



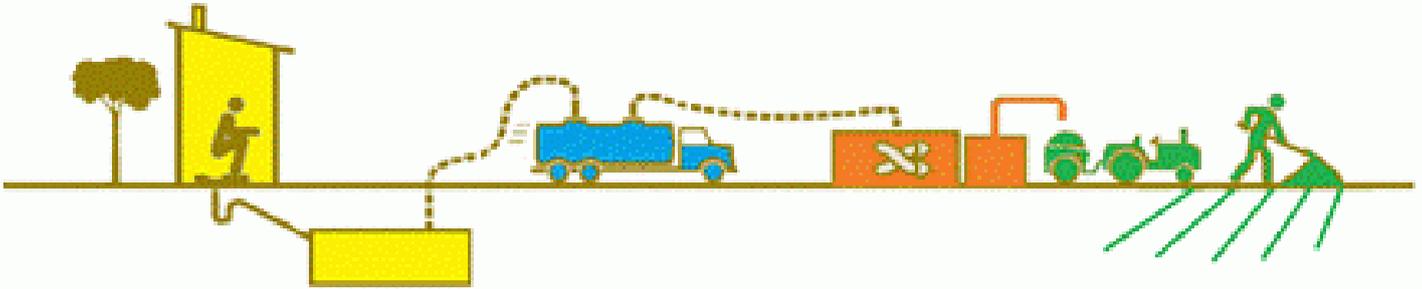
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Water and Sanitation  
REPUBLIC OF SOUTH AFRICA



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# FAECAL SLUDGE MANAGEMENT CONCEPTUAL FRAMEWORK

NATIONAL FAECAL SLUDGE MANAGEMENT STRATEGY, SOUTH  
AFRICA

March 24, 2021

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Cover photo: The Sanitation Service Chain. The Bill and Melinda Gates Foundation  
WASH Strategy Overview (July 2011).

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## LIST OF ACRONYMS

CoGTA	Department of Cooperative Government and Traditional Affairs
CSDA	City Service Delivery Assessment
CWIS	City-Wide Inclusive Sanitation
DEA	Department of Environmental Affairs
DEWAT	Decentralized wastewater treatment
DWS	Department of Water and Sanitation
EMM	eThekweni Metropolitan Municipality
FS	Faecal Sludge
FSTP	Faecal Sludge Treatment Plant
FSM	Faecal Sludge Management
ISHP	Integrated School Health Programme
PLM	Polokwane Local Municipality
PPE	Personal Protective Equipment
REVAMP	Resource Value Mapping tool
RSA	Government of South Africa (Republic)
RWP	Resilient Waters Program
SFD	Faecal waste Flow Diagram
USAID	United States Agency for International Development
VIP	Ventilated Improved Pit latrine
WHO	World Health Organisation
WRC	Water Research Commission (South Africa)
WSA	Water Services Authority
WSUP	Water and Sanitation for the Urban Poor
WWTW	Wastewater Treatment Works

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## SECTION I.

# INTRODUCTION

## BACKGROUND TO THIS DOCUMENT

The Department of Water and Sanitation (DWS) has entered into a collaboration agreement with the USAID Resilient Waters Program to develop a National Faecal Sludge Management Strategy for South Africa (Ref: RWP\_CA\_ZA\_02\_11/2019). In addition, the USAID Resilient Waters Program has entered into another collaboration agreement with the Polokwane Local Municipality (PLM) in order to create the evidence upon which the Strategy could be developed (Ref: RWP\_CA\_ZA\_01\_11/2019). The latter agreement sees both institutions partnering to pilot the use of various faecal sludge management tools.

Both collaboration agreements are set to run concurrently with the collaboration between PLM and the USAID Resilient Waters Program taking place between June 2020-June 2021 and the collaboration between the Department of Water Sanitation and the USAID Resilient Waters Program taking place between October 2020-December 2022.

While there are two collaboration agreements, all collaborating partners mentioned here are working together to deliver on the outcomes of both collaboration agreements.

This document sets out the Conceptual Framework for Faecal Sludge Management (FSM), at a national level in South Africa. The Conceptual Framework for FSM is the basis for the National FSM Strategy, which is aimed at improving FSM in South African municipalities over a ten-year period. A realistic and practical strategy should address areas with the highest potential impact. Due to the high costs associated with addressing FSM, areas with higher potential impact are commonly the urban and peri urban environments.

## FAECAL SLUDGE MANAGEMENT

Faecal sludge (FS) can be defined as a mixture of human excreta, water, urine and solid wastes (e.g. toilet paper or other anal cleansing materials, menstrual hygiene materials) that are disposed of in on-site sanitation technologies such as ventilated and non-ventilated improved pit latrines, conservancy tanks, septic tanks, chemical toilets, flush bucket toilet and aqua privies. Faecal sludge is raw or partially digested in form (Strande *et al* 2014) and is essentially the sludge or slurry that collects in, and needs to be removed from, on-site sanitation systems such as pit latrines or septic tanks systems and comes from toilets that are not connected to sewers.

Almost 3 billion people globally, rely on such on-site sanitation systems (Strande *et al* 2014). This number is growing exponentially with rapid urbanisation occurring across the globe and is expected to reach 5.5 billion people by 2030.

While, globally there is a heavy reliance on on-site sanitation systems, the infrastructure and management systems for faecal sludge containment, emptying, collection, transport, treatment and end-use or disposal either does not exist, or is inadequate to deal with the volumes of faecal sludge that need to be processed. Historically, the authorities in cities and towns have focused on developing sewer systems. However, “the costs and operational challenges of expanding, operating and maintaining conventional sewage systems for all the developing world’s cities would by far outstrip the technical, financial and water resources available” (Arbogast & So 2013).

New and more inclusive solutions are needed, and over the last 10 years there has been an increasing focus on the relatively new field of FSM.

In addition to the need for “new” sanitation systems, there is also a growing understanding of the opportunities raised by viewing faecal sludge as a resource, rather than simply as waste material.

Not only can FSM solutions be five times less expensive than sewer systems (Dodane et al, 2012), but it is also possible to partially offset some of the costs of implementation, operations and management by processing the faecal sludge into end use products that have a commercial value.

New technologies for processing faecal sludge to create these products are constantly emerging and represent a useful additional role for the private sector to work with local government, and also provide opportunities to generate local livelihoods from FS processing, to support safe and sustainable sanitation for all.

## **FAECAL SLUDGE TREATMENT**

The characteristics of FS are generally very different from wastewater sludge. FS might contain solid objects like stones, wood, plastics, baby diapers, paper or even solid waste (pits are used as rubbish pits). Where FS is collected in industrial areas, it may contain contaminants, such as heavy metals, or fats / oils (Singh et al 2017). Therefore, there are two stages of treatment for FS, primary treatment (separating solids from liquids or sometimes referred to as dewatering), and final treatment of the sludge that results from primary treatment.

In some instances, co-treatment is possible, depending on the type of technology and available space (e.g. for septic tank waste). However, co-treatment may require some adjustments like pre-treatment to make wastewater treatment systems suitable. It is important to note that without the extra pre-treatment the wastewater treatment systems could be damaged. FS from VIPs should not be treated through conventional wastewater systems as it is materially different from wastewater or septic tank waste.

The WWTW processes play an important part and vary from plant to plant. Therefore the impact of FS on a WWTW depends on:

1. WWTW process and technology,
2. WWTW capacity in relation to FS quantity (in some cases it is insignificant),
3. The type of FS and mode of transport and,
4. Effluent quality criteria

According to Singh *et al* (2017), there are a number of different options for primary treatment including planted or unplanted drying beds, and technologies such as the following:

- Centrifugation: A mechanical treatment (often used in wastewater treatment),
- Settling-thickening tank: A non-mechanical rectangular tank where solids settle at the bottom. Scum rises to the top and liquid (called supernatant) is discharged through an outlet pipe,
- Imhoff tank: A V-shaped chamber which acts as a settling tank (sedimentation) and,
- Geobag: a non-mechanical filtration system using geotextiles

As mentioned above, the decision about which type of primary treatment is appropriate depends on the available space, capacity and the physical conditions (e.g. depth of groundwater, rainfall levels, proximity of human settlement etc) at the treatment site.

