SFD Lite Report

Wobulenzi
Uganda

This SFD Lite Report was prepared by Sandec, Eawag and ETH Zurich

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1 The SFD Graphic

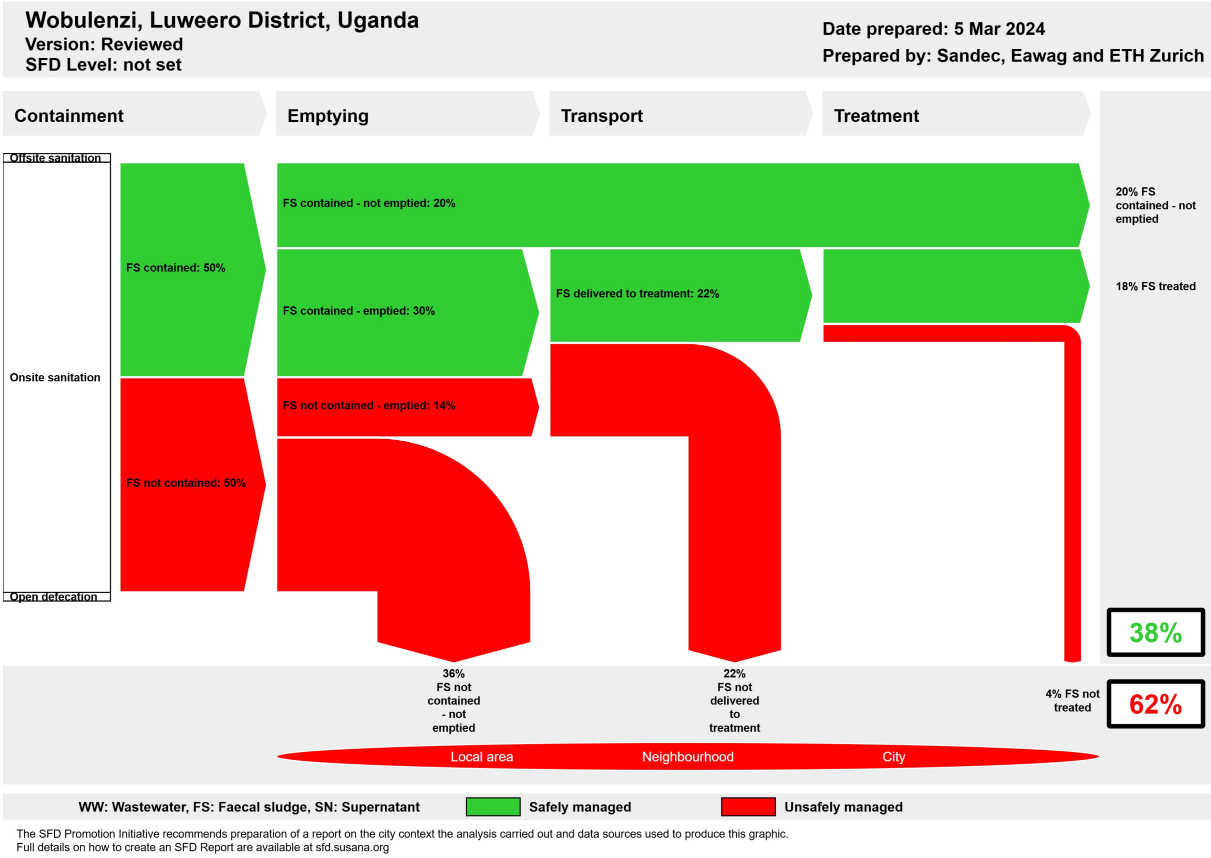

Figure 1: SFD Graphic for Wobulenzi, Uganda.

2 SFD Lite information

Produced by:

- Julian Fritzsche (Master Student) in collaboration with Sandec, Eawag and ETH Zurich, partly sponsored by the Swiss Agency for Development and Cooperation (SDC).
- Support of University of Makerere, namingly Prof. Dr. Charles Niwagaba and Dr. Ronald Sakaya.

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3 General city information

Wobulenzi is located around 50km north of Kampala along Gulu Road. It is a small town with a population of around 36.000 inhabitants mainly working in the agricultural sector. About 60% of the population lives in urban areas, whereas 20% live in peri-urban, respectively rural areas. Figure 2 shows a map of Wobulenzi with its city boundaries and buildings.

