



Promotion of SFDs

(Faecal waste flow diagrams or
Shit Flow Diagrams)

Review of Phase I Report

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List of abbreviations

CSE	Centre for Science and Environment
Eawag	Swiss Federal Institute of Aquatic Science and Technology
FDG	Focus Discussion Group
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
KCCA	Kampala Capital City Authority
KII	Key Informant Interview
NWSC	National Water and Sewerage Corporation
SFD	Shit Flow Diagram
UKZN	University of KwaZulu-Natal
UNC	University of North Carolina at Chapel Hill
UoL	University of Leeds
WEDC	Water, Engineering and Development Centre
WWTP	Wastewater Treatment Plant

1. Purpose of this report

This document represents a review report of the experience gained from producing SFDs from GIZ, WEDC, UoL, CSE and Eawag under the of the Phase I of the “Promotion of Shit Flow Diagrams” project funded by the Bill & Melinda Gates Foundation.

This report results from collating inputs from all partners on the use of the manual for SFD production, the SFD calculation tool, key learning points and experiences gained during the process of producing SFDs.

Therefore, the purpose of this report is to provide a summary of the challenges as well as the successful achievements encountered during the implementation process of the methodology for producing SFDs and to present prioritizing areas of work to improve the methodology and tools, including further recommendations to be carried out in Phase II of the project.

In order to achieve this, the report has been divided into three parts, each of them comprising different aspects on the review process of Phase I of the project:

- *Review of Phase I: **Lessons learnt***. The main lessons learnt during the development and completion of Phase I are summarized in this section.
- *Review of Phase I: **Tools and Methods***. A summary of the comments based on the experience gained from producing SFDs from all partners is presented in this section, comprising itself of 8 subsections and covering aspects such as the methodology for data collection, costs and uptake of the results, among others.
- *Review of Phase I: **Recommendations***. Further recommendations that need to be addressed in Phase II are presented in this section.

2. Review of Phase I: Lessons learnt

After completion of Phase I of the project, the main lessons learnt can be summarized as follows:

- The methodology and tools provide a sound basis for completing an SFD analysis in any type of city or town. The results provide to be a useful basis for the planning of follow-up actions and investments but are not intended to be sufficiently detailed to be used in feasibility level planning.
- The SFD manual and toolbox remain complex. That is mainly due to the fact that a wide range of complex conditions related to urban sanitation are found in most of the studied cities and the tools need to accommodate a significant range of technical options. The online-tools will allow for a more user-friendly interface and an ease of use of the calculation and the data-to-graphic-tools.
- Simplifying the usability of the tools sufficiently for a non-specialist is necessary in order to lower the hurdle of producing SFDs in general.
- The tools have a significant value in stimulating local dialogue and discussion, which challenge standard 'preconceptions' about how services are delivered. Good examples of this include the fact that review of 'collection' facilities reveals that many assumed 'septic tanks' are in fact open bottomed pits or sealed vaults. The level of collection and treatment is usually being overestimated by local government and technical managers – this is a particularly notable problem where there are sewered systems which are often assumed to work perfectly. Nevertheless, the SFDs have proven to enhance communication and discussions (by common understanding of the local situation) about shit flows and the needs within cities and under different city stakeholders.
- The wide range of conditions found in the cities studied suggests that a generalized data-to-graphic converter, which can produce consistent results can be challenging. Currently, the tool produces reliable graphics, which often require some editing after generation to improve the formatting. This is a good start. Further work on the data-to-graphic conversion will be a focus of Phase II.
- There is considerable consistency with earlier findings of Peal et. al (2014a)¹ and Peal et. al (2014b)² when reviewing the preliminary results of the completed SFDs. Very few examples of good urban sanitation management have been found. Failures in collection, transport and treatment are common.
- The collected results from SFDs reports provide a valuable picture of prevailing conditions in typical cities and towns globally. There is potential to generate excellent

¹ Andy Peal, Barbara Evans, Isabel Blackett, Peter Hawkins, Chris Heymans (2014a). *Fecal sludge management (FSM): analytical tools for assessing FSM in cities*. 4 (3) 371-383

² Andy Peal, Barbara Evans, Isabel Blackett, Peter Hawkins, Chris Heymans (2014b). *Fecal sludge management: a comparative analysis of 12 cities*. 4 (4) 563-575

summary data from these case studies as time progresses. The quality of this analysis will improve as the number of completed and approved SFDs continues to rise.