There are various types of treatment for the faecal sludge that results from the primary treatment as follows:

- Co-composting: where sludge is mixed with organic waste,
- Deep row entrenchment: where sludge is buried in deep trenches and covered with soil (can act as a fertilizer for trees),
- Vermicomposting: where earthworms feeding on the sludge convert it to compost, which could be further enhanced by adding waste such as garden waste,
- Anaerobic digester: “This technology is used for the digestion of organic matter in the presence of anaerobic microorganism” (Singh et al, p. 210) with resultant products of slurry and biogas,
- Solar drying: Sludge deposited in either concrete or greenhouse-type structures is dried by the sun,
- Shallow trenches: Where sludge is mixed with soil in a shallow trench,
- Solar sludge oven: An insulated box which reaches high temperatures to dry the sludge, which can then be used as soil conditioner and,
- Black soldier fly larvae: Black soldier fly larvae feed on decomposing waste but the product is insect protein which could be used in fishmeal. The resultant product is not suitable for agriculture with this method.

Singh et al (2017) have developed a decision matrix for selecting appropriate types for both primary and sludge treatment.

Some of the above technologies have been tested at a municipal level in South Africa and in the section below entitled “Examples of FSM in Practise”, a case study of a number of these used by eThekweni Metropolitan Municipality (EMM) is presented.

The concept of FSM is relatively new to South Africa, however the government, along with sector stakeholders, is mobilizing to integrate FSM into the sanitation systems managed by Water Services Authorities (WSAs) across the country, including the development of this National FSM Conceptual Framework and the FSM strategy which will be based upon it.

## **FAECAL SLUDGE MANAGEMENT IN SOUTH AFRICA**

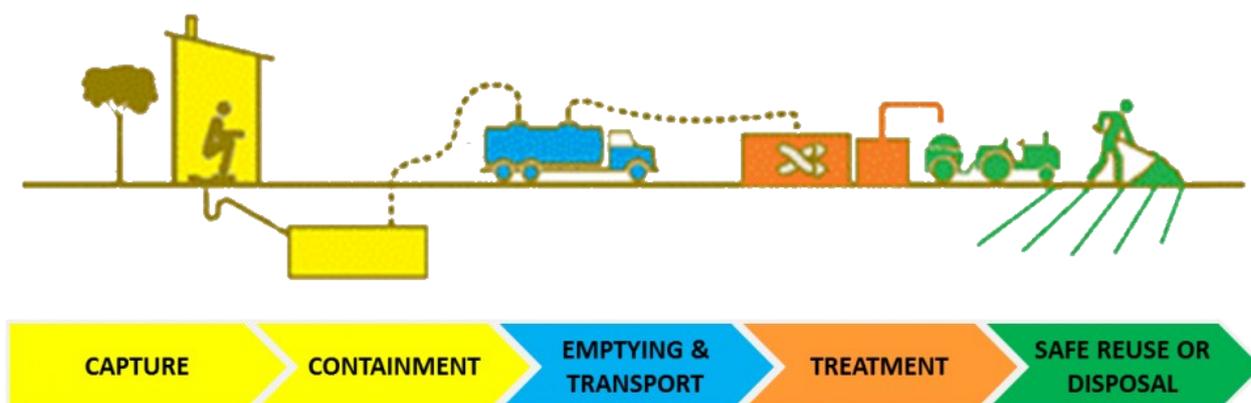
The South African government has shown commitment in providing access to improved sanitation services. The number of households served with basic sanitation has increased in 2002 from 61% to 83% in 2018 (STATS SA, 2019). The provision of sanitation service varies from on-site to offsite sanitation technologies depending on settlement conditions.

Approximately 61% of the households in South Africa have access to sewer networks, with 36% dependent on on-site sanitation systems (mainly septic tanks, Ventilated Improved Pit latrines (VIPs) and 4% practising open defecation (VWRC 2020). However, 10% of households (507 732) served by on-site sanitation technologies have full pits (STATS SA, 2019) – which could lead to people resorting to open defecation.

Access and use of improved sanitation services ends open defecation but does not end with the construction of a sanitation facility. There are operations and maintenance needs required which include FSM to sustain the service. In the past the operation and maintenance of on-site sanitation technologies have not been given much attention when compared to sewerage systems and wastewater treatment with a general expectation that the end user or household will attend to pit emptying.

In urban settlements when a basic level of on-site sanitation has been provided it is often considered as a temporary solution, with a sewerage system as the permanent future sanitation solution. The challenges experienced in the sanitation sector have shown that waterborne sanitation (sewerage) and wastewater treatment is not sustainable owing to a number of factors, such as water shortages in the country, technical capacity gaps, low billing and collection rates, and the lack of resources to adequately maintain these systems. The conventional sewer networks and wastewater treatment cannot keep up with rapid urbanisation and population growth. For example, in the Msunduzi Municipality (Pietermaritzburg) the incidence of serious sewage pollution (defined as more than 10 000 *E. coli* per 100 ml) detected in weekly stream and river monitoring samples is now five times more prevalent than it was 25 years ago (Duzi-uMgeni Conservation Trust, 2020), the average incidence having moved from 10% to over 50%.

On-site sanitation needs to be safely managed throughout the faecal sludge service chain (Figure 1) which entails capturing faecal sludge from the toilet, containment, transportation, treatment, and disposal or safe reuse. In South Africa, faecal sludge management and sewer systems would complement the wastewater treatment systems that are regulated by the DWS.



**FIGURE 1: THE FSM SERVICE CHAIN (SOURCE: [WWW.IRCWASH.ORG](http://WWW.IRCWASH.ORG))**

In terms of the on-site sanitation systems used by 36% of the population, the largest proportion are Ventilated Improved Pit Latrines (VIPs). These systems have been used quite extensively in government sanitation roll-out programmes as they do not need a reliable piped water supply to function and also because they are the most economical formal sanitation option. They do however fill up, with the typical pit filling time being 6 to 12 years (Still et al 2012), and, as mentioned earlier, 10% of households with VIPs have full pits (STATS SA 2019).

In fact, a recent study (WRC 2020) conducted in a number of Eastern Cape and KwaZulu-Natal municipalities indicated that to a large degree, data on FSM requirements is relatively poor, and that there is a significant backlog in emptying services.

In addition, only a few of South Africa's 144 Water Services Authorities have compiled a Faecal Waste ("Shit") Flow Diagram (SFD). This implies that the impact of unsafe faecal waste flows on people and the environment is unknown and therefore not fully integrated in decision making on sanitation management within the Water Services Authorities.

Finally, South Africa has only recently begun to take the requirements for effective FSM into account in their policy, legislative, regulatory, financing and management frameworks.

## SECTION 2.

# THE PLATFORM FOR FSM IN SOUTH AFRICA

## LEGISLATIVE FRAMEWORKS

South Africa has a policy framework for safe and equitable sanitation, but there are significant gaps with regard to FSM and FSM services.

The Constitution of the Republic of South Africa (Act 108 of 1996) provides for the right of all people in South Africa, to dignity and access to an environment that is not harmful to health and well-being and is sustainable and protected from pollution and degradation through legislative measures. Access to adequate sanitation services is important to achieve these goals of improved health, safety, environmental standards, and dignity for all South Africans. The Water Services Act (Act 108 of 1997) Section 3 (1) provides for this basic right of access to basic water supply and basic sanitation to everyone.

The implementation of sanitation policies has been guided by the Strategic Framework for Water Services (2003) which advanced in addressing sanitation services delivery essentials for 10 years. The Department of Water and Sanitation (DWS), as a sector leader, has been at the forefront of reviewing the White Paper on Basic Household Sanitation (Department of Water Affairs and Forestry (currently DWS), 2001) which resulted into National Sanitation Policy 2016 (RSA 2016).

The National Sanitation Policy 2016 provides a suite of procedures, rules, and allocation mechanisms for sanitation in the country. These are implemented through the policy instruments of laws and regulations, economic measures, information, educational programmes, and assignment of rights and responsibilities for providing services.

