



# QUICK GUIDE TO MANAGING FAECAL SLUDGE



WATER  
RESEARCH  
COMMISSION

**Obtainable from:**

Water Research Commission  
Private Bag X03  
Gezina  
0031

**Disclaimer**

The Water Research Commission (WRC) has approved this book for publication. Approval does not signify that the contents necessarily reflect the views and policies of the WRC, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Authors: Partners in Development  
Production editor: Lani van Vuuren  
Design and layout: Anja van der Merwe  
Printed in the Republic of South Africa  
© Water Research Commission



## CONTENTS

INTRODUCTION.....	04
WHY IS FAECAL SLUDGE MANAGEMENT IMPORTANT? .....	06
WHAT OPTIONS EXIST FOR MANAGING FAECAL SLUDGE? .....	08
WHAT DO WE KNOW ABOUT THE COSTS OF FAECAL SLUDGE MANAGEMENT?.....	14
HOW CAN ONE BUDGET FOR FAECAL SLUDGE MANAGEMENT?.....	22
FURTHER READING .....	29

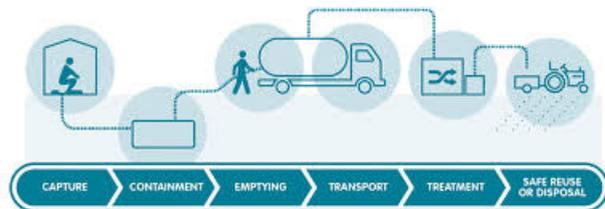
# INTRODUCTION

Safe, dignified sanitation is fundamental to public health and in the last three decades much progress has been made in providing sanitation to all South African households.

While there are a range of sanitation technologies in use, they can be split into those which deal with the waste off-site using some form of wastewater treatment and those which retain waste on site. The latter is the focus of this guide booklet.

Conventional on-site sanitation, such as ventilated improved pit (VIP) toilets result in a build-up of faecal sludge, which has to be handled safely. A sanitation system deals with human excreta of faecal matter from the time it is generated until it is used or disposed of safely. Faecal sludge is excreta from an onsite sanitation technology (such as a pit toilet) that may also contain used water, anal cleansing materials (e.g. toilet paper), and solid waste.

Faecal sludge management (FSM) refers to the management of sludge produced from on-site sanitation systems across the sanitation service chain. The sanitation service chain includes containment, emptying, transport, treatment, and end-use / disposal of faecal sludge. Until recently, in South Africa, FSM was largely absent from public discourse and service delivery, which focuses primarily on toilet provision. However, with the publishing of the National Faecal Sludge Management Strategy by the Department of Water and Sanitation in 2023, FSM is on the radar of policymakers and practitioners.



*A typical on-site sanitation value chain.*

This booklet provides a brief and general overview of faecal sludge management options and then presents cost estimates for a few options based on the results from a recent study, funded by the Water Research Commission and undertaken by Partners in Development.





## WHY IS FAECAL SLUDGE MANAGEMENT IMPORTANT?

Sustainable Development Goal (SDG) 6.2 aims to “achieve access to adequate and equitable sanitation and hygiene for all and end open defecation” (WHO, 2024). While one key indicator speaks to **access** to at least basic sanitation, another key indicator speaks to **safely managed sanitation services**. FSM is central to **safely managed sanitation**, focusing on the entire sanitation service chain and not just toilet facilities.

FSM is critical to ensuring human excreta does not pollute the environment, especially in the South African context where onsite sanitation systems are found everywhere. According to the 2022 Census data (Stats SA), around 20% of households across the country rely on some form of onsite sanitation. By neglecting FSM, these households sanitation needs are being neglected.

In the absence of planned FSM services, households will make their own plans. Households that can afford it will pay for someone to empty their sanitation system, and those that cannot will resort to low-cost options such as unsafe emptying, using old dilapidated pit latrines, or open defecation. Without options for safe disposal or treatment of faecal sludge, emptiers may resort to unsafe approaches such as unauthorised dumping, which can pollute the environment and put public health at risk.

### So, why is faecal sludge management important?

- **Ensuring access** to safely managed sanitation is maintained.
- **Supporting the needs of marginalised and vulnerable communities** that often rely on onsite sanitation.
- **Preventing the pollution of the environment.**
- **Protecting public health.**
- **Unlocking the potential** for job creation, faecal sludge beneficiation, and entrepreneurship that can come from FSM systems.



