Fecal Sludge Management: Diagnostics for Service Delivery in Urban Areas

Tools and Guidelines

Final

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Preface / Acknowledgements

These Tools and Guidelines constitute a key output of a World Bank Economic and Sector Work, on *Fecal Sludge Management: Diagnostics for Service Delivery in Urban Areas* (P146128). The task team leaders were Isabel Blackett and Peter Hawkins and the task team members were Zael Sanz Uriarte, Ravikumar Joseph, Chris Heymans and Guy Hutton.

This report is based on work conducted under a consultancy between January 2014 and February 2016, led by Oxford Policy Management (OPM) in partnership with the Water, Engineering and Development Centre (WEDC) at Loughborough University. This report was authored by Ian Ross (OPM), Rebecca Scott (WEDC), Ana Mujica (OPM), Zach White (OPM) and Mike Smith (WEDC). The broader research team who contributed to the study included Rashid Zaman and Simon Brook from OPM, as well as Mike Smith, Andy Cotton and Sam Kayaga from WEDC. Andy Peal (independent consultant) also contributed to certain aspects of the methodology.

The inputs of many other World Bank staff, consultants and data collection firms are acknowledged with thanks from the task team. They have all contributed to the research, findings, analysis and reviews but are too numerous to mention.

Executive summary

Introduction

Addressing the need for fecal sludge management (FSM) from on-site sanitation systems is critical to improving sanitation in poor urban settlements. A preliminary review of the status of FSM in 12 cities, using secondary data, adopted certain diagnostic tools and proposed that others be developed further (Peal et al, 2014). This study has since been built on by further World Bank work using extensive primary data from five cities (Balikpapan, Dhaka, Hawassa, Lima and Santa Cruz). Using the field data, a series of diagnostic and decision-support tools have been developed to guide FSM intervention options in the context of the economic and political economy reality.

This report describes diagnostic and decision-support tools to guide the improvement of FSM services. It also advises how to use them, with links to a number of other resources. Related documents include (i) a summary report on the tools, and experiences of using them in the context of five city case studies, and (ii) the data collection protocols and instruments and (iii) terms of reference.

The tools and guidelines and how they fit together

The table below summarises the tools and their objectives, as well as further related tools which play an important role but were not developed as part of this initiative. The figure on the next page sets out how they fit together.

Summary of tools and their objectives

	Tool	Objective
Diagnostic tools	1. **Fecal Waste Flow Diagram**	Represent where fecal waste goes, what proportion is managed and where the unmanaged portion ends up
	2. **City Service Delivery Assessment**	Assess the enabling environment and quality of service delivery along the service chain, identifying areas for attention
	3. **Prognosis for Change** (Political Economy Analysis)	Identify the interests and incentives that could block action, and possible entry points for overcoming them
Decision-support tools	4. **Service Delivery Action Framework**	Guide identification of actions in relation to the enabling environment, necessary to deliver desired results
	5. **Intervention Options Assessment**	Guide for identification of technical interventions along the service chain – linking to Program Design guidelines
Tools being developed by partners	**Fecal sludge technical tools**	Quantify volumes and characteristics of sludge, using standard methods. Assess FS end-products to suit market potential, evaluate collection and transport options and optimized treatment processes for resource recovery.
	Urban Sanitation Status Index	Quantify and represent in cartographic form the status of sanitation services, disaggregated by neighborhood
	FSM finance tool	Estimate the costs of fecal sludge management services

Key audiences for the outputs of these tools are government decision-makers, development banks, utilities and municipal authorities. Various toolkits already exist (e.g. Sanitation 21 and Strategic Sanitation Approach) to help decision-makers identify actions to take at city level. However, most

existing tools do not focus specifically on FSM or address political economy aspects. They also tend to focus around municipal and community action, with limited acknowledgement that tackling the problems will require substantial external support, from other levels of government as well as under project-type arrangements. The tools set out here take these factors into account, and aim to help stakeholders consider how to develop urban sanitation services that manage all fecal waste rather than only that which is discharged to sewers.

Diagram of how the tools fit together

These tools are primarily intended for carrying out a sanitation situation diagnosis and the preliminary selection of intervention options, bringing a focus to each part of the sanitation service chain. They will be particularly useful at the project identification and preparation stage. However, much of the data collected will also be useful later in the design of interventions. While some of the tools are specific to FSM, others are applicable to urban sanitation as a whole, as explained below.

The diagram below shows how the various tools fit together. Everything stems from the fecal waste flow diagram, with each tool providing further information. All tools provide information to help guide the assessment of intervention options. Most of these tools actually apply to urban sanitation overall, but the focus of this report is on FSM.

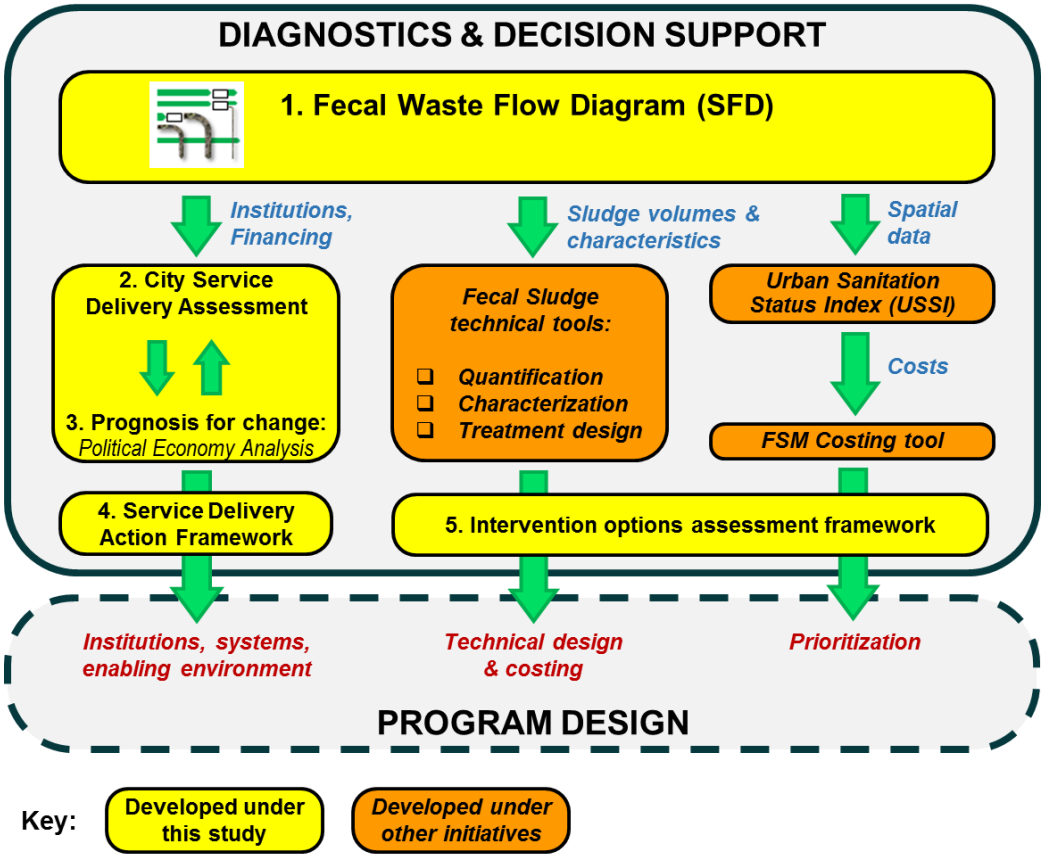


Table of Contents

List of tables and figures

List of abbreviations

CSDA	City Service Delivery Assessment
FS	Fecal Sludge
FSM	Fecal Sludge Management
IUWM	Integrated Urban Water Management
OSS	On-Site Sanitation
PEA	Political Economy Analysis
PFC	Prognosis For Change
SFD	Shit Flow Diagram (fecal waste flow diagram)
USSI	Urban Sanitation Status Index

1 Introduction

1.1 About this report

This document provides the background to the diagnostic tools, decision-support tools and program design guidelines, as part of a package to support the improvement of fecal sludge management (FSM) services. It is part of a World Bank Economic and Sector Work (ESW) entitled 'Fecal Sludge Management: Diagnostics for Service Delivery in Poor Urban Areas'. This work is funded by the World Bank Water and Sanitation Programme (WSP). The tools and diagnostics are based on field work carried out in the five cities of Balikpapan, Dhaka, Hawassa, Lima and Santa Cruz.

Consultants for the project are Oxford Policy Management (OPM) in partnership with the Water, Engineering and Development Centre (WEDC) at Loughborough University. The overall objective of this assignment is: "to work with the World Bank WSP urban sanitation team to develop the methodology, design, develop survey instruments and undertake analysis of data collected from five field case studies (linked to World Bank operations projects), refine diagnostic tools and develop decision-support tools and guidelines for the development of improved FSM services." Specific objectives of this report are listed in the next section. The scope includes the need to consider city-wide septage services and the systematic inclusion of poor urban communities.

1.2 Rationale and objectives

It is common for poor people living in urban areas of many low-income countries to either use on-site sanitation facilities or defecate in the open. Even when improved on-site options are used to contain feces, in many cities only limited services exist for collection, transport and disposal or treatment of the resulting fecal sludge. Resource recovery through end-use of fecal sludge is rare. The service delivery gaps within and between stages of the sanitation service chain become more apparent as sanitation coverage increases in poor urban areas. Failure to ensure strong links throughout the service chain results in untreated fecal sludge (FS) contaminating the environment, with serious implications for public health.

Despite this, there are very few tools and guidelines to help city planners navigate complex FSM situations, despite increasing demand for them. This study builds on existing frameworks and tools, in particular the City Service Delivery Assessment scorecard, Fecal Waste Flow Diagram (Shit Flow Diagram, SFD), and the Economics of Sanitation Initiative toolkit. Some of these were developed in a preliminary review in 12 cities, using secondary data (WSP, 2012). Development of the tools and guidelines was based on primary data collection in five cities, supported by interaction with city stakeholders. Acknowledging the difficulty of reforming FSM services in cities, and political economy questions around FSM are explicitly included as part of the overall analysis. The aim is to produce tools and guidelines that are based on real-life examples related, where possible, to ongoing World Bank operations, with a focus on practicality.

The approach adopted acknowledges that city-wide solutions aiming to deliver decent sanitation to the city as a whole are required, while also emphasising that solutions for poor urban areas must not be left out of implementation plans. Primary data collection under this project was developed to follow this principle, and the analysis and the outputs of the tools flow from that.

The specific objectives of this "tools and guidelines report" are:

- Present the diagnostic tools, decision-support tools and program design guidelines

- Explain how to use them, giving city examples from primary data collection.
- Identify policy recommendations for enhanced FSM service delivery as part of developing urban sanitation services.

1.3 Report structure

This report is sub-divided into the following sections.

- Overview of the tools and why they are required
- Diagnostic tools
    - Fecal waste flow diagram
    - City Service Delivery Assessment
    - Prognosis for change
    - Service Delivery Action Framework
    - Intervention options assessment framework
- Other useful resources
- Annexes
    - How to use the tools

2 Overview of the tools and why they are required

2.1 Why tools are required

Decision-makers involved with city sanitation services include national and local governments, local and development banks, utilities and municipal authorities. Where mandates are clear these decision-makers are often responsible for planning improvements to urban sanitation which are challenging, particularly in low-income areas – be they formal or informal. Various approaches and frameworks already exist to help city decision-makers identify actions to take at city level and these include: the Strategic Sanitation Approach (SSA), Sanitation 21 and Community-Led Urban Environmental Sanitation (CLUES).[1]

However, these sanitation planning approaches do not focus specifically on fecal sludge management or address the capacity and political economy aspects of the challenge. They also target municipal and community action, with limited acknowledgement that where the sanitation problems are greatest it may be hardest to make a significant impact without substantial external support, probably under a project arrangement involving consulting resources. The tools and guidelines presented here aim to fill an important gap by taking these factors into account. With their intuitive meaning, they can help stakeholders consider how to ensure comprehensive urban sanitation services, avoiding the tendency to focus only on conventional, often sewered, solutions.

The tools set out in this report are to be used for diagnosis and preliminary options selection, along the whole sanitation service chain (outlined in Figure 1 below), especially for the project identification and preparation stage. However, much of the data collected at this stage will be applied in the later design of the interventions. Some of the tools are specific to FSM, others are applicable to urban sanitation as a whole. This is further explained below.

Figure 1 The sanitation service chain

[1] As identified in Hawkins et al (2013)

2.2 Overview of the tools and guidelines

Table 1 below summarises the tools and their objectives, as well as further related diagnostic tools which play an important role but were not developed as part of this initiative. Figure 2 then sets out how they fit together.

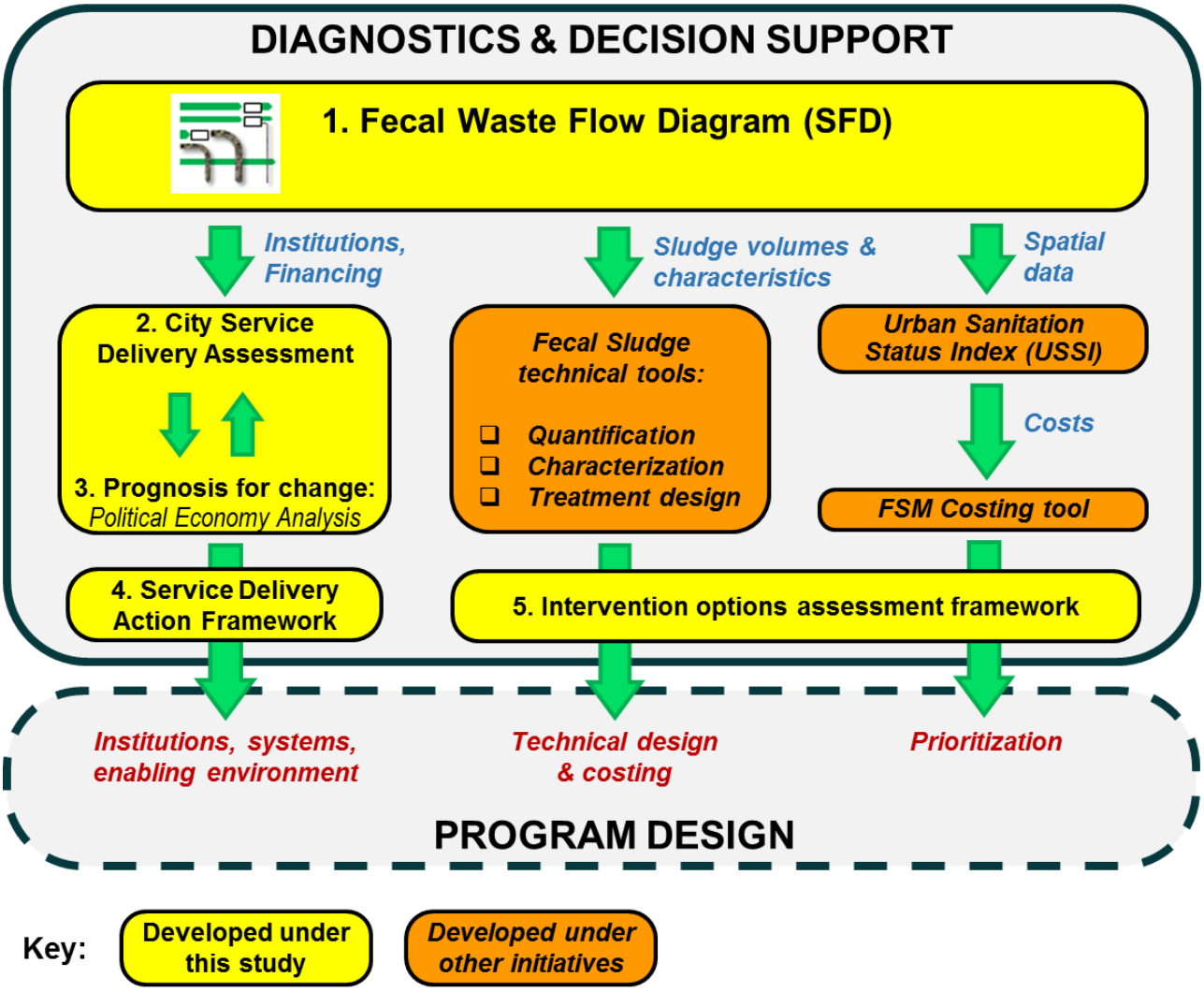
Table 1 Summary of tools and their objectives

	Tool	Objective
Diagnostic tools	**1. Fecal Waste Flow Diagram**	Represent where fecal waste goes, what proportion is managed and where the unmanaged portion ends up
	2. City Service Delivery Assessment	Assess the enabling environment and quality of service delivery along the service chain, identifying areas for attention
	3. **Prognosis for Change** (Political Economy Analysis)	Identify the interests and incentives that could block action, and possible entry points for overcoming them
Decision-support tools	**4. Service Delivery Action Framework**	Guide identification of actions in relation to the enabling environment, necessary to deliver desired results
	5. Intervention Options Assessment	Guide for identification of technical interventions along the service chain – linking to Program Design guidelines
Tools being developed by partners	**Fecal sludge technical tools**	Quantify volumes and characteristics of sludge, using standard methods. Assess FS end-products to suit market potential, evaluate collection and transport options and optimized treatment processes for resource recovery.
	Urban Sanitation Status Index	Quantify and represent in cartographic form the status of sanitation services, disaggregated by neighborhood
	FSM finance tool	Estimate the costs of fecal sludge management services
	Public health risk assessment	Assess public health risk related to poor FSM. Work is in progress at Emory University, UNC, UCL and other universities

As explained in the introduction, the overall focus is on analysis which is city-wide and poor-inclusive. This approach aims to acknowledge that city-wide solutions serving the entire population are required, while also emphasising that solutions for poor urban areas must be included in implementation plans. This principle is followed in all the tools and guidelines. Therefore, while the focus of this project is on FSM, most of these tools are applicable to urban sanitation overall.

In Figure 2 below, the fecal waste flow diagram (or 'shit flow diagram', SFD) is shown to be the starting point, with each subsequent tool providing further information on a different aspect. Each is linked to one of three elements of program design (enabling environment, technical design and prioritisation), while the outputs of all tools provide inputs to the implementation options assessment framework. A smaller version of Figure 2 is included at the beginning of each chapter, with the specific tool being explained question indicated in colour.

Figure 2 Diagram of how the tools fit together



From the Fecal Waste Flow Diagram (SFD, 1) there are three 'streams' of information required for program design. The first relates to institutions and financing (to inform enabling environment interventions), the second to sludge and wastewater volumes and characteristics (to inform technical interventions) and the third to spatial data and costs to inform prioritization of interventions. Information and analysis under all three 'streams' should inform a comprehensive approach to program design.

For the enabling environment stream, the City Service Delivery Assessment (CSDA, 2) assesses the quality of processes affecting service delivery, intermediate and resulting service outcomes along the sanitation service chain and diagnoses the main impediments within the current enabling environment to supporting the development, expansion and sustainability of FSM services. The PFC/PEA (Prognosis for Change/Political Economy Analysis, 3) is strongly linked to the CSDA, identifying the interests and incentives that could block or delay action, and possible entry points for overcoming them. In addition, the FSM costing tool supports the analysis of different models for who should pay, which must be proposed with an understanding of the political economy (3) and current financing context. This then feeds into the Service Delivery Action Framework, which suggests appropriate non-technical (or "soft") interventions for improving FSM, as a function of the status of the enabling environment. Finally, technical intervention options can be assessed (5).

