SFD Lite Report

Shariatpur Municipality
Bangladesh

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

Date of production/ last update: 12/10/2021

1 The SFD Graphic

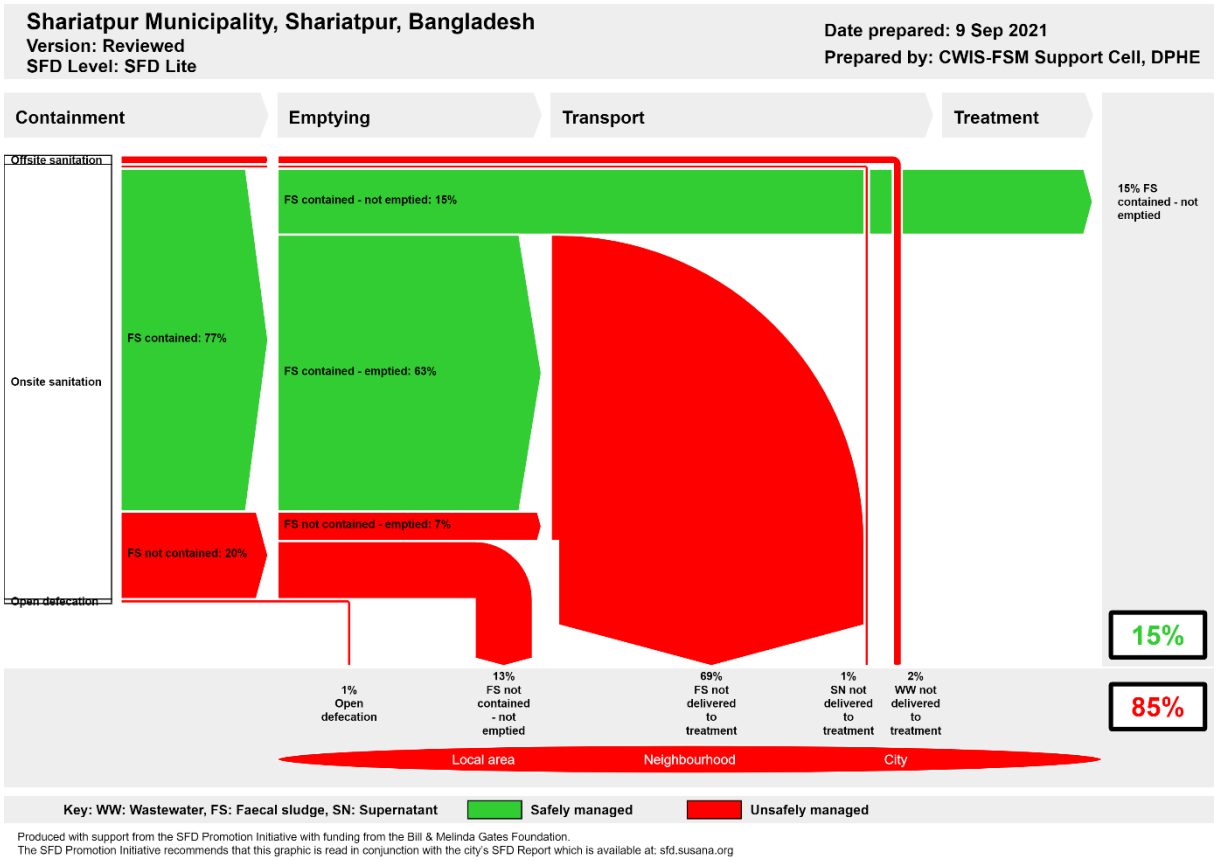

Figure 1: SFD Graphic for Shariatpur municipality.

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"*****, (December 2020).** The project was implemented under the supervision of the Department of Public Health Engineering (DPHE). In-depth information and data were collected for the towns which included project documents, master plans and baseline reports from the municipality and national levels, statistical data like population and household income expenditure, GIS data and other geospatial data and satellite images, and open street maps (OSM). The Field Survey of the project was conducted from 01 January 2020 to 24 March 2020 and from 04 July 2020 to 30 November 2020. The field survey includes household surveys, key informant interviews, focus group discussions, and physical feature surveys. A central server has been established to monitor FSM and SWM databases under the project. The results of the study are shared with the municipal authority and are considered as a basis for preparing investment projects

by the government and development partners, and sustainable plans for operating and maintaining the systems by the municipal authorities.