(Groundup/Ashraf Hendriks)



# WHAT OPTIONS EXIST FOR MANAGING FAECAL SLUDGE?

Other publications have detailed technology options for different parts of the faecal sludge management service chain<sup>1</sup>. Below is a brief description of the general options available, to set the stage for conducting cost comparisons for the complete service chain.

**Containment** includes the user interface (toilet) and the containment unit which stores the faecal sludge. In South Africa, the following user interfaces are typically used:

- Dry toilet (e.g., VIP pedestals)
- Dry, urine-diverting toilet
- Cistern-flush toilets
- Pour flush toilets (no cistern included)

The above user interfaces can be used with different containment units. Different containment unit options are described below.



<sup>1</sup> See the *Compendium of Sanitation Systems and Technologies* (Tilley et al., 2016), which can be accessed here: [Compendium-Sanitation-Systems-and-Technologies.pdf \(iwnetwork.org\)](https://www.iwnetwork.org/Compendium-Sanitation-Systems-and-Technologies.pdf)

**Table 1: Typical containment options for onsite sanitation systems**

Containment Option	Notes on context/use
Lined pit with open joints (most VIP toilets have this construction)	<ul style="list-style-type: none"><li>• Most used option in South Africa.</li><li>• Allows liquid to soak away into the soil, leading to lower sludge accumulation.</li><li>• Appropriate where groundwater contamination risk is low (refer to the DWS Groundwater Protocol for further information)</li><li>• Single pits are typical, but double pits can be used to extend the life of the toilet. In this case, one pit is in use while the other one rests, allowing the sludge to decompose and dry out.</li></ul>
Single sealed pit or vault	<ul style="list-style-type: none"><li>• Typically used with urine diverting toilets.</li><li>• Appropriate option for areas with a high groundwater contamination risk.</li><li>• Sealed containments typically fill up faster, as liquid cannot soak away.</li><li>• Single pits are typical, but double pits can be used to extend the life of the toilet. In this case, one pit is in use while the other one rests, allowing the sludge to decompose and dry out.</li></ul>
Septic tank with soakaway	<ul style="list-style-type: none"><li>• Septic tanks should have at least 2 chambers.</li><li>• Soakaway allows supernatant to drain into the ground, extending the emptying interval.</li><li>• Appropriate where groundwater contamination risk is low (refer to the DWS Groundwater Protocol for further information).</li></ul>
Conservancy tank/ sealed tank with no soakaway	<ul style="list-style-type: none"><li>• Appropriate option for areas with a high groundwater contamination risk.</li><li>• Require very frequent emptying, as all water and excreta must be emptied and transported to a wastewater treatment plant.</li></ul>

Containment Option	Notes on context/use
Container toilets	<ul style="list-style-type: none"> <li>Refers to chemical toilets, container toilets, and other containment systems utilising a small (&lt;50 litre) sealed tank to collect human excreta.</li> <li>Must be emptied extremely frequently (i.e., multiple times per week) depending on the number of users.</li> <li>Produce fresh excreta which may favour certain treatment processes, but also the volume of sludge to handle is much higher because no decomposition or drying take place.</li> <li>Appropriate option for areas with a high groundwater contamination risk.</li> </ul>

**Table 2: Typical emptying options for onsite sanitation systems**

Emptying Option	Notes on context/use
Fully mechanised	<ul style="list-style-type: none"> <li>Most commonly vacuum tankers.</li> <li>Works well with containment systems that have wet, pumpable sludge (e.g., septic tank systems).</li> <li>If sludge is dry, water will need to be added and mixed in to allow the sludge to flow.</li> <li>Can face difficulty with sludge that has a large amount of foreign material.</li> </ul>
Semi-mechanised	<ul style="list-style-type: none"> <li>Includes technologies for which some aspects are mechanised and others are human-powered. Many new, innovative technologies fall into this category (e.g., the Pitvaq, which is made in South Africa).</li> <li>Typically designed specifically for households that are difficult for a vacuum tanker to reach, for example, in densely populated, steep, and/or informal areas.</li> <li>Typically lower cost than a vacuum tanker and therefore provide opportunities for small businesses with limited capital.</li> <li>Works well with containment systems that have wet, pumpable sludge (e.g., septic tank systems).</li> <li>For pumping systems, if sludge is very dry, water will need to be added and mixed in to allow the sludge to flow.</li> <li>Can face difficulty with sludge that has a large amount of foreign material.</li> </ul>

