SFD Lite Report

Rangpur City Corporation Bangladesh

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

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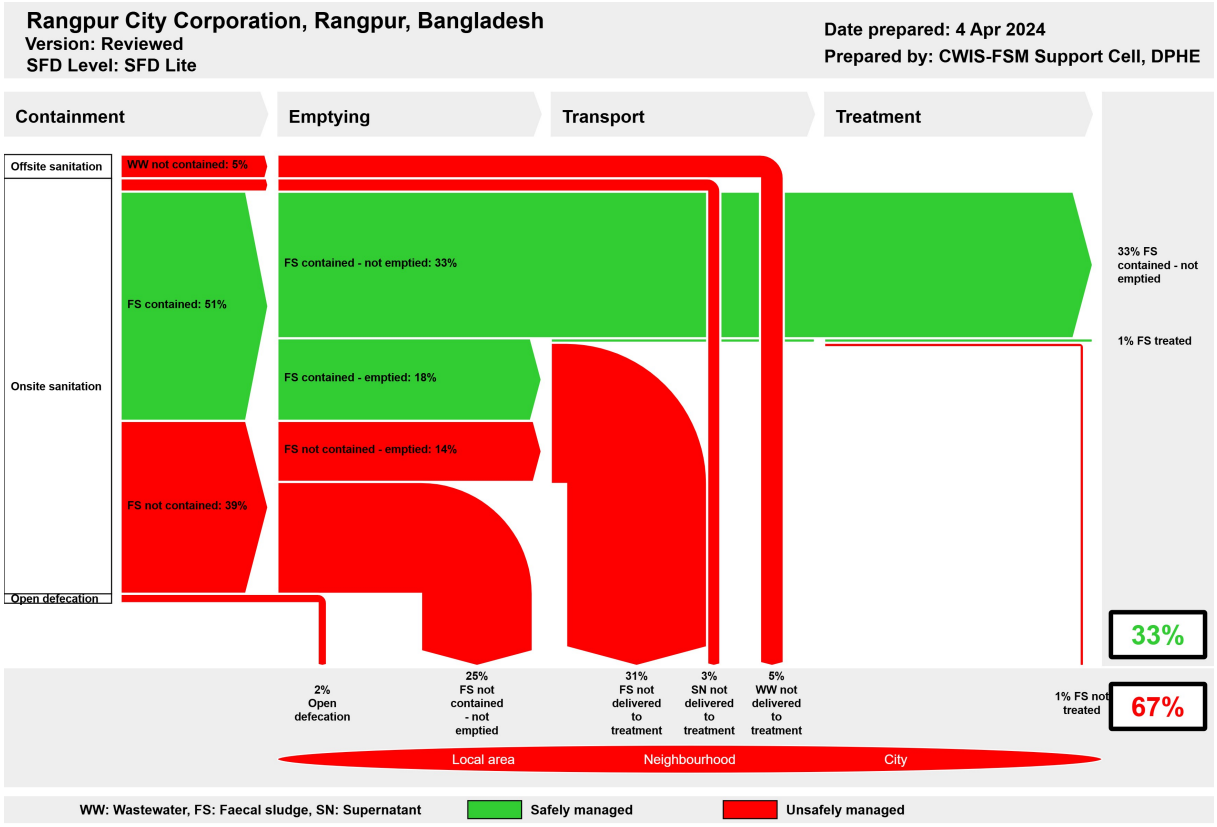
1 The SFD Graphic



The SFD Promotion Initiative recommends preparation of a report on the city context the analysis carried out and data sources used to produce this graphic.
Full details on how to create an SFD Report are available at sfd.susana.org

Figure 1: SFD Graphic for Rangpur City Corporation.

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 Md. Tawhidur Rahaman, Technical Expert, CWIS-FSM Support Cell, Department of Public Health Engineering (DPHE), Bangladesh.

Collaborating partners:

- DevCon, Tiller and Rangpur City Corporation played vital roles in collecting and sharing data, and producing this SFD graphic and SFD lite report.