- Key informant interviews and other data sources must be triangulated. Reliance on single informants leads to biased estimates.
- The India cases are notable in that there is an assumption of 100% treatment performance in most cases. A further discussion in Phase II about generalizing this assumption has to take place in order to have a common understanding and methodology on the one hand and an explanation about the validity of this assumption (in most of the cases less than 100% of the wastewater transported to a wastewater treatment plant (WWTP) is treated) on the other hand.
- Further research on the performance and outcomes from the range of collection systems found in Phase I would be a useful contribution in Phase II to enable more accurate estimates of flows from the typical systems which are found.
- Participation in conferences enabled the team to disseminate the work done with the project and also served as an opportunity to present case studies to the audience. In general, people responded well to the results presented and a large number of people already knew about the initiative beforehand.

3. Review of Phase I: Tools and Methods

This section represents a summary of the comments based on the experience gained from producing SFDs from GIZ, UoL, CSE, WEDC and Sandec under this project. It also presents recommendations arrived from the process of applying the methodology and tools. Selected recommendations are addressed in section 4 and will be taken up in Phase II of this project. The results of these discussions will be integrated in the version 2 of the tools and methods.

3.1 Methodology for data collection

Overall, how easy is the methodology to follow – and how effective is/was it for developing the SFD city study?

In general, the methodology is easy to follow. Developing a methodology and the necessary tools to produce SFDs was essential in order to have a guideline that could be followed in the phase of producing the SFDs, for both desk- and field-based studies. Guidance questions of Annex A are sufficient and provide a good base for the development of detailed questionnaires.

- *What methods worked / didn't work?*
 - In some cities, desk-based SFD studies were challenging due to the lack of available secondary data. In some cases, additional interviews and inquiries were necessary. For example, in Ethiopia, Key Informant Interviews (KIIs)³ with a wide range of stakeholders (water utilities, municipalities, health extension workers, private sector, etc.) were only possible upon arrival on the city under study.
 - Focus discussion groups (FDG)⁴ are hard to organize particularly when city managers lack capacity.
 - Stakeholder engagement through email contact worked partially. In general, stakeholders from academia responded relatively well to the call and showed a positive attitude on the willingness to participate in the project.

- *What adaptations were made?*
 - Secondary data were acquired during field visits in some cities, not being possible to collect them from an indirect source.
 - Desk-based SFDs require considerably less information than field-based studies. However, field visits were necessary to validate data in cities in India and Ethiopia, indicating that the data collection process varies depending on the city under study.

³ Key informant interviews (KIIs) are the way in which primary information is sought to address key questions about how both the 'enabling environment' and the operating environment affects sanitation and FSM services (past, current and future). (See section 3.1.8 of the methodology for further discussion).

⁴ Focus Group Discussions (FGDs) are discussions with community representatives to allow you to gather qualitative data that will complement, validate, or perhaps challenge data collected from a literature review, interviews and observations (See section 3.1.9 of the methodology for further discussion).

- *What other methods were used?*
 - In **field-based SFDs** where FDGs were not possible to organize, some KIs were conducted jointly with different stakeholders, allowing for an interchange of opinions and views regarding the sanitation situation and for data triangulation.
 - Establishing previous contact with local authorities was proved to be essential in terms of data collection and availability (case of field-based studies).
 - An “official” introduction letter, including questions to be answered, proved to be very helpful, especially when meeting with governmental institutions/utilities.
 - Transect walks to become familiar with city were very helpful in some cities.
 - Having a translator and a local partner was crucial in the field visits for data collection.
 - Household surveys were carried out in Indian cities to validate secondary data on containment, and helped develop information on emptying, transport and disposal since reliance on secondary data did not work as expected.
 - GIZ used GIS mapping to show the main urban features, surface water bodies, etc., which appeared to be very helpful for different aspects of the study like groundwater risk assessment. Nevertheless, the general use of GIS is not necessary for the development and production of an SFD.

