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AfWA

TOWARDS A LARGE SCALE PARTNERSHIP PROGRAM ON FECAL SLUDGE MANAGEMENT IN THE SUB-SAHARAN AFRICA COUNTRIES:

RAPID ASSESSMENT REPORT OF COUNTRY SANITATION STATUS

JUNE 2017

Disclaimer :

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ACRONYMS

AdeM	Maputo Water Utility
AfWA	African Water Association
AGER	General Regulation Authority of Sao Tome and Principe
AMCOW	African Ministers Council on Water
BMGF	Bill and Melinda Gates Foundation
CAR	Central African Republic
CFAF	CFA Francs
CLTS	Community Led Total Sanitation
CRA	Water Regulatory Council
CUs	Commercial Utilities
DNA	Designated National Authorities
DRC	Democratic Republic of Congo
DWA	Department of Water Affairs
DWRD	Department of Water Resource Development
EAWAG	Federal Institute for the Development, Treatment and Protection of Water
ECOSAN	Ecological Sanitation
EECAS	Economic Community of Central African States
ELISAL (Angola)	Empresa de Saneamento e Limpeza de Luanda, Lda
FABRI	Further Advancing the Blue Revolution Initiative
FIPAG	Water Investment Fund
FS	Fecal Sludge
FSM	Fecal Sludge Management
FSTP	Faecal Sludge Treatment plant
GDP	Gross Domestic Product
GDP	Gross Domestic Product
IDH	Human Development Index
IDWSD	International Drinking Water Supply and Sanitation Decade
INGO	International Non-Governmental Organizations
JMP	Joint Monitoring Program
LAs	Local Authorities
LEWA	Lesotho Electricity and Water Authority
M&E	Monitoring and Evaluation
MDGs	Millennium Development Goals
MK	Malawi Kwacha
MOC	Communal Project Management
MoF	Ministry of Finance
MoH	Ministry of Health
NDC	National Development Corporation

ACRONYMS

NGO	Non-Governmental organization
NGOs	Non-Governmental Organizations
NWASCO	National Water Supply and Sanitation Council
OD	Open Defecation
ODF	Open Defecation Free
ONAS	Office National de l'Assainissement du Sénégal (National Sanitation Office of Senegal
ONEA	Office National pour l'Eau et l'Assainissement (National Office of Water & Sanitation)
PDEA	Master Plan for Water and Sanitation Systems in Sao Tome and Principe
PNADD	National Plan for the Environment and Sustainable Development in Sao Tome and Principe
PNDS	National Health Development Plan in Sao Tome and Principe
PRONASAR	National Rural Water Supply and Sanitation Program
PSSAC	Politique Sous-Sectorielle de l'Assainissement Collectif du Togo (Sub-Sectorial Policy of Collective Sanitation of Togo)
SANDEC	Department Sanitation, Water and Solid Waste for Development
SDGs	Sustainable Development Goals
SEPO	Success, Failure, Potential and Obstacle
SME	Small and Medium Enterprise
SONEB	Société Nationale des Eaux du Bénin (National Water Company of Benin)
SONILS Ltd	Sonangol Integrated Logistics Services) in Angola
STC	Scientific and Technical Council
UNFCCC	United Nations Framework Convention for Climate Change
UNICEF	United Nations Children's Fund
USAID	U.S. Agency for International Development
USD	United States Dollars
WAB	Water Appointment Board
WARMA	Water Resources Management
WASCOP	Water and Sewerage Company
WASH	Water Sanitation and Hygiene
WHO	World Health Organisation
WOP	Water Operators Partnership
WRC	Water Research Commission
WSA	Water Services Authority
WSP	Water Service Providers
WSR	Water Sector Reform
WSS	Water Supply and Sanitation
WUC	Water Utility Corporation
WWTP	Waste water Treatment plant

FOREHEAD

Accurate data from various sources highlight on the overall status of access to drinking water and sanitation, including fecal sludge management and the non-sewer sanitation in the world. According to these statistics, the sub-Saharan Africa region shows the lowest access rate to drinking water and sanitation despite considerable efforts made by African governments and their partners. In line with the Sustainable Development Goals (SDG), main challenges on sanitation for the next 15 years reside on how to boost access to secure and safety sanitation system in peri-urban and rural areas in the sub-Saharan countries. Indeed, in the sub-Saharan Africa region, more than 65% of households are not connected to a sewer system while less than 31% of them have access to improved sanitation systems and about 21% still rely on open air defecation. However, it has been noticing that a substantial increase of the number of pit latrines (from 50% to 80% of the population) and septic tanks constructed during the "race" toward achieving the Millennium Development Goals (MDGs) on sanitation.

The direct consequence of the promotion of onsite sanitation systems is the huge production of fecal sludge which need to be properly managed. Without adequate treatment, the fecal sludge produced from the existing non-sewer sanitation systems constitute a significant environmental and health threat especially for children and women at this particular moment that the world is on the "starting block" to kick off for the Sustainable Development Goals (SDG) "race". Up to now, manual emptying practices are predominant compare to mechanical emptying system, and the cost of these services is prohibitive (about USD50 to USD300 per trip). It is therefore evident that, in the absence of appropriate management of non-sewer and fecal sludge processes which should include: (i) adapted draining, (ii) transportation, (iii) disposal and (iv) treatment systems, the mission toward SDG in sanitation is failed in advance.

Many promising initiatives exhibiting some replicable models and best practices have been experienced in some African and Asian cites on fecal sludge management strategies with various degrees of success. Most of

these activities conducted with the support of the Bill & Melinda Gates Foundation (BMGF) and the African Water Association (AfWA) throughout the Water Operators' Program for Africa (WOP-Africa), can inspire strategy and action plans to address the specific challenges on sanitation in Africa.

Indeed, the BMGF had promoted researches on the development of some promising technologies and approaches capable to reverse the worst situation of onsite sanitation practices to green and environmental friendly situations. In Senegal, a promising model for fecal sludge containment, sustainable emptying services and fecal sludge treatment has been developed and marketed. The AfWA/WOP Africa program, had implemented during its pilot phase (2009-2014) some peer-to-peer learning and benchmarking partnerships that proved with success that best practices can be quickly and efficiently spread across African utilities and municipalities to (i) improve urban sanitation, (ii) significantly help improving performance of sanitation operators and consequently, and (iii) boost the achievements of quality access to sanitation to African people. This is the case in Côte d'Ivoire with the winning support given by ONAS of Senegal to ONAD that highly contributed to operationalize the newly created sanitation company of Cote d'Ivoire.