2.3 Intended audience and how the tools should be used

The reports in the Table 1 above are tailored to the intended audiences and distinguish between (i) users of the outputs of the tools (e.g. diagrams and tables), (ii) users of the tools themselves (e.g. questionnaires and spreadsheets).

Key intended audiences for the *outputs* of the tools are government decision-makers, international development agencies, utilities and municipal authorities. In the case where the tools are applied to a particular city, the *outputs* produced will be of interest to those responsible for, or working to enhance, sanitation services in that particular city. The tools themselves will be *used* by consultants and sanitation specialists in stakeholder institutions to produce the outputs. In more detail:

- ***Users of the tools*:** evidence-based project design work is typically outsourced to consultants or carried out in-house by city stakeholders or staff of development financing institutions. The intended users of these tools are therefore consultants or in-house staff with the appropriate expertise, capacity and means to apply the tools in a participatory manner. The results and recommendations are then intended to be discussed with their clients or managers as the principal output.

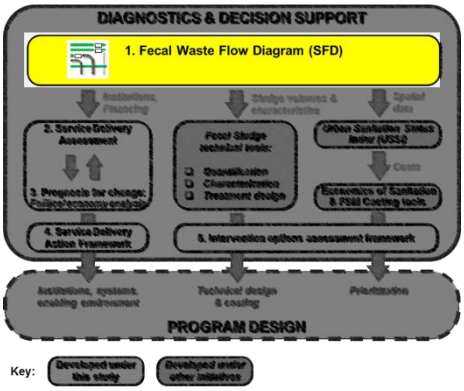
- ***Users of the tool outputs*:** The reported results and recommendations need to appeal to, and be used by decision-makers working in government, utilities, municipal authorities and international development agencies. The outputs of applying the tools are therefore designed to be visual, clear and accessible to people with technical and non-technical backgrounds. The outputs would typically be used in project or program concept, preparation and design documents.

While the Summary Report is designed for users of the outputs, the audience of this report ("Tools and Guidelines") is for users of the tools themselves. Therefore, together with the Data Collection Instruments (and generic Terms of Reference) this report provides more detail and a "how to" guide.

3 Fecal waste flow diagram

3.1 Introduction and objectives

A Fecal Waste Flow Diagram ('shit flow' diagram, or SFD) is a credible visualisation of how fecal waste (consisting of both fecal sludge and wastewater) flows along the sanitation service chain for a given population (e.g. city-wide, informal settlements). The aim of an SFD is to give a compelling visual summary of a city's sanitation chain, specifically showing at which stages problems need to be solved. The graphic to the right indicates where the SFD fits on the tools diagram (Figure 2).



The proportions of households using different sanitation options are identified according to where the waste discharges (e.g. sewer, on-site containment etc.). The number of households is a proxy for the amount of fecal pollution, and is used rather than the actual volume of sewage or fecal sludge, as it is the contributing population that determines the potential pathogen load. It does not estimate the public health risk, as this depends not only on pollution levels, but also the degree of human exposure to the pollution. At each stage of the chain, the SFD shows the proportion of fecal waste that is effectively managed and ineffectively managed. This means that where fecal waste is deemed to be:

- Effectively managed from one stage of the chain to the next (for example, where wastewater from cistern flush toilets is effectively transported through sewers to a designated treatment site, or fecal sludge is transported by a tanker to a designated disposal site), the SFD shows the flow of fecal waste continuing along the chain – and the arrow representing that flow of fecal waste to the next stage remains green;

- Not effectively managed from one stage of the chain to the next (for example, where wastewater leaks from sewers before reaching a designated treatment site, or fecal sludge is dumped into the environment or drainage channels), then the SFD shows the fecal waste "dropping out" of the service chain – and the arrow representing that flow of fecal waste turns brown.

The proportion of fecal waste that is effectively managed all the way to the end of the service chain is indicated as "safely managed", with the remaining proportion that has dropped-out of the chain deemed "unsafely managed". The primary destination of that "unsafe" fecal waste is indicated (e.g. receiving waters, general environment, drains, etc.).[2]

3.2 Methods and data sources

Data sources used to develop SFDs can include household surveys, key informant interviews, secondary literature, and measurements at treatment facilities. Examples of SFDs from the five case studies in this project are provided below, with city-specific methods discussed in more detail

[2] It is acknowledged that FS may pass from irrigation canals into other water bodies, e.g. rivers, but the diagram focuses on the *primary* destination. It was beyond the scope of this study to be able to track the pathways of sludge beyond the household, e.g. which canals did it pass through and where was its eventual destination.

there. In general, a pragmatic combination of data sources based on expert judgement is required, because data availability and available funds for new data collection will vary across cities.

Most SFDs so far (including those in the 12-city study, WSP, 2012) were undertaken using secondary data and expert estimates. This project is amongst the first to use primary household survey data and field-based observations to construct SFDs. A group of urban sanitation experts funded by the Bill & Melinda Gates Foundation (BMGF) is currently 'rolling-out' the use of SFDs, making SFD examples and guidance available for use by others.[3]

The more reliable the underlying data, and the greater confidence decision-makers have in that data, the more likely they are to act on the basis of what it shows. There is therefore a relationship between SFD accuracy and credibility. However, an SFD primarily aims to give an overview of the situation. While there is a minimum level of evidence for advocacy and engagement, debates over one or two percentage points are not required provided the underlying data is mostly sound.

3.3 Examples from primary data collection in five cities

As explained in the introduction, the project followed the overall principle of analysis of being city-wide and poor-inclusive. This approach acknowledges that solutions serving the entire city are required, while also emphasising that specific solutions for poor urban areas must be included in implementation plans. Primary data collection followed this principle and two SFDs were developed for each city representing (i) the city-wide situation, and (ii) the situation in low-income areas[4]. A detailed description of the methodology is provided in Annex A. Here it can be summarised that, in most cities, there were two sub-sample areas (denoted A and B) with a total of 720 households interviewed:

- Sub-sample A was representative of the city as a whole (360 households)
- Sub-sample B focused on poor urban areas, without any attempt to be statistically representative (360 households)

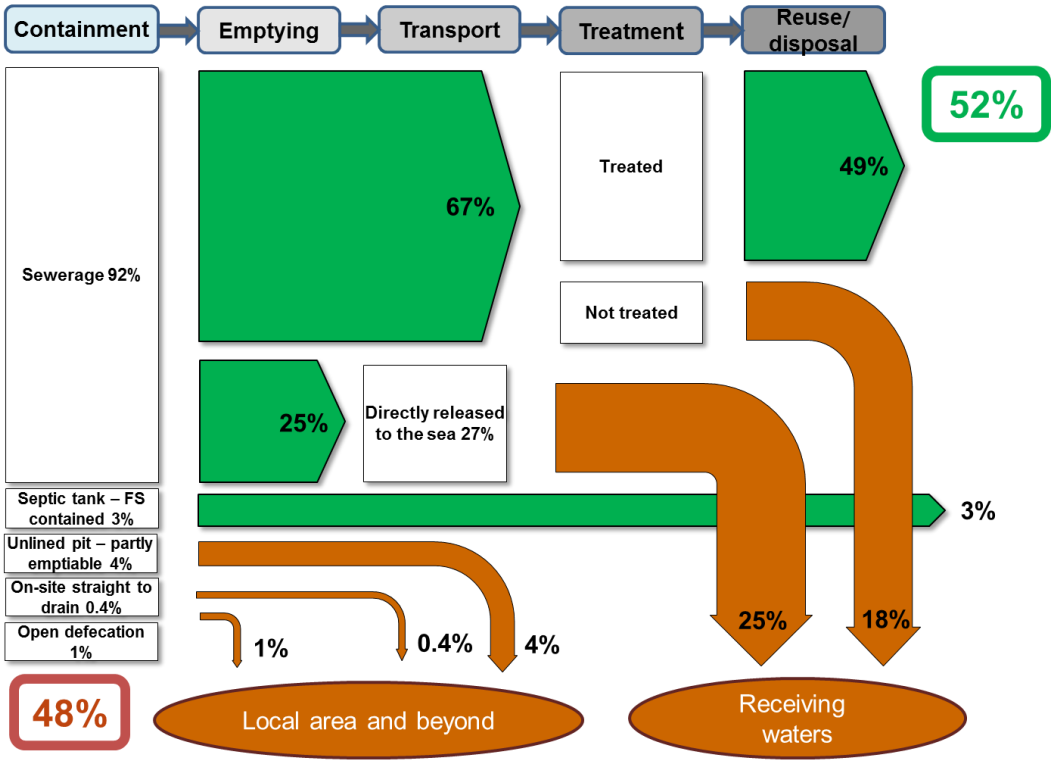
The aim of sub-sample A was to get city-representative estimates at minimum cost and minimum administrative burden. Therefore, it has a relatively small sample size, for example compared to what would be necessary for studies with different objectives (e.g. an evaluation aiming to attribute impact to an intervention). The aim of sub-sample B was to get a picture of the character of low-income areas, since it would be too difficult to get an accurate sampling frame (meaning an understanding of the geography of the entire 'low-income population' from which to sample).

Figures 3 and 4 show examples of fecal waste flow diagrams for Lima, Peru. The first represents a city-wide picture, while the second represents informal settlements in the city (designated as "slums" for ease of reference). What is clear from the city-wide SFD (Figure 3) is that 48% of FS in Lima is not effectively managed, although city wide 95% of fecal waste is removed from the immediate domestic and residential environment. However, although 92% of households have a sewer connection, almost 30% of wastewater does not make it to the treatment plant due to leakages in the system. Also of the wastewater which makes it to the treatment plant just over 70% is actually treated. The other point of note is that when pits are abandoned (when full), they are considered to be effectively managed if the pit/tank was lined, and ineffectively managed if it

[3] See website for the SFD promotion initiative here.
[4] The terms "slum", "informal settlement" or "low-income area" are variously used in different cities depending on the national context and have a similar meaning.

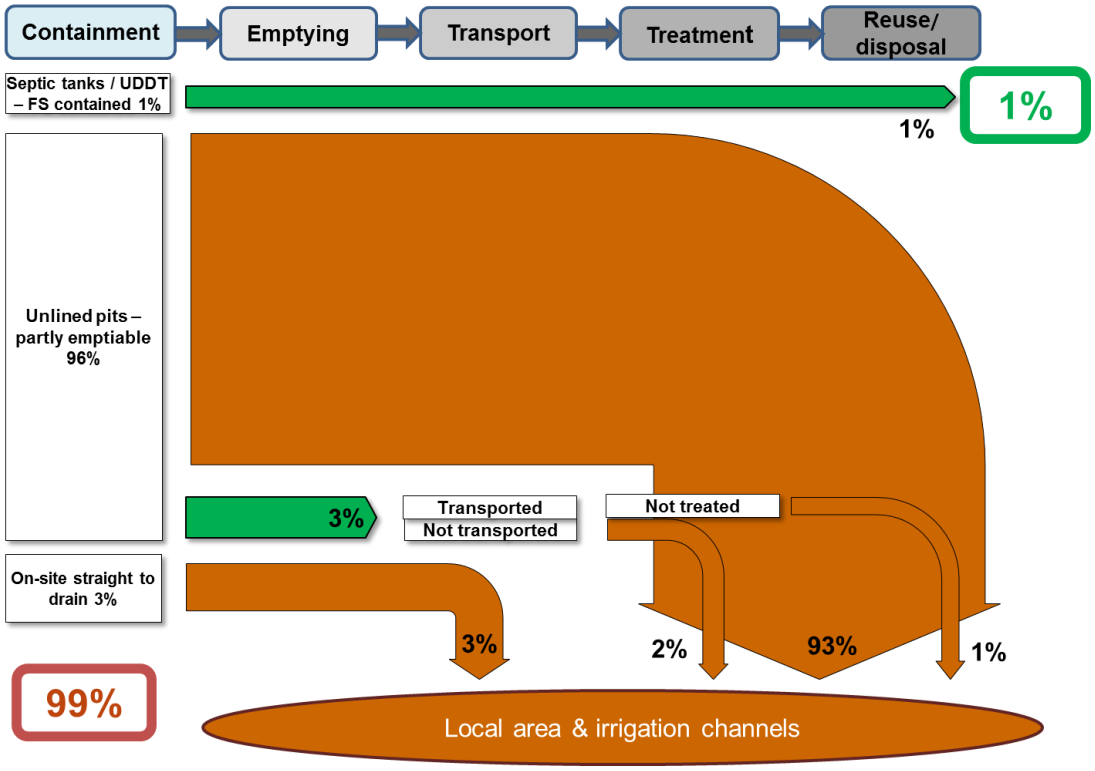
was unlined. Only 7% of households city-wide use an on-site sanitation (OSS) system which is "emptiable".[5]

Figure 3 Fecal Waste Flow Diagram for Lima – city-wide, based on secondary data



[5] A containment option is "emptiable" if involves a pits or septic tanks which can be emptied. However, emptiable options can also be connected to drains through an overflow, so as to avoid the need for emptying. What is emptiable may or may not be emptied. It is common in some cities (e.g. Dhaka) for toilets to be connected to drains with no intermediate containment – this is designated as non-emptiable.

Figure 4 Fecal Waste Flow Diagram for Lima – slums, based on household survey



Considering next the SFD for the slum sample (Figure 4), the picture is completely different because there are no sewers in the slums. The vast majority of households (96%) have an unlined pit, nearly all of which are covered unsafely and abandoned when full. Of the few that are emptied, the faecal sludge is disposed of unsafely nearby, or dumped illegally if transported further afield. A further 3% have toilets which discharge straight to drains or open ground, and only 1% have a properly constructed containment facility from which the sludge is safely removed, transported and treated. Overall then, 1% of FS in slums in Lima is effectively managed. As illustrated in this case, the situation in slums is much worse than the city-wide picture, with far more fecal waste going directly into the local area, especially via unlined pits which leak. This should help inform development of poor-inclusive intervention options, for example improvements to on-site containment and pit emptying services.

It is useful to also consider a second city example which brings a different perspective, but with the same division into a city-wide picture and a slum-specific picture. On the next page, SFDs for Dhaka, Bangladesh are shown.

The main difference between Dhaka and Lima is that in Dhaka the city-wide picture similar to the slums, except the slum situation is even worse. The sewer system in Dhaka is almost completely dysfunctional (and non-existent in slums) and households (67% city-wide, 90% in slums) use a toilet which is directly or indirectly connected to the drainage system.

Figure 5 Fecal Waste Flow Diagram for Dhaka – city-wide sample

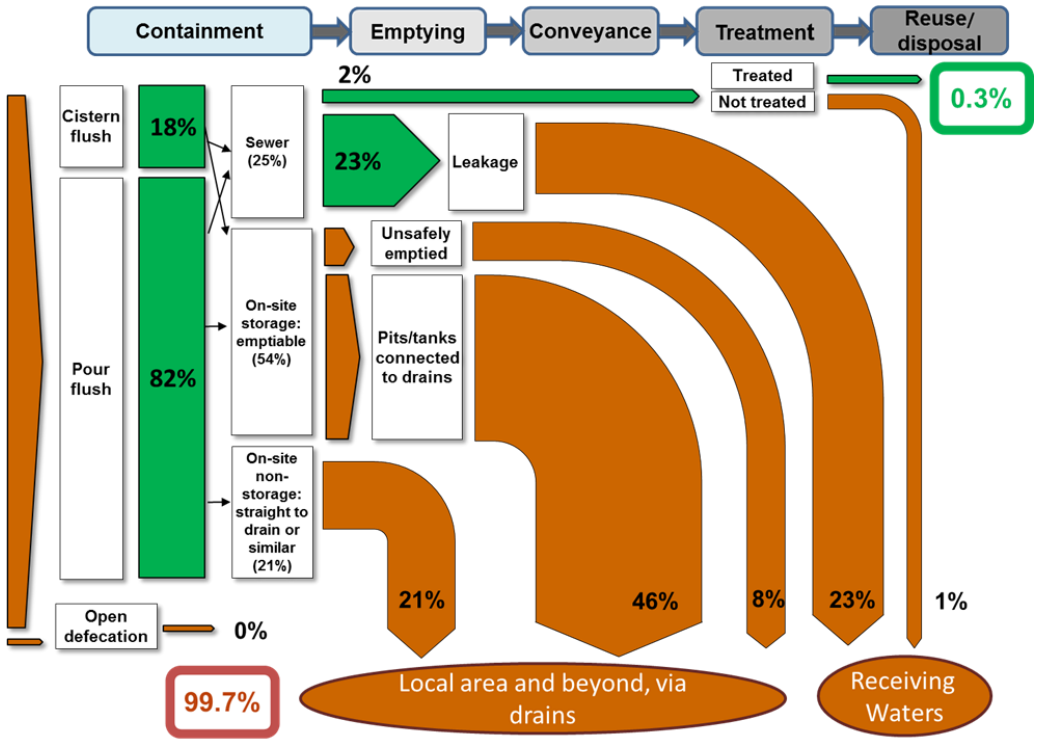
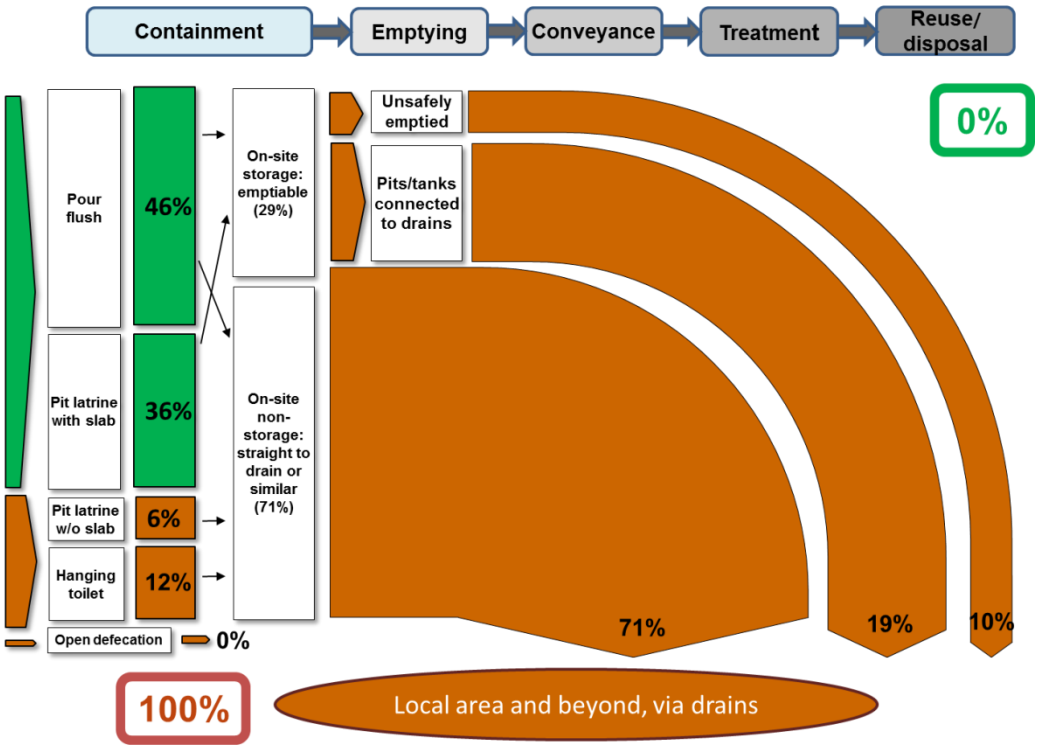


Figure 6 Fecal Waste Flow Diagram for Dhaka – slum sample



3.4 Using the Fecal Waste Flow Diagram

The SFD is the starting point of any analysis. It helps set the scene for identifying the scale of the problem and explaining it in terms of the sanitation service chain. Analysis in other tools is then linked to that, in particular:

- **City Service Delivery Assessment** – this identifies weaknesses in operationalizing the service chain which delivers the outcomes as shown in the SFD

- **Public Health Risk Assessment** – risk-based approaches (e.g. SaniPATH) identify which areas of the sanitation chain are of highest risk to public health.

