the procedures for such use. Finally, the system should also allow transparency and auditing of the collection and use of the revenue.

It will also be important to regularize and streamline collection by other public agencies such as the health and safety department, fire brigade, payams, traffic police, etc. to make collection of these fees transparent and accountable.

4.7 Areas for Further Research

The exhauster business sector is clearly a key part of the sanitation solution in Juba and it has taken off to a good start. This survey has highlighted key achievements and challenges in the sector. However, there are also a number of questions that still need clarification and therefore further research is proposed in the areas below:

4.7.1 Ownership and Organizational Structure of the Informal Businesses

As indicated in the analysis, identifying and getting the owners of the private individual trucks to participate in the survey of owners was challenging as most were not willing to be interviewed. This means that the bulk of the analysis in the report has been based on the group of 12 formally registered truckers associated with other businesses. In the meantime, the informal sector is the majority, which means there is still a gap in our understanding of this market. It will therefore be important to carry out a study to unravel this segment of the market in order to provide a fuller picture of what is happening in the sector. Understanding this segment is also important if the authorities wish to regularize their operations as well as undertake such tasks as formation of a truckers association for instance.

A better understanding of this segment is also necessary to provide a better picture of the financial viability not only of the individual companies but the sector as a whole. For example, a detailed review of the six trucks owned by Juba City Council suggests that they may either be making a profit or they could also be making losses. If the six trucks owned by the Juba City Council blocks were operational throughout the year, they would either make the council an annual profit of US\$71,837 or a loss of US\$57,330 (Table 12).

Table 12: Profitability of Juba City Council Exhauster Trucks

Number of trip s/truck/day	2.3
Fees per trip (US\$)	122/ 83
Number of trucks in the city	6
Total revenue per day (US\$)	1683.6
Total revenue per year (US\$)	404064
Operating cost per truck trip	100.31
Total operating Cost for 6 trucks / day	1384.28
Total operating Cost for 6 trucks / Year	332226
Annual profit (US\$)	71837
Annual loss (US\$)	57330

Discussions with drivers and owners seem to suggest that the pricing is not related to whether it is a septic tank or pit latrine but rather, it is linked to the amount of sludge being collected. It is therefore assumed that the higher price of US\$122 is probably applied to the large trucks Juba City Council however has trucks of size 7500m³ which is way below the average. This means that they would probably be charging the lower fee of US\$83. With operating costs at US\$332,226, the trucks would probably make the council a loss of US\$57330. Furthermore, it is possible that a reduction in fees (together with an increase in license fees and emptying fees that better reflect the cost of service), would impact the financial viability and profitability of the businesses. This suggests that the smaller the truck, the smaller the fleet size, the less likely that the business would be making a profit. It is rather more likely that the bigger companies with fleet that is big both in capacity and number would be the profitable ones. The only way to fully get to this fact is by being able to unravel further how the 60% of trucks are currently owned and managed.

4.7.2 What Other Fees are Paid by Truckers

The lack of consistency in fees paid by truck owners needs further analysis to determine exactly what fees are paid, the purposes for which they are paid, and the mandates of these departments to charge these fees. For instance, if the SSP40 paid by traffic police is applied throughout the year for the 150 trucks, it means that the police are collecting SSP6000 (US\$1,935) per day, or SSP144,000 (US\$46,452) per month and SSP1,728,000 (US\$557,419) per year. This is a significant amount of money which if it was collected for the right reasons and accounted for would go a long way in sustaining the sub-sector.

4.7.3 Why is Limited Manual Emptying

The finding that manual emptying is very rare in Juba is very welcome. However as noted in the discussion, there is need to get better information on the reality of this finding in order to ensure that this situation continues if indeed this is the case or to begin to define measures to deal with manual emptying if the practice is much higher than reported here. Such an investigation would also be useful and beneficial to other countries especially if indeed the practice is as uncommon as suggested here.

4.8 References

Government of South Sudan, 2008 Southern Sudan Centre for Census, Statistics and Evaluation (SSCCSE)

USAID's Sustainable Water and Sanitation in Africa (SUWASA), 2013, Juba Sanitation Mapping and Household Survey

USAID's Sustainable Water and Sanitation in Africa (SUWASA), Assessment of Roton Lagoon, 2015

USAID's Sustainable Water and Sanitation in Africa (SUWASA), 2015, Sanitation Institutions Mapping

WSP 2010, Country Status Overview, Water Supply, Sanitation and Hygiene in Southern Sudan, Draft

Sangeeta Chowdhry and Doulaye Kone, 2012, Business Analysis of Fecal Sludge Management:

Annex I: Interview Guide for Sewage Exhauster Truck Drivers

Name of Enumerator _____ Date: _____/_____/2013 (dd/mm/yy)

Good morning/afternoon, my name is _____. I have been engaged by Juba County council to collect information about the exhauster businesses operating in Juba. The information collected is strictly confidential and will be used by the County with Support from SUWASA to improve sanitation services in Juba city. I will be grateful if you could spend about 30 minutes to answer some questions about your exhauster business. Are you willing to participate? If so, Kindly sign here to indicate your consent

Sign _____

Truck Registration no: a) Number plate _____ b). City council Reg. no _____

A. Demographics of the Respondent

1) Role of the respondent? (Tick as appropriate). DO NOT interview if the respondent is not an employee managing the exhauster truck.

a. Employee managing the Exhauster (specify) _____

2) Gender of respondent (Tick appropriate one)

a. Male

b. Female

3) Age of respondent (years): _____

4) Nationality of respondent: _____

5) How long have you been working with this business _____

6) What protective clothing does the company provide for the employees

a) Over all

b) Gumboots

c) Gloves

d) Facial mask

e) Others (specify) _____

f) None

						a) Munuki b) Juba c) Kator d) Northern Bari e) Rejaf
		No. of renewals/ years	Renewal fee	Number of inspection per year	Cost of inspection per year	
Juba City council						
Others-Specify						