This report is the result of a rapid assessment of stakeholder status in the sanitation sector in four sub-regions of

Sub-Saharan Africa, study undertaken from October to December 2015 under the coordination of AfWA. This assessment specifically sought to:

briefly characterize the sanitation situation, particularly the status of non-sewer sanitation and fecal sludge management highlighting opportunities and constraints,

identify and explore a number of non-sewer sanitation and FSM cases in Africa that are potential models for replication,

shortlist municipalities, utilities and operators from the sub-regions as potential mentors and mentees.

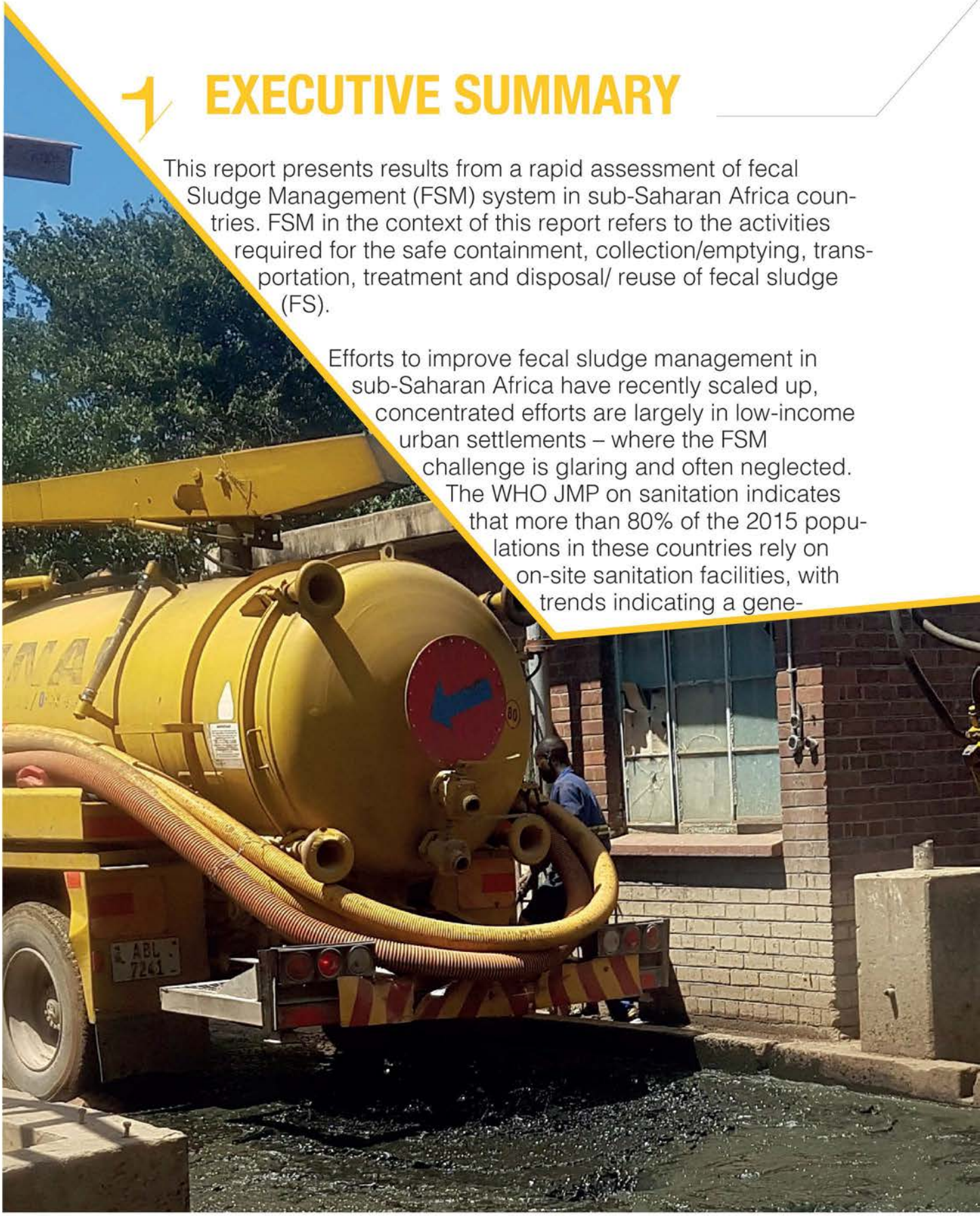
We strongly invite WASH specialists to read this report which contributes to improve knowledge sharing on sanitation sector while in lighting on the status of fecal sludge management, the available institutional arrangement, financial and operational issues, human resources capacity and best practices for replication. By identifying and exploring interesting and creative examples of non-sewer sanitation and fecal sludge management cases across Africa, we hope that this manual serves its purpose of laying the groundwork for future potential peer-to-peer learning partnership programs under AfWA/WOP Africa Program that will help increase and expand the impact of AfWA on water and sanitation in Africa.

As such we do not doubt for a moment that this report will improve the understanding of the situation of sanitation in urban and rural areas in Sub-Saharan Africa, and from that, this will influence decisions of stakeholders on future strategies and policies related to projects and programs to increase access to sustainable sanitation in Africa.

1 EXECUTIVE SUMMARY

This report presents results from a rapid assessment of fecal Sludge Management (FSM) system in sub-Saharan Africa countries. FSM in the context of this report refers to the activities required for the safe containment, collection/emptying, transportation, treatment and disposal/ reuse of fecal sludge (FS).

Efforts to improve fecal sludge management in sub-Saharan Africa have recently scaled up, concentrated efforts are largely in low-income urban settlements – where the FSM challenge is glaring and often neglected. The WHO JMP on sanitation indicates that more than 80% of the 2015 populations in these countries rely on on-site sanitation facilities, with trends indicating a gene-



EXECUTIVE SUMMARY

ral positive trajectory in sanitation improvements across the board. This implies continued reliance on FSM in the region in the near future, with opportunities for innovation and expansion of FSM, including business models for improved latrine construction and emptying services.

The rapid assessment results indicate a generally informal and unrestricted system of FS emptying and transportation comprising both public and private sector. Emptying charges of up to USD 300 per trip have been reported which is prohibitive in a region with high poverty levels and low gross per capita national incomes. There have thus been efforts in countries like Senegal, Malawi, Uganda, and South Africa to improve and regularize this service by strengthening private sector participation through piloting the service level agreement (SLA) model.