- **Quantification and characterisation** – while the SFD is designed in terms of proportions of households, deriving as it does from household survey data primarily, it is implies volumes. The relationship between numbers of households and volumes of FS is not simple, as discussed below.

- **Intervention options assessment** – the twin SFDs are also the starting point for intervention options assessment, as any sensible analysis should begin from an understanding of the problem, its scale and nature.

A Bill & Melinda Gates Foundation (BMGF) funded study is making examples of SFDs and guidance on how to produce them available to a global audience via the SuSanA website. More details are available at http://www.susana.org/en/sfd.

In conclusion, the aim of an SFD is to give a compelling visual summary of a city's sanitation chain, specifically showing the general nature and relative extent of the problems at each stage. Box 1 provides further examples to illustrate what the SFD is and is not. Of itself, an SFD does not tell the viewer what should actually be done, or how different problems along the chain should be prioritised. This requires informed analysis of the underlying data and results, as explained in following sections of this report.

Box 1 What the SFD is and is not

The SFD ***is***:

- A tool for engineers, planners and decision-makers
- Based on contributing populations and an indication of where their excreta goes
- A representation of public health hazard
- An effective communications and advocacy tool
- An overview from which to develop sanitation priorities

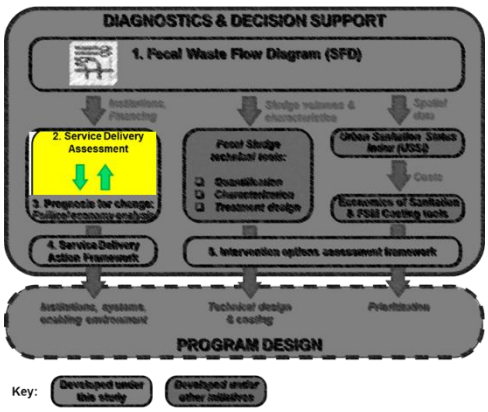
The SFD ***is not***:

- Based on actual volumes/mass – these are determined by other related factors
- A representation of public health risk (risk = hazard x behaviour)
- A precise scientific analytical tool

4 City Service Delivery Assessment

4.1 Introduction and objectives

The City Service Delivery Assessment (CSDA) for FSM is a tool for diagnosing the main impediments to service delivery based on objective criteria, and to visualise them in a colour-coded scorecard. The process and CSDA output answers overarching questions about the quality of the *current* enabling environment, the extent of FSM service development and the commitment to FSM service sustainability. The graphic to the right indicates where the CSDA fits on the overall tools diagram (Figure 2).

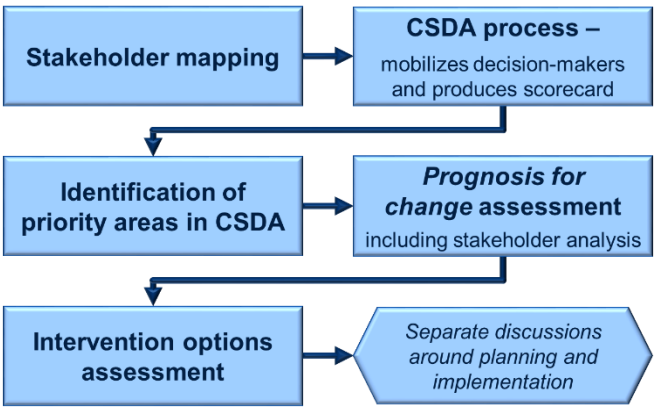


The CSDA provides a structured assessment, based on responding to the same questions on FSM service performance through all stages of the service chain, across the five cities so as to be objective and allow comparison. The current format is adapted from the draft used in the FSM 12-city study (WSP, 2013), which was developed from WSP's Water Supply and Sanitation Country Status Overviews (WSP, 2010). The resulting CSDA scorecard shows areas of strength and weakness for FSM in a city and helps identify priority areas for action, e.g. establishing plans and associated budgets to improve FSM services, or focusing on developing poor-inclusive technical interventions.

The CSDA process does not, however, explain why the current situation prevails, or identify potential obstacles to progress. This is why the CSDA should be undertaken in an iterative process which also takes into account the political economy of FSM in that city. A Prognosis for Change (PFC) assessment (see section 5) supports an explanation of why the CSDA looks like it does.

The process of developing the CSDA is important and requires key stakeholders to discuss all stages of the sanitation service chain and use the evidence about the current situation to agree appropriate scores. Figure 7 summarises this interlinked process, starting with stakeholder mapping. Once priority areas in the CSDA have been identified, a PFC assessment is undertaken. This then informs the intervention options assessment, so they are considered in the context of the city's political economy realities.

Figure 7 Interlinked CSDA and PFC process



4.2 Methods and data sources

The CSDA aims to be objective and transparent, so the analysis is clear and stakeholders can engage with it and update it over time as the situation improves. It is primarily an evidence based qualitative analysis, based on a review of key documents and interviews with stakeholders at the city level presented in an intuitive and well-structured way. As noted above, an initial stakeholder mapping exercise is necessary to ensure interviews are targeted to those best placed to inform and to generate unbiased scoring.

The CSDA analysis and output is arranged around three broad pillars: enabling services, developing services, and sustaining services. This is illustrated in Table 2 below, alongside the key question associated with each area, and the indicators used.

Table 2 The CSDA framework for FSM

Area	Question in research framework	Indicator
Enabling	What are current policies, planning issues and budgetary arrangements?	Policy
		Planning
		Budget
Developing	What is the level of expenditure, degree of equity and level of output?	Expenditure
		Equity
		Output
Sustaining	What is the status of operation and maintenance, what provisions are made for service expansion and what are current service outcomes?	Maintenance
		Expansion
		Service Outcomes

There are several questions beneath each of the nine overall indicators in Table 2 above. For each question, there are objective criteria to define a score of 0 (poor), 0.5 (developing) or 1 (good). Each question is scored for each step of the service chain, from containment to disposal. An example is given in Table 3 below, for the first question under the “policy” indicator. 21 questions were used in the field studies, but these have been reduced to 17 for the recommended tool, in light of the experience gained.

Table 3 Example CSDA question, criteria and scoring

Question	Containment	Emptying	Transport	Treatment	End-use / disposal	Indicator/ Score
Policy: Is FSM included in an appropriate, acknowledged and available policy document (national / local or both)?	**0.5**	**0**	**0**	**0**	**0**	• 1: policy is appropriate, approved (or in draft form), acknowledged and available • 0.5: policy is appropriate, approved (or in draft form), but not clearly acknowledged / available • 0: policy not available, or inappropriate to the context

Once all the questions are scored for all steps in the service chain, the scores are aggregated into a city scorecard, by summing together the scores for each indicator (policy, planning etc.) and for each step of the service chain. The overall scores for each indicator are out of 3 (more detail is provided in Annex A). Example CSDA outputs are shown in the next section.

4.3 Examples from primary data collection in five cities

Examples of CSDA scorecards from Balikpapan and Bangladesh are shown below, with discussion on the following page.

Figure 8 CSDA scorecard for Balikpapan, Indonesia

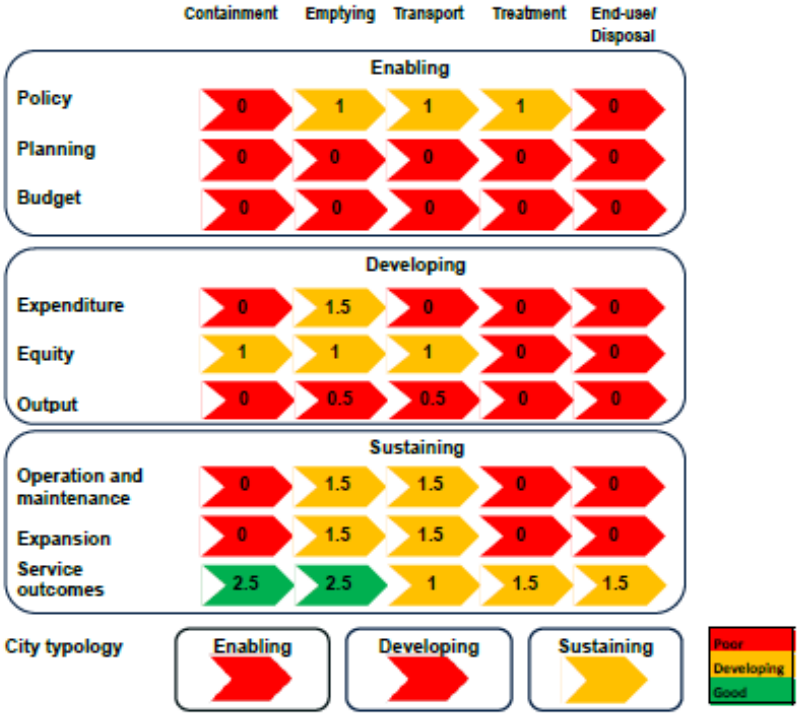
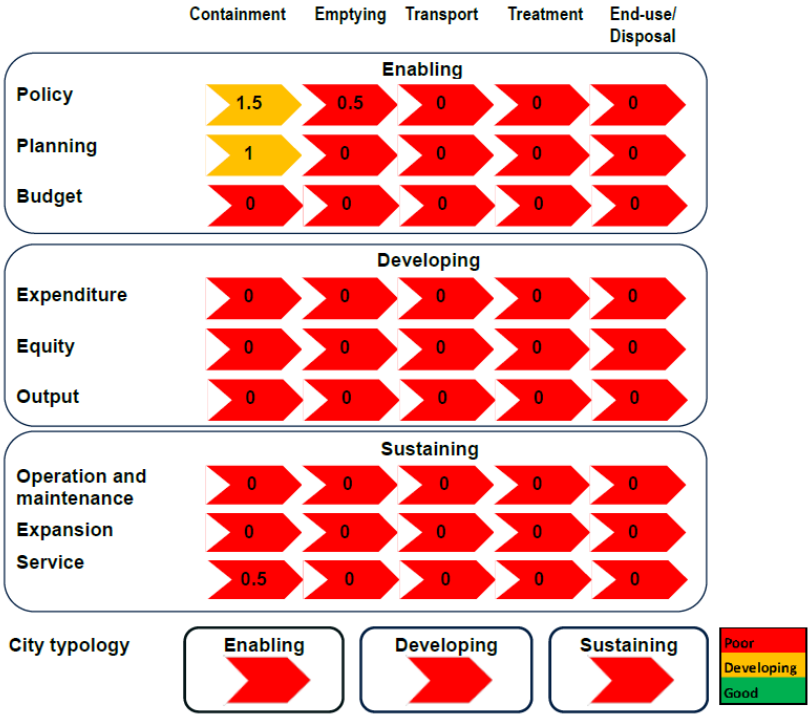


Figure 9 CSDA scorecard for Dhaka, Bangladesh



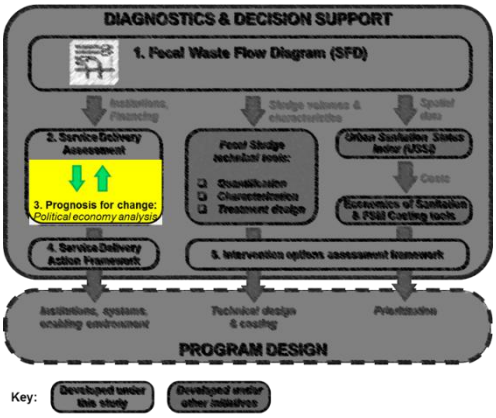
As can be seen for Balikpapan, some policies exist and services are available to some extent (e.g. trucks emptying to a sludge treatment plant). The main areas of weakness along the chain (though there are others) are in the realm of planning, budgeting and outputs. Scoring for the latter is mainly related to the lack of capacity of service providers to meet demand, and the quality of services sufficient to protect against risks. It is also useful to look at each column of the CSDA, which represents a particular step in the service chain. In Balikpapan, treatment and disposal are clearly weaknesses.

For Dhaka, however, it is clear that there are problems along the whole chain on most components of the CSDA. The only 'yellow' scores are for policy and planning around containment, since there is a relatively clear policy framework for use of latrines and almost universal access to latrines. Action is therefore required along the whole sanitation chain across all areas.

It is possible to use the CSDAs above to identify areas of action for the city, if not specific actions themselves. In Balikpapan, getting together city plans and budgets for FSM seems to be a priority across the chain and a focus on treatment in general seems to be required across all three CSDA pillars. The Intervention Options chapter and then the Program Design guidelines help identify how to structure action, including in Dhaka where there are weaknesses across the whole chain and at first glance it may seem hard to know where to start.

5 Prognosis for Change / Political Economy Analysis

5.1 Introduction and objectives



The Prognosis for Change (PFC) assessment aims to understand three things:

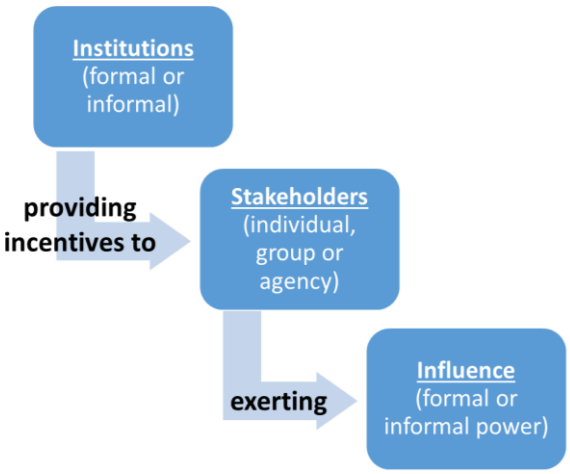
- how key formal and informal **institutions** function,
- what incentives those institutions provide to **stakeholders**, and
- how the formal or informal power those stakeholders have exerts **influence**.

It also considers the implications of the findings for effective engagement with the problem by those wanting to improve the situation. The aim of the PFC is to make interventions more likely to succeed, by ensuring they are taking the underlying political economy of the city into account.

A PFC assessment is close to a political economy analysis (PEA), but with an important distinction. To be most useful to the commissioning agency, PEA should be a "warts and all" analysis which could be damaging if publicly available. In some countries, even using the phrase "political economy" can close doors. Therefore, the important distinction is that a PFC addresses delicate topics more sensitively, such that the analysis can be shared with all stakeholders.

The PFC could be thought of as an abridged PEA with most sensitive parts removed. However, it is more logical to think about it the other way around, as in this report, where there is an "internal" PEA annex to the "external" PFC. Furthermore, as set out in section **¡Error! No se encuentra el origen de la referencia.** in the context of the CSDA, the PFC should be undertaken as part of the iterative process shown in Figure 7. The CSDA does not explain why the current situation prevails or identify potential obstacles to progress – this is the job of the PFC. The three key concepts involved in the PFC are summarised in Figure 10.

Figure 10 Three key concepts in PFC assessment



Firstly, it should first consider how "institutions" function where institutions are defined as "the rules and norms governing human interaction", rather than a narrower definition of organisations. Institutions can be formal, such as codified laws – one example might be a by-law about where FS

can be legally dumped. More importantly, institutions also can be informal, such as social norms. For example, prevailing attitudes towards reusing FS in agriculture are an informal institution.

Secondly, a PFC considers the incentives which institutions provide to stakeholders. A stakeholder is any individual or group with an interest in the outcome of a policy. Some examples of relevant stakeholders may include (but are certainly not limited to) sludge truck companies, the City Council, or slum-dwellers. Stakeholders can be defined broadly or narrowly as required by the breadth and depth of the analysis. For example, the earlier three stakeholder examples could be narrowed to recent entrants to sludge truck market, the planning department of the city council, or female slum-dwellers. This would allow more nuanced analysis rather than taking whole organisations as homogenous.

Finally, a PFC considers how stakeholders exert influence. Here, influence is defined as the formal or informal power to cause something or to prevent it from happening. In FSM, it might be worth considering city council by-laws on FS. A city council may have formal legal power, but if all their by-laws are openly flouted by service providers without fear of punishment, then their influence is very low by that measure. However, they may have informal power to influence FSM in other ways, for example in the ways their employees act when they find a blocked sewer pipe.

In addition, as set out in the tools diagram (Figure 2) it is important to understand that the PFC / PEA is strongly linked to a financing dimension. The availability of finance, and the mechanisms through which it is distributed, have a profound impact on what actually happens. Finally, as noted earlier, to be practically useful a PFC assessment should consider the implications of the findings for effective engagement in a reform or change process.

5.2 Methods and data sources

Given its purpose as an external-facing PEA, it is unsurprising that a PFC essentially uses PEA methods. These methods have undergone rapid development in recent years. In the sanitation sector, key PEA studies include a multi-country study carried out by World Bank-WSP with OPM (WSP, 2010) and a series of papers by the Overseas Development Institute (ODI, 2013). In addition, SANDEC's recent FSM book includes a chapter on stakeholder analysis, which is one key PEA methodology (Strande et al., 2014).

Undertaking a PFC is primarily a qualitative exercise. In terms of data sources, it relies on targeted key informant interviews (KIIs) with stakeholders or focus group discussions (FGDs), alongside secondary data in the form of key sector documents, reports and studies. A PFC requires an analytical structure in order to be clearly communicated. Specific PEA tools can be used to support this, but there are a large number of such tools available. Many are contained in a World Bank sourcebook (Holland, 2007), with the most useful being stakeholder mapping, stakeholder analysis and process mapping. More detail on key tools and methods themselves, and how to use them, is provided in Annex A. They are best demonstrated with city examples, which follow in the next section.

5.3 Examples from primary data collection in five cities

5.3.1 Stakeholder responsibility mapping

As set out above, the focus of PFC is on how institutions function, the incentives which those institutions provide to stakeholders, and how those stakeholders exert influence. It is therefore important to understand who those stakeholders are, alongside their formal and informal roles. A

useful tool to do this is institutional responsibility mapping. As set out in Figure 7, a mapping would already have taken place as part of the CSDA process. The next stage here is to take that further and analyse the formal role of each stakeholder, and how things look in reality. Background information is provided in Annex A, but an abridged example for Lima is provided below. Stakeholders have been categorised by sector (e.g. national or local government, private, etc.), and both their formal and actual responsibilities ('the reality') in FSM in Lima are described. A final column summarises some of the main challenges faced. Further analysis continues below the table.

