



SFD Lite Report

Rajbari Municipality Bangladesh

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

Date of production/ last update: 24/01/2022

1 The SFD Graphic

Meherpur Municipality, Khulna Division, Bangladesh

Version: Reviewed
SFD Level: SFD Lite

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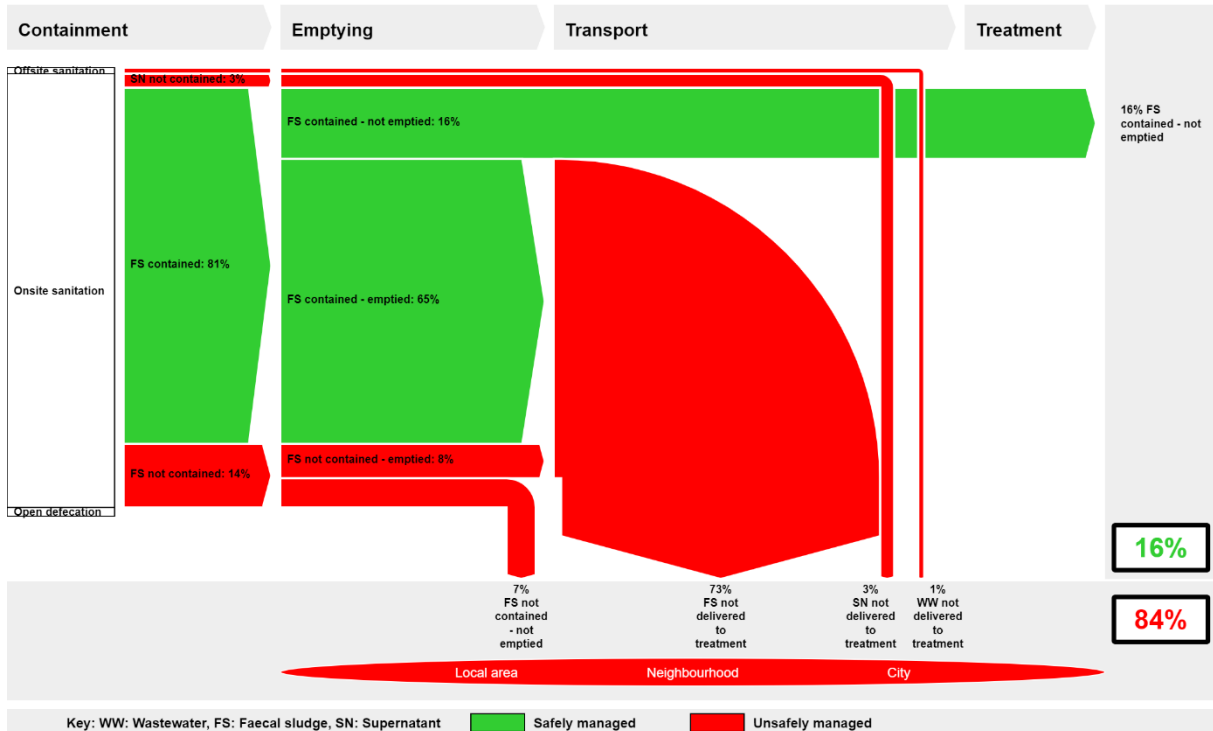


Figure 1: SFD Graphic for Rajbari municipality.

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

Date of production: 24/01/2022

3 General city information

Rajbari municipality, the district headquarter of Rajbari district is situated in Dhaka Division, Bangladesh. It is located 110 km from the capital Dhaka (Figure 2). It is beside the Padma River, and it is well connected with road and water. Rajbari Municipality was established in 1913 and was recognized as Town Committee. Later in 1923, it was renamed as Rajbari Municipality. It is one of the oldest towns in the sub-continent and was declared a municipality in 1913. Rajbari is one of the 53 district-level municipalities in the country.

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

Population parameters	
Estimated population, 2020	66,847
Households, 2020	14,100
Area, sq. km	12.66
Total drains, km	8.81



Figure 2: Rajbari municipality location map (BBS/ GIS report 2017).

