Review Paper

Fecal sludge management (FSM): analytical tools for assessing FSM in cities

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ABSTRACT

This paper describes the results of a research study which aimed in part to develop a method for rapidly assessing fecal sludge management (FSM) in low- and middle-income cities. The method uses innovative tools to assess both the institutional context and the outcome in terms of the amount of fecal sludge (FS) safely managed. To assess FSM outcomes, a FS matrix and accompanying flow diagram was developed to illustrate the different pathways FS takes from containment in water closets, pits and tanks, through to treatment and reuse/disposal. This was supplemented by an FSM service delivery assessment tool which measures the quality of the enabling environment, the level of service development and the level of commitment to service sustainability. The tools were developed through an iterative process of literature review, consultation and case studies. This paper considers previous work done on FSM, suggest reasons why it is often neglected in favor of sewerage, and highlights the importance of supporting the increasing focus on solving the FSM challenge. The tools are presented here as useful initial scoping instruments for use in advocacy around the need for a change in policy, funding, or indeed, a city's overall approach to urban sanitation.

Key words | fecal sludge management, institutions, low-income countries, sanitation, service/value chain, urban

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INTRODUCTION

Why is fecal sludge management (FSM) important?

Globally, a huge number of people rely for their sanitation on non-sewered systems which generate a mix of solid and liquid wastes generally termed 'fecal sludge' (FS). FS is the general term given to undigested and partially digested slurry or solids resulting from storage or treatment of black-water or excreta. FSM is the management of FS contained within non-sewered sanitation systems such as pit latrines and septic tanks. Non-sewered sanitation is also commonly referred to as on-site sanitation because the containment facilities are situated within the plot occupied by a dwelling or its immediate surroundings. In contrast, wastewater management is concerned with sewered sanitation only (Eawag/Sandec 2008).

Particularly in low-income and rapidly expanding cities, FS represents a growing challenge, generating significant negative public health and environmental risks. Without proper management FS is often allowed to accumulate in poorly designed pits, or is discharged into storm drains and open water, or is dumped into waterways, wasteland and insanitary landfill sites. Only a small percentage of FS is managed and treated appropriately.

The problem is significant for many cities. International data, reported by Joint Monitoring Programme (JMP), show that an increasing proportion of urban dwellers now have

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access to improved sanitation (UNICEF/WHO 2012). However, this conceals three important points:

- First, in developing countries urban sanitation access is achieved mostly through on-site sanitation systems. For instance, in Sub-Saharan Africa among utilities serving the largest cities, only half of them report operating a sewerage network at all and most of these serve less than 10% of the population (Morella *et al*. 2009). More than half of urban Africans rely on traditional latrines, and 8% have no toilet at all.
- Second, poorer people are typically heavily reliant on informal or unmanaged on-site systems. Figure 1 shows how urban people in Sub-Saharan Africa access sanitation; more than half of the poorest 20% rely on unimproved sanitation or have no toilet at all. Even in regions doing relatively well in terms of overall access, for instance in Latin America and the Caribbean (LAC), there is still a substantial reliance on unplanned on-site systems and even some open defecation in many cities (nearly two million urban Brazilians practice open defecation for example, and a further 28 million rely on unimproved or shared toilets (UNICEF/WHO 2012)). In all regions inadequate and *ad hoc* services are concentrated in slums and informal settlements (Morella *et al*. 2009; IBNET 2013).
- Third, the fecal waste from the on-site sanitation facilities rarely reaches a treatment facility for safe reuse or disposal; in general, safe management of fecal waste downstream of the household is severely neglected. This is true even where households have what is termed an 'improved' toilet.

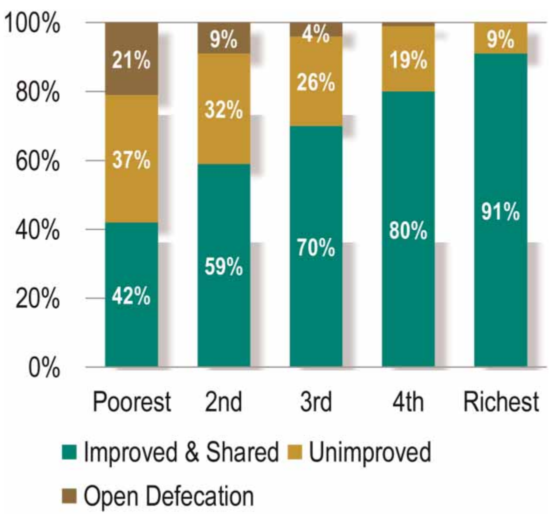

Figure 1 | Urban sanitation in Sub-Saharan Africa by wealth quintile. Source: UNICEF/WHO (2012).

In summary, in many 'poor' cities across Africa, Asia, and LAC improving sanitation is predominantly a matter of FSM but crucially few cities have the management structures, institutional arrangements, infrastructure, skills, or financial systems to deliver these services and it consequently remains a significant but largely neglected and ignored challenge.