The area exhibits a relatively rapid annual urban population growth rate of 5.7%. The area is approximately 17.3 km^2 (Eawag, 2023a, Wobulenzi Town Council, 2020). Due to rapid population growth, problems such as deteriorating living environments, unplanned settlements informal developments, and disorderly land management arise. As there was no legally endorsed planning framework until 2006, the municipality faced multiple physical planning problems linked to uncontrolled and unplanned development. Imbalance in service provision, narrow and poor road networks, drainage problems, and poor solid and liquid waste management are some of the issues linked to the lack of a legal planning framework. High illiteracy levels, high prevalence of HIV/AIDS or the inaccessibility to education and health services are just a few causes of prevailing poverty in Wobulenzi leading to issues such as high infant mortality and morbidity rates, food insecurity or increased environmental degradation (Wobulenzi Town Council, 2020).

Wobulenzi consists of inhabited hilly areas, as well as several swamps and wetlands, which often serve as agricultural zones. The soil consists mainly of red gravel soil containing a large fraction of clay. Two rainfall seasons can generally be observed in the study area, one is from October to November and the other from April to May.

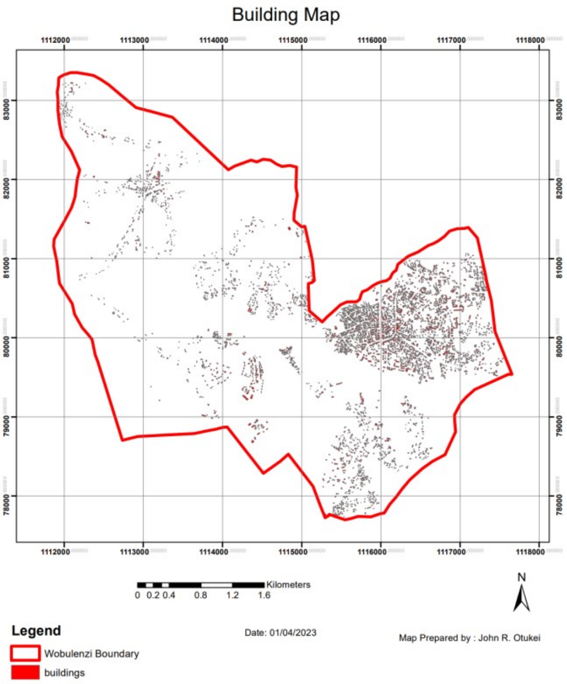

Figure 2: Map showing boundaries and buildings of Wobulenzi, Uganda.

The groundwater level of the deep aquifer is about 70m below the surface. Due to heavy rainfalls during rainy seasons and insufficient drainage networks, flooding occurs relatively often in the lower-lying areas (Local government, 2023, NWSC and Corporation, 2023, Health Inspector, 2023). The average rainfall is about 1,250 mm/year (Jury, 2018, Bukomeko et al., 2019, Opio, 2019). Actual evapotranspiration is 489 mm/year (Department of Water Resources, 2023). For the assessment of the SFD graphic, the city boundaries as defined by the municipality are adopted (Wobulenzi Town Council, 2020).

4 Service outcomes

In Wobulenzi, 100% of the sanitation service chain is on-site, which means that there are no sewers within the study area to transport sewage. Almost 97% of the population use a drop hole as a user interface. Only a bit less than 3% use a cistern or pour flush toilet, which are generally connected to a sanitation containment technology with a soak pit. A small percentage of 0.3% still practice open defecation in the form of flying toilets (Sandec, 2024). Since this value for open defecation is less than 0.5%, it is not included in the SFD matrix.

Table 1 summarizes the sanitation systems in use, as well as estimates of the population connected to each system. It shows the proportions of each from which faecal sludge is then emptied, transported to treatment and treated.

