SFD Lite Report

Bandarban Municipality
Bangladesh

This SFD Lite Report was prepared by
CWIS-FSM Support Cell, DPHE

Date of production/ last update: 07/10/2021

1 The SFD Graphic

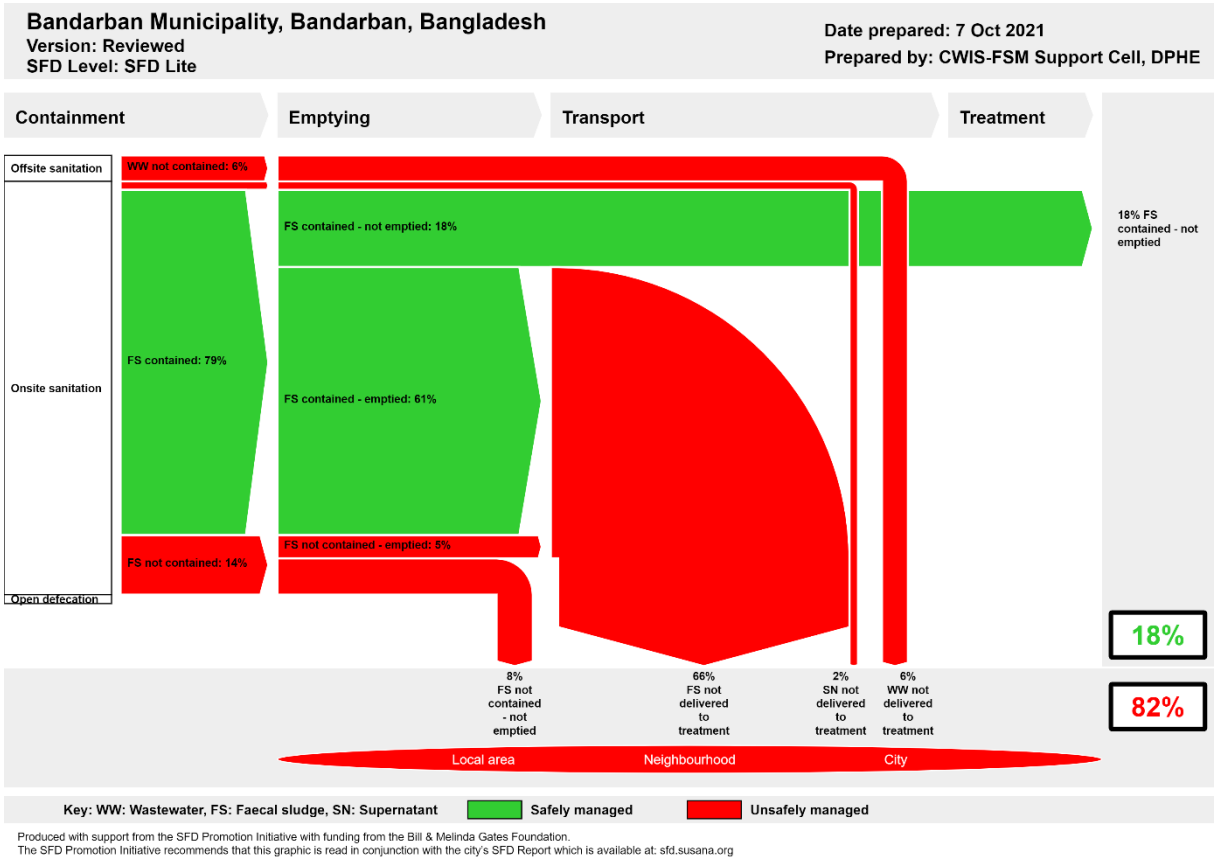

Figure 1: SFD Graphic for Bandarban municipality.

2 SFD Lite information

Produced by:

- Dr. Abdullah Al-Muyeed, Chief Operating Officer, CWIS-FSM Support Cell; Shishir Kumar Biswas, Project Director: *Feasibility for Implementing of Solid Waste and Faecal Sludge Management System in 53 District Level Municipalities and 8 City Corporations*, Department of Public Health Engineering (DPHE); and Suman Kanti Nath, Technical Expert, CWIS-FSM Support Cell, Department of Public Health Engineering (DPHE), Bangladesh.