Emptying Option	Notes on context/use
Manual	<ul style="list-style-type: none"> <li>Typically, long-handled spades and shovels.</li> <li>Appropriate for dry sludge and sludge with excessive foreign material.</li> </ul>

**Table 3: Typical transport options for onsite sanitation systems**

Transport Option	Notes on context/use
Vacuum tanker	If a vacuum tanker is used for emptying, the faecal sludge is pumped to the tank on the truck. Thus, the tanker functions as emptying and transport technology.
Bakkie or other small vehicles (e.g., tuk tuk, tractor with trailer)	Other vehicles can be used to transport faecal sludge, as long as the sludge is placed in bins with tight-fitting lids or another type of sealed container.

**Table 4: Typical treatment options for faecal sludge**

Treatment Option	Notes on context/use
Faecal sludge treatment plant	<ul style="list-style-type: none"> <li>Designed specifically to handle faecal sludge.</li> <li>Just like WWTPs, Faecal Sludge Treatment Plants (FSTPs) should be designed based on the specific quantity and characteristics of the faecal sludge to be treated.</li> <li>Typical treatment processes used in FSTPs include, inter alia, anaerobic digestion, drying beds, composting, and constructed wetlands (to treat liquid fraction).</li> </ul>
Co-treatment in wastewater treatment plant (WWTP)	<ul style="list-style-type: none"> <li>If the WWTP has spare capacity, faecal sludge can potentially be co-treated.</li> <li>For liquid faecal sludges (e.g., those from container toilets), the faecal sludge is typically discharged at the headworks of the WWTP after initial screening of the faecal sludge to remove foreign material</li> <li>For dryer sludge, there may be options for adding it to the sludge treatment stream, again following screening to remove foreign material. Dry sludge from systems like VIP toilets should typically not be added at the WWTP headworks, because it is entirely different from wastewater and can inhibit and even damage the WWTP process.</li> </ul>

Treatment Option	Notes on context/use
Faecal sludge treatment units	Innovative technologies are in development which treat faecal sludge within a single unit. These could be understood as similar to package wastewater treatment plants, but for faecal sludge. The technologies use different processes to treat faecal sludge and vary in terms of required energy input and final output from the process.

**Table 5: Typical disposal and end-use options for faecal sludge**

Disposal/End-Use Option	Notes on context/use
Deep row entrenchment	<ul style="list-style-type: none"> <li>• Burial of faecal sludge in pits/trenches and covering with at least 300mm soil to prevent pollution and exposure.</li> <li>• Can be done safely onsite if the site has low groundwater contamination risk and is appropriate for soakaway and/or lined pits with open joints. Can also be done at a designated site which is appropriate for burial.</li> <li>• Buried sludge can support trees/plants and thus contribute to the circular economy.</li> </ul>
Agricultural products	<ul style="list-style-type: none"> <li>• Faecal sludge contains organic matter and nutrients that can be helpful for farming and agriculture.</li> <li>• Faecal sludge that is treated to remove pathogens can provide agricultural products such as compost, soil amendment, and fertiliser. This depends on the specific treatment processes used.</li> </ul>
Energy	<ul style="list-style-type: none"> <li>• Organic matter in faecal sludge also means that it can become an energy source in the form of, e.g., biogas or briquettes.</li> </ul>
Building materials	<ul style="list-style-type: none"> <li>• It is also possible to produce bricks/blocks out of treated faecal sludge. This process is still at the research stage and has not reached a commercial level.</li> </ul>



*Deep row entrenchment of faecal sludge is one disposal option.*

The appropriate technologies for each stage above will depend on several factors including, among others, water availability, sanitation practices, faecal sludge characteristics, site characteristics such as groundwater table and soil type, and demand for products. These can be considered at each stage of the service chain in order to design a complete system that is appropriate for a given area and community.

## WHAT DO WE KNOW ABOUT THE COSTS OF FAECAL SLUDGE MANAGEMENT?

Because FSM services have not been provided systematically across most of South Africa, very little is known about the actual costs to provide this service. The WRC project included a total of five case studies focusing on the management of sludge from onsite sanitation systems. Within some case studies, multiple different scenarios were relevant, leading to a total of eight data points. These are summarised below, including a description of the data received.