- We would like to Mr. Md Rafiqul Islam Kotwal, Mayor, Shariatpur Municipality, Mr. Md. Anamul Haque, Secretary, Shariatpur Municipality; Mr. Md. Sirajul Haque, Executive Engineer, Shariatpur 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 Shariatpur municipality played vital roles in collecting and sharing data, and producing this SFD graphic and SFD lite report.

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3 General city information

Shariatpur municipality is the heart of Shariatpur district, formed by the floodplain of the Padma, about 60 km south of the capital Dhaka. Although it was established as a district town in 1974, Shariatpur municipality was declared in 1975. Shariatpur is one of the 53 district-level Municipalities in the country.

Table 1: City profile (Source: KII with the Secretary, Shariatpur Municipality)

Population Parameters	
Estimated population, 2020	59,593
Households, 2020	12,039
Area, sq.km	24.92
Total roads, km	169
Total drains, km	6

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

According to the population census in 2011 by the Bangladesh Bureau of Statistics (BBS), the Shariatpur city population was 49,535. Considering the 1% population growth rate and 10% floating population, such as farmers and traders, comes to the city every day, the present (2020) population is estimated to be around 59,593 (Table 1).

The Municipality covers an area of 24.92 square kilometers. At present Shariatpur Municipality has 169 km road of which 60 km is the bituminous road, 06 km Herring-bone bond (HBB) road, 30 km reinforced cement concrete (RCC) road, 18 km brick flat soling road, 5 km Water Bound Macadam (WBM) road, and 50 km earthen road. The City has about 6 km Cement Concrete (CC) drain.[1]