Previous work on FSM

The international sanitation community has focused considerable effort on addressing the FSM challenge; recent notable work includes research by Eawag/Sandec into excreta and wastewater management (see Eawag/Sandec (2013)) in various locations, including Burkina Faso, Ghana, Mali, Senegal, and Vietnam (Strauss *et al*. 2006; Strande 2012). Similarly, research by universities in USA and Europe on a broad range of technical issues is ongoing; but until field-testing in realistic market conditions is undertaken, the usefulness of this work remains unknown. In addition, organizations such as Water and Sanitation for the Urban Poor (WSUP) and Water for People currently support initiatives in an increasing number of cities (see WSUP (2013) and Water for People (2013)). The Bill and Melinda Gates Foundation has provided much of the funding for this work, including a ten-country study on business models for emptying, and transportation services in Africa and Asia (see Chowdhry & Kone (2012)). Another notable study is USAID's seven-country review of septage management in Asia (see USAID (2010)).

In general, the broad focus of these initiatives is on the need for

- solutions to the challenge of emptying badly designed pits, septic tanks, and other containers;
- improved management of pit emptying;
- institutionalize collection and transport processes;
- business models for FSM;
- more appropriate treatment systems and capacity; and
- the need for improved reuse of treated FS.

Overall, much of this work focuses on specific technical interventions with limited analysis on the overall status of FSM on a global scale or of providing an understanding of how the challenges vary from city to city. For instance, a key observation made by practitioners at the October, 2012 Fecal Sludge Management Conference (FSM2) organized by the Water Research Commission in Durban, South Africa (SuSanA 2012), was that despite the fact that most of the presentations and discussion at the conference centered around scientific and technical issues, it is the underlying policy, regulatory, institutional and financial issues which need to be addressed if FSM is to be improved. Indeed, a recent Water and Sanitation Program (WSP) Urban Sanitation Scoping Study observes that 'In addition to the need for including and coordinating the many diverse stakeholders in urban sanitation … several technical issues must be resolved to enable the delivery of appropriate services to poor communities. These include developing at-scale FSM services for peri-urban, dense, and informal settlements' (Hawkins *et al.* 2013).

Building on this, the Water and Sanitation Program's Urban Global Practice Team commissioned a study to examine global trends in FSM using 12 city case studies as a basis and to develop a methodology for rigorous global assessments of city level FSM performance. This paper describes the development of analytical tools to facilitate international benchmarking of FSM performance in cities.

METHODOLOGICAL APPROACH; TOWARDS AN ANALYTICAL FRAMEWORK

The outcome of this research was the development of two tools which, when taken together, provide an overview of the estimated status and challenges associated with FSM in a given city. In order to develop the tools the research team undertook several activities including

1. A review of both the academic and practice literature on the topic of FSM.
2. Semi-structured interviews and discussions with specialists in the field.
3. The development of a preliminary framework for analysis based on current knowledge.
4. A workshop with WSP staff and colleagues to further develop this framework for use in the analysis of FSM specifically. The output of this workshop was also subsequently further modified by the team on the basis of the findings from the literature.
5. Collection of secondary data from 12 cities including interviews with key informants in those cities in order to assess the availability of data, test and further refine the methodology.
6. Finalization of case studies and modifications to analytical tools where required.
7. Presentation of results and discussion with specialists and key informants in case study cities.

The comparative analysis of the case studies is presented in a second paper to be published shortly in this journal (Peal *et al.* forthcoming); in the following section the final tools are presented and discussed.

RESULTS

Existing tools

A small number of very high quality analyses have been done on FSM in specific cities. Two key ideas emerge from different strands of the literature. The first is the importance of understanding the scale of FSM outside of formal networked sanitation services. The development of simple mass-flow diagrams has been proposed on a number of occasions and some examples exist in the literature (Whittington *et al.* 1993; Scott 2011). However, this work has not been scaled up or formalized for wider use. The second idea relates to understanding the enabling environment, which promotes or hinders effective FSM.

The management of fecal wastes has a number of features in common with the management of solid waste. In particular, the International Solid Waste Association has highlighted the challenges and opportunities presented when informal and formal service provision exist side by side (see e.g. Velis *et al.* (2012) and Wilson *et al.* (2012)). Review of this work confirmed the value of both physical/technical analysis and institutional/enabling environment analysis to assess complex systems of waste management.

Interestingly in the early stages of this study the enabling environment analysis was seen by a number of key informants as the most important tool but it quickly became evident that it is almost impossible to understand the effectiveness of policy and investment decisions in the absence of information on how FSM performs across the entire sanitation process from collection to disposal.

These two strands therefore ultimately formed an equally balanced basis for the development of the FSM tools which are further described below.

Fecal waste flow matrix and diagram

The first step therefore was to develop a simple method to visualize how fecal waste physically flows through the system. For this purpose a fecal waste flow matrix and fecal waste flow diagram were developed to summarize an estimate of the net effect of the FSM system in each city. The matrix and diagram help to check on outcomes at the city level that are reported both in documents and by colleagues and key informants; they also clearly highlight the real bottlenecks to FSM. The fecal waste flows are estimated based on the estimated populations falling into each category of service. In this study we relied heavily on secondary data and partial analysis of sections of the system; all the data presented below could be improved by detailed primary data collection. The fecal waste flow diagram is similar to concepts developed independently by Scott (2011) in Dakar, Senegal, who uses the term 'sanitation cityscape' and also by Whittington *et al.* (1993) in Kumasi, Ghana.

