SFD Lite Report

Cumilla City Corporation Bangladesh

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

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1 The SFD Graphic

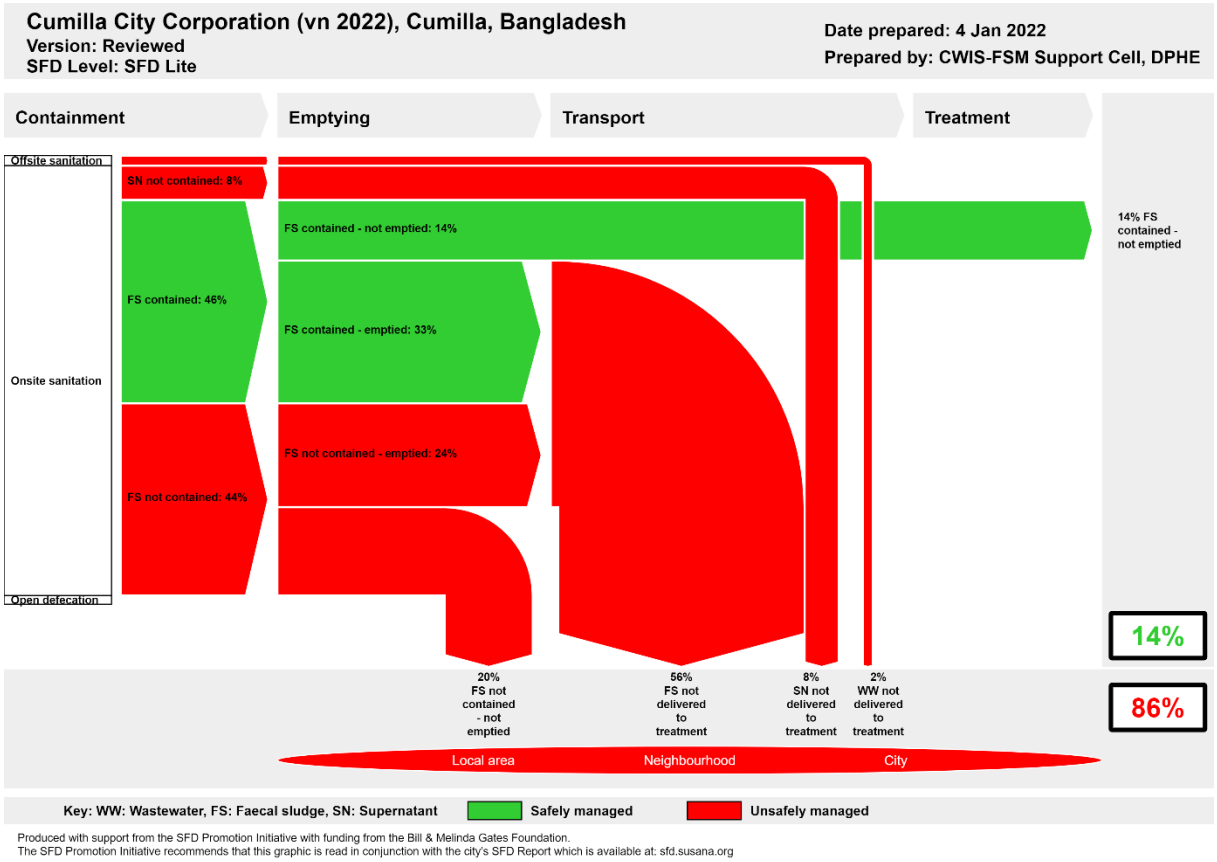

Figure 1: SFD Graphic for Cumilla City Corporation.