**Table 6: Summary of case studies with cost data on faecal sludge management**

Study no.	Approach description	Containment	Emptying	Transport	Treatment	Disposal/Beneficial Use	Data provided
5	Container toilets in a Metro, emptied 4x per week with sludge delivered to the WWTP headworks	✓	✓	✓			Only cost of emptying and transport provided, plus cost for janitorial services
10	Urine diverting dehydration toilets (UDDT) emptied 2x per year, faecal sludge delivered to a treatment facility to produce a soil conditioner	✓	✓	✓	✓		Actual costs from company doing emptying and treatment. Product given away for free
11a	VIP toilets emptied manually or with Pitvaq, sludge disposed of safely on site through deep row entrenchment (DRE)		✓			✓	Rates for emptying and disposal
11b	VIP toilets emptied manually or with Pitvaq, sludge transported to farm where composting takes place		✓	✓			Rates for emptying and transport (excludes treatment cost)
12a	UDDT toilets emptied manually and sludge disposed of through DRE, including a tree planted	✓	✓			✓	Rates for emptying and disposal, including health and safety, and fruit trees
12b	UDDT toilets emptied manually and sludge disposed of through DRE, excluding tree	✓	✓			✓	Rates for emptying and disposal, including health and safety
13a	UDDT toilets emptied manually, sludge transported to black soldier fly (BSF) treatment (income generated from protein and oil)	✓	✓	✓	✓	✓	Contract rates for emptying, plus OPEX for treatment and projected income

Study no.	Approach description	Containment	Emptying	Transport	Treatment	Disposal/ Beneficial Use	Data provided
13b	UDDT toilets emptied manually, sludge transported to black soldier fly (BSF) treatment (no income generated)	✓	✓	✓	✓		Contract rates for emptying, plus OPEX for treatment and projected income

The costs of the above approaches are summarised below, showing the cost per household served per year.

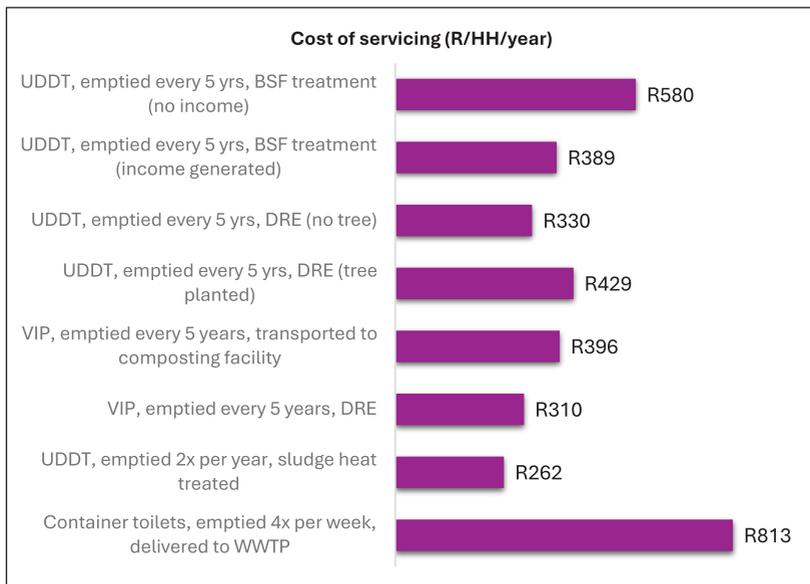


Figure 1: Costs for different FSM solutions per household, averaged per year, reported in case studies (R/HH/yr)