Table 4 Mapping institutional responsibilities for FSM (abridged example from Lima)

Sector	Stakeholder	Formal role	The reality	Core challenge
National government- ment	**Ministry of Housing, Construction and Sanitation**	Guarantee the provision of high quality urban water and sanitation services and encourage its sustainable use.	There are no specific policies for OSS or FSM in urban areas, and no budget has been allocated for these purposes.	Although the problems with OSS sanitation in peri-urban areas are acknowledged by different stakeholders at national and local levels, responsibilities for OSS and FSM are not adequately allocated and thus no plans or interventions are carried out. Current focus on FSM nationally is on rural rather than urban areas.
	Ministry of Environment	Reduce and prevent the contamination of water sources, air pollution, and soil degradation.	Currently drafting the 'Law of Solid Wastes', which is mainly focused on sludge produced by treatment plants, but may incorporate some or all of the components of the FSM chain.	
	Ministry of Health – Directorate for Environmental Health & Health Directorate (DESA)	Guide the design of sanitation policies to prevent diseases and improving health. 80% of budget allocated is directed towards drinking water quality assurance, with the remaining 20% directed towards waste water management.	They carry out health promotion and prevention activities, and inspections of potential foci of infection due to mismanagement of OSS facilities. There is no participation in specific FSM programmes.	
Local govern- ment	**Drinking Water and Sewerage Service of Lima (SEDAPAL)**	Provide adequate access to drinking water and sewerage, as well as treatment and disposal of waste water.	FSM services for other types of OSS besides septic tanks are not considered. However, they are currently designing a FSM pilot programme to reach poor peri-urban areas.	Funding and limited capacity to pay from poor households may be an issue in scaling-up FSM services in the future.
	Metropolitan Municipality of Lima	Design and assess urban plans and interventions. They also approve SP registration and grant licenses for their operation.	They have an indirect role in FSM by providing land titles to poor households and encouraging them to settle in areas where the provision of sewerage in the future is possible.	Focus on sewerage as the only alternative and limited knowledge of the potential demand for FSM services. They also have a limited budget for sanitation interventions.
NGOs	**X-Runner**	Provide urine-diverting toilets, and emptying, transport, treatment and reuse of FS.	They only serve a few households in slums (approx. 200) but uptake and satisfaction have been high. Services remain unaffordable for many households (US $12 per month).	They have low visibility and have been unable to get the necessary funding to scale-up their services.
Private sector	**Services providers (e.g. Megapack Trading, Tecnisan)**	Provide SWM services, emptying and transport of FS from septic tanks, and construct and operate sanitary landfills.	No operations in peri-urban areas due to limited willingness and ability to pay by poor households. Limited access to dwellings and pits, as well as inadequate equipment / emptying methods, may also be a deterrent for the provision of services. SWM services are not always timely.	Current business is profitable and no incentives to develop FSM in peri-urban areas as market scale is unknown.

The main messages of Table 4 are the following:

- At both national and local levels, no responsibilities for FSM have been clearly designated across stakeholders, which discourages the development of FSM services. Sector planning, and thus, public budgets are unlikely to encompass FSM if no stakeholder can be held accountable for investments and results. Indeed, budget allocations are primarily directed to the expansion of the sewerage network and treatment facilities.

- Moreover, given the current segmentation of the sanitation sector across different institutions (as shown in Table 4), a clear designation of responsibilities is needed (as is the case for sewerage). Several key informants emphasised that sector or national development plans that encompass FSM cannot be developed without a prior definition and allocation of competencies. Further evidence from KIIs also suggests that, although there seems to be no political opposition to the development of FSM, there is also no political drive to carry it forwards. This is partly driven by the persistent demand for sewerage (and piped water) by slum dwellers, which drives political campaigns and sanitation policy more broadly, as well as the lack of actual commitment and actions by government.

- Poor households in peri-urban Lima face significant financial restrictions to pay for the FSM services currently offered. The usual practice of digging new pits once the ones in use fill up has allowed for the maintenance of the current *status quo*. However, limited space, land tenure issues and health hazards and risks, as well as delays in getting access to sewerage (which can take between 8 to 10 years), is encouraging people to explore other alternatives, as is the case of the urine-diverting facilities offered by X-Runner.

Overall, as shown in the CSDA scorecard for Lima (see above), the whole sanitation chain needs to be formally enabled, developed and sustained. Even if current legal frameworks for solid waste management service providers allow for the inclusion of FSM service providers, there is an urgent need to explicitly include FSM within urban development plans and budgets. Without a proper distribution and designation of responsibilities for FSM, to which stakeholders are held accountable, it will not be possible to establish FSM services and develop a strong FSM market. There are no obvious incentives for stakeholders to undertake FSM activities, and they cannot be expected to independently take this venture forwards.

5.3.2 Process mapping

The section presents another tool, using an example from Dhaka. It is helpful to consider the ongoing problem of poor FSM in Dhaka in two dimensions. The first dimension is static, that is, the way households and businesses are dealing with their FS at present. At present millions of people in Dhaka have their latrine outflow directly or indirectly connected to some kind of drain. The second dimension is dynamic – the city is changing rapidly, both spatially (e.g. more high-rise buildings, slums transferring to periphery) and demographically (population growth and inward migration).

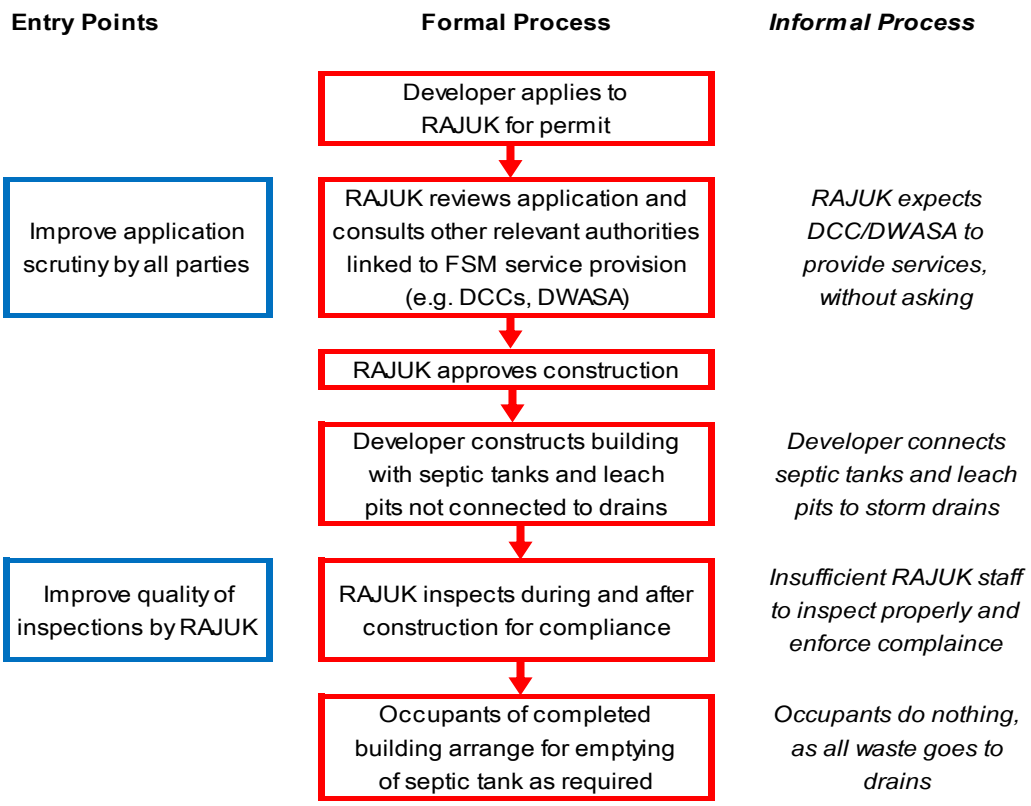
In terms of policy, the static problem requires a response which could be implemented slowly over time – for example, there are ways of persuading or obliging households to disconnect their toilets from the drains. The dynamic problem, however, requires engagement in areas that are more the domain of urban planning than sanitation policy and practice. If property developers are to be prevented from connecting the wastewater outflow of new buildings to the drains, they must be compelled to build proper septic tanks which are not connected to drains. As new migrants to

Dhaka arrive, and as existing households upgrade their living conditions, they must have sanitation options open to them offer the potential of effective FSM.

It is possible to illustrate the first aspect of the dynamic problem by using a tool called process mapping. This aims to understand the interaction of formal and informal "moments" in a process, and to identify entry points for engagement. It is important to identify the roles of stakeholders in a process, how and where they exert influence over the process, and the incentives they face in the informal system.

The process for constructing a new building in Dhaka is shown in Figure 11 below. The central column shows the formal process which is supposed to be followed by the property developer, RAJUK (the capital development authority) and the occupants of the eventual building. The third column, however, shows elements of the informal process, i.e. what really happens. For example, RAJUK is supposed to consult the Dhaka City Corporations and DWASA (the utility) about services to be provided (e.g. water supply, sewerage, drainage, solid waste etc.) when a new building is constructed. However, this may be limited to only the bare minimum (e.g. water) or RAJUK may sometimes simply expect services to be provided. Another example would be that the developer is supposed to construct septic tanks (and leach pits) which be easily accessed for desludging, but in reality they connect these to the drains. There is also some anecdotal evidence of developers constructing 'sham' facilities to fool or placate overworked RAJUK inspectors.

Figure 11 Process mapping for new building construction



In terms of entry points, there are two ways in which the formal process could be improved so as to make it less likely that the informal process is followed. Firstly, process for planning applications could be tightened up, so that the DCCs and DWASA have greater scrutiny of what is going on. This would not necessarily be easy to implement, and would bring new problems (e.g. time/inclination of staff to engage, desire to slow down development due to red tape, etc.). In any case, the relevant DCC and DWASA staff involved in the planning process would need time to

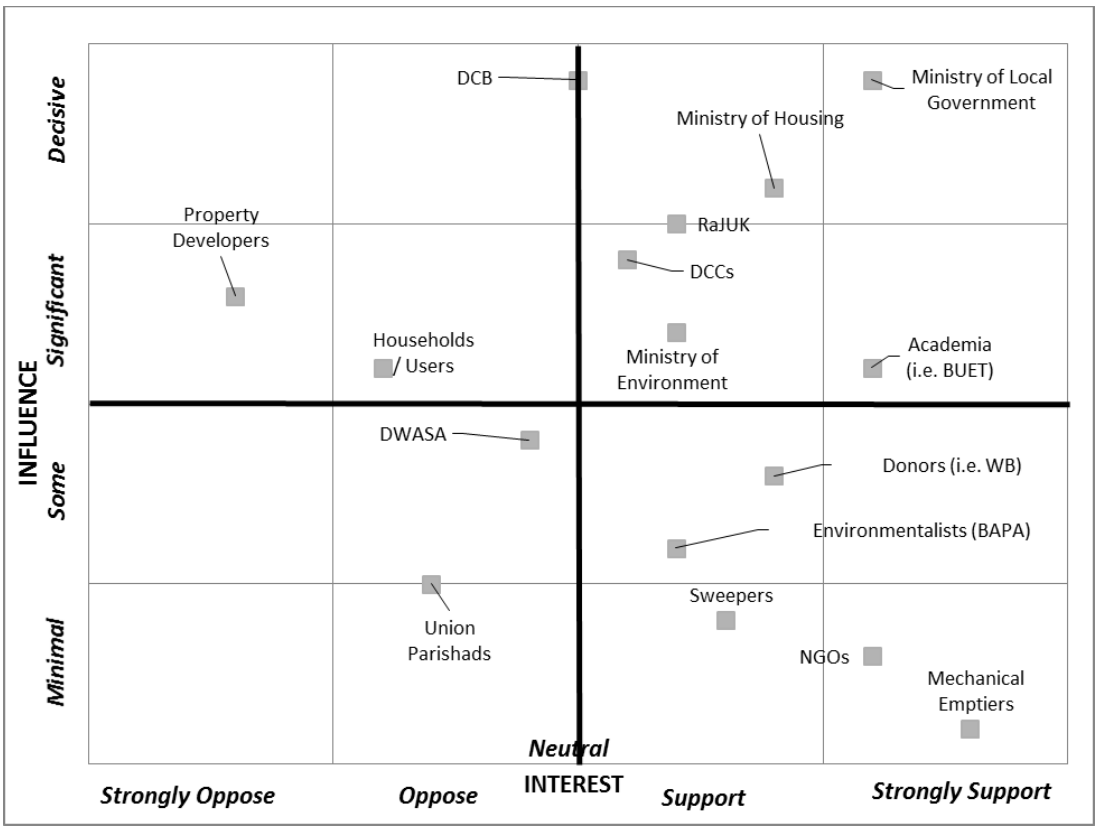
engage. A second entry point could be at the inspection stage. If RAJUK's inspectors were better resourced, or if their incentives were better aligned towards preventing unscrupulous property developers from connecting to the drains, then this could improve the situation.

5.3.3 Stakeholder influence analysis

This section presents another tool called stakeholder influence analysis, using an example from Dhaka. When considering reform options, it is crucial to consider how stakeholders might respond, e.g. who would be supportive, who would oppose – in other words, their interest, or whether they stand to gain or lose from any change. With a limited amount of time and effort to put into preparing the ground and working with different stakeholders, it would be wise to use that time efficiently and target it at the right people. Therefore, information about stakeholders' interests is not enough. It must be used in combination with an analysis of their relative influence. It is not worth spending as much time on people who oppose the reform but have no power, as with those who oppose it but have decisive power to prevent it from happening.

Interest and influence can be scored and mapped onto a stakeholder matrix, as in Figure 12 below. In this matrix, the question of whether each stakeholder would support or oppose a move towards better containment and emptying practices in Dhaka is considered, i.e. a move towards preventing the connection of toilets to drains and an associated spike in demand for emptying services sooner or later. Next, their relative influence to cause or prevent such a change is considered. Each stakeholder is scored on a scale from -10 to +10 on both axes.

Figure 12 Stakeholder matrix for 'moving to better containment and emptying practices'



Stakeholder matrices can help start a conversation about stakeholder engagement in reform processes. It has inherent limitations (e.g. it is not possible to be sure about how different stakeholders would respond, these stakeholder groups are not homogenous etc.), but nonetheless provides a basis for discussion amongst reform proponents, even if the matrix is discarded. From Figure 12, it might be suggested that there are quite a lot of influential stakeholders who would be

supportive of FSM reform, under the right conditions. This could be contributing to the fact that reforms are now beginning to take place.

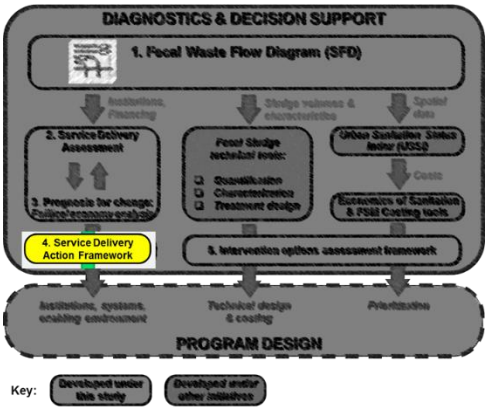
It is worth considering some specific examples to illustrate Figure 12. For example, the Dhaka City Corporations would stand to gain in terms of a smaller load being placed on their small-bore drainage system, which might be expected to become blocked less often as a result. If FSM reform creates more work for them, in terms of the new responsibilities they are only beginning to realise they have (see Dhaka case study report), then this might make them less enthusiastic. Overall, then, they are scored as being cautiously in favour. Also, as the key local government stakeholder, they have relatively high influence over the decision.

Informal sweepers (manual latrine emptiers) are in a similar situation. Stopping latrines being connected to drains would work well for them in the short term, in the sense that they would get more business pit emptying. However, they may also be wary of market developments which would enable mechanical truck emptiers to break into their market in the medium term. However, sweepers have relatively little influence over FSM reform. They can affect the day-to-day situation on the ground. For example, there is anecdotal evidence that sweepers have interfered with the ability of mechanical operators to empty pits, but they are not an influential constituency on the whole. It is also worth noting that many of them are DCC employees, who carry out private emptying work on the side.

Households and property developers, on the other hand, might be expected to oppose reforms, as they do not perceive the societal damage costs of inaction, but only the personal costs they would bear from a change to the situation. Both would stand to face higher costs, households from having to adapt their toilet facility and eventually pay emptying fees, and property developers from having to spend more on proper septic tanks and appropriate access to them. Both are likely to be influential, households in terms of public opinion, and developers in terms of their political connections.

6 Service Delivery Action Framework

6.1 Introduction and objectives



A fecal waste flow diagram represents a response to the planning question *"Where are we now?"*. From this, the a set of proposed solutions (intervention options) and associated actions respond to the question *"Where do we want to get to?"*. This section explains how to identify a set of actions as the initial step in responding to the question "*How do we want to get there?*". The process is focused on the institutional requirements to achieve effective service delivery.

When considered carefully, the outputs of all diagnostic and decision-support tools provide comprehensive information, informing a further process of detailed design towards an FSM improvement and investment program. A strong data set and well-informed evidence base ensure that decisions for achieving enhanced service standards are more firmly based, recognised and acknowledged by the key stakeholders, as intervention options and program design guidelines will be responding to what people recognise as happening within the city. The process essentially results in a set of recommended actions, in relation to the enabling environment, necessary to deliver desired results.

6.2 Methods and data sources

Together, the output from the CSDA and PFC diagnostic tools identifies barriers to progress for FSM services, framed around three aspects of the enabling environment: enabling, developing and sustaining. Overcoming these identified barriers will need action taking that addresses non-technical components of the enabling environment (such as policy and planning, institutional arrangements, capacity and financing), as well as technical responses. The 'Program Design' process is essentially about identifying a set of recommended actions in relation to the enabling environment.

For actions to be effective, recommended interventions must respond to how well developed the enabling environment currently is. The Service Delivery Action Framework (CSDAF) is therefore a way to conceptualise the range of non-technical, 'institutional' interventions that may be most appropriate for a given city, depending on the status of FSM service development as identified using the diagnostic tools. Actions are grouped according to the current status of the enabling environment, with three stages of development identified as *Basic, Intermediate or Consolidating*.

A set of recommended actions is shown in Table 5 that follows. These actions have been developed from good practice and informed by the experience of the authors in relation to the enabling environment for urban sanitation (see the References and Bibliography section for details). They are presented as an *Action Framework* in the sense that they are tailored to how well developed the enabling environment currently is, with a view to strengthening it. As the actions account for the current realities of the city, they must be recognised as essentially sequential and should be viewed as dynamic; that is, actions start with from the Basic stage before moving towards the Intermediate, then the Consolidating stages. If a city is identified to already be delivering FSM services from one of these stages, the resulting set of actions would be taken from the 'next stage'. Actions are therefore informed by the current realities experienced on the ground

and highlight where best to focus attention for that aspect of the enabling environment, in order to improve services.

This is illustrated by way of an example of an CSDAF for Dhaka in Figure 13 that follows Table 5. It serves to highlight where the actions for each element of the enabling environment are considered to be best located, informed by the extent to which actions have already been achieved in the city.

Actions to consider are shown within the shaded boxes with a bold outline, as shown. *'Action'*

The actions are also strongly influenced by the recognition that public health is likely to be at greatest risk where FSM services are least developed. Basic actions therefore focus more strongly on protecting public health, while actions within an already developed enabling environment can include those giving more emphasis to protecting the environment, ensuring effective treatment of fecal sludge and establishing options for fecal sludge re-use.