2 SFD Lite information

Produced by:

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- We would like to thank Mr. Monirul Haque Shakku, Mayor, Cumilla City Corporation (CuCC); Md. Abu Sayem Bhuiyan, Secretary, Cumilla City Corporation (CuCC); Mir Sawkat Hossen, Chief Executive Officer, CuCC; Md. Masudur Rahman, Chief Accounting officer, Sheikh Md. Nurullah, Executive engineer, Md. Mesbah Uddin Bhuyan, Sanitary Inspector (CuCC), Cumilla, 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. Monirul Haque Shakku Mayor, CuCC, 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 Cumilla City Corporation played vital roles in collecting and sharing data, and producing this SFD graphic and SFD lite report.

Date of production: 04/01/2021

3 General city information

Cumilla City Corporation stands on the south bank of the Gumti River in Cumilla district. Cumilla (previously known as Comilla) is one of the fast-growing cities located beside the Dhaka Chittagong highway, 97 km south to Dhaka and 167 km north to Chittagong (Figure 2). Cumilla, one of the oldest towns of the sub-continent was declared a city corporation in the year 1864. Cumilla City Corporation was formed on 10 July 2011, consisting of 27 wards. Cumilla is one of the 11 city corporations in the country.

Table 1: City profile (Source: KII with the Secretary, Cumilla City Corporation).

Population parameters	
Estimated population, 2020	490,000
Households, 2020	90,782
Area, sq.km	53.04
Total roads, km	482
Total drains, km	177

Figure 2: Cumilla City Corporation location map (BBS/ GIS report 2017).

According to the population census in 2011 by the Bangladesh Bureau of Statistics (BBS), the Cumilla city population was 326,386. The urban population growth in Bangladesh is 3.5% per year. Considering a 3.5% growth rate annually and a 10% floating population, such as farmers and traders, comes to the city every day, the present (2020) population is estimated to be around 490,000 (Table 1).