Treatment and disposal is similarly either not well regulated or enforced and capacity limited, despite a legal framework in all countries that provides for the need for safe disposal and standards for waste water discharge. Disposal and discharge of FS locally in open drains and directly in gardens/ open fields is common practice; the latter mainly in the major cities.

The role for FSM past the containment stage is mainly undertaken by urban authorities, although often this role is either shared or delegated to water utility companies; the latter mainly involved with transportation and treatment components of the FSM chain. Civil society has also been a major player in FSM with most initiatives undertaken in low-income/unplanned settlements.

Additionally there is limited and sometimes conflicting responsibility and detailed data on the state of sanitation in many countries. In some cases, where data exists it is difficult to come by making planning and development of solutions an onerous task.

Challenges highlighted thus require that actors involved in the FSM chain are well identified and capacitated to undertake their roles and improve service delivery in FSM.

2/ CONTEXT

The lack of access to improved drinking water and sanitation is an acknowledged hindrance to economic and social development. Improving the ability of service providers to manage and deliver water and sanitation services effectively is critical to reducing the access gap.

Since 2005, the African Water Association (AfWA) created a committee dedicated to sanitation and environment in Africa under its Scientific and Technical Council (STC) and in 2008, a task force on fecal sludge management (FSM) was formed within this Committee. The mandate of these groups is to advise African operators on addressing capacity building needs on sanitation and environmental issues in order to improve service delivery.

In addition, the Further Advancing the Blue Revolution Initiative (FABRI), funded by the U.S. Agency for International Development (USAID), has been partnering with AfWA and the African Ministers Council on Water (AMCOW) to improve the water and sanitation sector services in countries across the continent. AfWA and FABRI's joint approach has been to "scale-up" by working with large numbers of entities simultaneously for maximum impact and increased representativeness.

Building on current work to reduce non-revenue water in 20 utilities across the continent, AfWA intends to use the same model to improve sanitation. Working at both the national and local levels to expand the development, monitoring, and use of national plans and strategies while supporting private sector sanitation service provider engagement in implementation.

CONTEXT

As part of program design, a rapid assessment of stakeholder status in the sanitation sector in four sub-regions of Sub-Saharan Africa was undertaken during the period October to December 2015. Specifically, the assessment sought to:

- briefly characterize the sanitation situation, particularly the status of non-sewer sanitation and fecal sludge management, highlighting both opportunities and constraints;
- identify and initially explore a number of non-sewer sanitation and FSM cases in Africa that are potential models for replication;
- shortlist municipalities, utilities and operators from the sub-regions as potential mentors and mentees.

This report presents a synthesis of the results from the different sub-regional assessments of the overall situation of African stakeholders in the sanitation sector. The data in the sub-regions report was gathered through a combination of desktop review and data verification using interviews with relevant stakeholders in the thirty one study countries.

The outcome of this report will contribute to improve AfWA and its partners' knowledge on the sanitation sector in Africa in general, and on the status of FSM and non-sewer sanitation in particular, including the available institutional, financial, operational, human resource capacity and best practices for replication. Furthermore, by identifying and exploring interesting and creative examples of non-sewer sanitation and FSM cases across Africa, this study will lay the groundwork for future potential peer-to-peer learning partnership programs under AfWA Water Operators' Partnerships Africa Program that will help increase and expand the impact of AfWA on water and sanitation in Africa.

3

OVERVIEW OF THE SANITATION SECTOR IN SUB-SAHARAN AFRICA

This section sets the tone for this study by providing the context of water and sanitation in the Sub-Saharan Africa. It presents an overview of the WASH situation, key opportunities and constraints and further summarizes the state of non-sewered sanitation therein. The discussion that follows considers the fecal sludge management (FSM) chain as represented in the figure 1 below adapted from Strande (2015) and the supporting environment. Fecal Sludge generally refers to undigested or partially digested sludge, either slurry or solid, collected from on-site sanitation systems such as latrines, non-sewered public toilets, septic tanks, aqua privies, cesspits, containing blackwater (Tilley et al, 2008). The FSM chain represents an approach to safe containment, collection and transportation, treatment and storage, and disposal or reuse of fecal sludge that ensures health and environmental protection while also closing the sanitation loop for increased sustainability and economic development.

Figure 1 : **Fecal sludge management chain**

3.1 OVERALL WATER AND SANITATION STATUS IN SUB-SAHARAN AFRICA

3.1.1 The Statistics and General status

The contribution of improved water supplies and sanitation to human well-being and livelihood is widely acknowledged. It is argued that universal access to water and sanitation in Africa can bring an estimated annual economic benefit of $22 billion, from reductions in health care costs and increased productivity from reduced illness. The WHO and others further state that inadequate sanitation is a major cause of preventable diseases.

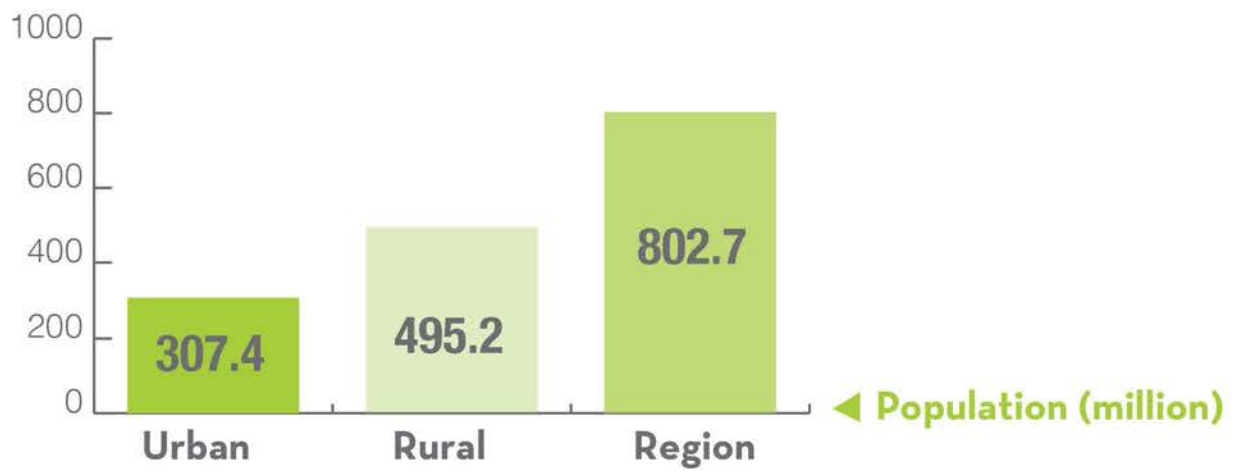
According to 2015 JMP estimates , there are 695 million people in Sub-Saharan Africa without access to sanitation. The 2015 population in the study countries ranges from 0.2 million in Sao Tome and Principe to 183.5 million in Nigeria, with a total estimated urban population of 373 million. Poverty still remains synonymous with Africa. As part of progress reporting on MDG status, Africa remained the region with the highest income inequalities, with poverty being multi-faceted and an impediment to key social services including water and sanitation (UNECA 2015a). The demographic profile indicates continued population growth in the region coupled with increased urbanization estimated at a rate of 4.5%. UN Statistics indicate that by 2035, urban populations will comprise up to 50%. This, combined with risks, vulnerabilities and challenges of poverty, implies social service delivery will continue to suffer.