Wobulenzi, Luweero District, Uganda, 5 Mar 2024. SFD Level: not set
Population: 36000
Proportion of tanks: septic tanks: 100%, fully lined tanks: 100%, lined, open bottom tanks: 1

Containment				
System type	Population	FS emptying	FS transport	FS treatment
	Pop	**F3**	**F4**	**F5**
System label and description	Proportion of population using this type of system (p)	Proportion of this type of system from which faecal sludge is emptied	Proportion of faecal sludge emptied, which is delivered to treatment plants	Proportion of faecal sludge delivered to treatment plants, which is treated
T1A2C5 Septic tank connected to soak pit	1.0	100.0	50.0	80.0
T1A3C10 Fully lined tank (sealed), no outlet or overflow	12.0	100.0	50.0	80.0
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	3.0	100.0	50.0	80.0
T1A6C10 Unlined pit, no outlet or overflow	14.0	100.0	50.0	80.0
T1B7C10 Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow	20.0			
T1B8C10 Pit (all types), never emptied, abandoned when full but NOT adequately covered with soil, no outlet or overflow	21.0			
T2A2C5 Septic tank connected to soak pit, where there is a 'significant risk' of groundwater pollution	2.0	100.0	50.0	80.0
T2A6C10 Unlined pit, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	12.0	100.0	50.0	80.0
T2B7C10 Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	15.0			

Table 1: SFD Matrix for Wobulenzi.

4.1 Sanitation Containment Technologies

The distribution of sanitation containment technologies is (N = 267) (Sandec, 2024):

- 3% septic tanks.
- 65% unlined pit latrines.
- 8% partially lined pit latrines.
- 24% fully lined pit latrines.

4.2 Emptying and Disposal

Emptying is performed by vacuum trucks from Kampala, which will transport the emptied faecal sludge back to Kampala to be treated in a wastewater treatment plant. The recovered sludge is sold as an agricultural fertilizer (Makerere; Prof. Dr. Charles, 2023). It was reported by various stakeholders that many users in the study area open their sanitation containment during heavy rainfalls or use pumps to empty their sanitation containment in the immediate vicinity as emptying services are expensive. Sludge dumping on local landfills has been reported by one informal waste trader but is expected to only happen rarely (Sandec, 2024, GOV2, 2023, GOV4, 2023).

4.3 Faecal Sludge Treatment Plant

There is a faecal sludge treatment plant in Kakooge, which is closer to Wobulenzi than Kampala, but many users lack the financial ability to pay for emptying services. This is one of the reasons the faecal sludge treatment plant in Kakooge is not in operation, and many users resort to abandoning their latrines to build a new one or to improperly empty the contents (Sandec, 2024).

4.4 SFD Graphic

The outcome of the SFD graphic shows that 38% of the excreta flow is classified as safely managed, and the remaining 62% is classified as unsafely managed (Figure 3).

