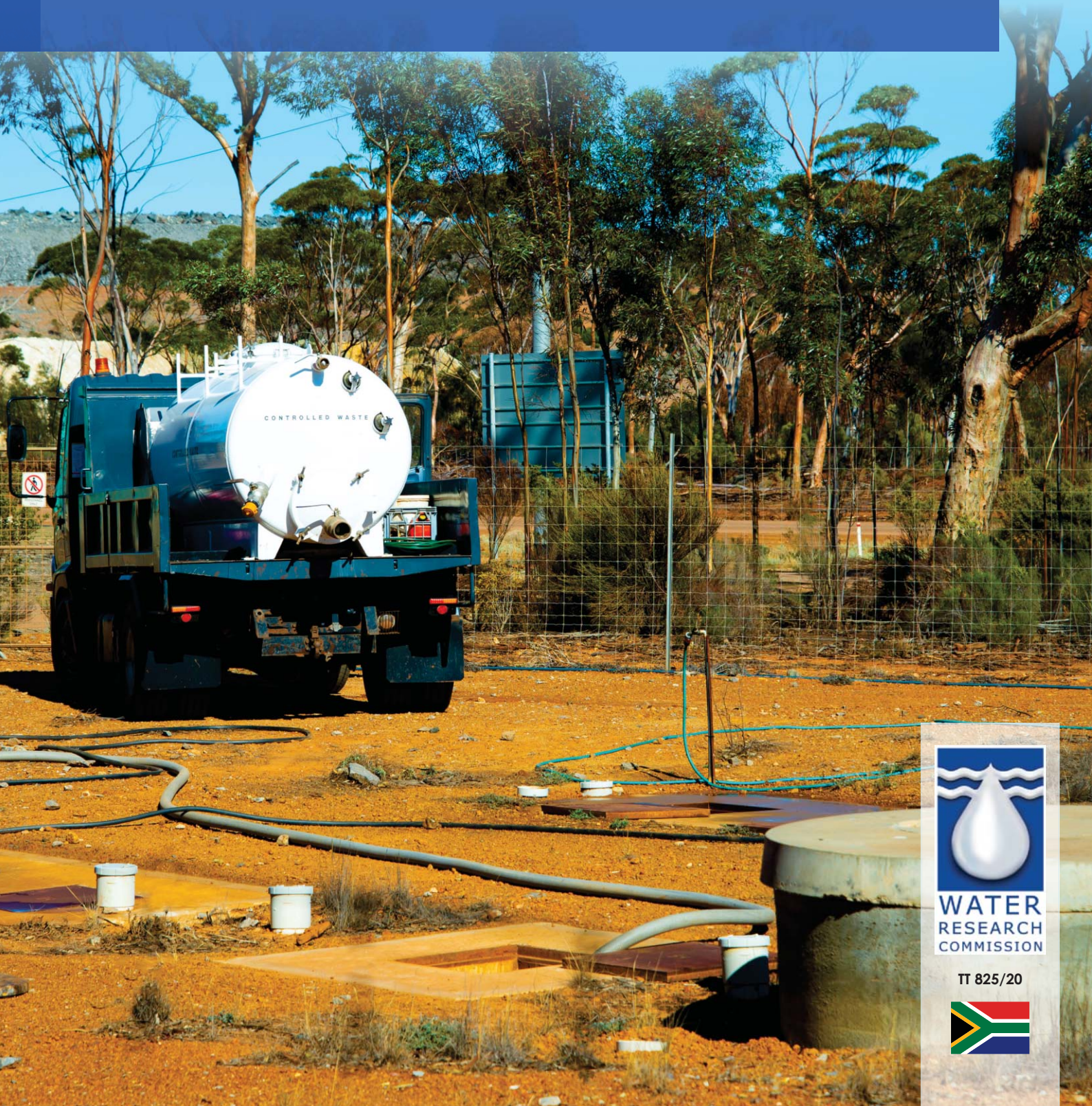
COUNTRY-WIDE SHIT-FLOW DIAGRAM: ESTABLISHING NATIONAL EXCRETA FLOWS IN SOUTH AFRICA

Unathi Jack, Grant Mackintosh and Philip de Souza

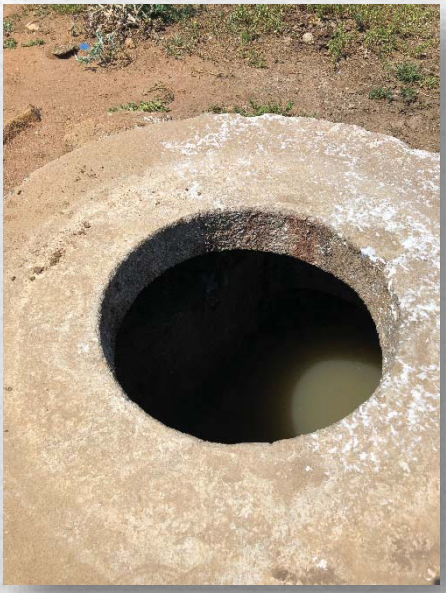


WATER RESEARCH COMMISSION

TT 825/20

Country-wide Shit-Flow Diagram:

Establishing National Excreta Flows in South Africa



Report to the Water Research Commission

by

Unathi Jack, Grant Mackintosh and Philip de Souza

on behalf of

Emanti Management (Pty) Ltd

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WATER RESEARCH COMMISSION

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EXECUTIVE SUMMARY

The Statistics South Africa general household survey in 2016 noted that despite the large improvements made since 1994, many households still lack access to safe, affordable and reliable sanitation services. The establishment of sanitation infrastructure and public services that are sustainable, protect the environment and nurture human health remains a major challenge, and requires an understanding of issues across the entire sanitation service chain, including waste containment (toilets), emptying (of pits and septic tanks), transportation (to sewage treatment facilities), waste treatment, and disposal/reuse.

Understanding the sanitation situation allows appropriate strategies to be developed to close notable gaps in South Africa. In particular, a need exists to provide guidance to decision makers on improving on-site sanitation management, and in particular faecal sludge management (FSM). To assist with improving the understanding of the sanitation situation and challenges faced/improvement actions required, the Water Research Commission appointed Emanti to develop shit-flow diagrams (SFDs) (a tool developed by SuSanA that takes into account all the components of the sanitation value chain) for selected sanitation systems in South Africa. This study also supported the establishment of regional capacity within South Africa to prepare high quality SFDs.

The benefit of the SFD tool is that it offers an innovative way to engage relevant stakeholders, including political leaders, sanitation experts, civil society organizations, in a co-ordinated dialogue about excreta management. Therefore, it can assist with both improved understanding and communication of technical issues to non-technical persons and can subsequently be used to support decision-making regarding sanitation planning and programming.

Furthermore, knowing your current situation is not enough, and municipalities often struggle to turn identified gaps/challenges into meaningful actions. The *Faecal Sludge Management* (FSM) Toolbox, developed by the *Bill & Melinda Gates Foundation* (BMGF), is a tool designed to assist the sanitation sector with status quo assessments, planning improvements, financial estimates preparation, etc. Furthermore, the FSM Toolbox currently contains a number of case studies and resources aimed at various sector stakeholders and along various components of the sanitation supply chain.

60% of the population is connected to sewage network offsite	**36%** of the population is dependent on onsite sanitation system (e.g. pit systems)	**4%** of the population still defecates in the open/have no sanitation facilities

Collated results from the above SFDs indicates the following insightful and useful information:

It can be noted that the three onsite storage types used (besides offsite) by most population in the municipalities for onsite sanitation are:

Pit, never emptied abandoned when full and covered	Fully lined tank (sealed), no outlet or overflow	Lined pit with semi-permeable walls and open bottom

Without the necessary information indicating sanitation status (such as a sanitation management plan, including SFDs), the risk of sanitation management failures and associated environmental pollution – including untreated faecal sludge ending up directly in the local environment – is substantially raised. In particular, poorly managed faecal and wastewater sludge (e.g. where it is left to accumulate in inadequately designed pits or discharged into the environment) pose a significant health threat to the public and to the natural environment.

By contrast, correct use of sanitation management plans (including SFDs) in managing human waste can substantially assist in improved sanitation services and the associated reduction in health and environmental risks.

The WRC-led South African SFD initiative has developed a number of SA-specific innovations to make SFDs more appropriate for SA conditions.

These include an SFD-based Sanitation Priority Improvement Plan which notes that identifying your municipal SFD status is only the advocacy starting point for improvements. Sanitation Priority Improvement Plan guides to:

- Close the gaps
- Develop a remedial action plan and
- Implement the remedial action plan.

The South African SFD initiative team is ready and able to assist municipalities/utilities with developing and implementing SFDs and associated action plans. Please note that the above also applies to, inter alia, schools, health care facilities and public facilities such as national parks, etc.

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Water Research Commission

Stakeholder institutions and in kind contributors

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- Teddy Gounden — eThekwini Municipality
- MILE — Municipal Institute of Learning
- SALGA — South African Local Government Association
- CoGTA — Cooperative Governance and Traditional Affairs
- DWS — Department of Water and Sanitation
- NT — National Treasury Department

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- eThekwini (KZN)
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- Chris Hani (EC)
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ABBREVIATIONS

BMFG	Bill and Melinda Gates Foundation
CSE	Centre for Science and Environment
DM	District Municipality
DWS	Department of Water and Sanitation
EC	Eastern Cape
FS	Faecal Sludge
FSM	Faecal Sludge Management
GIZ	Gesellschaft für Internationale Zusammenarbeit
IWA	International Water Association
KZN	KwaZulu-Natal
PSP	Professional Service Provider
REVAMP	Resource Value Mapping
SDGs	Sustainable Development Goals
SEI	Stockholm Environment Institute
SFD	Shit-Flow Diagram
SuSanA	Sustainable Sanitation Alliance
UNICEF	United National Children's Emergency Fund
WHO	World Health Organisation
WRC	Water Research Commission
WSA	Water Service Authority
WWTW	Wastewater Treatment Works

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1 BACKGROUND

1.1 Introduction

Sanitation is considered a daily basic element of human life. The right to access to basic sanitation is covered in Chapter 2 of the Bill of rights, section 24 where it is stated that – "Everyone has the right
a) to an environment that is not harmful to their health or wellbeing; and
b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures."

Sanitation has an impact on and influences many of the SDGs and the SDGs cannot be met unless sanitation is addressed as a priority.

A recent report by (UNICEF and WHO, 2017) on progress related to sanitation and the *Sustainable Development Goals* (SDGs) indicated that in 2015:

1) Only 39% of the global population (2.9 billion people) used a safely managed sanitation service (i.e. excreta safely disposed of or treated off-site),
2) 2,3 billion people still lacked even a basic sanitation service, and
3) 892 million people worldwide still practised open defaecation.

Specific sanitation related SDGs include:

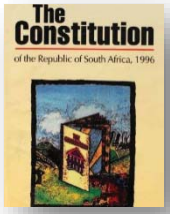
- By 2030, ensure all men and women, in particular the poor and vulnerable, have equal rights to economic resources, as well as access to basic services
- By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defaecation, paying special attention to the needs of women and girls and those in vulnerable situations.

Creating sanitation infrastructure and public services that are sustainable and protect the environment is a major challenge, and requires an understanding of issues across the entire sanitation service chain, including waste containment (toilets), emptying (of pits and septic tanks), transportation (to wastewater treatment facilities), waste treatment, and disposal/reuse. The common perception is that on-site sanitation systems fulfil sanitation needs for rural areas or as temporary solutions until sewer could be built, but in reality, on-site sanitation systems are also found in urban areas, especially in informal settlements. It has been highlighted by Naidoo and Bhagwan (2018) that the fact is, South Africa is a water-scarce country and universal access to waterborne sanitation cannot be attained due to the prohibitive costs and the scarcity of water. They continued by stating that the current norms in sanitation technology in the form of flush toilets does not seem to be sustainable in the future, in terms of both water and sanitation security.

In addition to this, the Water Research Commission (WRC, 2015) reported that the management of faecal sludge from on-site sanitation systems does not get the attention it deserves. This could be due to the fact that development goals focus primarily on providing sanitation facilities whilst overlooking the need for cost-effective processes to collect, transport, treat and re-use of faecal sludge that

accumulates in those facilities, and the operation and maintenance needed. Therefore, a multi-disciplinary, systems level approach to *Faecal Sludge Management* (FSM) is required to ensure that untreated faecal sludge is removed from the community, not remaining at the household level, and that it is treated in a safe and effective manner.

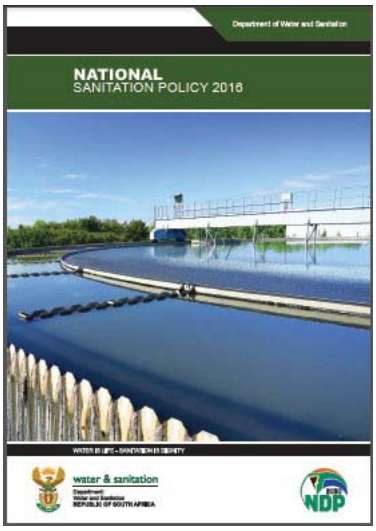
1.2 South African Sanitation Management



Sanitation is considered a daily basic element of human life. The Constitution of South does not directly address the right to basic sanitation. However, various sections within chapter 2 make provision for access to basic rights. The basic rights under chapter 2 includes equality. Equality has implications on equal rights, access to basic freedoms, right to a safe environment, education, right to human dignity, right to privacy, adequate housing and security. Equitable access to basic sanitation, sanitation facilities and education about the environment and the importance of having a safe environment, is likely to reduce the risk of disease and environmental degradation.

The right to access to basic sanitation is covered in Chapter 2 of the Bill of rights, section 24 where it is stated that – "*Everyone has the right*
a) to an environment that is not harmful to their health or wellbeing; and
b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures."

In keeping with the rights as set out in the constitution; policies, frameworks, regulations and laws have been drafted and implemented since 1994. These consider the provision, protection and use of water, as well as provision and access to basic Sanitation. Together with the National Sanitation Policy of 2016, the sanitation sector in South Africa is supported by the following policy, plans and strategy documents:



- The White Paper on Basic Household Sanitation of 2001,
- National Water Act of 1998,
- The White Paper on a National Water Policy of South Africa of 1997,
- Water Services Act of 1997,
- The White Paper on Water Supply and Sanitation of 1994),
- Water and Sanitation Policy of South Africa of 1994,
- Medium Term Strategic Framework of 2014-2019, and
- National Development Plan of 2011 – Vision for 2030

These documents were developed through the principles of the country's constitution and water and sanitation related Acts. The Acts generally provide guidance on how to protect the people and the resources of the country. The policies elaborate on what should be done, with clear objectives, procedures on how to and role players involved with their responsibilities.

1.3 Overview of Sanitation Status in South Africa

Since 1994 South Africa has made significant progress to improve the quality of life of unserved and underserviced households, through the provision of basic services. The focus areas for the provision of these basic services were primarily rural and informal areas. During the expansion of services to these areas, existing infrastructure suffered as they were not maintained. The lack of maintenance was attributed to many municipalities being unable to expand service delivery, while maintaining the existing infrastructure. The areas affected by the lack of infrastructure maintenance were remote areas, or those areas where the services were of a high quality and expensive, such as areas with waterborne sanitation instead of *Ventilated Improved Pits* (VIPs) (Statistics South Africa (STATSSA), 2016). The Community Survey Report therefore suggested that service delivery be evaluated in terms of infrastructure quality, effective functioning and accessibility of services (STATSSA 2016). The objectives of the Community Survey (which is the mechanism used to monitor status) Report 2016 are to provide:

- Descriptive analysis of basic service delivery (water, sanitation, electricity, refuse removal) in provinces and local municipalities.
- List of Service Delivery indicators used to assess municipal service delivery using the results of Community Survey 2016.
- Survey of perceptions of service delivery across municipalities.

South Africa is expected to experience an increase in urbanisation, and growing and changing rural settlements. These increases and changes in settlements are likely to place increased strain on sanitation systems and sanitation services. The Community Survey Report indicated that sanitation services in the future will need to prioritize human settlement appropriate systems, and the availability of water will have to be considered before the type of system is chosen. In order for sanitation services to be sustainable, the economic value of sanitation has to be recognized.

Access to adequate sanitation is vital to the health of populations. It is for this reason that government seeks to increase the percentage of households with access to functional sanitation services to 90% by 2019 and move forward with the continued efforts to eliminate the bucket sanitation in formal areas. The status of household access to sanitation by province is presented in the table below.

Table 1: Percentage of household having access to sanitation by province (STATSSA, 2016).

	WC	EC	NC	FS	KZN	NW	GP	MP	LP	RSA
Flush toilet connected to public sewage system	90.5	44.4	63.2	70.1	43.1	43.9	84.4	43.0	20.8	60.6
Flush toilet connected to a septic tank	2.9	2.3	5.9	2.1	3.7	3.8	1.9	2.7	2.8	2.7
Chemical toilet	1.2	5.6	0.3	2.1	14.6	0.9	1.5	3.3	1.6	4.2
Pit latrine with ventilation pipe	0.1	27.7	9.4	6.8	18.3	16.9	2.1	14.7	28.0	12.2
Pit latrine without ventilation pipe	0.2	9.6	9.8	11.2	12.2	28.2	6.1	28.8	39.8	13.7
Ecological toilet	0.0	0.4	0.3	0.2	0.7	0.3	0.1	0.5	0.1	0.3
Bucket toilet (collected by municipality)	2.9	1.3	2.9	2.5	0.4	0.1	2.3	0.2	0.1	1.4
Bucket toilet (emptied by household)	0.8	0.9	1.4	1.4	1.3	0.5	0.4	0.7	0.6	0.8
Other	0.5	1.9	1.1	2.0	3.1	1.5	0.6	3.0	2.0	1.6
None	0.9	5.9	5.5	1.7	2.5	3.9	0.5	3.1	4.3	2.4
Percent	**100.0**	**100.0**	**99.9**	**100.1**	**99.9**	**100.0**	**99.9**	**100.0**	**100.1**	**99.9**
Numbers (thousands)	**1 934**	**1 773**	**354**	**947**	**2 876**	**1 249**	**4 951**	**1 239**	**1 601**	**16 923**

The table above shows that approximately 63.3% of South African households have access to flush toilets either connected to a centralised sewerage system or local septic system. In addition, 12.2% of households use VIP toilets, and a small percentage of 0.3%, used a combination of solutions including ecological and urine diversion toilets. This indicates that many South Africans still have access to inadequate sanitation, such as the 13.7% of households that continue to use the pit toilets with no ventilation, or the 2.2% of households still using some kind of bucket system, and a further 2.4% with no access to sanitation (which could imply open defaecation).

Even though nationally, it appears that most South Africans have access to adequate sanitation, the status is very different when considering access to adequate sanitation at a provincial scale. The Western Cape and Gauteng provinces indicated the highest levels of access to flush toilets being at 93.4% and 86.3% respectively. As flush toilets in other provinces were less than 50%, they have reliance on on-site sanitation now and into the future. Therefore, on-site sanitation needs to be properly managed. The use of pit toilets without ventilation was still particularly prevalent in 3 provinces of Limpopo with 39.8%, Mpumalanga with 28.8% and North West with 28.2%.

The Community Survey Report clearly defines the difference between improved sanitation and unimproved sanitation as follows:

- Improved sanitation refers to the type of facilities that prevent human contact with faeces whereas
- unimproved sanitation does not prevent human contact with faeces.

Examples of these types of sanitation services are presented in the table below.

Table 2: Examples of improved and unimproved sanitation facilities (STATSSA, 2016)

Improved sanitation facilities	Unimproved sanitation facilities
Flush toilets	Flush or pour flush to elsewhere
Flush or pour flush to: • Piped sewer system • Septic tank • Pit latrine	Pit latrine without slab or open pit
Ventilated improved pit latrine (VIP)	Bucket
Pit latrine with slab	Hanging toilet or hanging latrine
Composting toilet	No facilities or bush or field (open defaecation)
	Shared or public facilities

Table 3: Number of Households per province that reported the use of the bucket toilets (STATSSA, 2016)

Province	Bucket toilet (collected by municipality)	Bucket toilet (emptied by household)	Total
Western Cape	55,348	14,506	69,854
Eastern Cape	22,882	15,435	38,317
Northern Cape	10,201	5,073	15,274
Free State	24,131	13,650	37,781
Kwa-Zulu Natal	12,409	38,245	50,654
North West	1,751	6,416	8,167
Gauteng	113,594	21,777	135,371
Mpumalanga	2,544	8,500	11,044
Limpopo	1,551	9,217	10,768
South Africa	**244,411**	**132,820**	**377,231**

The four provinces with the higher number of households using bucket toilet system were Gauteng, Western Cape, Free State and Eastern Cape. The three provinces with the lower number of households using bucket toilets was Limpopo, Mpumalanga and North West. It should be noted that two categories for bucket toilet system are provided namely, bucket toilet collected by municipality and bucket toilet emptied by household. This is to avoid confusion as some households report the use of the bucket toilet system only at night due to fear of going outside, which they then empty themselves at their earliest convenience.

Lack of sanitation is defined as the absence of sanitation services. In such situations, households tend to revert to open defaecation. The problem with open defaecation is that it presents a serious health risk which can lead to increased instances of disease. In South Africa, the national percentage of

households that lacked sanitation was reported as 2.4%. At the provincial level, the three provinces with the percentage of households lower than the national average, that lacked sanitation are namely, Gauteng with 0.5%, Western Cape with 0.9% and Free State with 1.7%. The six other provinces were all above the national average percentage, with Eastern Cape being the province that had the highest percentage of households that lacked sanitation with 5.9% (see figure below).

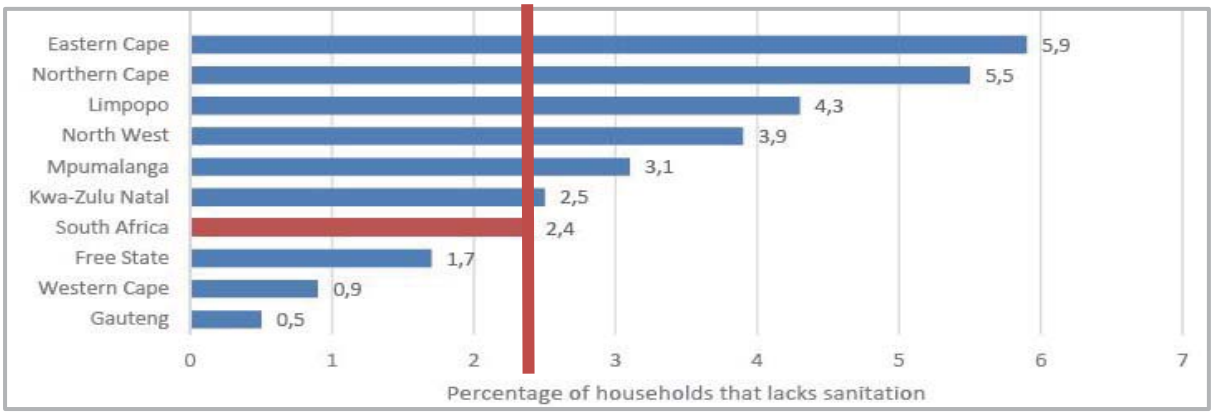


Figure 1: Percentage of Households that lacked sanitation by province (STATSSA, 2016)

Efficiency of sanitation services

The provision of sanitation has been prioritised, by government, in such a way that it should be easily accessible to households and sustainable. Sanitation facilities should be accessible in terms of distance, so that users do not have to walk long distances to access the facility. This is to avoid queues, and to ensure access to vulnerable individuals such as children, the disabled, and the elderly who may find it difficult to walk. The location of the sanitation facilities vary between provinces. The Western Cape and Northern Cape have the highest prevalence of sanitation facilities that are located inside the dwelling. Provinces such as, Eastern Cape, KwaZulu-Natal, North West and Limpopo had the lowest prevalence of sanitation facilities located in the household as demonstrated in the following figure.

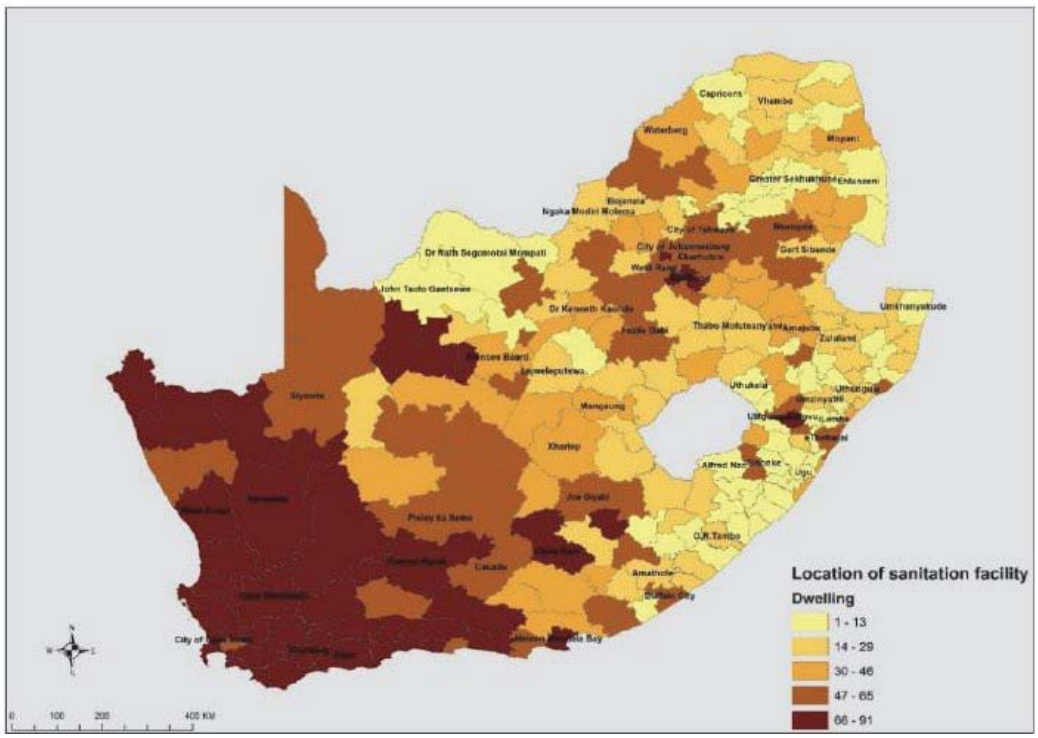


Figure 2: Percentage prevalence of households located within the dwelling (STATSSA, 2016)

On the other hand, municipalities that reported low access of sanitation facilities within the household, also reported relatively high access to sanitation facilities located in the yard (see following figure).

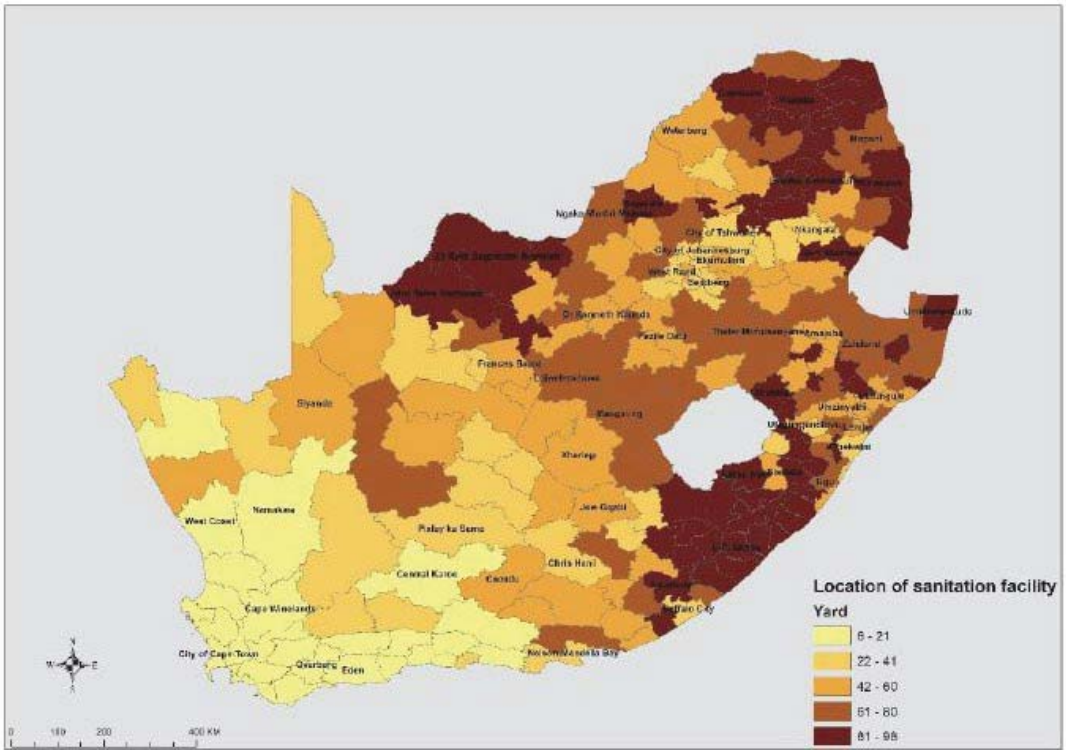


Figure 3: Percentage prevalence of households with sanitation facility located in the yard (STATSSA, 2016)

Perception of sanitation facilities

The perception of sanitation facilities by households was gathered by asking households to rate their satisfaction with the quality of sanitation services. The ratings were categorised as 'good', 'average', or 'poor'. The household's opinion about the quality of sanitation services varied, with the Western Cape and Gauteng having >70% of population reporting 'good' sanitation services. Whereas, only 50-60% of the population in Limpopo, Mpumalanga, North West, KwaZulu-Natal and Eastern Cape provinces rated sanitation services as 'good' (see figure below).