An example fecal waste flow diagram is shown in Figure 2, for Dhaka, Bangladesh. In Dhaka a large percentage of fecal waste is generated in non-sewered systems. As it flows downstream, fractions of the waste drop out at various points and reach unsatisfactory disposal points – some through illegal dumping, some through defective treatment and also through defects in the sewerage system. In these flow diagrams the defects reported in the sewerage system are due to broken down pumping stations and

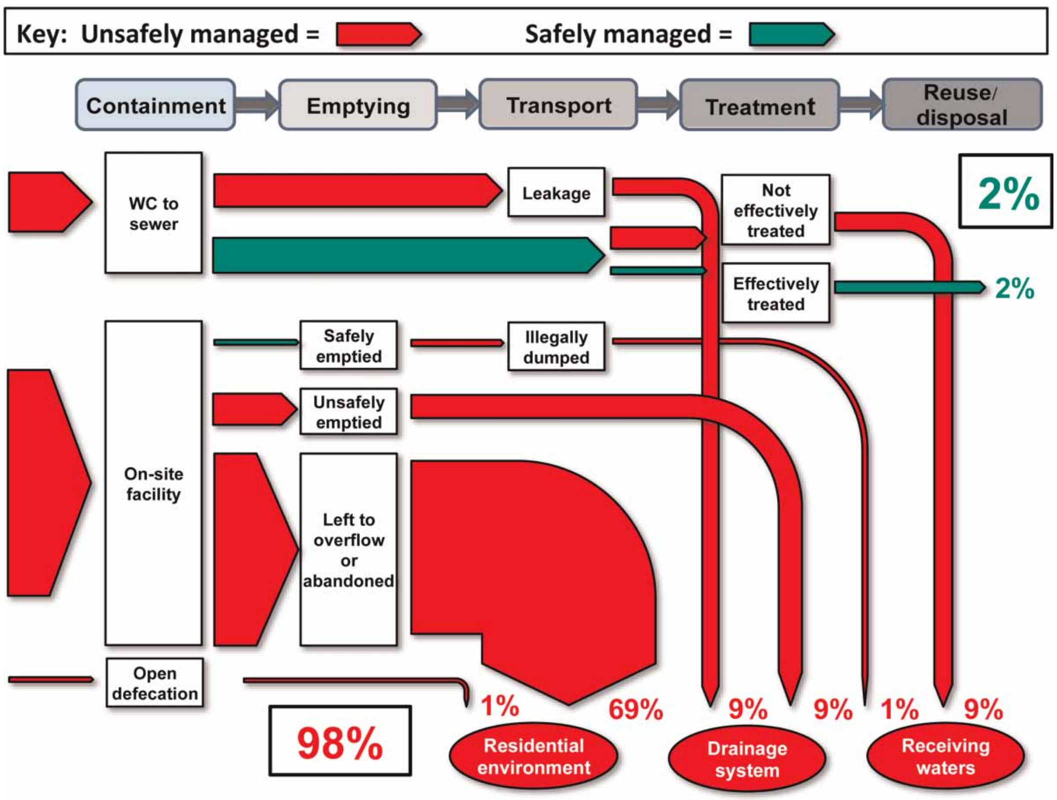

Figure 2 | Example of fecal waste flow diagram – this is for Dhaka, Bangladesh.

leakage from broken pipes. The defective treatment reported is: (a) where the installed capacity is insufficient so some waste is treated and some not at all; (b) where a generally defective treatment plant is operating well below its design capacity so waste is treated ineffectively; (c) a combination of (a) and (b).

The width of the bars in Figure 2 represents the proportion of FS at each step in the chain. The red shading represents unsafe management, and the green shading, effective management. In this case the system in Dhaka has failed, with all but a tiny proportion of the waste (from the sewerage system) entering the environment in an unregulated and uncontrolled manner. Fecal waste flow diagrams are based on tabulated data as illustrated in Table 1.

The fecal waste flow diagram provides a clear snap shot of the performance of FSM in a city. For example, Figure 3 shows the same analysis for Maputo in Mozambique.

The authors estimated that 1% of Maputo's 1.9 million residents practice open defecation while around 10% are connected to the city's sewer network. There is a lack of hygienic desludging services in Maputo: the majority of on-site sanitation is found in the poor peri-urban neighborhoods and these latrines are either emptied manually by individuals or by small-scale contractors with the sludge generally buried in the user's backyard, dumped in the drainage system or in the skips used for secondary collection of solid waste. The authors estimate that around 60% of non-sewered households carry out this practice and a much smaller percentage (around 20% of pits built by non-sewered households) are not emptied but are buried safely when they become full. Three-quarters of the mechanically emptied sludge is transported to treatment – the remainder being dumped illegally – but the level of treatment it receives is low. There is no dedicated FS treatment plant in Maputo although the discharge of FS to the Infulene wastewater treatment works stabilization ponds is permitted. However, even then the treatment of the waste that does reach the site is not guaranteed; the site is not maintained at all, and no monitoring is done to assess its effectiveness (Muxímpua & Hawkins 2011). Only 50% of the waste delivered to the site is treated effectively.

Overall, and making allowances for poor operation and maintenance of the sewer network and dysfunctional treatment, it is estimated that around 74% of the fecal waste generated in Maputo is unsafely reused/disposed of to the environment.

By contrast, the situation in Dumaguete in the Philippines is comparatively better (Figure 4).