A summary of the water and sanitation status in Sub-Saharan Africa region is presented in table[1] below. In this region, more than 60% of the population relies on on-site sanitation facilities (WSP, 2014) and open defection (OD) is still present, particularly in rural areas. Further analysis indicates a high percentage of urban population that use shared sanitation facilities. Sanitation has also gained prominence over

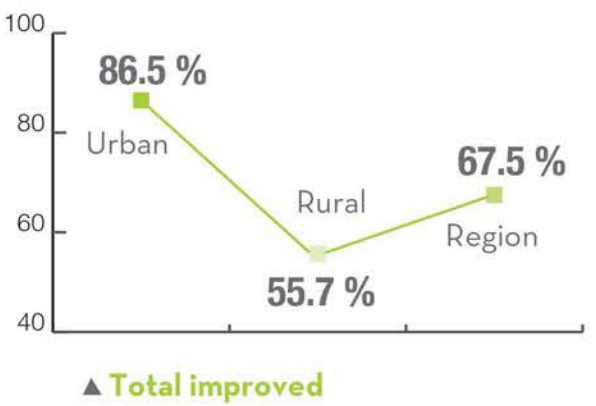
[1]JMP estimates have been used for consistency, although it is acknowledge that some countries like Uganda have different sector performance measurement criteria with conflicting statistics; this being an issue of contention globally

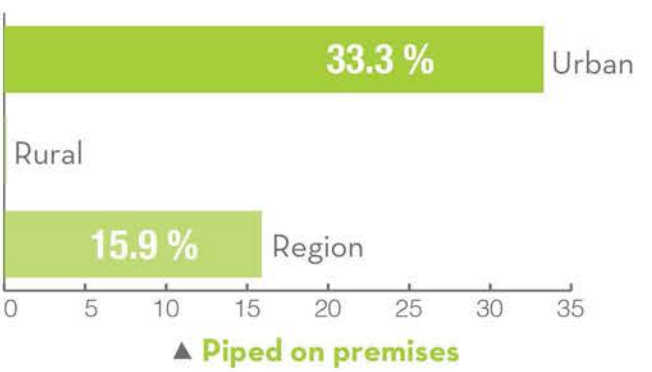
the years with more financing allocated to the sector in all the countries. Proportionally there has been a positive trend in the WASH situation in the studied countries as shown by the proportional increase in improved coverage, averaging 43 and 19 percent points for water and sanitation respectively since year 1990.

Table 1: **Summary country WASH and demographic statistics**

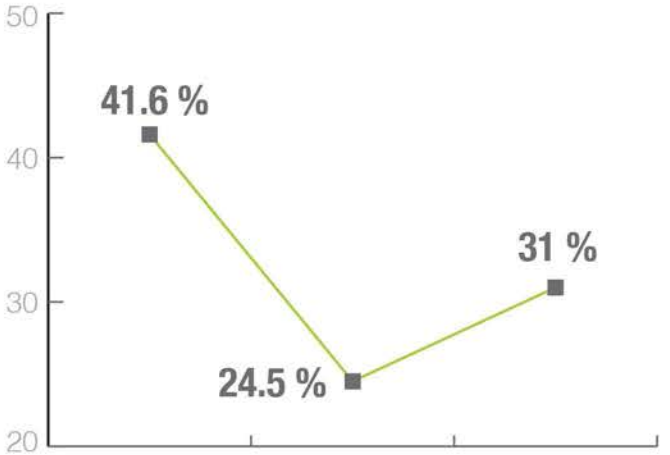


Water coverage %

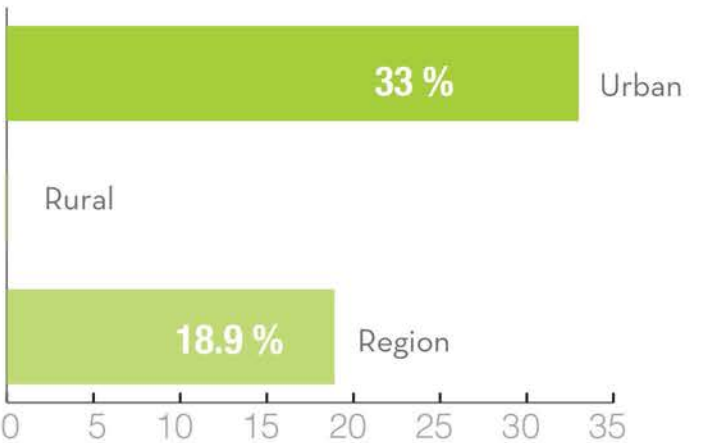




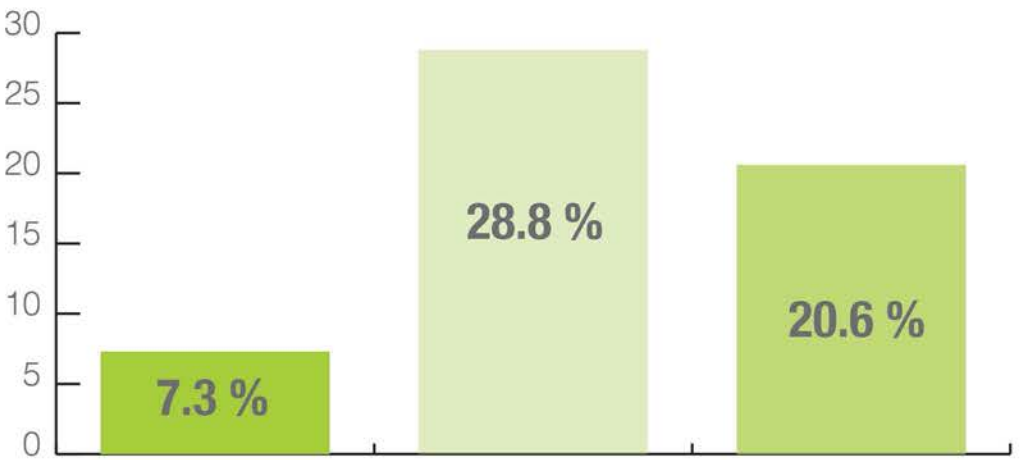
Sanitation coverage (%)