According to the population census in 2011 by the Bangladesh Bureau of Statistics (BBS), the Rajbari municipality was 56,313. The urban population growth in Bangladesh is 0.85% 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 66,847.

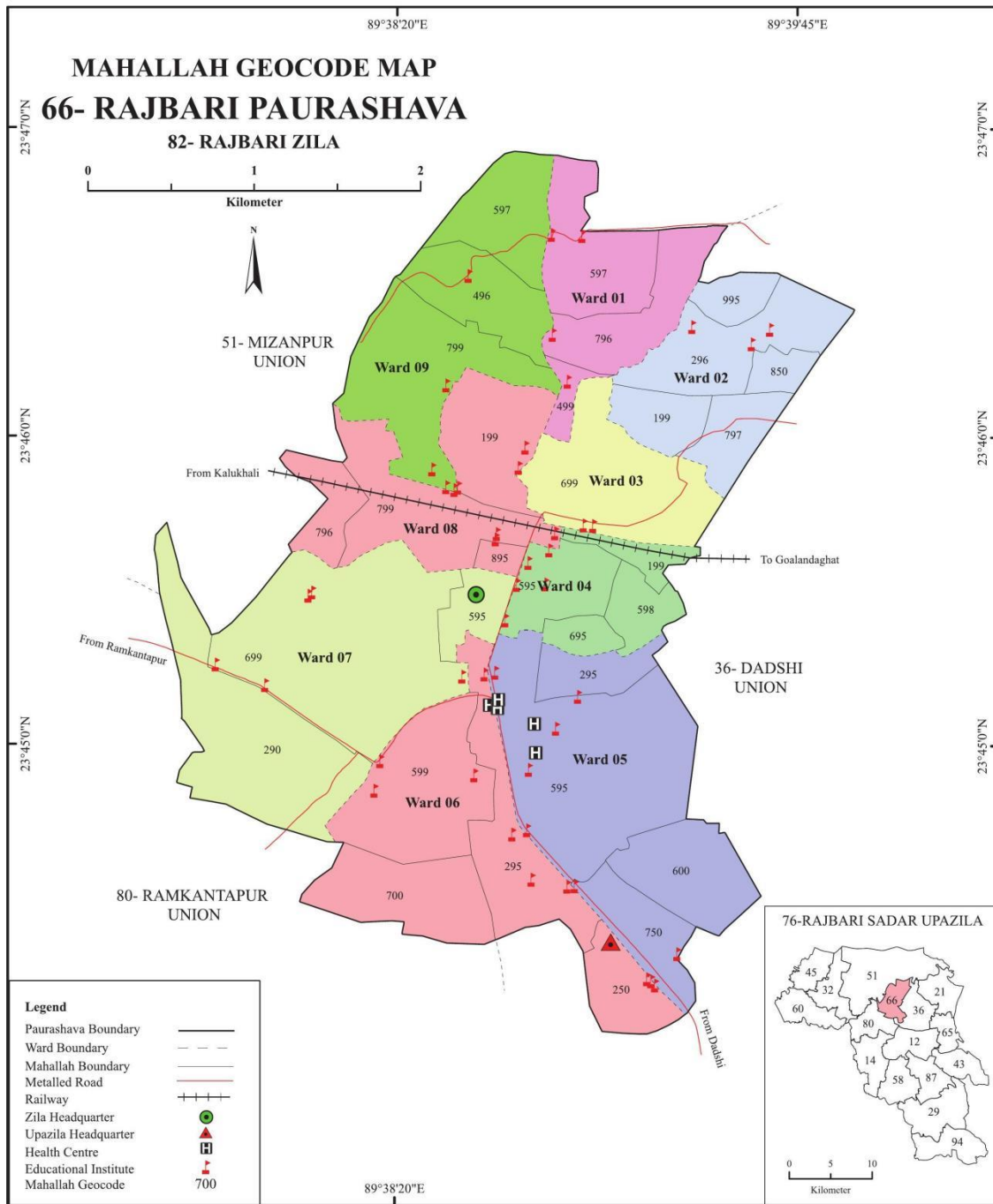


Figure 3: Rajbari municipality ward boundary map.