There is no sewerage in this small city (population 120,000) and with an estimated 3% of the Philippines' urban population practicing open defecation (UNICEF/WHO 2012) the remaining 97% of households in Dumaguete use on-site sanitation.

The FSM system is relatively new (commenced in May 2010 (City Government of Dumaguete, no date a)) and complete data sets on FSM performance were not available. Robbins *et al.* (2012) report that the FSM system is designed so that all containment systems are emptied once every five years. Until the first full cycle has been completed it is difficult to fully assess level of service and how many households it is reaching. However, it is estimated that the system safely manages as much as 78% of the fecal waste generated (City

Table 1 | FS flow matrix for Dhaka, Bangladesh

Type of system	% of fecal waste	Of which: Safely collected	Safely delivered	Safely treated	Safe: 2%
Sewered (off site centralized or decentralized)	20%	100%	55%	18%	2%
On-site containment – permanent/emptiable	79%	0%	0%	0%	0%
On-site containment – single use/not emptied/safely abandoned	0%	100%	100%	100%	0%
Open defecation	1%	0%			
Unsafe: 98%: *Affected zone*		80%: *Residential zone*	9%: *Drainage system*	9%: *Receiving waters*	

Sources: Authors' calculations from data in WaterAid (2011), UNICEF/WHO (2012) and Tayler (Tayler K, 2013, personal communication).

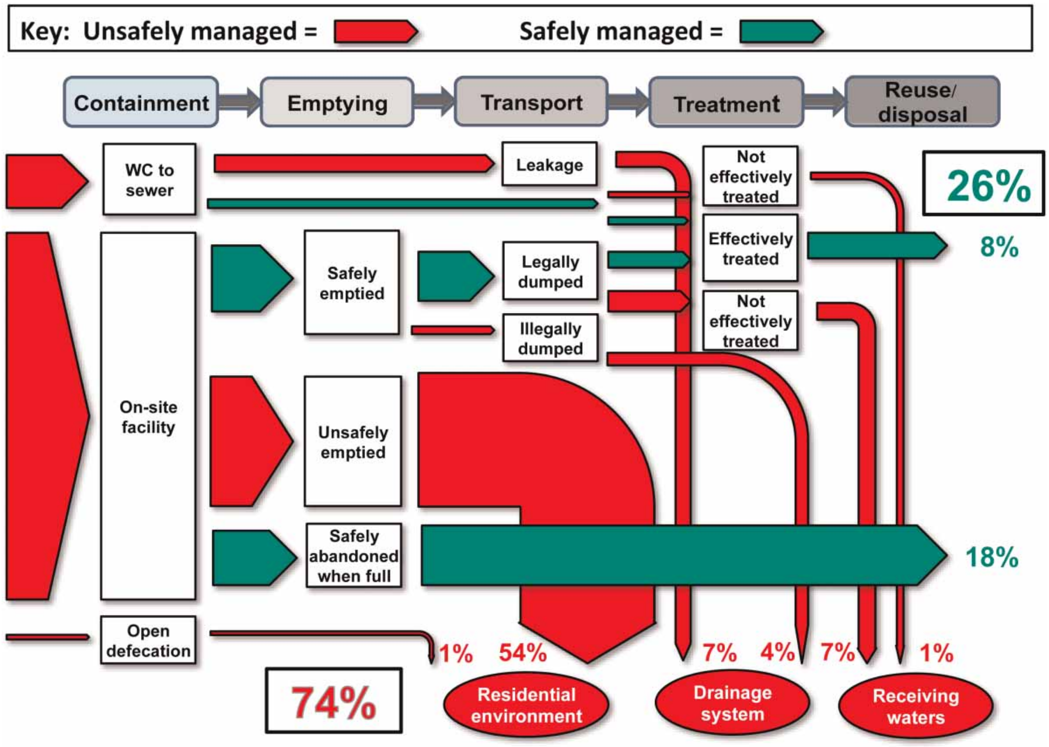

Figure 3 | Fecal waste flow diagram for Maputo, Mozambique.