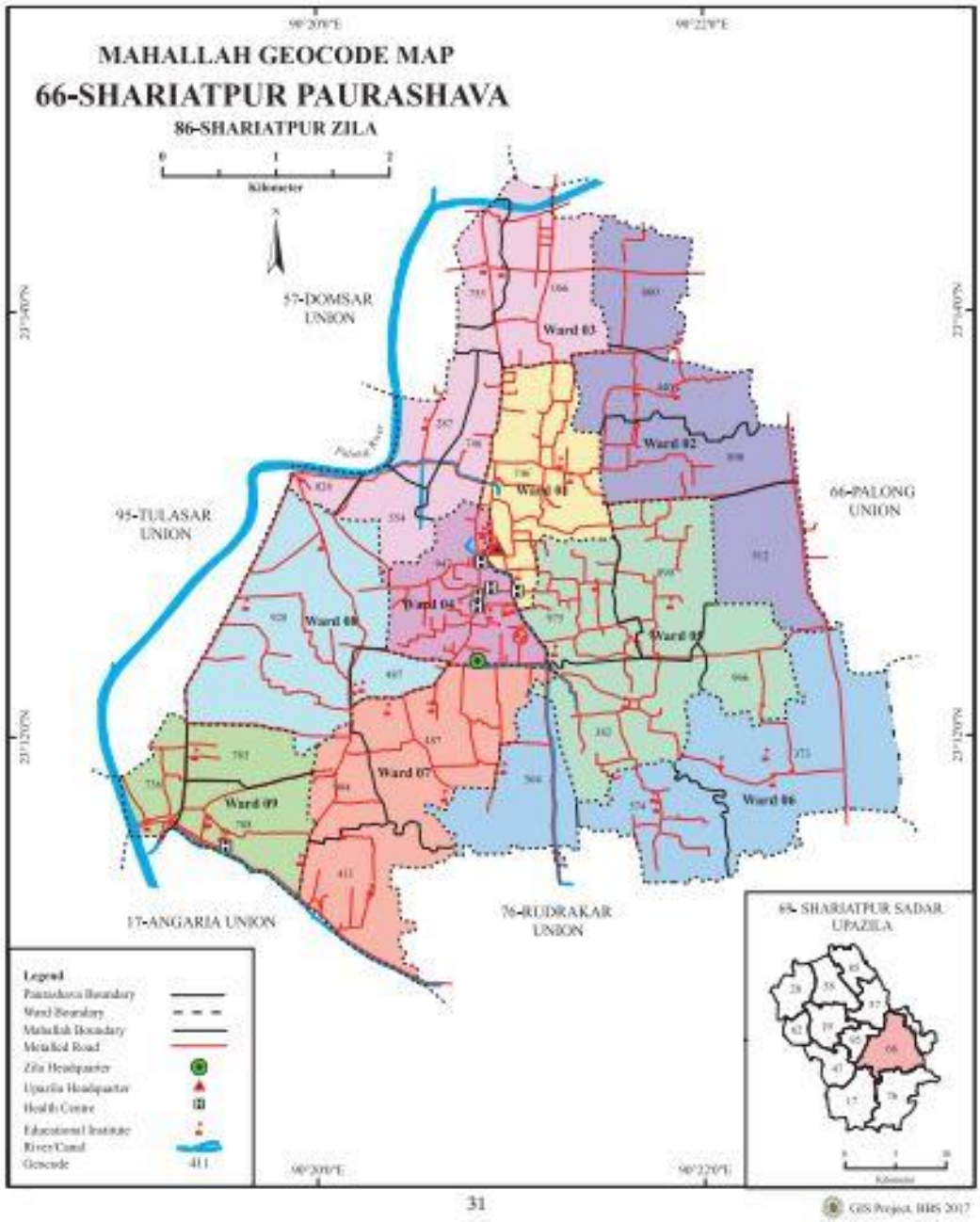

Figure 3: Shariatpur Municipality Ward Boundary Map (BBS/ GIS report 2017)

[1] *Source: 'At a Glance: Shariatpur Municipality', by municipal office*

The geographical coordinates of Shariatpur are: 23°12′36″ N and 90°20′59″ E[2]. In the context of Bangladesh, the city area is relatively flat. The elevation of the land is approximately 7 m. Palong River passed the northwest side of the Municipality.

According to the Bangladesh Meteorological Department (1981-2017)[3], the city area and surrounding area is experiencing 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 Madaripur which is about 16 km away from the Municipality area. Weather data from this station is 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 31.7-34.1°C between April-August, with the minimum mean temperatures of between 11.9-13.8°C in January. The annual average rainfall is about 2095 mm, according to BMD (1981-2017).

According to the flood zoning map of Bangladesh[4] , the city falls in Physiographic Unit 8: Ganges River Flood Plain (in the last 12 years no flooding event happens). General soil type is Calcareous Alluvium (Non saline). However, the drainage network of the city is not adequate[5]. Every year, many city areas face water logging during the monsoon for drainage congestion. There are some secondary drains caring stormwater and domestic wastewater to the outfalls the rivers and canals.

The population density in the 9 Wards of the city is shown in Figure. The density is high in the center, ranging from 6,001 to 7,917 per sq km. The population density in the 5 wards (2, 3, 5, 6, and 9) is lower, ranging from 856 to 2000 per sq km[6].

[2] *Source: https://www.gps-latitude-longitude.com/gps-coordinates*
[3] *http://bmd.gov.bd/p/Rainfall-Situation-202*
[4] http://www.ffwc.gov.bd/index.php; Flood Forecasting & Warning Centre; Bangladesh Water Development Board (BWDB)
[5] *KII and field visit during Baseline survey 2020*