▲ Total improved



▲ Shared



▲ OD (%)

Source: wssinfo.org, 2014

A positive trajectory has been recorded with declining OD rates over the last decade. Literature and anecdotal evidence indicates that the shift along the sanitation ladder still involves reliance on non-sewer sanitation. Further amplifying the case for attention to FSM services in the region and opportunities therein. In September 2015, the world adopted the sustainable development goals, which Africa signed on to and have commitments towards providing safe water and sanitation to all by 2030. This translates to increased investment in sanitation improvements, and increased focus on improving processes/systems to ensure that sanitation services are effectively delivered and used.

3.1.2 Institutional arrangements and legal framework

Common to all Sub-Saharan Africa countries, is the decentralized governance structure for service delivery. In most of the countries, there are specific ministries responsible for water and sanitation with supporting regulations which provide the basic framework for water and sanitation service delivery. The institutional responsibility for sanitation is often multi-sectorial and shared among different line ministries including those responsible for water, health, environment, Local governments, and housing.

Consequently, in practice the roles are fragmented, not well articulated and/or appreciated by key stakeholders/ duty bearers. In other cases, there is weak enforcement and available regulations and standards are not adhered to and/ or well known. Therein lies the opportunity to clearly define procedural arrangements, stakeholder responsibilities and thus strengthen FSM in this region. Decentralized governance implies that solutions can be localized and that services can be brought closer, provided the relevant actors have sufficient capacity.

3.2 OVERALL SANITATION SECTOR STATUS

Study countries Map	Central Africa	EastAfrica	Southern Africa	West Africa
	Angola	Ethiopia	Zambia	Benin
	Burundi	Kenya	Botswana	Burkina Faso
	Cameroon	Malawi	Lesotho	Cote d'Ivoire
	CAR	Tanzania	Mozambique	Gambia
	Congo	Uganda	South Africa	Guinea
	Chad		Namibia	Mali
	Gabon			Mauritania
	Equatorial Guinea			Nigeria
	Congo D. R.			Senegal
	Sao Tome and Principe			Togo

Table 2: **Study sample**

Urban sanitation is a cross-cutting sector that is rarely the responsibility of a single institution. This assessment noted that majority of the study countries had similar characteristics. It is noted that there are efforts to improve FSM in majority of the countries albeit the policy and institutional gaps presented. Challenges of limited or no specific regulatory provisions for FSM particularly with regard to latrine emptying, limited human resources and infrastructure capacity, informal nature and high costs of emptying service are common to all countries.

Table 3 below gives a summary of sanitation statistics for each country. General characteristics for the study countries indicate a heavy reliance on on-site sanitation as indicated by the limited sewerage coverage and high latrine coverage. Generally urban sanitation in most of the countries leaves a lot to be desired with only Angola, Botswana, Equatorial Guinea, South Africa and Senegal registering access figures in excess of 65%.

Table 3: **Country level summary demographic and WASH statistics**

Country	Population		Sanitation Access		Latrine coverage%		Sewerage coverage %	
	National	Urban	Urban	National				
	Million	%	%	%	Urban	National	Urban	National
Angola	22.8	44.1	88.6	51.6	14.3	23.0	32.0	18.0
Benin	10.9	44.0	35.6	19.7	54.8	33.4	2.0	1.0
Botswana	2.1	57.4	78.5	63.4	56.0	54.6	2.0	1.0
Burkina Faso	17.9	29.9	50.4	19.7	79.6	34.1	2.0	0.0
Burundi	10.8	12.1	43.8	48.0	64.6	94.1	11.0	1.0
Cameroon	23.4	54.4	61.8	45.8	77.6	82.5	2.0	1.0
C A R	4.8	40.0	43.6	21.8	91.6	72.1	0.0	0.0
Chad	13.6	22.5	31.4	12.1	63.1	26.7	3.0	0.0
Congo	4.7	65.4	20.0	15.0	86.0	82.6	0.0	0.0
Côte d'Ivoire	21.3	54.2	32.8	22.5	47.5	42.9	15.0	7.0
D R C	71.2	42.5	28.5	28.7	80.3	81.5	1.0	0.0
Equatorial Guinea	0.8	39.9	79.9	74.5	33.5	23.5	12.0	9.0
Ethiopia	98.9	19.5	27.2	28.0	78.2	60.9	0.0	0.0
Gabon	1.8	87.2	43.4	41.9	59.1	63.6	38.0	33.0
Gambia	2.0	59.6	61.5	58.9	65.8	80.0	5.0	2.0
Guinea	12.3	37.2	34.1	20.1	74.6	66.3	0.0	0.0
Kenya	46.7	25.6	31.2	30.1	60.1	74.8	0.0	0.0
Lesotho	2.1	27.3	37.3	30.3	84.0	0.0	7.0	0.0
Malawi	17.3	16.3	47.3	41.0	84.7	92.4	2.0	0.0
Mali	16.3	39.9	37.5	24.7	87.3	84.3	0.0	0.0
Mauritania	4.1	59.9	57.5	40.0	43.6	32.4	4.0	2.0
Mozambique	27.1	32.2	42.4	20.5	77.1	57.7	0.0	0.0
Namibia	2.4	46.7	54.5	34.4	9.7	12.1	63.0	33.0
Nigeria	183.5	47.8	32.8	29.0	46.5	51.9	9.0	5.0
Sao Tome and Principe	0.2	65.1	40.8	34.7	6.6	6.2	6.0	6.0
Senegal	15.0	43.7	65.4	47.6	68.7	65.6	11.0	5.0
South Africa	53.5	64.8	69.6	66.4	12.3	32.7	0.0	0.0
Togo	7.2	40.0	24.7	11.6	38.5	29.1	0.0	0.0
Uganda	40.1	16.1	28.5	19.1	86.8	73.2	0.0	0.0
Tanzania	52.3	31.6	31.3	15.6	67.8	74.2	0.0	0.0
Zambia	15.5	40.9	55.6	43.9	61.5	68.3	25.0	10.0

Source: wssinfo.org, 2014

3.3 NON-SEWER AND FSM STATUS IN THE REGION

3.3.1 Collection and transportation

According to UN country statistics on sanitation, majority of the Sub-Saharan Africa countries have very low sewerage coverage with only Namibia recording a high at 63%. Other countries with appreciable coverage figures are Angola, Gabon and Zambia with 32%, 38% and 25% respectively. This implying the heavy reliance on non-sewer sanitation; the statistics further indicate that fecal containment is pre-dominantly through pit latrines on-site. Non-sewer status is typified by the pit latrines with coverage figures ranging from to 6.6% in Sao Tome and Principe to 91.6% in Central African Republic. An opportunity for latrine construction and emptying services.