'Basic sanitation services' is the provision of a basic sanitation facility which is environmentally sustainable and easily accessible to a household and a consumer. Basic sanitation includes the sustainable operation and maintenance of the facility, including the safe removal of human waste, grey-water and wastewater from the premises where this is appropriate and necessary, and the communication and local monitoring of good sanitation, hygiene and related practices (RSA 2016). However, the policy definition lacks clarity on safely managed sanitation throughout the sanitation service chain, specifically FSM.

According to the National Sanitation Policy (RSA 2016), there is a vast array of institutions and stakeholders in sanitation service provision in South Africa. While "the sanitation efforts of these stakeholders and institutions is often uncoordinated, incompatible and in some cases conflicting resulting in poor provision of services to areas of the country" (RSA 2016, p 28) overall, responsibility of ensuring the provision of services to the population of their area rests with the Water Services Authorities (although actual provision of services may be contracted out to a separate service provider such as a Water Board). The WSAs are regulated by the Department of Cooperative Governance and Traditional Affairs (CoGTA). Other agencies, such as the Department of Environmental Affairs, Forestry and Fisheries (DEFF) are responsible for enforcement and DWS, as sector leader, is responsible for the regulation of the sector, as well as policy and strategy development, monitoring and institutional oversight. Still other ministries have a responsibility for various components of the sector.

In terms of financing, current revenues are sourced mainly from government through grant allocations, such as the Municipal Infrastructure Grant, the Urban Settlements Development Grant among many others, or from internal budget allocations from various government departments. Private sector revenue comes from organisations that have specific social responsibilities such as mines, or from Corporate Social Responsibility programmes in specific areas. Other sources include South Africa's development partners (donors) who provide funding into various initiatives at policy and project levels or into research. Within the WSAs, sanitation services are often cross subsidized by revenues from other municipal services.

The Water Research Commission (WRC) conducted viable pilot studies on faecal sludge management. Academic and public institutions received donor funding which contributed knowledge on faecal sludge management in the country.

A pilot program commenced in the Polokwane Local Municipality where an analysis of the legislative and institutional frameworks that relate to safely managed sanitation was analysed as part of the implementation of a Sanitation Safety Plan for non-sewered sanitation services in Polokwane. The results of the analysis are set out in Annex A. The results highlight institutional and legislative gaps relevant to PLM (and also to a large extent to the national context).

The DWS, as a sector leader needs to support, manage, and regulate faecal sludge management activities in the sanitation services chain commencing with this Conceptual Framework for FSM in South Africa.

Many countries around the world are mobilizing to implement FSM programmes and projects in order to align their sanitation sectors with the Sustainable Development Goals.

## **A GLOBAL SHIFT IN MINDSETS**

The City-Wide Inclusive Sanitation Initiative led by the World Bank in partnership with sector development organisations such as the Bill and Melinda Gates Foundation has released a Call to Action which “seeks to mobilize all stakeholders to embrace a radical shift in urban sanitation practices deemed necessary to achieve citywide inclusive sanitation” (CWIS website). This mindset shift is backed up by a range of tools and mechanisms which can assist national and local governments to implement FSM programmes.

The suite of support tools includes:

- The Faecal Waste (“Shit”) Flow Diagram (SFD): an advocacy tool for working with decision makers for FSM investments. It provides an easy to understand graphic of the current sanitation situation at municipal level (in a city). The SFD assessment tries to provide a diagnostic of where the key issues of FSM reside. This may be intransport, treatment or both. These dynamics need to be understood across the chain to guide strategic investment planning,
- The City Service Delivery Assessment (CSDA): a follow-on tool to assess the policy, institutional and regulatory environment – the reason why the SFD and the sanitation situation is the way it is,
- The Resource Value Mapping tool (REVAMP): a tool for assessing resource value potential in faecal sludge processing,
- The Sanitation Safety Plan (SSP): a tool developed by the WHO to assist sanitation service providers with a step-by-step, risk-based approach to implementing safe sanitation practices along the FSM service chain in specific areas (cities / towns or specific sanitation chains),

- The Guidelines on Sanitation and Health: guidance document “to promote safe sanitation systems and practices in order to promote health” (WHO 2018, p xiii),
- and there are many others in the FSM toolbox (FSM toolbox website).

There are excellent examples of FSM implementation which can provide knowledge and guidance to the South African sector.

## EXAMPLES OF FSM IN PRACTISE

There are a myriad of examples across the globe of successful FSM in practice, but the following five examples demonstrate the various potential benefits of FSM at different points in the FSM service chain. It should be noted however, that many of the technologies that are promoted as FSM solutions are very much in the experimental stage and are not yet proven in varying contexts. Any technologies which are promoted for FSM in South African municipalities need to be well proven and cost effective. The WRC has done considerable research on technologies in South Africa and there are many examples of technologies being tested globally. These should be carefully evaluated and contextualised before implementation on the ground in municipalities.

### A SANITATION BUSINESSWOMAN FIGHTING THE ODDS IN INDIA

Ventakalakshmi, a sanitation businesswoman in the city of Narsapur in India has been running a sewage collection business for 25 years. She was initially on her own in the business, but competition from other operators – which even lead to personal threats against her – forced her to reconsider her business model. She engaged her family, and even approached another operator who was a competitor. The new model helped them save costs and implement systems to ensure equitable operations, and the business prospered. In 2017, the government of India developed the Operative Guidelines for Faecal Sludge and Septage Management – known as GO134.

These guidelines meant that city and state (provincial in the South Africa context) governments need to align their processes with GO134. As a result, the municipality in Narsapur is now licensing desludging operators so that they and the city government are aligned with safe sanitation guidelines as set out in the new regulations. According to Dr Y Malini Reddy of the Administrative Staff College of India, which is supporting the Narsapur municipality, these guidelines also state that all operators should have two essential tools; a GPS tracker so that the movement of trucks can be monitored in real time; and the FSM tracker mobile app which can provide information to both operators and government on toilet typologies and where desludging is happening. These tools will eventually assist the city in implementing scheduled desludging.

For Ventakalakshmi, the implementation of GO134 should increase desludging work, and she expects to have to purchase more trucks to meet the demand. In order to support enterprises like Ventakalakshmi’s business, the state (government of Andhra Pradesh) is planning to establish business support through the national Urban Livelihood Mission. The city of Narsapur is planning to construct a new Faecal Sludge Treatment Plant, which also includes facilities for end-use processing to produce biochar (a type of fuel similar to charcoal) and compost – which can then be sold to offset some of the operational cost. In addition, Ventakalakshmi’s vehicles (and others like hers) will now be licensed by the Municipality to collect FS from households and deliver to the new facility.

Ventakalakshmi’s story can be viewed at the following link: [A Sanitation Businesswoman Fighting the Odds - YouTube](#).

## PIT EMPTYING IN MAPUTO – A SERIOUS BUSINESS

The Maxaquene low income district in Maputo used to have a high incidence of cholera and conditions were extremely unhygienic. Recently, Paulino, a former geography teacher has changed all that. Paulino was a resident of Maxaquene and decided to get a group of youths together to collect solid waste from household pit latrines (both improved and unimproved) in the district. Initially, he offered his services free of charge, but then began to charge small amounts, and soon had over 300 households contracted according to Amaka Godfrey of the NGO, Water and Sanitation for the Urban Poor (WSUP). This came to the attention of the city government, who approached Paulino to provide FS collection services on their behalf. Paulino, suggested that the government license his organisation to contract his services directly with residents if they agreed to this model. The community agreed to pay him directly and he established his business investing his own money in a truck and taking on local staff.

His team, which is well supplied with personal protective equipment (PPE), use a piece of equipment called a “gulper” to empty household toilets. Previously, residents used to dig a hole and move the faecal sludge to the new hole so that they could continue to use the toilets at their households. “Everywhere here is full of holes” he says. Now, however, people prefer to use his service as he takes away the faecal sludge in his truck and they do not have to dig new holes.