The Municipality covers an area of 12.66 square kilometres. At present Rajbari municipality has 94.54 km of road out of which 66 km is bituminous road, 8.70 km is Cement Concrete (CC) road, 7.35 km is Herring-Bone-Bond (HBB) road, and 12.43 km is earthen road. The city has about 8.81 km of drain which includes 6.81 of Reinforced Cement Concrete (RCC) drain and 2 km of earthen drain¹ (Table 1).

¹ Source: 'At a Glance:Rajbari Municipality', by municipal office

The geographical coordinates of Rajbari are 23.7639° N, 89.6467° E². In the context of Bangladesh, the municipality area is relatively high. The Padma River passed the north side of the municipality.

According to the Bangladesh Meteorological Department (BMD) (1981-2017)³, the city area and surrounding area are 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 Bangladesh Meteorological Department is located in Faridpur which is about 26 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 and the driest months of the years are November to March. The maximum mean temperature observed is 31.3-34.2°C between April-August, with the minimum mean temperatures found to be between 12.1-13.7°C in January. The annual average rainfall is about 1,953 mm, according to BMD (1981-2017). The monthly precipitation records clearly show a distinct dry and rainy season.

The Padma River passed the north side of the Municipality. The Harai Khal flows 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 adequate⁴. There are some secondary drains carrying storm water and domestic wastewater to the outfalls of the rivers and canals.

The ward boundary map and the population density in the 9 wards of the city are shown in Figure 3 and Figure 4. The density is high in the north, ranging from 7,001 to 7,931 per sq km. The population density in the west is lower, ranging from 3,675 to 4,000 per sq km⁵.

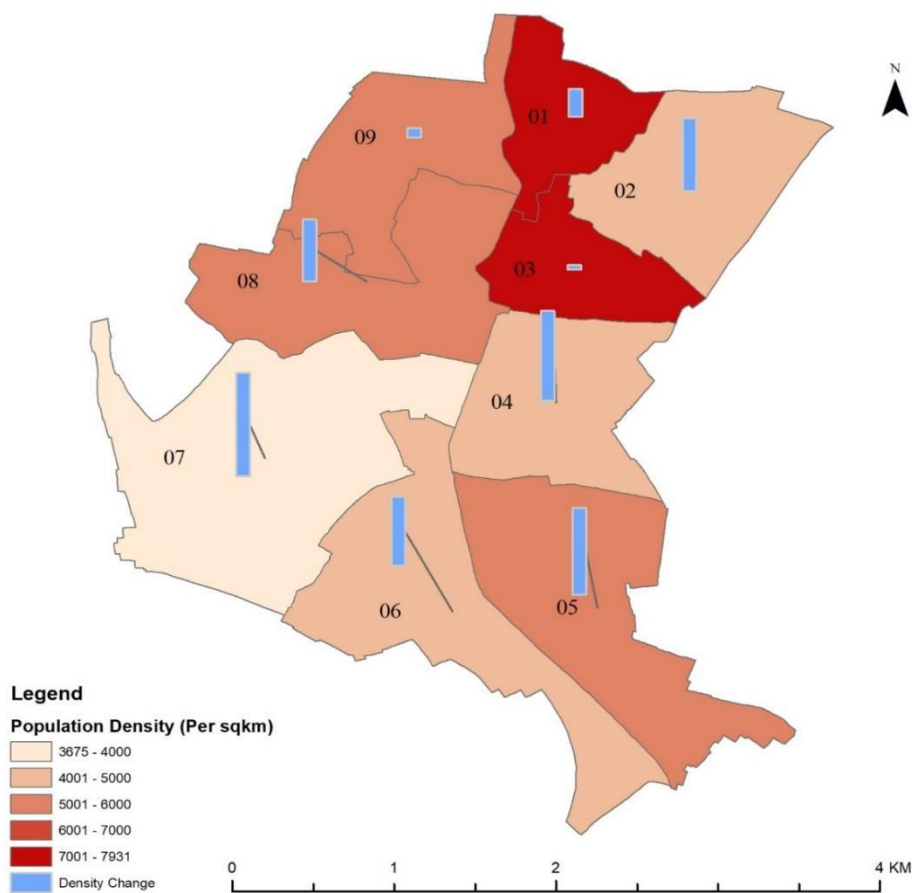


Figure 4: Population density in different wards of Rajbari municipality.