- This report was compiled as part of the Baseline Survey of the project "Feasibility for Implementing of Solid Waste and Faecal Sludge Management System in 53 District Level Municipalities and 8 City Corporations" DPHE. We would like to thank Mr. Mohammad Islam Baby, Mayor, Bandarban Municipality, Mr. Mong Shwe Khai Marma, Executive Engineer, Ms. Geeta Rani Dey, Mr. Dilip Barua, Councillor, Bandarban Municipality for providing all the required primary and secondary data and cooperating for Key Informant Interviews (KIIs) & Focused Group Discussions (FGDs). This report would not have been possible to produce without the constant support of the Mayor, Municipality, who helped in conducting sample surveys and FGDs in the field.

- We also acknowledge the support of the Centre for Science and Environment, India for the promotion of SFD in Bangladesh.

Collaborating partners:

- DevCon, Tiller, and Bandarban municipality played vital roles in collecting and sharing data, and producing this SFD graphic and SFD lite report.

Date of production: 7/10/2021

3 General city information

Bandarban is located in the South-East of Bangladesh. Bandarban is a hilly District and Bandarban municipality is the district town. It is a fast-growing city, which is 324 km away from Dhaka city. It is beside the Sangu River and well connected with road and water. It is one of the oldest towns in the sub-continent and was declared Municipality in 1984. Bandarban is one of the 53 district-level Municipalities in the country.

Table 1: City profile (Rapid assessment 2020-21, DPHE)

Population parameters	
Estimated population, 2020	59,520
Households, 2020	12,159
Area, sq. km	13.05
Total roads, km	241.1
Total drains, km	285.30

Figure 2: Bandarban municipality Location Map (BBS/ GIS report 2017)

According to the population census in 2011 by the Bangladesh Bureau of Statistics (BBS), the Bandarban city population was 41,434. The urban population growth in Bandarban is 3.01% per year. Considering 10% floating population, such as farmers and traders, comes to the city every day, the present (2020) population is estimated to be around 59,520.

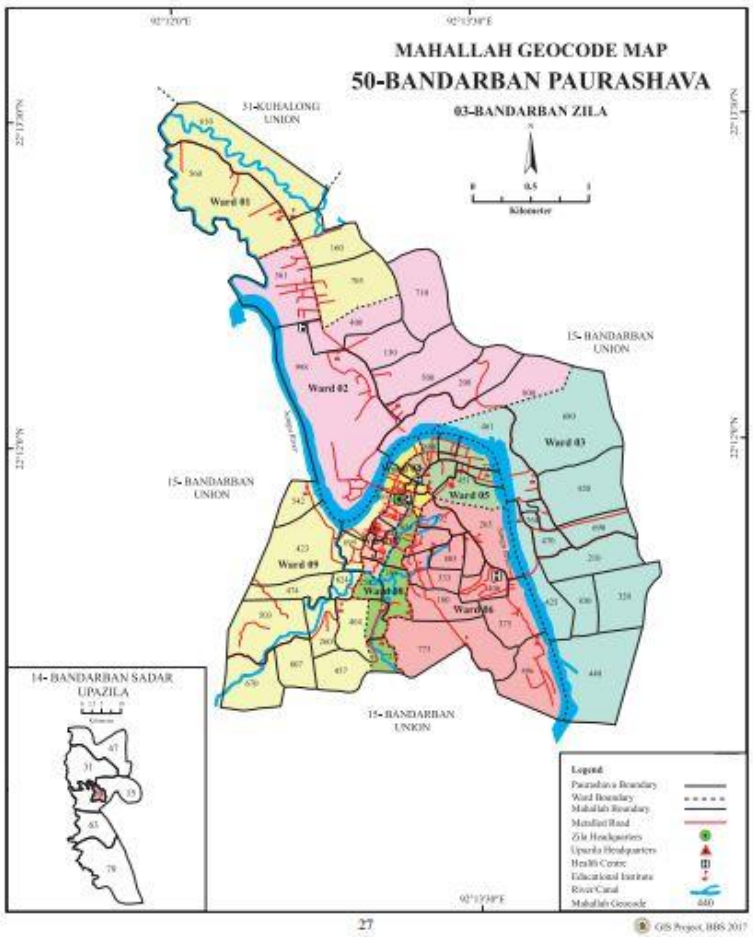

Figure 3: Bandarban municipality Ward Boundary Map (GIS Project, BBS 2016)

The Municipality covers an area of 13.05 square kilometers. At present Bandarban has 241.10 km of roads, of which 20 km are bituminous roads, 15.50 km cement concrete roads, 3.60 km Herring-Bone-Bond (HBB) roads, 2 km Brick flat soling (BFS) roads, and 200 km earthen roads. The Municipality has about 285.30 km of drains which include 17.50 km brick drains, 7.80 Km Reinforced cement concrete (RCC) drains, 250 km earthen drains, and 10 km natural drains.