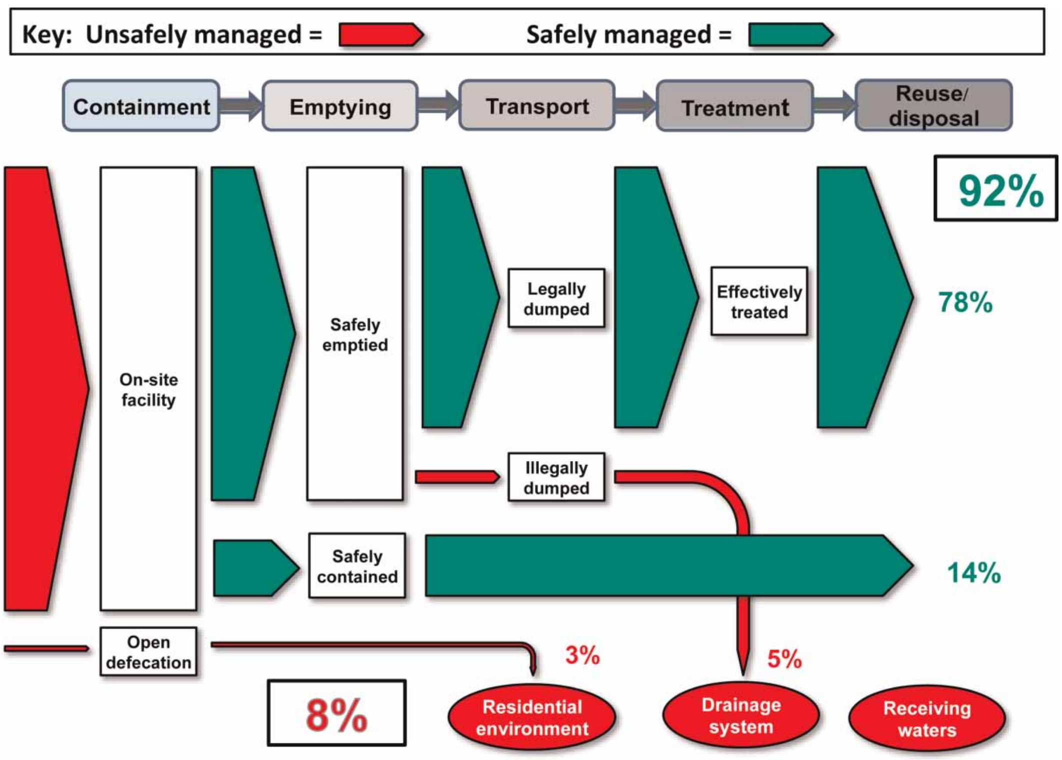

Figure 4 | Fecal waste flow diagram for Dumaguete, Philippines.

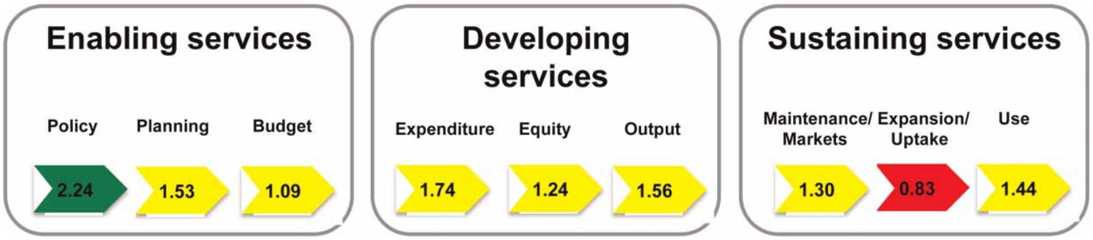

Figure 5 | Example of typical SDAscorecard for urban sanitation (this is for Uganda).

Government of Dumaguete, no date a) with a nominal 14% of waste safely contained in over-sized tanks or leach pits. These are large containers built by owners who seek to avoid the need for costly and inconvenient desludging and/or open-bottom pits that percolate efficiently; this fecal waste is considered safely contained (at least in the short to medium term).

From the limited data available there is no evidence of waste being illegally discharged en-route and it is understood from City Government of Dumaguete (no date a) and City Government of Dumaguete (no date b) that to date the treatment plant has received and treated 100% of the sludge emptied by the Water District operated service. There is no manual emptying in Dumaguete, but a few private contractors still operate in the area who still choose to dump emptied sludge illegally. Therefore, the waste flow diagram shows that a nominal 5% of waste is illegally dumped.

Modified service delivery assessment (SDA)

In order to understand the underlying drivers of FSM performance we decided to use a modified form of the SDA. The SDA is an analytical framework used to measure the quality of the enabling environment, the level of service development (primarily investment) and the level of commitment to service sustainability for WASH services in general. The SDA was developed to assess the quality of service delivery of urban, rural, sanitation and water sectors at national level and has now been used in 32 African countries and in LAC, South Asia and in East Asia and the Pacific. The scorecard tool forms the basis for international comparisons of sector performance at the national level and results are used to inform, for example, WHO's Global Assessment of Water Supply and Sanitation and the work of Sanitation and Water for All. The SDA scorecard for urban sanitation in Uganda is shown in Figure 5 with scores ranging from zero (worst case) to three (best case) in response to a set of specific questions, with a red, yellow, green color coding to highlight the scores.

We used an adapted version of the SDA to analyze FSM service delivery at the city level around the three SDA pillars: the enabling environment, development of services, and sustainability of service. Each of these was in turn broken down further into three 'building blocks' as shown in the adapted SDA scorecard tool in Figure 6.

In conjunction with the adapted SDA scorecard the sanitation service chain shown in Figure 7 was used in the study to reflect that urban sanitation comprises several functions in sequence.

The modified SDA/service chain tool is thus a matrix, as shown in Figure 8. This framework is used to assess the enabling environment, level of investment and capacity to sustain services along the sanitation service chain. In

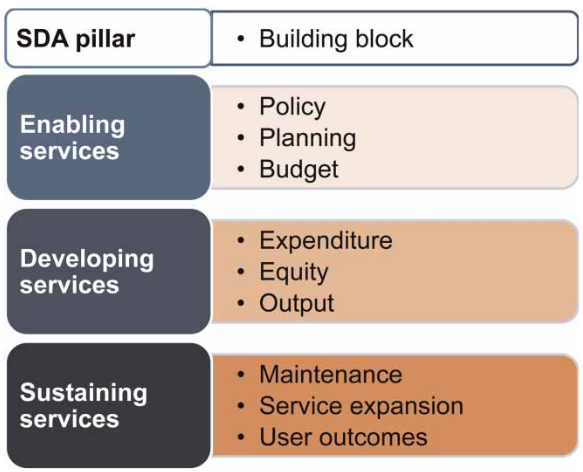

Figure 6 | SDA scorecard adapted to analyze FSM service delivery at the city level.