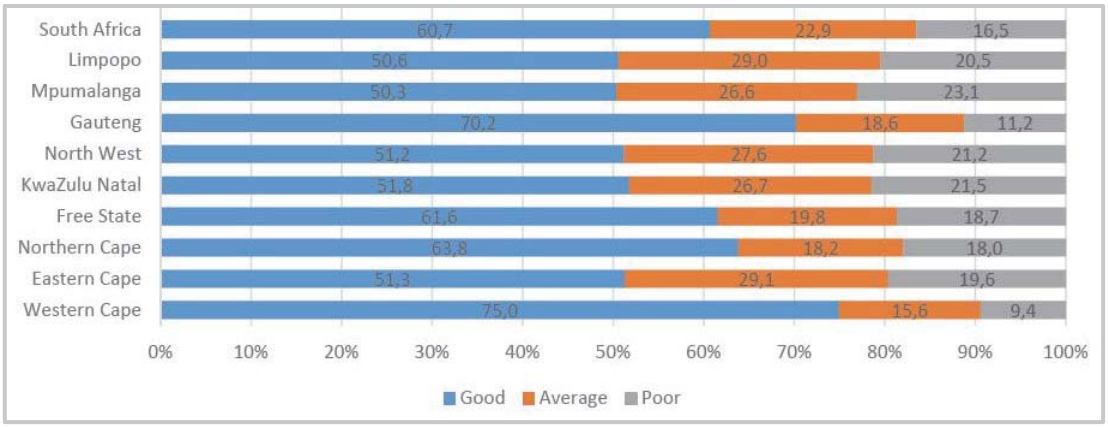


Figure 4: The perceived satisfaction of sanitation services by province (STATSSA, 2016)

It should be noted that the reports from which the status was sourced are focusing on accessibility, provision and infrastructure quality without any reference to operation and maintenance status. This could be misleading as provision and access to sanitation facilities do not guarantee the operation thereof.

Sanitation status results indicate that Eastern Cape and KwaZulu-Natal have sanitation challenges and, therefore, these two provinces were targeted for the project.

Considering the above, the *Shit-Flow Diagram*/Excreta Flow Diagram (SFD) is a tool that can assist with improved understanding of how faecal sludge is managed in an area. It could also support and contribute to an improved understanding of the sanitation status in South Africa. The SFD tool is provided by the *Sustainable Sanitation Alliance* (SuSanA) to the global sanitation community via an open source-based software tool and its application in selected countries is currently guided by *Gesellschaft für Internationale Zusammenarbeit* (GIZ), the German development agency, and through funding obtained from the *Bill and Melinda Gates Foundation* (BMGF). The benefit of the tool is that it offers an easy visualised representation of excreta flows which provides an innovative way to engage a range of relevant stakeholders including political leaders, sanitation experts, civil society organizations, etc. in a co-ordinated dialogue about excreta management. The SFD serves as an advocacy tool to ensure human excreta is managed safely through the sanitation supply chain including storage, collection, transport, treatment and safe end-use or disposal of *Faecal Sludge* (FS).

1.4 Project Aims

The project aims are as follows:

- Apply the SFD tool to targeted municipalities in South Africa.
- Check the relevance of *Resource Value Mapping* (REVAMP) tool in South Africa (as developed by *Stockholm Environment Institute* (SEI)) to estimate potential for resource recovery and if appropriate.
- Profile SFD to the broader municipal sector
- Provide capacity training to local government, provincial and regional stakeholders (such as *Department of Water and Sanitation* (DWS)), in order to prepare a national SFD for South Africa.

1.5 Shit-Flow Diagram Background

1.5.1 Shit-Flow Diagram Overview

The establishment of sanitation infrastructure and public services that are sustainable, protect the environment and nurtures human health remains a major challenge, and requires an understanding of issues across the entire sanitation service chain, including waste containment (toilets), emptying (of pits and septic tanks), transportation (to disposal facilities), waste treatment, and disposal/reuse. A multi-disciplinary, systems level approach to *Faecal Sludge Management* (FSM) is required to ensure that untreated faecal sludge is removed from the community, not remaining at the household level, and that it is treated in a safe and effective manner. A study conducted by the World Bank, aiming to provide a comprehensive understanding of excreta management along the sanitation chain led to the development of tools (including the SFD) for assessing the context and outcomes relating to the flow of excreta through a city.

1.5.2 What is an Excreta/Shit-Flow Diagram?

Excreta Flow Diagram (most commonly referred to as Shit-Flow Diagram due to the sensitivity around the term *shit*), is a tool that summarises service outcomes in terms of the flow and fate of excreta in a municipality or city areas. The SFD provides an easy to understand, visualised representation of excreta flows and serves as an advocacy tool to ensure human excreta is safely managed through the entire sanitation value chain including storage, collection, transport, treatment and safe end-use or disposal. The benefit of the SFD tool is that it offers an innovative way to engage relevant stakeholders, including political leaders, sanitation experts, civil society organisations, in a co-ordinated dialogue about excreta management. Therefore, it can assist with both improved understanding and communication of technical issues to non-technical persons, and can subsequently be used to support decision-making regarding sanitation planning and programming.

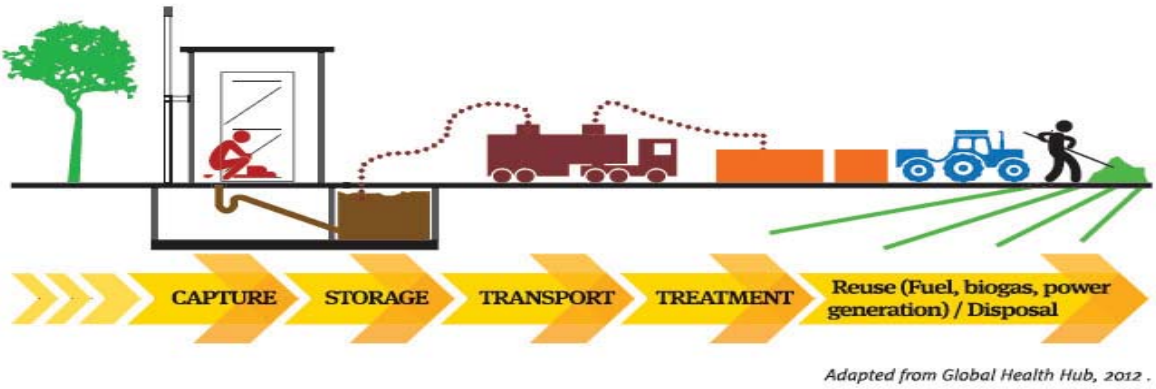


Figure 5: Components of sanitation value chain

It is important to note the difference between onsite sanitation and offsite sanitation.

On-site sanitation is a system in which excreta and wastewater are collected, stored and/or treated where they are generated. For example, pit latrines (no treatment) and septic tanks (primary treatment of wastewater).

Off-site sanitation is a system in which excreta and wastewater are collected and conveyed away from the plot where they are generated. For example, a conventional sewer system.

Below is a short description of each component of a typical sanitation value chain.

Capture/containment /user interface → Storage/collection → Transport → Treatment → Re-use/disposal

Containment is the part with which the user comes in contact (e.g. pedestal, pan, toilet). It is the way by which the user accesses the sanitation system.

Capture/containment /user interface → **Storage/collection** → Transport → Treatment → Re-use/disposal

Storage is the way of collecting and storing what has been generated at the user interface. This considers what the user interface is connected to (e.g. toilet connected to a septic tank).

Capture/containment /user interface → Storage/collection → **Transport** → Treatment → Re-use/disposal

Transport refers to the conveyance of waste (wastewater, faecal sludge and supernatant), sometimes via a network of pipes (e.g. sewer lines), or otherwise via human powered transportation (e.g. vacuum tankers).

Treatment is a system designed to convert waste into a product that is safe for end use or disposal (e.g. wastewater treatment plant).

The final waste form, either as a useful resource or a product with reduced risk (e.g. compost).

1.5.3 SFD Production Process

The SFD production process includes collecting information about the service delivery context within a defined area and using the collected information to assess the situation. The information available or collected about the assessed area determines the level of SFD that will be produced. The different levels of SFD are:

- *Level 1 – Initial SFD*
  This level SFD is developed with limited amount of data or information (e.g. only desktop). Limited data may be as a result of limited interviews or field visits conducted or limited resources. In the process of developing an SFD with limited data, assumptions could be made, however, they should be clearly defined and justified. An initial SFD can be upgraded to a higher level when additional data is obtained.
- *Level 2 – Intermediate SFD*
  This level SFD is developed where extensive data is obtained, by way of example through interviews with stakeholders including report and field visits. Secondary data allows for validation of assumptions based on information received via interviews and/or field visits. An intermediate SFD provides a broader understanding of the sanitation service delivery situation and can be upgraded to a comprehensive level with the systematic collection of desktop data.
- *Level 3 – Comprehensive SFD*
  A comprehensive SFD is developed where at least the same amount of secondary data as for intermediate SFD, and with additional stakeholder engagement and systematic primary data collection. This level SFD is appropriate to inform the planning of service improvement options or budgeting decisions.

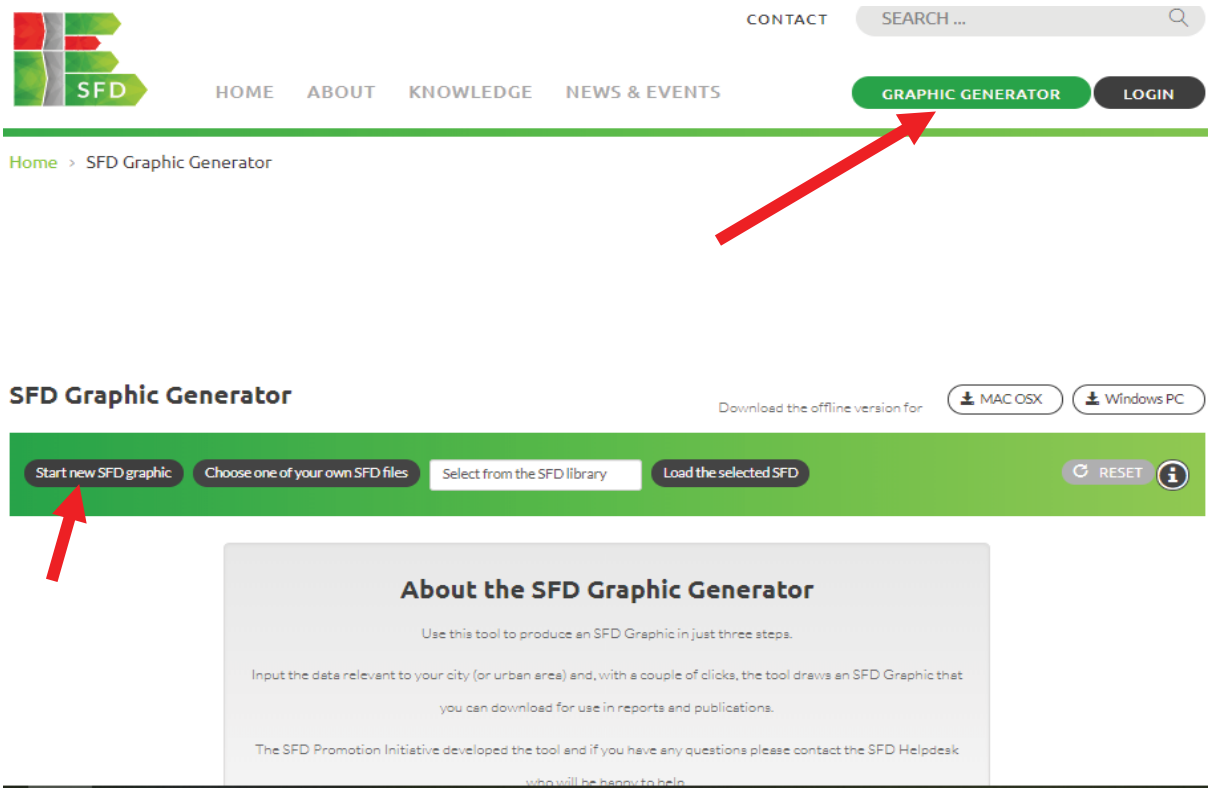
1.5.4 SFD data/information collection

The process of SFD development requires data or information collection about the system assessed. Data required may be obtained through literature, by conducting interviews, through field visit observations, measurements in the field, etc. The process of data collection for SFD development may include the following considerations:

- General information – This includes a broad understanding of the area (e.g. mapping where SFD is developed, area assessed, total population size, topography, seasonal variations, climate, groundwater levels, etc.).
- Policies – including national, regional and local key policies, legislations, frameworks related to sanitation services.
- Institutional roles – roles played by public and private institutions engaged in the sanitation service provision.
- Data on service provision – relates to those providing services along the sanitation service chain.
- Standards and norms affecting the services – including water quality and effluent standards, monitoring systems, design standards, relates to those providing services along the sanitation service chain.
- Planning – this considers different national, regional, local plans or strategies from which the service development targets and investments are based.
- Equity – this considers the sanitation technologies and services that are present in the area and how they meet the needs of the people served.
- Service outputs – this considers the capacity through the sanitation value chain to meet needs and demands of the population and monitoring and reporting on access to services.
- Expansion of services – this considers the extent to which policies, procedures, plans and programmes are considering the increasing demand for services.
- Assumptions – these are made where there are uncertainties in the data, and should be clearly defined.
- Key Informant Interviews with different role players (e.g. community, tanker drivers, etc.).

1.5.5 Producing a SFD

The data/information collected is used to develop both a (1) SFD graphic and to (2) compile a SFD report for the area assessed. The SFD graphic is generated by accessing the website www://sfd.susana.org/data-to-graphic. On the landing page, there is a “Start new graphic button” that allows the user to create a new SFD graphic. This takes the user through a step by step method of inputting the required data to develop SFD.



An SFD graphic is then generated based on the data provided, which presents the status of sanitation management within the assessed area. An example of an SFD graphic is presented below.

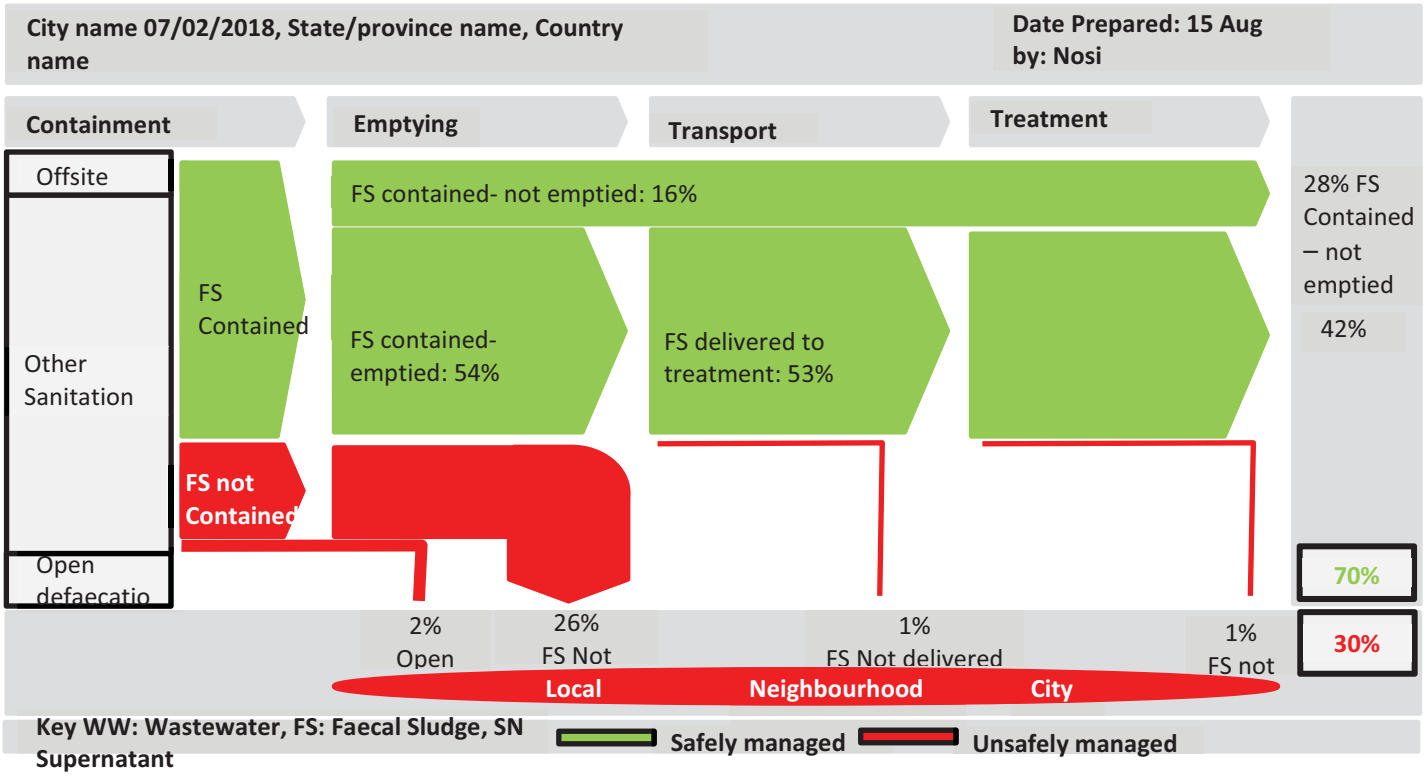


Figure 6: Example of SFD graphic

1.5.6 SFD Report

The SFD Report is written based on the data and information collected. A standard template on the contents of the SFD report are available on the SuSanA website. Guidance is provided about which data to report on and to what level.

The report is defined by three parts:

1. Executive summary presents outcomes and conclusions as well as the assumptions that have been made.

2. Detailed report includes all of the information collected. It is recommended that it should not be longer than 20 pages with additional details provided in the appendices. This part should include references that are presented in an approved standard.

3. Appendices contain relevant information including information to understand the sanitation situation in the area, stakeholder identification, the SFD selection grid and SFD matrix, evaluation of the Quality and Credibility of data.

Report and graphic need to be looked at together as the report provides details about the area, explanation of sanitation systems used, assumptions made, etc.

1.6 REVAMP Background

Historical evidence from societies in Asia (especially Japan, Korea and China) as well as in Central and South America indicates that the reuse of excreta as fertiliser and soil conditioner was widely practiced until the introduction of chemical fertilisers in the 19th century (Ddiba, 2016). Excreta was also used in aquaculture to grow fish for human consumption in many parts of South-East Asia.

Resource recovery can be a strategy not only for covering a significant portion of sanitation and waste management investment and operation costs but also for tackling the problem of resource scarcity. However, practice on investing in faecal sludge for resource recovery have not been very popular (Ddiba, 2016). This could be due to lack of knowledge of the potential resources contained in sanitary waste, or the market for organic waste is not very developed. A *REsource VAlue MAPping* (REVAMP) tool was therefore developed through *Stockholm Environment Institute* (SEI) initiative on sustainable sanitation to allow for evaluation of the potential resource recovery and associated economic benefits possible from human sanitary and organic waste. REVAMP helps decision makers to estimate the total resources and reuse potential available in an area's wastewater and other organic waste streams, as well as their financial values. The estimates provided by REVAMP are particularly intended to help decision makers regarding waste management (e.g. planning of new sanitation infrastructure, wastewater treatment plants, or climate mitigation measures).

1.6.1 REVAMP completion process

REVAMP tool is a mathematical model which was developed in MS Excel (2013) to estimate the possible recoverable amounts of by-products from sanitation systems. The Excel workbook with the model was designed to contain four worksheets which include:

1. Instructions – contains step by step guidelines on how to use the model

Estimating the potential for resource recovery from productive sanitation systems

Instructions

This Model consists of three Excel worksheets, all in this workbook. They are; Model, Data and Graphs and they are described below.

Model

This is the main interface of the tool where you will can in the amounts of each waste stream that you have available in your city and the tool will in turn give you figures of the potential amounts of recoverable resources you can get from those waste streams. In this worksheet, you should only change figures in the cells which are yellow in colour, as per the instructions you will see. Note that the figures you put in should be in the units specified in the tool.

The Model worksheet comes with some default values of prices for the different products and these should only be changed if more relevant local values are available.

It should also be noted that the amount of products given from each waste stream are mutually exclusive i.e. they indicate the amount of product that would be obtained if the entire amount of the waste stream available was used to generate that product alone.

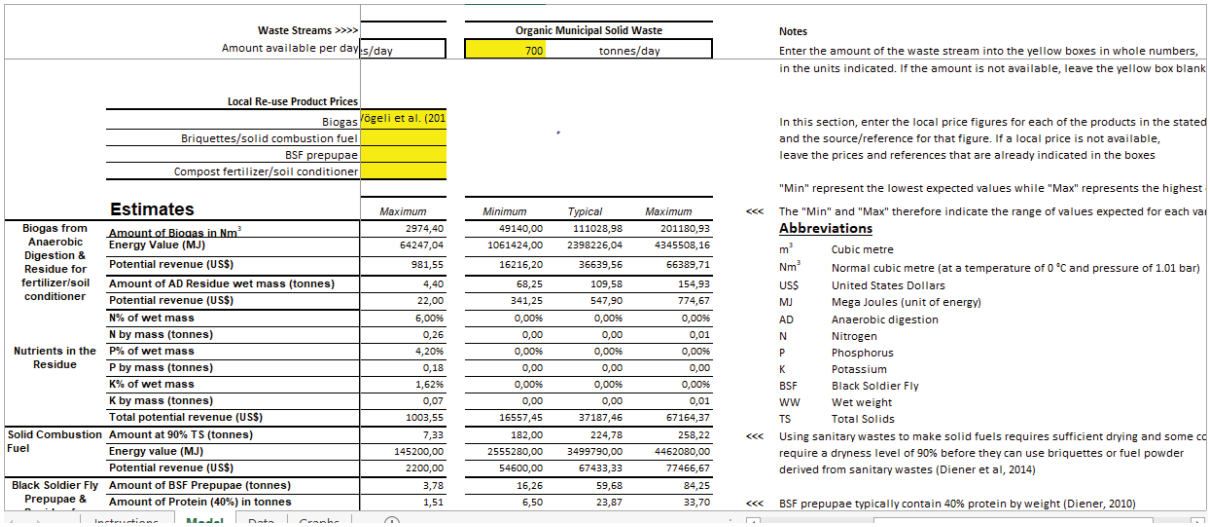
Data

This is the sheet with characterization data on a range of physical and biochemical parameters for the different waste streams you have in your city. The calculations that the tool makes are based on this data. The tool comes with some default data, based on the references stated. Please look carefully at this data and assess how closely it is to the characterisation of the waste streams in your city. If you have characterisation data available for these waste streams in your city, you should replace the existing data with your own local data. However, you should maintain the same template and units as specified by the tool. If you don't have all the data, then you should only change those parameters for which you have available data and leave the rest unchanged. The tool will not work if any data field is empty.

Graphs

This worksheet contains bar graphs that you can use to compare the various resource recovery options on the basis of the financial value of the end-products, the amounts of nutrients that can be recovered and the energy amount that can be recovered. The graphs portray the typical values that can be obtained along with bars

2. Model – contains the main component of the tool where data is loaded and results are displayed according to the inputs



	Waste Streams >>>>		Organic Municipal Solid Waste			Notes
	Amount available per day	s/day	700	tonnes/day		Enter the amount of the waste stream into the yellow boxes in whole numbers, in the units indicated. If the amount is not available, leave the yellow box blank
	Local Re-use Product Prices					
	Biogas	Vögeli et al. (201				In this section, enter the local price figures for each of the products in the stated and the source/reference for that figure. If a local price is not available, leave the prices and references that are already indicated in the boxes
	Briquettes/solid combustion fuel					
	BSF prepupae					
	Compost fertilizer/soil conditioner					"Min" represent the lowest expected values while "Max" represents the highest
	Estimates	*Maximum*	*Minimum*	*Typical*	*Maximum*	<<< The "Min" and "Max" therefore indicate the range of values expected for each va
Biogas from Anaerobic Digestion & Residue for fertilizer/soil conditioner	Amount of Biogas in Nm^3	2974,40	49140,00	111028,98	201180,93	**Abbreviations**
	Energy Value (MJ)	64247,04	1061424,00	2398226,04	4345508,16	m^3 Cubic metre
	Potential revenue (US$)	981,55	16216,20	36639,56	66389,71	Nm^3 Normal cubic metre (at a temperature of 0 °C and pressure of 1.01 bar)
	Amount of AD Residue wet mass (tonnes)	4,40	68,25	109,58	154,93	US$ United States Dollars
	Potential revenue (US$)	22,00	341,25	547,90	774,67	MJ Mega Joules (unit of energy)
Nutrients in the Residue	N% of wet mass	6,00%	0,00%	0,00%	0,00%	AD Anaerobic digestion
	N by mass (tonnes)	0,26	0,00	0,00	0,01	N Nitrogen
	P% of wet mass	4,20%	0,00%	0,00%	0,00%	P Phosphorus
	P by mass (tonnes)	0,18	0,00	0,00	0,00	K Potassium
	K% of wet mass	1,62%	0,00%	0,00%	0,00%	BSF Black Soldier Fly
	K by mass (tonnes)	0,07	0,00	0,00	0,01	WW Wet weight
	Total potential revenue (US$)	1003,55	16557,45	37187,46	67164,37	TS Total Solids
Solid Combustion Fuel	Amount at 90% TS (tonnes)	7,33	182,00	224,78	258,22	<<< Using sanitary wastes to make solid fuels requires sufficient drying and some co
	Energy value (MJ)	145200,00	2555280,00	3499790,00	4462080,00	require a dryness level of 90% before they can use briquettes or fuel powder
	Potential revenue (US$)	2200,00	54600,00	67433,33	77466,67	derived from sanitary wastes (Diener et al, 2014)
Black Soldier Fly Prepupae &	Amount of BSF Prepupae (tonnes)	3,78	16,26	59,68	84,25	
	Amount of Protein (40%) in tonnes	1,51	6,50	23,87	33,70	<<< BSF prepupae typically contain 40% protein by weight (Diener, 2010)

3. Data – contains characterization and transformation data for the various waste streams

Characterisation of Waste Streams								
Parameter	Units	Faecal Sludge			Reference(s)	Sewage sludge		
	Range>>>>	Min	Typical	Max		Min	Typical	Max
Total solids, TS	%	2,20	3,00	4,00	Schöbitz et al. (2014)	4,00	5,00	10
Total solids, TS	mg/L	22 000,00	30 000,00	40 000,00	Schöbitz et al. (2014)			
Total volatile solids, TVS	% TS	45,00	57,00	70,00	Schöbitz et al. (2014)	60,00	65,00	80
Total volatile solids, TVS	mg/L	9 900,00	18 000,00	24 500,00	Schöbitz et al. (2014)			
COD	mg/L	10 000,00	30 000,00	35 000,00	NWSC (2008) and Schöbitz et al. (2014)	47,00		608
Total Nitrogen, TN	mg N/L	1 000,00	3 310,00	5 000,00	Assumed values based on TKN in Schöbitz et al. (2014)	32,00		250
Total Nitrogen, TN	mg N/kg TS					15 000,00	########	40 000
Total Phosphorus, TP	mg P/L	150,00	390,00	500,00	Schöbitz et al. (2014)	9,00		63
Total Phosphorus, TP	mg P/kg TS					8 000,00	########	28 000
Total Potassium, TK	mg K/L	88,00	120,00	160,00	Based on K_2O figures for primary sludge from Tchobanoglous et al. (2003)			
Total Potassium, TK	mg K/kg TS					2 600,00	4 000,00	10 800
Calorific Value, CV	MJ/Kg TS	14,80	16,20	18,30	Muspratt et al. (2014)	10,00	16,00	22
Biomethane Potential, BMP	Nm^3 CH_4/ton VS_{added}	270,00	304,00	338,00	Davidsson et al. (2007) and Kjerstadius et al. (2015)	270,00	304,00	338
Dry Matter Reduction rate for AD/Biogas	%	60,00	67,50	75,00	Alfa et al. (2014)	60,00	67,50	75
Total solids in AD residue, AD.TS	%	60,00	60,00	60,00	Based on Diener et al. (2014)	60,00	60,00	60

1.6.2 REVAMP outputs

Outputs are presented in a bar graph format indicating comparison between different resource recovery options with respect to the nutrient and energy content and potential revenues generated. Based on data input about the volume of the different waste streams, REVAMP calculates the benefits from different reuse scenarios (e.g. composting of faecal sludge for agricultural fertiliser, production of biogas or solid waste briquettes). In terms of energy and nutrient content the tool provides an indication of how much of competing products they could substitute, and what those products would cost.