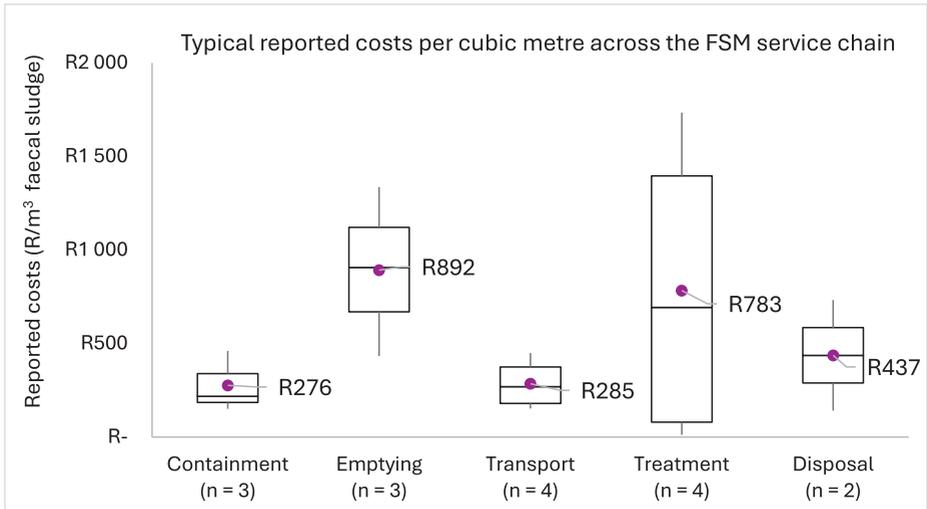


Figure 2: Typical reported costs for various aspects of the FSM service chain

Table 7: Cost ranges for different aspects of FSM, based on case study data

	Range (R/m <sup>3</sup> )	Median (R/m <sup>3</sup> )	Average (R/m <sup>3</sup> )
<b>Containment (n = 3)</b>	R151 – R 460	R218	R276
<b>Emptying (n = 3)</b>	R433 – R1 336	R907	R892
<b>Transport (n = 4)</b>	R152 – R449	R269	R285
<b>Treatment (n = 4)</b>	R11 – R1 734	R697	R785
<b>Disposal (n = 2)</b>	R141 – R733	R437	R437
<b>Reuse cost (n = 1)</b>		R475	R475
<b>Income (n = 1)</b>		R907	R907
<b>TOTAL (n = 8)</b>	<b>R822 – R2 573</b>	<b>R1 762</b>	<b>R1 771 (± R578)</b>

## CONTAINMENT

Containment is the first part of the sanitation service chain, relating to the toilet and storage of faecal sludge on site before emptying. Various activities relating to containment were described in the case studies, including janitorial services for communal toilets, household education, and fixing aspects of containment (e.g., panels/access hatches). The reported costs were normalised per cubic metre (m<sup>3</sup>) of faecal sludge, and these are presented in Table 8.

**Table 8: Reported ‘containment’ costs for on-site sanitation systems**

Description	Reported rate (R/m <sup>3</sup> )	Case study ref.
Janitorial services for container toilets	R460	5
Household education and management	R151	10
Re-attachment of back panels to urine-diverting dehydrating toilets	R218	12/13

## EMPTYING

Costs of emptying were provided in three different case studies. Two of them involve manual emptying of urine diverting dehydration toilets (UDDTs), while the other is for manual or semi-mechanised emptying of VIP toilets. The reported costs per cubic metre are presented in Table 9. The reported costs range from R433 to R1 336 per cubic metre. The lowest cost reported was for a municipal contract for emptying 50 000 UDDTs, and this likely points to the economies of scale in comparison to the other two rates from much smaller-scale operations.

**Table 9: Reported emptying costs for on-site sanitation systems**

Description	Reported rate (R/m <sup>3</sup> )	Case study ref.	Note(s)
Manual emptying of UDDTs	R907	10	Cost to service provider
Manual / semi-mechanised emptying of VIP toilets	R1 336	11	Rate charged to households
Manual emptying of UDDTs	R433	12/13	Municipal contract rate



*A latrine being emptied manually.*

## TRANSPORT

Transport of faecal sludge was provided in 4 case studies. The average rate for transport of faecal sludge was R285 per cubic metre, with a range from R152 to R449 per cubic metre. Considering transport distance, the average cost is R18.94/m<sup>3</sup>/km. Again, the two lowest cost options per kilometre are the options with the largest scale operation.

**Table 10: Reported transport rates for faecal sludge**

Description	Reported rate (R/m <sup>3</sup> )	Distance (avg.)	R/m <sup>3</sup> /km	Case study ref.
Vacuum tanker transport of chemical toilet sludge to WWTP	R350	34	R10.29	5
Tuk tuk transport of dried sludge to processing facility	R152	4	R38.10	10
Bakkie with sealed bins for faecal sludge on back	R449	25	R17.95	11
Bakkie with sealed bins for faecal sludge on back	R189	20	R9.43	13

## TREATMENT

Treatment costs vary widely depending on the actual treatment process utilised. The costs presented below exclude capital costs and only represent operational expenses. The faecal sludge treatment costs provided in this study are presented in Table 11.