Table 5 Service Delivery Action Framework

Action point		Basic actions *Critical interventions for public health protection*	Intermediate actions *Strengthening existing foundations*	Consolidating actions *Focussing on sustainable services (and downstream interventions)*
National	**Policy, legislation and regulation**	• Review national sanitation policy and ensure FSM is included • Review the regulatory framework around the protection of public health and the environment from poor sanitation	• Set norms and minimum standards for public health and environmental protection • Establish a legal basis from which to regulate FSM services	• Require local regulation and its enforcement • Develop a policy and regulatory framework to incentivise improved treatment and re-use options for FS where feasible
	Institutional arrangements	• Review institutional arrangements for sanitation – ensure FSM is included • Identify an institutional framework for FSM services with defined roles, responsibilities and coordination mechanisms	• Establish an institutional framework for FSM services with defined roles, responsibilities and coordination mechanisms • Establish institutional roles for FS treatment and re-use options • Propose incentives for improved FSM	• Strengthen the institutional framework to enhance all FSM service outcomes, with fully recognised and implemented roles, responsibilities and coordination mechanisms • Establish incentives for improved FSM
	Planning, monitoring and evaluation	• Build awareness of FSM in national planning entities and relevant sector ministries (works, housing, health, environment, etc.)	• Develop plans to enhance public access to FS emptying services • Establish a monitoring framework against standards of FSM services – focusing on household and institutional emptying services • Establish systems to evaluate service quality	• Establish a framework to monitoring quality standards of all FSM services, including FS treatment facilities and re-use arrangements • Develop plans to enhance treatment capacity and re-use technologies
	Capacity and technical assistance (TA)	• Identify the scale of the existing capacity gap and the technical assistance required to address FSM service needs	• Build public and private sector capacity for city-wide FSM services	• Strengthen public and private sector capacity for city-wide FSM services, including good FS treatment and markets for re-use
	Financing	• Build awareness and agreement around the budgetary requirements for FSM services	• Develop programs with FSM funding windows and incentives for cities	• Mobilize finance for FS processing, re-use and disposal
Local	**Legislation and enforcement**	• Review and, if required, establish byelaws, and ensure that they address on-site systems and FSM services	• Strengthen byelaws and their enforcement • Introduce regulation of service providers • Establish incentives to increase disposal at recognised FS transfer and treatment sites	• Consolidate regulation of pollution of receiving waters or the like • Introduce penalties for indiscriminate FS dumping by service providers • Enforce use of emptiable facilities
	Institutional arrangements	• Review local institutional arrangements for sanitation – ensure FSM is included • Identify an institutional framework for FSM services, with agreed and defined roles, responsibilities and coordination mechanism	• Establish an institutional framework for FSM services, with agreed and defined roles, responsibilities and coordination mechanism • Establish institutional roles for FS treatment and re-use options • Identify appropriate incentives for improved FSM	• Strengthen institutional roles for managing improved FS treatment re-use facilities and options • Implement appropriate incentives for improved FSM
	Planning, monitoring and evaluation	• Conduct rapid diagnostic studies by area, with a gender and pro-poor focus • Develop local plans for FS services, finance and institutional needs	• Establish revenue streams (e.g. water bill surcharge, extra property tax) • Refine and implement local service plans • Establish systems for monitoring and	• Introduce plans to enhance treatment capacity and re-use arrangements • Strengthen monitoring and evaluating of FS treatment facilities and re-use arrangements against service standards

Action point		Basic actions *Critical interventions for public health protection*	Intermediate actions *Strengthening existing foundations*	Consolidating actions *Focussing on sustainable services (and downstream interventions)*
		• Plan and design FS treatment options	evaluating achievement of service standards	
	Promotion	• Stimulate customer demand and WTP for FSM services	• Disseminate information about FSM services and regulations to the public	• Stimulate market demand for re-use of FS
	Capacity and technical assistance (TA)	• Identify capacity gaps and TA required to help improve FSM services • Promote the emergence of private sector emptying services • Implement basic (possibly temporary) measures to more safely dispose of FS that is currently dumped in the environment	• Promote or support development of improved, emptiable containment facilities • Strengthen FSM service providers (business development, financing options, etc.) • Pilot scheduled desludging (if applicable) • Pilot use of FS transfer stations (if applicable) • Build or rehabilitate FS processing plants	• Consolidate and expand use of scheduled desludging, transfer stations, etc. – based on outcome of pilot studies • Develop business models for re-use of treated FS
	Financing	• Identify the extent of financing required to address service improvements to the poorest	• Introduce specific pro-poor financial arrangements (such as targeted subsidies)	• Identify opportunities for financial flows generated from the sale of FS end products
Users	**Planning**	• Consult with communities to identify what they need and want • Identify the gap between the range of technical options and services currently available, and what communities' say they need and want	• Gain user feedback on improved FSM services • Improve technical options and services, in response to user feedback	• Gain user feedback on current and future FSM services, including FS re-use options • Expand on the range and quality of technical options and services, in response to user feedback
	Tenant sanitation[6]	• Map the tenure status (tenure "mix"), resulting sanitation pathways and stakeholder relationships • Engage and consult with landlords on constraints to FSM services	• Develop sanitation options within planning frameworks and approaches that are appropriate to the tenure "mix" within the city • Develop assistance and enforcement packages for landlords	• Strengthen tenure-status informed sanitation options in future planning frameworks and approaches • Focus on enforcement of service quality for landlords

[6] Actions informed by Scott et al (2015)

6.3 Guidelines for action

The Service Delivery Action Framework provides a way to identify the range of 'institutional' actions that may be appropriate for any city, depending on the current status of FSM service development. The actions are grouped according to the how well developed each element of the enabling environment is considered to be. Identifying the most appropriate actions for a particular city recognises that the steps are essentially sequential for any of the actions points – i.e. starting with the basic actions before moving towards intermediate, then consolidating actions. Thus, if a city has already addressed the basic actions, the intermediate actions may be the ones to focus on for that particular element.

As a city progresses through these stages, actions shift from being mainly about identifying, reviewing or building awareness of services, through to actions that are more about establishing, strengthening and promoting commitment to services, and on towards actions that are about strengthening, consolidating and expanding engagement to achieve a more sustainable range of enhanced services. The actions also move from prioritising public health protection (which may include developing temporary measures), to ensuring the protection of the environment and looking at the potential for the re-use of fecal sludge end products.

The actions proposed are therefore considered to be most appropriate to the current situation – indicating a "trajectory of change" as the enabling environment develops and strengthens. Identifying how developed each of the components of the enabling environment is and therefore which actions to take next, must be informed by the result of the City Service Delivery Assessment (CSDA) and Prognosis for Change (PFC) process (Figure 7). A resulting Program Design will therefore be built up through a process of discussion around the CSDA/PFC outputs in relation to the Service Delivery Action Framework.

Examples of how this might look for Dhaka city is shown in Figure 13 and for low-income, informal settlements in Lima is shown in Figure 14 that follow. The figures illustrate where the actions for each element of the enabling environment are considered to be best located, informed by the extent to which actions have already been achieved in the city.

Dhaka city's CSDA scorecard highlighted that progress in the enabling environment is limited to developing policy around containment and establishing an institutional framework for FSM more generally. A focus on intermediate action is needed in relation to these areas, but basic action remains the priority in all other areas, including planning, budgeting, promotion and capacity

This process should recognise that actions will need to be implemented through systematic, strategic and pragmatic steps, if they are to be 'actionable'. The result will be a matrix of actions for the city, with a range of actions targeted at national, city and user level. These in turn can be considered in more detail to inform project and program planning and implementation. Essentially then, the Action Framework helps prioritise where attention needs to be given in developing the details for planning and implementation.

Actions are recommended in the highlighted areas: being focused at either the Intermediate level of action (in relation to Policy and Institutional arrangements), or the Basic level of action (in relation to Planning, Capacity and Financing.

Figure 13 Resulting prioritised actions: Dhaka city

For illustration only – the text is the same as shown in Table 5

Stages of action		Basic actions *Critical interventions for public health protection*	Intermediate actions *Strengthening existing foundations*	Consolidating actions *Focussed on full-chain, sustainable services*
National	**Policy, legislation and regulation**	• Review national sanitation policy and ensure FSM is included • Review the regulatory framework around the protection of public health and the environment from poor sanitation	• Set norms and minimum standards for public health and environmental protection • Establish a legal basis from which to regulate FSM services	• Require local regulation and its enforcement • Develop a policy and regulatory framework to incentivise improved treatment and re-use options for FS where feasible
	Institutional arrangements	• Review institutional arrangements for sanitation – ensure FSM is included • Identify an institutional framework for FSM services with defined roles, responsibilities and coordination mechanisms	• Establish an institutional framework for FSM services with defined roles, responsibilities and coordination mechanisms • Establish institutional roles for FS treatment and re-use options • Propose incentives for improved FSM	• Strengthen the institutional framework to enhance all FSM service outcomes, with fully recognised and implemented roles, responsibilities and coordination mechanisms • Establish for improved FSM
	Planning, monitoring and evaluation	• Build awareness of FSM in national planning entities and relevant sector ministries (works, housing, health, environment, etc.)	• Develop plans to enhance public access to FS emptying services • Establish a monitoring framework against standards of FSM services – focusing on household and institutional emptying services • Establish systems to evaluate service quality	• Establish a framework to monitoring quality standards of all FSM services, including FS treatment facilities and re-use arrangements • Develop plans to enhance treatment capacity and re-use technologies
	Capacity and TA	• Identify the scale of the existing capacity gap and the technical assistance required to address FSM service needs	• Build public and private sector capacity for city-wide FSM services	• Strengthen public and private sector capacity for city-wide FSM services, including good FS treatment and markets for re-use
	Financing	• Build awareness and agreement around the budgetary requirements for FSM services	• Develop programs with FSM funding windows and incentives for cities	• Mobilize finance for FS processing, re-use and disposal
Local	**Legislation and enforcement**	• Review and, if required, establish byelaws, and ensure that they address on-site systems and FSM services	• Strengthen byelaws and their enforcement • Introduce regulation of service providers • Establish incentives to increase disposal at recognised FS transfer and treatment sites	• Consolidate regulation of pollution of receiving waters or the like • Introduce penalties for indiscriminate FS dumping by service providers • Enforce use of emptiable facilities
	Institutional arrangements	• Review local institutional arrangements for sanitation – ensure FSM is included • Identify an institutional framework for FSM services, with agreed and defined roles, responsibilities and coordination mechanism	• Establish an institutional framework for FSM services, with agreed and defined roles, responsibilities and coordination mechanism • Establish institutional roles for FS treatment and re-use options • Identify appropriate incentives for improved FSM	• Strengthen institutional roles for managing improved FS treatment re-use facilities and options • Implement appropriate incentives for improved FSM
	Planning, monitoring and evaluation	• Conduct rapid diagnostic studies by area, with a gender and pro-poor focus • Develop local plans for FS services, finance and institutional needs • Plan and design FS treatment options	• Establish revenue streams (e.g. water bill surcharge, extra property tax) • Refine and implement local service plans • Establish systems for monitoring and evaluating achievement of service standards	• Introduce plans to enhance treatment capacity and re-use arrangements • Strengthen monitoring and evaluating of FS treatment facilities and re-use arrangements against service standards
	Promotion	• Stimulate customer demand and WTP for FSM services	• Disseminate information about FSM services to the public	• Stimulate market demand for re-use of FS
	Capacity and technical assistance (TA)	• Identify capacity gaps and TA required to help improve FSM services • Promote the emergence of private sector emptying services • Implement basic (possibly temporary) measures to more safely dispose of FS that is currently dumped in the environment	• Promote or support development of improved, emptiable containment facilities • Strengthen FSM service providers (business development, financing options, etc.) • Pilot scheduled desludging (if applicable) • Pilot use of FS transfer stations (if applicable) • Build or rehabilitate FS processing plants	• Consolidate and expand use of scheduled desludging, transfer stations, etc. – based on outcome of pilot studies • Develop business models for re-use of treated FS
	Financing	• Identify the extent of financing required to address service improvements to the poorest	• Introduce specific pro-poor financial arrangements (such as targeted subsidies)	• Identify opportunities for financial flows generated from the sale of FS end products
Users	**Planning**	• Consult with communities to identify what they need and want • Identify the gap between the range of technical options and services currently available, and what communities' say they need and want	• Gain user feedback on improved FSM services • Improve technical options and services, in response to user feedback	• Gain user feedback on current and future FSM services, including FS re-use options • Expand on the range and quality of technical options and services, in response to user feedback
	Tenant sanitation	• Map the extent of tenure status (tenure "mix"), resulting sanitation pathways and stakeholder relationships • Engage and consult with landlords on constraints to FSM services	• Develop sanitation options within planning frameworks and approaches that are appropriate to the tenure "mix" within the city • Develop assistance and enforcement packages for landlords	• Strengthen tenure-status informed sanitation options in future planning frameworks and approaches • Focus on enforcement of service quality for landlords

Figure 14 Resulting prioritised actions: Lima's low-income, unsewered settlements

For illustration only – the full detail is in the Lima case study report. Actions are recommended in the highlighted areas, which are all at the basic level.

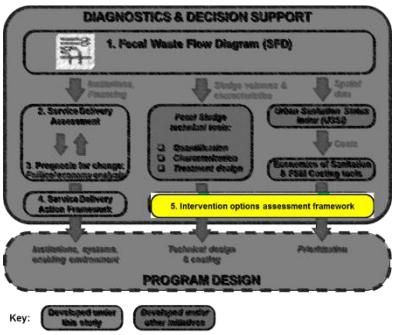
Stages of action		Basic actions *Critical interventions for public health protection*	Intermediate actions *Strengthening existing foundations*	Consolidating actions *Focussed on full-chain, sustainable services*
National	Policy, legislation and regulation	• Review national sanitation policy and ensure FSM is included • Review the regulatory framework around the protection of public health and the environment from poor sanitation	• Set norms and minimum standards for public health and environmental protection • Establish a legal basis from which to regulate FSM services	• Require local regulation and its enforcement • Develop a policy and regulatory framework to incentivise improved treatment and re-use options for FS where feasible
	Institutional arrangements	• Review institutional arrangements for sanitation – ensure FSM is included • Identify an institutional framework for FSM services with defined roles, responsibilities and coordination mechanisms	• Establish an institutional framework for FSM services with defined roles, responsibilities and coordination mechanisms • Establish institutional roles for FS treatment and re-use options	• Strengthen the institutional framework to enhance all FSM service outcomes, with fully recognised and implemented roles, responsibilities and coordination mechanisms
	Planning, monitoring and evaluation	• Build awareness of FSM in national planning entities and relevant sector ministries (works, housing, health, environment, etc.)	• Develop plans to enhance public access to FS emptying services • Establish a monitoring framework against standards of FSM services – focusing on household and institutional emptying services • Establish systems to evaluate service quality	• Establish a framework to monitoring quality standards of all FSM services, including FS treatment facilities and re-use arrangements • Develop plans to enhance treatment capacity and re-use technologies
	Capacity and TA	• Identify the scale of the existing capacity gap and the technical assistance required to address FSM service needs	• Build public and private sector capacity for city-wide FSM services	• Strengthen public and private sector capacity for city-wide FSM services, including good FS treatment and markets for re-use
	Financing	• Build awareness and agreement around the budgetary requirements for FSM services	• Develop programs with FSM funding windows and incentives for cities	• Mobilize finance for FS processing, re-use and disposal
Local	Legislation and enforcement	• Review and, if required, establish byelaws, and ensure that they address on-site systems and FSM services	• Strengthen byelaws and their enforcement • Introduce regulation of service providers • Establish incentives to increase disposal at recognised FS transfer and treatment sites	• Consolidate regulation of pollution of receiving waters or the like • Introduce penalties for indiscriminate FS dumping by service providers • Enforce use of emptiable facilities
	Institutional arrangements	• Review local institutional arrangements for sanitation – ensure FSM is included • Identify an institutional framework for FSM services, with agreed and defined roles, responsibilities and coordination mechanism	• Establish an institutional framework for FSM services, with agreed and defined roles, responsibilities and coordination mechanism • Establish institutional roles for FS treatment and re-use options	• Strengthen institutional roles for managing improved FS treatment re-use facilities and options
	Planning, monitoring and evaluation	• Conduct rapid diagnostic studies by area, with a gender and pro-poor focus • Develop local plans for FS services, finance and institutional needs • Plan and design FS treatment options	• Establish revenue streams (e.g. water bill surcharge, extra property tax) • Refine and implement local service plans • Establish systems for monitoring and evaluating achievement of service standards	• Introduce plans to enhance treatment capacity and re-use arrangements • Strengthen monitoring and evaluating of FS treatment facilities and re-use arrangements against service standards
	Promotion	• Stimulate customer demand and WTP for FSM services	• Disseminate information about FSM services to the public	• Stimulate market demand for re-use of FS
	Capacity and technical assistance (TA)	• Identify capacity gaps and TA required to help improve FSM services • Promote the emergence of private sector emptying services • Implement basic (possibly temporary) measures to more safely dispose of FS that is currently dumped in the environment	• Promote or support development of improved, emptiable containment facilities • Strengthen FSM service providers (business development, financing options, etc.) • Pilot scheduled desludging (if applicable) • Pilot use of FS transfer stations (if applicable) • Build or rehabilitate FS processing plants	• Consolidate and expand use of scheduled desludging, transfer stations, etc. – based on outcome of pilot studies • Develop business models for re-use of treated FS
	Financing	• Identify the extent of financing required to address service improvements to the poorest	• Introduce specific pro-poor financial arrangements (such as targeted subsidies)	• Identify opportunities for financial flows generated from the sale of FS end products
Users	Planning	• Consult with communities to identify what they need and want	• Gain user feedback on improved FSM services	• Gain user feedback on current and future FS re-use options
	Tenant sanitation	• Engage and consult with landlords on constraints to FSM services	• Develop assistance and enforcement packages for landlords	• Focus on enforcement of service quality for landlords

Making actions context-specific and localised

A further step in the process will be to take the actions from each of the highlighted areas and translate them into objectives, targets and indicators that respond to the specific context of the given city – at the scale (e.g. city-wide, or focused on specific locations) to enable detailed planning. This step must not be overlooked and requires a significant commitment of time, resources and skills to achieve effective results.

7 Intervention options assessment framework

7.1 Introduction and objectives



As indicated in Figure 2, Intervention Options for developing and improving FSM services requires an pre-existing assessment of various aspects (including fecal waste flows, sludge volumes etc.). The intended result is a set of recommended intervention options and actions that can support the ultimate aim of fully developed, effective FSM services. Only when all aspects are considered together for a given city will the proposed options and actions be both directly informed by the current state of service delivery and prioritised in such a way as to identify realistic, achievable and sustainable objectives and outcomes.

To achieve this requires further assessment of the outputs from the Diagnostic Tools; notably the fecal waste flow diagram (SFD) in relation to technical aspects of current levels of service delivery through the service chain, and the City Service Delivery Assessment (CSDA) and Prognosis for Change (PFC) in relation to the enabling environment. Evidence from the use of other tools (related to identifying levels of public health risk, financing and economics, and fecal sludge quantification and characterisation) can help when selecting what actions to take.

7.2 Assessing Technical Intervention Options: methods and data sources

The starting point to assessing appropriate Technical Intervention Options for a city is the fecal waste flow diagram (SFD), as informed analysis must begin with an understanding of the current problem, its nature and scale. The assessment focuses around where fecal waste flows are shown to be *ineffectively managed* – that is, the point at which the flow 'drops out' of the service chain. This assessment is done for each sanitation type in the diagram (e.g. sewer, on-site storage emptied, on-site straight to drain), with the most significant problems put into a table showing problems against the stages of the service chain. Technical Intervention Options to respond to the specific problems can then be proposed and added to the table. Assessing the problems and identifying options to solve them must be informed by knowledge and expertise of good sanitation and fecal sludge management practice, as well as experience of potential technical solutions that are appropriate to the various stages of the service chain. Publications, including the SANDEC/EAWAG's Fecal Sludge Management and Compendium of Sanitation Systems and Technologies books, are valuable to support this process. Technical intervention options must also be based on an understanding of the predominant characteristics of fecal sludge in the city, as well as an understanding of how much of it there is to manage. This is essential to avoid inappropriate technical options being proposed. The work by SANDEC/EAWAG on fecal sludge quantification and characterisation (FAQ) will be particularly valuable here. The References and Bibliography section has further details.