Data about waste stream flow rates are completed in the model worksheet and the monetary value of the existing resource recovery end-products. Waste streams include:
Faecal sludge – sludge that comes from onsite sanitation technologies, i.e. it has not been transported through a sewer. It results from the collection and storage/treatment of excreta or blackwater, with or without greywater. Faecal sludge includes both sludge from pit latrines and that from septic tanks.
Sewage sludge – sludge that originates from sewer-based wastewater collection (also referred to as wastewater sludge).
Organic municipal solid waste – this is the organic part of the urban solid waste and it includes items like food waste, market waste and crop residues

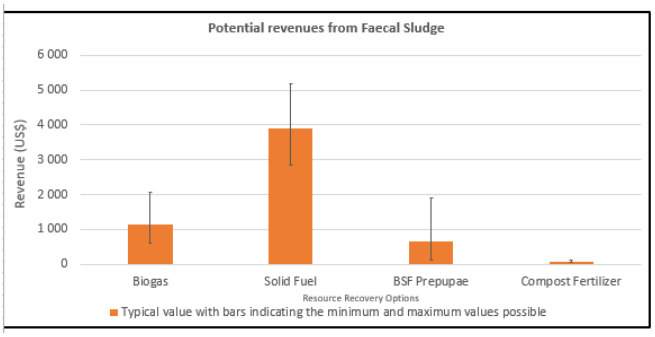
The worksheet then displays the minimum, typical and maximum amounts of resource products that can be recovered from each respective waste stream.

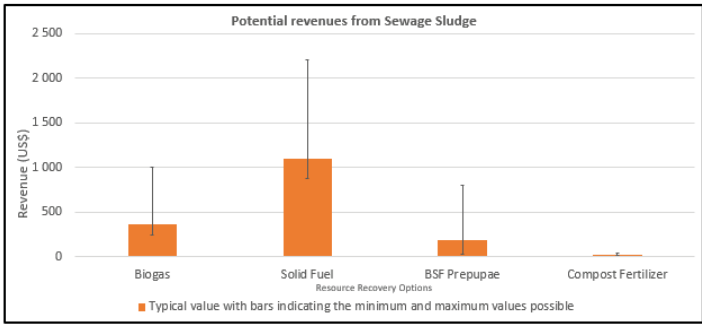
The resource recovery options included in the tool are:

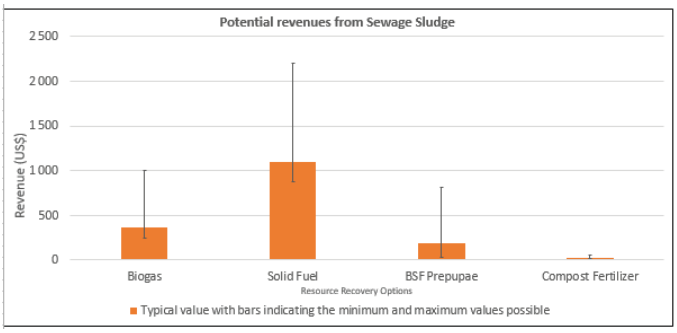
- Biogas – is generated from the process of anaerobic digestion and can be used for lighting, cooking and also for generating electricity and heat.
- Solid combustion fuel – excreta and organic waste streams have a high calorific value and can be turned into a solid dry fuel for combustion in briquette or powder form.
- Black soldier fly prepupae – organic waste streams can be treated using fly larvae composting, for example with the Black Soldier Fly, to produce valuable prepupae and a residue. The prepupae of the black soldier fly is 40% protein and 30% fat and can therefore make a protein-rich animal feed and/or be used to make biodiesel among other things (Ddiba, 2016).
- Soil conditioner - this would be the case when the entire waste stream is composted to make soil conditioner or fertiliser for applying on farms.

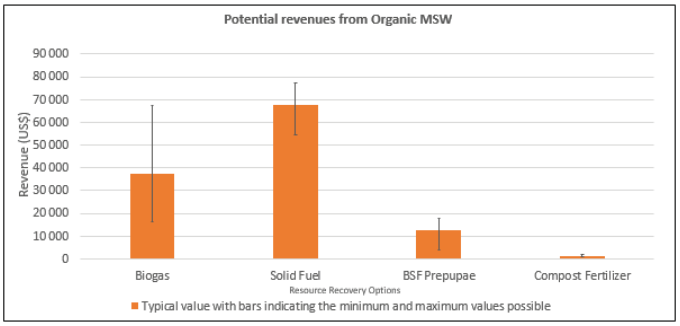
Each of these are displayed in a separate column. The minimum and maximum values give the user an idea of the lowest and highest amounts of resources they could obtain from their waste streams while the typical values show what could normally be expected, based on averages.

The graphs below contain produced bar graphs from the calculations in order to visually compare the different model outcomes and scenarios (Ddiba, 2016).


Potential revenues from Faecal Sludge
6 000
5 000
4 000
3 000
2 000
1 000
0
Revenue (US$)
Biogas
Solid Fuel
BSF Prepupae
Compost Fertilizer
Resource Recovery Options
Typical value with bars indicating the minimum and maximum values possible


Potential revenues from Sewage Sludge
2 500
2 000
1 500
1 000
500
0
Revenue (US$)
Biogas
Solid Fuel
BSF Prepupae
Compost Fertilizer
Resource Recovery Options
Typical value with bars indicating the minimum and maximum values possible


Potential revenues from Sewage Sludge
2 500
2 000
1 500
1 000
500
0
Revenue (US$)
Biogas
Solid Fuel
BSF Prepupae
Compost Fertilizer
Resource Recovery Options
Typical value with bars indicating the minimum and maximum values possible


Potential revenues from Organic MSW
90 000
80 000
70 000
60 000
50 000
40 000
30 000
20 000
10 000
0
Revenue (US$)
Biogas
Solid Fuel
BSF Prepupae
Compost Fertilizer
Resource Recovery Options
Typical value with bars indicating the minimum and maximum values possible

SECTION 2

PROJECT APPROACH

2 PROJECT APPROACH

2.1 Approach

The following approach was adopted.

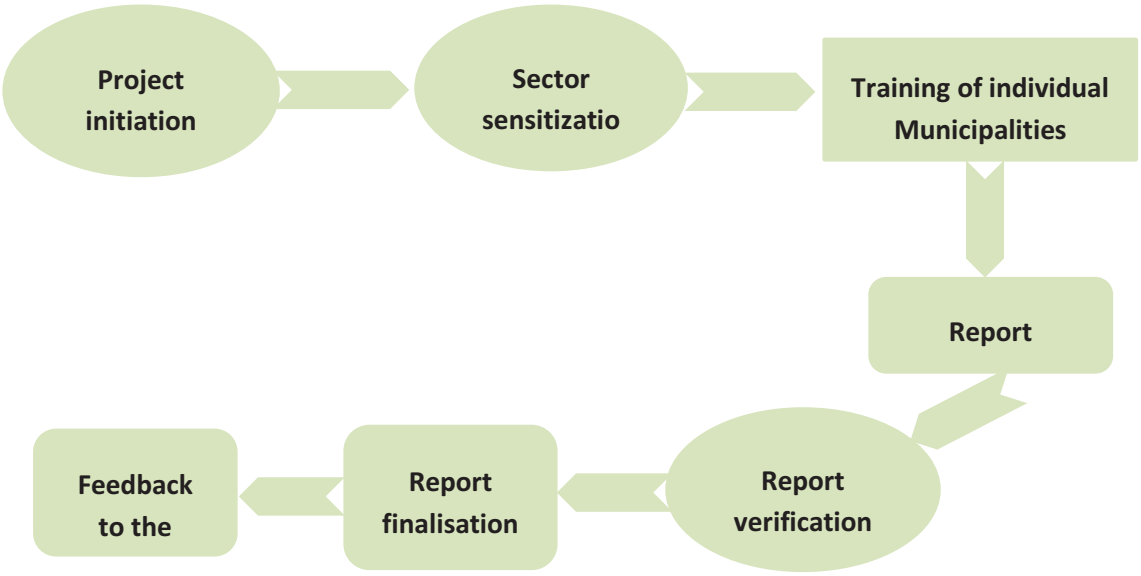


Figure 7: Project Approach

1. Project initiation
   Project initiation included:
   a. Project kick off meeting and finalising approach with the client
   b. Reviewing legislation/policies/strategies related to sanitation in South Africa.
   c. Ascertaining current status of sanitation in South Africa.
   d. Reviewing international best practise sanitation management plans and strategies
2. Sector sensitisation
   a. Sector sensitisation was achieved via training/profiling workshops (MBI masterclasses) in the two provinces of *Eastern Cape* (EC) and *KwaZulu-Natal* (KZN)
3. Training of individual municipalities
   a. Municipalities that volunteered to be part of the programme during sector workshops were targeted.
   b. Through a workshop process, these municipalities were trained on how to use the SFD tool and interpreting its outputs.
4. Report drafting and verification
   a. Based on the information provided and assumptions made with the municipality, summary SFD reports for each municipality were drafted.
   b. The draft reports were sent to the municipalities for verification before finalisation.
5. Report finalisation
   a. Once the information and assumptions were verified by the municipal officials, the reports were finalised.

6. Sector feedback
    a. Feedback sessions to the sector were conducted, where the SFD municipal reports were presented and the findings of the project were presented. The workshops were held at the same two provinces as the initial sensitisation, namely EC and KZN.

2.2 Project Initiation

2.2.1 Project initiation meeting

Project initiation meeting with the client was carried out where project approach was finalised. It was agreed that the 2016 community survey report together with the project team's experience with municipalities will be used to select participating municipalities. It was suggested that the stakeholder workshop should be carried out as a first task where the key sector stakeholders and municipalities are sensitised about the project.

2.2.2 Project Team training on SFD

Emanti was working with, and drawing on the lessons of, *eThekwini Water and Sanitation* (EWS), the only municipality in South Africa (SA) to have developed an SFD before this project. Furthermore, the SFD SA team received training from the *Centre for Science and Environment* (CSE) of India, an active contributor to SFD development internationally and a partner of WRC. The training included understanding data/information required to develop SFD, how to collect data/information, SFD development process, SFD graphic interpretation, SFD report development. The team continues to draw on the considerable experience of both (i) the SuSanA, and in particular their SFD tool, and (ii) the extensive experience of CSE.

2.3 Sector Stakeholder SFD Sensitisation Through Sector Stakeholder Workshops

Sector training workshops were held at EC and KZN Provinces in August 2018. Relevant stakeholders (including WRC, DWS, *South African Local Government Association* (SALGA), *Co-operative Governance and Traditional Affairs* (CoGTA), municipalities, consultants, were invited to the training workshop where the initiative was introduced.

Out of five municipalities that attended the KwaZulu-Natal workshop, four indicated their willingness to participate in the project going forward. Whilst all four municipalities that attended the Eastern Cape workshop indicated their willingness to participate. Attendance registers and programme for the workshops are included in Appendix A.

2.3.1 Workshops Content

The workshops focused on introducing the project and aimed to help build SFD and FSM related competence within the sanitation sector. CSE assisted the project team in conducting the sector training workshops. The target audience included:

- Municipal officials responsible for the management of sanitation services (e.g. planning, operations and maintenance)
- Department of Water and Sanitation (DWS) officials responsible for sanitation, regulation and enforcement,
- Researchers and engineers involved in the sanitation management,
- Companies responsible for operation and maintenance of sanitation services (e.g. emptying, transportation, sludge reuse).

The value of the workshops was that they provided the sector with an opportunity to understand the sanitation value chain, standard terminology used in SFD development, sanitation situation at a number of municipalities and simultaneously train the sector on how to develop SFDs and associated reports. This would allow appropriate strategies to be developed to close any gap within sanitation, wastewater effluent and faecal sludge management in South Africa.

Both, EC and KZN workshops followed the same basic format, and included:

- Sanitation status in South Africa and/or the associated Region
- SFD project introduction
- Municipal experience of developing SFD
- SFD development role playing and interactive exercises
- How to interpret SFD outputs
- Facilitated discussion (questions and answers)

2.3.2 KwaZulu-Natal Workshop

The *Municipal Benchmarking Initiative* (MBI), the South African Local Government Association (SALGA), *Water Research Commission* (WRC), eThekwini Municipality's Water and Sanitation Department (EWS) Unit, CSE, and the *Municipal Institute of Learning* (MILE) collaborated to organize the workshop. The one and a half day workshop was held in Durban, KwaZulu-Natal on the 7th and 8th August 2018 and 1.5 CPD points were allocated for attendees.

The forum was very well attended (approximately 35 delegates) with five KwaZulu-Natal municipalities represented. Consulting companies and government departments such as DWS, CoGTA, Public Works were also represented.

2.3.3 Eastern Cape Workshop

The project team, together with CSE, organized a workshop in East London, Eastern Cape on the 16th and 17th August 2018.

The workshop was very well attended. Thirty-three (33) delegates from municipalities, consulting companies and government departments (e.g. DWS, CoGTA) attended.

2.3.4 Observations and feedback from the sector stakeholder workshops

The following observations were noted from the two workshops:

- The sector partners supported the initiative
- The workshops sensitized the municipalities to participate in SFD development
- The timing of the workshop should be factored into municipal travel requirements
- It was necessary to provide an understanding of the SFD terminology, and this should be aligned to the South African sanitation sector terminology.

"The SFD assist users put something complex in a simpler way" stakeholders

All sector stakeholders participated in the discussions. Below is the feedback received from the sector at the workshops:

- The sector believes that SFDs could assist in highlighting gaps and areas of concern related to the sanitation chain and faecal sludge management. This includes highlighting backlogs.
- It was proposed that more time is required for such workshops to assist with absorbing the extent of the information presented.
- SFD outputs could assist in interpreting a complex sanitation situation by using a graphic that can be easily interpreted.
- It was noted that SFD reports could help motivate the appropriate allocation of sanitation budget during municipal planning.
- The biggest challenge indicated by municipalities was that monitoring of sludge transporting trucks/vacuum trucks is poor. This has also been confirmed by municipalities where initial SFD development has been conducted. The municipalities noted that the SFD development process assisted with the identification of gaps relating to monitoring of toilet emptying (such as in the case of emptying of septic tanks by vacuum trucks which is currently not monitored).
- A shortcoming in the SFD tool that was noted was that it does not include disposal/reuse in the process flow (e.g. what happens to sludge after treatment).
- Another shortcoming noted was that SFD does not address how industrial effluent affects compliance.

Following the workshops, the following municipalities indicated their willingness to participate further in the project and develop SFDs. The team would need to consider the above when developing SFDs for the targeted municipalities.

Table 4: Targeted municipalities

Eastern Cape	**KwaZulu-Natal**
Amathole District Municipality (DM)	Amajuba DM
Buffalo City Metropolitan	Ilembe DM
Chris Hani DM	uMgungundlovu DM
Joe Gqabi DM	Zululand DM

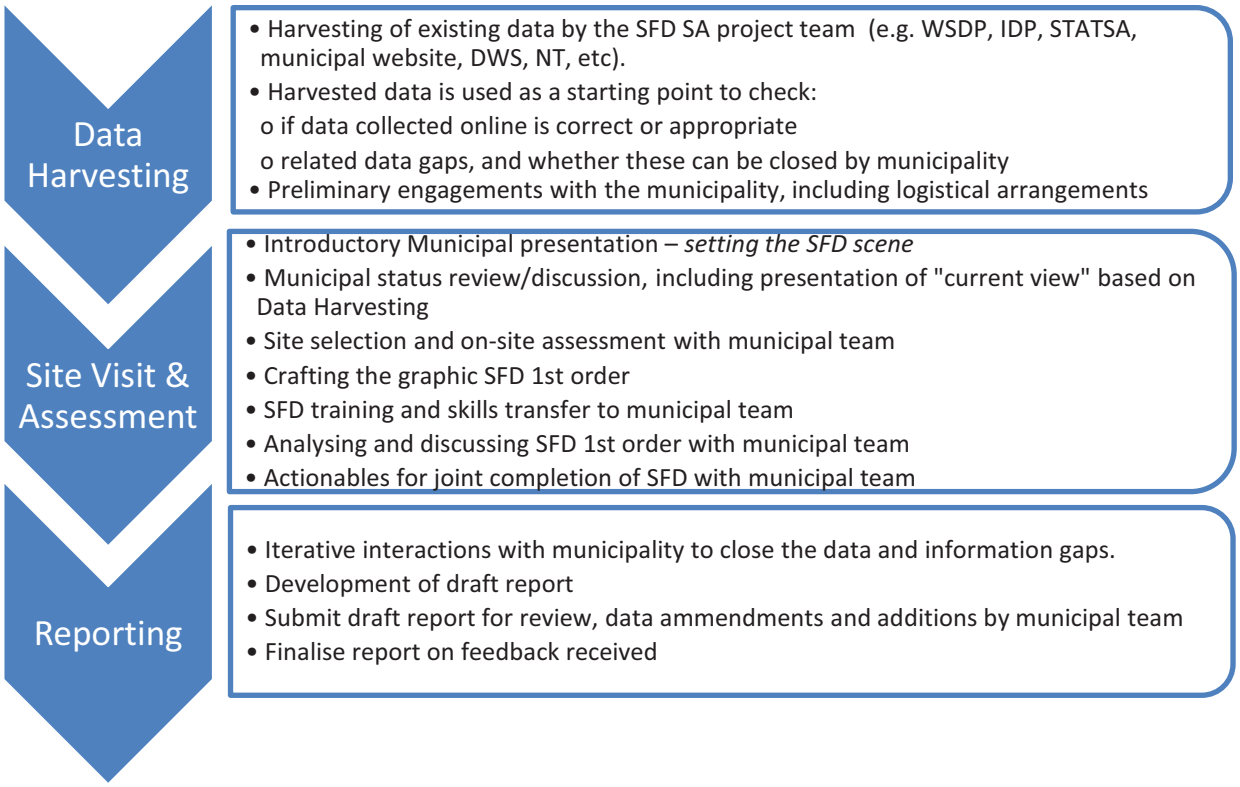
SECTION 3

SFD DEVELOPMENT PROCESS

3. SFD DEVELOPMENT PROCESS

3.1 SFD Development Methodology

Following the sector stakeholder workshops that were held in the targeted provinces of Eastern Cape (16-17 August 2018) and KwaZulu-Natal (6-7 August 2018). Initial communications with targeted municipalities were conducted to confirm their participations in the project. All eight municipalities confirmed. Interactions were held with each targeted municipality representatives on the set dates. A similar approach was followed for all eight municipalities, which included the following.



Following this, the necessary follow ups and reporting was done. These aspects are presented in the next section.

3.2 SFD Graphic Development via Municipal Workshops and Site Visits

Municipal workshops were held at each municipality offices to collect data and train municipal representatives on SFD development. The workshops were attended by varying representatives at each municipality; ranging from sanitation managers, area managers, operations managers, superintendents, technicians, etc. Attendance registers for participants within targeted municipalities are included in Appendix B. The dates on which the workshops were conducted are presented in the table below.

Table 5: Municipal workshop dates

Province	Municipality	Date	SFD developed for:
Eastern Cape	Amathole DM	08-09 November 2018	Whole District
	Buffalo City Metropolitan	15 August 2018	Whole Metropolitan
	Chris Hani DM	06-07 November 2018	One town (Tarkastad)
	Joe Gqabi DM	13-14 August 2018	One town (Ugie)
Province	**Municipality**	**Date**	**SFD developed for:**
KwaZulu-Natal	Amajuba DM	31 October-01 November 2018	One town (Dannhauser)
	Ilembe DM	2 November 2018	One Local municipality (KwaDukuza)
	uMgungundlovu DM (developed subsequent to KZN Master Class session)	7 August 2018	One town (Dalton/ Coolair)
	Zululand DM	29-30 October 2018	One Local municipality (Ulundi)

During the workshops, the project team gave an introductory presentation (examples of presentations given are included in appendix B). The status of the municipality was presented and discussed with the project team. The area that the SFD would be developed for was discussed and decided in consultation with the municipality. Considerations on deciding on the area to target/focus on varied per municipality. Some municipalities targeted the most challenging areas, where a lot of sanitation issues are experienced. Some targeted the whole municipality because of lack of detailed data for particular towns.

Once the area for developing SFD was decided, data required to develop SFD was gathered. Data was sourced (e.g. via IDP, WSDP, STATSSA, Water Services Master Plan, Sanitation municipal IWA water balance, Rural Development Plan, etc.) prior to municipal workshop and verified with the municipal representatives during workshops. The available data was populated onto the SuSanA website – SFD tool to develop the 1st order SFD graphic. Discussions on how to read SFD graphic were held. It was discussed that outstanding data should be sent to the project team to finalise SFD graphic and report. After the workshops, the project team, accompanied by the municipal representatives went for field visits to understand the sanitation technologies within the municipality.

3.3 Sanitation Status Summary About Participating Municipalities

3.3.1 Amathole DM

Amathole DM is a WSA for its area of jurisdiction in terms of the Water Services Act. Amathole DM is constituted by six Local Municipalities; Amahlathi, Great Kei, Mbhashe, Mnquma, Ngqushwa and Raymond Mhlaba. Amathole DM decided to develop SFD for the entire district which covers an area of 21 117km^2 and has an estimated population of 914,823.

The following sanitation technologies and systems used in Amathole DM with indication of population using each technology are presented in the table below.

Table 6: Amathole sanitation technologies and contribution of excreta in terms of percentage of population

No.	Sanitation technologies and systems as defined by:		Percentage of population
	Amathole DM	**SFD promotion initiative**	
1	Toilet flushes directly to sewer	Toilet discharges directly to a centralised foul/separate sewer	6%
2	Septic tank (plastic or concrete)	Fully lined tank (sealed), no outlet or overflow	11%
3	VIPs – lined with cement blocks and open bottom	Lined pit with semi-permeable walls and open bottom	37%
4	VIPs – unlined	Unlined pit	33%
5	Not serviced (rural and informal)	No toilet, open defaecation	13%



Figure 8: Amathole data gathering, verification, analysis and interpretation workshop and field visits

3.3.2 Buffalo City Metropolitan

Buffalo City Metropolitan Municipality (BCMM) is a WSA on the east coast of Eastern Cape Province, South Africa. It includes the towns of East London, Bhisho and King William's Town, as well as the large townships of Mdantsane and Zwelitsha. BCMM's land area is approximately 2,515 km², with 68 km of coastline. Buffalo City is the key urban centre of the eastern part of the Eastern Cape. 60% of BCMM can be considered urban and 40% rural. Buffalo City Metropolitan decided to develop SFD for the entire metropolitan which has an estimated population of 843,997 and 253,477number of households.

The following sanitation technologies and systems used in Buffalo City with indication of population using each technology are presented in the table below.

Table 7: Buffalo City sanitation technologies and contribution of excreta in terms of percentage of population

No.	Sanitation technologies and systems as defined by:		Percentage of population
	Buffalo City	**SFD promotion initiative**	
1	Toilet flushes directly to sewer	Toilet discharges directly to a centralised foul/separate sewer	65%
2	Conservancy tanks (concrete all around)	Fully lined tank (sealed), no outlet or overflow	2%
3	Community ablution blocks (replaced chemical toilets)	Fully lined tank (sealed), no outlet or overflow	1%
4	VIPs – unlined	Unlined pit	7%
5	VIPs – lined with cement blocks and open bottom	Lined pit with semi-permeable walls and open bottom	9%
6	Pit latrines – unlined (noted as "no service")	Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	7%
7	Not serviced (rural and informal)	No toilet, open defaecation	10%


Figure 9: Data gathering, verification, analysis and interpretation with Buffalo City Metro team

3.3.3 Chris Hani DM

Chris Hani District Municipality (CHDM) is a WSA for its area of jurisdiction in the Eastern Cape region. CHDM DM is constituted by six Local Municipalities; eMalahleni, Enoch Mgijima, Engcobo, Intsika Yethu, Inxuba Yethemba and Sakhisizwe. Chris Hani DM decided to develop SFD for Tarkastad which is a town within Enoch Mgijima LM. Tarkastad is estimated to have a population of 33,000.

The following sanitation technologies and systems used in Tarkastad with indication of population using each technology are presented in the table below.

Table 8: Tarkastad sanitation technologies and contribution of excreta in terms of percentage of population

No.	Sanitation technologies and systems as defined by:		Percentage of population
	Chris Hani DM	**SFD promotion initiative**	
1	Toilet discharges directly to sewer	Toilet discharges directly to a decentralised foul/separate sewer	75%
2	Septic tank (plastic or concrete)	Fully lined tank (sealed) no outlet or overflow	1%
3	Septic tank (plastic or concrete)	Fully lined tank (sealed) connected to a centralised foul/ separate sewer	3%
4	VIPs (urban)	Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow	21%

Figure 10: Chris Hani field visits

3.3.4 Joe Gqabi DM

Joe Gqabi District Municipality (JGDM) is a WSA for its area of jurisdiction in the Eastern Cape region. JGDM includes towns of Aliwal North, Barkly East, Burgersdorp, Jamestown, Lady Grey, Maclear, Mount Fletcher, Oviston, Rhodes, Rossouw, Sterkspruit, Steynsburg, Ugie and Venterstad. JGDM decided to develop SFD for Ugie town which has an estimated population of 144,929 (2016) with 35,804 households.

The following sanitation technologies and systems used in Ugie with indication of population using each technology are presented in the table below.

Table 9: Ugie sanitation technologies and contribution of excreta in terms of percentage of population

No.	Sanitation technologies and systems as defined by:		Percentage of population
	Joe Gqabi DM	**SFD promotion initiative**	
1	Toilet flushes directly to sewer	Toilet discharges directly to a centralised foul/separate sewer	2%
2	Septic tank (plastic or concrete)	Fully lined tank (sealed), no outlet or overflow	13%
3	Septic tank (plastic or concrete)	Containment (fully lined tanks, partially lined tanks and pits, and unlined pits) failed, damaged, collapsed or flooded – with no outlet or overflow	6%
4	VIPs (urban)	Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow	20%
5	VIPs (urban)	Pit (all types), never emptied, abandoned when full but NOT adequately covered with soil, no outlet or overflow	1%
6	VIPs (rural)	Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	58%

Figure 11: Ugie field visits

3.3.5 Amajuba DM

Amajuba District Municipality is a WSA for its area of jurisdiction in KwaZulu-Natal. Amajuba DM has an estimated total population of 531,327 people who are accommodated in 117,256 households. Amajuba DM decided to develop SFD for Dannhauser LM which has an estimated 102,937 people and 20,242 households within the 13 wards (Stats SA, 2016) (5.1 persons per household).

The following sanitation technologies and systems used in Dannhauser with indication of population using each technology are presented in the table below.