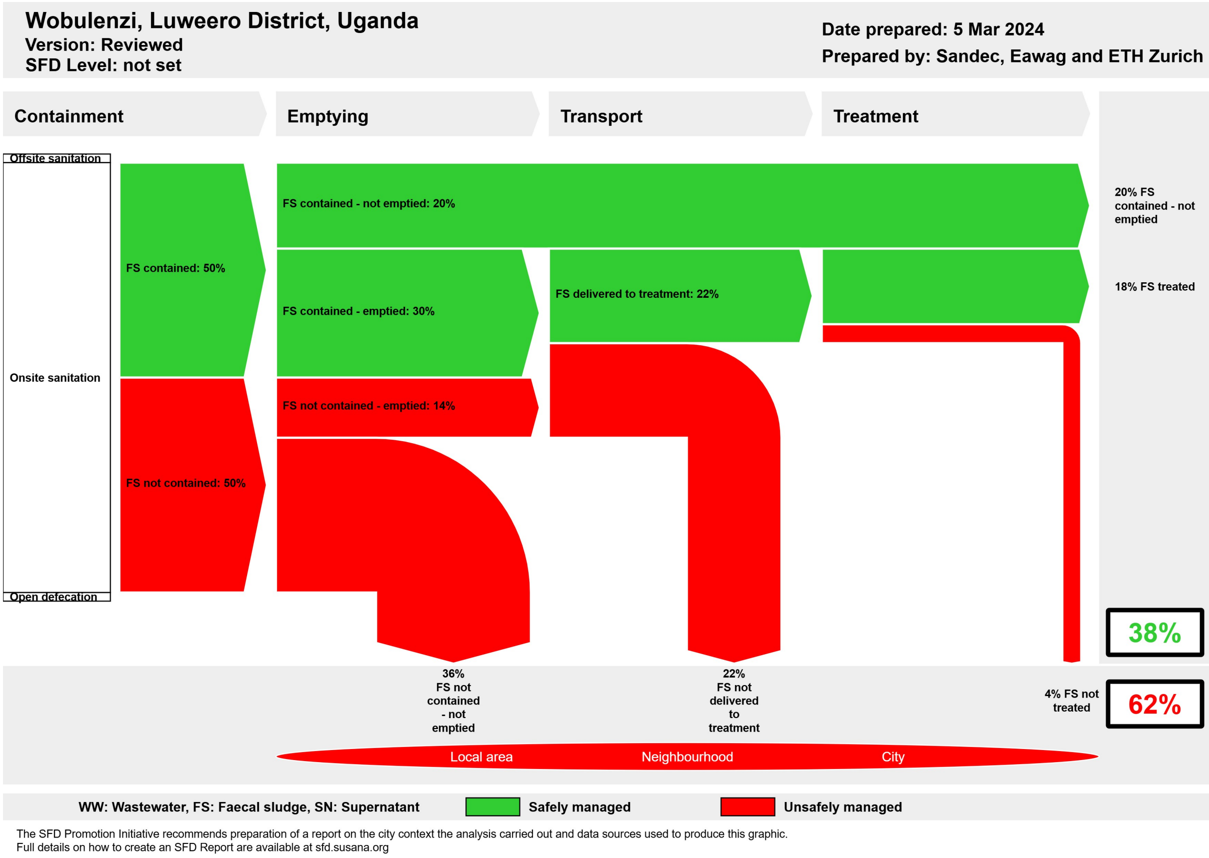

Figure 3: SFD Graphic for Wobulenzi.

The unsafely managed excreta originate from Faecal Sludge (FS) delivered to treatment but not treated (4%), FS emptied but not delivered to treatment (22%) and FS not contained - not emptied (36%).

The safely managed excreta originate from FS delivered to treatment and treated (18%) and FS contained - not emptied (20%). This 20% resembles the FS stored in containments without significant risk to groundwater pollution. Thus, the safely managed percentage of FS generated by this 20% of the population is temporary until the FS from the containments is emptied. Therefore, these systems will require emptying services in the short and medium term as they fill up.

5 Data and assumptions

The majority of the data points needed were collected during the integrated baseline assessment (IBA), which serves as a main data source (Eawag, 2023a). Missing data points were collected in a separate field trip, adapted from literature with comparable contexts or expert judgement. The Integrated Baseline Assessment was conducted in July and August 2023 in Wobulenzi and Kakooge, Uganda. It comprised an extensive data collection campaign consisting of interviews, document analysis, household surveys, observations, detailed sampling, and characterization. Two additional, separate field trips took place in Wobulenzi, Uganda during November and December 2023. Interviews were conducted with the National Water and Sewerage Corporation (NWSC), the health inspector from Wobulenzi Town Council (Ms. Prossy), the local government of Luweero, Uganda (mWata, Muhammad Kaweesi) and informal value-chain traders. Observations were carried out in all Wobulenzi to observe leakage influencers of the formal and informal solid waste management chain, the state of storm drains, and the environment in the immediate vicinity. Relevant literature was obtained from databases (Google Scholar) or experts (Makerere University, Eawag, NWSC). Throughout the text, the identifiers (IDs) of the interviews or observations from the field trips are given as a citation to make the origin of the data easier to understand.

During the IBA, it was identified, whether a sanitation containment was ever emptied or not. Answers with “Don’t know / no answer” were removed. 3% of unlined pit latrine users reported emptying their containment, whereas 0% of septic tanks, 0% of partially lined pits and 6% of fully lined pit latrines (N = 267) were reported to be emptied. It was reported by different stakeholders, that users deliberately open their sanitation containments during heavy rainfalls and floods to empty their containments or pump out containments. As many containments have not been in use long enough to fill up and might be emptied properly eventually in the future, the unknown fate of the sanitation containments is split equally between the options to minimize the error (value for variable F4 is set to 50% in all sanitation systems).