**Table 11: Reported costs for faecal sludge treatment**

Description	Cost (R/ m <sup>3</sup> )	Case study ref.	Notes
Treatment of container toilet waste in WWTP	R12	5	Production cost from WWTP assumed, as the sludge is added at the WWTP headworks (Green Drop 2022)
Solar heat drying in a stainless-steel bin to produce soil conditioner	R1 283	10	Includes cost of land rental for treatment facility, running costs, and workers' salaries
Treatment in Black Soldier Fly treatment facility	R1 734	13	Total operational expenses

## DISPOSAL

Disposal on site was reported in two case studies, and both involved on-site disposal at the household level. In both cases, faecal sludge was buried on site through deep row entrenchment (DRE), which simply involves burying sludge in a trench or hole and covering it with soil. The reported rates for DRE are presented in Table 12. The average cost for disposal from these two case studies is R437 per cubic metre of faecal sludge.

**Table 12: Reported rates of faecal sludge disposal**

Description	Reported rate (R/ m <sup>3</sup> )	Case study ref.	Note(s) on costs
Burial of VIP sludge at household	R141	11	Deep row entrenchment (DRE)
Burial of UDDT sludge at household	R733	12	Deep row entrenchment (DRE)

## REUSE

Reuse of faecal sludge can come with costs and potentially income. Two cases provided costs/income for faecal sludge reuse. These are described below. In addition, Case Study 10 includes the beneficiation of faecal sludge to a soil conditioner, but the product is given away for free to the community and so there is no income received.

Planting a fruit tree on buried sludge can allow a household to reap benefits from buried sludge. Case study 12 included DRE and planting of a fruit tree at a cost of R475/m<sup>3</sup>.

The Black Soldier Fly (BSF) treatment used in Case Study 13 produces two products with potential for income generation, namely, protein and oil, both of which can be used in animal feeds. Assuming there is a market for these products, the potential income generation from these products is R907/m<sup>3</sup>. This can offset the operational expenses for the treatment process.





## HOW CAN ONE BUDGET FOR FAECAL SLUDGE MANAGEMENT?

How does one start to budget for faecal sludge management, especially when no systems are in place and the limited cost information available is so variable? This is difficult to answer, because the appropriate options will be based on the specific context, and also the cost of the options will vary based on specific factors. Ideally, the full sanitation service chain for FSM services is planned from the beginning, including toilet type, emptying, transport, treatment, and disposal/reuse. Treatment systems would be designed based on the desired disposal or reuse option. The reality in South Africa is that sanitation coverage is wide, and many communities are using on-site sanitation systems, but no plan is in place for the rest of the service chain. Thus, the starting point in most cases will be the existing sanitation systems.

The following steps can start to illuminate which options are possible and how to start setting aside budget for FSM:

- 1. Know what systems exist that produce faecal sludge and where they are located:** This will require data collection in communities served by on-site sanitation systems. The type(s) of information that should be collected include:
  - Toilet and containment type.
  - Condition of the toilet and containment.
  - Fullness of the containment, and characteristics of the faecal sludge if feasible
  - Estimate the faecal sludge to be handled each year, based on approximate sludge accumulation rates, population, and containment sizes.
  - Access characteristics including, e.g., space, road access, distance to key landmarks such as WWTP.

- 2. Determine possible options for FSM based on the assessment:** Assess each stage of the service chain to identify which option(s) may be appropriate:
- Emptying and transport: Is the sludge dry and diggable or wet and pumpable? What equipment do you or contractors already have available?
  - Treatment: Does the WWTP have spare capacity to co-treat faecal sludge? Is there unused land or facilities at the WWTP that can be used to treat or dispose of faecal sludge? Is the WWTP too far from the households with on-site systems? Is land available that could be used for a designated faecal sludge treatment facility?
  - Reuse: Is there demand for faecal sludge by products? Is there a private partner who is interested in beneficiating the sludge?
  - Disposal: How big are individual plots, and is there sufficient space for on-site deep row entrenchment? If so, is this appropriate in terms of the DWS groundwater protocol? Is there land available to establish a designated disposal/sludge burial site? Is there demand or opportunity for beneficiating by planting trees over buried sludge?
- 3. Compare the approximate costs of the options:** The provided costs for options in this study have been used as the basis for comparing different options for FSM, and costs have been converted to approximate cost per household, to assist with calculating an actual budget amount. The approximate costs for options included in this study are summarised below in Table 13.