Date of production: 04/04/2024

3 General city information

Rangpur is a fast-growing city, which is 303 km away from the Dhaka city. It is beside the Ghaghat River and well connected with road and railways. It is one of the oldest towns and was declared City Corporation in 2012 (Figure 2). The geographical coordinates of Rangpur are in between 25°18' and 25°57' north latitudes and in between 88°56' and 89°32' east longitudes. [1]

Figure 2: Rangpur City Corporation Location Map.

According to the population census in 2011 by the Bangladesh Bureau of Statistics (BBS), the Rangpur city population was 294,265. The urban population growth is 3.5% 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 441,158 (Table 1).

[1] https://en.banglapedia.org/index.php/Rangpur_District

Table 1: City profile (Source: KII with the Executive Engineer, Rangpur City Corporation).

Population parameters	Values
Estimated population, 2020	441,158
Households, 2020	95,489
Area, sq.km	80.69
Total roads, km	1287.25
Total drains, km	235

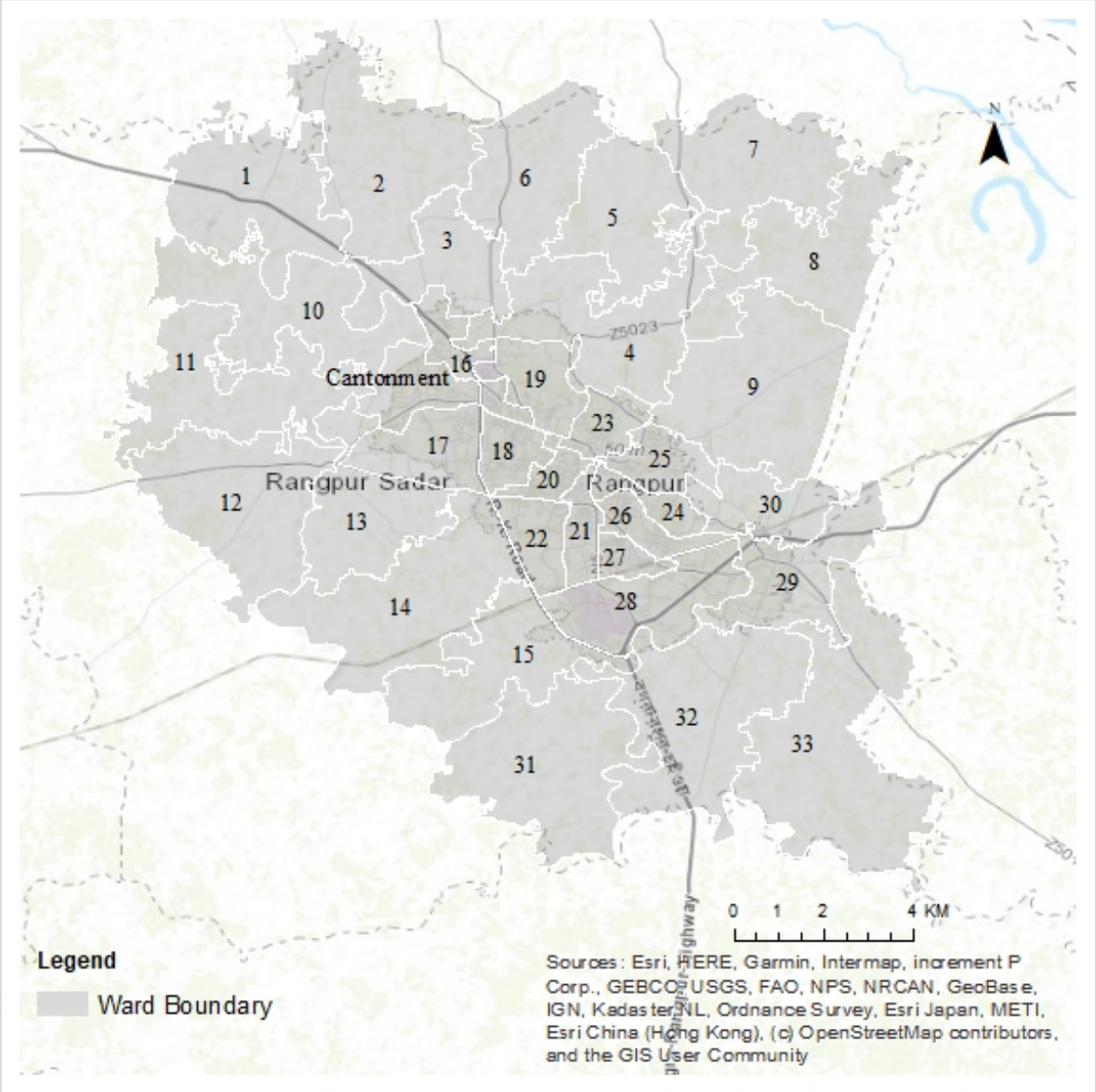


Figure 3: Rangpur City Corporation Ward Boundary Map.

The City Corporation covers an area of 80.69 square kilometres. The current population of Rangpur City Corporation is Above 4 lakhs. At present Rangpur City Corporation has 1287.25 km road of which 433.25 km is bituminous road, 20 km Herringbone Bond Brick (HBB) road and 834 km earthen road. The city has about 235 km drain which includes 60 km pucca and 175 km earthen drain.

According to the Bangladesh Meteorological Department, 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 climatological station within the City Corporation. 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 31.7-32.2°C between April-August, with the minimum mean temperatures of between 10.7-12.7°C in January. The annual average rainfall is about 2,236 mm, according to BMD (1981-2017).[2]

The Ghaghat River passes west side and Teesta River passes east side of the City Corporation. Shamsundori *khal* passed through the City Corporation. According to the flood zoning map of Bangladesh, the City Corporation is in a flood-free zone (no flooding event in the last 12 years). However, the drainage network of the city is not adequate. Every year, City Corporation areas face water logging during monsoon for drainage congestion. There are some secondary drains carrying stormwater and domestic wastewater to the outfalls, rivers and canals. [3]