WSUP CEO, Sam Parker says that independent entrepreneurs are important because they can reach areas that often city utilities or government services cannot get to because their equipment is not suitable for those densely populated and congested urban conditions.

Local Councillors, like Celina Cossa of the Ka-Maxaquene District, agree that Paulino’s service has had a great impact not only on the hygiene conditions in the district but also on local livelihoods. She believes other similar enterprises should be encouraged and the service is now expanding across Maputo.

Paulino’s story can be viewed at the following link: [Emptying pits in Maputo, Mozambique: a serious business - YouTube](#).

## THE FSM MARKET STRUCTURING PROGRAM IN DAKAR

The National Sanitation Office (ONAS) in Dakar, Senegal initiated the Faecal Sludge Market Structuring Programme (PSMBV) in the city in 2011 (Diop and Mbéguéré 2017). The program needed to provide services to the population of Dakar, 75% of whom relied on on-site sanitation services. The program targeted two districts of the city in particular where almost all residents had on-site sanitation systems.

Toilets were emptied either by aging vacuum trucks (colloquially known as honey suckers) or by manual emptying; in both cases unregulated. The PSMBV program followed on from an infrastructure program in Dakar, which refurbished the city’s three Faecal Sludge Treatment Plants (FSTPs) which were in disrepair.

Key objectives of the project, developed collaboratively with stakeholders were:

- “to provide a good mechanical emptying service at the lowest possible cost to low-income urban residents; and
- to help increase the incomes of the mechanical emptiers” (Diop and Mbéguéré 2017, p. 3).

The project established a Call Centre linking customers and emptying services providers who bid on the services through the call centre. The result of this was that costs of services remained competitive and bidders had ready access to the market. In addition, a Guarantee Fund was established which allowed for the purchase of 26 new vacuum tankers now in service in Dakar. Finally, the management of FSTPs was delegated to private entities through Public-Private Partnerships aimed at making operations of FSTPs profitable and self-sustainable through efficient operations.

The FSM Case Study on the PSMBV can be accessed at the following link: [I0\\_fsm\\_innovation\\_dakar.pdf \(eawag.ch\)](#).

Further information on FSM in Senegal can be viewed at the following link: [Faecal Sludge Management in Sub-Saharan Africa: Enhancing the Value Chain - YouTube](#).

## END-USE PROCESSING IN ETHEKWINI MUNICIPALITY

eThekweni Metro Municipality (EMM) was consolidated from 38 municipalities in and around Durban in 1996. At this point, the city had a population of three million people, with a steady stream of new arrivals coming in from rural areas. One million people had access to waterborne sanitation and a further million had access to sanitation infrastructure that needed rehabilitation. One million people had no services at all. The concept of “The Waterborne Sanitation Edge” was created by the EMM within which sewered services could be provided and beyond which the most cost-effective option would be to provide off-grid solutions.

To serve the informal settlements within the sewered part of the city communal ablution blocks were constructed comprising showers, toilets and wash-hand basins serving a maximum of 75 households. These were connected to sewers and janitors are employed to ensure that they are clean and safe. These communal toilets also include facilities for disabled people. When these settlements are upgraded it is envisaged that some form of waterborne sanitation will be extended to the homes.

Beyond the Waterborne Sanitation Edge there are over 30 000 VIPs and over 100 000 double vault urine diversion toilets. Since 2007 the municipality provided for the emptying of these toilets on a 5 to 8-year cycle with the service being provided at no cost to the toilet users. Emptying is all done manually by private contractors employed by EMM. Most of the faecal sludge is buried on site with a portion being disposed of via Durban’s sea outfall sewers.

Over the last 10 years the EMM has been proactive in funding innovative research looking into alternative methods for faecal sludge disposal, in particular methods which aim to capitalize on the nutrient value in the sludge.

- One of these is the LaDePa (Latrine Dehydration and Pasteurization) plant – a technology which pasteurizes and pelletizes faecal sludge to create a pathogen-free low grade organic compost. Durban tested and proved the LaDePa in 2010 and the Pollution Research Group (PRG) has subsequently done extensive research on the LaDePa using a laboratory scale machine. EMM has plans to install three more LaDePa plants in the field. It must be noted however, that the LaDePa is energy and maintenance intensive and the commercial value of the LaDePa product (assuming a commercial market can be found) is significantly less than the cost of transporting the sludge to the LaDePa site and operating and maintaining the LaDePa machine.

- Another pilot project tested the viability of feeding faecal sludge to the larvae of the black soldier fly with the resulting products being used for animal feed, bio-oil, and soil conditioner. The conversion rate of sludge to useful end products was however, found to be much lower than expected and after two years of trials the project has been discontinued. In addition to the low conversion rate other difficulties experienced included dealing with the trash in faecal sludge, climate control and the reliability of the complex machinery needed for processing the end products.
- For several years EMM has also maintained a pilot DEWATS (DEcentralised WAstewater Treatment System) plant at its Newlands-Mashu research facility. The plant comprises an anaerobic baffled reactor (essentially a multi-compartment septic tank) followed by a number of constructed wetlands (vertical and horizontal). The effluent from the DEWATS can safely and beneficially be used for irrigation of certain food crops (e.g. maize, fruit trees). The PRG has carried out extensive research on this DEWATS plant and in 2021 the EMM plans to construct a DEWATS plant which will serve a 400-home community which located outside the Waterborne Sanitation Edge. It is probable that DEWATS plants of this type will become more common as EMM seeks to increase access to waterborne sanitation outside the waterborne sanitation edge. As with all wastewater treatment, treated sludge builds up and can be re-used (e.g. vermicomposting or biochar production) however, with DEWATSs being much smaller scale there is potential for smaller scale operations to re-use sludge that could promote livelihoods diversification in the area of the DEWATS.

This information was consolidated from Personal Communications with David Still, South African Sanitation Specialist ([dave@pid.co.za](mailto:dave@pid.co.za)), 14 December 2020.

## LINKAGES WITH CURRENT SOUTH AFRICA GOVERNMENT INITIATIVES

The National FSM Strategy will evaluate potential linkages with other initiatives which are currently underway in South Africa across various National Departments. Examples of existing programmes are listed below, the implementers of which will be key stakeholders throughout the process of strategy development. This list is not exhaustive and is expected to be updated as the strategy development process unfolds.

### OPERATION PHAKISA: CHEMICALS AND WASTE ECONOMY

The Operation Phakisa: Chemicals and Waste Economy programme is implemented jointly by the Department of Environmental Affairs together with the Department of Planning, Monitoring and Evaluation. This programme is aimed at “engaging on opportunities that can lead to reduction of impact on the environment, while growing the GDP contribution and creating jobs”<sup>1</sup>.

The Waste component of the programme<sup>2</sup> has the following motivation, scope and solution space:

*Motivation:* Promoting the SA economy and creating jobs while reducing its environmental footprint

*Scope:* Broad scope across all waste types and the entire value chain

*Solution space:* 3R economy opportunities for all the major categories of waste

Faecal sludge falls within the scope of “all waste types” and given that the involvement of private sector service providers in the sanitation service chain is key to successful implementation of FSM

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<sup>1</sup> Operation Phakisa: Chemicals and Waste Economy website: [Operation Phakisa - Chemicals and Waste Economy | Department of Environmental Affairs](#)

<sup>2</sup> Operation Phakisa: Chemicals and Waste Economy details: [Pages - Home \(operationphakisa.gov.za\)](#)

in South Africa, and that there is considerable potential for private sector investment in re-use technologies which would also reduce faecal sludge disposal, there are significant opportunities for linkages with this programme.

Engagement with the implementing Departments throughout the process of building the National FSM Strategy will strengthen those linkages and highlight more opportunities for creating jobs through its implementation. This engagement also has the potential to broaden the reach of the initiatives of the Operation Phakisa: Chemicals and Waste Economy programme.