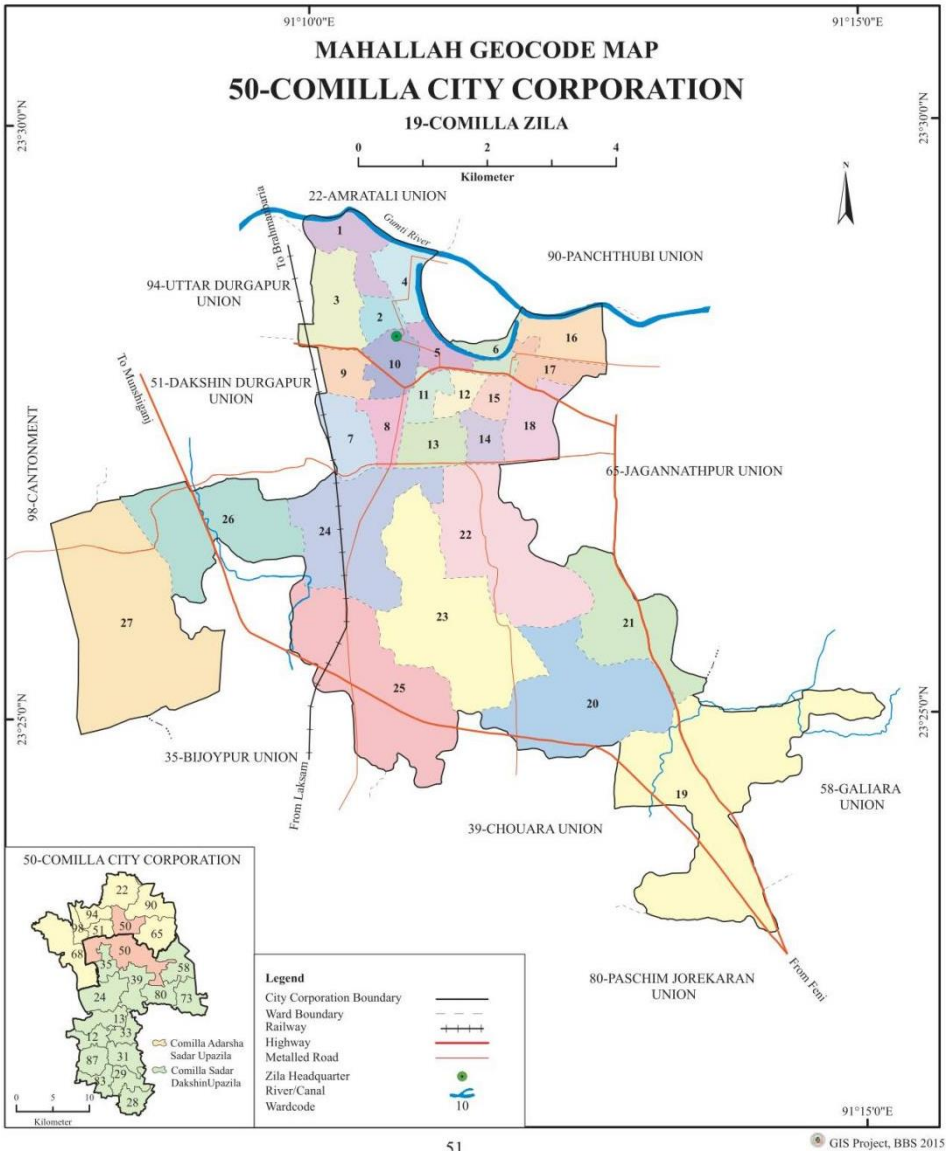

Figure 3: Cumilla City Corporation ward boundary map (BBS/ GIS report 2017).

The City Corporation covers an area of 53.04 square kilometres. At present Cumilla City Corporation has a 482 km of road out of which 197 km is bituminous road, 60 km is Cement Concrete (CC) road, 16 km is Reinforced Cement Concrete (RCC) road, 55 km is brick flat soling road, and 154 km is earthen road. The city has about 177 km of drain which includes 65 km of lined drain and 106 km of earthen drain[1].

The geographical coordinates of Cumilla are 23°27'42.7" North 91°11.102' East[2] (Figure 2). In the context of Bangladesh, the city area is situated on medium to highland with some western parts having small hilly areas. Besides the hilly areas, it is the mostly flat plain area known as alluvium land

[1] *Source: 'At a Glance: Cumilla City Corporation', by Corporation office*
[2] *Source: https://www.gps-latitude-longitude.com/gps-coordinates*

with both hard and granular sandy or clayey silts and sloping gently to the south and south-east. The soil is light to medium gray, fine sandy to clayey silt. Soils are poorly stratified; average grain size decreases away from the main channel.

According to the Bangladesh Meteorological Department (1981-2017)[3], the city area and surrounding area is distinctive as tropical-subtropical sub-humid climate. It is characterized by warm, humid summers and cool, and dry winters. From November to March, it is dry and cool while from April to May it is extremely hot during the pre-monsoon season. From June to October, the monsoon season is warm, cloudy, and wet. The warmest month is April, the coolest is January, the wettest is July and the driest is January. The maximum mean temperature observed is 25-32°C between May-August, with the minimum temperatures found to be between 12-15°C in January. The annual average rainfall is about 2,430 mm.

Cumilla City Corporation is situated on the bank of Gomti River. Several canals (Guingadhari canal, Balujhuri canal, Katakhal, and Nagguniya Khal) flow through the city. There is a flood protection embankment on the north-side of the city which protects the inhabitants from river flooding. 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[4]. 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 27 wards of the city are shown in Figure 3 and Figure 4. The density is high in the north, ranging from 20,000 to 50,000 per sq km. The population density in the south is lower, ranging from 1,500 to 19,000 per sq km[5].

