

SANITATION

From Excreta Flow Diagrams to Brown Drop?

Sue Matthews investigates the potential of SFDs, and what they might mean for South Africa's sanitation revolution.

Ashraf Hendricks/Groundup



It's a term that gets people's attention, and leaves little to the imagination – Shit-Flow Diagrams. Nowadays, they're typically referred to by the acronym SFDs or the more socially acceptable Excreta Flow Diagrams, but the intention is the same – to increase understanding of how faecal waste moves through a city or municipal area, from containment at the point of origin to final disposal or reuse. They're seen as an innovative tool for identifying areas of concern and engaging with stakeholders on sanitation issues, presenting information often considered taboo in an easy-to-visualise way.

An early version was used by the World Bank's Water and Sanitation Programme in an analysis of faecal sludge management carried out in 12 cities in Latin America, Africa and Asia in 2012/13. Subsequently, the tool was developed further,

tested and rolled out as part of the SFD Promotion Initiative, funded by the Bill and Melinda Gates Foundation. A web portal containing background information, training materials, an SFD graphic generator, templates for SFD reports and a database of completed reports is now hosted by the Sustainable Sanitation Alliance at <https://sfd.susana.org>.

South Africa's first SFD was for the city of Durban and the surrounding eThekweni area, created in 2016 by Master's student and intern, Xanthe Cross, together with Prof Chris Buckley of the University of KwaZulu-Natal's Pollution Research Group. By that time, the Water Research Commission (WRC) was wrapping up its Sanitation Research Fund for Africa (SRFA) programme, established in 2012 with the aim of stimulating research and increasing capacity around 'dry' – as opposed to waterborne –



All four of the Eastern Cape municipalities that attended the initial SFD training workshop in August 2018 opted to participate in the project.

sanitation. It comprised 12 projects from Eastern and Southern Africa on pit latrines, with half focusing on understanding the contents of pits and the biological degradation processes taking place within them. The rest sought to develop techniques for emptying the pits – a task that is typically difficult, messy and potentially dangerous – and managing the faecal sludge.

The WRC had already built up a body of knowledge of the subject through various research projects, including Project No. K5/1745, published as a three-volume report titled 'Tackling the challenges of full pit latrines' in 2012 (**WRC Report no. 1745/1/12 to 1745/3/12**), the same year it co-hosted the 2nd International Faecal Sludge Management Conference. The SFRA programme was intended to allow sharing of this knowledge beyond South Africa's borders while also learning from other countries' experience. Like the SFD Promotion Initiative, the SFRA programme was funded mainly by the Bill and Melinda Gates Foundation, although the WRC contributed towards the South African projects.

Even today, according to the findings of Statistics South Africa's 2019 General Household Survey, only 60% of households countrywide have flush toilets connected to the waterborne sewerage system. Most of the rest rely on pit latrines, more than half of these being the 'improved' type with a ventilation pipe. As government focused on the mass roll-out of these so-called 'VIP' latrines as part of its commitment to providing basic services, little planning went into maintaining and servicing the existing latrines, which tend to fill up faster than expected. And while people in rural areas historically just dug a new pit and moved their 'outhouse' over it, this is not possible in poor urban areas, due to space constraints between densely packed dwellings.

Since full pits pose a hazard to human health and the environment, latrines remained high on the WRC's agenda following the completion of the SFRA programme. So it was a natural next step to host a workshop on SFDs in September 2017, facilitated by the Centre for Science and the Environment (CSE), India – one of the implementing parties of the SFD

Promotion Initiative.

The following year, the WRC initiated the research project Country-wide Shit-Flow Diagram: Establishing National Excreta Flows in South Africa (**WRC Project No. K5/2813**). The project, which came to an end in mid-2020, was awarded to Stellenbosch-based Emanti Management, but conducted in the Eastern Cape and KwaZulu-Natal. Initially, a training workshop attended by sector stakeholders was held in each of these two provinces. Four of the five municipalities that attended the KwaZulu-Natal workshop opted to participate in the project, as did all four of the municipalities that attended the Eastern Cape workshop.