Figure 7 | Sanitation service chain. Note: The term 'value chain' is often used synonymously with 'service chain' (Trémolet 2011) but in this study the term service chain is preferred.

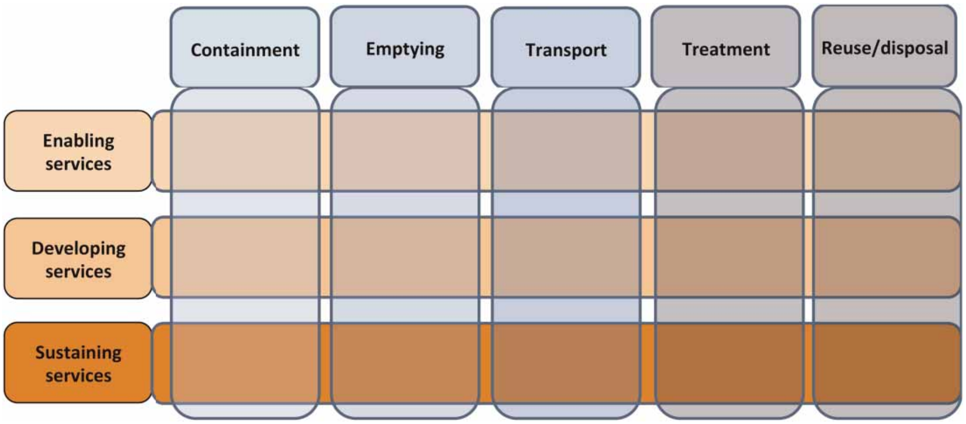

Figure 8 | SDA/service chain scorecard modified for FSM.

order to utilize the tool, a set of standardized questions are used to analyze information from primary and secondary sources. The SDA questions are shown in Table 2.

The SDA has three 'pillars': enabling services, developing services, and sustaining services. Within each pillar there are three building blocks. A composite SDA score is calculated for each building block at each step along the value chain. Therefore, in total, the SDA produces a set of 45 scores. Each score is derived from individual scores for a set of questions, known as 'area of evidence' questions. Thus, for example, for the enabling services pillar at the containment step, scores are calculated for each of the building blocks; policy, planning, and budget. For every area of evidence question, the score can range from zero (indicating no progress or no performance), to 1 (indicating sufficient performance). For each building block the final score is the scaled average of all these, scaled between 1 and 3.

Question 3.3.1, which contributes to the element of user outcomes, is derived from the fecal waste flow diagram.

The composite SDA scorecard for Maputo is shown in Figure 9. FSM service delivery in Maputo is poor, as indicated by the low scores in the enabling, developing, and sustaining aspects of the FSM scorecard. The relatively high scores for the policy element of the enabling block indicate that the institutional framework is largely in place and significantly the recently agreed National Urban Water and Sanitation Strategy does include FSM. However, the strategy is new and has not yet been operationalized. Therefore, in terms of delivering an FSM service the responsible organizations remain ineffective with very little planning and no budgetary allocation for FSM services – hence the poor level of service as indicated in the developing and sustaining blocks. A degree of limited progress is being made by donor-supported local community organizations that have set up small-scale pit-emptying operations but these are not yet operating at scale, and remain dependent on donor support (WUSP 2011).

In contrast, the FSM scorecard for Dumaguete (Figure 10) shows that the core of the enabling environment is in place, although the policy element is clearly much more advanced than the planning and budget components. The developing pillar is improving fast, and this highlights the recent introduction of the new FSM service led by the City government and Water District partnership. However, the regular desludging program is new; consequently, FSM outcomes lag behind outputs as households and service providers first adjust to the system and then structures are put in place to sustain the service over the long term. Nevertheless, the sustaining pillar does indicate that uptake by households has been good and that from containment to treatment the service is improving.