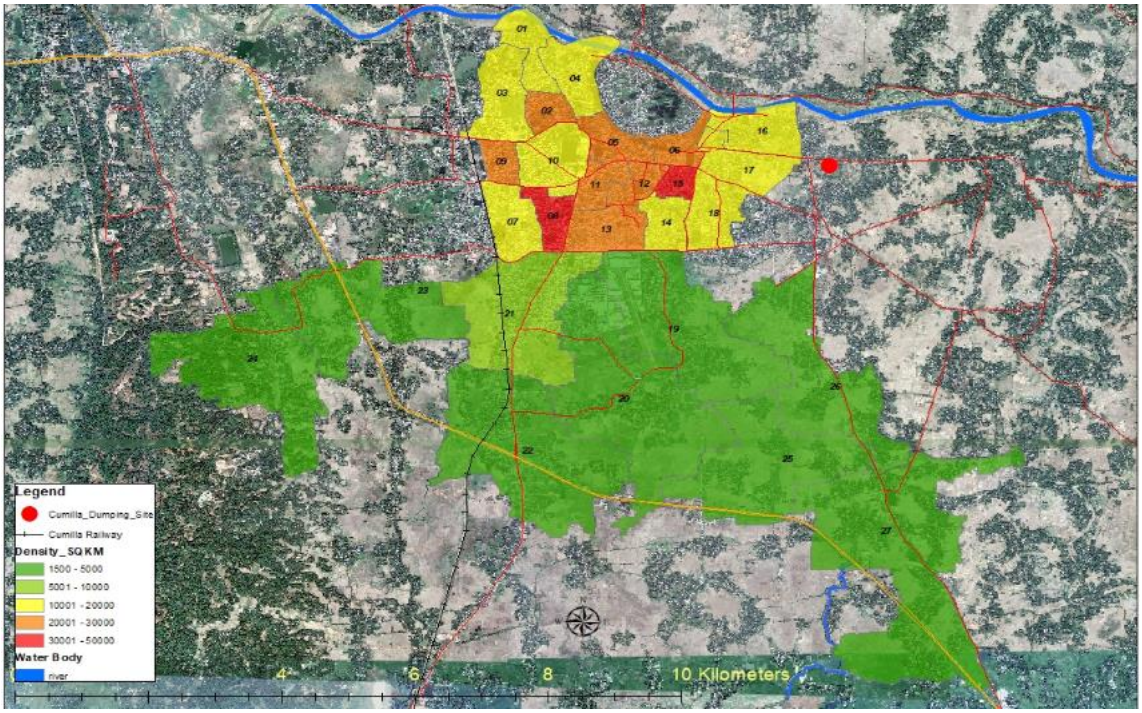

Figure 4: Population density in different wards of Cumilla City Corporation.

[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

Cumilla City Corporation, Cumilla, Bangladesh, 4 Jan 2022. SFD Level: SFD Lite
Population: 490000
Proportion of tanks: septic tanks: 74%, 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	2.3	0.0	0.0					
T1A2C5 Septic tank connected to soak pit	6.6			62.0	0.0	0.0		
T1A2C6 Septic tank connected to open drain or storm sewer	30.1			62.0	0.0	0.0	0.0	0.0
T1A2C7 Septic tank connected to open water body	4.3			62.0	0.0	0.0		
T1A2C8 Septic tank connected to open ground	1.6			62.0	0.0	0.0		
T1A2C9 Septic tank connected to 'don't know where'	15.6			62.0	0.0	0.0		
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	10.0			25.0	0.0	0.0		
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	28.1			96.0	0.0	0.0		
T1A6C10 Unlined pit, no outlet or overflow	1.6			0.0	0.0	0.0		

Table 2: SFD Matrix for Cumilla City Corporation.

The outcome of the SFD graphic shows that only fourteen percent (14%) of the excreta flow is classified as safely managed, and the remaining eighty-six (86%) percent is classified as unsafely managed (Figure 1). The unsafely managed excreta originate from wastewater not delivered to treatment (2%), Faecal Sludge (FS) emptied but not delivered to treatment (56%), FS not contained - not emptied (20%) and 8% of supernatant not delivered to treatment. The safely managed excreta originate from FS contained - not emptied (14%).

The percentages presented in Table 2 and discussed in the next section are based on data collected through household (HH) surveys, Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) (Figure 5 and Figure 10).