B. Information about the Exhauster Business

- 7) What is the name of the Exhauster business
- 8) Location and physical address of exhauster business (where is your business premises/ office).
 Payam:
 Block
- 9) Are the owners of the business
- a) South Sudanese
- b) Foreign Nationals (Name Nationality) _____
 Contact: Name: _____ Tel: _____
- 10) Registration with Juba city Council
- 11) Information about exhauster trucks
- a) How many exhauster trucks does the business have? _____
- b) Information about this truck

Truck	Truck information
Type of truck	
Capacity of truck	
Which country did you buy the truck from	
In Which Year did you buy the truck	
How many drivers drive this truck	
How many turn boys does this truck have?	
Do you empty Septic tanks	a) Yes b) No
How many septic tanks do you empty per day	
How much do you charge for each septic tank(\$sp)	
Do you empty Pit latrines	a) Yes b) No
How many pit latrines do you empty per day	
How much do you charge for each latrine(\$sp)	
How many trips do you make per day	
How much do you pay for emptying each truck (\$sp)	
When was the last time your truck was taken for full service (mm/yy)	
When was the last time your truck broke down (mm/yy)	
How long did it take to fix it (repair)(Days)	
How much did it cost to repair it (\$SP)	
Where did you get spare parts (Country)	
1) Do you collect sewage from these clients?	a) Domestic b) Industrial c) Commercial d) Government/Ministries e) Schools a) Hospitals

13) What are the main challenges you face in exhausting?

C. Physical Observation

(Observe and take photographs of the following)

1. The state of repair of the exhausters
2. The cleanliness of the exhausters
3. Protective clothing of the workers

Thank you very much for taking part in this study

Questionnaire checked by: Name _____ Sign _____

Annex 2:

Assessment Of Private Exhausters - Interview Guide For Exhauster Owners

D. Demographics of the Respondent

- 14) Role of the respondent? (Tick as appropriate). DO NOT interview if the respondent is neither of these two categories.
- a. Owner of the Exhauster
 - b. Employee managing the Exhauster
- 15) Gender of respondent (Tick appropriate one)
- a. Male
 - b. Female
- 16) Age of respondent (years): _____
- 17) Nationality of respondent: _____

E. Information about the Exhauster Business

- 18) Location of exhauster business (where is your business premises/office).
- Payam: _____
- Boma: _____
- 19) Name of Exhausters business _____

- 20) Are the owners of the business South Sudanese or foreign nationals? _____

- 21) When was the exhauster business established or started? _____

- 22) Does the exhauster business have a business plan? _____

- 23) Does the business have a bank account? _____

- 24) Is the business registered with Juba Municipal Council? _____

25) How much is the registration with the Juba Municipal council

26) How many times do you have to register with the council in a year

27) What agencies do you pay tax to?

28) With which other government agencies is the business registered?

29) How many employees does the business have? List each one, their qualifications and describe their jobs.

30) What items of clothing does the business provide to the different employees?

31) How many exhauster trucks does the business have? (List the make and capacity of each exhauster)

32) Where did you buy the exhausters from

33) List the year when each exhauster truck was bought.

34) How much did the exhausters cost to buy and to bring into the country?

Particulars	Purchase cost	Clearance costs	Transportation costs	Other costs	
Truck 1					
Truck 2					
Truck 3					
Truck 4					
Truck 5					

35) Were the exhausters bought new or second hand

36) Who financed the purchase of the exhauster?

- a. Individual owner
- b. Private company
- c. Central government
- d. State Government
- e. Local Government
- f. A donor or NGO (Name)

G. Do not know

37) If the financing was by the individual owner or private company, how did you raise the finance?

- a. Loan from bank
- b. Contribution from shareholders
- c. Loan from friends/ family
- d. Capital from other business
- e. Other

(Explain)

38) Does the owner have another exhauster business in another town of Juba, both in South Sudan and in other countries

H. Information About the Exhausting Activities

39) What areas (Payams/ Bomas) does the exhauster business serve in Juba?

40) How many customers are registered with the exhauster business in Juba?



41) How many pit latrines and septic tanks do you empty every week?

Pit latrines:.....

Septic tanks:.....

42) Do you charge the same fee for emptying a pit latrine and a septic tank?

Yes _____

No _____

43) How much do you charge per exhauster truck?

44) How many exhauster trips does one exhauster truck make per day?

45) Where do you empty your exhausters after collecting sewage from your customers?

46) Do you pay to empty and if yes, how much do you pay per truck and where do you pay?

47) What are the main challenges to your business?

48) What are the main opportunities for your business?

49) Does the owner of the exhauster business also have a water tanker business they are operating in Juba

50) Does the owner of the exhauster business have other businesses? If yes, what are these other businesses

I. Physical Observation

(Observe and take photographs of the following)

- 4. The state of repair of the office
- 5. The state of repair of the exhausters
- 6. The cleanliness of the exhausters
- 7. Protective clothing of the workers

Annex 3: Juba Exhauster Tanker Count Form

Enumerator _____ Date: ___/___/2014 (dd/mm/yy)

NO.	Time in	Truck ownership	Make of Truck	Vehicle Registration Number	Truck Capacity(ltrs)	Amount paid (SSP)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

US. Agency for International Development
1300 Pennsylvania Avenue, NW
Washington, DC 20523
Tel: (202) 712-0000
Fax: (202) 216-3524
www.usaid.gov