The household survey results show that most of the occupation is business (28%) followed by labourer (21%) and agriculture (19%).The survey assessed the different types of building structure in the city which are pucca (houses single or multi-storied built with substantial materials such as brick, cement, and concrete), semi pucca houses (either the roof or the walls, but not both, are not made of pucca materials), tin-shed (roof of the house made of corrugated iron sheets) and thatched (roof and walls made of temporary materials like bamboo, paper boards, polyethylene sheets, etc. [4]

[2] http://bmd.gov.bd/p/Rainfall-Situation-202
[3] KII and field visit during Baseline survey 2020
[4] KII and field visit during Baseline survey 2020

4 Service outcomes

The city does not have a dedicated sewerage system and most sanitation systems available in the town are classified as onsite systems (94.7%). The main types of toilet facilities are septic tanks connected to a soak pit, to an open drain, or to a water body, or to open ground, lined tanks or lined pits, with no outlet or overflow and unlined pits.

Table 2 summarizes the sanitation systems in use, as well as estimates of the population connected to each system. For the onsite sanitation systems, it shows the proportions of each from which faecal sludge is then emptied, transported to treatment and treated.

Rangpur City Corporation, Rangpur, Bangladesh, 4 Apr 2024. SFD Level: SFD Lite
Population: 441158
Proportion of tanks: septic tanks: 84%, 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	5.3	0.0	0.0					
T1A2C5 Septic tank connected to soak pit	16.1			43.0	5.0	95.0		
T1A2C6 Septic tank connected to open drain or storm sewer	18.5			39.0	0.0	0.0	0.0	0.0
T1A2C7 Septic tank connected to open water body	13.8			39.0	0.0	0.0		
T1A2C8 Septic tank connected to open ground	9.2			39.0	0.0	0.0		
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	20.7			33.0	1.0	95.0		
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	11.3			51.0	3.0	95.0		
T1A6C10 Unlined pit, no outlet or overflow	3.0			0.0	0.0	0.0		
T1B11 C7 TO C9 Open defecation	2.1							

Table 2: SFD Matrix for Rangpur City Corporation.

The figures shown in Table 2 and elaborated in the following section are derived from information obtained through household (HH) survey, Key Informant Interviews (KIIs), and Focus Group Discussions (FGDs) (as shown in Figure 4).