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 as 2.3% of the total population of the city to generate the SFD graphic. Similarly, the T1A2C6 system is considered 30.1% 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 (97%) 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 (2.5%) and neighbour's toilets (0.5%). From a household survey, it was found that over half of the city population (58.14%) uses septic tanks as the containment system, 28.05% of the toilets have single pit systems, and 9.95% of people use double pits in the city. About 1.58% of people have an unlined pit and 2.26% 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 Cumilla City Corporation. Left: Toilet pit open to a nearby water body, Right: Toilet pipe connected to open drain (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: 6.6% of the population uses septic tanks connected to soak pits (T1A2C5), 30.1% of the population uses septic tanks connected to open drain (T1A2C6), 4.3% of the population uses septic tanks connected to water bodies (T1A2C7), 1.6% of the population uses septic tanks connected to open ground (T1A2C8), 15.6% of the population uses septic tanks connected to 'don't know where' (T1A2C9), 10% of the population uses lined tanks with impermeable walls and open bottom, no outlet or overflow (T1A4C10), 28.1% of the population relies on the lined pit with semi-permeable walls and open bottom, no outlet or overflow (T1A5C10). Nearly, 1.6% of the population uses the unlined pit, no outlet or overflow (T1A6C10) (KII, FGDs, HH survey, 2020). Thus, at the containment stage, the city's excreta of only 46.3% of the population are contained. Figure 6 shows some pictures of these technologies in use.

Groundwater Pollution: The groundwater level below the ground surface is 20-25 m. The most common drinking water production technology is a borehole with a hand pump or motorized pump. Nearly three-quarters of the households (74.21%) use their own tube well fitted with an electric motor and 14% use their own hand pump tube well. Only a few households (13.5%) are supplied with piped water.

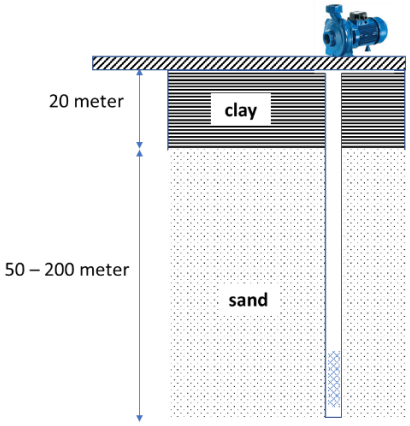

Figure 7: Soil profile in Cumilla city and location of tube well screen.

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. 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 62% 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 or 'don't know where' are also emptied within 4-5 years. Almost 96% of single 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 (88%) done by private sweepers. Only in a few households, desludging is done by city corporation sweepers (7%), family members (4%), and private agencies (1%). Around 54% of

this withdrawal is done manually using a bucket and rope. 3% of the withdrawal is done by manual pumps. A substantial number (38%) use electric pumps and 5% use a mechanical vacuum truck to empty and transport the sludge (Figure 8). 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 city corporation authority has two Vacutugs, a mechanical collection tanker, which provides mechanical emptying service in limited way in this city corporation[6].

Figure 8: Septic tanks and pit emptying vehicle (vacuum truck) in Cumilla City Corporation (Source: *Feasibility study 2020-21/DPHE).*

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 31% of the respondents who use any kind of containment system, informed that the 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 portion of sludge disposed into the canal and river is 28%, into the drain is 37% and into the open ground is 4%. The conservancy department of city corporation currently has 2 functional mechanical vacuum trucks, which has been used as sludge transport system in a limited way. Solid waste collection practices in Cumilla are shown in Figure 9.

Figure 9: Solid waste collection practices in Cumilla.