Table 2 | The modified SDA questions

Building block	Areas of evidence	Question
Enabling services pillar		
Policy	1.1.1: Sector targets	Are there service targets for each part of the FSM value chain in the national level development plan?
	1.1.2: Sector policy	Is FSM included in the urban sanitation or another policy that is agreed by stakeholders, approved by government, and publicly available?
	1.1.3: Institutional roles	Are the institutional roles and responsibilities for FSM service delivery clearly defined and operationalized?
	1.1.4: Private sector	Does the policy, legislative and regulatory framework enable private sector investment in FSM?
	1.1.5: Regulation	Are there national/local regulatory mechanisms for FSM?
Planning	1.2.1: Fund flow coordination	Does government have a process for coordinating FSM investments in the subsector (domestic or donor, e.g., national grants, state budgets, donor loans and grants, etc.)?
	1.2.2: Investment plans	Is FSM prioritized in the medium term investment plan (as part of sanitation) and is it published and used?
	1.2.3: Human resource capacity	Is there capacity to implement the FSM plans and if not, is there a capacity building program for FSM based on an assessment of human resource and TA needs?
Budget	1.3.1: Adequacy	Are the annual public financial commitments to FSM commensurate with meeting needs/targets (within approx. 10 years)?
	1.3.2: Structure and budget	Do budget structures permit capital investments and recurrent costs for FSM to be clearly identified?
Developing services pillar		
Expenditure	2.1.1: Capital funding	What is spent per capita on FSM *by the Municipality* – Capex (3 year average)? Capex only e.g., on household toilets, storage/transfer stations/septage management facility at wastewater treatment works.
Equity	2.2.1: Local participation	Are there clearly defined procedures for informing, consulting with and supporting local participation in planning, technology choice, costs and implementing sanitation, including FSM?
	2.2.2: Budget allocation criteria	Have criteria (or a formula) been determined to ensure adequate funding is allocated to FSM within the larger urban sanitation allocation? These criteria or formulae should be codified in policy/strategy/orders/acts.
	2.2.3: Reducing inequality	Are there specific plans and measures to ensure FSM serves all users, including the urban poor? The procedures should be codified in policy/strategy/orders/acts.
Output	2.3.1: Quantity (access)	Is the annual rate of expansion of households gaining access to FSM consistent with meeting needs/targets (within approx. 10 years)?
	2.3.2: Capacity of system	Is the capacity of each part of the FSM value chain growing at the pace required to have a significant impact on public and environmental health?
	2.3.3: Quality of all infrastructure	What is the quality of FSM infrastructure?
	2.3.4: Reporting	Are there procedures and processes applied on a regular basis to monitor FSM access and the quality of services and is the information disseminated?
Sustaining services pillar		
Operation and Maintenance	3.1.1: Cost recovery	Are O&M costs known and fully met by either cost recovery through user fees and/or local revenue or transfers?
	3.1.2: Standards	Are there norms and standards for each part of the FSM value chain that are systematically monitored under a regime of sanctions (penalties)?
Expansion	3.2.1: Demand	Has government (national or local) developed any policies, procedures or programs to stimulate demand of FSM services and behaviors by households?
	3.2.2: Planning	Do service providers have (business) plans for each part of the value chain for expanding FSM services?
	3.2.3: Private sector development	Does the government have ongoing programs and measures to strengthen the domestic private sector for the provision of FSM services in urban or peri-urban areas, in line with their plan?
User outcomes	3.3.1: Quantity (outcome)	Percentage of total urban fecal waste generated by the city that is managed within each part of the sanitation value chain?
	3.3.2: Equity of use	To what extent does the FSM system serve the city's low-income communities?

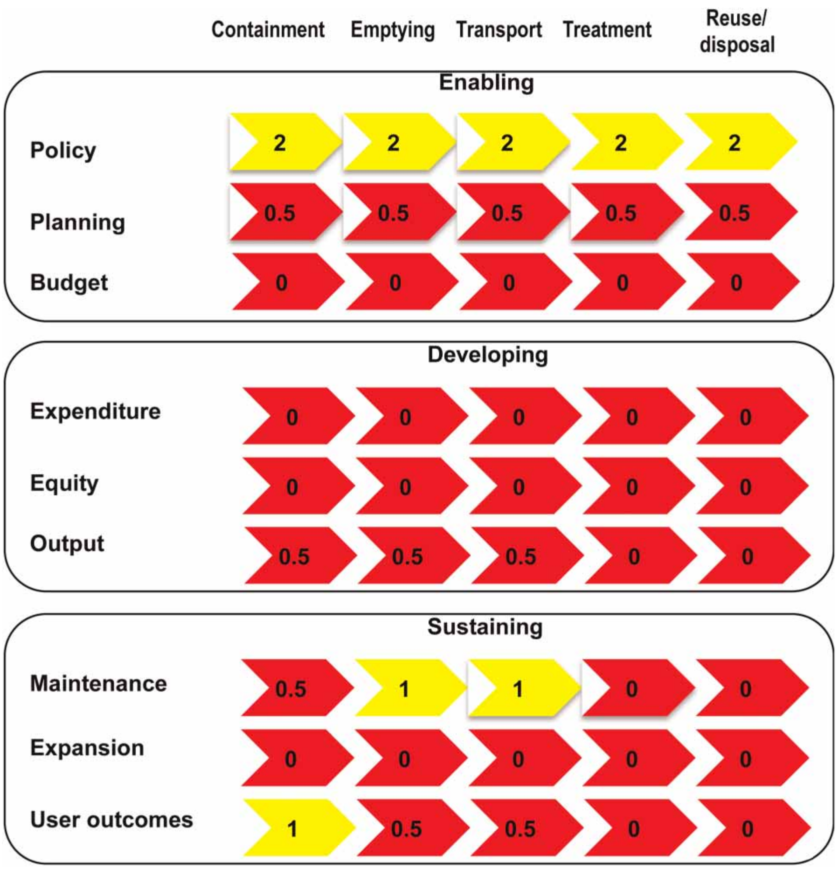

Figure 9 | FSM scorecard for Maputo, Mozambique.

Areas of weakness remain in reuse/disposal – this will need to be addressed in the future.