Table 10: Dannhauser sanitation technologies and contribution of excreta in terms of percentage of population

No.	Sanitation technologies and systems as defined by:		Percentage of population
	Amajuba DM	**SFD promotion initiative**	
1	Toilet flushes directly to sewer	Toilet discharges directly to a centralised foul/separate sewer	8%
2	Septic and conservancy tanks (plastic or concrete)	Fully lined tank (sealed), no outlet or overflow	1%
3	VIPs – fully lined	Fully lined tank (sealed), no outlet or overflow	89%
4	Not serviced	No toilet, open defaecation	2%

Figure 12: Dannhauser field visits

3.3.6 Ilembe DM

The iLembe DM is a WSA for its area of jurisdiction in terms of the Water Services Act. iLembe DM is constituted by four Local Municipalities; Mandeni, KwaDukuza, Ndwedwe and Maphumulo. iLembe DM decided to develop SFD for KwaDukuza LM which has an estimated population of 231,187.

The following sanitation technologies and systems used in KwaDukuza with indication of population using each technology are presented in the table below.

Table 11: KwaDukuza sanitation technologies and contribution of excreta in terms of percentage of population

No.	Sanitation technologies and systems as defined by:		Percentage of population
	iLembe DM	**SFD promotion initiative**	
1	Toilet flushes directly to sewer	Toilet discharges directly to a centralised foul/separate sewer	49%
2	Septic tank (plastic or concrete)	Septic tank connected to soak pit	1%
3	Conservancy tanks (plastic or concrete)	Fully lined tank (sealed), no outlet or overflow	1%
4	VIPs – partially lined and open bottom	Lined pit with semi-permeable walls and open bottom	14%
5	VIPs – unlined	Unlined pit	20%
6	Not serviced	No toilet, open defaecation	15%

Figure 13: KwaDukuza field visits

3.3.7 uMgungundlovu DM

uMgungundlovu District Municipality is a WSA located in Pietermaritzburg. Its area of jurisdiction covers seven local municipalities. The District covers about 8,500 square kilometres with population of approximately 1,017,763. uMgungundlovu DM decided to develop SFD for Dalton/Coolair town which has an estimated population of 7,420.

The following sanitation technologies and systems used in Dalton/Coolair with indication of population using each technology are presented in the table below.

Table 12: Dalton/Coolair sanitation technologies and contribution of excreta in terms of percentage of population

No.	Sanitation technologies and systems as defined by:		Percentage of population
	Umgungundlovu DM	**SFD promotion initiative**	
1	Toilet discharges directly to sewer	Toilet discharges directly to a decentralised foul/separate sewer	70%
2	Septic tank (plastic or concrete)	Connected to soak pit	19%
3	Septic tank (plastic or concrete)	Containment (fully lined tanks, partially lined tanks and pits, and unlined pits) failed, damaged, collapsed or flooded – with no outlet or overflow	8%
4	VIPs (urban)	Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow	1%
5	VIPs (urban)	Pit (all types), never emptied, abandoned when full but NOT adequately covered with soil, no outlet or overflow	1%
6	Open	Defaecation	1%

Figure 14: Data gathering, verification, analysis and interpretation with uMgungundlovu DM team

3.3.8 Zululand DM

The Zululand DM (ZDM) is a WSA for its area of jurisdiction in terms of the Water Services Act. ZDM is constituted by five Local Municipalities; Abaqulusi LM, eDumbe LM, Nongoma LM, Ulundi LM and uPhongolo LM. ZDM decided to develop SFD for Ulundi LM which has an estimated population of 18,420.

The following sanitation technologies and systems used in Ulundi LM with indication of population using each technology are presented in the table below.

Table 13: Ulundi sanitation technologies and contribution of excreta in terms of percentage of population

No.	Sanitation technologies and systems as defined by:		Percentage of population
	Zululand DM	SFD promotion initiative	
1	Toilet flushes directly to sewer	Toilet discharges directly to a centralised foul/separate sewer	11%
2	Septic tank (plastic or concrete)	Fully lined tank (sealed), no outlet or overflow	1%
3	VIPs – lined with cement blocks and open bottom	Lined pit with semi-permeable walls and open bottom	53%
4	VIPs – unlined	Unlined pit	28%
5	Not serviced (rural and informal)	No toilet, open defaecation	7%



Figure 15: Ulundi field visits

3.4 Observations from Municipal Workshops and Site Visits

The following were observed from municipal workshop and site visit sessions:

- Desktop collection of data was insufficient to develop SFDs as most data was gathered during workshops.
- Varying levels of data availability through different municipalities were observed.
- Different sources of information presented conflicting data information. The municipal representatives guided on the most appropriate data to use, depending on the source or most updated data.
- The terminology used on the SFD tool was confusing to municipalities as different terms are used in different areas.
- Some Key Informant Interviews were not held due to the availability of the targeted stakeholders (e.g. truck drivers).
- It was noted that SFD tool does not sufficiently address sludge management from wastewater treatment plants.

"This SFD graphic presents the real situation within my municipality" Buffalo City

SECTION 4 DEVELOPED SFDs

4. DEVELOPED SFD'S

4.1 SFD Summary Reports

Subsequent to municipal workshops, outstanding information was collected from municipalities to develop SFD reports. The SFD report format available on SuSanA website was followed with some variations in order to fit South African municipal context. SFD graphics were developed through the SusanA website as explained in section 1.4. The summary reports developed are a combination of initial and intermediate. SFD reports contents included:

- Executive summary
- Municipal context
- Service outcomes
- Stakeholder engagements
- Acknowledgements
- References

The level of detail contained in each of the summary reports varies, depending on the information provided and assumptions made. Though the summary reports followed the standard contents mentioned above, there were some innovations included (e.g. future scenario projection) where noted necessary.

Draft summary reports were developed and sent to the respective municipalities for verification and approval. Detailed developed SFD summary reports are attached as Appendix D.

4.2 SFD Reports Innovations

During iterative engagement on SFD report finalisation with the volunteer municipalities, a common strong request resonated that the report be structured (if possible) in such as manner as to initiate and guide remedial actions within the municipality and its decision making structures: "*we would like to table this report to Council for adoption of the SFD current status within the municipality, the implications thereof, proposed remedial actions and budgetary requirements*".

Further common requests were for a flow diagram to guide the reader, a descriptor of wastewater sludge status, a SFD graphical representation as to likely "future scenario", and a remedial action plan. Each of these is briefly covered below. The reports developed are therefore something in-between an SFD lite and an SFD intermediate, including human resource, water conservation and demand management, wastewater sludge management, finance aspects.

- Inclusion of a flow diagram – a diagram that shows the sanitation flow within the city. An example of a flow diagram is shown below.

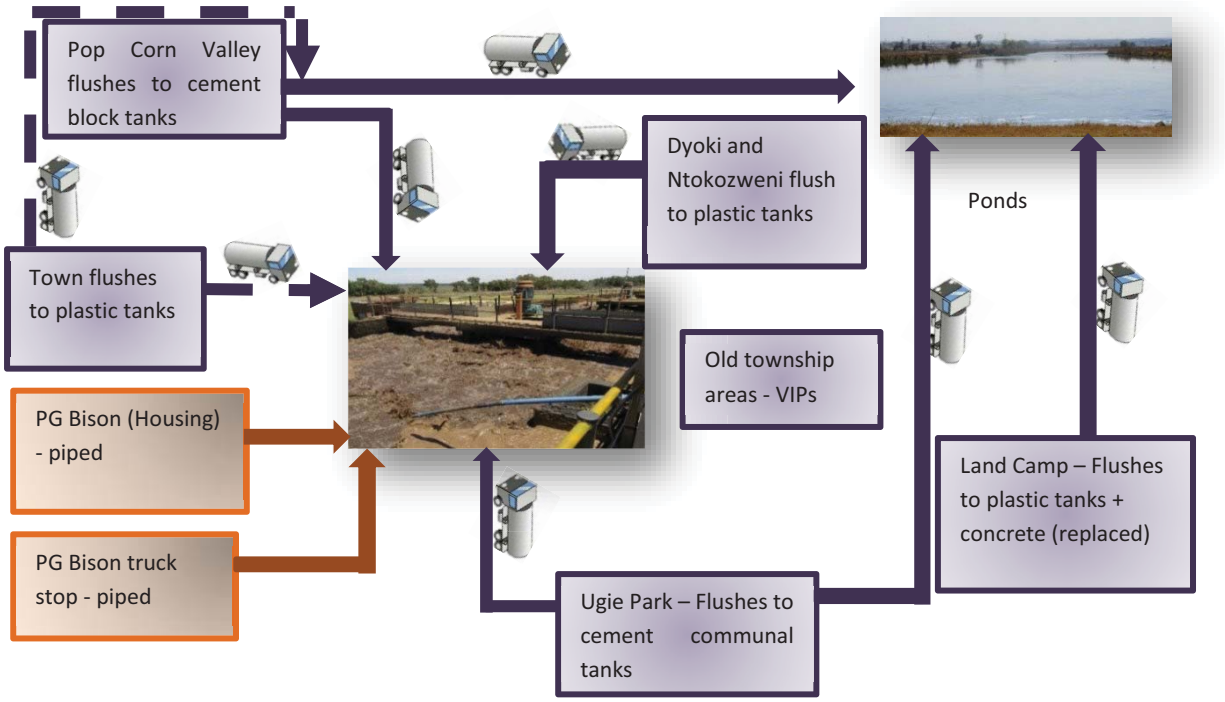


Figure 16: Flow diagram innovation example

- Inclusion of Wastewater Sludge Status – within SA, wastewater sludge is a common significant challenge. An example of the approach used to calculate that is presented below.

Table 14: Wastewater sludge status innovation example

Plant	Sludge quantity (kg/day)	Acceptable for "intended use without further treatment/action"?	Sludge quantity that is acceptable (kg/day)	"compliance" (%)
A	10	Yes	10	100%
B	5	Yes	5	100%
C	20	No	0	0%
Total	**35**		**15**	**Sludge mass weighted compliance = 15 / 35 = 43%**

- Inclusion of a Future Scenario – Future scenario is included where necessary (and a link to a budget if possible). The current status SFD graphic may indicate that faecal sludge is largely managed within the community at the time of assessment (see example below). This would be the case if faecal sludge is noted to be contained (i.e. there is no noted impact to the environment and human health).

Current Status SFD graphic:

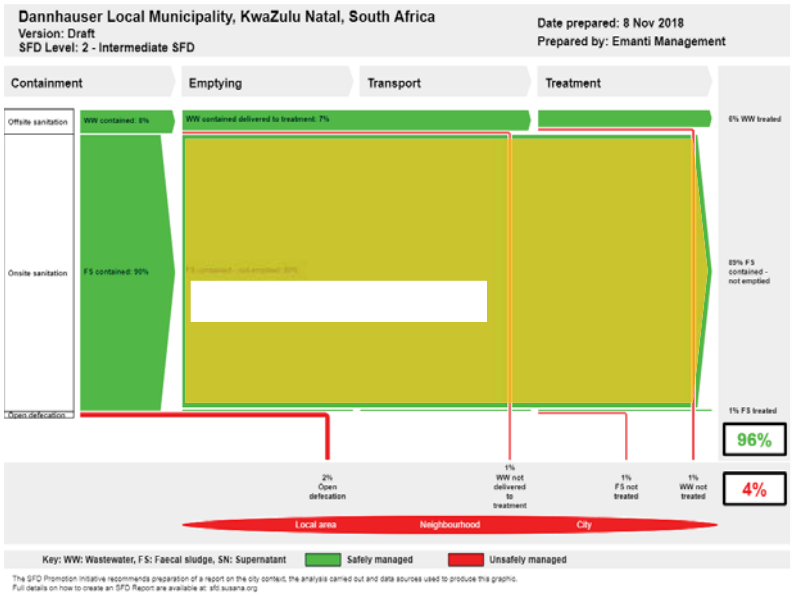
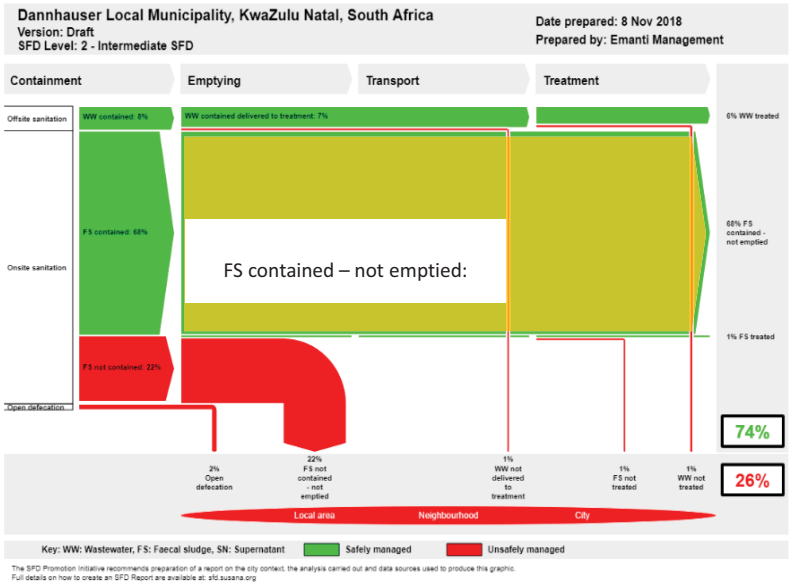


Figure 17: Future scenario innovation example

Future Scenario SFD Graphic

Though, this may be the case at the time of assessment, if there are no strategies or plans in place to ensure that faecal sludge is properly managed in future, the situation may change. This is considered via a future scenario SFD. This would assist the institution to plan properly and develop required strategies. Linkage to budget has not been done yet. This would probably be part of a follow up action plan that is envisaged. An example of this is presented below.

In the example, the majority of sanitation technologies are on-site sanitation systems (VIPs), and an emptying strategy has not yet been developed. With time, the VIPs will fill and without subsequent emptying, the current status could therefore deteriorate. By way of example, we could consider that some VIPs will never be emptied, but abandoned when full, but not adequately covered with soil (no outlet or overflow), while some households will move to unlined pits. Considering this, a change in the safely managed excreta could be expected, and an increase in untreated excreta could be discharged into the environment



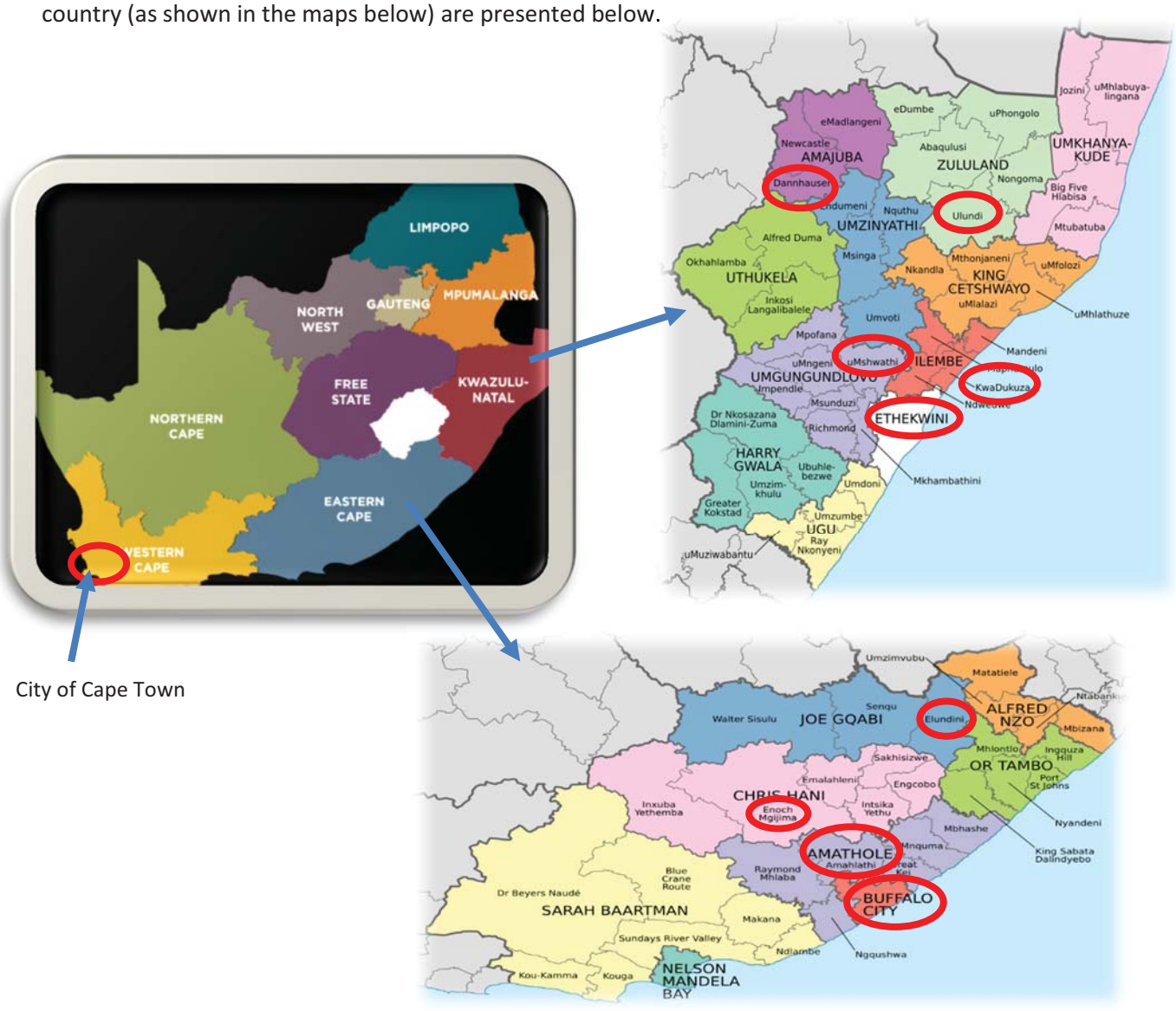
This helps to highlights the importance of developing and implementing an appropriate VIP emptying strategy.

Inclusion of Remedial Action Plan – in order to assist municipalities, a remedial action plan for municipalities will be developed has been requested and is in development. An example of the approach includes:

- A Remedial Action Plan template to assist and guide municipalities to plan after having their reports will be developed. Action plan will also utilise FSM toolbox and REVAMP to compliment.
- If there is a spreadsheet or web-based action plan, municipalities could monitor themselves maybe quarterly and at least annually as to a review of the SFD process and action plan implementation progress could be conducted.

4.3 Summary Outcomes

The summary of project outcomes based on the municipalities that have developed SFDs in the country (as shown in the maps below) are presented below.



The graph below provides insight into the population percentage using the various sanitation facilities as per SFD definitions.

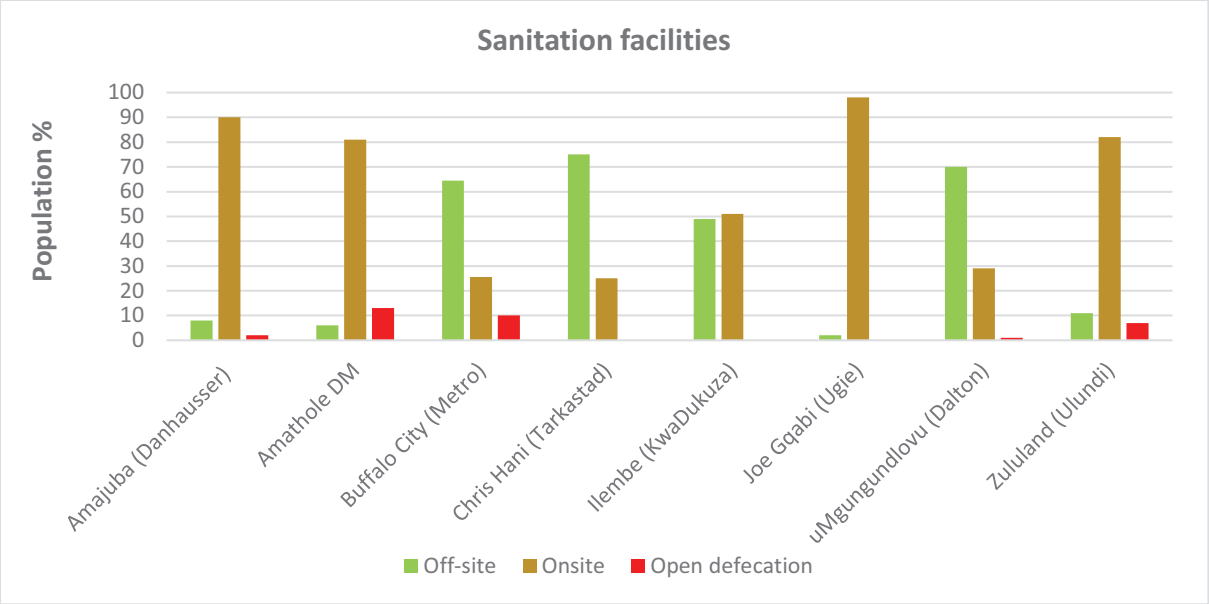


Figure 18: Representation of usage of sanitation facilities at the participating municipalities

Collated results from the above SFDs indicated the following insightful and useful information:

60% of the population is connected to sewage network offsite	**36%** of the population is dependent on onsite sanitation system (e.g. pit systems)	**4%** of the population still defecates in the open/have no sanitation facilities

No municipality is 100% sewered

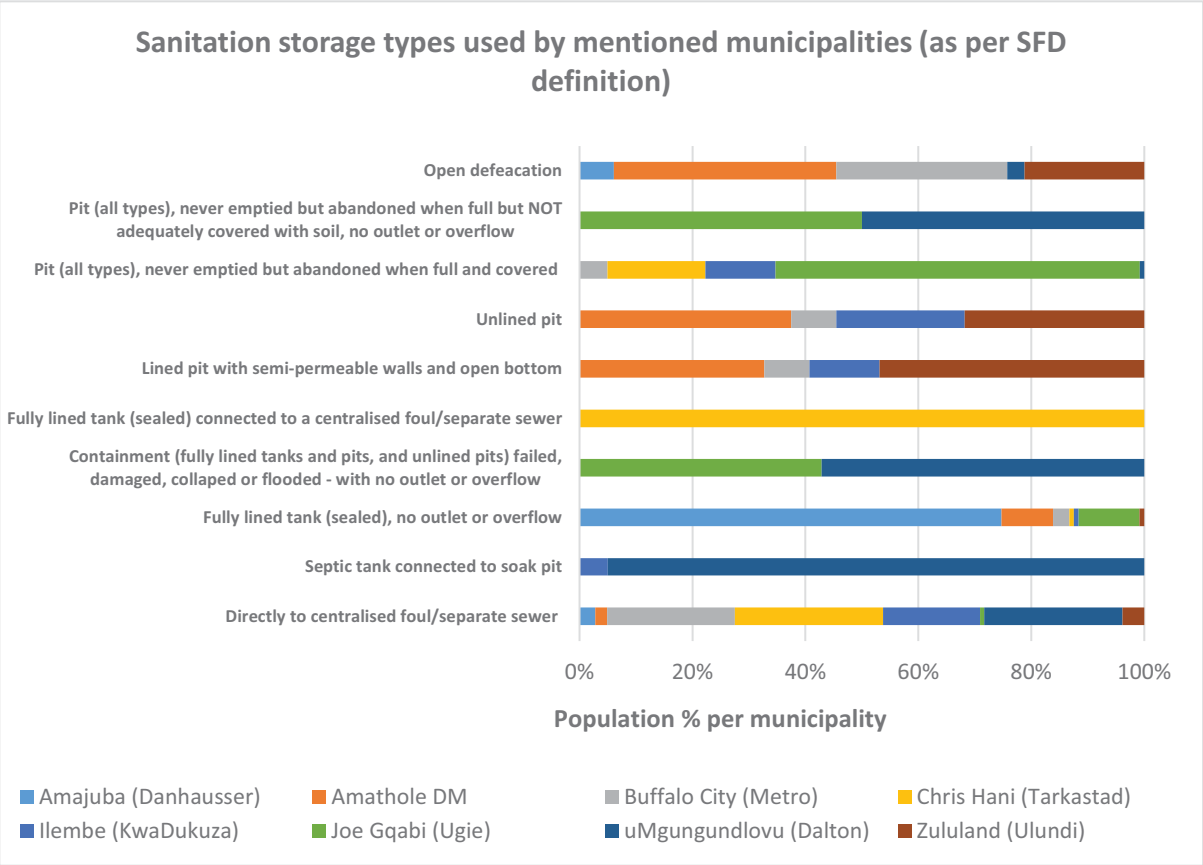
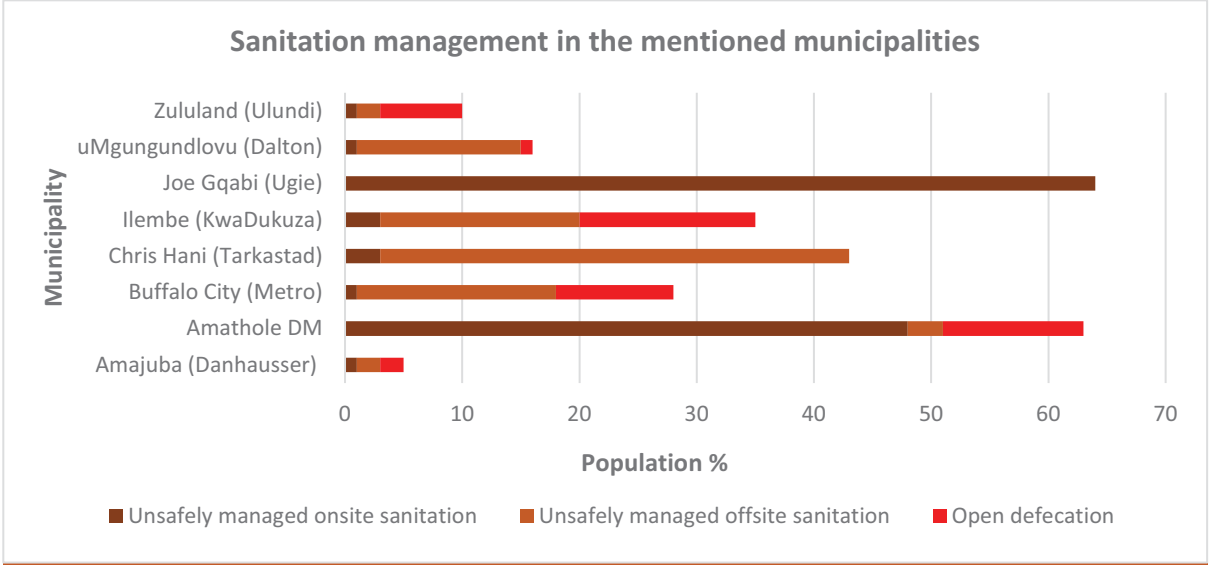


Figure 19: Representation of storage facilities at the participating municipalities

It can be noted that the three onsite storage types used (besides offsite) by most population in the municipalities for onsite sanitation are:

Pit, never emptied abandoned when full and covered and	Fully lined tank (sealed), no outlet or overflow	Lined pit with semi-permeable walls and open bottom

Interactions have confirmed that >50% of pits and/or tanks are not emptied



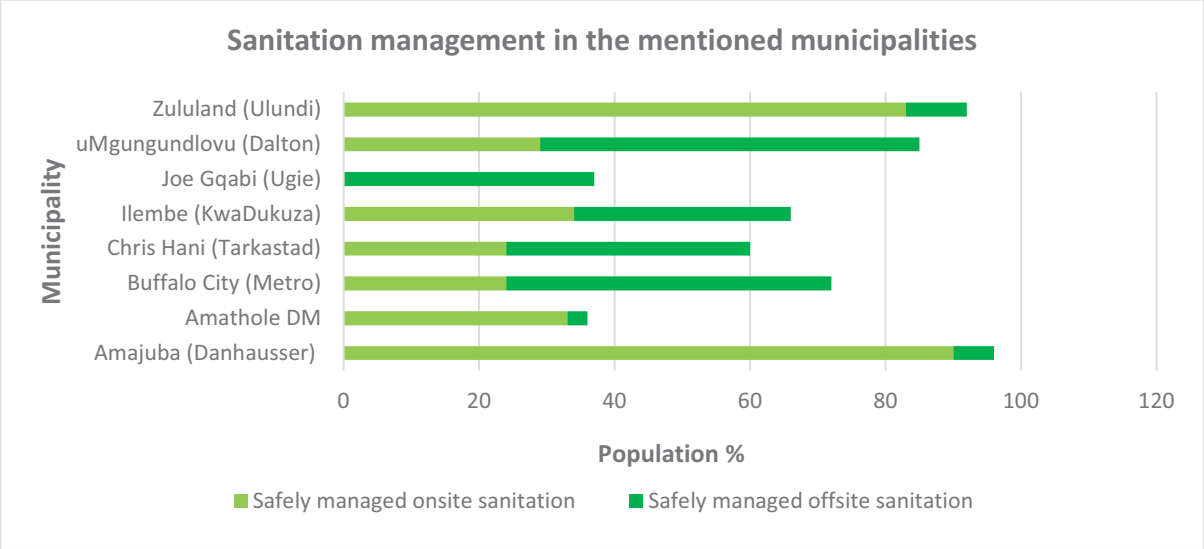


Figure 20: Representation of sanitation management at the participating municipalities

The dominance of unsafely managed onsite sanitation is due to backlog in emptying and therefore communities resorting to open defaecation and building unlined pits and abandoning the full pits without adequately covering/protection. This can lead to ground/source water contamination and other health issues	The contributors to unsafely managed offsite sanitation include: poorly designed systems, poorly managed sludge, poor planning, lack of O&M	Open defaecation is categorised as "no service" which needs to be addressed as a backlog

No municipality has 100% safely managed

4.4 REVAMP Application

The REVAMP tool explained in section 1.4 application was tested with eThekwini municipality. The tool requires data related to faecal sludge, sewage sludge and organic waste streams generated. An understanding or estimates of the amounts of recoverable resources listed in the tool are required. If the user does not have the amounts, the values provided in the tool could be used.

eThekwini municipality could provide an estimate of the amount of total solid waste generated per year, however, does not specify the proportion of organic waste from this amount. The municipality did not have records of faecal and sewage sludge generated. This was noted to be a challenge for all municipalities involved. These amounts could be estimated, however, it will affect the quality of the output generated from the REVAMP tool. Below is the information provided.