A further analysis indicates that majority (21) of the study countries recorded latrine coverage above 50%, 11 of which exceed 70%. Further analysis for the detailed statistics that constitute the above latrine coverage figures indicate that dry toilets comprise the largest proportion. Generally, non-sewer sanitation comprises water closets and wet pits connected septic tanks and dry latrines with either lined and unlined pits latrines. Ground water contamination is reported as a key risk from on-site sanitation systems, notably for countries like Botswana where ground water is the main source. Appropriate latrine technologies, standards and policy enforcement are key areas for consideration to address this challenge.

▲ Figure 2: **Sample Pit latrines**

Full pits are either abandoned or emptied, this dependent on availability of space and funds for construction of new facilities, cost of emptying services and such like. Emptying these facilities is typically done every couple of years, the rate depending on the age and type of facility as well as FS accumulation rates that are typically higher in unplanned settlements and institutions with higher latrine stance ratios.

Emptying of cesspits is done using both manual and mechanical methods. The latter is mainly through vacuum trucks of capacity between 6m3 to 10m3. FSM in the region is characterized by an informal system of FS emptying and transportation. This assessment found that the FS removal and haulage is largely unrestricted with limited or no formal obligations and service levels. However, in some cities in several of the countries for example Benin, Burkina, Mali, Gabon, Central Africa Republic, Senegal, Malawi, Kenya and Uganda have associations for service providers and some have started formalizing the process through, for example, pilots on service level agreements.

▲ Figure 3: **Vacuum tankers**

Cesspit emptiers exist in many of the major towns, albeit unregulated and often unaffordable. Charges are made based on volume of sludge and/ or trip. Costs per trip up to USD 300 in the central African region, USD 150 in West Africa (Gambia) and USD 50 in East Africa have been noted. These costs are very prohibitive for most urban dwellers and will continue to suffocate the FSM chain especially in low income settlements.

To address this challenge, some appropriate solutions for semi-mechanized pit emptying like the "gulper", "Evac" and mupet have been introduced. However, many of these solutions have not survived past the pilot phase due to several reasons mainly relating to institutionalization and O&M.

▲ Figure 4 : **Semi-mechanized pit emptying**

Manual pit emptying has not been regulated, neither are standards for occupational health and safety enforced for this service. The high demand for these services continues to sustain the status quo, largely because they continue to provide an affordable option especially for the low-income urban dwellers. Municipalities like eThekwini in Durban, South Africa have made some strides in improving this sector through development and promotion of appropriate hand tools as shown below.

Bucket emptying | hand tools | Manual emptying

▲ Figure 5 : **Manual cesspit emptying**

3.3.2/ Treatment and disposal

Several literature points to challenges of desludging and treatment; majority of this FS is emptied in a haphazard manner and not safely disposed of. Results from this assessment attribute some of these challenges to limited institutional capacity including the absence of infrastructure and appropriate technologies for treatment of the FS.

Generally, deliberate fecal sludge treatment initiatives are minimal and are concentrated in larger cities. According to stakeholder consultations, in the towns with sewerage systems, FS treatment is considered as part of the sewerage / WW

management operations, many of which use biological treatment methods involving lagoons and activated sludge treatment units. Also, fecal sludge disposal is not well regulated in general and indiscriminate and unsafe disposal in open drains, fields and gardens is common practice; the latter mainly in the major cities. Nyirenda and Holm (2015) reiterate this, noting that in Malawi, FS is (unsafely) disposed of directly in gardens or in open ditches acting as “transfer stations” from which private transporters collect for private gardens.

▲ Figure 6 : **Fecal sludge disposal methods**

Further, existing WWTP are not functioning effectively since operations are not well controlled; in some instances, the WWTP will have the same tipping point for both activated FS from cesspits and WW from sewers, which compromises the efficiency of treatment functions like BOD removal since optimal operating conditions cannot be guaranteed.

3.3.3 Supporting enabling environment

The role for FSM management in urban areas is not clearly cut, and at policy level is shared among several sectoral ministries. At operational level, it is majorly the responsibility of urban authorities, although often the role is either shared or delegated to water utility companies. Non-state actors, notably civil society organizations and NGOs like Water for people, WSUP and WaterAid, have also been a major player in FSM, especially in low-income/unplanned settlements where sanitation improvements are a critical need. The regulatory framework in most countries exists albeit with some gaps on roles related to management of non-sewer sanitation.

The region has seen more attention to FSM over the last five years particularly in low-income urban settlements. There are some targeted efforts to improve FSM in all the countries. For example, in most of the capital cities there are initiatives to improve the emptying and hauling stages of the FS chain. Technological interventions and business models that target the sustained engagement of the private sector in emptying and transportation services are being tested (e.g. research on treatment technologies, use of the localized emptying solutions like the MAPET and VACUTUG and engagement of private sector using service level agreements (SLAs), dedicated FSM projects targeting informal settlements in major cities).