### **THE GOOD GREEN DEEDS PROGRAMME**

The Good Green Deeds Programme<sup>3</sup> is implemented by the Department of Environmental Affairs and is aimed at promoting sustainable living practises through environmentally friendly actions. The programme is specifically targeting behaviour, attitudes and practise of “the man in the street” to improve the environmental safety of households and neighbourhoods. The programme objective is “a positive drive towards a clean South Africa which is free of litter and illegal dumping”<sup>3</sup>.

At the moment, the programme is focussed on solid waste with particular reference to littering but comprises outreach programmes and implementation of greening activities in schools and communities and could therefore be extended to include education around faecal waste and broader sanitation issues.

Engagement with the implementing agency (DEA) and their participation in the development of the strategy will be key to ensuring these linkages are built and maintained through the implementation of the National FSM Strategy.

### **THE INTEGRATED SCHOOL HEALTH PROGRAMME**

The Integrated School Health Programme (ISHP) is jointly implemented by the Department of Basic Education and the Department of Health and covers (in the long-term) school health for all learners at primary and secondary schools in South Africa. Among its strategic objectives are to increase awareness and education on health-promoting behaviours and also to increase knowledge and awareness of general health. A key outcome of the programme is to “contribute to the health and well-being of learners by screening them for health barriers to learning”<sup>4</sup>.

Faecal sludge management is a critical component of improving school health, particularly since many schools in South Africa have dry sanitation facilities such as pit latrines which require emptying services and which, if not correctly maintained, can have a very high negative impact on public health. The ISHP implementing agencies are therefore key stakeholders and engagement with the FSM Strategy is important so as to incorporate FSM considerations into the ISHP.

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<sup>3</sup> Good Green Deeds website: [Good Green Deeds | South African Government \(www.gov.za\)](http://www.gov.za)

<sup>4</sup> Integrated School Health Programme website: [Integrated School Health Programme | South African Government \(www.gov.za\)](http://www.gov.za)

## THE TECHNOLOGY INNOVATION PROGRAMME

The Department of Science and Innovation is responsible for the implementation of the Technology Innovation Programme. This programme includes a component relevant to sanitation / FSM in South Africa in the “Innovation Priorities and Instruments” component. This component of the DSI programme is aimed at “creating and sustaining an enabling environment for innovation, technology development, and the commercialisation of publicly funded R&D”. The “Containment” aspect of the Sanitation Service Chain is particularly relevant to this programme in the sense that considerable global funding is going into the development of new toilets technologies that is; water saving toilets, dry sanitation toilets, composting toilets etc. These new technologies should be available to and contextualised for users in South Africa. The DSI’s Innovation Priorities and Instruments component of the Technology Innovation programme could provide considerable support to these efforts.

In addition new technologies often have high unit costs and therefore mechanisms to make these technologies affordable would support the implementation of the strategy on the ground in South Africa. Finally, the DSI programme could stimulate livelihoods development by providing support to local manufactures for appropriate technologies in the South African context.

It is therefore essential for representatives from this programme to participate in the development of the National FSM strategy and to ensure that the considerations for FSM and sanitation technologies are incorporated into the Technology Innovation Programme. This programme is also closely linked with the WRC’s South African Sanitation Technology Enterprise Programme (SASTEP).

## THE SOUTH AFRICAN SANITATION TECHNOLOGY ENTERPRISE PROGRAMME (SASTEP)

The South African Sanitation Technology Enterprise Programme (SASTEP) is “a national system of innovation platform that seeks to fast-track the adoption of innovative and emerging sanitation technologies in South Africa through fostering local manufacturing and commercialization”<sup>5</sup>. The programme created by the WRC, in partnership with DSI and the support of DWS, is funded by the Bill and Melinda Gates Foundation.

The programme has supported the development of a number of toilet technologies, and also has an ongoing project on pit emptying services using new technologies, sanitation market analysis, field testing of new toilet technologies among others.

“The programme is an operational vehicle of the WRC’s sanitation transformational vision SANiTi: Sanitation Transformation Initiative”<sup>6</sup>. The WRC has conducted extensive case studies on technologies and operations and maintenance models in various contexts in the South African sanitation sector under this program which is also the subject of a publication which looks at the business perspective of sustainable solutions for sanitation and also water security (Akinsete *et al* 2019). The WRC is already a key stakeholder (as is DSI) and participating in the Steering Committee for the development of the FSM Strategy.

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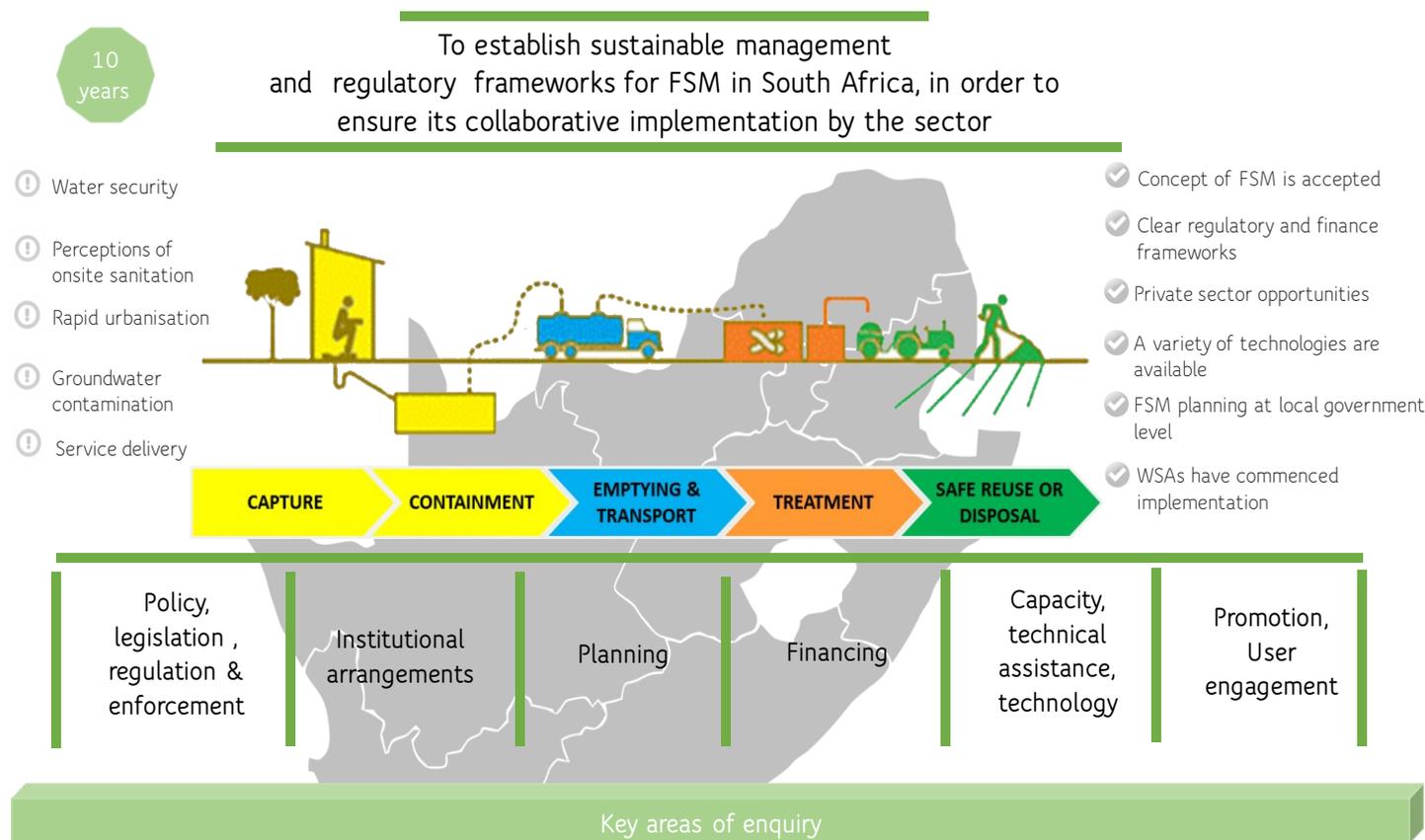
<sup>5</sup> SASTEP website: <https://www.sastep.org.za/>

<sup>6</sup> Water Research Commission website: [SASTEP – Water Research Commission \(wrc.org.za\)](https://www.wrc.org.za/)

SECTION 3.