Faecal sludge amount	Sewage sludge amount	Organic waste amount
No estimates provided – 40% of the municipal population use onsite sanitation	No estimates provided	1 466 037 tons per year. A proportion of this is organic waste. In Ddiba's scenario, 93% was estimated to be organic (Ddiba, 2016).

Lack of reliable data to apply on the REVAMP tool presented a challenge to demonstrate its benefit. It is believed though that with relevant data, REVAMP tool could complement the SFDs by providing a holistic picture of the potential of a closed loop approach to excreta and waste management.

4.5 Related Initiatives

4.5.1 FSM Toolbox linkage

The project team had an opportunity to work with a team that refined the FSM Toolbox developed through the Bill and Melinda Gates Foundation. The FSM Toolbox, developed with the Asian Institute of Technology and other partners, contains a number of tools, case studies and resources aimed at various sector stakeholders and along various components of the sanitation supply chain. The tools can assist the sanitation sector with planning, financial preparation, status assessment, etc. of sanitation/FSM related projects.

One of the functionalities of the tool is to assist collet information/data that lacks within the municipality. To be more specific, one of the components assists the user to estimate faecal sludge produced within the area. FSM Toolbox also contains business models from various countries, related to different components of the sanitation value chain. The user can learn and adopt from the business models listed. The business models could be also compared with REVAMP tool outputs to identify the best option.

The clear benefit of both REVAMP and FSM toolbox is that they present an opportunity for a paradigm shift where investments do not only solve the sanitation crisis but to also address resource-oriented sanitation systems, rather than systems that simply contain and dispose of excreta.

4.5.2 Municipal Strategic Self-Assessment (MuSSA) SFD questions

The Municipal Strategic Self-Assessment (MuSSA) is a process initiated by the Department of Water and Sanitation (DWS) in 2006. Municipalities undertake a self-evaluation both of their performance and future expected performance in providing water services. The process requires senior and knowledgeable municipal managers to provide answers to five questions for each of 18 business attributes related to service delivery in general and water and sanitation services in particular. This is at the level of Water Services Authority, which may be a district, local, or metropolitan municipality.

The Municipal Strategic Self-Assessment (MuSSA) conveys an overall business health of municipal water business and serves as a key source of information around municipal performance. MuSSA has been progressively refined in support of water sector trends and requirements. The primary target and beneficiary of each MuSSA is the Municipality undertaking its own assessment.

18 key Business Health Attributes were identified in consultation with domain specialists and stakeholders. These are the legs of the MuSSA:

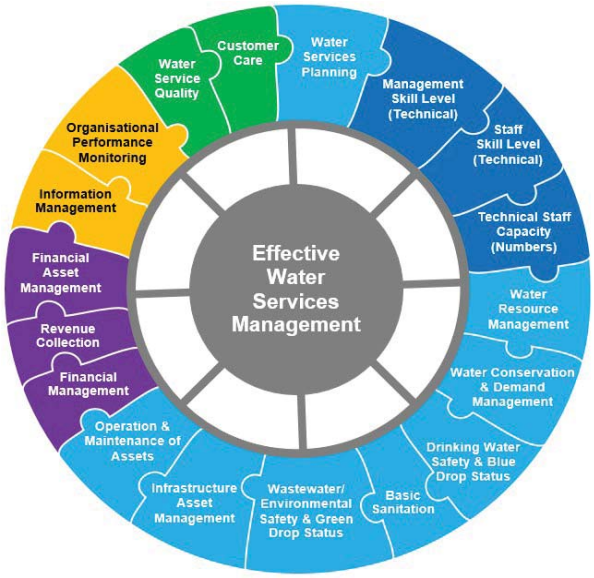


Figure 21: MuSSA legs

In an effort to have an overview understanding of municipal sanitation status, a plan to introduce SFD related questions is under discussion with DWS. This was motivated by the SFD development initiative. MuSSA gets updated annually. If every municipality updates the MuSSA, a first order sanitation status for the country could be developed. That would provide progress on SDG goals.

4.5.3 SFD Related Engagements/Platforms

SFD Week – India (2-5 April 2019)

It has been noted that eight SFDs were developed through this project. However, 10 SFDs have been developed in the country to-date. Engagements with eThekwini municipality were conducted as a first municipality that developed SFD in SA. The project team requested eThekwini municipality (sanitation department) to be part of the project in order to learn from their experiences and receive guidance in conducting the project.

In addition to that, engagements with the University of Cape Town which assisted the City of Cape Town to develop their SFDs were held. This was to understand their SFD development processes and share experiences.

SFD Week – India (2-5 April 2019)

One of the project team members attended the SFD week which was conducted from the 2nd to 5th April 2019 in India. This is gathering comprising of global experts in the sanitation sector. The sessions in the SFD Week covered issues ranging from water security and climate change, and tools and approaches for ensuring citywide inclusive sanitation, to best practices, solutions and technologies. A number of experiences from across the world were shared by the speakers over the three days of the conference.

WRC Symposium (11-13 September 2019)

Since 2011, the WRC has been hosting a symposium, which has become a key event on the SA water calendar. The WRC symposium is a strategic knowledge, information and solution sharing platform. The platform allows acknowledgement of scientific solutions that have had a global impact, showcasing and celebrating excellence in the SA water research and development domain, linking various institution value chain together; and ensure that each actor understand the role they play as water custodian in the value chain.

The 2019 symposium focused on sanitation and was grounded on the idea that new approaches and methodologies are required to bring about different results. The progress on SA SFD development was presented at the symposium. The benefit of using FSM Toolbox to close the SFD gaps was also highlighted.

SECTION 5

FEEDBACK WORKSHOPS

5. FEEDBACK WORKSHOPS

Understanding the sanitation situation allows appropriate strategies to be developed to close notable gaps in South Africa. In particular, a need exists to provide guidance to decision makers on improving on-site sanitation management, and in particular FSM.

Furthermore, knowing your current sanitation situation is not enough, and municipalities often struggle to turn identified gaps and challenges into meaningful actions that need to be implemented. The FSM Toolbox, developed by the Bill & Melinda Gates Foundation, is a tool designed to assist the sanitation sector with status quo assessments, planning improvements, financial estimates preparation, etc. Furthermore, the FSM Toolbox currently contains a number of case studies and resources aimed at various sector stakeholders and along various components of the sanitation supply chain.

The main aims and objectives of the training workshops were to:

- Discuss SFDs completed within South Africa including typical challenges faced, findings, etc.
- Introduce the FSM Toolbox and its functionality in the South African context.

The training workshops were held at the two provinces of EC and KZN, where SFDs have already been developed. As the workshop included the use of web-based tools (FSM Toolbox and SFD), participants were encouraged to bring their laptops so that they could connect to Wi-Fi/internet and access the relevant tools.

5.1 Workshops Content

The workshops focused on discussing completed SFDs in the region and training participants on the use and benefits of FSM Toolbox.

The value of the workshops was that they provided the participants with confidence to use the FSM Toolbox to assess, plan and prioritize sanitation related challenges within their towns and communities. The FSM Toolbox would possibly help municipalities plan the appropriate way forward and inform their improvement action plans.

Both workshops followed the same programme noted below:

DAY 1: DRAFT Programme	
08:30-09:00	**Registration and Tea/Coffee**
Opening Session: Welcome and Introduction	
09:00-09:10	Welcome remarks
09:10-09:30	Participant introductions
09:30-09:45	Shit-Flow Diagrams (SFDs) – Recap: what they are and how they can help? (video)
09:45-10:00	The South African SFD journey thus far
10:00-10:15	Developing a SFD: A Municipal perspective
10:15-10:30	**Tea/Coffee Break**
Session 1: What does a SFD tell me?	
10:30-11:30	Exercise 1: Understanding our SFD – Feedback from SFDs developed
Session 2: Tools that assist with closing the sanitation gap	
11:30-11:45	Exercise 2: What tools can assist us? What tools do you use?
11:45-12:00	Feedback by Groups
Session 2: Introduction to the FSM Toolbox	
12:00-12:15	FSM: Why is it important and what is required?
12:15-12:20	How can the FSM Toolbox assist (introductory video)?
12:20-12:30	FSM Toolbox at a glance
Session 3: Sanitation Situation Assessment	
12:30-12:45	Data required for assessing the sanitation situation Exercise 3: What data points are required for each component of the FSM value chain?
12:45-13:00	Feedback by Groups
13:00-13:45	**Lunch**
Session 3: Sanitation Situation Assessment (cont.)	
13:45-15:00	Using the Pro Assessment Tool
15:00-15:15	**Tea/Coffee Break**
Session 3: Sanitation Situation Assessment (cont.)	
15:15-15:45	Using the Rapid Assessment Tool
15:45-16:00	Wrap Up: Day 1
16:00	**Closure: Day 1**

DAY 2: DRAFT Programme	
08:30-09:00	**Registration and Tea/Coffee**
Opening Session: Recap	
09:00-09:30	Exercise 4: What did we learn from Day 1?
Session 4: FSM Planning	
09:30-09:45	Data required for planning FSM improvement initiatives Exercise 5: What data points are required for each component of the FSM value chain? Where would I get this data from?
09:45-10:00	Feedback by Groups
10:00-10:15	Stakeholder Engagement Planning Exercise 6: Who are our key stakeholders?
10:15-10:30	Feedback by Groups
10:30-10:45	Stakeholder Engagement Planning (cont.)
10:45-11:00	**Tea/Coffee Break**
11:00-11:45	Using the Rapid Infrastructure Planning Tool
11:45-12:30	Using the Pro Infrastructure Planning Tool
12:30-12:45	Exercise 7: When should I use what FSM Toolbox function?
12:45-13:00	Feedback by Groups
13:00-13:45	**Lunch**
Session 4: FSM Planning (cont.)	
13:45-14:15	Business Model Selection
14:15-14:30	Exercise 8: What Business Model is most appropriate?
14:30-14:45	Feedback by Groups
14:45-15:00	Learn and Contribute
15:00-15:15	**Tea/Coffee Break**
Closing Session: Discussion and Way Forward	
15:15-15:45	Q&A and Discussion (All)
15:45-16:00	Wrap-up and Next Steps (WRC)
16:00	**Closure**

5.2 Eastern Cape Feedback Workshop

5.2.1 Participation and Feedback

The project team organized a training workshop in East London, Eastern Cape on the 27th and 28th August 2019. The workshop was very well attended. Twenty-three (23) delegates from municipalities, consulting companies and government departments (e.g. DWS, CoGTA) attended.

Twenty-three (23, excluding facilitators) persons registered to attend the training workshop (as captured below).

	Organization	Organization Type	Attendees name
1	Chris Hani	District Municipality	Zendani Kuboni
2	Chris Hani	District Municipality	Sinawo Nzuzo
3	Chris Hani	District Municipality	Moses Shasha
4	Chris Hani	District Municipality	Thandisizwe Makhwabe
5	Joe Gqabi	District Municipality	Scelo Pongoma
6	Joe Gqabi	District Municipality	Stompie Lourens
7	Buffalo City	Metropolitan Municipality	Xolani Mtsolongo
8	Buffalo City	Metropolitan Municipality	Jonathan Clarke
9	Buffalo City	Metropolitan Municipality	Anathi Dukane
10	Buffalo City	Metropolitan Municipality	Siyamcela Mamane
11	Buffalo City	Metropolitan Municipality	Nosiphiwo Mdiya
12	Buffalo City	Metropolitan Municipality	Thembela Rala
13	Buffalo City	Metropolitan Municipality	Dunyiswa Ntsebeza
14	Buffalo City	Metropolitan Municipality	Thumeka Menjenalo
15	Buffalo City	Metropolitan Municipality	Michael Kriek
16	Buffalo City	Metropolitan Municipality	Pierre Bezuidenhout
17	Buffalo City	Metropolitan Municipality	Sizwe Dyani
18	Buffalo City	Metropolitan Municipality	Mkhuseli Nongogo
19	Buffalo City	Metropolitan Municipality	Wandile Tole
20	Department: Housing, Water and	Sanitation sector lead	Luxolo Mditshane
21	Department: Housing, Water and	Sanitation sector lead	Landile Jack
22	South African Local Government	Local government body	Aseza Dlanjwa
23	Iserve	Private sector	Philipe Kanise
24	Emanti	Project Team	Unathi Jack
25	Emanti	Project Team	Philip de Souza

Considering the above, of the 23 registered participants -

- 19 were from local government
  - 13 from a Metropolitan Municipality
  - 6 from District Municipalities
- 2 were sector stakeholders
  - 2 from the Department: Housing, Water and Sanitation
  - 1 from the South African Local Government Association (SALGA)
- 1 was from the private sector
  - 1 was a sanitation entrepreneur

Considering the above, twenty-four (24) persons attended Day 1 and twenty-one (21) Day 2 of the workshop (excluding the trainers). The workshop attendance register is included as **Appendix C**.

Figure 22: SFD and FSM Toolbox Training Workshop – East London

All participants were asked to complete an evaluation form. The individual feedback provided by participants is included in **Appendix C**.

Participants were asked to consider the following key aspects of the workshop and rate the workshop considering a 5 point scale (1 = strongly disagree, 5 = strongly agree).

- The objectives of the training were clearly defined.
- Participation and interaction were encouraged.
- The topics covered were relevant to me.
- The content was organized and easy to follow.
- The materials distributed were helpful.
- This training experience will be useful in my work.
- The trainer was knowledgeable about the training topics.
- The trainer was well prepared.
- The training objectives were met.
- The time allotted for the training was sufficient.

Overall feedback from participants is shown in the figure that follows.

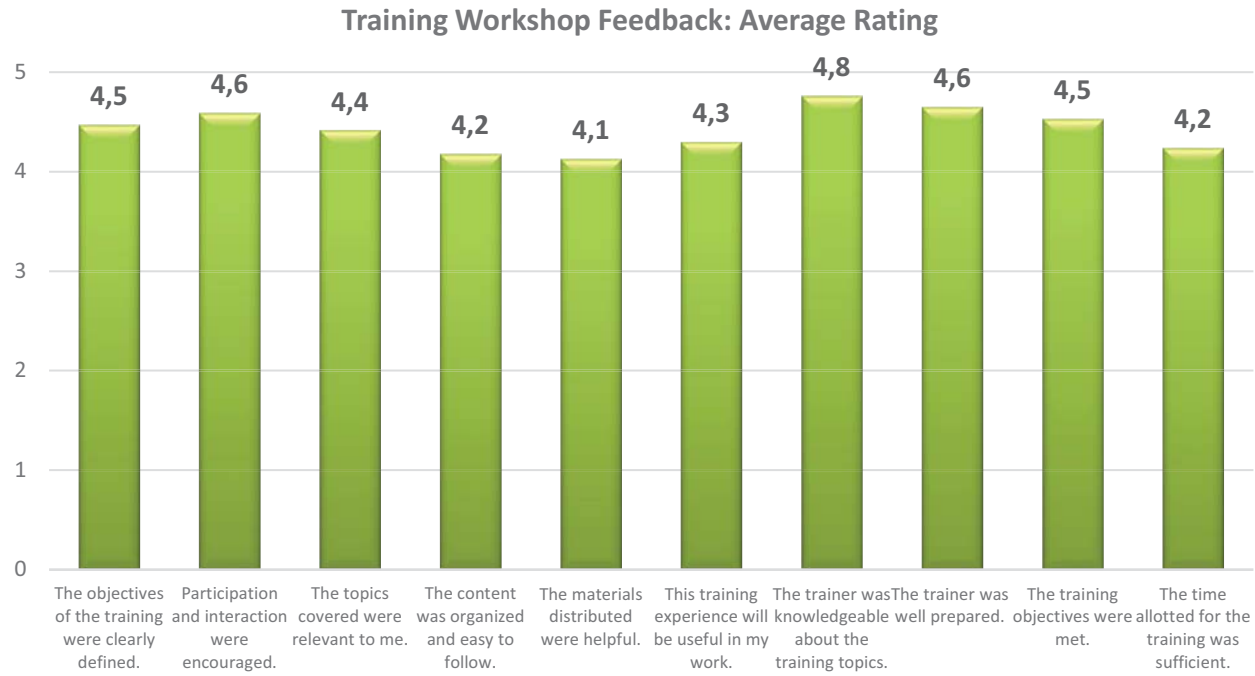
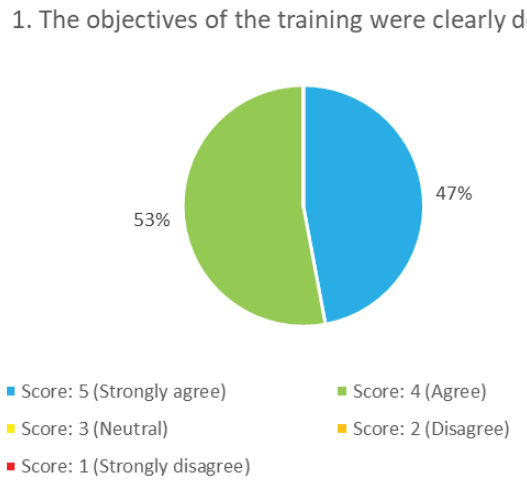


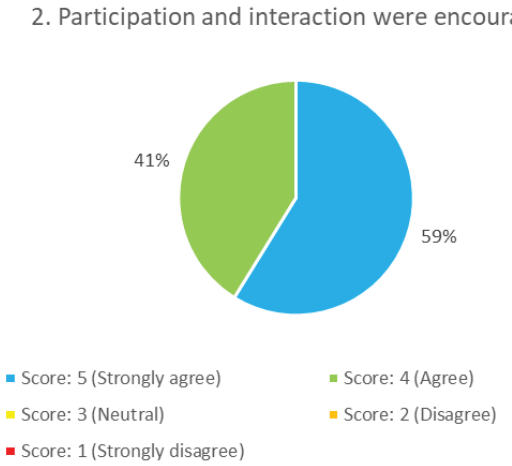
Figure 23: Overall feedback from training workshop – East London

The overall feedback for the workshop is overwhelmingly positive, with all aspects scoring very high (on average). Analysis shows that:

- The training objectives were fully met for the vast majority of the participants (i.e. 90%).
- From the 17 evaluations forms received and 10 questions evaluated, only two (2) ratings of "disagree" (score: 2) were obtained (no "strongly disagree" ratings obtained (score: 1)).
- The vast majority of ratings obtained were either "strongly agree" (score 5) or "agree" (score: 4).
- These results indicate that a very successful training workshop was held in East London.

Specific feedback received from each question is summarized in the pages that follow.





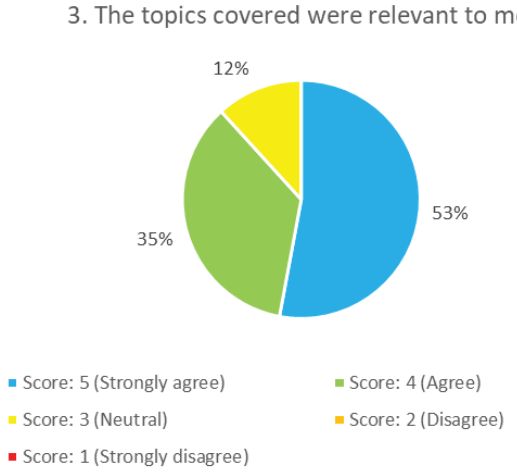


Figure 24: Individual question feedback from the training workshop (Questions 1-3) – East London

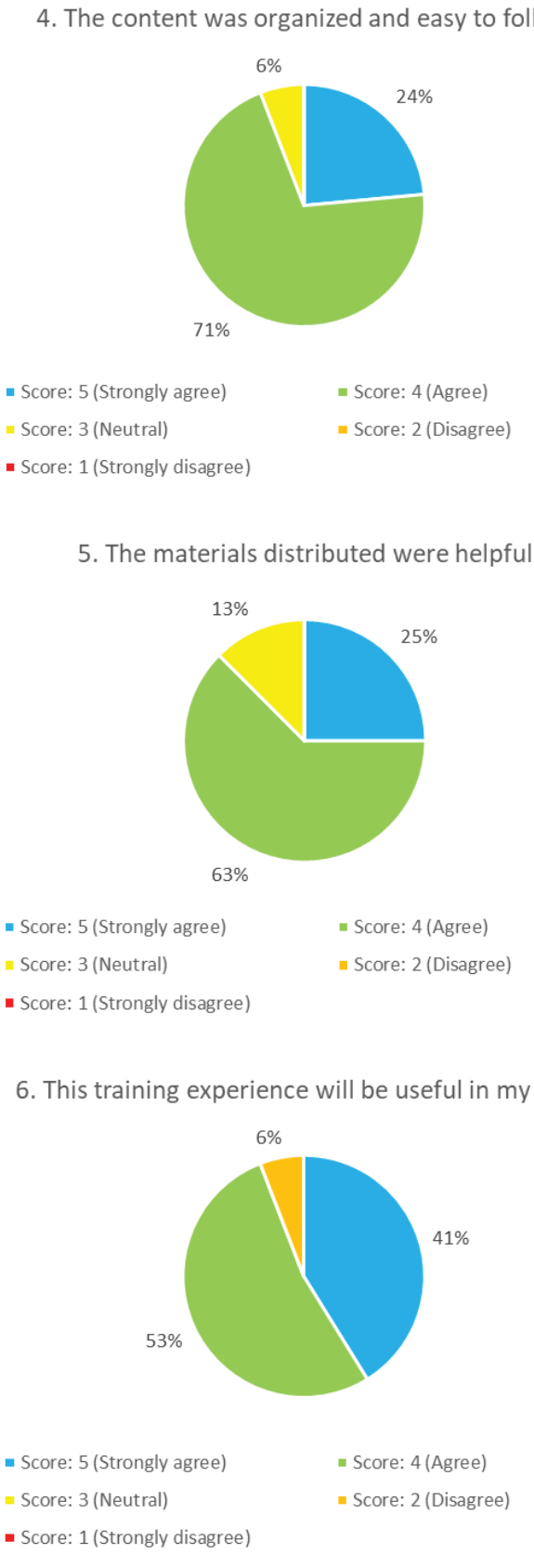
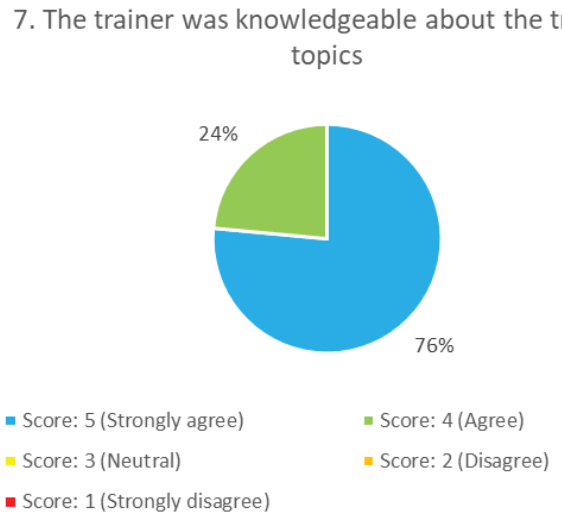
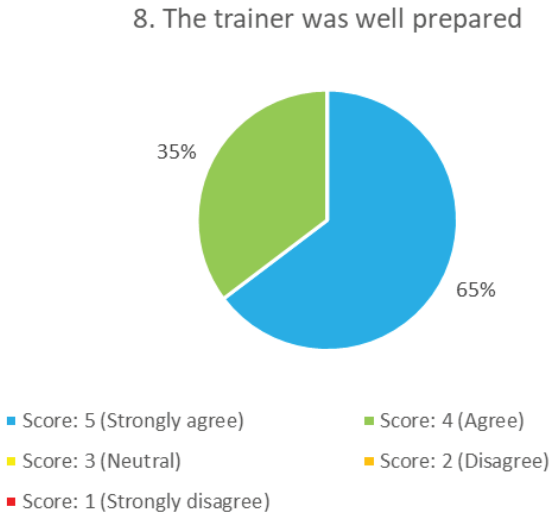


Figure 25: Individual question feedback from the training workshop (Questions 4-6) – East London





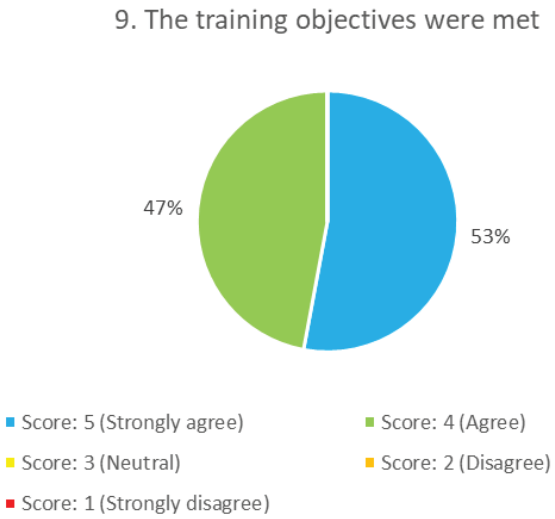


Figure 26: Individual question feedback from the training workshop (Questions 7-9) – East London

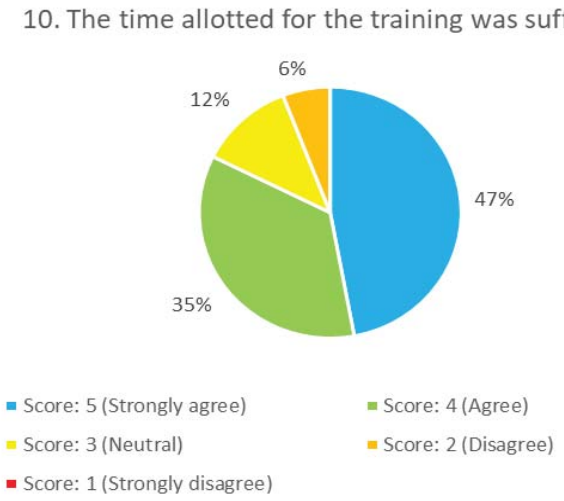


Figure 27: Individual question feedback from the training workshop (Question 10) – East London

In addition, participants were asked to comment on the following:

- What did you like most about this training?
  - Well organized
  - Practical/interactive and informative
  - Provision of exercises to promote active participation
  - Practical demonstrations on FSM Toolbox, not just theory
  - Provided access to a wealth of information about how other countries are handling the FSM challenge
  - I learned how to interpret a SFD
  - Improved my knowledge of faecal sludge
  - Practical exercises which showed that we need to consider the entire sanitation value chain when developing future projects
  - Engaging on issues with other municipalities/learning from other institutions
  - Provided information sources and platform for engagement with practitioners
  - Generated improved awareness for practitioners
  - Planning and sharing information from/with other stakeholders
  - Showed us new things and how to improve our sanitation
  - FSM and SFD related tools

- What aspects of the training could be improved?
  - The training needs more time – 2 days is insufficient, a lot to learn in a short space of time (consider longer training period, or more specific focus area – particular aspect of the sanitation value chain)
  - Facilities
    - Audio/sound
    - Visual
    - Venue was not user friendly (disabled person comment?)