² Source: <https://www.gps-latitude-longitude.com/gps-coordinates>

³ <http://bmd.gov.bd/p/Rainfall-Situation-202>

⁴ KII and field visit during Baseline survey 2020

⁵ KII and field visit during Baseline survey 2020

4 Service outcomes

Rajbari Municipality, Rajbari, Bangladesh, 3 Nov 2021. SFD Level: SFD Lite

Population: 66847

Proportion of tanks: septic tanks: 95%, 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	0.7	0.0	0.0					
T1A2C5 Septic tank connected to soak pit	11.2			53.0	0.0	0.0		
T1A2C6 Septic tank connected to open drain or storm sewer	2.0			62.0	0.0	0.0	0.0	0.0
T1A2C7 Septic tank connected to open water body	3.6			62.0	0.0	0.0		
T1A2C8 Septic tank connected to open ground	2.3			62.0	0.0	0.0		
T1A2C9 Septic tank connected to 'don't know where'	2.3			62.0	0.0	0.0		
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	13.7			32.0	0.0	0.0		
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	61.4			96.0	0.0	0.0		
T1A6C10 Unlined pit, no outlet or overflow	1.7			0.0	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'	1.0			0.0	0.0	0.0		

Table 2: SFD Matrix for Rajbari municipality.

The outcome of the SFD graphic shows that only nineteen percent (19%) of the excreta flow is classified as safely managed, and the remaining eighty-one (81%) percent is classified as unsafely managed (Figure 1). The unsafely managed excreta originate from wastewater not delivered to treatment (1%), Faecal Sludge (FS) emptied but not delivered to treatment (75%), FS not contained - not emptied (5%) and 1% of supernatant not delivered to treatment. The safely managed excreta originate from FS contained - not emptied (19%).

The percentages presented in Table 1 and discussed in the next section are based on data collected through the household (HH) surveys, Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) (Figure 5 and Figure 9).

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 are some certain areas where toilets are directly connected to open drains. Similarly, a portion of septic tanks is directly connected to open drains or storm sewer. Therefore, T1A1C6 system is considered 0.7% of the total population of the city to generate the SFD graphic. Similarly, the T1A2C6 system is considered 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 untreated into the river or the environment.

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 (99%) 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 (0.25%) and neighbour’s toilets (0.75%). From a household survey, it was found that 21.46% of the city population uses septic tanks as the containment system, 61.40% of the toilets have single pit systems, and 13.70% of people use double pits in the city. 1.70% of people use the unlined pit, which has no outlet or overflow. Besides, 1.0% of the city population uses containments (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) that have failed, damaged, collapsed, or flooded which are connected to water bodies, or open ground or 'don't know where'. About 0.7% of the population 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: 11.2% of the population uses septic tanks connected to soak pits (T1A2C5), 2.0% of the population uses septic tanks connected to open drain (T1A2C6), 3.6% of the population uses septic tanks connected to water bodies (T1A2C7), 2.3% of the population uses septic tanks connected to open ground (T1A2C8), 2.3% of the population uses septic tank connected to 'don't know where' (T1A2C9), 13.7% of the population uses lined tanks with impermeable walls and open bottom, no outlet or overflow (T1A4C10), 61.4% of the population relies on the lined pit with semi-permeable walls and open bottom, no outlet or overflow (T1A5C10). Nearly, 1.7% of people use the unlined pit, which has no outlet or overflow (T1A6C10) and 1.0% of the population uses containments (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) that have failed, damaged, collapsed or flooded which are connected to water bodies, or open ground or 'don't know where' (T1B10 C7 TO C9). About 0.7% of the populations do not have any type of containment and discharges directly to the environment (T1A1C6) (KII, FGDs, HH survey, 2020). Thus, at the containment stage, the city’s excreta of only 88.0% of the population are contained. Figure 6 shows pictures of these technologies in use.