For septic tanks, the options are either to properly empty the tank or to open it during floods to wash out the contents. To cover a septic tank and build a new one is assumed not to be a feasible option due to high expenses and space requirements. Unlined pits and partially lined pits will either be adequately covered with soil, inadequately covered, emptied properly, or contents are deliberately washed out during heavy rainfalls. Even if unlined pit latrines are not recommended to be emptied, it is assumed that emptying is also feasible for unlined pits due to the compact, clayey structure of the soil in the study area (Reed, 2017, Zziwa et al., 2016). If unlined or partially lined pits are adequately covered and abandoned after use, it is still important to know if they are at low or significant groundwater risk, which will then determine if it is safely managed or not.

For fully lined pits, the options are either to properly empty them, to deliberately wash them out during heavy rain events, to cover them adequately with soil or to inadequately cover them with soil when full. In contrast to the SFD manual, adequately covered fully lined pits are considered to be safely managed.

Thus, despite most of the households reported not to empty their sanitation system in the survey, it was assumed that all sanitation systems have been emptied at some point for the above-mentioned reasons (i.e. opening of the sanitation containments during heavy rainfalls and floods, the clayey structure of the soil, etc.), and thus, value for variable F3 for all sanitation systems was set to 100%.

Figure 4 shows the fates considered of different sanitation containments. If containments are emptied by emptying trucks, excreta is brought to Kampala for treatment, where the treatment efficiency is 80% (Makerere; Prof. Dr. Charles, 2023). Dumping of faecal sludge is neglected as it only happens rarely. 1% was subtracted from T1B7C10 - Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow (see SFD Manual), to sum up to 100%.