- "Business Model Selection" and "Stakeholder Engagement Planning" components of the training could be improved
- Need more focus on specific items in the value chain, for example, transportation
- Need more clarity on the FSM Toolbox algorithms/methods (how are calculations made?)

- How do you hope to change your practice as a result of this training?
  - To better understand sanitation networks/systems within our area (including statistics)
  - Need to practice using the tools and implement outcomes in my municipality
  - Will conduct research using the FSM Toolbox
  - Need to integrate between various departments within municipality (not operate in silos) – we need to get everyone on board, especially decision-makers.
  - I will test if it is really practical to use in real-life situation
  - Improved planning through the use of the tool will allow me to budget more appropriately
  - Close the gaps – guided by the tools
  - Enhance planning within the municipality
  - Proper planning is needed – it might take some time to improve the situation

- Other comments?
  - Disappointed that I was not included within the initial SFD training workshop
  - Need to organize more of this kind of training in the future
  - We need additional engagements in the near future

5.2.2 Summary and Way Forward

Considering the training workshop, the following key points are of importance:

- The level of engagement and interaction by participants and associated feedback shows that the general sentiment from participants was overwhelming positive in terms of content, pace, professional development and networking opportunities.
- Participants have engaged with each other, discussed pressing sanitation challenges and issues of concern, and reviewed their status performance via the SFD. Participants have found the FSM Toolbox to be useful for assessing their status and planning the way forward.
- Participants have found the peer engagement to be useful and in particular found the opportunity to engage in facilitated discussions and exercises covering topics of relevance and need worthwhile.
- Participants have been trained in the use of the FSM Toolbox and being able to interpret a SFD.
- Participants agree that additional similar training would be useful, and various formats thereof (including content/focus areas, duration, etc.) have been proposed for future consideration. In particular, participants enquired whether the time allocated for the training (2 days) was sufficient.

5.3 KwaZulu-Natal Feedback Workshop

5.3.1 Participation and Feedback

The project team, eThekwini Municipality's Water and Sanitation Department (EWS) Unit and the Municipal Institute of Learning (MILE) collaborated to organize the workshop. Sixteen (16) persons registered to attend the training workshop (as captured below, and excluding the training facilitators).

	Organization	Organization Type	Attendees name
1	eThekwini	Metropolitan Municipality	Lungi Zuma
2	Zululand	District Municipality	Xolani Buthelezi
3	Uthukela	District Municipality	Cindy Coetzee
4	Uthukela	District Municipality	Phindile Khumalo
5	Uthukela	District Municipality	Sifiso Shabalala
6	Uthukela	District Municipality	Sipho Zama
7	Umgungundlovu	District Municipality	Siphindile Shange
8	Umgungundlovu	District Municipality	Duncan Fowler
9	Private	Consultant	Kenny Charles
10	Ugu	District Municipality	Royal Mlambo
11	Umgungundlovu	District Municipality	Royal Nzuza
12	City of Umhlathuze	Local Municipality	Aletta Phoshoko
13	Umgungundlovu	District Municipality	Thandiwe Zuma
14	Umgungundlovu	District Municipality	Buhle Msomi
15	City of Umhlathuze	Local Municipality	Neeran Maharaj
16	Amajuba	District Municipality	Luyanda Simelane
17	Emanti	Project Team	Unathi Jack
18	Emanti	Project Team	Philip de Souza

Considering the above, of the 16 registered participants -

- 15 were from local government
  - 1 from a Metropolitan Municipality
  - 12 from District Municipalities
  - 2 were from Local Municipalities
- 1 was from the private sector
  - 1 was a water and wastewater services expert

Considering the above, thirteen (13) persons attended Day 1 and eleven (11) persons attended Day 2 of the workshop (excluding the training facilitators). The workshop attendance register is included as **Appendix C**.

Figure 28: SFD and FSM Toolbox Training Workshop – Durban Day 1

Figure 29: SFD and FSM Toolbox Training Workshop – Durban Day 2

All participants were asked to complete an evaluation form. The individual feedback provided by participants is included in **Appendix C**.

Participants were asked to consider the following key aspects of the workshop and rate the workshop considering a 5 point scale (1 = strongly disagree, 5 = strongly agree).

- The objectives of the training were clearly defined.
- Participation and interaction were encouraged.
- The topics covered were relevant to me.
- The content was organized and easy to follow.
- The materials distributed were helpful.
- This training experience will be useful in my work.
- The trainer was knowledgeable about the training topics.
- The trainer was well prepared.
- The training objectives were met.
- The time allotted for the training was sufficient.

Overall feedback from participants is shown in the figure that follows.

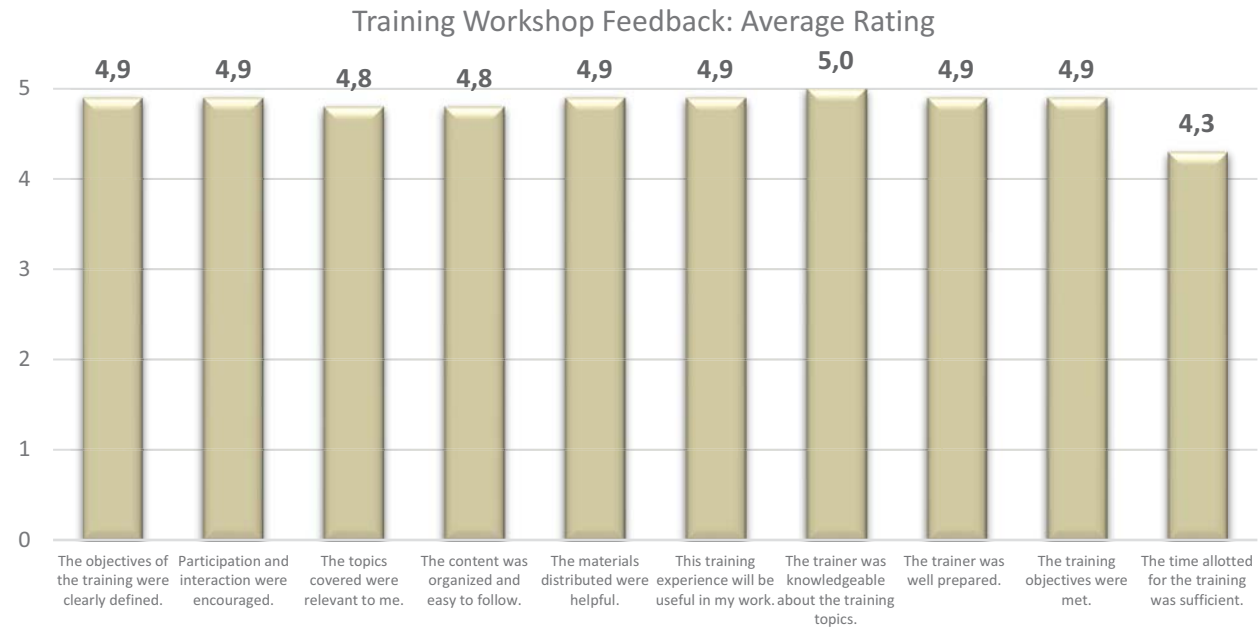


Figure 30: Overall feedback from training workshop – Durban

The overall feedback for the workshop is overwhelmingly positive, with all aspects scoring very high (on average). Analysis shows that:

- The training objectives were fully met for the vast majority of the participants (i.e. rating of 4.9 out of 5).
- From the 10 evaluations forms received and 10 questions evaluated, only one (1) rating of "disagree" (score: 2) was obtained (no "strongly disagree" ratings obtained (score: 1)).
- The vast majority of ratings obtained were either "strongly agree" (score 5) or "agree" (score: 4).
- These results indicate that a very successful training workshop was held in Durban.

Specific feedback received from each question is summarized in the pages that follow.

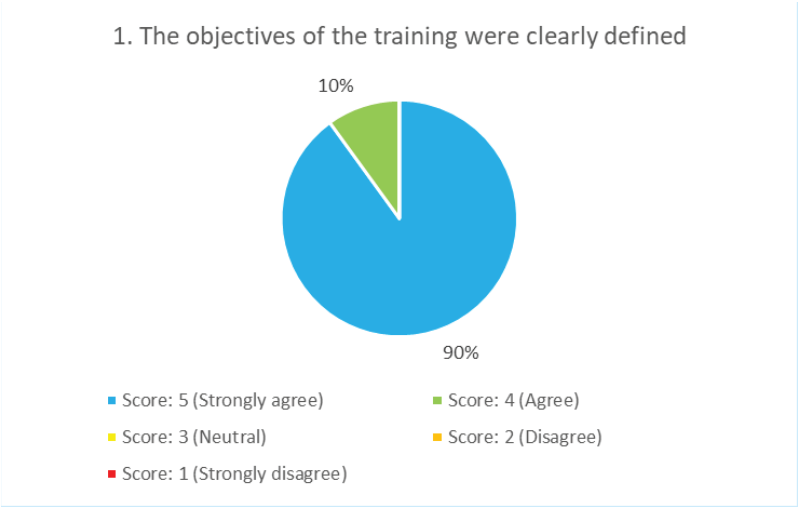
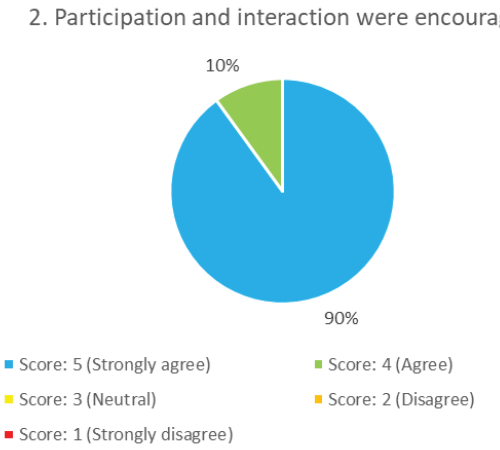
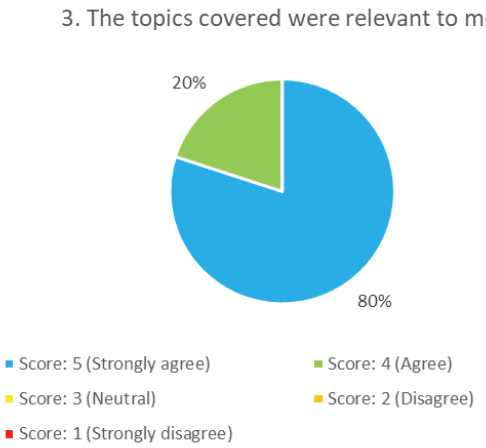


Figure 31: Individual question feedback from the training workshop (Question 1) – Durban





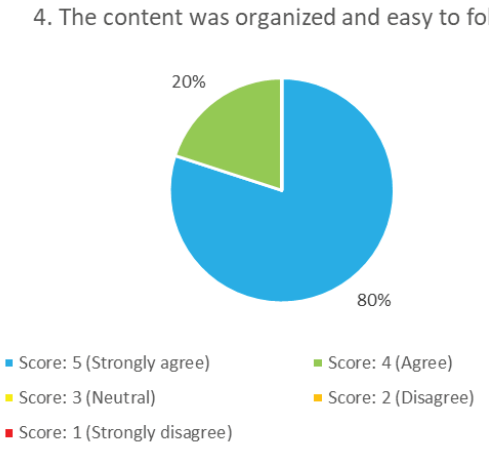
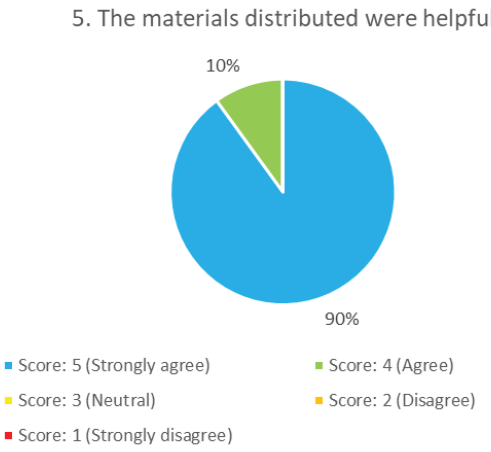
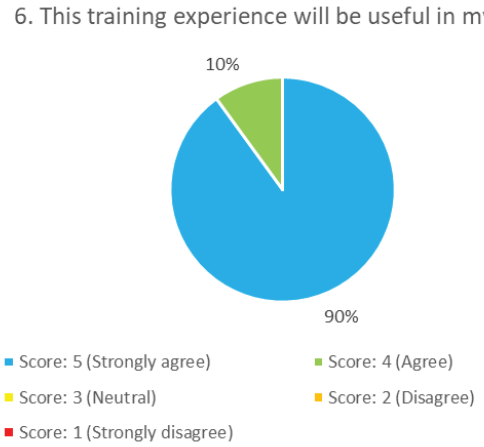


Figure 32: Individual question feedback from the training workshop (Question 2-4) – Durban





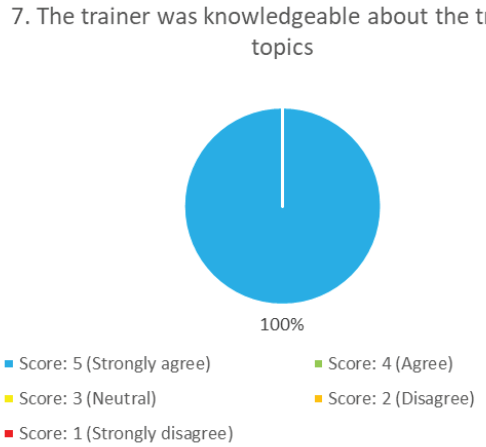
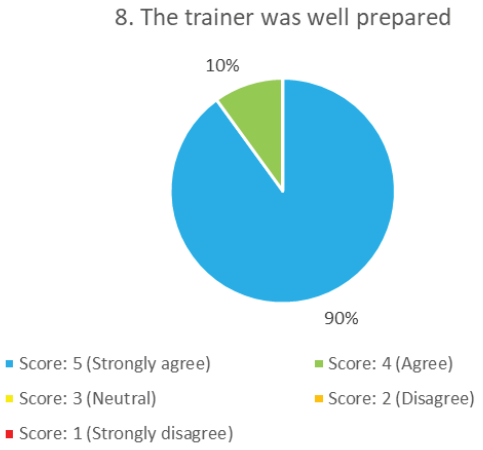
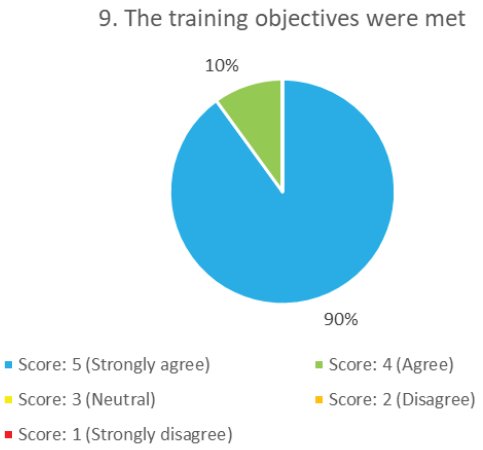


Figure 33: Individual question feedback from the training workshop (Question 5-7) – Durban





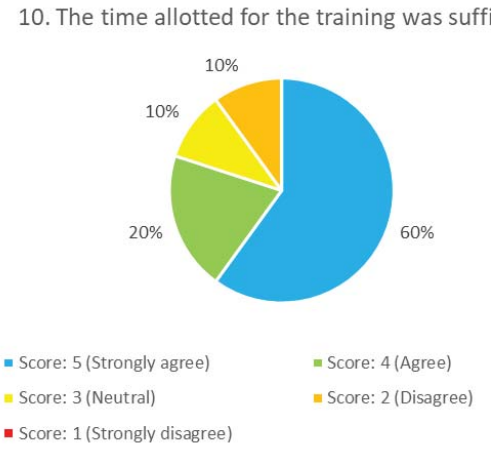


Figure 34: Individual question feedback from the training workshop (Question 8-10) – Durban

In addition, participants were asked to comment on the following:

- What did you like most about this training?
    - Well presented with adequate training materials.
    - FSM Toolbox is very useful.

- It was an eye opener as there are many things that we are not yet covering as a municipality.
- Everything was clear and we were all engaging in the problem.
- It was easy to follow and engage in all exercises.
- It was interactive, and there was lots of learning between the attendees.
- Learning new things from the facilitators and other Water Services Authorities (WSAs).
- Information shared.
- It taught me a lot about SFD and FSM Toolbox.
- Presentations were clear and relevant to my work.
- Interactions.

- What aspects of the training could be improved?
  - Extend invitations to all sanitation stakeholders within each municipality.
  - Perhaps include a site visit to get a clear understanding from those that are already implementing the SFD and FSM Toolbox.
  - Sludge management site visit.
  - I think more time is required for the training.
  - Need more training and sufficient time for the training (e.g. focused course on sludge management from start to finish – both wastewater and faecal sludge)
  - Need to spend more time on the complicated FSM Toolbox modules such as infrastructure planning.

- How do you hope to change your practice as a result of this training?
  - Initiate development of SFD in my municipality.
  - Introduce use of SFD and FSM Toolbox in my municipality.
  - Improve on data collection and management.
  - I will try to apply the knowledge I gained in my District Municipality.
  - If we can get support from our General Managers we can easily identify gaps in our municipalities.
  - Practice everything that we learnt in our Local Municipalities and District Municipality.
  - Implement at my District Municipality.
  - Map out sanitation stakeholders.

- Other comments?
  - The training was superb in such a way that we learned from other municipalities on how they operate.
  - Inclusion of site visits should be considered.
  - Workshop was well presented. Thank you.
  - Very good workshop.

5.3.2 Summary

Considering the training workshop, the following key points are of importance:

- Registration for the event and associated attendance of the event was significantly lower than anticipated. General sentiment was that current financial constraints within many municipalities in KwaZulu-Natal limit the ability of municipal officials to attend such events (i.e. municipality can't pay for accommodation, municipal officials need to cover own transport costs).
- Despite the low attendance numbers, the level of engagement and interaction by participants and associated feedback shows that the general sentiment from participants was overwhelming positive in terms of content, pace, professional development and networking opportunities.
- Participants have engaged with each other, discussed pressing sanitation challenges and issues of concern, and reviewed their status performance via the SFD. Participants have found the FSM Toolbox to be useful for assessing their status and planning the way forward.
- Participants have found the peer engagement to be useful and in particular found the opportunity to engage in facilitated discussions and exercises covering topics of relevance and need worthwhile.
- Participants have been trained in the use of the FSM Toolbox and being able to interpret a SFD.
- Participants agree that additional similar training would be useful, and various formats thereof (including content/focus areas, duration, etc.) have been proposed for future consideration. In particular, participants enquired whether the time allocated for the training (2 days) was sufficient. Participants also indicated the need for more detailed and practical training on both wastewater sludge management and faecal sludge management, including site visits to municipalities who are successfully managing these aspects.

SECTION 6

CONCLUSIONS

6 CONCLUSIONS

From the project initiation it was imperative to understand that this was a new initiative in the country and therefore support from the experts is required. Hence the training of the project team by CSE.

The workshops and associated interactions with municipalities have indicated that SFD could be successfully used as a planning and advocacy/awareness tool within South Africa as it is easy to interpret and allows effective communication of issues. During workshop interactions, it was confirmed that SFD will greatly assist Water Service Institutions (WSIs) in helping guide decision-makers when developing required strategies and plans. A further outcome of the workshop interactions is the contribution by participants in highlighting shortcomings of the current SFD process which will need to be considered and incorporated into the South African methodology/process/summary reports.

It was also noted that FSM toolbox could be useful to address the shortcomings or gaps identified through the SFD outcomes.

- If more municipalities within each region could have SFDs developed, an overall regional sanitation status could be developed or even a national status.

Without the necessary information indicating sanitation status (such as a sanitation management plan, including SFDs), the risk of sanitation management failures and associated environmental pollution – including untreated faecal sludge ending up directly in the local environment – is substantially raised. In particular, poorly managed faecal and wastewater sludge (e.g. where it is left to accumulate in inadequately designed pits or discharged into the environment) pose a significant health threat to the public and to the natural environment.

By contrast, correct use of sanitation management plans (including SFDs) in managing human waste can substantially assist in improved sanitation services and the associated reduction in health and environmental risks.

The WRC-led South African SFD initiative has developed a number of SA-specific innovations to make SFDs more appropriate for SA conditions. These include an SFD-based Sanitation Priority Improvement Plan which notes that identifying your municipal SFD status is only the advocacy starting point for improvements. Sanitation Priority Improvement Plan guides to:

- Close the gaps
- Develop a remedial action plan and
- Implement the remedial action plan

The above could be applied at, inter alia, schools, health care facilities and public facilities such as national parks, etc.

In summary, the following should be noted:

- SFDs could assist in highlighting gaps and areas of concern related to the sanitation chain and faecal sludge management. This includes highlighting backlogs.
- SFD outputs could assist in interpreting a complex sanitation situation by using a graphic that can be easily interpreted.
- SFD reports could help motivate the appropriate allocation of sanitation budget during municipal planning.
- The biggest challenge indicated by municipalities was that monitoring of sludge transporting trucks/vacuum trucks is poor. This has also been confirmed by municipalities where initial SFD development has been conducted. The municipalities noted that the SFD development process assisted with the identification of gaps relating to monitoring of toilet emptying (such as in the case of emptying of septic tanks by vacuum trucks which is currently not monitored).
- A shortcoming in the SFD tool that was noted was that it does not include disposal/reuse in the process flow (e.g. what happens to sludge after treatment).
- Another shortcoming noted was that SFD does not address how industrial effluent affects compliance.
- The sector agrees that additional similar training would be useful, and various formats thereof (including content/focus areas, duration, etc.) have been proposed for future consideration. In particular, participants enquired whether the time allocated for the training (2 days) was sufficient. Participants also indicated the need for more detailed and practical training on both wastewater sludge management and faecal sludge management, including site visits to municipalities who are successfully managing these aspects.
- Guidance on strategies and plans to be developed to close the gaps identified through SFD would be beneficial. This could include incorporating SFD outputs and action plans into institutional plans and strategies (e.g. WSDP, IDP).
- Development of SFD outputs for each province and South Africa could provide the sector with a clear sanitation status in the country.
- Tracking implementation of SFD methodology innovations (e.g. how to develop an action plan with budget requirements to address identified issue) will provide the sector with continuous updates of sanitation status in the country.

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25. www.fsmtoolbox.com

APPENDIX A:

Stakeholder Workshops associated documents

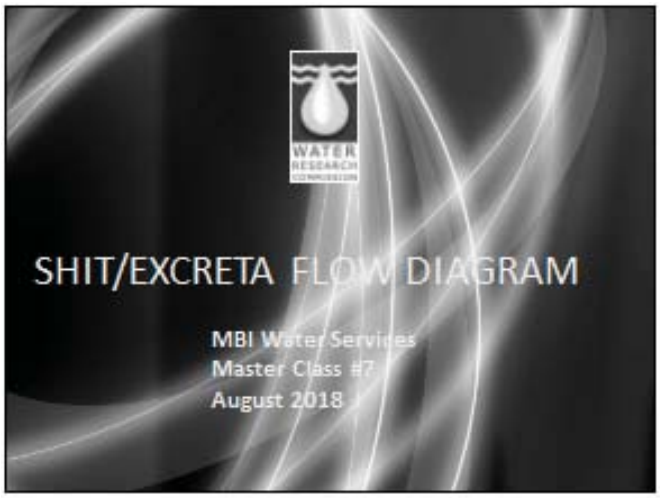
A 1: SECTOR STAKEHOLDER WORKSHOP AGENDA

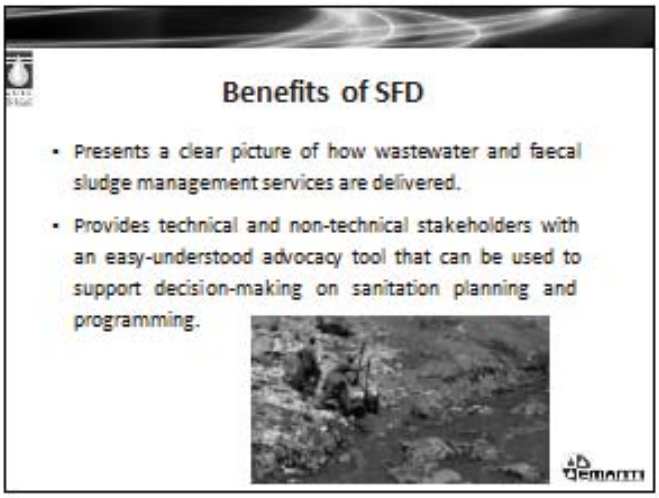
SFD MASTERCLASS DRAFT PROGRAMME:

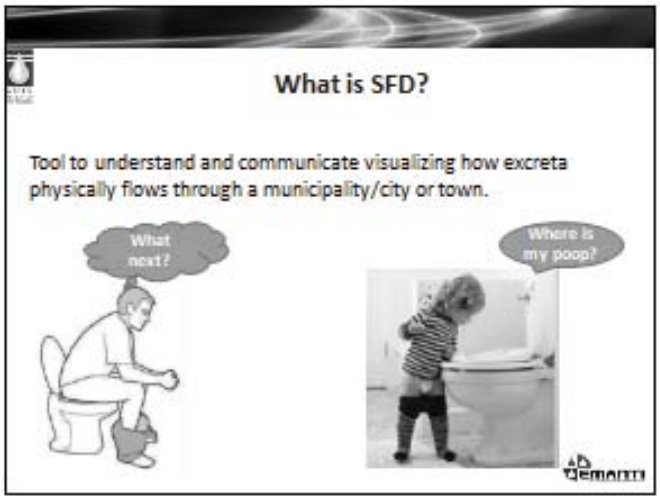
Item	Presenter	Time
	DAY 1: Monday, 6 August 2018	
Welcome	Dr Sudhir Pillay, WRC	10:00 – 10:05
Setting the scene + FS use options	Dr Sudhir Pillay, WRC	10:05 – 10:25
A perspective on sanitation challenges	Department of Water and Sanitation	10:25 – 10:45
SFD Project introduction	Ms Unathi Jack, SFD Team	10:45 – 10:55
eThekwini case study/SFD development experience	Mr Teddy Gounden, eThekwini Water and Sanitation	10:55 – 11:15
	BREAK	11:15 – 11:30
SFD Introduction	SFD Team (including experts from CSE, India) Terms and variables used to develop SFD Sanitation Systems Methodology for data collection	11:30 – 13:00
	LUNCH	13:00 – 13:45
Introductory exercise – desk based study	SFD Team	13:45 – 15:00
Introduction to SFD graphic generator	SFD Team	15:00 – 16:00
	DAY 1 Closure	
	DAY 2: Tuesday, 7 August 2018	
Recap	All – led by SFD Team	9:00 – 9:10
Group Discussion	All – led by SFD Team	9:10 – 9:40
Developing your own SFD exercise: Part 1	All – led by SFD Team	9:40 – 10:15
	BREAK	10:15 – 10:30
Developing your own SFD exercise: Part 2	All – led by SFD Team	10:30 – 11:30
Next Steps	All – led by SFD Team	11:30 – 12:00
Wrap up and way forward	All – led by SFD Team	12:00 – 12:30
	LUNCH	12:30 – 13:00
	DAY 2 Closure	

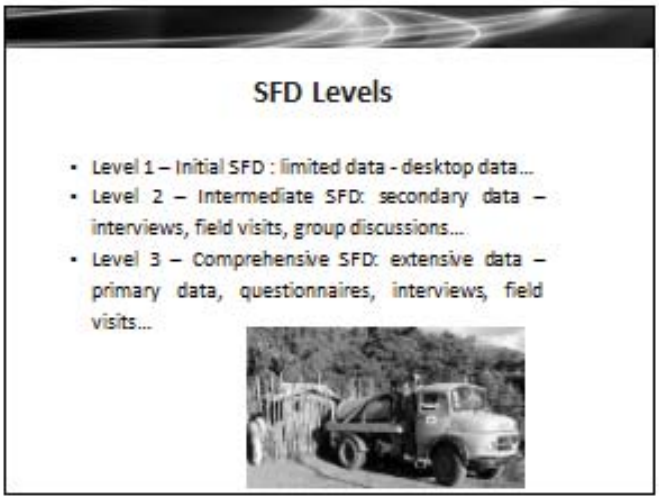
A 2: SECTOR STAKEHOLDER WORKSHOP PRESENTATION EXAMPLES