3.3.4 Key FSM challenges in the region

Sanitation and in particular FSM in urban areas still remains a challenge despite the considerable efforts made by the states and their respective partners over the years to commitments as prescribed in the MDGs, National strategy documents and now the SDGs. Studies undertaken in the region on FSM, including WSP (2014) and Morella et al (2008) continue to highlight several challenges related to FSM. Country level assessments also reiterated these as outlined in the below:

- *A history of focusing on sewerage over FSM, leading to poor development of solutions to improve fecal sludge management.*
- *Unplanned and irregular provision of FSM; largely managed in the informal sector by private businesses. Efforts to improve FSM are focused in informal settlements, excluding the large population in peri-urban areas that use septic tanks.*
- *Poor regulation and management of the FSM cycle e.g. in most cities, containment is an unregulated household responsibility, often resulting in construction of simple pit latrines that cannot be emptied. Collection is poorly regulated, leading to illegal dumping; treatment and disposal facilities are largely lacking.*
- *Poor governance and the inadequacy or lack of specific laws to regulate the sub-sector; the latter limiting the effectiveness of financing to effect any improvements.*
- *Rapid urbanization contributing to the proliferation of informal settlements, characterized by unplanned infrastructure and dismal sanitation provisions if any. The high-density of the informal settlements coupled with other challenges such as lack of tenure limit the solutions that would be technically and financially viable.*
- *Inadequate capacity in the sector in terms of infrastructure, human resource numbers and skills, financing, regulation and involvement of private sector as development partners. The limited availability at national level of experts to conduct of national and capacity building.*
- *Project driven FSM initiatives that are not institutionalized and seldom survive past the pilot or end of project phase. This limits sustainability of solutions and improvements are short-lived.*
- *The opportunities in the FSM value chain are several as earlier outlined. It is imperative for African governments and their development partners to optimize the benefits if any sustainable urban sanitation improvements are to be made.*

4

MODELS FOR REPLICATION IN THE SANITATION SECTOR IN SUB SAHARAN AFRICA

Research and practice has shown that service delivery along the FSM chain is still challenging. Countries are constrained financially due to competing community needs. Technologies are not well developed and used, regulation exists to facilitate FSM activities but the provisions therein are not adequately implemented and / or enforced. However, this dismal situation presents opportunity for improved engagement. This is also supported by an enabling environment: stable governments that are committed to the well-being of populations, institutions mandated for sanitation exist with varying levels of capacity. Below are presented some best practices and promising initiatives that could be replicated.

i. Promising models for FS containment, sustainable emptying services and FS treatment- Case of Senegal

The ongoing initiative to improve FSM as part of the fecal sludge market structuring program supported by the Bill & Melinda Gates Foundation presents promising practices and options. The project aims to:

- *reduce the cost of emptying, increase the income of emptiers, enable sustainable management of sites developed for unloading and professionalize the emptying activity*
- *improve Non-sewer sanitation in flood zones*

Key activities include:

- *testing the Omni-Processor as an optimal FS treatment option that produces electricity, promotes re-use through producing potable water and ash for soil conditioning*
- *business development support to emptiers through (i) a guarantee fund that provides low rate credit to emptiers for purchase of new trucks and spare parts; (ii) setting up a call center for customer management; (iii) policy revision to allow for licencing of emptiers; (iv) and improve infrastructure to reduce truck haulage distances and thus opex to maximize returns*
- *developing appropriate on-site toilet options for flood zones*

So far the project is still ongoing but presents promising replicable models in the three areas of FS containment, Pit emptying and FS transportation services and FS treatment. The omni processer is reported to treat about 30% of the FS in Dakar and is currently producing the three by-products.

▲ Figure 7 : **Omni processor in Dakar**

ii. Partnerships – potential for facilitating and improving FSM Case of Malawi

One of the objectives of the Malawi Peri-Urban Water and Sanitation Project, an European Investment Bank (EIB) funded project, was to provide basic sanitation to 468,000 people in low income areas of the cities of Blantyre and Lilongwe through increasing latrine coverage. The project gave WaterAid, an NGO, small local concessions for the provision of services through kiosks and associated public sanitation facilities.

The collaborative model succeeded in rolling out 70,000 latrines through sanitation awareness building and marketing; training slab builders; setting up private pit latrine emptying services using the Gulper; Nibbler (van Gilst, Thomas 2008).

▲ Latrine - before situation

▲ Latrine - project intervention

▲ Figure 8 : **Latrine improvement**

iii. Innovative resource recovery options for FS treatment Cases studies of Kenya and Kampala, Uganda

The practice of reuse of FS as an energy source (biofuel) has advanced in Kenya, notably are the initiatives involving biogas production at specially designed public sanitation facilities locally referred to Bio-centers. Several projects championed civil society organizations including Umande Trust, GOAL and WSUP have rolled out the concept mainly targeting informal and unplanned settlements, with a unique sanitation challenge.

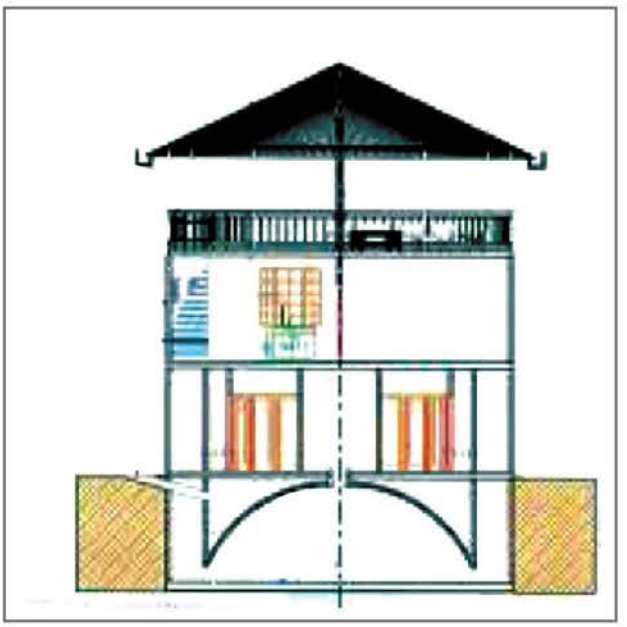
Bio-centers are a sanitation innovation comprising a multi-purpose sanitation structures (see figure 9 below) with toilet and bathroom-facilities[2] like operated on pay per use basis[3] that are designed to

[2] In some cases like existing toilets have been connected to discharge into the bio-centre and increase capacity

[3] This is only for facilities located in public places for communal use

produce bio-gas and liquid fertilizer through anaerobic digestion in dome structures. These structures are typically managed by community groups, serve as community information and resource centers, have space for other activities like kiosks.

These centers originally targeted improvement of sanitation and livelihood informal settlements but have also been used at institutions (e.g. schools). Chowdry and Kone (2014) highlight the high coverage levels, with over 100 bio-centers recorded in only Mombasa, Kisumu and Nairobi. The biogas from these units is harvested and used mainly as cooking fuel for beneficiaries at the facility. Daily output from a bio-center has been reported as 12 m^3 of gas per day.