Figure 6: Containment technologies and their connections in Rajbari. Left: Septic tank connected to the nearby water body. Right: Toilet pipe connected to open drain (Source: Feasibility study 2020-21/DPHE).

Groundwater Pollution: The groundwater level below the ground surface is 5-7m. The most common drinking water production technology is a borehole with a hand pump or motorized pump. 35% of the households use their own tube well fitted with the electric motor and 50% use their own hand pump tube well (Figure 7). Only 15% of the households are supplied with piped water.

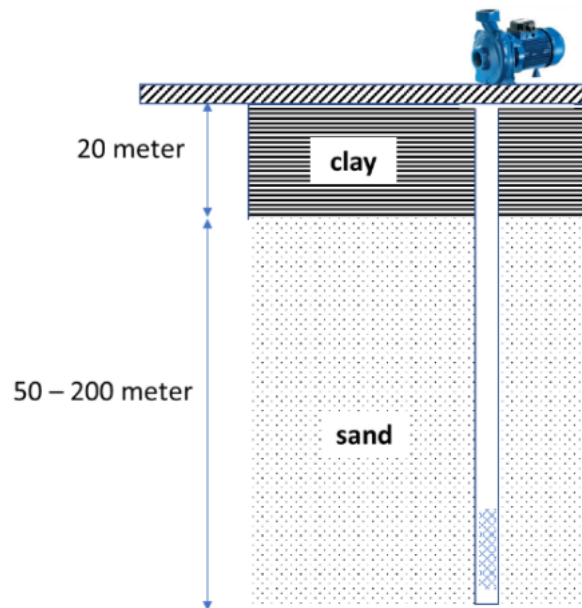


Figure 7: Soil profile Rajbari city and location of tube well screen.

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 was found that less than 25% of sanitation facilities are located within 10 metres 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 (Figure 7). 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 was 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 62% of the septic tanks connected to open drains, open ground, water bodies and 'don't know where' are emptied within 2-5 years. Almost 96% of single pit latrines and 32% of the double pit latrines are emptied within 1-2 years. Besides the above information, it was also revealed during the discussion in FGDs and household visits, that the demand for desludging septic tanks would increase shortly. Desludging of the septic tanks or pits is mostly (93%) done by private sweepers. Only in a few households, desludging is done by family members (4%) and municipal sweepers (3%). Around 74% of this withdrawal is done manually using a bucket and rope. A limited number (21%) use electric pumps, and some (5%) use manual 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 mechanical collection tanker (capacity of 1,500 litres), that is not yet being used regularly⁶, so there is no mechanical emptying service in this municipality.

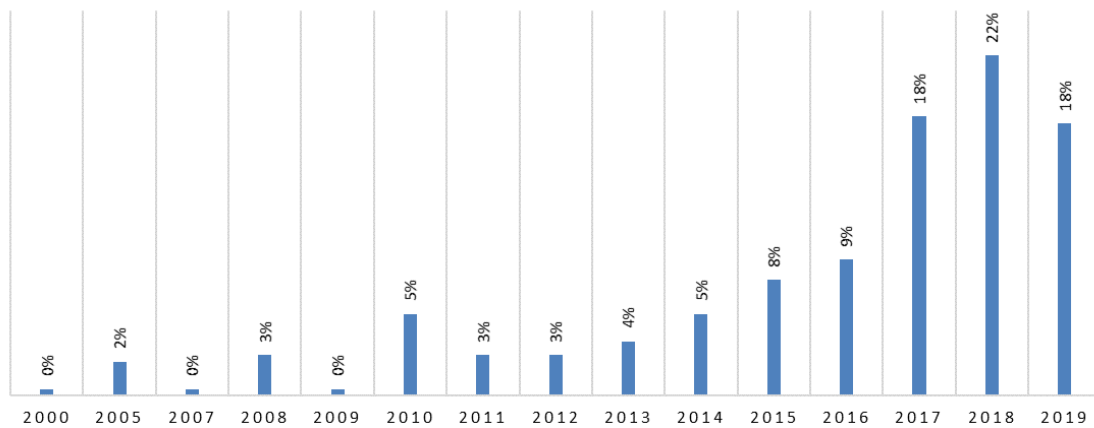


Figure 8: Year of septic tanks construction.