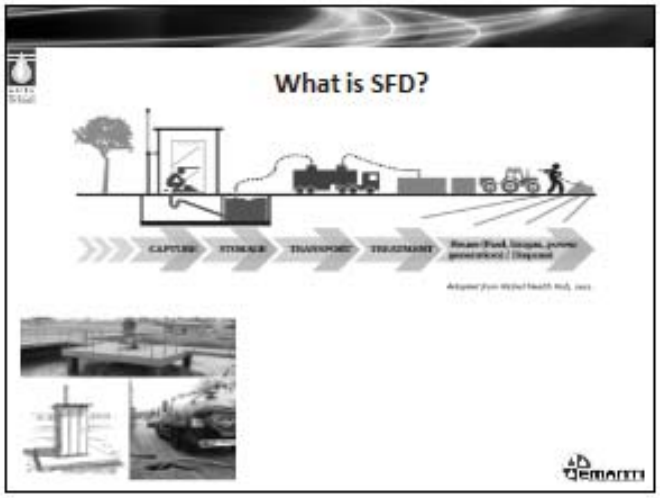
A 2.1: Project introduction presentation











SFD Project

- 1st April 2018
- SFD development for selected SA municipalities
- Economic benefits
- Resources

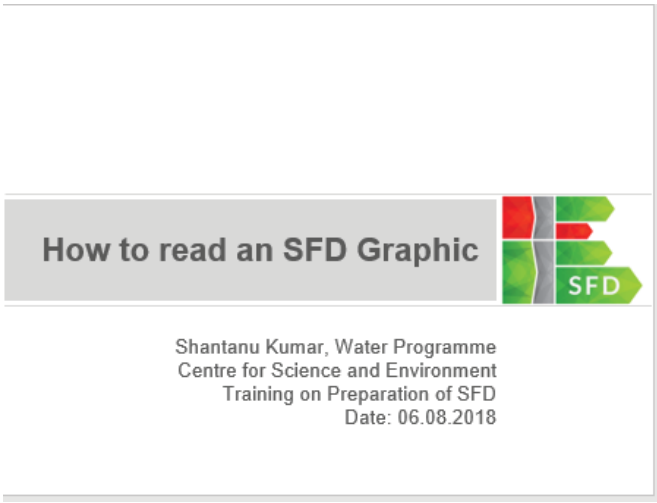
SFD Project

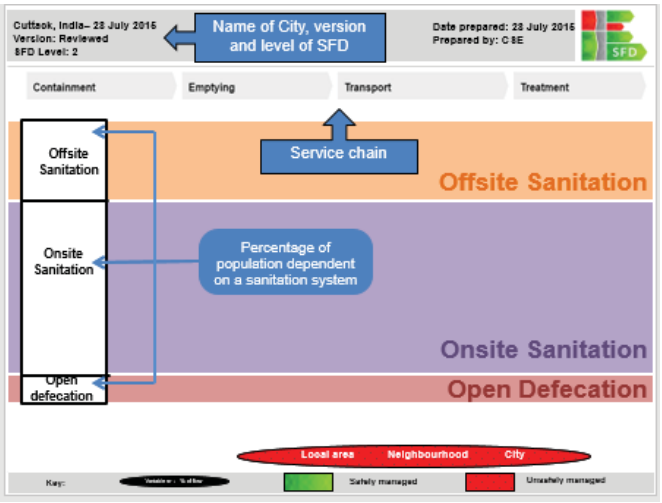
- Data collection
- Data analysis
- SFD summary reports
- Presented to participating municipalities
- PLANS – REVAMP and FSM Toolbox assistance
- Volunteers – follow up with data provision

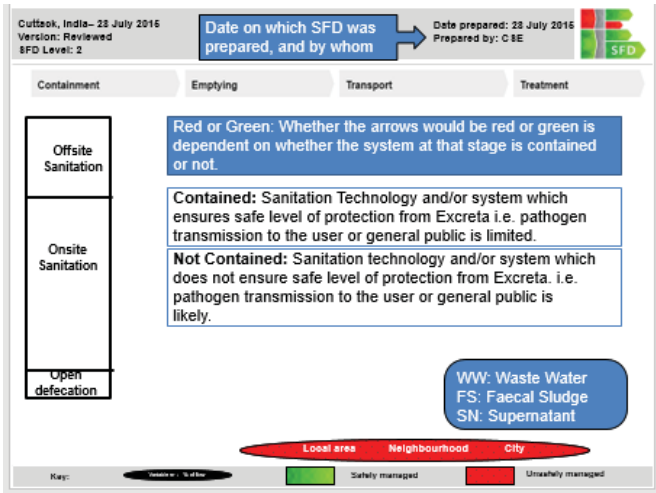
Table of Content

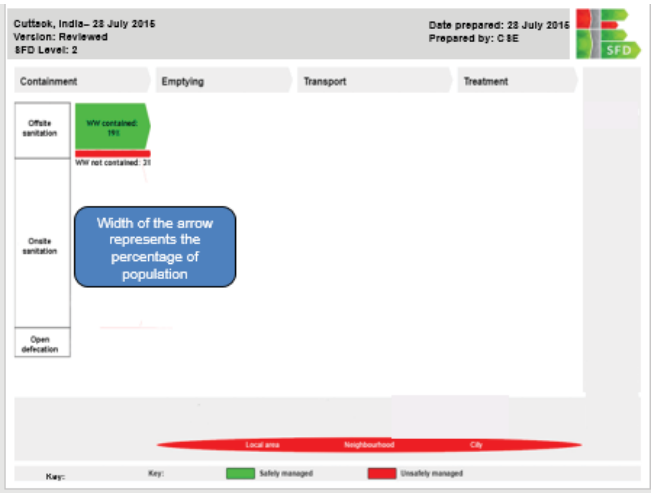
Thank you!

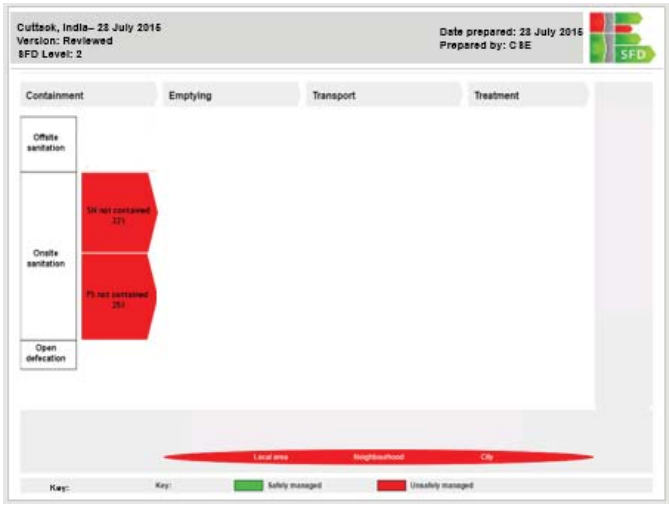
A 2.2: How to Read an SFD Graphic presentation



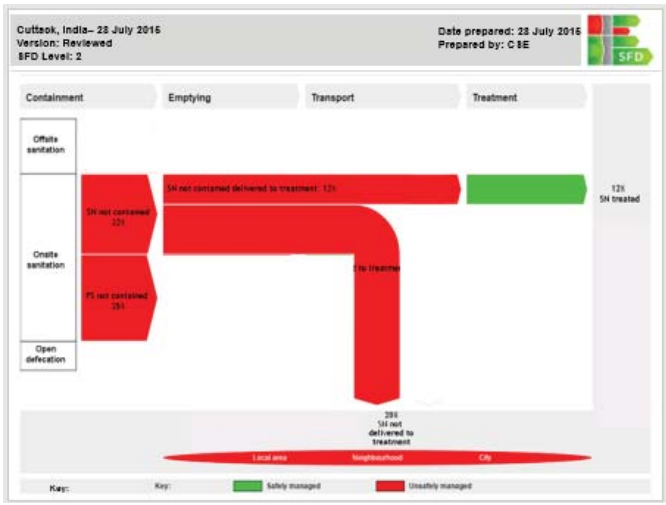




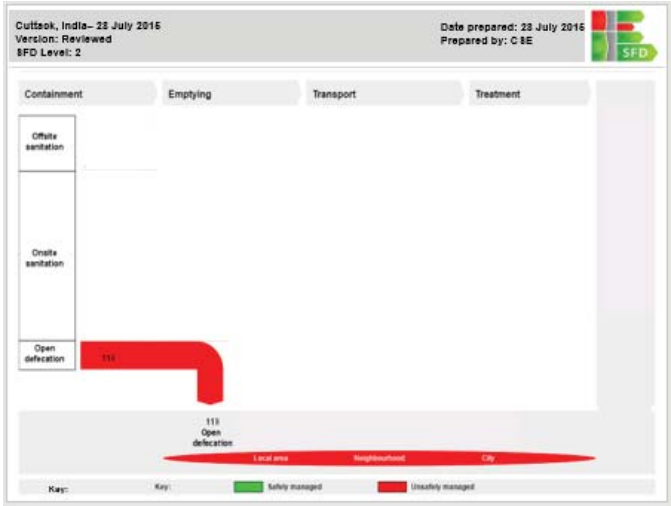


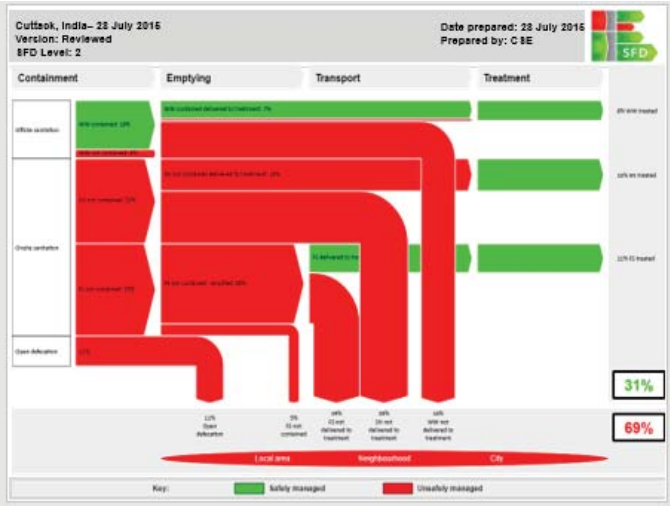

Cuttack, India– 28 July 2016
Version: Reviewed
SFD Level: 2
Date prepared: 28 July 2016
Prepared by: C 8E
SFD
Containment
Emptying
Transport
Treatment
Offsite sanitation
Onsite sanitation
Open defecation
SN not contained 32%
FS not contained 28%
Local area
Neighbourhood
City
Key:
Safely managed
Unsafely managed

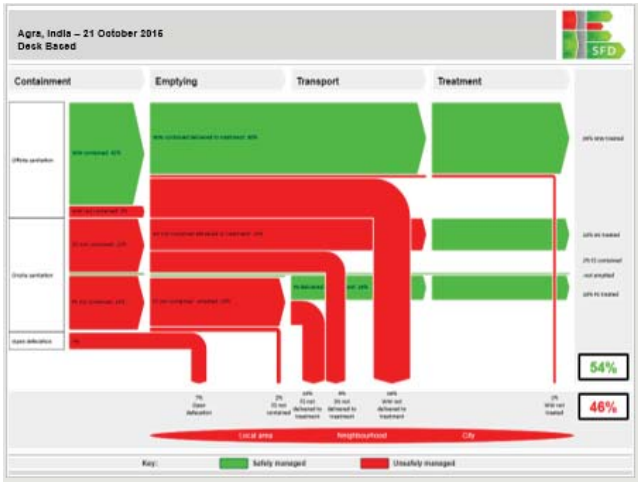

Cuttack, India– 28 July 2016
Version: Reviewed
SFD Level: 2
Date prepared: 28 July 2016
Prepared by: C 8E
SFD
Containment
Emptying
Transport
Treatment
Supernatant from septic tank discharges into open drain
Offsite sanitation
Onsite sanitation
Open defecation
SN not contained 32%
FS not contained 28%
SN not contained delivered to treatment: 12%
12% SN treated
Local area
Neighbourhood
City
Key:
Safely managed
Unsafely managed

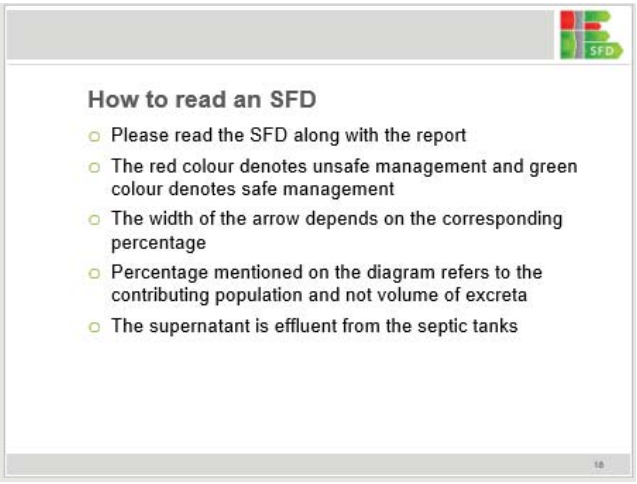

Cuttack, India– 28 July 2016
Version: Reviewed
SFD Level: 2
Date prepared: 28 July 2016
Prepared by: C 8E
SFD
Containment
Emptying
Transport
Treatment
Offsite sanitation
Onsite sanitation
Open defecation
SN not contained 32%
FS not contained 28%
SN not contained delivered to treatment: 12%
12% SN treated
28% SN not delivered to treatment
Local area
Neighbourhood
City
Key:
Safely managed
Unsafely managed


Cuttack, India– 28 July 2016
Version: Reviewed
SFD Level: 2
Date prepared: 28 July 2016
Prepared by: C 8E
SFD
Containment
Emptying
Transport
Treatment
Offsite sanitation
Onsite sanitation
Open defecation
SN not contained 32%
FS not contained 28%
SN not contained delivered to treatment: 12%
12% SN treated
FS not contained - emptied: 28%
5% FS not contained
28% SN not delivered to treatment
Local area
Neighbourhood
City
Key:
Safely managed
Unsafely managed


Cuttack, India– 28 July 2016
Version: Reviewed
SFD Level: 2
Date prepared: 28 July 2016
Prepared by: C 8E
SFD
Containment
Emptying
Transport
Treatment
Offsite sanitation
Onsite sanitation
Open defecation
11% Open defecation
Local area
Neighbourhood
City
Key:
Safely managed
Unsafely managed


Cuttack, India– 28 July 2016
Version: Reviewed
SFD Level: 2
Date prepared: 28 July 2016
Prepared by: C 8E
SFD
Containment
Emptying
Transport
Treatment
31%
69%
Local area
Neighbourhood
City
Key:
Safely managed
Unsafely managed


Agra, India – 21 October 2016
Desk Based
Containment
Emptying
Transport
Treatment
54%
46%
Local area
Neighbourhood
City
Key:
Safely managed
Unsafely managed


How to read an SFD
Please read the SFD along with the report
The red colour denotes unsafe management and green colour denotes safe management
The width of the arrow depends on the corresponding percentage
Percentage mentioned on the diagram refers to the contributing population and not volume of excreta
The supernatant is effluent from the septic tanks


Thank you for listening . . .
Please visit: www.sfd.susana.org
Email us at: sfdhelpdesk@cseindia.org
sustainable sanitation alliance
giz
UNIVERSITY OF LEEDS
WORLD BANK GROUP
wsp
WEDC
Loughborough University
eawag

A 3: SECTOR STAKEHOLDER WORKSHOPS – ATTENDANCE REGISTERS

A 3.1: KwaZulu-Natal Attendance Register

DURBAN 6-7 AUGUST 2018 — **ATTENDANCE REGISTER DAY 1**

	NAME	SURNAME	ORGANISATION	DESIGNATION	EMAIL ADDRESS	CONTACT NO.	SIGN IN	SIGN OUT
1	~~Padhi~~ AMRITA	Bhatnagar	CSE					
2	Dumisani	Biyela	uMgungundlovu DM		biyelad@umdm.gov.za	076 7939 487		
3	Xolani	Buthelezi	Zululand LM		xbuthelezi@zululand.org.za	0720999024		
4	Zinhle	Dladla	uMgungundlovu DM		mjwaraz@umdm.gov.za	0828027279		
5	Jabulani	Dlamini	uMgungundlovu DM		jabulani.dlamini@umdm.gov.za			
6	Raynund	Ganesh	Ilembe DM		Raynund.ganesh@ilembe.gov.za			
7	Teddy	Gounden	eThekwini Metro		Teddy.Gounden@durban.gov.za	082804		
8	Mike	Greatwood	Msunduzi LM		Mike.greatwood@msunduzi.gov.za			
9	Genevieve	Hartley	MILE		Genevieve.Hartley@durban.gov.za	0718574093		
10	Unathi	Jack	Emanti		unathij@emanti.co.za	083 362 4077		
11	Ntokozo	Khanyi	CoGTA		Ntokozo.khanyi@kzncogta.gov.za	0789036390		
12	Mthembeni	Khumalo	KZN COGTA (Mun Infra)		mthembeni.khumalo@kzncogta.gov.za			
13	Phindile	Khumalo	Uthukela DM		pkhumalo@uthukela.gov.za			
14	Charmaine	Kugesan	MILE		charmaine.kugesan@durban	0833247541		
15	Shantanu	Kumar	CSE		shantanu@cseindia.org	07888620950		
16								

DURBAN 6-7 AUGUST 2018 — **ATTENDANCE REGISTER DAY 1**

DURBAN 6-7 AUGUST 2018 — **ATTENDANCE REGISTER DAY ~~1~~**

	NAME	SURNAME	ORGANISATION	DESIGNATION	EMAIL ADDRESS	CONTACT NO.	SIGN IN	SIGN OUT
49	Bheka	Zondi	DWS		zondib@dws.gov.za			
50	Thandiwe	Zuma	Umgungundlovu DM		thandiwe.zuma@umdm.gov.za	0828035773		
51	Lungi	Zuma	eThekwini Metro		lungi.zuma@durban.gov.za	0827213424		
52	Ntokozo	Zwane	uMgungundlovu DM		Ntokozo.zwane@umdm.gov.za	0766000783		
53	KENNY	CHARLES	KC PTY LTD		kennymchorles@gmail.com	0824605578		
54	Muziwesipho	Ngwane	KZN COGTA	DIR: SECTOR PLANNING & CO-ORDINATION	muzi.ngwane@kzncogta.gov.za	083 320 5204		
55	LUSAPHO	TSHANGELA	EWS		lusapho.tshangela@durban.gov.za	0718582209		
	Hlengiwe G	Mkhize	Works					
25	Noluthando	Mkhize	MILE		Noluthando.mkhiza@durban.gov.za	031-5114514		
26	Numbulelo	Mnisi	National Dept Public Works		Nombulelo.mnisi@dpw.gov.za	031 3147071		
27	Janice	Moodley	MILE		Janice.moodley@durban.gov.za			
28	Shawn	Moorgas	Emanti		shawnm@emanti.co.za	0826514757		
29	Andiswa	Mpetshwa	CoGTA		Andiswa.mpetshwa@kzncogta.gov.za	0796111645		
30	Buhle	~~Msani~~ MSOMI	Umgungundlovu DM		buhle.msani@umdm.gov.za buhle.msani@umdm.gov.za	0829090758		
31	Viv	Naidoo	DWS	P.DIRECTOR	naidoov@dws.gov.za	0828057464		
32	Sizwe	ngubane	Zululand LM		sngubane@zululand.org.za	072 309 3864		

DURBAN 6-7 AUGUST 2018 **ATTENDANCE REGISTER DAY 1**

	NAME	SURNAME	ORGANISATION	DESIGNATION	EMAIL ADDRESS	CONTACT NO.	SIGN IN	SIGN OUT
33	Muziwesipho	Ngwane	KZN Cogta					
34	Nokuphiwa	Ngwenya	MILE		Nokuphiwa.ngwenya@durban.gov.za	0315245518		
35	Bright	Nkontwana	CoGTA	LG Specialist	Hlakanipha.nkontwana@kzncogta.gov.za	0719637276		
36	Xola	Ntobongwana	The Mvula Trust	RA	xola@themvulatrust.org.za	0834199108		
37	Royal	Nzuza	uMgungundlovu DM		nzuzar@umdm.gov.za	0878860741		
38	Nathaniel	Padayachee	KZN COGTA (Mun Infra)	PROGRAMME MANAGER.	nathaniel.padayachee@kzncogta.gov.za	0836444904		
39	Sudhir	Pillay	WRC		sudhirp@wrc.org.za	0605021841		
40	Jeanette ~~Jaenette~~	Neethling ~~Pretorius~~	Consultant (Partners in Development)	Engineer	Jeanette@pid.co.za	0720658143		
41	Dave	Rimmer	Consultant		daverimmer@mweb.co.za			
42	Devchand	Rugbeer	Abaqulusi LM/Amajuba DM		Devchand.Rugbeer@misa.gov.za			
43	Siphindile	Shange	uMgungundlovu DM		Siphindile.shange@umdm.gov.za	0839613435		
44	Moses	Sibeko	Uthukela DM		moses@uthukeladm.co.za			
45	Luyanda	Simelane	Amajuba DM		luyandas@amajuba.gov.za	074868 3422		
46	Glen	Singh	Uthukela DM					
47	Bivek	Singh	Uthukela DM		bsingh@uthukela.gov.za			
48	Sanele	Tenza	Ugu DM		Sanele.Tenza@ugu.gov.za			

A 3.2: Eastern Cape Attendance Register

East London 16-17 AUGUST 2018

ATTENDANCE REGISTER DAY 1

	NAME	SURNAME	ORGANISATION	DESIGNATION	EMAIL ADDRESS	CONTACT NO.	SIGN IN	SIGN OUT
1	Unathi	Jack	Emanti		unathij@emanti.co.za	(+27) 83 362 4077		
2	Philip	de Souza	Emanti	SFO Team	philipds@emanti.co.za	(+27) 83 235 4900		
3	Mzi	Ramba	Emanti		mzir@emanti.co.za	(+27) 82 613 5382		
4	Godfrey	Sitholimela	Emanti	WRC STD Team	gsitholimela@gmail.com	0795152301		
5	Shantanu Kumar	Padhi	CSE					
6	Amrita	Bhatnagar	CSE					
7	Zendani	Kuboni	Chris Hani DM	Inv. Tech Water	zendane.kuboni@gmail.com	(+27) 83 240 9071		
8	Sinawo	Nzuzo	Chris Hani DM	Technician WMIS	sinawo@gmail.com	(+27) 78 855 3901		
9	Moses	Shasha	Chris Hani DM	KISA	mosesshasha@gmail.com	(+27) 72 650 1122		
10	~~Dr Lulamile~~ Songezo	~~Hanabe~~ Peter	~~Amathole DM~~ Amathole	P&D	Songezop@amathole.gov.za	0833215020		
11	Sakhiwo	Balfour	Amathole DM	Regional Manager	sakhiwob@amathole.gov.za	(+27) 82 419 0858		
12	Stompie	Lourens	Joe Gqabi DM	Head Water Services Compliance	stompie@jgdm.gov.za	(+27) 45 979 3141		
13	Yolanda	Matsiele	Joe Gqabi DM		wsa@jgdm.gov.za	(+27) 45 979 3141		
14	Bongani	Makehle	Joe Gqabi DM		bonganim@jgdm.gov.za	(+27) 45 979 3141		
15	James	Maher	Buffalo City Metro	Technician Info. Management	jamesm@buffalocity.gov.za	(+27) 73 337 6418		

ATTENDANCE REGISTER DAY 1

East London 16-17 AUGUST 2018

	NAME	SURNAME	ORGANISATION	DESIGNATION	EMAIL ADDRESS	CONTACT NO.	SIGN IN	SIGN OUT
16	Luxolo	Mditshane	DWS		mditshanel@dws.gov.za	(+27) 83 633 2855		
17	Abraham Nkululeko	William	MISA		nkululeko.william@misa.gov.za	(+27) 83 387 1548		
18	Tendai	Tiani	MISA	T.C. Engineer	tendai.tiani@misa.gov.za	(+27) 79 998 9707		
19	Joe	Gqogqa	Buffalo City Metro	SNR Process Controller	jgqogqa@buffalocity.gov.za	(+27) 76 512 3009		
20	Jonathan	Clarke	Buffalo City Metro		JonathanC@buffalocity.gov.za	(+27) 78 446 8195		
21	Darkley	Horner	Buffalo City Metro	Snr Process Controller	darkleyh@buffalocity.gov.za	(+27) 84 499 5934		
22	David Mthuthuzeli	Dyakop	Buffalo City Metro	Snr Process Controller	mthuthuzelid@buffalocity.gov.za	(+27) 83 509 6016		
23	Namhla Bongweni	Ngabayena	Chris Hani DM		nbongweni@chrishani.gov.za	(+27) 73 424 9049		
24	David	Langley	Buffalo City Metro		davidl@buffalocity.gov.za	(+27) 78 696 5129		
25	Tumeka	Menjenjalo	Buffalo City Metro		tumekam@buffalocity.gov.za	(+27) 83 491 7819		
26	Dunyiswa	Ntsebeza	Buffalo City Metro	Engineer Sanitation	dunyiswan@buffalocity.gov.za	(+27) 72 351 5689		
27	Nolubalalo	Gqotana	Amathole DM	Chief Env. Health Officer	nolubabalo@amathole.gov.za	(+27) 73 190 6012		
28	Phillip	Venter	Buffalo City Metro	Engineer	venterp@boschprojects.co.za	(+27) 78 876 9632		
29	Phil	Kanise	Impilo Yabantu Services	Impilo GM: Yabantu	phil@iyserve.co.za	(+27) 81 546 4574		
30	Andiswa	Noholoza	Amathole DM	Area manager	andiswan@amathole.gov.za	(+27) 72 213 4187		

East London 16-17 AUGUST 2018

ATTENDANCE REGISTER DAY 1

	NAME	SURNAME	ORGANISATION	DESIGNATION	EMAIL ADDRESS	CONTACT NO.	SIGN IN	SIGN OUT
31	Amanda	Sizani	DWS		sizaniA@dws.gov.za	(+27) 82 909 9505		
32	Tim	Metcalfe	Aurecon	Senior Technologist	Tim.Metcalfe@aurecongroup.com	+27) 0836688917		
33	David	Langley	BCMM	Project Manager	david@buffalocity.go.za	043 705 2005		
34	Jonathan	Clarke	BCMM	Acting Supt	jonathanc@buffalocity.gov.za	078 696 5129		
35	Landile	Jack	DWS	Control Officer	jackl@dws.gov.za	0784463195		
36	Mark	Westmarsh	BCMM	GM WWSS	markw@buffalocity.gov.za	082887[illegible] / 043-7052[illegible]		
37	Montja	Mohlapamafsi	BCMM	Technician	montjam@buffalocity	0824675491		
38	Sizwe	Dyani	BCMM	Superintendent	Sizwedy@buffalocity			
39	Sicelo	Pongoma	JGDM	Manager: WSA	sicelop@jgdm.gov.za	0733913629		
40	Andrew	Macdonell	GIBB	Engineer	amacdonell@gibb.co.za	060 5358506		
41	Mark	Giebers	BCMM	District Engineer	markg@buffalocity	082 701 8868		
42	Oliver	Ive	Amanzi' Abantu	Director	olive@aserve.co.za	0824545766		
43	Thembela	Rala	BCMM	Snr Technician	thembelar@buffalocity.gov.za	0727914738		
44	Shawn	Kumm	BCMM	District Eng.	shawnk@buffalocity.gov.za	0827748[illegible]		
45	Khumbelo	Fungufungu	ADM	Sanitation Officer	khumbelof@amathole	0437035804		
46	Nosiphiwo	Mdiya	BCM	Acting Snr Engineer	nosiphiwom@buffal..	0734979605		

ATTENDANCE REGISTER DAY 1

East London 16-17 AUGUST 2018

	NAME	SURNAME	ORGANISATION	DESIGNATION	EMAIL ADDRESS	CONTACT NO.	SIGN IN	SIGN OUT
47	Ncebа	Titus	AAM	EHP	ncebat@amathole.gov.za	0733870118		
48	Mkhuseli	Nongogo	BCMM	Acting Manager	mkhuselino@buffalocity.gov.za	078 005 11[illegible]		
49	Patiswa	Gogela	ADM	EEMP	patiswag@amathole.gov.za	0835946685		
50	Ziliphа	Nkohla	BCMM	Technician	ziliphan@buffalocity.gov.za	082 952 9252		
51	~~Thembela~~	~~Rala~~	~~BCMM~~	~~Snr Technician~~	~~thembelar@buffalocity.gov.za~~	072 7914738		

APPENDIX B:

SFD Development workshops with municipalities

B1: MUNICIPAL WORKSHOPS PROGRAMME

A similar approach and programme was used for all municipal workshops as presented below, except for uMgungundlovu. UMgungundlovu SFD was developed just after the sector workshop.