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 5.3% of the total population of the city to generate the SFD graphic. Similarly, the T1A2C6 system is considered as 18.5% 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 4: Household survey and consultations. (Source: *Feasibility study 2020-21/DPHE).*

Containment: Almost all the households (97.9%) in the city have their latrine which is connected to single pits, twin pits, septic tanks, discharged directly into the environment (e.g., open-drain or storm sewer) or unlined pit, no outlet or overflow. From a household survey, it is found that 57.6% of the city population uses septic tanks as the containment system, 11.3% of the toilets have single pit systems, and 20.7% of people use double pits and 3.0% of the people use unlined pit in the city. About 5.3% of the toilets do not have any type of containment and discharges directly to the environment and 2.1% population practice open defecation (KII, FGDs, HH survey, 2020 and BBS 2022[5] report Vol I).

According to the type of connectivity and features of containment technologies, the discharging points of the toilets are categorized as: 16.1% population uses septic tanks connected to soak pits (T1A2C5), 18.5% population uses septic tanks connected to open drain (T1A2C6), 13.8% population uses septic tanks connected to water bodies (T1A2C7), 9.2% population uses septic tanks connected to open ground (T1A2C8), 20.7% population uses lined tanks with impermeable walls and open bottom no outlet or overflow (T1A4C10), 11.3% of the population relies on lined pits with semi-permeable walls and open bottom with no outlet or overflow (T1A5C10), 3.0% uses unlined pits (T1A6C10) and 2.1% rely on open defecation (KII, FGDs, HH survey, 2020). Thus, at the containment stage, the city's excreta of only 51% of the population are contained. Figure 6 shows pictures of these technologies in operation.

Groundwater Pollution: The depth to groundwater in the city ranges from 6-8 m. The most common drinking water production technology is a borehole with a hand pump or motorized pump. Among them, three-quarters of the households use their own tubewell fitted with electric motor and 4.5% use own

[5] Population and Housing Census 2022 by Bangladesh Bureau of Statistics

hand pump tubewell. Only a few households (17%) use supply water. Lateral separation between sanitation facilities and water sources varies from one area to another. Tube wells of different sizes and depths are generally used to pump water from the subsurface confined aquifers.

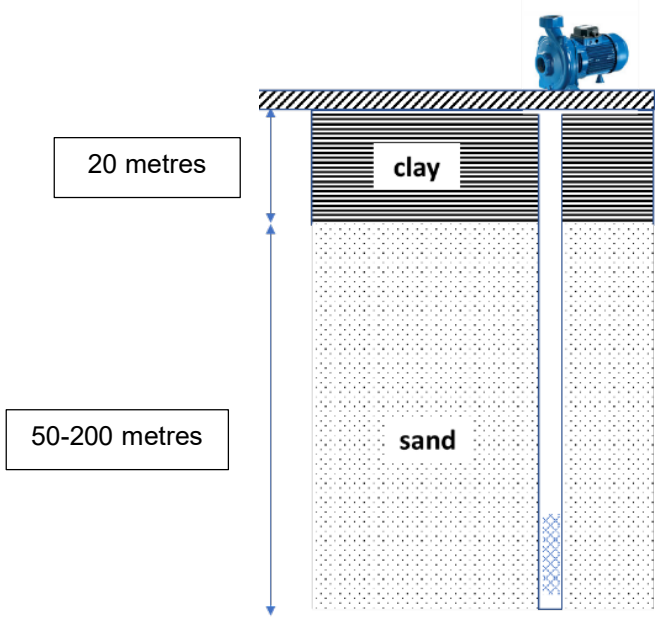


Figure 5: Soil profile in Rangpur district and location of tubewell screen.

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 (25m – 200m) through pumps. Hence, considering all these factors, it is considered that there is not any significant risk of groundwater contamination in the city. Therefore, a low risk of groundwater contamination is considered in the city.