According to the Bangladesh Meteorological Department (BMD), the city area and surrounding area experiences a tropical monsoon climate. It is characterized by warm, humid summers and cool, and dry winters. There is no climatological station within the Municipality. The closest meteorological station of the Bangladesh Meteorological Department is located in Rangamati which is about 51 km away from the Municipality area. Weather data from this station are collected from 1981 to 2017. About 90% of the total annual rainfall occurs in the period from May through October & the driest months of the years are November to March. The maximum mean temperature observed is 30.1-32.3°C between April-August, with the minimum mean temperature of 14.9-16.6°C in January. The annual average rainfall is about 2824 mm, according to BMD (1981-2017).

Sangu River flows through the Municipality. Several canals (Mechki Chora, Panchora Khal, and Chandabaj Khal) flow through the city. According to the flood zoning map of Bangladesh [BMD, 2012], the city is in a flood-free zone (in the last 12 years no flooding event happened). However, the drainage network of the city is not adequate. Every year, many city areas face water logging during the monsoon

due to drainage congestion. There are some secondary drains carrying stormwater and domestic wastewater to the outfalls for the rivers and canals.

The population density in the 9 wards of the city is shown in Figure 3. The density is high in the center, ranging from 20,001 to 25,181 per sq km. The population density in the west and east is lower, ranging from 1,316 to 5,000 per sq km