**Table 13: Approximate cost of FSM options presented in this study (R/HH/yr)**

Description	Approximate cost (R/household/yr)	Case study ref.
Container toilets, emptied 4x per week, delivered to WWTP	R813	5
UDDT, emptied 2x per year, sludge heat treated	R262	10
VIP, emptied every 5 years, DRE	R310	11a
VIP, emptied every 5 years, transport off site	R396	11b
UDDT, emptied every 5 yrs, DRE (tree planted)	R429	12a
UDDT, emptied every 5 yrs, DRE (no tree)	R330	12b
UDDT, emptied every 5 yrs, BSF treatment (income generated)	R389	13a
UDDT, emptied every 5 yrs, BSF treatment (no income)	R580	13b

**4. Implement a user-education campaign to improve sludge quality:** One aspect that impacts downstream treatment, whether in a WWTP or designated treatment facility, is foreign material in faecal sludge. Many households use their on-site toilets to dispose of solid waste and other items, which generally must be removed before treatment and beneficiation. Investing in a user-education campaign can lead to lowering costs of FSM, both in terms of extending the life of on-site containment systems and reducing the cost of treatment.

## A TOOL FOR ESTIMATING FSM COSTS

The “FSM options” MS Excel spreadsheet has been prepared to assist with budgeting and comparison of different options based on the type of on-site toilet(s). Specifically, the following toilet types are considered:

- Container/ Chemical toilets
- VIP (open joint)
- Plain pit (open joint)
- Urine diverting toilets (sealed containment)
- Composting toilets (sealed containment)
- Flush with septic tank to soakaway
- Flush with conservancy tank (sealed) (no greywater)
- Flush with conservancy tank (sealed) (incl. greywater)

For each of the above toilet types, two different options are considered. These are shown in Table 14, along with the assumed average sludge accumulation rate.

**Table 14: Options included in Faecal Sludge Management options spreadsheet**

Description	Avg sludge accumulation rate used (ℓ/ person/yr)	Option 1	Option 2
Container/chemical toilets with mechanised emptying	550	Transport to and treatment in WWTP	Transport to and treatment in FSTP

Description	Avg sludge accumulation rate used (ℓ/ person/yr)	Option 1	Option 2
Dry toilets with open joints (e.g., VIPs) with manual emptying	40	On-site burial	Transport to and treatment in FSTP
Dry toilets with sealed containment (e.g., UDDTs) with manual emptying	50	On-site burial	Transport to and treatment in FSTP
Septic tanks with soakaway, with mechanised emptying	30	Transport to and treatment in WWTP	Transport to and treatment in FSTP
Sealed conservancy tanks (blackwater only) with mechanised emptying	5475 (incl. water due to sealed containment)	Transport to and treatment in WWTP	Transport to and treatment in FSTP
Sealed conservancy tanks (black and greywater) with mechanised emptying	25 550 (incl. water due to sealed containment)	Transport to and treatment in WWTP	Transport to and treatment in FSTP

The user is prompted to enter the following information about the community:

1. No. households
2. Type of toilets (technology and communal/household)
3. Typical containment volume in cubic metres
4. Number of households per toilet
5. Average household size

Enter data about the community

<b>No. Households</b>	500
<b>Sanitation characteristics</b>	
Communal/household toilets	Household
Toilet type	VIP (open joint)
Typical containment volume (m <sup>3</sup> )	1.5
No. households per toilet (avg)	1
Average household size (no. people)	5

Based on the selected toilet type, containment size, and number of households/people, the approximate volume of faecal sludge generated each year is calculated, along with the required emptying frequency and volume to be removed during emptying. Three scenarios are included, namely, average sludge accumulation, high sludge accumulation, and excessive sludge

accumulation due to high trash/foreign material content.

	Approx. m <sup>3</sup> sludge/yr	Required Emptying Frequency	V removed each emptying period (m <sup>3</sup> )
Average sludge accumulation	100.0	6.0 Years	600
High sludge accumulation	150.0	4.0 Years	600
Excessive trash	200.0	3.0 Years	600

Based on the above calculations and toilet type, the approximate budgets for options 1 and 2 are calculated. The final outputs are shown in the figures on the right.