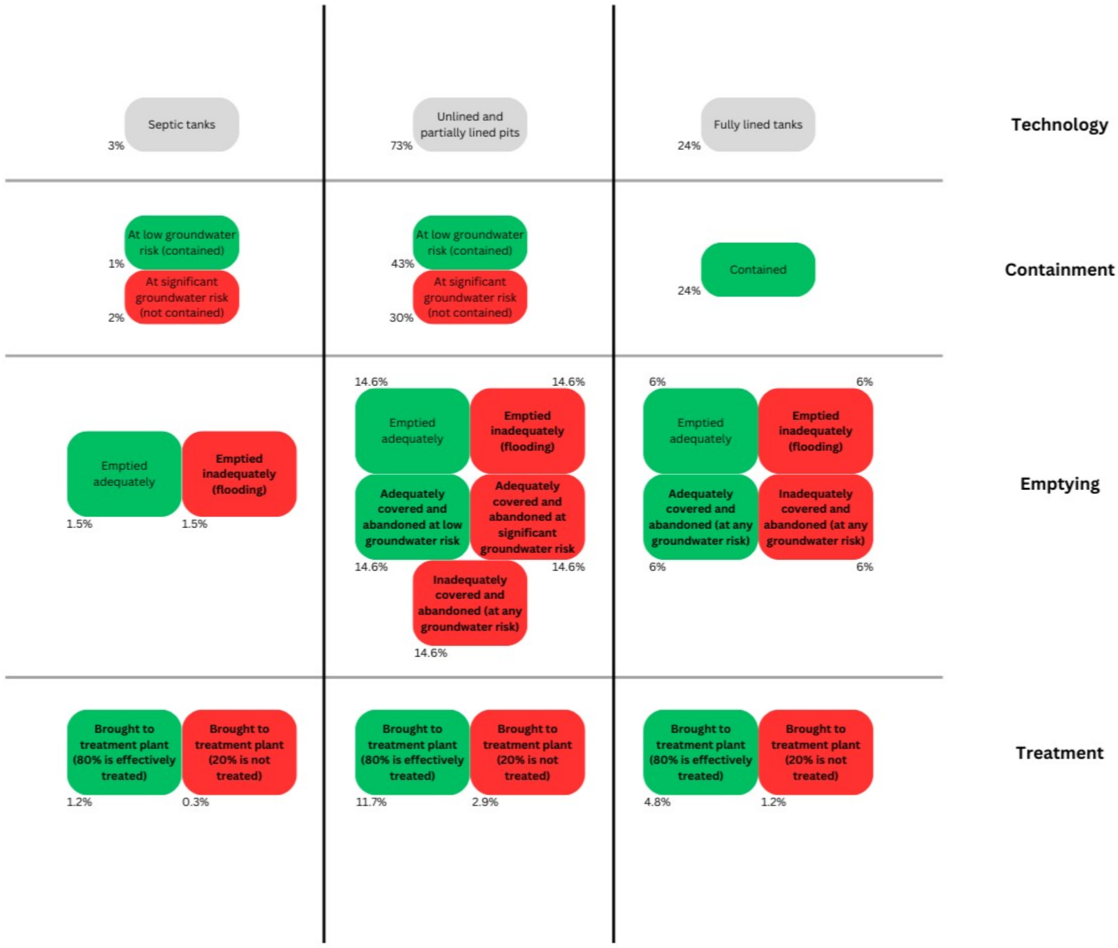

Figure 4: Sanitation containments and their fate with the respective amount. Boxes marked in bold are endpoints. Boxes marked in green and red are considered safely, respectively unsafely managed.

5.1 Groundwater risk

The groundwater risk assessment tool of the SFD Manual indicates a significant groundwater risk in the area. The risk originates from the lateral separation of the groundwater sources to the sanitation containments. As the soil consists mainly of fine sand, silt, and clay and the depth of the groundwater table is more than 10 m, the vulnerability of the aquifer is low (Q1 = low risk).

For the lateral separation (Q2), the fraction of the sanitation facilities located <10 m away from a groundwater source is decisive about the groundwater risk. During the IBA, the lateral separation of the sanitation containments and groundwater sources was identified and can therefore be used to distinguish between sanitation containments, which are at significant (<10 m) or low risk (>10 m) of groundwater pollution. Table 2 shows the according data.

Table 2: Lateral separation of sanitation containments to groundwater sources by type of containment.

Total fraction of							
Septic tanks	Unlined pit latrine	Partially lined pit latrines	Fully lined pits	Septic tanks	Unlined pit latrine	Partially lined pit latrines	Fully lined pits
<10 m				>10 m			
2.25%	29.96%	0.37%	4.49%	1.12%	34.83%	7.49%	19.48%

Partially lined pits at significant groundwater risk are only 0.37% of the total. Since this value is less than 0.5%, it is not included in the SFD matrix. Table 3 shows the types of containment in households in Wobulenzi and their equivalence to the SFD-PI.

Table 3: Types of containment in households in Wobulenzi and their equivalence to the SFD-PI.

Containment	Connected to	Risk of groundwater contamination	%	Recategorized as SFD	System	%
Septic tank	Soak pit	Low	1.1%	Septic tank connected to soak pit	T1A2C55	1%
Septic tank	Soak pit	High	2.2%	Septic tank connected to soak pit	T2A2C5	2%
Fully lined tanks (emptied inadequately or adequately)	---	High and Low	12%	Fully lined tank (sealed), no outlet or overflow	T1A3C10	12%
Partially lined pits at low groundwater risk and not abandoned after use	---	Low	3.0%	Lined tank with impermeable walls and open bottom	T1A4C10	3%
Unlined pits at low groundwater risk and not abandoned after use	---	Low	13.9%	Unlined pit, no outlet or overflow	T1A6C10	14%
Unlined pits at significant groundwater risk and not abandoned after use	---	High	12.0%	Unlined pit, no outlet or overflow (significant risk of groundwater pollution)	T2A6C10	12%
Fully lined pits at any groundwater risk or partially and unlined pits at low groundwater risk, abandoned and covered adequately	---	High and Low	20.6%	Pit (all types), never emptied but abandoned when full and covered with soil	T1B7C10	20%
Unlined or partially lined pits abandoned at significant groundwater risk	---	High	14.6%	Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	T2B7C10	15%
Fully lined, partially or unlined pits abandoned and not adequately covered	---	High and Low	20.6%	Pit (all types), never emptied, abandoned when full but NOT adequately covered with soil	T1B8C10	21%
TOTAL			**100.0%**			**100%**

6 List of data sources

Data sources elaborated in section 5:

- Integrated Baseline Assessment (IBA, by Eawag, Sandec).
- Individual field work.
- Interviews with NSWC, Makerere University and mWata.

Literature:

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SFD Promotion Initiative

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Produced by:
Julian Fritzsche, Sandec

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