[6] *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 (December 2020)*

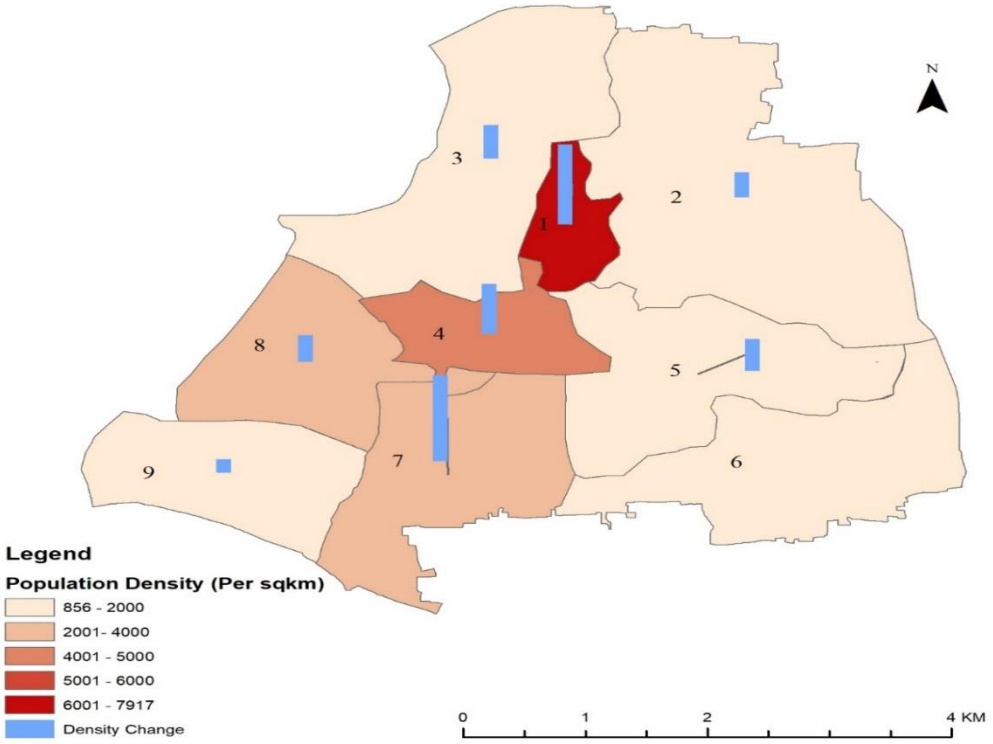

Figure 4: Population density in different Wards of Shariatpur municipality (Bangladesh Bureau of Statistics BBS, 2011)

4 Service outcomes

Shariatpur Municipality, Shariatpur, Bangladesh, 9 Sep 2021. SFD Level: SFD Lite
Population: 59500
Proportion of tanks: septic tanks: 99%, 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	2.0	0.0	0.0					
T1A2C5 Septic tank connected to soak pit	14.5			53.0	0.0	0.0		
T1A2C6 Septic tank connected to open drain or storm sewer	0.8			34.0	0.0	0.0	0.0	0.0
T1A2C7 Septic tank connected to open water body	10.0			34.0	0.0	0.0		
T1A2C8 Septic tank connected to open ground	9.0			34.0	0.0	0.0		
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	4.5			0.0	0.0	0.0		
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	58.4			94.0	0.0	0.0		
T1B11 C7 TO C9 Open defecation	1.0							

Table 2: SFD Matrix for Shariatpur municipality

The outcome of the SFD graphic shows that only fifteen percent (15%) of the excreta flow is classified as safely managed, and the remaining eighty-five (85%) percent is classified as unsafely managed (Figure 1). The unsafely managed excreta originate from wastewater not delivered to treatment (2%), Faecal Sludge (FS) not contained - emptied but not delivered to treatment (69%), FS not contained - not emptied (13%), 1% of supernatant not delivered to treatment and 1% of open defecation. The safely managed excreta originate from FS contained - not emptied (15%).

The percentages presented in Table 2 and discussed in the next section are based on data collected through household surveys, key informant interviews (KIIs), and Focus Group Discussions (FGDs) (Figure 5).

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 observation and HH survey, it was found that there is a certain area where toilets are directly connected to open drains or storm

sewer. Similarly, a portion of septic tanks is directly connected to open drains or storm sewer. Therefore, T1A1C6 system is considered as 2% of the total population of the city to generate the SFD graphic. Similarly, the T1A2C6 system is considered as 0.8% of the total population of the city to generate the SFD graphic. In the absence of a sewerage system, the faecal sludge in T1A2C6 and the supernatant in T1A2C6 are directly discharged into the river or the environment untreated.

4.2 On-site Sanitation Systems

Figure 5: Household survey and consultations. Left: Household survey. Right: Consultation meeting (Source: *Feasibility study 2020-21/DPHE)*

Containment: Almost all the households (97.75%) in the city have their latrine which is connected to single pits, twin pits, septic tanks, or discharged directly into the environment (e.g. open-drain or storm sewer). The rest of the households use community latrines (0.5%) and neighbor's toilets (0.75%). From a household survey, it is found that one-third of the city population (34.31%) uses septic tanks as the containment system, 58.4% of the toilets have single pit systems, and 4.5% of people use double pits in the city. About 1% of people do not have any kind of toilet facilities and 2% do not have any type of containment and discharges directly to the environment (KII, FGDs, HH survey, 2020).