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

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 4-5 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 43% of the septic tanks, connected to the soak pit are emptied within 2-5 years. About 39% of the septic tanks connected to open drains, open ground or water bodies are emptied within 4-5 years. Almost 51% 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 (97%) done by private sweepers. Only in a few households, de-sludging is done by municipal sweepers (2%), family members (1%). Around 87% of this withdrawal is done manually using a bucket and rope. A substantial number (9.0%) use electric pumps and some use (3.8%) manual pump– these reflect the use of the higher level of technologies by some of the workers. The City Corporation has three Vacutug available[6].

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 67% 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 where only 1% treated in a treatment plant. Besides, 32% of the faecal sludge is disposed of in the open environment like a drain, open ground, and water bodies.

Treatment/Disposal: Presently, there is one Faecal Sludge Treatment Plant operating at Rangpur City Corporation (RCC). The treatment system has twenty unplanted drying beds with a size of 4m x 10m. Sludge treatment capacity of the plant is 24 m³ per day in two beds and can receive 480 m³ of faecal sludge in 20 beds in a month[7]. The liquid wastewater is treated through settle with Anaerobic Baffled Reactor (ABR) and Anaerobic filter, horizontal planted gravel bed into polishing pond. The production capacity of co-compost is 15 ton/month.

Figure 7: Faecal Sludge Treatment Plant at Rangpur City Corporation (RCC). Left: Compost producing zone. Right: unplanted drying bed.

4.3 Open Defecation

From HH surveys, KIIs and FGDs, it was found that 97.9% of citizens use some kind of toilet in the City Corporation. Whereas 2.1% of users practice open defecation, Therefore, open defecation (T1B11 C7 TO C9) is considered as 2.1% of the total population of the city to generate the SFD graphic.

[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. 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.

[7] SFD Lite Report (2021) by ITN-BUET

4.4 SFD Graphic

The outcome of the SFD graphic shows that only forty three percent (33%) of the excreta flow is classified as safely managed, and the remaining fifty seven percent (67%) is classified as unsafely managed (Figure 8).