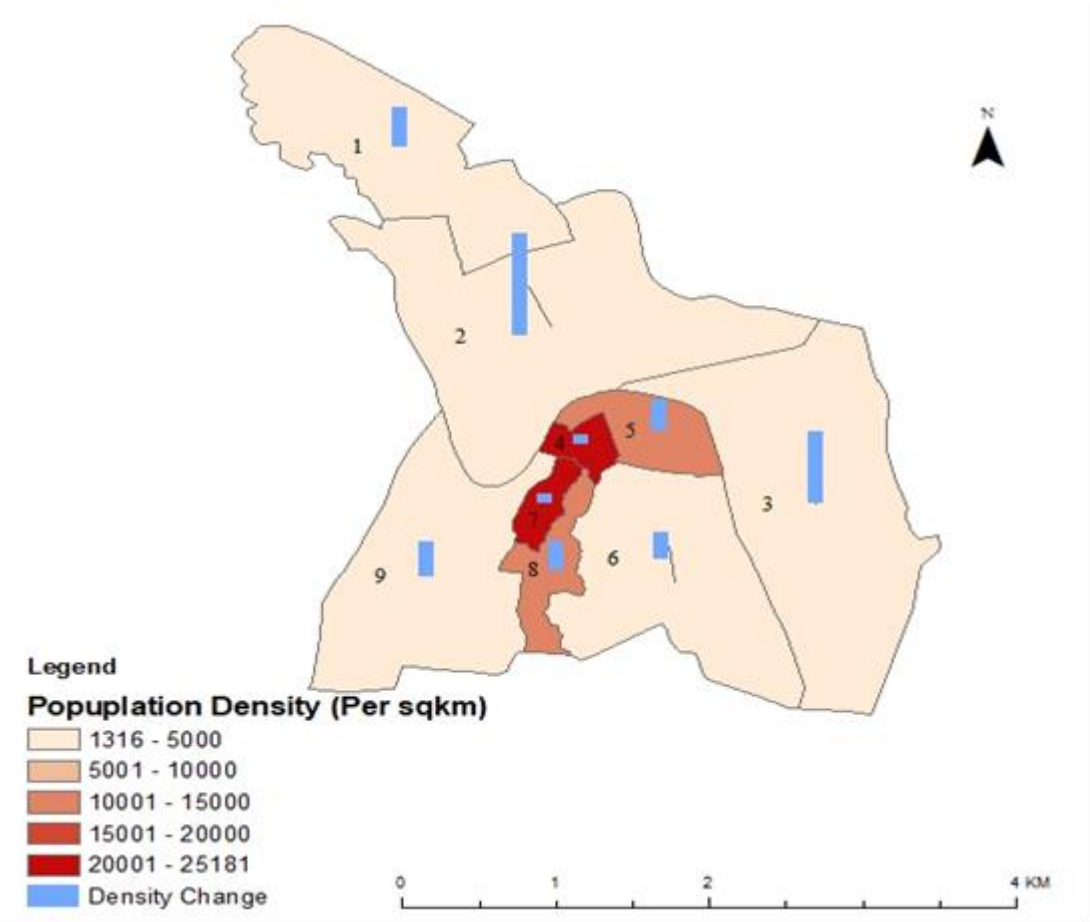

Figure 3: Population density in different Wards of Bandarban municipality.

4 Service outcomes

Bandarban Municipality, Bandarban , Bangladesh, 7 Oct 2021. SFD Level: SFD Lite
Population: 59500
Proportion of tanks: septic tanks: 81%, fully lined tanks: 0%, lined, open bottom tanks: 100%

Containment								
System type	Population	WW transport	WW treatment	FS emptying	FS transport	FS treatment	SN transport	SN treatment
	Pop	W4c	W5c	F3	F4	F5	S4e	S5e
System label and description	Proportion of population using this type of system (p)	Proportion of wastewater in open sewer or storm drain system, which is delivered to treatment plants	Proportion of wastewater delivered to treatment plants, which is treated	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	Proportion of supernatant in open drain or storm sewer system, which is delivered to treatment plants	Proportion of supernatant in open drain or storm sewer system that is delivered to treatment plants, which is treated
T1A1C6 Toilet discharges directly to open drain or storm sewer	5.9	0.0	0.0					
T1A2C5 Septic tank connected to soak pit	12.5			58.0	0.0	0.0		
T1A2C6 Septic tank connected to open drain or storm sewer	10.2			46.0	0.0	0.0	0.0	0.0
T1A2C7 Septic tank connected to open water body	3.0			46.0	0.0	0.0		
T1A2C8 Septic tank connected to open ground	1.0			46.0	0.0	0.0		
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	5.5			0.0	0.0	0.0		
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	60.6			91.0	0.0	0.0		
T1B10 C7 TO C9 Containment (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) failed, damaged, collapsed or flooded - connected to water bodies, or open ground or 'don't know where'	1.3			0.0	0.0	0.0		

Table 2: SFD Matrix for Bandarban municipality.

The outcome of the SFD graphic shows that only eighteen percent (18%) of the excreta flow is classified as safely managed, and the remaining eighty-two (82%) percent is classified as unsafely managed (Figure 1). The unsafely managed excreta originate from wastewater not delivered to treatment (6%), Faecal Sludge (FS) not contained - emptied but not delivered to treatment (66%), FS not contained - not emptied (8%) and 2% of Supernatant (SN) not delivered to treatment. The safely managed excreta originate from FS contained- not emptied (18%).

The percentages presented in Table 2 and discussed in the next section are based on data collected through rapid assessments, household surveys, Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) (Figure 4 and 65).

Overview on technologies and methods used for different sanitation systems through the sanitation service chain is as follows:

4.1 Offsite Systems

The city does not have a dedicated sewerage system. However, during field observations and the households survey, it was found that there is a certain area where toilets are directly connected to open drains or storm sewers. Similarly, a portion of septic tanks is directly connected to open drains or storm sewers. Therefore, T1A1C6 system is considered as used by 5.9% of the total population of the city to generate the SFD graphic. Similarly, the T1A2C6 system is considered as used by 10.2% of the total population of the city to generate the SFD graphic. In the absence of a sewerage system, the faecal sludge in T1A1C6 and the supernatant in T1A2C6 are directly discharged into the river or the environment untreated.