As a technical option is proposed at any given stage in the service chain, it is essential to consider the implications of applying this intervention for other stages of the same chain, so that interventions help to develop a fully-functioning service chain from containment through to eventual disposal or re-use of fecal sludge. So, for example, if a proposed technical intervention relates to introducing or extending the services of private providers who empty fecal sludge from on-site containment systems, those providers will need to have the appropriate means to transport the fecal sludge (using mechanised or manual-powered transport equipment) to suitable disposal

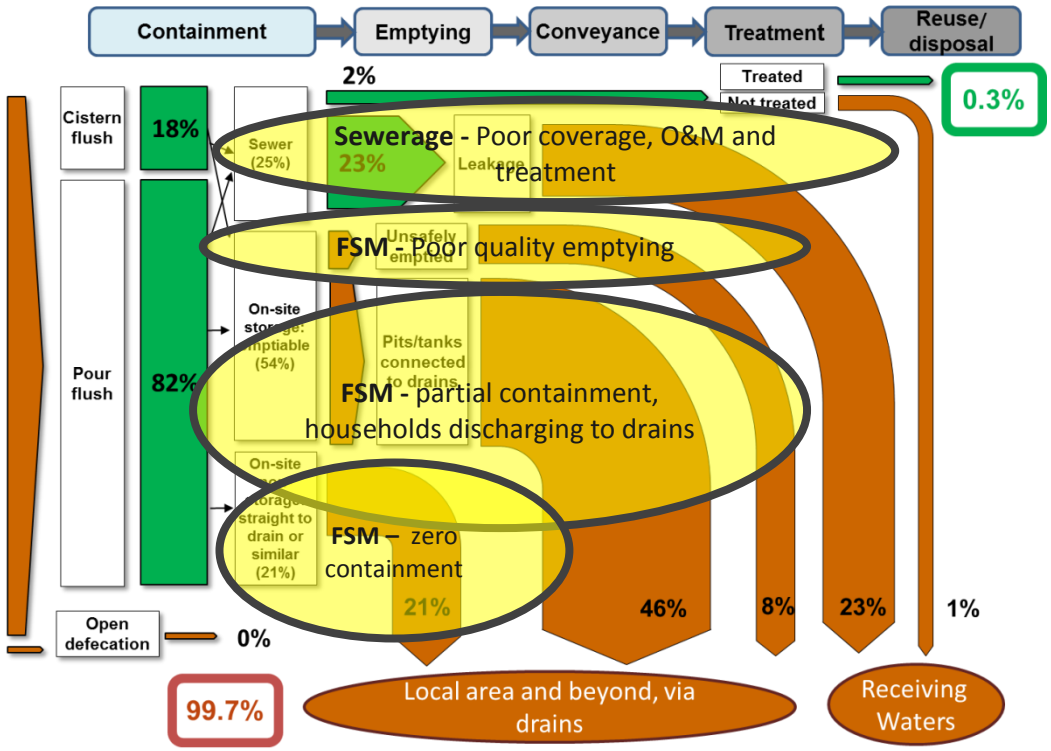
locations – which may be in the form of local FS transfer stations, receiving stations at FS treatment sites, or a safely managed disposal site. Key publications to support the identification of 'linked-up' technical options through the service chain are included in the References and Bibliography.

7.3 Examples from primary data collection in five cities

Dhaka city

Figure 15 below shows the city-wide fecal waste flow diagram for Dhaka. Where fecal sludge and wastewater 'drop out' of the service chain, examples of the most significant problems for each sanitation type are highlighted.

Figure 15 Dhaka city-wide fecal waste flow: results and problems



Backed by knowledge of the evidence used to generate the city-wide SFD for Dhaka, an assessment of the current status highlights the key problems of both fecal sludge and wastewater management services. These relate to the poor functionality of the existing sewer network, poor quality fecal sludge emptying services, a lack of fecal sludge being contained in on-site pits and septic tanks and a proportion of fecal sludge discharging directly into the environment where no on-site containment exists at the household.[7]

From this starting point, the table of technical intervention options can be built up. For these intervention options and proposed solutions to be realistic and workable requires a good understanding of the city context, as well as insight into any recent, current and imminent interventions, studies, pilot projects and research activities affecting sanitation services in the city that can be taken into account. The potential solutions should be developed and agreed with

[7] The SFD for a purposive sample of slums in Dhaka showed similar problems resulting from ineffectively managed fecal sludge management services (there being no connectivity to sewers identified in the slum sample). The dominant problem identified was zero on-site containment and fecal sludge discharging directly into drains.

participation from key decision-makers in the city, to achieve ownership and uptake. Table 6 shows a selection of the Intervention Options identified for Dhaka city, illustrating one intervention option at each step of the service chain for each system type.[8]

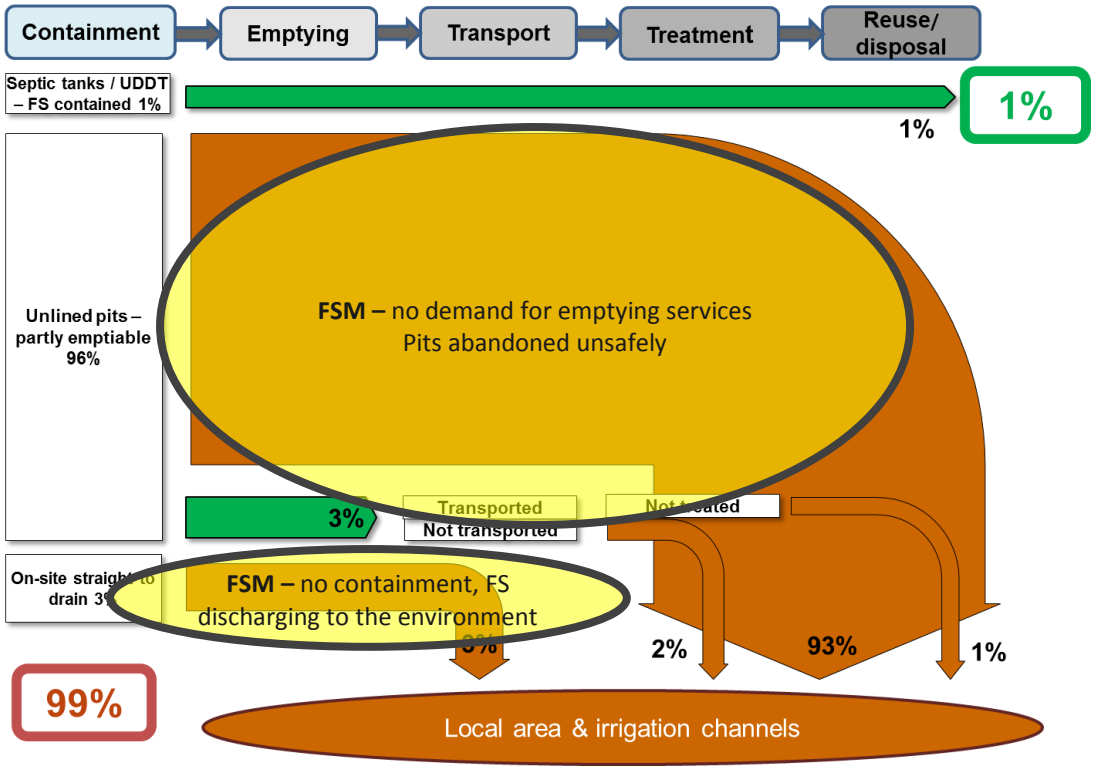
Table 6 Technical Intervention Options for sewers and on-site systems in Dhaka

System type • **Key problems** (one example per system)	**Potential solutions** (one option for each system type shown here for illustration)					
	Containment	**Emptying**	**Transport**	**Treatment**	**Disposal**	**Re-use**
Sewers • Limited O&M and functionality (leakage, blockages, overflows, etc.)	Enforce building codes for new-build housing; i.e. connected to existing or planned sewers.		Increase monitoring and recording of sewer conditions	Improve treatment standards of the existing wastewater treatment plant	Monitor and report on effluent standards	
On-site containment: emptiable • Limited use of emptying services – high rate of FS discharge to drains	Improve the design and construction of septic tanks (STs) and pits, with standards followed to maximise retention of FS	Improve range of responsive & affordable emptying options and services	Identify, pilot and develop innovative transport solutions (mechanised or human powered), offering affordable and responsive services	Introduce a range of decentralised treatment facilities and/or FS handling station at wastewater treatment plants	Modify existing sites and manage new FS disposal sites – to minimise risk to public and environ-mental health	Explore financially viable options for FS re-use
On-site containment: non-emptiable • poor containment infrastructure	Modify existing STs/pits, to convert to being both emptiable and providing effective containment	Extend emptying services to additional facilities				
No containment • direct discharge to environment	Invest in new household-level container-based options, where acceptable to users	Identify innovative servicing of household container-based options				

The full set of technical intervention options for Dhaka city (in the full city report) highlights how technical interventions to develop effective FSM services will be most varied and complex at the stages of containment, emptying and transport of fecal sludge, while treatment, disposal and end-use options are likely to coalesce into similar interventions. So, while there may be multiple systems and problems identified at the household level, common solutions may be more appropriate at certain stages of the service chain.

Figure 16 Lima low-income, unsewered settlements fecal waste flow: results and problems

[8] The full set of Intervention Options is given in the Dhaka city report



Taking the fecal waste flow diagram for the low-income, unsewered settlements of Lima (Figure 4) and the data used to develop it, the key problems associated with FSM services can be identified as relating to the poor functionality of the existing sewer network, poor quality fecal sludge emptying services, a lack of fecal sludge being contained in on-site pits/tanks and a proportion of fecal sludge discharging directly into the environment where no on-site containment exists at the household.

From this starting point, the table of intervention options is built up. Table 7 shows a selection of the Intervention Options identified for low-income, unsewered settlements in Lima city. It shows one intervention option at each step of the service chain for each system type.

Technical intervention options and the enabling environment

The resulting set of technical intervention options proposed for any city must next be considered in relation to the design of a FSM or sanitation program that will address the enabling environment affecting current and future services. How to do this, using the results of the CSDA and PFC, is explained in the following section addressing Program design guidelines.

Table 7 Technical Intervention Options by system type: Lima low-income areas

System type • **Key problems** (one example per system)	**Potential solutions** (one option for each system type shown here for illustration)					
	Containment	**Emptying**	**Transport**	**Treatment**	**Disposal**	**Re-use**
On-site with containment • Poorly constructed and managed pits	Improve the design and construction standards for existing pits – including more pit lining options	Promote use of a wider range of appropriate, low-cost pit lining options, as part of sanitation marketing	Mobilize a wider range of transport options – including improved manual and small-scale mechanised transport	Consider and build decentralised FS treatment sites, to support areas with increased levels of emptying – such as drying beds	Identify the current location of unofficial disposal / discharge sites and address key public and environmental health risks	Explore opportunities for FS re-use in: agriculture (nutrient value), industry (e.g. energy value as a dried fuel
On-site with no containment • No effective containment of FS	Promote and introduce a range of options that provide on-site containment of FS, including: - twin-pit composting toilet - *Fossa Alterna* - twin-pit urine-diversion toilets (UDTs) - simple pits - septic tanks	As for above, plus: Identify and pilot requirements (awareness, knowledge, skills, tools and products) to enable household-level safe handling and disposal or re-use of correctly stored FS from twin-pit systems	As above *Note: may not be required for household-level handling of safely dried FS*	As above, plus: Increase awareness, skills, tools and products to ensure FS from household-level twin-pit systems is safe to handle (through correct storage)	As above, plus: Increase awareness, skills, tools and products to support safe disposal (e.g. direct burial) of FS from household-level twin-pit systems	As above, plus: Increase awareness, skills, tools and products to support safe handling of correctly stored FS from household-level twin-pit systems (e.g. application to local land where demand exists, simple or co-composting)
Open defecation • Indiscriminate contamination from FS in the local area	Promote and introduce a range of simple, but durable pit latrines (basic and improved)	Increase variety and scope (range) of emptying services to additional facilities: see above				

8 Other useful resources

8.1 Integrated design approach for fecal sludge treatment

In low-income countries, regulations affecting fecal sludge often do not exist, or are not enforced, which makes defining performance goals for fecal sludge management extremely challenging. Most sanitation infrastructure projects are designed to overly-stringent performance goals, but end up not performing as intended and frequently failing. While over-designing wastes money and resources, under-designing does not provide adequate protection of human and environmental health. Technologies designed for the purpose of *resource recovery* can be used to define required and appropriate performance goals, including increased financial flows to offset costs in the service chain. The technologies can also provide an incentive for efficient and effective collection and transport service delivery arrangements and the operation of optimized treatment plants, as they function on the basis of meeting a market demand.

SANDEC at Eawag is currently developing a series of tools to support an integrated approach to designing fecal sludge treatment. The tools will be based on field experience in fecal sludge management and address five core arears with the following objectives:

- Market Driven Approach: to aid selection of treated end-products with the greatest potential for market volume and growth;
- Evaluate collection and transport service delivery and the siting of treatment plants;
- Optimized treatment technologies for resource recovery: to optimize existing treatment technologies for increased volumetric capacity or reduced footprint of the treatment plant;
- Faecal sludge quantification and characterization: to reasonably estimate the characteristics and quantities of fecal sludge on a city-wide scale, or an appropriate scale to suit the intended treatment plant; and
- Laboratory methods: to prepare reliable and replicable standard methods for laboratory analysis of fecal sludge.

Publications supporting development of the tools can be found on the SANDEC website at: www.sandec.ch/fsm_tools

8.2 SANDEC FSM Book

Faecal Sludge Management: Systems Approach for Implementation and Operation is the first book dedicated to faecal sludge management. It compiles the current state of knowledge of this rapidly evolving field and presents an integrated approach that includes technology, management and planning. It addresses the planning and organization of the entire faecal sludge management service chain, from the collection and transport of sludge and treatment options, to the final end use or disposal of treated sludge.

In addition to providing fundamentals and an overview of technologies, the book goes into details of operational, institutional and financial aspects, and provides guidance on how to plan a city-level faecal sludge management project with the involvement of all the stakeholders.

The FSM book can be downloaded for free from www.sandec.ch/fsm_book

8.1 Urban Sanitation Status Index

The Urban Sanitation Status Index (USSI) is a tool based on the sanitation service chain that visualizes sanitation status at neighbourhood level, which is usually the lowest administrative unit within a city. However, it can also be used at district or city level. It is based on 15 qualitative indicators assessed via household surveys and key informant interviews, using similar data to those required for the tools described elsewhere in this document, but also including very basic data on solid waste and drainage, which are important complementary aspects of sanitation in its narrow sense of excreta management.

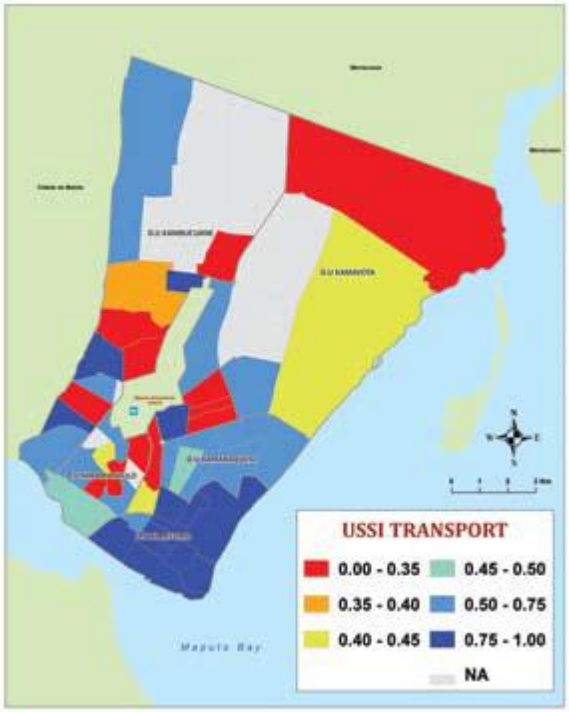
The 15 base indicators are aggregated into 9 numerical indicators and then into 4 components (see table below) based on the sanitation service chain – (i) containment; (ii) emptying and transport; (iii) treatment and disposal; and (iv) complementary services (solid waste and drainage). These can be mapped by neighbourhood to give a sense of where the service chain is failing most severely (see

Figure 17). They can also be aggregated into the overall USSI using the analytic hierarchy process, whereby sanitation experts familiar with the area under study provide relative rankings of pairs of the numerical variables which are aggregated and used to generate a weighted geometric mean of all the variables.

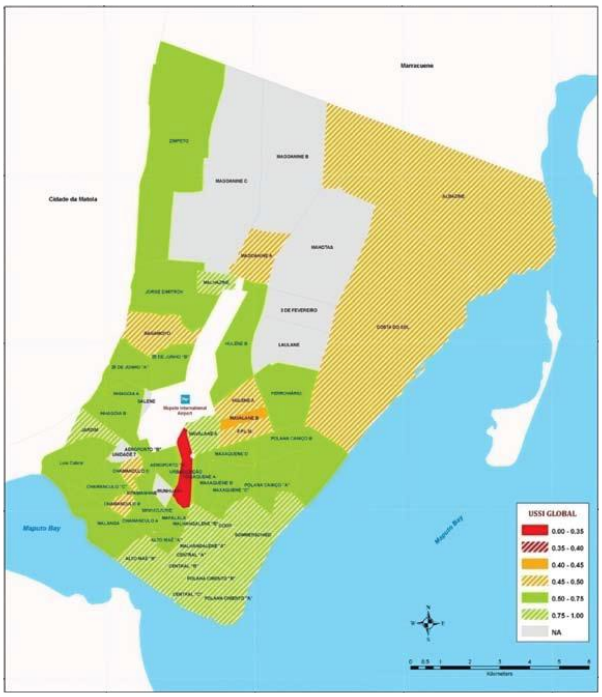
Table 8 Components and indicators in the USSI

Component	Indicator	Information capture
Containment	Access to toilet	Household
	Structural safety	Household
	Hygienic condition	Household
Emptying and Transport	Access to emptying services	Household
	Transport safety	Neighbourhood
Treatment and Disposal	Level of treatment	Household
	Final disposal	Household
Complementary Services	Solid waste management	Household + Neighbourhood
	Storm & greywater management	Household + Neighbourhood

Figure 17 Examples of USSI output maps from Maputo, Mozambique



Emptying and Transport

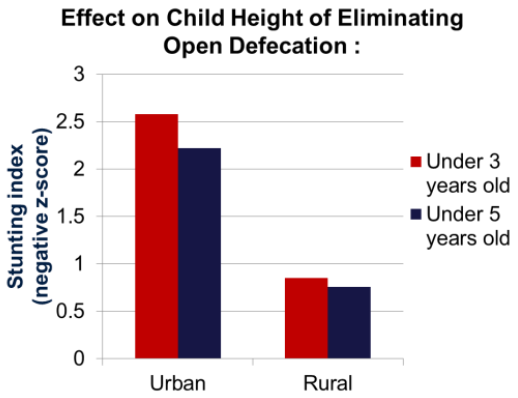


Overall Urban Sanitation Status Index

8.2 Public Health Risk Assessment

The principal rationale for improving sanitation is to improve public health. Statistical analysis (see Figure 18) shows that stunting, which aggregates many of the effects of poor sanitation, is closely correlated with levels of open defecation, and more so in densely populated urban areas rather than in rural areas. Many other studies show that improving sanitation reduces diarrheal disease, although a precise causative relationship is hard to pin down.