3.2 Stakeholder engagement

- *How helpful/easy was it to document and track stakeholder engagement using the tool?*
 - It was useful to have a “place” (the excel file) to put all the date of the interviews, the purposes of those interviews, the reason for making those interviews to that person/stakeholder.
- *What worked/didn't work?*
 - It was useful to keep a record of engagement and to have evidence of time/effort put in the engagement process.
 - It was a bit complicated to record some engagement (informal and off the record engagements).

3.3 Reporting template

- In general, a standard format is really helpful and being able to show existing examples on the website is useful as well.

3.4 SFD graphic⁵

- *What is your overall impression of the SFD graphic as it currently stands?*

Some stakeholders struggle with the SFD layout ‘model’ version. It has been proven to be useful to start with an ‘approximate’ version for the city (based on secondary data).

⁵ Formerly known as the *Master SFD diagram*

- *How well did stakeholders engage with the diagram during production and/or interpretation of the final diagram?*
 - The majority of stakeholders were only involved in data collection. However, the final SFDs were shown to stakeholders from water utilities and municipalities (people in charge of the faecal sludge in the cities under study) before publishing it online, so that they could provide with some feedback based on their knowledge.
 - A good technique to increase understanding of the actual sanitation situation of a city is to use draft SFD graphics for stakeholder meetings.
 - The overall SFD is easily understood. What brings up challenges are details like:
 - Onsite contained vs. not contained.
 - Contained, not emptied and the decision whether this flow is green or red (but can be both, according to the situation in the city).
 - Cannot reflect urine-diverting dry toilets, composting toilets, etc.

- *What were the particular challenges/limitations/opportunities of the diagram noted?*
 - The final SFD graphic does not tell the user the final end-use of the sludge, only shows if it is treated or not.
 - If the city has only few sanitation systems, the flows and arrows are easy to follow. If not, the complexity and number of arrows raises, making the interpretation of the diagram more challenging.
 - The SFD needs to have some words accompanied the graphic (a legend or something similar) since it deals with several terms that are confusing for a non-expert person to follow.
 - There is no allowance for sewer line ending up in open drain (and vice versa).
 - The graphic cannot reflect onsite sanitation technologies, such as urine-diverting dry toilets, composting toilets, ecosan, etc. where excreta is treated onsite and not removed by any emptying service provider. These systems are neither abandoned when full, nor is sludge collected and then treated.
 - The difference between percent of population served by wastewater treatment plants versus percent of wastewater treated seems difficult to understand for stakeholders.
 - Centralised/decentralised wastewater was not found to be significant in cities. This can be addressed on city level if it is more significant.

3.5 Excreta Flow Analysis

In general, how helpful were the definitions/terms/schematics in developing the SFD report?

In general, definitions/terms/schematics were very helpful in developing the SFD report. That provided with a reference frame that served as a basis to follow the same methodology in every city, allowing for further comparison among the cities studied.

- *Which of the definitions are unclear/ unhelpful?*
 - It should be noted that some terms/definitions can be different according to local conditions when developing the SFD. For example, septic tanks. They might not be “real” septic tanks in some locations.

- *Which of the terms are unclear/ unhelpful?*
 - The term *safely abandoned*⁶ in onsite sanitation systems is not very clearly defined. A lot of factors (groundwater table, manual emptying, etc.) could influence on this issue.
 - Groundwater risk assessment could be a bit challenging if there is no data on the soil type, for example.
 - Terminology needs to be consistent. Several terms have been used for:
 - SFD diagram/ master SFD diagram/ SFD graphic.
 - Online calculation tool/ Data-to-graphic generator/ SFD generator.
- *What new terms need to be added?*
 - There is no definition on the supernatant that comes out of septic tanks.
 - Regional terms could be included in the documents/methodology.
 - Centralised sewer system vs. decentralised sewer system. The difference needs to be more clearly defined. Defined by volume? Defined by technology? Defined by number of households connected? Defined by operators (public vs. private)?
- *What new schematics need to be added?*
 - Efficiency of the wastewater/faecal sludge treatment is not clearly specified in the methodology but it could have some impact and influence in the final SFD.
 - What is the required level of treatment in order to consider the wastewater/faecal sludge as well or not well treated? Measuring COD/BOD or the percentage of pathogen/nutrients removal? An explanation/methodology could be provided to help with this.
 - Glossary is a key part of SFD “training”. It could be linked directly to the methodology. It could be a possibility to discuss whether it might make sense to involve software developers that can transform the SFD manual into a program, which provides the user only with information necessary for a particular city context, as not all definitions and variables apply for each context).
 - Flooding events are likely to occur in waterlogged areas but also in rainy periods. Addressing this needs further discussion.