# THE FSM CONCEPTUAL FRAMEWORK

The FSM Conceptual Framework sets out the key areas of enquiry for the National FSM Strategy under development by DWS in partnership with the USAID Resilient Waters Program. The FSM Strategy will cover a ten-year timeframe and has the overall goal *to establish sustainable management and regulatory frameworks for FSM in South Africa, in order to ensure its collaborative implementation by the sector.*



**FIGURE 2: A CONCEPTUAL FRAMEWORK FOR FSM IN SOUTH AFRICA OVER THE NEXT TEN YEARS**

## OBJECTIVES AND EXPECTED OUTCOMES OF THE FSM STRATEGY

The strategy looks to address key challenges in South Africa with regard to the widespread use of on-site sanitation technologies and in the context of climate change. These challenges include:

- **Water security:** South Africa experiences shortages of both potable water and raw water resources owing to the effects of climate change and because of the incidence of prolonged droughts and minimum rainfall;
- **Service delivery:** Management systems for providing safe faecal sludge management services are limited and severely challenged. For example, in the country 10% of households (507 732) served by on-site sanitation technologies have full pits (STATS SA, 2019). This could result in people resorting to open defecation but improper management and lack of emptying services also intensifies the negative perceptions of on-site sanitation solutions.
- **Rapid urbanization:** South Africa's urbanization rate has been increasing more rapidly over the past 20 years and is currently at just over 66% (World Bank 2019). Urban infrastructure is unable to keep pace with this process;
- **Groundwater contamination:** Over six million South African households have access to on-site sanitation technologies where faecal sludge is not safely managed. In some situations, this may pose a risk to groundwater resources. For example, a groundwater research study conducted in Limpopo Province found that there are private and communal boreholes that are drilled next to sanitation facilities such as pit latrines and septic tanks. They could pose a health risk as leachate from on-site sanitation can percolate into groundwater (Potgieter et al. 2006). South Africa has a protocol to Manage the Potential of Groundwater Contamination from Onsite Sanitation (DWS 2003) which can be applied to identify areas where sanitation poses a risk to groundwater;
- **Perceptions of on-site sanitation:** With 36% of South Africa's households reliant on on-site sanitation solutions, it is critical that the term "on-site sanitation" and the range of solution the term covers (smart toilets, septic tanks, improved pit latrines, urine diversion toilets etc.) is well understood. Often perceptions of on-site sanitation are that it relates specifically to pit latrines which are often in the news because of unfortunate incidents where people have fallen into them and fatalities have occurred. There are limited regulatory mechanisms in place to ensure these latrines are both well-constructed and well managed and therefore public perception of pit latrines has become somewhat negative. It is important therefore, to broaden the understanding and definition of on-site sanitation across the board.

The main objectives of National Faecal Sludge Management Strategy are:

- To mainstream faecal sludge management as part sanitation services in South Africa,
- To provide support to municipalities through the development of tools and resources in FSM,
- To improve the regulation and monitoring of onsite sanitation systems (e.g. Brown Drop), including the promotion of stakeholder engagement in regulation and monitoring,
- To promote the beneficial use of faecal sludge as a resource that has a potential to create jobs and economic opportunities,
- To support training programmes to prepare a cohort of skills and competencies in FSM,
- To promote the inclusion of local based entrepreneurs in providing FSM goods and services,
- To encourage innovation in sanitation technologies to support climate change preparedness improve resilience in human settlements,
- To facilitate improved hygiene behaviour change programmes throughout the sanitation service chain, and

- To guide in identifying and prioritizing the locations where faecal sludge has a potential to pose a threat to public health, the domestic and wider environment; and pollute groundwater.

With these objectives in mind, the strategy aims to achieve the following results in a ten-year period:

- That the concept of FSM is widely accepted in SA,
- That there are clear regulatory and financing frameworks for FSM across the service chain,
- That private sector opportunities have been identified and the mechanisms to encourage private and other sector stakeholder involvement have been unlocked and established,
- That a variety of appropriate and affordable on-site sanitation technologies have been developed,
- That FSM capacity has been built across the aspects of the sanitation service chain,
- That FSM mechanisms and measures are integrated into planning and management systems of all WSAs (Water Services Authorities) in South Africa,
- That the implementation of the FSM service chain infrastructure and processes has commenced in WSAs, and
- That there is robust testing and implementation of FSM re-use opportunities and technologies.

## **KEY AREAS OF ENQUIRY**

The foundation upon which the strategy will be developed is based on six key areas of enquiry:

- I. Policy, legislation and regulation,
- II. Institutional arrangements,
- III. Planning,
- IV. Financing,
- V. Capacity, technical assistance and technology,
- VI. Promotion and user engagement.

## **PRIVATE SECTOR INVOLVEMENT IN FSM IN SOUTH AFRICA**

Another key area of enquiry is the potential for private sector involvement in the FSM service chain however, since there are different aspects to this in each of the listed key areas above, this has not been included as a separate key area of enquiry. For example, models for collaboration with the private sector should be explored under the policy, legislation, regulation, and enforcement key area. Institutional arrangements to work effectively with the private sector need to be reviewed under key area II. The private sector could also generate revenue flows into the sector under new financing models and mechanisms and private sector capacity and technical assistance can be leveraged to develop and implement new sanitation technologies. In terms of key area VI, the private sector is a key partner in promoting both new technologies for toilets and for end-use processing and can support local government in improving user engagement with newly established FSM models in their area.

## **ACTION PLANNING FOR FSM IN SOUTH AFRICA**

There are key actions recommended for consideration in each of these areas of enquiry to integrate FSM measures and mechanisms into sanitation planning at the municipal level. The City Service Delivery Assessment tool (Blackett & Hawkins 2020) sets out basic, intermediate, and consolidating actions in each of the key areas of enquiry, which should be implemented. The entry level of these actions depends on the context in each particular area, and therefore the actions indicated below are not prescriptive.

A municipality such as eThekweni for example, may only need to implement consolidating actions since there is already an FSM structure in place and implementation of FSM infrastructure has already begun. However, in PLM the completion of the CSDA will give indications of the immediate “basic actions” that need to be implemented as entry points to improve FSM.

As discussed previously the PLM will be used as one of the case studies for the National FSM strategy but the basic, intermediate and consolidating actions are summarized in the tables below as a guide to the type of actions that may need to be taken by WSAs across the country to achieve the objectives of the strategy. The CSDA tool (Inclusive Sanitation in Practice website) will be applied in PLM and the outcomes of that assessment will be used to support the development of the National FSM Strategy.

The SFD component of the work in PLM can be used to ground truth how much data on FSM is “typically” generated and monitored locally and to map out what the likely data gaps will be. This will enable the case study to provide guidance on how SFD process can be appropriately institutionalised. For example, inclusion of the requirements of FSM at a municipal level in the Water Services Development Plan (WSDP).

Planning and technology studies conducted by the WRC as well as initiatives carried out in other municipalities will also feed into the strategy. For example, the WRC is currently in the process of undertaking a study to develop the Faecal Sludge Guidelines, which will complement the Wastewater Guidelines and will add a practical component to guidelines for the sanitation sector in South Africa.

Finally, beneficiation through and valorisation of FSM reuse products is a crucial component of the strategy especially in terms of potential cost offsetting and private sector business and livelihoods opportunities. The WRC is about to commence a study looking at all components of sanitation waste from a mass balance point of view, with the following questions in mind: How much can we produce; What industry standards are required to be met and; Can we meet them.

The outcomes from previous and existing initiatives and studies will inform the actions set out in the tables below through the process of engaging with the relevant stakeholders and the Steering Committee programme of meetings.

The definition of each level of action is as follows:

- **Basic actions:** Immediate actions required to improve the existing situation and urgently provide a basic level of service,
- **Intermediate actions:** Building on existing policies, institutions, regulations, and systems to strengthen them and improve service delivery, and
- **Consolidating actions:** More advanced actions to promote reuse and improve.