4.2 On-site Sanitation Systems

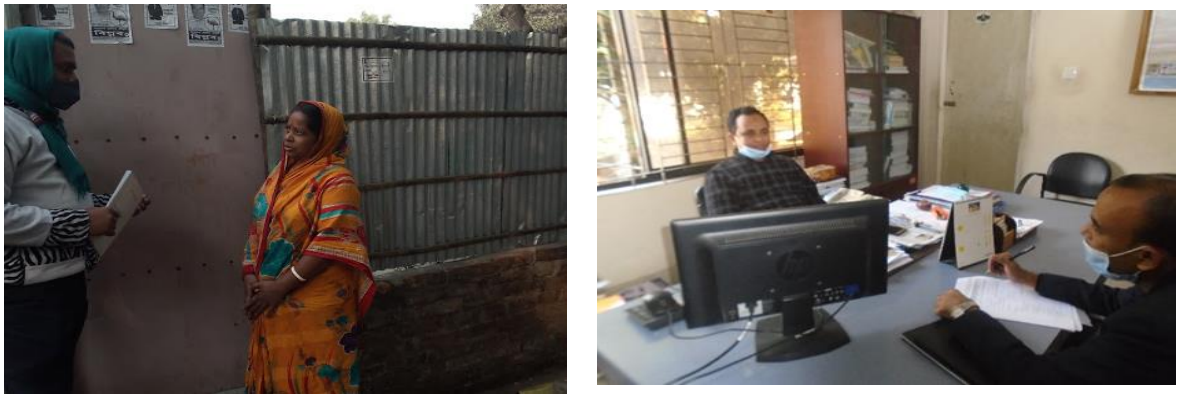

Figure 4: Household survey and consultations. Left: Household survey. Right: KII meeting. (Source: *Feasibility study 2020-21/DPHE)*

Containment: Almost all the households (99.25%) in the city have their latrines connected to single pits, twin pits, septic tanks, or discharged directly into the environment (e.g. open ground, open drain, waterbody, etc.). The rest of the households use community latrines (0.25%) and neighbor's toilets (0.5%). From the household survey, it is found that a quarter of the city population (26.68%) uses septic tanks as the containment system, 60.06% of the toilets have single pit systems, and 5.5% of people use double pits in the city. 1.3% of containments (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) are failed, damaged, collapsed or flooded and connected to water bodies, or open ground or 'don't know where' and 5.99% do not have any type of containment and discharges directly to the environment (KII, FGDs, HH survey, 2020).

According to the type of connectivity and features of containment technologies, the discharging points of the toilets are categorized as: 12.5% population uses septic tanks connected to soak pits (T1A2C5), 10.2% population uses septic tanks connected to open drain (T1A2C6), 3% population uses septic tanks connected to water body (T1A2C7), 1% population uses septic tanks connected to open ground (T1A2C8), 5.5% population uses lined tanks with impermeable walls and open bottom with no outlet (T1A4C10), 60.6% of the population relies on lined pits with semi-permeable walls and open bottom with no outlet or overflow (T1A5C10) and 1.3% of the populations have containments (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) which are failed, damaged, collapsed or flooded and connected to water bodies, or open ground or 'don't know where' (T1B10 C7 TO C9). Thus, at the containment stage, the city's excreta of only 79% of the population are contained. Figure 5 shows pictures of some of these sanitation technologies in operation.

Figure 5: Containment technologies and their connections in Bandarban. Left: Septic tank connected to a nearby waterbody. Right: Toilet pipe connected to open drain

(Source: *Feasibility study 2020-21/DPHE)*

Groundwater Pollution: The groundwater level below the ground surface is 6-7 m. The most common drinking water production technology is tubewell with a hand pump or motorized pump. 39% of the households use their own tubewell fitted with an electric motor and 7% use their own hand pump tubewell. Nearly 32% of households use water from the pipeline supply system.