3.6 SFD generator⁷

What is your overall impression of the SFD calculation tool as it currently stands?

In general, the tool is very helpful in making the SFD.

- *How well could you use the tool in producing the initial SFD and subsequent amendments?*
 - Sometimes, percentages do not add up to 100% and some “data manipulation” has to be made.

⁶ This term refers as a “pit latrine that when full is abandoned and completely covered and sealed with soil”.

⁷ Formerly known as the *data-to-graphic tool*

- *What were the particular challenges/limitations/opportunities noted?*
 - Including somehow the frequency of desludging to help to determine the total amount of faecal sludge generated in any given city.
 - Estimating the percentage of latrines that were safely covered and abandoned was a challenging in Ethiopian cities.
 - Proportion of population using a system with emptying (%) was difficult to answer in Indian cities.

3.7 User interface of the Web-Portal

- The user interface needs improvement. There is also poor communication regarding the objectives of the project, the tool and how to use it on the webpage.

3.8 Uptake of results

In some of the cities studied in Phase I, some examples of further can:

- CEPT University has demonstrated interest in making use of the tools. A first attempt to produce a diagram using their own data sources has been explored.
- The field-based studies through the KILs were useful to engage stakeholders working on the WaSH sector, promote regular meetings among them and work together closer in the future. According to the local authorities from the cities studied by University of Leeds, SFDs would be used for advocacy purposes and city sanitation planning purposes.
- In many Indian cities, the SFD reports will inform discussions with a larger group of stakeholders, be used for city sanitation planning and to guide national flagship programme.
- In Dar es Salaam, the SFD report was discussed and used during research seminars with city stakeholders and used in high level meetings (UKZN Durban - World Bank meeting with major role players).
- In Khulna and Bignona, the SFD reports were shared with all stakeholders that were interviewed/ involved during the time of research (informing large group of city stakeholders) and were used by a local collaborator for the purpose of informing large scale faecal sludge management implementation projects.
- In Kampala, the SFD report was shared with stakeholders to validate the SFD. This included NWSC, KCCA, Ministry of Water and Environment, Ministry of Health, in addition to other local stakeholders.
- The 39th WEDC Conference held in Kumasi (Ghana) hosted a capacity development workshop convened by the SFD Promotion Initiative.
- The SFD for Kumasi was used as a basis to model the impact over a 10-year period of sanitation projects in the city (MSc. dissertation).

4. Review of Phase I: Recommendations

In this section, a list of several recommendations will be presented as a result of the experiences (as of on the status of March 2016) gained during the implementation of Phase I of the project from all partners. All recommendations listed are encouraged to be discussed and/or addressed with all partners during the implementation of Phase II of the project at some point.

4.1 Methodology for data collection

The following changes to the methods are recommended

- Experiences could be included in the manual, depending on data availability, scale of the city, engagement level / interest of stakeholders, experience in working in the country and with the SFD tool, etc.
- Since data availability is an issue in some cities, the estimated time needed for data collection and therefore, for the development of an SFD can be expected to be less depending on the availability of previous studies conducted in the city.
- Some variables in the methodology need to be adapted to local conditions or definitions (i.e. septic tanks).
- Sampling: there should not be a suggested number for focus group discussions. The implementing team has to evaluate themselves the number of FGDs and KIs that are sufficient to produce credible results.
- An interview guideline/ detailed questionnaires for the interviewer could be added to the methodology. It is recommended to include an example document into the methodology for data collection as an Annex. For example: the website (or SuSanA forum) could include a section where people are allowed to share/upload their questionnaires and data collection tools. This would result in a reduction of time and need for resources for all future SFD assessments.
- There is a discussion ongoing if an overall introduction–straightforward guidance on “how to get going” should be added to the manual. A 1 or 3-page document providing a first-glance guidance is suggested.
- Informal service provision, clandestine and illegal activities (e.g. manual emptying and illegal dumping) can constitute a relevant and significant part in the overall sanitation chain of a city and therefore should be considered during data collecting.
- Variation in population (diurnal, weekly, etc.) in the cities could influence the outcome of the SFD. This aspect will be discussed and considered in the further development of the methodology.
- Data requirements for calculating the groundwater contamination risk should be included into the methodology⁸: drinking water sources, etc. More guidance on the process for collecting these data is recommended.
- Even though the methodology for the service delivery context analysis worked well, there is some discussion to consider some revisions to make the purpose of the

⁸ See section “2.2.1 Desk-based SFD and service delivery context description” in the methodology manual for further description of current data requirements regarding groundwater contamination risk.

analysis clearer. Non-scientific professionals may have difficulties understanding the core of the analysis.