DISCUSSION

The literature points to a strong need for practical analytical tools relating to FSM. Much of the information and data required in order to understand FSM in cities are relatively simple. The main challenge is that they are not regularly or reliably collected and almost never used to analyze the problem and plan for solutions. Where they exist at all, the vast majority of the information available on sanitation in the cities we examined relates to formal networked sanitation, which serves a small proportion of the population. However, there was widespread interest in the methods and tools developed as part of this research. The fecal waste flow diagram in particular was found to be a powerful tool for explaining the situation and challenges and for drawing attention to the need for improved FSM. The tool worked well for both technical and non-technical audiences and was easily understood by a wide range of stakeholders. The SDA is a more complex tool but provides a clear picture of the key policy and implementation bottlenecks. The process of data collection itself proved useful in identifying key policy and institutional elements of FSM. While the construction of the scorecard appears complex due to the number of elements of sanitation which must be described, it proved relatively easy to assemble provided data were available.

Disaggregating each part of the chain to include different containment mechanisms and the subsequent downstream services could further sharpen the tools. This would require primary research using household surveys, service observations, and key informant interviews to cross-check and fully validate the findings.

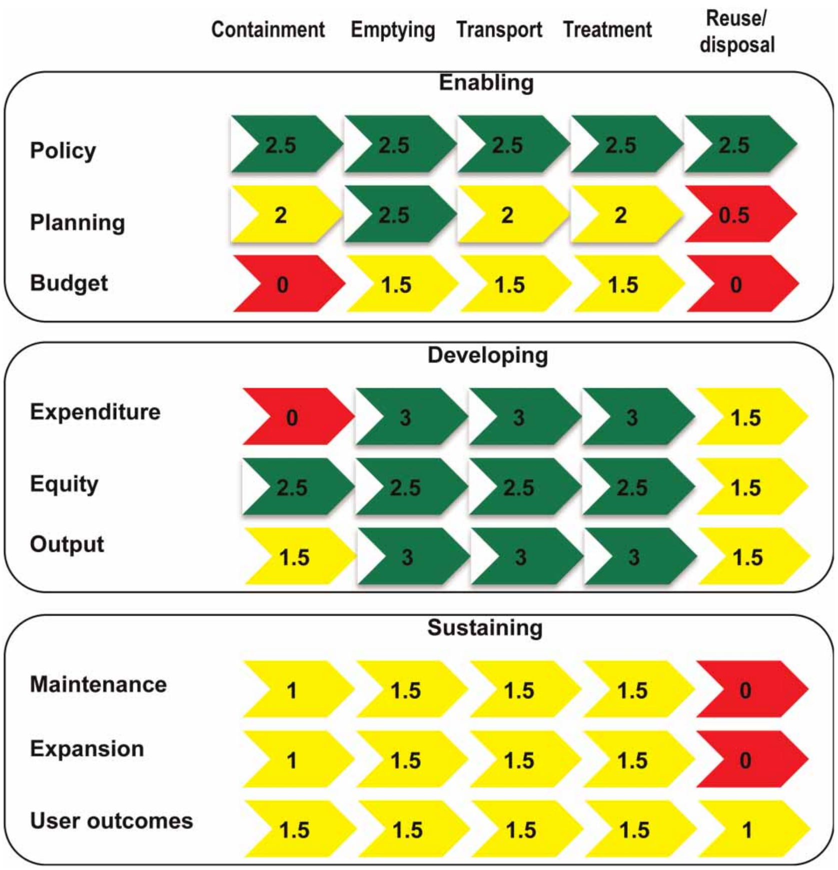

Figure 10 | FSM scorecard for Dumaguete, Philippines.

CONCLUSIONS

FSM is an important and significant element of urban sanitation in many poor and rapidly growing cities across the globe. While many cities aspire to provide networked sanitation for all, this goal is beyond the short-term capacity of most. Either as a long-term solution or, at least, as a short-run intervention, improved management of FS is likely to play an important role in managing public and environmental health and the environment more widely for many years to come. There is a lack of tools and approaches to understand and analyze the problem. The tools developed as part of this study draw on earlier work but are a first attempt to develop a systematic analytical approach to FSM. The tools produce good estimates, which provide valuable insights into the FSM challenges facing cities.

Tool development

The case studies and the study analysis illustrate how cities struggle to understand or describe the physical and organizational processes that are taking place in the arena of FSM. In general, the challenge of improving FSM services is generally grossly over-simplified and underestimated. The systematic approach used in the study provides both a diagnostic tool to address this challenge and a solid base on which to build further research and analysis.

The strength of the SDA framework is that while it gives a strategic overview of the situation it also points towards specific tactical interventions along the service chain. Meanwhile, the annotated FS waste flow diagram shows the relative importance of the various pathways FS takes and indicates the points along the sanitation service chain where technical interventions are required. The two dimensions of the analysis complement each other well and combining them in this way can help decision-makers understand the strengths and weaknesses of the FSM system in any given city.

The fecal waste flow diagram has a number of additional potential uses that could enhance the analysis. In environments with greater data availability, the waste flow diagram could be modified to indicate how volume, mass and even nutrient value flow through the FS network, thus helping decision-makers to identify parts of the FSM system with the potential to derive value through downstream processes and reuse. The cost of moving FS through the system could also be developed through the use of lifecycle costing models for parts of the value chain. Potentially these analyses could be used to derive benefit–cost data to help in the selection of priority FS investments.

Further development of the modified SDA/service chain concept and the fecal waste flow diagram is therefore recommended in order to enhance the ability of practitioners to make rapid assessments of FSM capacity. This could have a significant positive impact on the scale and poverty impact of interventions in urban sanitation.

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