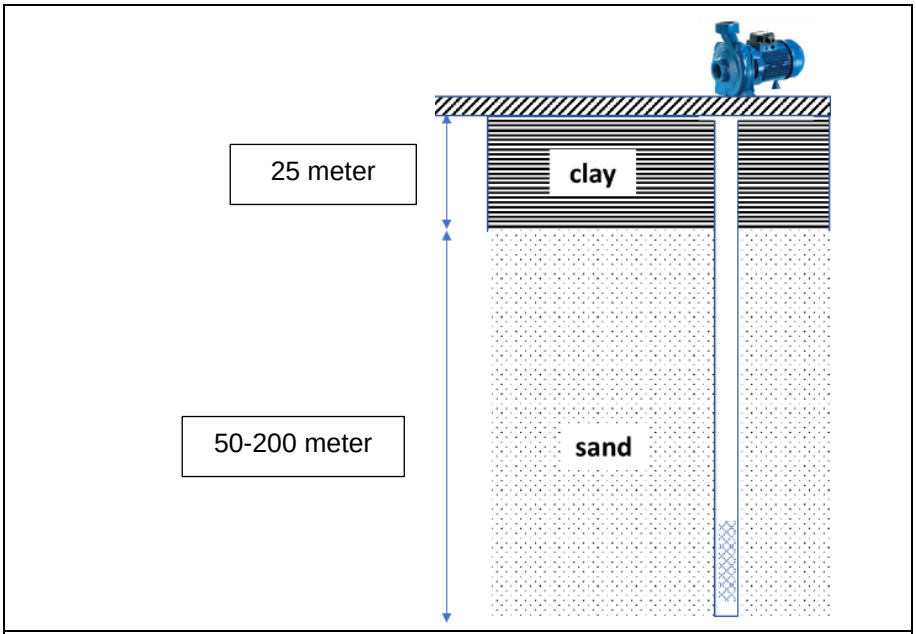

Fig 6 Soil profile in Bandarban district and location of tubewell screen

Lateral separation between sanitation facilities and water sources varies from one area to another. The main source of drinking water is tube well. Tube wells of different sizes and depths are generally used to pump water from the confined aquifers. During the household visit and FGDs, it is found that less than 25% of sanitation facilities are located within 10 meters from the groundwater source. Besides, due to the geographical situation, sanitation facilities are not located uphill of the groundwater sources. According to a survey report on 'Hydrogeological screening, slug test and geophysical logging on observation well units', conducted by the Department of Public Health Engineering (DPHE), drinking water is collected from the confined aquifer (25 m – 200 m) through pumps. Therefore, a low risk of groundwater contamination is considered in the city.

Emptying: Households relying on septic tanks have to arrange themselves for emptying their septic tanks. It is observed from the baseline survey that most of the septic tanks have been constructed in the last 4-6 years. According to the rapid assessment, the frequency of emptying of septic tanks or covered pits varies from 1 to 10 years depending upon the size, uses, etc.

However, about 58% of the septic tanks, connected to the soak pit are emptied within 2-5 years. About 46% of the septic tanks connected to open drains, open ground or water bodies are emptied within 4-5 years. Almost 91% of single pit latrines are emptied within 1-2 years. Besides the above information, it is also revealed during the discussion in FGDs and household visits, the demand for desludging septic tanks would increase shortly. Desludging of the septic tanks or pits is mostly done by private sweepers (88%). Only in a few households, desludging is done by municipal sweepers (8%) and family members (4%).

Around 88% of this withdrawal is done manually using a bucket and rope. 1.7% of the withdrawal is done by electric pumps, 3.4% of the withdrawal is done by manual pumps and 6.8% of the withdrawal is done by mechanical vacuum trucks. The manual method has high risks for the health and safety of the workers. These reflect the absence of safe and improved technologies for sludge emptying. The municipal authority has two Vacutug, a mechanical sludge emptying and a transportation tanker, which is providing recently the mechanical emptying service in this municipality. But there is an absence of an operational plan and business model for emptying operations.

Transportation: The sludge withdrawn from the septic tanks and latrine pits by the cleaners is disposed of in various places. A portion of the sludge (21%) is disposed of in the open environment like a drain, open ground, and water bodies. 12% of emptied sludge is carried away by mechanical emptying machines but discharged in the open environment. A substantial portion (67%) is disposed of in a dug hole covered with soil away from the house.

Treatment/Disposal: Presently, there are no treatment facilities in the town. There is currently no re-use of the faecal sludge.

4.3 Open Defecation:

From the Household visit, rapid assessments, KIIs and FGDs, it was found that 100% of citizens use any kind of toilet in the Municipality. Thus, the town is considered an open defecation-free town.

5 Data and assumptions

The baseline survey conducted in October 2020 contains detailed data on different stages of the sanitation value chain. It included sample household surveys, along with informal interviews, open-ended consultations, key informant interviews and focus group discussions with the municipality officials, town level coordination committee, households, social workers, business persons, pit emptiers and the citizens including women in all the wards of the municipality.

The SFD matrix was generated from these data. Data from all these sources were triangulated to produce the SFD matrix, the SFD graphic and the SFD lite report.

The last census was carried out about 10 years ago. So, the actual population, household, and sanitation data are not updated yet. Most of the households with septic tanks do not know the actual type, size, and design desludging periods. Also, a large number of pit users are unaware of the emptying events and frequency of their pits or not. Due to all these data gaps, some assumptions have been made to produce the SFD graphic.