Preparation of Shit-Flow Diagram for ABC Municipality

Time	Details	Who
Day 1		
08:30-08:40	Welcome and introductions	All
08:40-09:00	Overview of SFDs and WRC SFD project	Emanti
09:00-10:00	Overview of municipal selected sanitation system	Municipality
10:00-11:00	Initial discussion of selected sanitation system	All
11:00-14:00	Site visit to selected sanitation system • Examples of sanitation technologies and operations along the sanitation value chain to ascertain on the ground situation • Including VIPs, pit latrines, septic tanks, conservancy tanks, pit emptying, vacuum trucks, wastewater treatment works, interviews with operational staff (as appropriate)	All
14:00-16:00	Initial data collection, gap analysis, data interpretation	All
Day 2		
08:30-12:30	Additional data collection, gap analysis, data interpretation and generation of draft SFD matrix	All
12:30-13:00	Closure and Way Forward	All

B2: MUNICIPAL WORKSHOPS ATTENDANCE REGISTERS

1. Amathole DM

Meeting Sign-In Sheet

Project: SFD

Meeting Date: 2018 . 11 . 08

Facilitator: EMANTI Management

Place/Room: Amathole Resource Centre (Sanitation)

Name	Organisation	Title/Position	Tel/Cell	e-mail	Sign
Thabisa Manxodidi	~~SFD~~ Emanti Man.	SFD Team Support	082 6135383	thabisam@emanti.co.za	
Stephen Nah	ADM	GM: WSP	082 4198871	stephenn@amathole.gov.za	
Gervais	ADM	SM - WSP	043 703 5880	gervais —	
Mkangeli Maseti	ADM	SR-COORD	043 703 5836	mkangelim@amathole.gov.za	
SAKHIWO BABA	ADM	OPS Manager	043-7035854	sakhiwob@amathole.gov.za	
Mpho Lefophana	ADM	Assistant Manager	043 783 2388	mpho1@amathole.gov.za	
Khumbulo Fumbafumba	ADM	Sanitation Officer	0437035804	khumbulof@amathole.gov.za	
Wendy Silwane	ADM	Control Tech	043 703 5841	wendys@amathole.gov.za	
Vusi Novukela	ADM	ISD	0437035804	isaacn amathole.gov.za	
Peter Songezo	ADM	Sanitation P. Officer	043 708 2326	songezop@amathole.gov.za	
Nosikhumbuzo Loliwe	ADM	Ops Manager	0437035850	nosikhumbuzol@amathole.gov.za	
Mongezi Mabece	ADM	Ops Manager	0437035857	mongezim@amathole.gov.za	
MZI RAMBA	EMANTI	SFD TEAM	0826135382	mzir@emanti.co.za	

30/01/2015

2. Buffalo City Metropolitan

BUFFALO CITY

WRC initiative on Country-wide Shit Flow Diagram (SFD): WORKING SESSION - DRAFT SFD FOR BUFFALO CITY

ATTENDANCE REGISTER **PLANNING AND ENGINEERGING BUILDING - 15 AUGUST 2018**

NAME	CONTACT NO	COMPANY / DEPARTMENT	SIGNATURE
Dunyiswa Ntsebeza	043 7051097	BCMM - Sanitation	
Tumeka Menjenja Co	043 705 2033	BCMM - Sanitation	
Mkhuseli Nongogo	043 705 2126	BCMM - Sanitation	
Philip De Souza	0218802932	Emanti WRC SFD Project	
Shantanu Kumar		Centre for Science & Environment	
Godfrey Sitholimela	0795152301	Emanti WRC SFD Project	
Mzi Ramba	0826135382	mzir@emanti.co.za	
Unathi Jack	083 362 40 77	Emanti : Project team	

NAME	CONTACT NO	COMPANY / DEPARTMENT	SIGNATURE
JAMES MAHER	043-705-2562	BCMM / SANITATION	
NOSIPHIWO MDIYA	043 705 1090	BCMM / SANITATION	
MARK WESTRAUSEN	705 2084	BCMM / WATER / SANITATION	
Unathi Jack	083 362 4077	Emanti : Project team	
Mzi Ramba	082 613 5382	mzir@emanti.co.za	
Godfrey Sitholimela	0795152301	Emanti WRC SFD Team	

3. Chris Hani DM

Meeting Sign-In Sheet

Project: SFD

Meeting Date: 2018 . 11 . 06

Facilitator: Emanti Management

Place/Room: Komani WTW Boardroom

Name	Organisation	Title/Position	Tel/Cell	e-mail	Sign
T. Manxodidi	Emanti Management	SFD Team	021 8802932	thabisam@emanti.co.za	
M Sonkoko	CHDM – WSP	Tarkastad Area Manager	0713818529	msonkoko@chrishanidm.gov.za	
R Pottas	CHDM	AREA MANAGER	0763724951	JR POTTAS@GMAIL.COM rpottas@chrishanidm.gov.za	
Z. Kubuni	CHDM –	Sur. Techn WMS	0458084748 0832409071	zkubuni@chrishanidm.gov.za	
M. [illegible]	CHDM – WSP	Civil Tech.	078 474651[illegible]	[illegible]@chrishanidm.gov.za	
S. NZUZO	CHDM – WSA	TECHNICIAN: WMIS	078 855 3901	sinquzo@gmail.com sn2426@chrishanidm.gov.za	
N. Bongweni	CHDM	SNR TECH: WCOM	0734249049	nbongweni@chrishanidm.gov.za	
Z. Mngomeni	CHDM – WSP	Civil Technician	0832607712	zmngomeni@gmail.com zmngomeni@chrishanidm.gov.za	
N. Ncedo	CHDM	Civil Technician	0835044547	nncedo@chrishanidm.gov.za	
Mfesane	CHDM – WSP	Water Quality Technician	0733800197	mfesanen@gmail.com	
[illegible]	CHDM – WSP	[illegible]	[illegible]	[illegible]	
S. Sinyeke	CHDM – WSP	Civil Tech	0733329856	swsinyeke@gmail.com	
MK Ramulifho	CHDM – WSP	Water Quality Technician	0727760270	ramuken@gmail.com	

V01/2015

4. Joe Gqabi DM

Page | 1

JOE GQABI DISTRICT MUNICIPALITY

ATTENDANCE REGISTER
SHIT FLOW DIAGRAM WORKING SESSION: JGDM

Date : 13 & 14 August 2018
Venue : Barkly East – Council Chamber
Time : 09:00

Surname & Initials	Organisation	Designation	Contact Details	Signature 13/08/2018	Signature 14/08/2018
Pongoma SV	JGDM	Manager: WSA	045 979 3141 060 555 8506 sicelop@jgdm.gov.za		
D.C. Lourens	JGDM	Head WS Compliance	045-979 8187 0827741137 stompie@jgdm.gov.za		
P. De Souza	Emanti	Emanti SFD Team	0218802932 0832354900 philipds@emanti.co.za		
G. Sitholimela	Emanti	SFD Team	0795152301 gsitholimela@gmail.com		
Shantanu Kumar	CSE	Researcher	shantanu@cseindia.org		
Anwita Bhatnagar	CSE	Researcher	anwita@cseindia.org		

SHIT FLOW DIAGRAM WORKING SESSION

5. Amajuba DM

ATTENDANCE REGISTER – Day 1

Contract No:		Contract Description: SHIT FLOW Diagram					
Meeting No: 1		Venue: Amajuba Municipal Office			Date: 2018/10/31st – 1st November		Time: 8h00

PRESENT

Mr	Ms	Name	Organisation	Designation / Title	Contact No	Email	Signature
	✓	T. Manxodidi	Emanti Management	SFD Team	082 6135383	thabisam@emanti.co.za	
X		P. DE SOUZA	EMANTI	SFD TEAM	0218802932	philipds@emanti.co.za	
	✓	L C Simelane	Amajuba DM	Process Technician	0343297215	luyandas@amajuba.gov.za	
	✓	N Shabalala	Amajuba DM	Technician	034 3297237	nokwazi@amajuba.gov.za	
X		S. Dube	Amajuba DM	Technician	034 329 7237	sabelod@amajuba.gov.za	
X		S.K Buthelezi	Amajuba Sun	Superintendent	0114707970	[illegible]@amajuba.gov.za	
	✓	L.P Thwala	AMAJUBA DM	SUPERINTENDENT	0343297200	lungile[illegible]@amajuba.gov.za	

6. Ilembe DM

ATTENDANCE REGISTER – 1 Day

Contract No:	Contract Description: SHIT FLOW Diagram			
Meeting No: 1	Venue: Ilembe Municipal Office		Date: 2018/11/2	Time: 8h00

PRESENT

Mr	Ms	Name	Organisation	Designation / Title	Contact No	Email	Signature
X		P. DE SOUZA	EMANTI	SFD TEAM	0218802932	philipds@emanti.co.za	
	✓	T. Manxodidi	Emanti	SFD Team	021 880 29 32	thabisam@emanti.co.za	
X		R. Ganesh	IDM	Mngr: Water Quality	0836288453	raynund.ganesh@ilembe.gov.za	
X		Bongani Mthiyane	IDM	CDO	0823094107	bo[illegible]@ilembe.gov.za	

7. uMgungundlovu DM

All uMgungundlovu DM representatives who attended the KZN Masterclass were part of the workshop afterwards.

8. Zululand DM

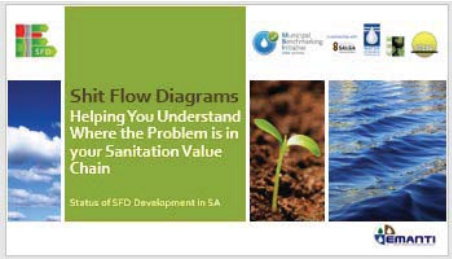
ATTENDANCE REGISTER – Day 1

Contract No:	Contract Description: SHIT FLOW Diagram		
Meeting No: 1	Venue: Zululand Municipal Office	Date: 2018/10/29 – 30th	Time: 12h00

PRESENT

Mr	Ms	Name	Organisation	Designation / Title	Contact No	Email	Signature
	✓	T. Manxodidi	Emanti	SFD Team	0826135383	thabisam@emanti.co.za	[signature]
X		P. DE SOUZA	EMANTI	SFD TEAM	0218800932	philipds@emanti.co.za	[signature]
X		S NGUBANE	ZDM	M: TS	072 309 3664	sngubane@zululand.org.za	[signature]
X		S. NGWBO	ZDM	TECHNICIAN/O(WSA)	0848726939	sngcobo@zululand.org.za	[signature]
	✓	D. MYAKA	ZDM	SENIOR PROCESS CONTROLLER	0730697122	doctormyaka1984@gmail.com	[signature]
X		B.M. GASA	ZDM	Superintendent	0603770145	– – –	[signature]
X		L.E Mbatha	Z.D.M	Process Controller	0734299270	– – –	L.E Mbatha
X		T.D Mdlalose	ZDM	Prin. [illegible]	0737863159	dmdlalose@zululand.org.za	[signature]

B3: MUNICIPAL WORKSHOPS PRESENTATIONS EXAMPLE



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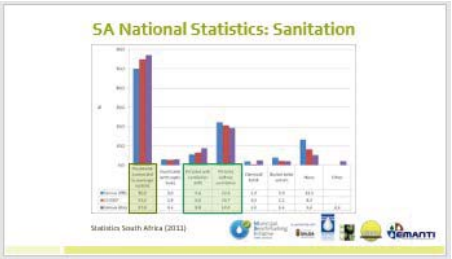

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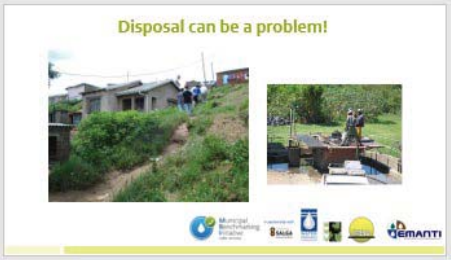

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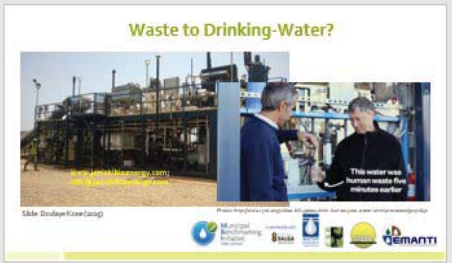


15

Why Is It Important?

- Around 30% of South Africans rely on on-site sanitation
  - ➢ Do you know the state of your infrastructure?
- Recent unfortunate events with children falling into latrines have highlighted the issues related to on-site sanitation
  - ➢ Pres. Ramaphosa requested audit of all school sanitation systems – Do you have the data?

16 ★

Approach

- Sanitation and sludge management challenges in the country
- Infrastructure programmes to build – O&M budget, policies & procedures
- Green Drop audits – focusing on wastewater treatment systems

→ Develop SFDs for ~30 municipalities (in different provinces)

17 ★

What is SFD?

→ Standardised tool to understand and communicate visualizing how excreta physically flows through a municipality/city or town

18 ★

What is the Baseline?

- Clear picture of WW and FSM services delivery
- How much and what is / is not treated
- For both technical and non-technical stakeholders
- Easy to understand advocacy tool
- Support decision-making, planning and programming

19 ★

Project Progress

- Start: 1st April 2018
- Introduce project to the water, wastewater and sanitation sector - Masterclasses
  - Masterclass in 2 out of 3 targeted regions
  - Benefits of developing SFDs
  - CSE assisted in sensitising the sector at masterclasses

20 ★

Project Progress

- Data - Institution public documents, interviews, site visits (where applicable)
- Municipality decides on SFD boundary
- To-date: 3 municipalities completed
  - ✓2 decided on one system within their area
  - ✓1 entire municipal area
- Susana website – generate SFD graphic

21 ★

SFD Levels

- **Level 1** – Initial SFD : limited data - desktop data…
- **Level 2** – Intermediate SFD: secondary data – interviews, field visits…
- **Level 3** – Comprehensive SFD: extensive data – primary data, questionnaires, interviews, field visits, community workshops…

22 ★

SA Approach: SFD lite/intermediate

23 ★

SFD Development Process

- No specific way of collecting data
- Not a precise scientific analytical tool
- Focus – percentage of population served not necessarily volumes produced/generated
- Interventions – low hanging fruits, how much population will be affected
- Glossary standardised – definitions provided (e.g. type of system
  - Choose the closest to your situation

24 ★

Some Challenges

- Terminology – sanitation technologies
- Information collection – different departments
- Conflicting sources of data
- Selecting boundary (Towns, Cities, Municipal)
- Interviews with some stakeholders (e.g. tanker drivers)
- Record keeping – tankers discharging at the WWTW

25 ★

Way Forward

- Data collection
- Data analysis
- SFD summary reports

- Improved planning – REVAMP and FSM Toolbox assistance

26 ★

Understanding a SFD: What do you see?

27 ★

"It always seems impossible until it's done."

28 ★

29 ★

- Identify the structure A

30 ★

- Identify the structure B

31 ★

- Identify the structure C

32 ★

- Identify the structure D

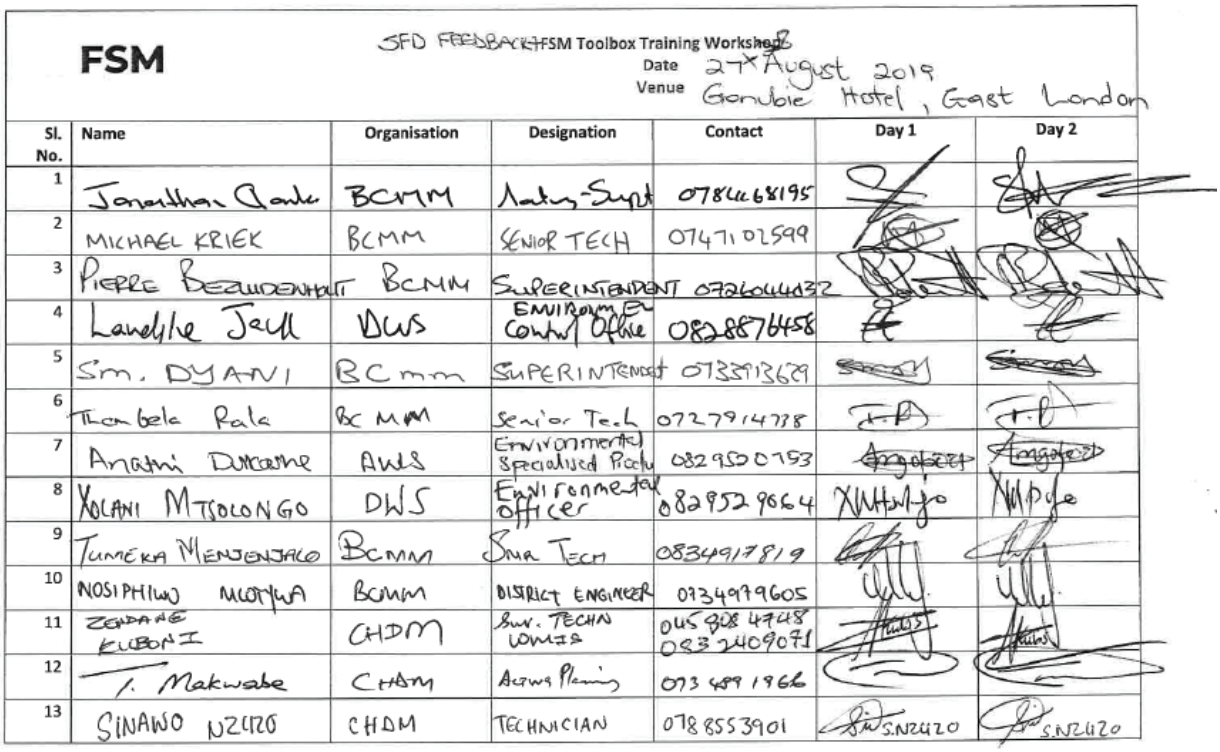
33 ★

APPENDIX C:

Sector Feedback Workshops associated

C 1: FEEDBACK WORKSHOPS ATTENDANCE REGISTERS

EC Feedback Workshop Attendance Register



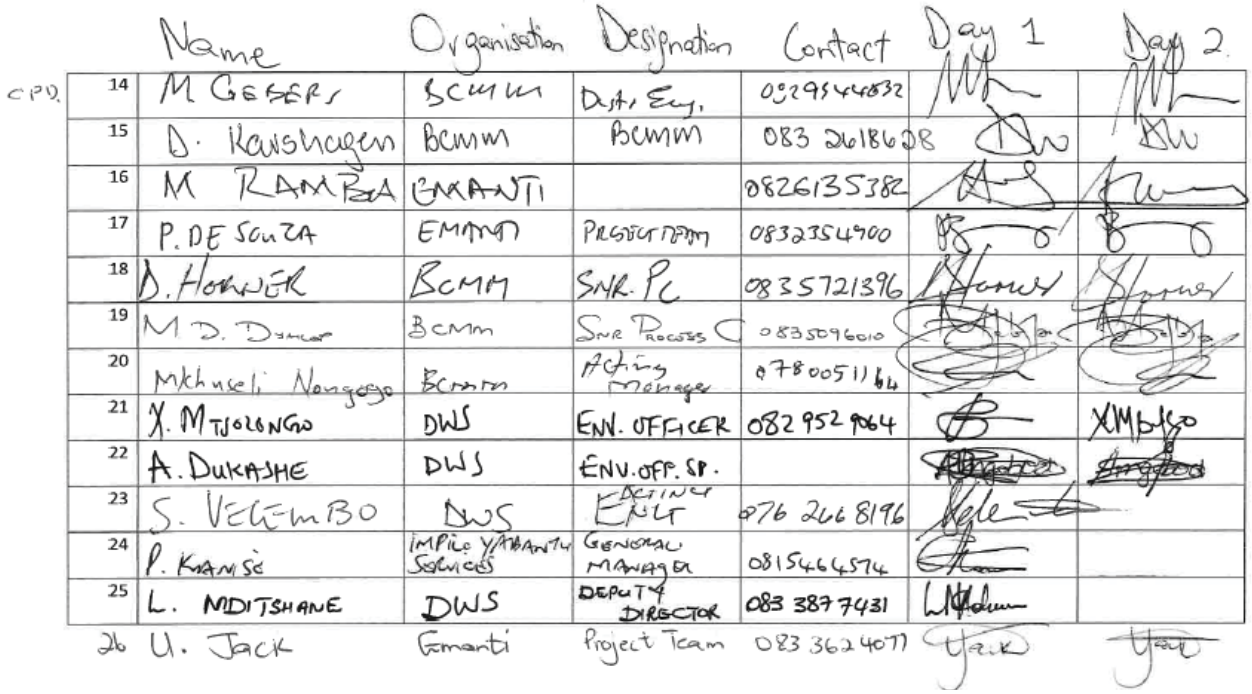
FSM

SFD FEEDBACK/FSM Toolbox Training Workshop

Date 27th August 2019

Venue Gonubie Hotel, East London

Sl. No.	Name	Organisation	Designation	Contact	Day 1	Day 2
1	Jonathan Clarke	BCMM	Acting Supt	0784468195		
2	MICHAEL KRIEK	BCMM	SENIOR TECH	0747102599		
3	PIERRE BEAUDENHUIT	BCMM	SUPERINTENDENT	0726044432		
4	Landyle Jack	DWS	ENVIRONMENTAL Control Officer	0828876458		
5	Sm. DYANTI	BCMM	SUPERINTENDENT	0733913679		
6	Thembela Pala	BC MM	Senior Tech	0727914778		
7	Anathi Dukashe	AWS	Environmental Specialised Practi	0829500753		
8	XOLANI MTSOLONGO	DWS	Environmental officer	0829529064		
9	TUMEKA MENJENJALO	BCMM	Snr Tech	0834917819		
10	NOSIPHIWO MLOTYWA	BCMM	DISTRICT ENGINEER	0734979605		
11	ZENDANE KUBONI	CHDM	Snr. TECHN WORKS	045 838 4748 0832409071		
12	T. Makwabe	CHDM	Acting Planning	073 459 1966		
13	SINAWO NZUZO	CHDM	TECHNICIAN	0788553901	S.NZUZO	S.NZUZO



	Name	Organisation	Designation	Contact	Day 1	Day 2
CPD 14	M GEERS	BCMM	Dist. Eng.	0829544832		
15	D. Kaschagen	BCMM	BCMM	083 2618628		
16	M RAMBA	GMANTI		0826135382		
17	P. DE SOUZA	EMM	PROJECT TEAM	0832354900		
18	D. HORNER	BCMM	SNR. PC	0835721396		
19	M D. Duncan	BCMM	Snr Process C	0835096010		
20	Mkhuseli Nongogo	BCMM	Acting Manager	0780051164		
21	X. MTSOLONGO	DWS	ENV. OFFICER	0829529064		
22	A. DUKASHE	DWS	ENV. OFF. SP.			
23	S. VELEMBO	DWS	ACTING ENLT	076 266 8196		
24	P. KAMISE	IMPILO YABANTU Services	GENERAL MANAGER	0815464574		
25	L. MDITSHANE	DWS	DEPUTY DIRECTOR	083 387 7431		
26	U. Jack	Gmanti	Project Team	083 362 4077		

KZN Feedback Workshop Attendance Register

FSM Toolbox Training Workshop
Date 15–16 October 2019
Venue Durban ICC

Sl. No.	Name	Organisation	Designation	Email address	Day 1	Day 2	Contact
1	FEZILE NJOKWENI	MILE-ETK	SM.		[signature]	[signature]	083955[illegible]
2	BUHLE MSOMI	UMDM	MANAGER: WSA	buhle.msomi@umdm.gov.za	[signature]	[signature]	0829090758
3	SIPHO ZAMA	UTDM	SDS Compliance Officer	SZama@uthukela...	[signature]	[signature]	076 480 3338
4	Sipho Shabalala	UTDM	SDS Compliance	SShabalala@uthukela.gov.za		[signature]	03290 [illegible]
5	Tshabalala Thulani	KZN Industry	SDS	[illegible]	[signature]		0790772384
6	Kenny Chade	KC PTY Ltd	CEO	[illegible]@gmail.com	[signature]		
7	PHILIP DE SOUZA	EMANTI	PROJECT TEAM	philipds@emanti.co.za	[signature]		0218802932
8	S						
9	[illegible]	MILE	eThekwini learning office		[signature]	[signature]	
10	charmaine kugesan	MILE	Event Coordinator Prin Clerk	charmaine.kugesan@durban.gov.za	[signature]	[signature]	0313224522
11	~~ALETTA PHOSHOKO~~	~~COU~~	~~WQO~~	~~phoshokoma@umhlathuze.gov.za~~	[signature]		
12	~~Siphamandla Ngubane~~						
13							

FSM Toolbox Training Workshop
Date 15 – 16 October 2019
Venue Durban ICC

Sl. No.	Name	Organisation	Designation	Email address	Day 1	Day 2	Contact
1	Niko Greatwood	Msunduzi	WSA Manager		[signature]		0[illegible]
2	Buyisiwe	MILE	Programme Manager		[signature]	[signature]	0726[illegible]
3	Siphamandla Ngubane	MILE	Admin		[signature]	[signature]	07882[illegible]
4	Nonsikelelo Khumalo	City of uMhlathuze	Eng Technician	KhumaloNG@umhlathuze.gov.za	[signature]	[signature]	035907582
5	ALETTA PHOSHOKO	〃	WQO	PhoshokoMA@umhlathuze.gov.za	[signature]	[signature]	035907507
6	Noluthando Mnikathi	MILE	COMM		[signature]	[signature]	
7	STHEMBILE BANI	MILE	ADMIN		[signature]		X24519
8	NOKUPHIWA NGWENYA	MILE	ADMIN	Nokuphiwa.Ngwenya@durban.gov.za	[signature]	[signature]	X24513
9	Lungi Zuma	eThekwini water	Chem. Engineer	lungi.zuma@durban.gov.za	[signature]	[signature]	X18590
10	Siphindile Shange	UMDM	MANAGER: SAN	siphindile.shange@umdm.gov.za	[signature]	[signature]	0839613435
11	Thandiwe Zuma	UMDM	Sanitation	Thandiwe.Zuma@umdm.gov.za	[signature]	[signature]	033-[illegible]
12	PHINDILE KHUMALO	UTDM	SDS Comp. Off.	PKhumalo@uthukela.gov.za	[signature]	[signature]	079510908
13	Cindy Coetzee	UTDM	Acting WSA Manager	CCoetzee@uthukela.gov.za	[signature]	[signature]	0829046115

C 2: FEEDBACK WORKSHOPS FEEDBACK FORMS

Feedback forms for the Feedback Workshops held in KwaZulu-Natal and the Eastern Cape can be downloaded from the Water Research Commission website at www.wrc.org.za:

Eastern Cape Workshop [www.shorturl.at/cmINU]

KwaZulu-Natal Workshop [www.shorturl.at/ceQTY]

APPENDIX D:

SFD Summary Reports

D 1: SFD SUMMARY REPORTS

This report is complemented with SFD Summary Reports for each of the 8 participating municipalities in the study, which can be downloaded from the Water Research Commission website at www.wrc.org.za:

Buffalo City Metropolitan Municipality [www.shorturl.at/cijF6]

Chris Hani District Municipality [www.shorturl.at/xS345]

Ilembe District Municipality [www.shorturl.at/gv235]

Ugie (Elandini Local Municipality) [www.shorturl.at/xAEJ4]

Dalton (uMshwati Local Municipality) [www.shorturl.at/emOR3]

Zululand District Municipality [www.shorturl.at/aoP69]

Amajuba District Municipality [www.shorturl.at/ltDFR]

Amathole District Municipality [www.shorturl.at/bfxAJ]