Figure 18 Relationship between open defecation and stunting



Source: Spears, D (2013) - DHS data from 130 countries

Public health risk has two major components – hazard, or the levels of fecal contamination along various pathways from faces to mouth; and exposure, or the frequency and extent of contact with each contamination pathway.

Hazard may be estimated from measurements of fecal pollution in the environment, or by taking the SFD a stage further by consideration of microbiological decay along the various pathways. Exposure is much more difficult to estimate but may involve individual and group surveys, observation, key informant interviews, GPS mapping etc. Various initiatives are in progress, and may eventually be developed to a stage where they can help to pinpoint priority public health risks in specific areas of the city which can then be targeted with specific interventions.

Various approaches are being developed, mostly by academic institutions. The most advanced is SaniPATH, developed by Emory University, USA, which guides the user through a comprehensive environmental microbiological sampling and analysis process, and links this with behavioral observations and discussions. However, the tool is not quite ready for routine use as yet, and is being further developed to make it easier to apply. The University of North Carolina, USA, is developing an analysis of the return of fecal pollution to the environment, which focuses more on hazard than risk (= hazard x exposure) since exposure is hard to measure. This initiative is at an early stage, so it is not very clear in which direction it might develop. University College London, UK, was involved in the SPLASH program, of which one sub-project further developed community-based risk assessment tools which are more subjective, but incorporate exposure issues through working directly with the target populations. Much thinking is going into this area, and we are in touch with all of the above-mentioned groups. It may be realistic to hope for easily usable tools within the next 2-3 years. For now, we need to follow developments and assist in getting the various ideas field-tested.

8.3 SFD promotion initiative

Based on the Fecal Waste Flow Diagram (Shit Flow Diagram, or SFD) developed by World Bank-WSP, institutions active in the field of excreta management convened in June 2014 to further develop the SFD, which clearly shows how excreta is or is not contained as it moves along multiple pathways from defecation to disposal or end-use, and is presented together with the City Service Delivery Assessment tool. This joint initiative is managed under the umbrella of the Sustainable Sanitation Alliance (SuSanA) and funded by BMGF since September 2014.[9]

BMGF's first grant kick-started a process of developing tools and mechanisms for the easy production of standardized SFDs, backed by a description of information sources and the enabling environment in the city concerned. The approach is being tested in 50 cities in Africa, Asia and Latin America and the results disseminated via the SuSanA website. The aim is to promote better understanding of excreta management by demonstrating the power of the SFD to summarize and present what happens to excreta in cities. The SFD is an advocacy and decision-support tool that has the potential to shift the focus of attention, money and activities towards more effective and inclusive urban sanitation and more efficient investments.

[9] The consortium consists of the World Bank Water and Sanitation Program (WSP); the Global Sector Program on Sustainable Sanitation of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ GmbH) commissioned by the German Federal Ministry for Economic Development and Cooperation (BMZ); the Department of Water and Sanitation in Developing Countries (SANDEC) at the Swiss Federal Institute of Aquatic Science and Technology (EAWAG); the water@leeds research group of the University of Leeds (UoL); the Water, Engineering and Development Centre (WEDC) of Loughborough University, and the Centre for Science and Environment in Delhi (CSE).

References / Bibliography

AMCOW (African Ministers Council on Water). 2011. *AMCOW Country Status Overviews – Regional Synthesis Report. Pathways to Progress: Transitioning to Country-Led Service Delivery Pathways to Meet Africa's Water Supply and Sanitation Targets*. Washington, DC: The World Bank/Water and Sanitation Program

DFID, 1998, *Guidance Manual on Water Supply and Sanitation Programmes,* London, UK: Department for International Development

Evans, B.E., Saywell, D. and the Sanitation 21 Task Force, 2006, *Sanitation 21: Simple Approaches to Complex Sanitation – A Draft Framework for Analysis*, London: International Water Association

Hawkins, P, Blackett, I. and Heymans, C., 2013, *Poor-Inclusive Urban Sanitation: An Overview*, Water and Sanitation Program Study, Washington , DC: World Bank Water and Sanitation Program

IWA (International Water Association), 2006, *Sanitation 21 – Simple Approaches to Complex Sanitation: A Draft Framework for Analysis.* IWA Publishing, London, UK

Lüthi, C., Morel, A., Tilley, E. and Ulrich, L., 2011, *Community-Led Urban Environmental Sanitation Planning (CLUES).* Swiss Federal Institute of Aquatic Science and Technology (Eawag), Dübendorf, Switzerland

Medland, L., Cotton, A.P. and Scott, R.E., 2015, *SPLASH Urban Sanitation Research Programme Briefing Note 1: An enabling environment for urban sanitation*, Loughborough University, UK: Water, Engineering and Development Centre (WEDC), Loughborough University

Medland, L., Cotton, A.P. and Scott, R.E., 2015, *SPLASH Urban Sanitation Research Programme Briefing Note 2: City wide planning to support effective sanitation service chain operation*, Loughborough University, UK: Water, Engineering and Development Centre (WEDC), Loughborough University

Peal A., Evans B., Blackett I., Hawkins P. and Heymans C., 2014. Fecal sludge management (FSM): analytical tools for assessing FSM in cities. Review paper. Journal of Water, Sanitation and Hygiene for Development: 04.3, pp. 371-383. IWA Publishing

Scott, P., Cotton, A. and Sohail, M. (2015), Using tenure to build a "sanitation cityscape": narrowing decisions for targeted sanitation interventions, Environment & Urbanization, Vol 27(2): 1-18, International Institute for Environment and Development, UK

Spears, D., 2013, *How Much International Variation in Child Height Can Sanitation Explain?* World Bank Policy Research Working Paper 6351. Washington, DC: The World Bank

Strande, L., Ronteltap, M. and Brdjanovic, D. (eds.), 2014, *Faecal Sludge Management: Systems Approach for Implementation and Operation*, London, UK: IWA Publishing

Tayler, K., Parkinson, J. and Colin, J., 2003, *Urban Sanitation: A Guide to Strategic Planning,* Rugby, UK: Practical Action Publishing

Tilley, E., Lüthi, C., Morel, A., Zurbrügg, C. and Schertenleib, R., 2014, *Compendium of Sanitation Systems and Technologies, 2nd Revised Edition.* Swiss Federal Institute of Aquatic Science and Technology (Eawag). Dübendorf, Switzerland

Wright, A.M. (1997), *Towards a Strategic Sanitation Approach: Improving the Sustainability of Urban Sanitation in Developing Countries*, Washington , DC: UNDP-World Bank Water and Sanitation Program,

WSP, 2013. *A Review Of Fecal Sludge Management in 12 Cities*, DRAFT for Internal Review. Prepared by Andy Peal and Barbara Evans. Washington , DC: World Bank Water and Sanitation Program (WSP) Urban Global Practice Team

Other recent tools and approaches for assessing city-wide fecal sludge management

PAS, 2015, *Integrated Faecal Sludge Management Tools for Citywide Assessment and Planning*, Performance Assessment System (PAS) team, CEPT University, India

Annex A How to use the tools – methodology of the five city study

A.1 Introduction

This Annex summarises key aspects of the methodology for the five city case studies, as an indication of how to use the tools. For these case studies, primary data was collected so as to (i) inform ongoing WB operations, (ii) inform the development and refinement of the FSM tools in this report through field testing.

The OPM / WEDC team developed a Research Framework (RF) structured around WSP's planned project components (as shown in Table 9 below), also considering possible data collection instruments (e.g. household survey, key informant interviews). The RF comprised research questions and sub-questions aligned along the sanitation chain. The sub-questions were in turn allocated to the data collection instruments which could answer those questions. This logical approach ensured that no questions were asked which could not be answered.

Table 9 FSM project components

	Assessment	Objective		Component	Primary link to CSDA
1	City Service Delivery Assessment	To understand the status of service delivery building blocks, and the political economy of FSM services overall	1a	CSDA scorecard	
			1b	Prognosis for Change (Political Economy Analysis)	
2	FS situation assessment	To understand current FS management patterns and future scenarios	2a	FS flows (SFD)	Sustaining - User outcomes
			2b	FS characteristics and end-use potential	Developing - Output
			2c	Public health risk analysis	Sustaining - User outcomes
3	Existing demand & supply assessment	To understand customer demand for FSM services and the current status of service providers	3a	Mapping customer demand / preferences	Sustaining - Expansion
			3b	Mapping service provider supply / capacity	Developing - Output
4	Intervention assessment	To identify a hierarchy of FSM intervention options and guidelines for implementing them	4a	Intervention options	Enabling - Planning
			4b	Program design guidelines	Enabling - Planning
5	Economic appraisal	To appraise different interventions against the "business as usual" scenario	5a	Economic appraisal	Enabling - Policy

The next step was to develop the data collection instruments, based on the questions allocated to them. Research protocols for each of the instruments, as well as the instrument formats themselves, were also developed. There were six main instruments, four quantitative and two qualitative, as set out in Table 10 below.

Table 10 Summary table of data collection instruments

	Instrument	Data source	n per city[10]	Sampling
Quantitative	1. Household survey	Survey of households (i) across the city, (ii) in slums / informal settlements	360 + 360 = 720	Random sampling of 12 households within each of 60 primary sampling units (PSUs), within two sub-samples: A - 30 "city-wide" PSUs randomly sampled from across the whole city B - 30 "slum" PSUs randomly sampled from purposively selected slum areas.
	2. Observation of service provider practices	Observation of containment, collection, transport/disposal and treatment/disposal	5	Purposive, based on what is practical in collaboration with SPs
	3. Testing FS characteristics	Samples from (i) pits/tanks during emptying, (ii) truck/vessel outflow, (iii) final drying bed or outflow	5	Purposive, based on what is practical in collaboration with SPs. Pre-selection criteria may be needed to ensure relevance of observed emptying (i.e. in both "city-wide" & "slum" PSUs, both manual & mechanised practices).
	4. Transect walk	Observation of environmental and public health risks through transect walk	30 + 10 = 40	A transect walk in each of the 30 sub-sample A PSUs. A transect walk in 10 PSUs randomly selected from the 30 sub-sample B PSUs
Qualitative	5. Key informant interviews	(a) government (e.g. council / utility, ministries) (b) service providers along the sanitation chain (c) other key FSM agencies	As req.	Purposive
	6. Focus group discussions	FGDs with slum, low-income and informal communities	10	Purposive, from community members in selected PSUs in sub-sample B.

Links to the data collection instruments are in Annex B, as are the detailed research protocols. The remainder of this section summarises the methodology for each of the tools referred to in the body of this report. In other words, it explains how the diagnostics and decision-support tools draw on primary and secondary data.

A.2 Fecal waste flow diagram

For this analysis, several key indicators from the household survey were used. In particular, data from the following household survey questions was used:[11]

A. "What kind of toilet facility do members of your household usually use?"

B. "Where do the contents of this toilet empty to?"

C. "What did you do when the pit or septic tank filled-up last time?"

D. "What was [the fecal sludge] emptied into?"

[10] Numbers for each City study to be detailed in the ToRs for data collection for that City

[11] Full response categories for these questions are included in the survey questionnaire. In particular, it should be noted that the response categories to question B varied across countries. In Dhaka, for example, they were: (i) Directly to piped sewer system, (ii) Septic tank connected to "piped sewer system", (iii) Septic tank with no outlet, (iv) lined pit with no outlet, (v) septic tank connected to drain, (vi) lined pit with overflow to drain/elsewhere, (vii) unlined pit, (viii) directly to sea, lake or river, (ix) directly to drain/ditch

Of these, question 'B' is one of the most crucial for the construction of the SFD. It should be noted that the household's response is taken as given. It was not possible to confirm responses by observation since enumerators were selected for a background in social research and not sanitation, so could not easily understand the 'below ground' components. It was however felt that they could be trained to observe 'above-ground' components, so observation of slab, water seal, superstructure, etc. was carried out in all households where permission was given.

Given that 'B' is based on household response, possible sources of bias include the household not knowing the true answer, or knowing it but answering differently for fear of being identified as practicing illegal behaviour (e.g. pits/tanks connected to drains). The former is certainly likely, the latter does not seem to be an issue given the vast majority of households who willingly disclosed illegal behaviour.

To analyse this data, an SFD matrix is created, as shown in Figure 19 below. It shows which data sources are used and how they are analysed into levels of effective / ineffective management of fecal waste through the stages of the service chain – with results in the next section.

First, the household survey data on use of infrastructure (questions (A) and (B) above) is used to allocate households to five categories shown in the column marked (1) in the figure below:

(i) **"Sewered (off site centralised or decentralised)"** – toilets connected to sewers (not OSS)
(ii) **"On-site storage – emptiable"** – OSS toilets (involving pits or tanks) which can be emptied. However, they can also be connected to drains through an overflow, to avoid the need for emptying. These toilets are emptiable but may or may not be emptied.
(iii) **"On-site storage - single-use / pit sealed"** – OSS toilets where pits or tanks are sealed and/or abandoned once full. These toilets are emptiable but never emptied.
(iv) **"On-site non-storage - straight to drain/similar"** – OSS toilets which connect to drains or open water bodies (e.g. hanging latrine, or latrine with a pipe connecting the pan directly into a drain). These toilets are therefore non-emptiable.
(v) **"Open defecation"** – self-explanatory

The question of emptiability is key. Category (ii) above is denoted as emptiable, meaning that this containment option involves a pit or tank which fills with FS. In Dhaka, many such pits/tanks are also connected to drains through a variety of means (e.g. overflow pipe). This means that while they are emptiable they are not in fact emptied as often as would be expected, or even at all. Between the two extremes of a closed system and a system which never fills up, there is a spectrum of scenarios. For example, some pits/tanks may have an overflow to the drain but may still require emptying if they become blocked.

The data from questions (A) and (B) at the beginning of this section are allocated in column (2) below (a key shows the meaning of the colour-coding of cells by data source). Next, the proportions for each of the stages of the chain are allocated. As can be seen from the emptying column, marked (3), a certain proportion of the population's FS which makes it to that stage is emptied by a service provider, and the rest is not emptied (e.g. overflows to drains). This is estimated by dividing the number of households which reported emptying their pit (question (C) above), by the number of households using emptiable technologies (questions (B) above). This section has given a brief overview of where the data underlying the SFDs comes from. Since the

data comes from a household survey, the proportions in the matrix are proportions of households, not proportions of people or of FS volumes.[12]

Figure 19 Fecal Waste Flow Matrix – empty example

1	2			3						4
		Containment		Emptying		Transport		Treatment		Overall
		of which		*of which*		*of which*		*of which*		Safe:
Type of system	*% pop. using*	*contained*	*not contained*	*emptied*	*not emptied*	*transported*	*not transported*	*treated*	*not treated*	0%
Sewered (off site centralised or decentralised)		100%	0%	100%	0%		100%		100%	
		0%	0%	0%	0%	0%	0%	0%	0%	0%
On-site storage - emptiable		100%	0%		100%		100%		100%	
		0%	0%	0%	0%	0%	0%	0%	0%	0%
On-site storage - single-use / pit sealed		100%	0%							
		0%	0%							
On-site non-storage - straight to drain/similar		0%	100%							
		0%	0%							
Open defecation		0%	100%							
		0%	0%							
		Containment	0%	Emptying	0%	Transport	0%	Treatment	0%	
Unsafe:	0%		0%		0%		0%		0%	
Affected zones (you can adapt the terms to suit the context)		*Local area and beyond via drains (amount direct to groundwater not identified)*		*Local area (via overflowing latrines or dumped FS)*		*Neighbourhood (via leakage/overflow from sewers or drains)*		*Receiving waters (via sewer outfall/discharge)*		
		from household survey								
		from secondary data								
		de facto value								

A.3 City Service Delivery Assessment

Most of the methodology for the CSDA was already presented in section 4.2 of this report. Here, therefore, only the matrix of questions and criteria is shown (Table 12 on the next page), as well as the maximum scores per component (Table 11 below). It is important to note that the CSDA tool was shortened for this report based on findings from the five cities. Therefore the CSDA scorecards in the full city reports are based on more questions per CSDA component than the below.

Table 11 CSDA scorecard for creating the city scoring

SDA components		Containment	Emptying	Transport	Treatment	End-use / disposal
		Max score				
Enabling	Policy	3	3	3	3	3
	Planning	2	2	2	2	2
	Budget	1	1	1	1	1
Developing	Expenditure	1	1	1	1	1
	Equity	2	2	2	2	2
	Output	2	2	2	2	2
Sustaining	Operation & Maintenance	2	2	2	2	2
	Expansion	2	2	2	2	2
	Service outcomes	2	2	2	2	2
Total		**17**	**17**	**17**	**17**	**17**

[12] The impression given by the SFD therefore involves assumptions that (i) each person produces the same amount of FS, and (ii) pit accumulation rates are constant across the city. This is an approximation but the most pragmatic approach in the context of uncertainty around FS volumes. This study is primarily about identifying the broader picture of *where* the management of FS is or isn't effective, not what volumes are being managed or mismanaged.