- Experience from the methods used could be captured: “Stories from the field”. Capture stories from the team (for example, videos) and publish them on the webpage.
- Gathering additional data⁹ (not just the ones suggested in the methodology) could be considered like groundwater sources etc. The value of maps in dialog with city stakeholders to identify the location of faecal sludge management realities was helpful and could be added to the methodology.
- Distinction regarding field vs. desk-based studies could be adapted maybe to ‘Stage 1: minimum level study’ and ‘Stage 2: additional/optional data’.

4.2 Stakeholder engagement

Recommended changes to the tracking-tool can be found in the following.

- The embedding of the tracking-tool into the SFD helpdesk could help to reduce the complexity of use.
- Stakeholder engagement write up only differentiates between KII, FGDs and observations. Another option could be created to put “other” like questionnaires with truck drivers, attending research seminars or other interviews which are not KIIs.
- If the stakeholder tracking was published in the report, names of interviewees would be shown. For data security reasons an anonymization could be taken into account, using Stakeholder 1, Stakeholder 2, etc.
- It could be useful to include a review of stakeholders in the body of the reporting template.

4.3 Reporting Template

- Length of the report put some people off. Therefore, it could be considered to adapt the report to target audience of users.
- Change the order to have Service Outcomes (section 3) before Service Delivery Context (section 2) to ease replicability.

4.4 SFD graphic

Recommended changes to the visual appearance of the SFD are described in the following.

- It could be useful to provide a set of ‘model’ examples for cities to look at when starting the discussion with the stakeholders in order to provide stakeholders with a background on the methodology and/or outcome of the SFD, what it means and what not, etc.
- The issue of managed seepage (infiltration) needs to be addressed.
- Variables (labels) could be left out of the diagram to increase clarity.

⁹ See section “2.1.2 Methods for data collection”

- Including the indication of level of precision/margin of error could increase the reliability of the diagram.
- Arrows could be renamed to reflect infiltrate, compost, etc.
- Standard “cut-off”/minimum values in the methodology and calculation tool could be introduced.
- It could be considered to include “abandoned when full” as a separate category. II.
- Septic tank effluent should not fall under the same category as wastewater, due to significantly different characteristics.
- Assuming that 50% of lined tank, lined pit, septic tank is not faecal sludge but effluent, supernatant or infiltrate could be revised, as this assumption compares a consistent daily flow with inconsistent removal.

4.5 Excreta Flow Analysis

- Definition on the supernatant that comes out of septic tanks needs to be added to the methodology and SFD generator.
- Definition of level of treatment and/or safely disposed of:
 - Defining the level of treatment and/or defining faecal sludge that is safely disposed of is a complicated issue that needs to be addressed.
 - A feasible approach such as defining a 0/100, 50/50 or 100/0 treated/not treated of faecal sludge/wastewater has been suggested.
 - Open discussions with all partners to solve this issue are encouraged in order to get a feasible solution during Phase II.

4.6 SFD generator

The following changes in the structure, appearances and use of the SFD generator are recommended or to be discussed within phase 2.

- 10 sanitation combinations can be made in the tool. In some cases, due to the local conditions, that works well. However, in more complex scenarios, those 10 combinations might not be enough and more combinations could be included in order to better represent the current faecal sludge management situation of a particular city.
- Complexity of system options: Some guidance on the details and classification in the report could be provided, explaining the logic behind this. For example, adding it to the FAQs section.
- Septic tank supernatant issue: It could be addressed by including categories for septic tanks. Maybe separating the septic tank line in the calculation tool.
- How composting toilets would be shown in the SFD? They are fully lined tank with no outlet. When they get emptied, the dried/composted excreta are applied to the field. In the SFD this would be considered unsafely managed, as it is not delivered to treatment. Including its own category for such systems could be the solution for this issue.