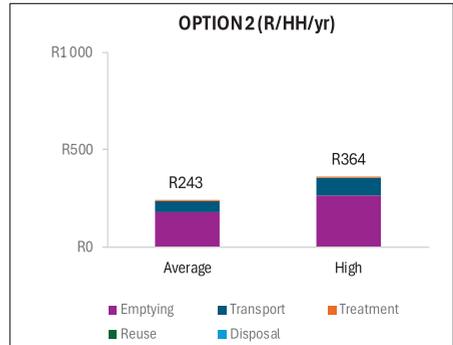
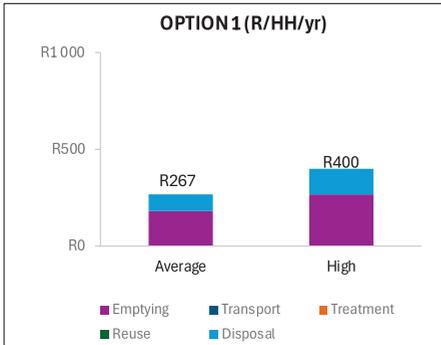


Figure 4: Example output showing estimated cost per household per year for options 1 and 2 described in example above

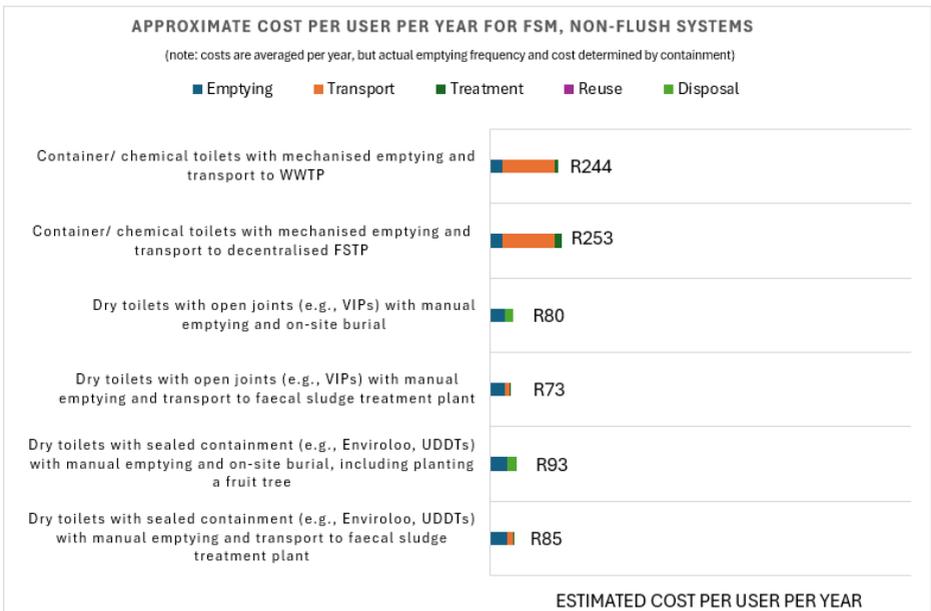


Figure 5: Estimated cost per user per year, for non-flush toilets

## FURTHER READING

- CAWST, Introduction to faecal sludge management, 2016, [https://www.fsmttoolbox.com/assets/pdf/35.Sanitation\\_TB\\_Intro\\_to\\_FSM\\_2016-07\\_en.pdf](https://www.fsmttoolbox.com/assets/pdf/35.Sanitation_TB_Intro_to_FSM_2016-07_en.pdf)
- DWS, National faecal sludge management policy, 2023, <https://www.dws.gov.za/Documents/PRINTERS%20FINAL%20=%20FSM%20Strategy%202023.pdf>
- E. Tilley et al, *Compendium of Sanitation Systems and Technologies (Second edition)*, <https://iwa-network.org/wp-content/uploads/2016/06/Compendium-Sanitation-Systems-and-Technologies.pdf>
- Partners in Development, Guidelines for deep row entrenchment of faecal sludge and secondary wastewater sludge (**WRC report no. TT 880/22**), <https://wrcwebsite.azurewebsites.net/wp-content/uploads/mdocs/TT%20880%20final%20web%20NEW.pdf>









WATER  
RESEARCH  
COMMISSION