Figure 6: Containment technologies and their connections in Shariatpur.
Left: Toilet Pit open to a nearby water body, Right: Toilet pipe connected to open environment
(Source: *Feasibility study 2020-21/DPHE)*

According to the type of connectivity and features of containment technologies, the discharging points of the toilets are categorized as: 14.5% population uses septic tanks connected to soak pits (T1A2C5), 0.8% population uses septic tanks connected to open drain (T1A2C6), 10% population uses septic tanks connected to water bodies (T1A2C7), 9% population uses septic tanks connected to open ground (T1A2C8), 4.5% population uses lined tanks with impermeable walls and open bottom no outlet or overflow (T1A4C10), 58.4% of the population relies on lined pits with semi-permeable walls and open bottom with no outlet or overflow (T1A5C10). 1% of the population practice open defecation (T1B11 C7 TO C9) (KII, FGDs, HH survey, 2020). Thus, at the containment stage, the city's excreta of only 77% of the population are contained. Figure 6 shows pictures of these technologies in use.

Groundwater Pollution: The groundwater level below the ground surface is 6-7 m. The most common drinking water production technology is a borehole with a hand pump or motorized pump. 34% of the households use their own tube well fitted with electric motor and 40% use own hand pump tubewell. Only 4% of households use pipeline suppled water.

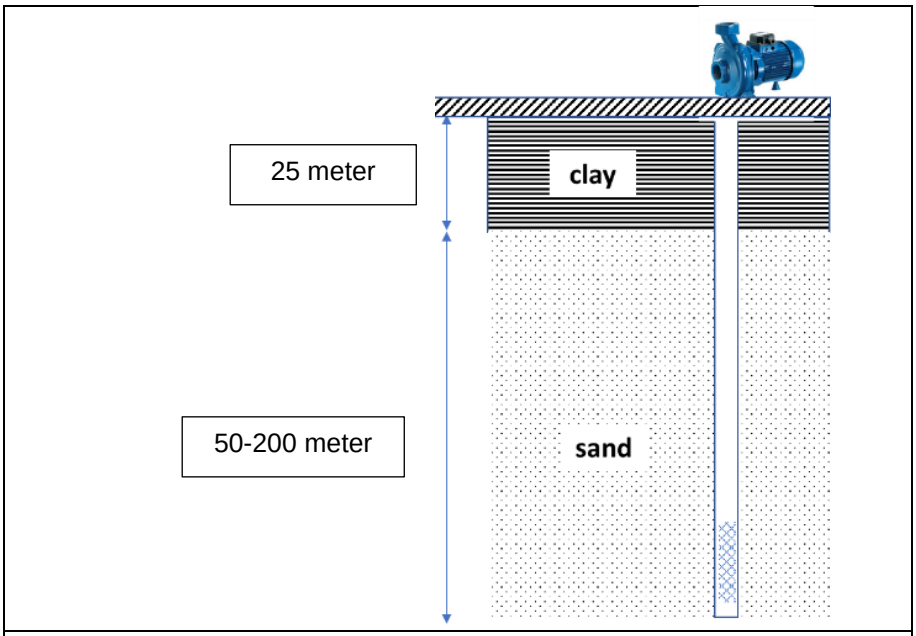

Fig 7 Soil profile in Shariatpur district and location of tubewell screen

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) on March 2017, 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 of the septic tank. 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 survey from 2020, the frequency of emptying of septic tanks or covered pits varies from 1 to 10 years depending upon the size, uses, etc.

However, about 53% of the septic tanks, connected to the soak pit are emptied within 2-5 years. About 34% of the septic tanks connected to open drains, open ground or water bodies are emptied within 2-5 years. Almost 94% 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 pit is mostly (96%) done by private sweepers. Only in a few households, de-sludging is done by municipal sweepers (2%), family members (1%), and private agencies (1%). Around 94 % of this withdrawal is done manually using a bucket and rope. A small number (6%) use electric pumps. 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 one Vacutug, a mechanical collection tanker, that is not yet being used, so there is no the mechanical emptying service in this municipality[7].