4.7 User interface of the Web-Portal

- Develop a short introduction video with the main goals and objectives of the project.
- Build a FAQs section to address people's questions on the project, objectives, usability of the manual and tools, etc.
- An introduction to "how to use the manual" needs to be made.
 - The online tutorial is a deliverable for WEDC in Phase II.
 - EAWAG online material relating to SFDs could be helpful to build-on but should be adapted to the project itself.

4.8 Usability of the tools and manuals

- A very structured and clear step-by-step manual (no longer than 7 to 10 pages) with implementation examples and references to the main manual is needed. In addition, a linkage to the SFD preparation area on the SFD Web portal is considered to be developed.
- A more adequate way of differentiating the level of information required and therefore, level of efforts for producing an SFD needs to be decided upon (previously referred to as desked- and field-based studies).
- Specific comments on the SFD generator tool need to be added.

A. Groundwater risk issue

- Assessment of groundwater risk was found to be challenging in some cases, especially in those cities where data were not/hardly available.
- The main purpose of this analysis could focus on evaluating the risk of drinking water, rather than focusing on just groundwater since drinking water sources in a city could come from surface water, groundwater or both. This discussion is ongoing.
- A guideline to evaluate the drinking water risk needs to be made. This guideline should fit within the purpose of the project.
- Assumptions made in case of lack of data availability need to be included in that guideline, keeping in mind that more complexity does not necessarily mean better assessment.
- This guideline and the (necessary) assumptions to assess drinking water risk need to be added to the SFD manual.

B. Rounding error

- In some cases, percentages do not add up to 100%.
- Further discussions are encouraged to deal with this (fixing or not fixing the tool to address this, etc.).

C. The “snake” issue¹⁰

- SFDs with excreta flows of faecal sludge as discharging from septic tanks being transported via drainage networks to sewerage treatment plants result in a lot of confusion.
- Three solutions have been suggested:
 - ✓ Not a problem at all – all explained in SFD arrows.
 - ✓ Allow for the snake.
 - ✓ Creating a new category of systems to be included in the SFD.
- Three city examples will be developed and taken to the SFD Steering Committee meeting in Stockholm in August 2016 for an open and result-orientated discussion.

D. Decentralised/centralised sewers

- Calculation tool can include both options but the SFD needs to show only one sewer option (which can be either combined or separate) to simplify the SFD without losing information and accuracy.

E. Emptying/abandonment

- The calculation tool asks for the “population using this system with emptying”, a number difficult to calculate/estimate. This percentage could be calculated in many different ways and could lead to inconsistency between cities if not clearly indicated. Solutions suggested:
 - i. Percentage of people that theoretically have access to emptying and transport services.
 - ii. Actual percentage of onsite sanitation technologies emptied:
 - Number of households per systems.
 - Number of people per household.
 - iii. Using a timeframe that defines how many systems have been emptied within:
 - Two to five years for systems containing faecal sludge.
 - Two years for systems not containing faecal sludge.
 - Above five years is regarded as not emptied.
 - iv. Using existing data (or assumptions) for:
 - Desludging intervals.
 - Volume of containment systems.
 - Volumes of faecal sludge delivered to treatment/discharge locations.
- A decision needs to be taken in Phase II. It is recommended to develop a decision support tool, which provides different approaches for different contexts, included in the FAQs section. Examples of this could be put in the manual as well.

¹⁰ This term refers to FS discharging from septic tanks and being transported via drainage networks to a disposal site/sewerage treatment plants (i.e. as an offsite system).

F. List A and list B from the manual need to be unified

- This task will be done in the next version of the manual.

G. Tables in the calculation tool

- Tables are complicated to comprehend and need to be more accessible and visible.
- It is recommended for the further development in Phase II to refer to them in the introduction section of the manual, accompanied with a clear explanation of how tables link to the collected data.

H. Red starting arrows of the SFD

- The idea to have starting red arrows is that shit is not managed (safely or unsafely) until it reaches containment (pit or tank) or a sewer line.
- This led to confusions in discussions with stakeholders during the production of SFDs. A new approach/solution is to be discussed in the SFD Steering Committee meeting in Stockholm, in August 2016.