Following assumptions were made for developing the SFD graphic for Bandarban municipality:

- ✓ The proportion of FS in septic tanks, fully line tanks, and line, open bottom tanks are considered 81%, 0%, and 100% respectively as per the guidance given in the Frequently Asked Questions (FAQs) in the Sustainable Sanitation Alliance (SuSanA) website.
- ✓ According to the population census in 2011 by the Bangladesh Bureau of Statistics (BBS), the Bandarban city population was 41,434. The urban population growth in Bandarban is 3.01% per year. Considering 10% floating population, such as farmers and traders, comes to the city every day, the present (2020) population is estimated to be around 59,520.
- ✓ There are around 5.5% of twin pit latrines in the containment system. It is assumed that all these twin pit containment technologies are defined as a lined tank with impermeable walls and open bottom (system T1A4C10, 5.5%). Thus, variable F3 for system T1A4C10 is set to 0%.
- ✓ There are around 60.6% of single pit latrines in the containment system. It is assumed that all these single pit containment technologies are defined as a lined pit with semi-permeable walls and open bottom, no outlet or overflow (system T1 A5C10, 60.6%). 91% of single pit latrines are found to be emptied within 1-2 years. Thus, variable F3 for system T1A5C10 is set to 91%.
- ✓ 12.5% of septic tanks are connected to soak pits (system T1A2C5). They are well-constructed as per the field visit observation. The risk of groundwater contamination was deemed low, therefore that option was selected in the SFD Matrix.
- ✓ Around 58% of HHs have emptied their soak pits of septic tanks with a desludging frequency of 2-5 years. Thus, variable F3 for system T1A2C5 is set to 58%.
- ✓ There are 46% of septic tanks connected to open drains, open ground and water bodies which are emptied within 2-5 years. Thus, variable F3 for systems T1A2C6, T1A2C7 and T1A2C8 are set to 46%.
- ✓ 1.3% of the populations have containments (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) that are failed, damaged, collapsed or flooded and connected to water bodies, or open ground or 'don't know where' (T1B10 C7 TO C9). These systems are never emptied (variable F3 set to 0% and hence, variables F4 and F5 are also both set to 0%).
- ✓ Wastewater in T1A1C6 and the SN in T1A2C6 are directly discharged into the river or the environment untreated. Therefore, variables W4c, W5c, S4e and S5e were set to 0%.
- ✓ Since there are no wastewater or faecal sludge treatment facilities in the town and all the collected FS is disposed untreated into the environment, variables F4 and F5 for all systems are considered to be 0%.

6 List of Sources

Reports, literature and website

- Bangladesh Bureau of Statistics (BBS), 2011.
- Population and Housing Census, 2011.
- Socio-economic HH study – 'Feasibility for Implementing of Solid Waste and Faecal Sludge Management System in 53 District Level Paurashavas and 8 City Corporations', Department of Public Health Engineering (DPHE), Dhaka, Bangladesh.

Key Informant Interviews (KIIs) from September 2020 to March 2021

- KII with Mayor, Bandarban Municipality.
- KII with Town planner, Bandarban Municipality.
- KII with Conservancy Inspector, Bandarban Municipality.
- KII with Councilor, Bandarban Municipality.
- Facilitators: Md. Mynul Islam Hemel, Field Coordinator, MD. Zakaria Salim, Junior Urban Planner, & Shohel Rana, Research Assistant, Tiller.

Figure 6: KIIs with different stakeholders in Bandarban. (Source: *Feasibility study 2020-21/DPHE)*

Focus Group Discussions (FGDs) from September 2020 to March 2021

- Sweepers/emptiers and waste collectors.
- Conservancy inspector, sanitary inspector of the Municipality.
- Masons Association (septic tank builders).
- A group of the representative from house owners.
- Participants from local NGOs

Figure 7: Focus Group Discussions in Bandarban (Source: *Feasibility study 2020-21/DPHE)*

Bandarban Municipality, Bangladesh, 2021

Produced by:

Dr. Abdullah Al-Muyeed, Chief Operating Officer, CWIS-FSM Support Cell

Shishir Kumar Biswas, Project Director, Feasibility for Implementing of Solid Waste and Faecal Sludge Management System in 53 District Level Paurashavas and 8 City Corporations

Suman Kanti Nath, Technical Expert, CWIS-FSM Support Cell

Department of Public Health Engineering (DPHE), Bangladesh

This SFD lite report is available from:

www.sfd.susana.org

SFD Promotion Initiative