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

4.3 Open Defecation:

From HH surveys, KIIs and FGDs, it was found that 100% of citizens use any kind of toilet in the City Corporation. Thus, from the sanitation point of view, 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. 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 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 city corporation and accepted by them. Following assumptions were made for developing the SFD graphic for Cumilla City Corporation:

- ✓ The proportion of FS in septic tanks, fully line tanks, and line, open bottom tanks are considered 74%, 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 Cumilla city population was 326,386. Considering the annual growth rate of the urban population in Cumilla City Corporation area is 3.5% annual growth rate and a 10% floating population, such as farmers and traders, comes to the city every day, the present (2020) population is estimated to be around 490,000.
- ✓ There are around 10 % 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, 10%). Based on the household survey, variable F3 for system T1A4C10 is set to 25%.
- ✓ There are around 28.1% of single pit latrines. 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, 28.1%). All of the single pit latrines are found to be emptied within 1-2 years. Based on the HH survey, variable F3 for system T1A5C10 is set to 96%.
- ✓ 6.6% of septic tanks are connected to soak pits (system T1A2C5). Since they are well-constructed as per the field visit observation, they were considered to be located in areas of low risk of groundwater contamination. Around 62% 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 62%.
- ✓ There are 62% 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 is set to 62%.
- ✓ 1.6% of containments are found as unlined pits, no outlet or overflow (T1A6C10), since they are not constructed properly. 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 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%.

5.1 Comparison with the SFD report from 2018:

In this section, a comparison of the data sources and results produced with respect to a previous SFD report published in 2018, which was produced by WaterAid Bangladesh (Cumilla SFD Lite Report, 2018) 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 (2020)
Sources of data	3 KIIs, 2 FGDs and desk-based research (reports, papers).	Baseline survey (442 nos. household survey, 4 KIIs, 4 FGDs) and 6 secondary sources (reports, papers).
Service delivery context description	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	One field visit.	Four field visits.
Findings validation	Discussions were held with conservancy staff, town-level coordination committee members and sweepers.	Discussions were held with Mayor, Chief Executive Officer, Secretary, town level coordination committee members, conservancy staff, and sweepers.

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 (2018)	SFD lite report (2020)
Toilet discharges directly to open drain or storm sewer		2.3% (T1A1C6)
Septic tank connected to a soak pit		6.6% (T2A2C5)
Septic tank connected to open drain or storm sewer	40% (T1A2C6)	30.1% (T1A2C6)
Septic tank connected to open water body		4.3% (T1A2C7)
Septic tank connected to open ground		1.6% (T1A2C8)
Septic tank connected to 'don't know where'	12% (T1A2C9)	15.6% (T1A2C9)
Lined tank with impermeable walls and open bottom, no outlet or overflow		10% (T1A4C10)
Lined pit with semi-permeable walls and open bottom, no outlet or overflow		28.1% (T1A5C10)
Unlined pit, no outlet or overflow		1.6% (T1A6C10)
Fully lined tank (sealed) connected to open drain or storm sewer	3% (T1A3C6)	
Fully lined tank (sealed) connected to 'don't know where'	5% (T1A3C9)	
Lined tank with impermeable walls and open bottom, connected to open ground	7% (T1A4C8)	
Septic tank connected to a soak pit, where there is a 'significant risk' of groundwater pollution	10% (T2A2C5)	
Lined pit with semi-permeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	23% (T2A5C10)	
SFD graphic outcome	0% safely managed excreta. 100% unsafely managed excreta.	14% safely managed excreta. 86% unsafely managed excreta.

As seen in Table 3 and Table 4, It is well noticed that the depth of the data gathered by this report is greater. The main differences rely on the disaggregation of the data related to the sanitation options and the greater number of KIIs, FGDs and field visits carried out. As a consequence, the SFD graphic outcome is also different by around 14%.

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: Cumilla City Corporation, by corporation office
- https://www.gps-latitude-longitude.com/gps-coordinateshttp://bmd.gov.bd/p/Rainfall-Situation-202

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

- KII with Mayor, Cumilla City Corporation.
- KII with Secretary, Cumilla City Corporation.
- KII with Conservancy Inspector, Cumilla City Corporation.
- KII with Councilor, Cumilla City Corporation.
- Facilitators: Abu Zubair, 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).

Figure 10: Focus Group Discussions in Cumilla.

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 city corporation 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 city corporation and municipal authorities.

Cumilla City Corporation, Bangladesh, 2022

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