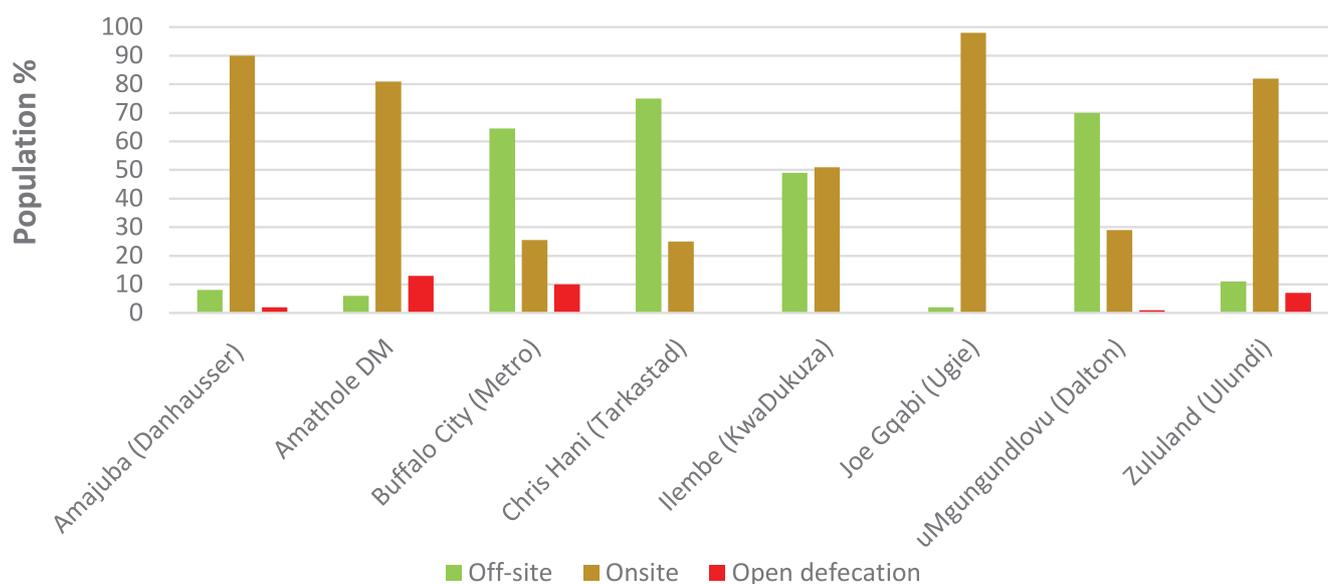
More focused workshops were then held at each of these municipalities, where the area for which an SFD would be developed was agreed upon, additional data was collected – the project team having gathered some existing data prior to the workshop – and a first-order SFD graphic developed on the basis of the available information. After the workshops, the project team went on a field visit with the municipal representatives, and then continued interacting with them over the following months to close information gaps, write a draft SFD report and finalise it on the basis of feedback received.

The SFD process allows for reporting at various levels of detail, from a 'Lite' report based on the first-order SFD graphic to Initial, Intermediate and Comprehensive reports. All address service outcomes in terms of the quantity of faecal sludge produced, but differ on the data collection needed on aspects such as policy, institutional roles, investment and equality considerations.



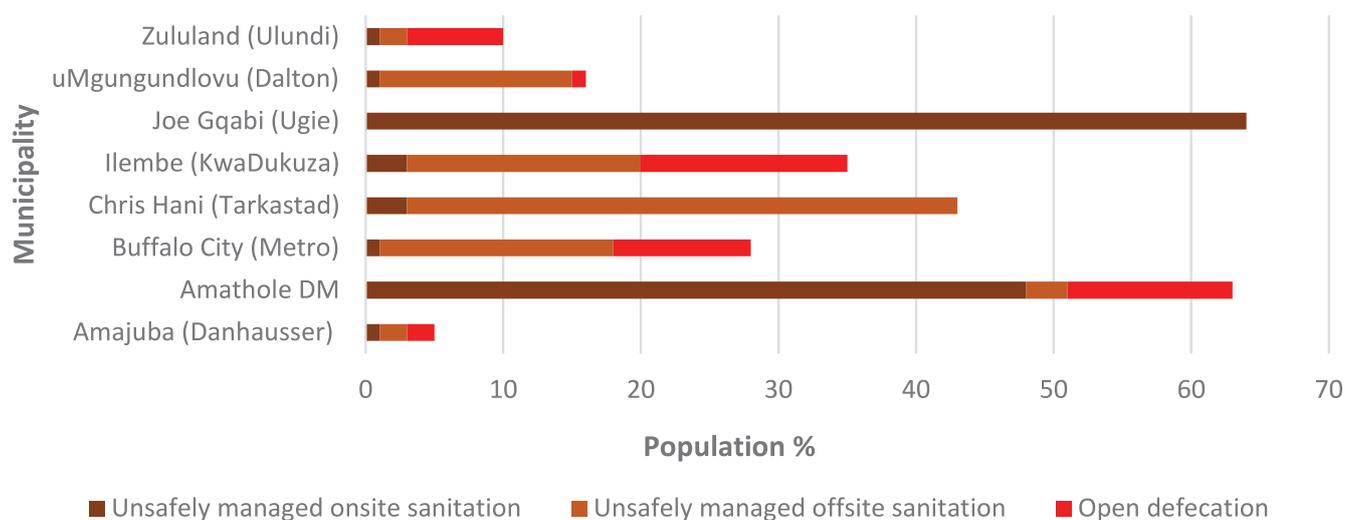
The Emanti project team toured sanitation facilities with municipal representatives following each data-collection workshop.

Sanitation facilities



Collated results from the SFDs revealed that 36% of the population of the eight participating municipalities is dependent on onsite sanitation systems such as pit latrines and septic tanks, while 4% defecate in the open or have no sanitation facilities.