These actions are set out under each of the key areas of enquiry in the tables below.

## I. POLICY, LEGISLATION, REGULATION AND ENFORCEMENT<sup>7</sup>

Overall				
Basic actions	Review and update national sanitation policies to ensure all aspects of FSM are addressed	Review regulatory framework for the protection of public health and environment	Design programme to equip, train and motivate environmental health staff to enforce sanitation rules	
Intermediate actions	Disseminate and apply FSM policies	Set norms / standards for public health and environmental protection	Strengthen enforcement of environmental and public health regulations (e.g. Review NEMA and NWA in the context of FSM)	Promote circular economy approaches in policy frameworks (e.g. FSM reuse options – which would require review of Agricultural and Environmental regulations)
Consolidating actions	Strengthen regulatory powers across whole FSM service chain	Regulate pollution of receiving waters		
Non-sewered sanitation				
Basic actions	Review and establish or strengthen legal basis for regulation of FSM services	Review and establish or improve by-laws addressing on-site systems and FSM services	Formally recognize existing informal FSM service providers in regulations and legislation	Require and enable service providers to dispose of all faecal sludge safely
Intermediate actions	Introduce regulation of service providers	Strengthen FSM by-laws	Develop "one-stop shop" licensing arrangements	Incentivise faecal sludge disposal at recognized sites and introduce sanctions for illegal dumping
Sewered sanitation				
Basic actions	Review and establish legal basis for regulation of sewerage services	Review and establish or improve by-laws, to ensure an obligation to connect to sewerage if available		
Intermediate actions	Strengthen sewerage by-laws, including payment for services			

<sup>7</sup> Based on the Service Delivery Action Checklist, included in [City Service Delivery Assessment \(CSDA\)](#), ISP, 2020 accessed on 11 December 2020

## II. INSTITUTIONAL ARRANGEMENTS

<b>Overall</b>	<b>Actions</b>	
Basic actions	Identify all FSM stakeholders, form a coordinating forum for FSM, and define and agree institutional roles	
Intermediate actions	Establish institutional framework. Coordinate non-sewered sanitation (NSS) and sewerage - possibly under a single entity	
<b>Non-sewered sanitation</b>	<b>Actions</b>	
Basic actions	Formally agree local institutional framework for FSM, including mandates, responsibility & accountability	Establish responsibility for faecal sludge treatment and beneficial use
Intermediate actions	Review (dis)incentives for improved FSM. Increase incentives for households and service providers	Strengthen institutional setup for FSM, including treatment facilities and beneficial use options
Consolidating actions	Enforce disincentives for unimproved FSM	
<b>Sewered sanitation</b>	<b>Actions</b>	
Basic actions	Identify & agree local institutional framework for sewerage. Formally clarify mandates, responsibility, and accountability	Ensure sewerage authority has sufficient financial and administrative autonomy
Intermediate actions	Investigate reasons why users and utilities do or do not invest in sewerage	
Consolidating actions	Implement incentives and sanctions to encourage users and utilities to invest in sewerage	

### III. PLANNING

Overall	Actions	
Basic actions	Conduct area-based, gender and pro-poor focused diagnostic studies as basis for planning	Develop a common SFD dataset – data that needs to be collected by Municipalities for the SFD
Intermediate actions	Establish systems to monitor and evaluate service quality	Develop a forecasting scenario for the SFD process – to identify how the SFD will change when pits are full.
Consolidating actions	Develop plans to enhance treatment capacity and beneficial use technologies	Strengthen monitoring of all sanitation services
Non-sewered sanitation	Actions	
Basic actions	Responding to the SFD, make local plans for FSM services and associated finance and institutional arrangements	Advocate for FSM in national planning entities and sector ministries (works, housing, health, environment, etc.)
Intermediate actions	Develop plans to enhance public access to FSM services	Establish monitoring framework for NSS service standards – focus on FSM and on-site facilities
Sewered sanitation	Actions	
Basic actions	Build awareness of sewerage in national planning entities & sector ministries (works, housing, health, environment, etc.)	
Intermediate actions	Establish monitoring framework for sewerage – focus on connection rates and overflows	

#### IV. FINANCING

Overall	Actions		
Basic actions	Identify the financing required to address service improvements to the poorest	Develop costing and tariff models for sanitation	Identify funds needed for inclusive sanitation services and introduce practical demand-led financing mechanisms
Intermediate actions	Introduce specific pro-poor financial arrangements (such as targeted subsidies)	Establish revenue streams (e.g. water bill surcharge, extra property tax)	
Consolidating actions	Identify opportunities for financial flows generated from the sale of treatment end-products		
<b>Non-sewered sanitation</b>	<b>Actions</b>		
Basic actions	Build awareness and agreement around the budgetary requirements for FSM services		
Intermediate actions	Develop programmes with inclusive FSM funding windows and incentives for cities		
Consolidating actions	Mobilize finance for faecal sludge processing, beneficial use, and disposal		
<b>Sewered sanitation</b>	<b>Actions</b>		
Basic actions	Build awareness and agreement around the budgetary requirements for sewerage services		
Intermediate actions	Develop and implement programmes with sewerage funding windows and incentives for cities	Develop and implement improved financing model for sewer connections	

## V. CAPACITY, TECHNICAL ASSISTANCE AND TECHNOLOGY

Overall		Actions		
Basic actions	Map the land/housing tenure status (tenure “mix”), resulting sanitation pathways and stakeholder relationships	Based on community needs and aspirations, identify technology gaps and pilot appropriate, affordable options	Develop sanitation options appropriate to the city's tenure “mix” within planning frameworks and approaches	Repair broken pumping stations and leaking sewers, and improve management to avoid recurrence of problems
Intermediate actions	Develop a range of sanitation technology and market supply chains for all population groups	Scale up the use of successful sanitation options for tenants (renters) so they can meet demand		
Consolidating actions	Strengthen sector capacity for services, including treatment and beneficial use markets	Strengthen tenure-status informed sanitation options in planning frameworks and approaches		
Non-sewered sanitation		Actions		
Basic actions	Identify scale of the capacity gap and TA required to address FSM service needs	Support service providers with promotion, training, skills development, and access to capital		
Intermediate actions	Build public and private sector capacity for city-wide FSM services			
Sewered sanitation		Actions		
Basic actions	Identify capacity gap and TA required for sewerage service needs, with focus on connections and O&M			
Intermediate actions	Build public and private sector capacity for city-wide sewerage services			

## VI. PROMOTION AND USER ENGAGEMENT

Overall	Actions		
Basic actions	Consult communities to identify sanitation needs and aspirations, taking account of housing tenure mix	Engage with landlords and tenants on constraints to FSM and sewerage services	
Intermediate actions	Improve technical options and services, in response to user feedback	Develop assistance and enforcement packages for landlords	
Consolidating actions	Expand on the range and quality of technical options and services, in response to user feedback	Focus on enforcement of service quality for landlords	
Non-sewered sanitation	Actions		
Basic actions	Do formative research on reasons for open defecation, and develop and start to implement a strategy to reduce it	Engage with manual emptiers and their clients to develop a strategy for phasing out unhygienic manual emptying	Stimulate customer demand/ willingness to pay for safe FSM
Intermediate actions	Review rates of open defecation and adjust strategy as needed.	Support transition from informal manual emptying to improved and regulated services	Stimulate customer demand/ willingness to pay for improved on-site sanitation facilities
Consolidating actions	Enforce use of emptiable facilities where space is insufficient for single-use (fill and cover) pits		Stimulate market demand for beneficial use of faecal sludge
Sewered sanitation	Actions		
Basic actions	Stimulate customer demand / willingness to pay sewerage tariffs		
Intermediate actions	Formative research and sewer connection campaign		

## SECTION 7.

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# ANNEX A: INSTITUTIONS RESPONSIBLE FOR KEY ACTIVITIES EACH STEP IN THE SANITATION SERVICE CHAIN

It should be noted that this data was collected for the Polokwane Local Municipality as part of the pilot FSM programme that is currently underway. This Conceptual Framework document is a National document, but many of the FSM stakeholders at municipal level are also relevant at national level, and therefore the tables are presented as an indicative guide.