Transportation: The sludge withdrawn from the septic tanks and latrine pits by the cleaners is disposed of in various places. Based on the survey from 2020, it is observed that about 72% of the respondents who use any kind of containment system, informed that faecal sludge (sludge from the septic tank or covered pit latrines) is disposed of in a dug hole covered with soil away from the house. Besides, the sludge disposed into the canal and river is 8%, into the drain is 1%, whereas 19% of respondents did not have any idea about sludge disposal.

Treatment/Disposal: Presently, there are no excreta treatment facilities in the town.

4.3 Open Defecation:

From HH surveys, KIIs and FGDs, it was found that 1% of citizens do not have any kind of toilet in the Municipality. Thus, from the sanitation point of view, the town is not considered as an open defecation-free town.

[7] In the last few years, mechanical vacuum trucks have been provided to several municipal authorities from different government and non-government sources. But municipal authorities have shortage of expert manpower and service delivery mechanism to operate the vehicles. Recent years, the situation is improving. Institutional Regulatory Framework (IRF) and National Action Plan (NAP) have been approved by government. Different service delivery and business models have been developed in few cities. Capacity building program of local government institutions are conducting by govt. institutions and development partners. A significant improvement in FSM will be found within few years.

5 Data and assumptions

The baseline survey conducted in October 2020 contains detailed data on different stages of the sanitation value chain. The SFD matrix is generated from these data, collected during 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. Finally, 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. These assumptions were shared with key informants at the municipality and accepted by them.

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

- ✓ The proportion of FS in septic tanks, fully line tanks, and line, open bottom tanks are considered 99%, 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 Shariatpur city population was 49,535. Considering the 1% population growth rate and 10% floating population, such as farmers and traders, comes to the city every day, the present (2020) population is estimated to be around 59,593
- ✓ There are around 4.5% of twin pit latrines in the containment system. So, it is assumed that all these twin pit containment technologies are defined as a lined tank with impermeable walls and open bottom (system T1A4C10, 4.5%). Based on the household survey, variable F3 for system T1A4C10 is set to 0%.
- ✓ There are around 58.4% of single pit latrines in the containment systems. So, it is assumed that all these single pit containment technologies are defined as lined pits with semi-permeable walls and open bottom, no outlet or overflow (system T1A5C10, 58.4%). Most of the single pit latrines are found to be emptied within 1-2 years. Based on the household survey, variable F3 for system T1A5C10 was set to 94%.
- ✓ 14.5% 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 53% of HHs have emptied their septic tank with a soak pit with a desludging frequency of 2-5 years. Based on the household survey, variable F3 for system T1A2C5 is set to 53%.
- ✓ There are 34% of septic tanks connected to the open drain, water bodies and ‘don’t know where which are empties within 2-5 years. Based on the household survey, variable F3 for systems T1A2C6, T1A2C7 and T1A2C8 are set to 34%.
- ✓ 1% of the population practice open defecation (T1B11 C7 TO C9)
- ✓ Wastewater in T1A1C6 and supernatant 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.
- 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", Department of Public Health Engineering (DPHE), Dhaka, Bangladesh (December 2020).
- Report on 'Hydrogeological Screening, Slug Test and Geophysical Logging on Observation Well Units' under *Bangladesh Rural Water Supply and Sanitation Project (BRWSSP),* Arsenic Management Division, Department of Public Health Engineering (DPHE) (March 2017)
- The revised 'National Strategy for Water Supply and Sanitation, 2021'
- 'At a Glance: Bagerhat Municipality', by municipal office
- https://www.gps-latitude-longitude.com/gps-coordinateshttp://bmd.gov.bd/p/Rainfall-Situation-202

Key Informant Interviews (KII) (September 2020 to December 2020)

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

Figure 8: KIIs with different stakeholders in Shariatpur (Source: *Feasibility study 2020-21/DPHE)*

Focus Group Discussions (FGD) (September 2020 to December 2020)

- FSM sweepers
- First Stage Collector for SWM
- Slum-dwellers

Figure 9: Focus Group Discussions in Shariatpur (Source: *Feasibility study 2020-21/DPHE)*

Shariatpur 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

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