Sanitation management in the participating municipalities



Unsafely managed onsite sanitation is primarily due to a backlog in emptying full pits, which results in people abandoning them and building new pits, or resorting to open defaecation.

Since comprehensive reports require quite extensive stakeholder engagement as well as primary data collection through direct measurements and field observations at sanitation service facilities, these were beyond the scope of the project. Adaptations were also made to the standard report format to suit South African conditions and comply with requests from the municipalities, so the completed reports fall somewhere between the Lite and Intermediate levels.

One of the adaptations was the addition of a table showing the

status of treated sludge at wastewater treatment works within the municipalities, including the quantity produced per day and the percentage that was acceptable for intended use without further treatment. The SFD tool's failure to address what happens to sludge after treatment, in terms of either disposal or reuse, was seen as a shortcoming.

Municipal officials also recognised that SFD reports could help motivate for better budget allocations needed to take remedial action on existing sanitation issues, and plan ahead for future



Participants at the SFD and FSM Toolbox training and feedback workshop in East London discuss an Excreta Flow Diagram.

ones. A Future Scenario SFD graphic was therefore included to show what would happen if strategies were not put in place for effective faecal management, and a template for a Remedial Action Plan is under development. The latter will make use of two other internationally developed tools, the FSM Toolbox and REVAMP.

The FSM (faecal sludge management) Toolbox, yet another product of the Bill and Melinda Gates Foundation, is a web platform with resources to assist the sanitation sector in undertaking assessments – including estimating the faecal sludge produced within an area – and planning interventions. Its City Service Delivery Assessment (CSDA) can be integrated with the SFD, while the planning tools include offerings for infrastructure planning, stakeholder engagement and business model selection.

The REVAMP (resource value mapping) tool, originally developed by the Stockholm Environment Initiative, allows the resources that can be recovered from faecal sludge, sewage sludge, food waste and other organic waste to be estimated and valued using an MS Excel-based model. Options for resource recovery include the production of biogas, briquettes, soil conditioner and black soldier fly prepupae, which provide a protein-rich animal feed or can be used to make biodiesel.

In their project report, the Emanti team note that REVAMP and the FSM Toolbox present an opportunity for a paradigm shift in sanitation system investments. Rather than being seen simply as a means to contain and dispose of excreta, sanitation systems can generate revenue to help cover operational costs while also providing scarce resources such as energy and agricultural inputs.

The REVAMP tool was tested with eThekweni Municipality, but a lack of data meant that the outputs were unreliable. The municipality could estimate the total solid waste generated per year, but not the percentage organic waste, and does not

keep records on the faecal and sewage sludge generated. The same applies to other municipalities – indeed, during the workshops the municipalities had identified the lack of monitoring of vacuum trucks, typically called honeysuckers, as a major challenge. Nevertheless, the project team noted that the REVAMP tool could complement the SFDs and prove very useful should data collection be improved.

At the two feedback workshops held in East London and Durban in the latter half of 2019, information from the completed SFD reports was discussed, and participants were given training on the FSM Toolbox. This was very well received, based on the overwhelmingly positive comments from participants on the course evaluation questionnaires.

The end of this project is just the beginning of a much broader roll-out of SFD awareness-raising by the WRC and its partners. With the start of Phase 3 of the SFD Promotion Initiative in September 2019, the WRC partnered with CSE to scale up implementation of the SFD approach in Africa as a whole. This is seen as an important step towards bridging data gaps necessary for monitoring safely managed sanitation – and hence achieving Sustainable Development Goal 6.2 – and for improving sanitation planning. On April 2020, the WRC and CSE co-hosted a webinar on ‘Mainstreaming SFD into practice in Africa’, which was attended by 90 invited participants.

More recently, the WRC has articulated that its intention when introducing the SFD approach to South Africa was to catalyse the establishment of a Brown Drop programme for non-sewered sanitation systems, to complement the existing Green Drop system for wastewater systems and Blue Drop for drinking-water systems.

In their Working Paper titled ‘Towards establishment of the Brown Drop – A regulatory platform in managing excreta flows in South Africa’, Sudhir Pillay and Jay Bhagwan explain that the WRC aims to achieve critical mass of SFD reporting, close the knowledge-practice for SFD reporting and facilitate the buy-in of the SFD as a regulatory mechanism. They highlight the urgent need for effective management of sanitation infrastructure, rather than reactive operations.

“The facilitation of the Brown Drop certification system will alleviate a long-term crisis and ticking time bomb with regards to regular servicing, O&M as well as giving the necessary attention to sanitation services that will ensure sustainable services, longevity of investments and protection of public health and the environment,” they conclude. “The Brown Drop also offers several opportunities for creation of new jobs through infrastructure audits, and possibilities to explore circular economy approaches to sanitation.”



To obtain the report, *Country-wide Shit-Flow Diagram: Establishing national excreta flows in South Africa (WRC Report No. TT 825/20)* Visit: http://wrcwebsite.azurewebsites.net/wp-content/uploads/mdocs/TT%20825%20Main%20report_Final%20Edits_web.pdf