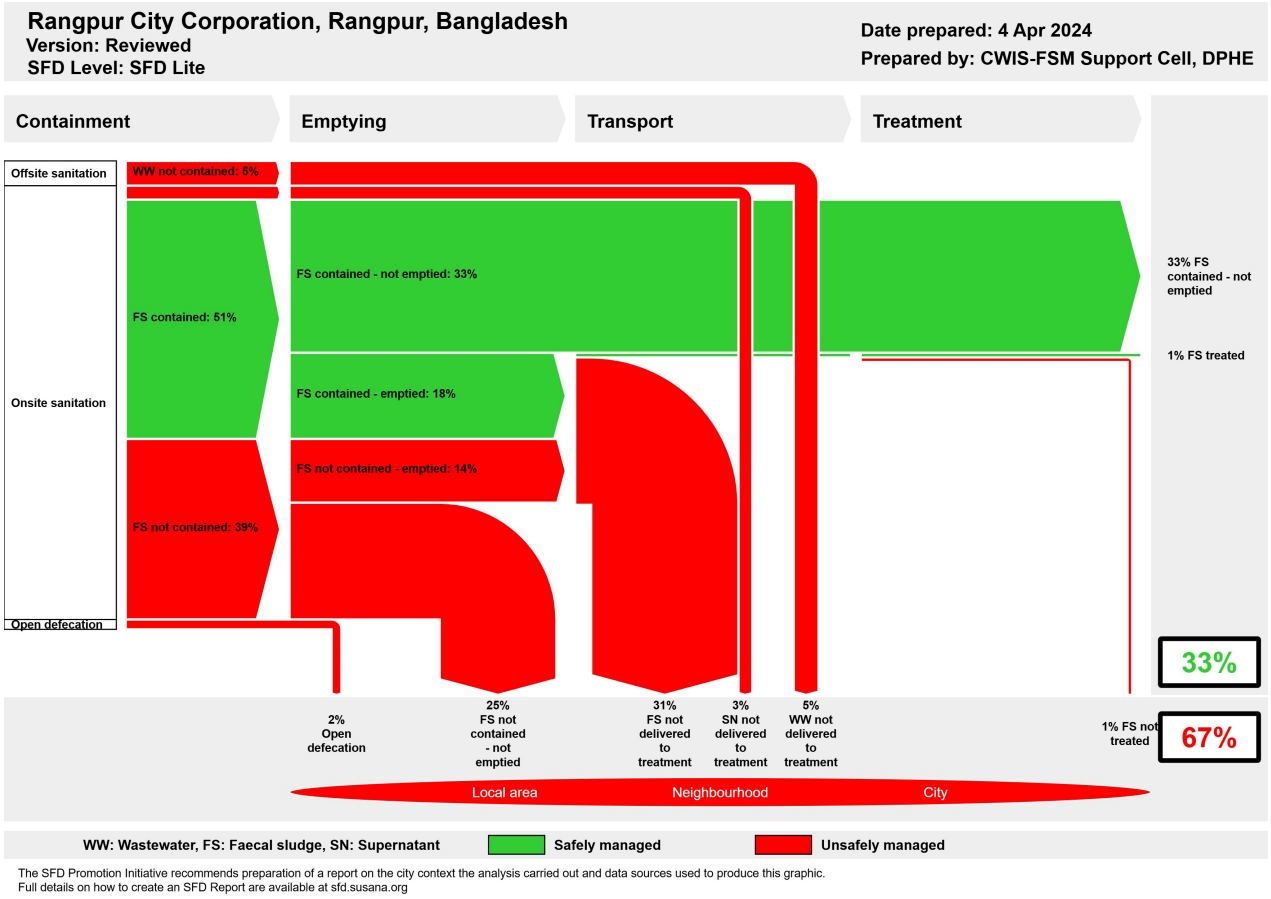


Figure 8: SFD Graphic for Rangpur City Corporation.

The unsafely managed excreta originated from wastewater not delivered to treatment (5%), Faecal Sludge (FS) both contained and not contained - not delivered to treatment (31%), FS not contained - not emptied (25%), 3% of supernatant not delivered to treatment, 2% of people practising open defecation.

The safely managed excreta originate from FS treated (1%) and FS contained - not emptied (33%). This 33% resembles the FS stored in containments without significant risk to groundwater pollution. Thus, the safely managed percentage of FS generated by this 33% 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 baseline survey conducted in September 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 City Corporation officials, town level coordination committee, households, social workers, business persons, pit emptiers and the citizens including women in all the wards of the City Corporation. 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 City Corporation and accepted by them.

Following assumptions were made for developing the SFD graphic for Rangpur City Corporation:

- ✓ The proportion of FS in septic tanks, fully lined tanks, and lined, open bottom tanks are considered 84%, 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 Rangpur city population was 294,265. The urban population growth is 3.5% 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 441,158 (Table 1).
- ✓ There are around 20.7% 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, 20.7%). Based on the household survey, variable F3 for system T1A4C10 is set to 33%. After emptying, 3% of the faecal sludge is delivered to a treatment plant (F4 is set to 3%).
- ✓ There are around 11.3% 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, where there is no 'significant risk' of groundwater pollution (system T1A5C10, 11.3%). 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 51%. After emptying, 3% of the faecal sludge is delivered to a treatment plant (F4 is set to 3%).
- ✓ 16.1% 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. After emptying, 5% of the faecal sludge is delivered to a treatment plant (F4 is set to 5%).
- ✓ Around 43% 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 43%.
- ✓ There are 41.5% of septic tanks connected to the open drain, water bodies and open ground, 39% of which are emptied within 2-5 years. Based on the household survey, variable F3 for systems T1A2C6, T1A2C7 and T1A2C8 are set to 39%.
- ✓ 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%.
- ✓ After being delivered to the treatment plant, 95% of the faecal sludge is treated. Thus, variable F5 for T1A2C5, T1A4C10 and T1A5C10 are considered to be 95%.
- ✓ There are 3.0% of unlined pits, no outlet or overflow, so the system T1A6C10 is set as 3.0%.

✓ 2.1% of users practice open defecation, Therefore, open defection (T1B11 C7 TO C9) is considered as 2.1% of the total population of the city.