Table 12 CSDA scoring criteria

RF Sub-question	SDA question		Containment	Emptying	Transport	Treatment	End-use/disposal	Evidence / scoring (for each stage of the chain)
Enabling: What are current policies, planning issues and budgetary arrangements?	Policy	**Policy:** Is provision of FSM services enabled by an appropriate, acknowledged and available policy document (national/ local or both)?	1	1	1	1	1	1: policy is appropriate, approved (or in draft form), acknowledged and available
								0.5: policy is appropriate, approved (or in draft form), but not clearly acknowledged / available
								0: policy is not available, or inappropriate to the context
		Institutional roles: Are the institutional roles and responsibilities for FSM service delivery clearly defined and operationalized?	1	1	1	1	1	1: roles defined and operatationalised
								0.5: roles clearly defined but not operationalised, or not-defined by work in practice
								0: roles not defined / not operationalised
		Legislation / Regulation: Are there national and/or local legal and regulatory mechanisms (i.e. bylaws and means of enforcement) for FSM?	1	1	1	1	1	1: legal and regulatory mechanisms for FSM exist and are operational
								0.5: legal and regulatory mechanisms for FSM exist but are not operational
								0: no legal and regulatory mechanisms for FSM exist
	Planning	**Targets:** Are there service targets for (each part of) the FSM service chain in the city development plan, or a national development plan that is being adopted at the city level?	1	1	1	1	1	1: targets are clearly included
								0.5: service levels are included, but no targets stated
								0: no reference to service levels or targets
		Investment: Is FSM incorporated into an approved and used investment plan (as part of sanitation) - including ensuring adequate human resources and Technical Assistance? (Ideally a medium term plan, but if not, at least an annual plan)	1	1	1	1	1	1: investment plan for FSM exists, based on identified needs and addressing human resource and TA needs
								0.5: investment plan for FSM exists, but does not address human resource or TA needs
								0: no investment plan for FSM
	Budget	**Fund flows:** Does government have a process for coordinating FSM investments (domestic or donor, e.g. national grants, state budgets, donor loans and grants etc.)?	1	1	1	1	1	1: coordination of investments is defined and operationalised
								0.5: coordination of investments is defined, but not operationalised
								0: no coordination of investments defined

(table continued)

RF Sub-question	SDA question		Containment	Emptying	Transport	Treatment	End-use/disposal	Evidence / scoring (for each stage of the chain)
Developing: What is the level of expenditure, degree of equity and level of output?	**Expenditure**	**Adequacy & structure:** Are the annual public financial commitments for FSM sufficient to meet the service levels and needs for Capex and Opex in the coming 5 years?	**1**	**1**	**1**	**1**	**1**	1: annual public financial commitments are sufficient to meet >75% of requirements (estimated need if no targets set)
								0.5: annual public financial commitments are sufficient to meet >50% of requirements (estimated need if no targets set)
								0: annual public financial commitments insufficient to meet 50% of requirements (estimated need if no targets set)
	Equity	**Choice:** Is there a range of affordable, appropriate, safe and adaptable technologies for FSM services available to meet the needs of the urban poor?	**1**	**1**	**1**	**1**	**1**	1: range of technical options exist (i.e. are "offered" formally) and are used by the urban poor
								0.5: range of options exist, but are not accessed by the urban poor, or just not used
								0: options are not present
		Reducing inequity: Are there specific and adequate funds, plans and measures to ensure FSM serves all users, and specifically the urban poor?	**1**	**1**	**1**	**1**	**1**	1: funds, plans and measures are codified and in use
								0.5: funds, plans and measures are codified but not in use
								0: no funds, plans and measures codified
	Outputs	**Quantity / capacity:** Is the capacity of each part of the FSM value chain growing at the pace required to ensure access to FSM meets the needs/demands and targets that protects public and environmental health?	**1**	**1**	**1**	**1**	**1**	1: capacity growing at a pace to meet >75% of the needs/demands and targets to protect health
								0.5: capacity growing at a pace to achieve >50% of needs/demands and targets to protect health
								0: capacity insufficient to meet 50% of the needs/demands and targets to protect health
		Quality: Is the quality of FSM sufficient to ensure functioning facilities and services that protect against risk through the service chain?	**1**	**1**	**1**	**1**	**1**	1: >75% of services that protect against risk and are functional through the service chain
								0.5: >50% of services that protect against risk and are functional through the FSM service chain
								0: less than 50% of services that protect against risk and are functional through the FSM service chain

(table continued)

RF Sub-question	SDA question		Containment	Emptying	Transport	Treatment	End-use/disposal	Evidence / scoring (for each stage of the chain)
Sustaining: What is the status of operation and maintenance, what provisions are made for service expansion and what are current service outcomes?	**O&M**	**Cost recovery:** Are O&M costs known and fully met by either cost recovery through user fees and/or local revenue or transfers?	**1**	**1**	**1**	**1**	**1**	1: O&M costs known and >75% met (through appropriate mechanisms)
								0.5: O&M costs known and >50% met
								0: O&M costs not known and/or <50% met
		Standards: Are there norms and standards for each part of the FSM value chain that are systematically monitored under a regime of sanctions (penalties)?	**1**	**1**	**1**	**1**	**1**	1: norms and standards exist, are monitored and sanctions applied
								0.5: norms and standards exist and are monitored, but no sanctions applied
								0: norms and standards (if they exist) are not monitored
	Expansion	**Demand:** Has government (national or city authority) developed any policies and procedures, or planned and undertaken programs, to stimulate demand of FSM services and behaviours by households and responses by service providers?	**1**	**1**	**1**	**1**	**1**	1: policies, procedures or programs are being implemented, with resulting demand for services growing and being responded to
								0.5: policies, procedures or programs are being implemented (or partially implemented), but resulting demand is not fully addressed
								0: policies, procedures or programs are not being implemented
		Sector development: does the government have ongoing programs and measures to strengthen the role of service providers (private or public) in the provision of FSM services, in urban or peri-urban areas?	**1**	**1**	**1**	**1**	**1**	1: programs and measures to strengthen service provision have been/are being implemented; service providers are organized, their actions are coordinated and the FSM services they provide are expanding.
								0.5: programs and measures to strengthen service providers have been implemented or partially implemented; the majority of service providers remain largely disorganized and the FSM services they provide are not expanding at an appropriate rate.
								0: programs and measures to strengthen the service providers do not exist (or exist on paper only and have not been implemented); the service providers remain disorganized and the FSM services they provide are not expanding.
	Service outcomes	**Quantity:** Percentage of total FS generated by the city that is managed effectively, within each part of the service chain	**1**	**1**	**1**	**1**	**1**	1: >75% of FS generated is managed effectively, at that stage of the service chain
								0.5: >50% of FS generated is managed effectively, at that stage of the service chain
								0: <50% of FS generated is managed effectively, at that stage of the service chain
		Equity: To what extent do the city's FSM systems ensure adequate services for low-income communities?	**1**	**1**	**1**	**1**	**1**	1: FSM systems and services are widespread and readily available in low-income communities
								0.5: FSM systems and services are available on a partial / piecemeal basis in low-income communities (or in some)
								0: FSM systems and services are not available to any significant extent in low-income communities
		Max scores	**17**	**17**	**17**	**17**	**17**	

A.4 Prognosis for Change

Process for gathering data for political economy analysis

The following process is intended to guide the data collection for political economy analysis of FSM. Individual question guides will need to be developed to support data collection for each process. The information from the question guides will provide data to complete the following mappings and analysis.

Responsibilities for FSM: Institutional mapping

Data for this should come from a broad range of sources: interviews with government and service provider stakeholders; interviews with key informants; policy documents and other relevant FSM service delivery guidelines. Steps to be followed are:

- Identify which actors have formal institutional responsibilities for particular aspects of FSM (e.g. containment, emptying and transport) as well as local FSM policy and strategy.
- Categorise these within broader groupings – e.g. national government ministries; local government agencies; private sector;
- For each actor, indicate whether they have formal responsibilities for particular aspects of FSM in the following table. This should be the formal responsibilities they have, not what actually happens in practice.

Table 13 Institutional mapping of formal responsibilities for local FSM

	Local policy and strategy	FSM infrastructure development and service delivery					
		Containment	Emptying	Transport	Treatment	End-use	Disposal
National government departments							
Local government departments							
Local government enterprises							
Non-government stakeholders							
Private enterprises							
NGOs/CBOs/community groups							
Individuals / households							

- In the next mapping, show who actually takes responsibility for FSM at the local level.
- Leave all the stakeholders identified above in the mapping, even if they do not undertake any responsibilities in practice.
- Add any further stakeholders who do not have formal responsibilities but in practice undertake particular activities of tasks.

Table 14 Institutional mapping of actual undertaking of local FSM

	Local policy and strategy	FSM infrastructure development and service delivery					
		Containment	Emptying	Transport	Treatment	End-use	Disposal
National government departments							
Local government departments							
Local government enterprises							
Non-government stakeholders							
Private enterprises							
NGOs/CBOs/community groups							
Individuals / households							

Stakeholder analysis and mapping

Stakeholder analysis aims to identify stakeholder characteristics, their interests and motivations, and the nature and degree of their influence on existing or future issues, policies, reforms, interventions or programme decisions.

A political economy analysis needs to help understand the reasons behind good or poor outcomes in the question area and therefore needs to go beyond a simple identification and/or categorisation of stakeholders and actors. We need to understand the institutional, political and governance arrangements and capabilities that shape stakeholders' relationships and behaviour in relation to FSM.

- As a first step, **draw up a list of relevant stakeholders**. These can be organised into specific categories, for example government (national and sub-national), private sector, semi-private actors, civil society, community members, NGOs (national and international), or global actors. Keeping these main broad categories in mind as the list is drawn up will help ensure all are covered appropriately. But there might also be other relevant categories or sub-categories that would be useful for particular issues or sectors (e.g. illegal actors, media).
    - It is important to remember that none of these categories are homogenous. Within government, there will be actors with different levels, types and forms of power. The same is true within civil society, the private sector and communities (e.g. a key issue, for instance, is that women and men will have different levels of power within all these categories). The different levels, types and forms of power that particular groups or individuals have will contribute to how agendas, conflicts, agreements and disagreements within and across these categories are played out. Political economy analysis needs to highlight these different power relations.
    - It is therefore important to break down stakeholders sufficiently in order to understand potentially different and competing interests and influence within broader stakeholder groups. It is important that the analysis unpacks broad terms

such as ‘government’, ‘civil society’, ‘community’ or ‘private sector’ and identifies relevant actors (individuals as well as groups or organisations) within these. Breaking down stakeholders helps move the analysis beyond the superficial to an in-depth and nuanced understanding of interests and influence.
    - This also means gender and social analysis should form an integral part of each stakeholder analysis in order to help break down broad categories of stakeholders more appropriately. For example, rather than assume all people living within an urban poor informal settlement all have the same interests in regards to FSM, and the same level of power and influence, the analysis needs to look deeper and consider whether there are different stakes or interests and levels of influence between different groups and individuals: for instance, young mothers versus older men (and how these may be created and/or maintained by gender and social norms). It is easy (and often quick) to undertake an initial stakeholder analysis. The challenge, but at the same time an important feature, of PEA is to go further and understand details about incentives, motivations and reasons behind the influence of some.
- Use the template below to present a stakeholder analysis. The standard headings are often just influence and interest, but others have been added here and can be useful for FSM policy and programming decisions.
    - Data for this will come from a broad range of sources: interviews with government and service provider stakeholders; interviews with key informants; focus group discussions with relevant stakeholders; FSM policy documents and other relevant FSM service delivery guidelines; other relevant literature.

Table 15 Stakeholder mapping template

Stakeholder categories	**Relevant stakeholders**	**Characteristics** (social, geographical, organisational)	**Influence** (power to facilitate or impede FSM poor inclusive policy and service provision)	**Interest** (what they gain or lose and how this affects their commitment to status quo to openness to change)	**Importance** (degree of priority needs and interests)
National government	Ministry of Public Works				
	Ministry of Finance				
	Ministry of Public Housing				
	National Legislators				
Local level government	Mayors				
	Local legislators				
	Local government department A				
	Local government department B				
Civil society	Consumer groups and advocacy NGOs				
	Media				
	Poor households				
	Better-off households				
Private sector	Septic tank				

Stakeholder categories	**Relevant stakeholders**	**Characteristics** (social, geographical, organisational)	**Influence** (power to facilitate or impede FSM poor inclusive policy and service provision)	**Interest** (what they gain or lose and how this affects their commitment to status quo to openness to change)	**Importance** (degree of priority needs and interests)
	contractors and emptiers				
	Large sewerage / treatment plant engineers (foreign and domestic)				
International organisations or projects	WSP				
	WB				

Source: Adapted from Holland (2007).

One way to ensure the stakeholder analysis goes beyond a superficial analysis is to also map stakeholders onto a matrix. A stakeholder interest or power matrix typically maps two variables that describe a stakeholder's interests in and influence / power over a particular issue, "problem" or policy. These are the two standard variables but if useful, a third dimension could also be added by using different sized circles for each stakeholder (e.g. to represent a stakeholder's importance[13], for instance).

The position of each stakeholder on the map conveys important information (how supportive and influential a particular stakeholder is) and can show a more nuanced positioning than the table above (e.g. slight differences can be seen more easily when shown graphically rather than described simply in text, although the positioning and differences also need to be explained).

The process of placing each stakeholder can be done by the team conducting the PEA based on their analysis of data they have gathered. It can also be done with the help of selected key informants, or as part of a focus group discussion, and the two can be compared. When done in a more participatory manner it is the process and discussion around placing each stakeholder that can produce the most interesting insights – i.e. understanding *why* particular stakeholders are positioned where they are relative to each other, and what that means in terms of how change occurs or can occur.

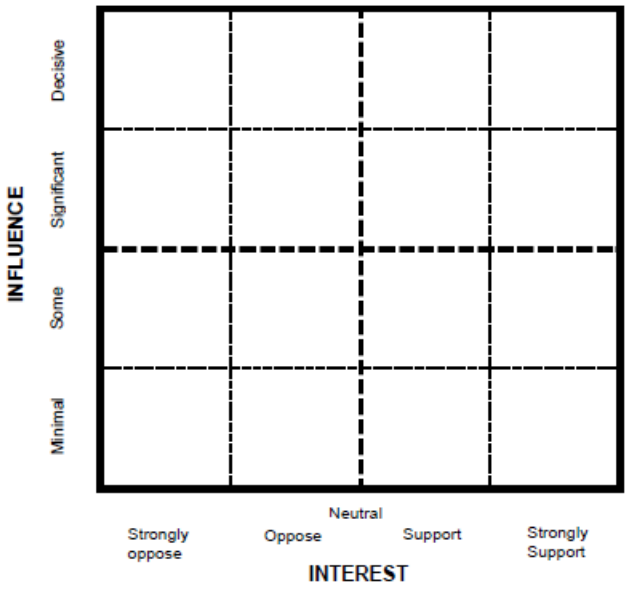
Even when done by the team alone, the process of placing stakeholders helps deepen the analysis beyond the simple mapping above – it encourages the team to think about *why* they are placing each stakeholder in a particular place and relative to another, and to justify this internally. This may even lead to a revision of the mapping and initial analysis.

The following questions are useful starting points in order to guide a discussion:

- What is the interest of each stakeholder in the issue, and what is it based on? Why does a specific stakeholder have a particular interest in the issue?
- What is the formal and/or informal basis of power and influence of a specific actor?
- Why does a specific stakeholder have little or significant influence over the issue? How does this compare to other actors?

[13] Importance in this case means the priority given to satisfying or addressing the needs and interests of a particular stakeholder from the perspective of an FSM intervention or project.

Figure 20 Example of a stakeholder matrix



Process mapping

A useful tool to provide more depth to the institutional analysis, while at the same time understanding certain processes, can be a process map. Process mapping illustrates the network of flows of decision making, resources or information. It is a comprehensive flow diagram that can be used to identify bottlenecks and constraints and to analyse opportunities for changing processes to make them more efficient and effective. In PEA, process mapping can help understand how both formal and informal institutions affect the implementation or functioning of different processes, showing how processes are intended to work but also how they actually work in practice (e.g. as a result of institutional pressures and/or support). Process mapping is a very flexible tool and one can map everything from the budget process, acquiring a planning permission, obtaining a driver's license, or informal flows of money in specific organisations.

Steps in process mapping

The following steps (adapted from Holland, 2007) outline a general approach to mapping an existing process (the "as-is" process). It can be adapted to suit the particular PEA objectives and questions, and the local context.

- First, it's important to be clear about the process (or processes) to be mapped. This should clearly be directly related to the PEA objectives, focus and questions, but might have been identified beforehand (particularly if the process is a central focus of the PEA) or through the analysis of foundational factors or stakeholders (i.e. it might have arisen as an important process to understand more only during the on-going analysis).
- Once the process has been identified, it's important to define the objectives of the mapping more clearly too. Objectives could include, for example, understanding how the budget process works in a decentralised context; identifying opportunities for process improvement; identifying and resolving blockages or restrictions; understanding and reducing risks; or identifying entry points for engagement. Being clear about these will help ensure that the right level of detail is known. This could range from broad organisational levels to the fine details of a work process.
- Once the objectives are clear, the starting and end points of the process can be defined (essentially the 'boundaries'). This helps avoid the process map moving beyond what is

needed. Move through from the start point, identifying key steps or activities in the process as you go.
- The data or information needed to complete a process map can come from three main sources: self-generation by teams or individuals, interviews and focus group discussions, and observation. In practice, this will depend on the process itself, the PEA objectives and questions, but most information will probably come from the first two sources. In some cases, a review of manuals or policies and procedures will also help, particularly in identifying the formal process as it is meant to be.

Individual interviews with people directly and indirectly involved in the process will provide useful information for creating the map. Group interviews with a number of people (a sample or all) involved in the process can also increase the participation of different stakeholders in the actual mapping. When interviewing people involved in the process, ensure that they understand the objectives of the mapping and how it will be used.

It might also be necessary and beneficial to ask questions of people involved in the process about their experiences with the process (such as problems they have had), areas they think can be improved, how the process might vary, if and how the process is done differently by different people, any unnecessary steps they perceive, and so forth. These responses will help identify areas of the process that might need improvement. Involve as many process stakeholders in the analysis as possible to get a wide range of perspectives. It is important to understand why a process is not operating as intended if improvements are to be made.

Process maps can use different symbols to show what occurs in a process. This can help in understanding what particular people do, or what particular activities are, for instance. However, it is sensible to keep the number of different symbols in a map as low as possible to prevent confusion. Process maps can become very complex, very quickly. Develop rough drafts and revise them often as the map develops. Sticky notes or cards can also be useful when developing the map – stick the notes on a large sheet of paper or whiteboard and move them around (or throw them away) as the map develops.

Use concise sentences for each step in the process to show what is happening, where it is happening, when it is happening, who is doing it, how long it is taking, how it is being done, and why it is being done. This information will come from the sources discussed above. However, if there is missing information then systematically asking these questions can also help show any knowledge gaps, which can then be filled by gathering further information from relevant people or sources.

Good analysis is key for a process map to be useful. Depending on the PEA objectives and focus questions, the following questions will help develop and analyse a process map:

- What are the main steps and/or activities in the process? Who designed these steps / activities and who is implementing them? Who else is involved in each step / activity?
- Which areas are working as the process was intended, and which are not? What are the repercussions? Why are they not working as intended (this might bring in a range of information related to foundational factors and stakeholder analysis)?
- Are there any wide separations of decision making from process implementation?
- Is there shared responsibility for steps among several people?
- Are there excessive control points (for example, many layers of approval), and what implications does this have? Who controls the process and what are their interests?
- What value does each activity or step add?
- Who benefits (for example, which stakeholders)?

- Could any steps be combined, run in parallel rather than serial, completed faster, or eliminated? Why aren't they?
- What linkages are there between different steps?

Taking into account this analysis, the map can be adjusted to incorporate any new information. This can be done on an iterative basis as needed, but it is useful to document any alterations are fully so that it is clear who made the changes and when they were made.

Annex B Data collection instruments and TORs

The Data Collection Instruments (with associated protocols) and TORs are separate documents. The various data collection instruments and the research methods associated with them are summarized in the table below.

The TORs should be adapted to a given city context, depending on which tools are planned to be used and the focus of the work. The consultants would need to be provided with the protocols and data collection instruments (once adapted). These are summarized in the table below.

Table 16 Research methods and associated instruments

	Research method	Data collection instrument	City where applied	Diagnostic tool or analysis this informs
Quantitative	1. Household survey	Household questionnaire	Dhaka, Hawassa, Lima, Santa Cruz	SFD tool, CSDA tool, supply and demand analysis economic analysis
	2. Observation of service providers	Structured observation form	Dhaka	Supply and demand analysis
	3. Transect walk	Transect walk form	Dhaka, Hawassa, Lima	Public health risk analysis
	4. Environmental sampling	Water supply and drain water testing protocol	Dhaka	Public health risk analysis
	5. Testing FS characteristics	Test of FS physical characteristics	Dhaka	Reuse analysis
		Test of FS chemical/biological characteristics	Dhaka	Reuse analysis
Qualitative	6. Focus group discussions	Focus group discussion guide	Dhaka, Hawassa, Lima, Santa Cruz	Prognosis for change tool, supply and demand analysis
	7. Key informant interviews	Interview guide	Dhaka, Hawassa, Lima, Santa Cruz	SFD tool, CSDA tool, prognosis for change tool, supply and demand analysis

The city case study reports are available via the links below. These are the in-depth studies of individual cities and are therefore targeted at professionals working on sanitation in the given city or the country, but may be of interest to others who want to use the tools or see how they were applied.

- Cities where most or all tools were applied:
  - Dhaka, Bangladesh
  - Hawassa, Ethiopia

- Lima, Peru

- Cities where some tools were applied:
  - Balikpapan, Indonesia
  - Santa Cruz, Bolivia