**TABLE I** indicates the institutions that *have the mandate to carry out the key activity according to the law* against the institutions that *actually carry out the activity in practice* modelled against Polokwane Municipality. A colour code helps to understand the findings:

- **Red** indicates that the key activity has **not been assigned by law to any institution** and it is not carried out by anyone;
- **Yellow**: indicates that the:
  - key activity has been assigned by law, but it not carried out in practice, or
  - it has been assigned by law to an institution, but it is carried out by someone else, or
  - it has not been assigned to any institution but in practice it is carried out by someone else;
- **Green**: performed by the institution assigned by law.

**TABLE 1: INSTITUTIONS RESPONSIBLE FOR KEY ACTIVITIES IN EACH STEP OF THE SANITATION SERVICE CHAIN**

User interface and collection at the HH level			Emptying/Transport			Treatment (and disposal)			Reuse		
Key Activity	According to law:	Carried out in practice by:	Key Activity	According to law:	Carried out in practice by:	Key Activity	According to law	Carried out in practice by	Key Activity	According to law	Carried out in practice by
Passing of regulations for the construction of toilets, latrines, septic tanks, and cesspools:	DWS (SFWS, 2003, with DHS (San Policy, p52)	NHRBC published SANS 10400-P and SANS 10252-2	Passing of regulations for the licensing/legalisation of desludging trucks operators:	(not clear) DWS DEA DoT	Nobody	Passing of by-laws or regulations for licensing/contracting private operators of FSTPs	DWA guidelines (SFWS p16) WSA (SPp54)	Nobody	Passing of by-law or regulation for licensing enterprises commercialising products originating in FSTPs	DWS, with Provincial DoH (SP, p46)	Nobody
Promulgating by-laws for the construction of toilets, latrines, septic tanks, and cesspools:	Water Service Authority (Sanitation Policy 16, p53)	PLM has not promulgated by-laws in this matter	Passing of by-laws for the licensing/legalisation of desludging trucks operators:	Water Service Authorities (Sanitation Policy, pag54)	Nobody	Providing licenses or contracts to FSTP Operators:	WSA (Sanitation Policy p54)	DWS, with waste discharge authorization	Providing licenses to enterprises commercialising products of FSTPs	DWS, with Provincial DoH (SPp46) and D. Agricu	Nobody
Development of guidelines and standards for construction latrines, septic tanks, cesspools:	DWS and DHS at national level (SPp45).. WSA (San Policy p53)	DWS is leading. DHS published the Red Book.	Licensing/certifying desludging truck operators:	Water Service Authorities (Sanitation Policy, pag54)	PLM permits to discharge in WWTW	Investing or financing FSTPs	WSA. DWS monitors MIG applications (SP p41-53)	PLM finances construction. Private parties too.	Developing official guidelines and quality standards for the products of faecal sludge	DWS, DEA, W Research Comm (N&S Vol 2)	Nobody
Construction of toilets, latrines, septic tanks, and cesspools:	Public and private organisations (Sanitation Policy p14)	Engineering companies, contractors, labour. PM PLM	Passing of by-laws or regulations for the controlling/surveillance/sanctioning mechanisms of desludging trucks	Water Service Authorities (Sanitation Policy, pag54)	At the WWTW PLM checks the quality of the sludge.	Developing official guidelines and standards for the design and/or construction of FSTP	DWS (SFWS, Sanitation Policy, all chapters)	Dpt. Human Settlement published Red Book.	Controlling the quality of the products of faecal sludge (e.g. compost, briquettes, treated wastewater, biogas):	Dept Agriculture and DoH (Guidelines Vol 5)	Nobody
Approval of new toilets, latrines, septic tanks, or cesspools:	Building inspectorate of the PLM. PLM as Water Authority	Project Engineer (private) and PLM Project Manager	Passing of by-laws or regulations to regulate the practices of desludging trucks operators	Water Service Authorities (Sanitation Policy, pag54)	Nobody	Training architects, engineers, construction companies, developers in the design of FSTPs	DWS, LGWSETA, DoE (San Policy, p36)	University Kwazulu-Natal. Int. Universities	Developing official guidelines for the safe (re)use of sanitation products (e.g. how to safely apply compost)	DWS, DAFF, DoH (Guidelines Vol 2)	Nobody
Payment for new on-site infrastructure, repairs, and upgrades:	-National and Local Grants (SFWS, p31) -Property owners (norms and stds p54)	-PLM pays for Basic Sanitation Policy beneficiaries. -Property owners	Passing of by-laws to regulate the business relation between operators and their clients (consumer protection):	Water Service Authorities (Sanitation Policy, pag54)	Nobody	Designing (calculations, drawings, BoQs...) of FSTP	WS Providers and WS intermediaries (SFWS o12-19)	Nobody has designed a FSTP in Polokwane	Application/use of sanitation products (like in agriculture)	Energy generators Farmers	Not clear in reuse is taking place in Polokwane
			Offering the service of desludging latrines,	Water service provider,	Private vacuum truck	Training contractors, developers, masons, etc.	DWS, LGWSETA,	Nobody has trained about	Training users of sanitation products (like in agriculture)	AgriSETA (Skill)	Limpopo Dp. Agricultur

User interface and collection at the HH level			Emptying/Transport			Treatment (and disposal)			Reuse		
			septic tanks, and cesspools in the city:	intermediaries (San Pol, p9-10)	operators (called honey sucker)	in the constructing of FSTPs	DoE (San Policy, p36)	FSTP in Polokwane		development (Act)	e and Rural Development
Monitoring of existing latrines, septic tanks, and cesspools:	Water Service Authority (SFWS, p32)	Nobody	Setting the price/tariff for desludging:	Water Service Authority (San Pol, p53-N&S p43)	Market-based (truck operators)	Construction of the FSTPs	WS Providers and WS intermediaries (SGWS o12-19)	Nobody has constructed a FSTP in Polokwane	Passing by-laws or regulations to control the health risk related to the consumption of FSTP fertilised produced	DAFF and DoH (Guid. Vol 5)	Nobody
Raise awareness of households on O&M of on-site systems:	Water Authority municipal Env. Health Practitioners	Social consultants hired by project engineers.	Payment for the service:	Households, property owner (N&S, p51 – 52)	Households, property owners	Monitoring and approval of the construction of the FSTPs	Water Service Authority (Norms and Standards, p72)	Nobody has approved a FSTP in Polokwane	Controlling the risk related to the consumption of produce/products produced with sanitation materials	Agency for Food Safety (appointed by DAFF)	Limpopo Dp. Agriculture and Rural Development
Registration and certification of contractors	Construction Industry Development Board	Construction Industry Development Board	Protecting the clients (Inc. management of complains):	Water Service Authority (Sanitation Policy, pag54)	Nobody	Passing by-laws that regulate the O&M of FSTPs	Water Service Authorities (Sanitation Policy, pag54)	Nobody			
Build capacity of developers, construction companies, masons, etc.:	DWS, WSA and LGWSETA (San Policy 2016, p36)	ESCA, SAICE and CETA	Enforcement of the regulation: controlling, surveillance and sanctioning the desludging trucks:	WSA (SP, p54) DoT (National Roads Traffic Act)	Nobody	Operate and maintain FSTPs	WS Providers and WS intermediaries (SGWS o12-19)	Nobody has O&M a FSTP in Polokwane			
			Training and building capacity of desludging operators:	(not clear)	Nobody	Regulate and control the operation of FSTPs	Water Service Authorities (Sanitation Policy, pag54)	Nobody regulates and control FSTPs			
			Raise awareness of households about timing of desludging, service rights, etc.	Water Services Authority/Provider (N&S p34)	Nobody	Passing by-laws that set the standards of the outputs of FSTPs to be discharged:	DWS & DEA at national level. WSA at local.	Nobody			
						Controlling and surveillance the quality standards of the liquid and solid treated effluents:	Water Service Authority (San. Pol, page 54)	Nobody			

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