5.1 Comparison with the SFD report from 2021

In this section, a comparison of the data sources and results produced with respect to a previous SFD report published in 2021, which was produced by ITN-BUET (Rangpur SFD Lite Report, 2021) is presented. Table 3 shows the comparison of data gathered in the two SFD reports.

Table 3: Comparison of data gathered in the two SFD reports.

	SFD lite Report (2018)	SFD lite report (2024)
Sources of data	Household survey, KIIs, FGDs	Household survey, 6 KIIs, 4 FGDs and 6 secondary sources (reports, papers)
Service delivery context description	Some information on policy, legislation and regulation of the sanitation service delivery chain is provided.	Some information on policy, legislation and regulation of the sanitation service delivery chain is provided.
Data validation	Field visits	Four field visits.
Findings validation	Discussions were held with Chief Executive Officer, Conservancy Inspector, Conservancy Supervisor, sweepers and users.	Discussions were held with Chief Executive Officer, Conservancy Inspector, Conservancy Supervisor, sweepers and users.

Table 4 depicts a comparison of the sanitation systems in the city according to the two SFD reports.

Table 4: Comparison of sanitation systems according to the two SFD reports.

Sanitation systems	SFD lite report (2021)	SFD lite report (2024)
Toilet discharges directly to open drain or storm sewer (T1A1C6)	-	5.3%
Septic tank connected to soak pit (T1A2C5)	-	16.1%
Septic tank connected to open drain or storm sewer (T1A2C6)	3.0%	18.5%
Septic tank connected to open water body (T1A2C7)	-	13.8%
Septic tank connected to open ground (T1A2C8)	-	9.2%
Lined tank with impermeable walls and open bottom, no outlet or overflow (T1A4C10)	-	20.7%
Lined pit with semi-permeable walls and open bottom, no outlet or overflow (T2A5C10)	32.0%	11.3%
Unlined pit, no outlet or overflow (T1A6C10)	-	3.0%
Fully lined tank (sealed),no outlet or overflow (T1A3C10)	22.0%	
Open defecation (T1B11 C7 TO C9)	3.0%	2.1%
Toilet failed, connected to sewer, soak pit, open drain or storm sewer, open ground or “don’t know where” (T1B9 C1 TO C10)	4.0%	-
Septic tank connected to soak pit, where there is a ‘significant risk ‘of groundwater pollution (T2A2C5)	18.0%	-
Fully lined tank (sealed) connected to soak pit, where there is a ‘significant risk ‘ of groundwater pollution (T2A3C5)	18.0%	-
SFD graphic outcome	15% safely managed excreta. 85% unsafely managed excreta.	33% safely managed excreta. 67% unsafely managed excreta.

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: Rangpur City Corporation', by City Corporation office
- https://www.gps-latitude-longitude.com/gps-coordinateshttp://bmd.gov.bd/p/Rainfall-Situation-202
- https://en.banglapedia.org/index.php/Rangpur_District

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

- KII with Mayor, Rangpur City Corporation.
- KII with Conservancy Inspector, Rangpur City Corporation.
- KII with Sanitary inspector, Rangpur City Corporation.
- KII with Engineer, Rangpur City Corporation.
- Facilitators: Md. Mynul Islam Hemel, Field Coordinator, Tillers

Figure 9: KIIs with different stakeholders in Rangpur. (Source: *Feasibility study 2020-21/DPHE).*

Focus Group Discussions (FGDs) (September 2020 to December 2021)

- FSM Sweepers and Service Providers.
- First Stage Solid Waste Collector.
- Slum Dwellers.

Figure 10: Focus Group Discussions in Rangpur. (Source: *Feasibility study 2020-21/DPHE).*

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 City Corporation 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. Md. Mostafizer Rahman (Mostofa), Mayor, Rangpur City Corporation, Ms. Umme Fatima, Chief Executive Officer, Rangpur City Corporation; Mr. Md. Anisuzzaman, Executive Engineer, Rangpur City Corporation, Mr. Md Nazrul Islam, Town Planner, Rangpur City Corporation 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 Mr. Md. Mostafizer Rahman(Mostofa), Mayor, Rangpur City Corporation, 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.

Rangpur City Corporation, Bangladesh, 2025

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