▲ Bio-centre drawing

▲ Bio-centre example as built

▲ Figure 9 : **Typical Bio-center in Kenya - drawing and As built**

According to Munala et al (2015), several successes and benefits have been reported for this concept. For example in Jasho Letu slum, Nairobi, the bio-center established in 2007 has positively impacted the community with increased incomes, improved sanitation and community financial management capacity. Several revenue streams including (i) from toilet and showers where daily and monthly payment options available, all less than USD 2[4] ; Weekly revenues of Ksh. 7,000 (US$ 77.78) a week from this source have been registered (ii) sale of cooking fuel (Ksh. 87(US$ 1) per litre) which has the additional benefit of greener energy options to the community (iii) space rental for meetings and entertainment (e.g watching football matches) and (iv) operating a local grocery.

Other initiatives include the FaME project in Uganda. FaME is a collaborative research project that aims to demonstrate innovative and profitable resource recovery options for fecal sludge treatment products that will generate revenue to improve the service chain, and increase public and environmental health in urban centers of Sub-Saharan Africa. In Kampala, Uganda, the project is piloting an industrial kiln (see figure 10 below) as a demonstration of the technical and financial viability of using dried fecal sludge as a solid biofuel to burn clay products.

Demonstration kiln at Bugolobi WWTP Kampala, UgandaA

Clay products from the kiln

▲ Figure 10 : **FS re-use options - FS Burning to fire clay bricks**

4 One time use Ksh. 5 (US$ 0.05) and Ksh. 10 (US$ 0.11) for toilet and shower respectively with monthly use costs at Ksh.150 (US$ 1.7)

In general, energy producing options have highest revenue compared to status quo/end-use in agriculture. In addition, about 70% of surveyed industries were willing to use the FS provided: it did not emit foul smell when burnt and it gave an equivalent or greater calorific value when compared to the fuels already in use, however, there is a health risks to workers if not well handled. The most promising FS end-use industrial applications were the Clay industries and the blacksmiths who were able to use their existing infrastructure/systems to optimize the kilns (Niwagaba, 2014).

iv. Advancing safe FS containment case of CLTS in Ethiopia

The sanitation activities in Ethiopia are largely driven by donors e.g. the WSP funded program financed the Community-Led Total Sanitation (CLTS) program that has contributed to significant reduction in open defecation.

The Southern Regional Health Bureau applied the CLTS approach, based on "zero subsidy" but allowing the communities to develop own-sanitation solutions that were affordable. The Health Bureau utilized a mass communication campaign to create awareness and advocate to households to construct their own latrines. The mass campaigns coupled with close collaboration with all key stakeholders helped to create buy-in, to build capacity and solicit volunteer health promoters.

The campaign used women to drive latrine construction, educate the population on the risks associated with open defecation and the benefits of safe sanitation. The volunteer health promoters were tasked to lead by example; to make house calls (accompanied by health workers) to persuade householders to build latrines; and to supervise the latrine construction. Morella et al (2008) report that pit latrine ownership rose by over 200% from < 13% in September 2003 to >50% in August 2004.

v. Latrine emptying technologies - case of Gulper Tanzania

The region has seen more into including the Gulper, VACUTUG and Maped In 2007, WaterAid, in association with the London School of Hygiene and Tropical Medicine introduced a hand pump for emptying pit latrines. This Gulper pump consists a long vertical stainless steel rod (pump rod), raiser pipe, and two non-re-turn valves. The pump rod is connected to a T-handle and an uPVC pump which lifts the fecal sludge.

▲ Figure 11 : **Use of the Gulper for FS extraction**

5 CONCLUSIONS RECOMMENDATIONS

Fecal sludge management is the weak link of past or planned programs in the African cities and countries. Given the huge number of African cities without a FSM strategy management plan, the few example of good practices shown in the cases studies highlighted in section 4, demonstrate to some extent, some commitments toward improving FSM services in some cities/countries. The innovation exhibited also allude to reduce reliance on traditional methods and potential for investment in knowledge management for improved learning on FSM and to develop appropriate solutions. There are also opportunities for supporting local research for the development and promotion of urban sanitation solutions and hence, turning sanitation from its current subsidies component of urban service into a fruitful business opportunity which can attract financing.

Whether the pit emptying service of on-site facilities is done manually or mechanically, most of the operators involved on this part of the chain of FM are private and hence there is a strong need of a minimal regulation by the city authorities. This highlights the potential market for mechanization of collection system, and the need for institutional reforms to restructure the FSM systems to enhance private sector participation.

So far as business is concerned, the need for developing and adopting realistic business models for FSM is vital for the sector. Such model should include not only the emptying truck cost, but also additional costs for operation and maintenance as well as sludge treatment ones to complete the FSM cycle as a safe and environmentally sustainable business.

Many African cities do not have sufficient FS treatment facilities due to the high infrastructure structure development costs or the very low volume of fecal sludge collected. The bu-

siness model should integrate mechanisms to improved coordination between the involved stakeholders which include: the regulatory bodies and the municipal authorities; but also, the recognition of the role of the private sector involved in collection and transportation.

The private emptiers should be recognized as a fundamental stakeholder in the FSM chain. This has to an extent been acknowledged, as evidenced by work in Senegal, Kenya, Malawi and Uganda where sanitation service level agreements (SLAs) are being piloted and there is operating space for private sector albeit unregulated. This may include development of guidelines and regulatory instruments to govern their operations. This may also require identification of a business model that aims at financial sustainability of the emptying business including marketing, provision of tax and business incentives to promote expansion of coverage and scope of operations say to include management of water supply systems or Public water points.

Argue on the need for a better articulation of the roles and standards particularly pertaining to FS containment and emptying services is another challenge to be considered. The assessment has also highlighted the overlapping roles of water utilities and Local authorities in practice albeit the regulatory provisions. Institutional strengthening to clearly roles, build sufficient performance capacity as well devise transitional arrangements where role changes are envisaged is thus necessary.

The similarity of contexts between the countries also provides opportunity for promote peer-to-peer learning partnerships as a cross learning approach between/among similar entities, cities and countries. Such approach is recommended for spreading good practices and share knowledge developed within successful pilot projects. Among the partnerships being implemented, capacity development component could include thematic such as:

- *resource recovery reuse of FS as a bio fuel source reported in Burkina Faso, Malawi and Uganda,*

- *models for improving latrine emptying service - PSP promotion as implemented using the SLA in Kenya, Malawi and Uganda*

Design of the mentorship program should be cognizant of the complementarity of roles and mandates of Urban Local authorities and sanitation utilities where ever they exist regarding FSM. In such cases, a tripartite model is thus recommended involving both parties as mentees to the identified mentor. By design, Local authorities or sanitation utility should have to take lead role/champion achievement of mentorship program objectives given the overarching on-sanitation mandate.

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