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 was observed that about 83% of the respondents who use any kind of containment system, informed that faecal sludge (sludge from the septic tanks 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 4%, into the drain is 4%, whereas 9% of respondents informed that sludge is carried away by vacuum trucks. Since there are no treatment facilities in the town, vacuum trucks also discharge emptied sludge to drain, water bodies, or open ground.

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

4.3 Open Defecation:

From HH surveys, KIs and FGDs, it was found that 100% of citizens use any kind of toilet in the Municipality. Thus, from the sanitation point of view, the town is considered an open defecation-free town.

⁶ 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. In 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 conducted by governmental institutions and development partners. A significant improvement in Faecal Sludge Management (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 pit emptying. 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 Rajbari municipality:

- ✓ The proportion of FS in septic tanks, fully line tanks, and lined, open bottom tanks are considered 95%, 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 Rajbari municipality was 56,313. The urban population growth in Bangladesh is 0.85% 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 66,847.
- ✓ There are around 13.7% of twin pit latrines in the containment system. So, it is assumed that all these twin pit containment technologies are defined as lined tanks with impermeable walls and open bottom, no outlet or overflow (system T1A4C10, 13.7%). Based on the household survey, variable F3 for system T1A4C10 is set to 32%.
- ✓ There are around 61.4% 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, 61.4%). All of the single pit latrines are found to be emptied within 1-2 years. Based on the household survey, variable F3 for system T1A5C10 is set to 96%.
- ✓ 11.2% 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 10.2% of septic tanks connected to the open drain, open ground, water bodies and 'don't know where', which are emptied within 2-5 years. Based on the household survey, variable F3 for systems T1A2C6, T1A2C7, T1A2C8 and T1A2C9 are set to 62%.
- ✓ Nearly, 1.0% of the population uses containments (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) that have failed, damaged, collapsed or flooded which are connected to water bodies, or open ground or 'don't know where' (system T1B10 C7 TO C9). Based on the household survey, variable F3 for this system is set to 0%.
- ✓ Wastewater in T1A1C6 and supernatant in T1A2C6 are directly discharged into the river or the environment untreated. Therefore, variables W4c, W5c, S4e and S5e are set to 0%.
- Since there are no operational wastewater or faecal sludge treatment plant 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)
- MANAGING MUNICIPAL WASTE: APPLICATION OF SPATIAL TOOLS AND TECHNIQUES Showmitra Kumar Sarkar* and Md. Esraz-Ul-Zannat; Department of Urban and Regional Planning, Khulna University of Engineering & Technology, Bangladesh; Journal of Engineering Science 10(1), 2019, 113-122
- The revised ‘National Strategy for Water Supply and Sanitation, 2021’
- ‘At a Glance: Rajbari Municipality’, by municipal office
- <https://www.gps-latitude-longitude.com/gps-coordinateshttp://bmd.gov.bd/p/Rainfall-Situation-202>



Figure 9: Left: KIIs with different stakeholders. Right: Focus Group Discussions.

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

- KII with Mayor, Rajbari Municipality.
- KII with Secretary, Rajbari Municipality.
- KII with Conservancy Inspector, Rajbari Municipality.
- KII with Councilor, Rajbari Municipality.
- Facilitators: Md. Mynul Islam Hemel, Field Coordinator, Tiller.

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

- A group of representatives from the Bazar Committee.
- Sweepers and waste collectors.
- A group of representatives from Educational Institutions.
- Masons Association (septic tank builders).

Additional information

- 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 thank Mr. Mohammad Ali Choudhury, Mayor, Rajbari Municipality, Mr. Md. Nazrul Islam, Administrative Officer, Rajbari Municipality; Mr. AHS Mohammad Ali Khan, Executive Engineer, Rajbari Municipality for providing all the required primary and secondary data and cooperating for Key Informant Interviews (KIIs) & Focussed Group Discussions (FGDs). This report would not have been possible to produce without the constant support of Mr. Mohammad Ali Choudhury, Mayor, Municipality, who helped in conducting sample surveys and FGDs in the field.

Rajbari Municipality, Bangladesh, 2022

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