SFD Lite Report

Chandpur Municipality Bangladesh

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

Date of production/ last update: 11/09/2022

1 The SFD Graphic

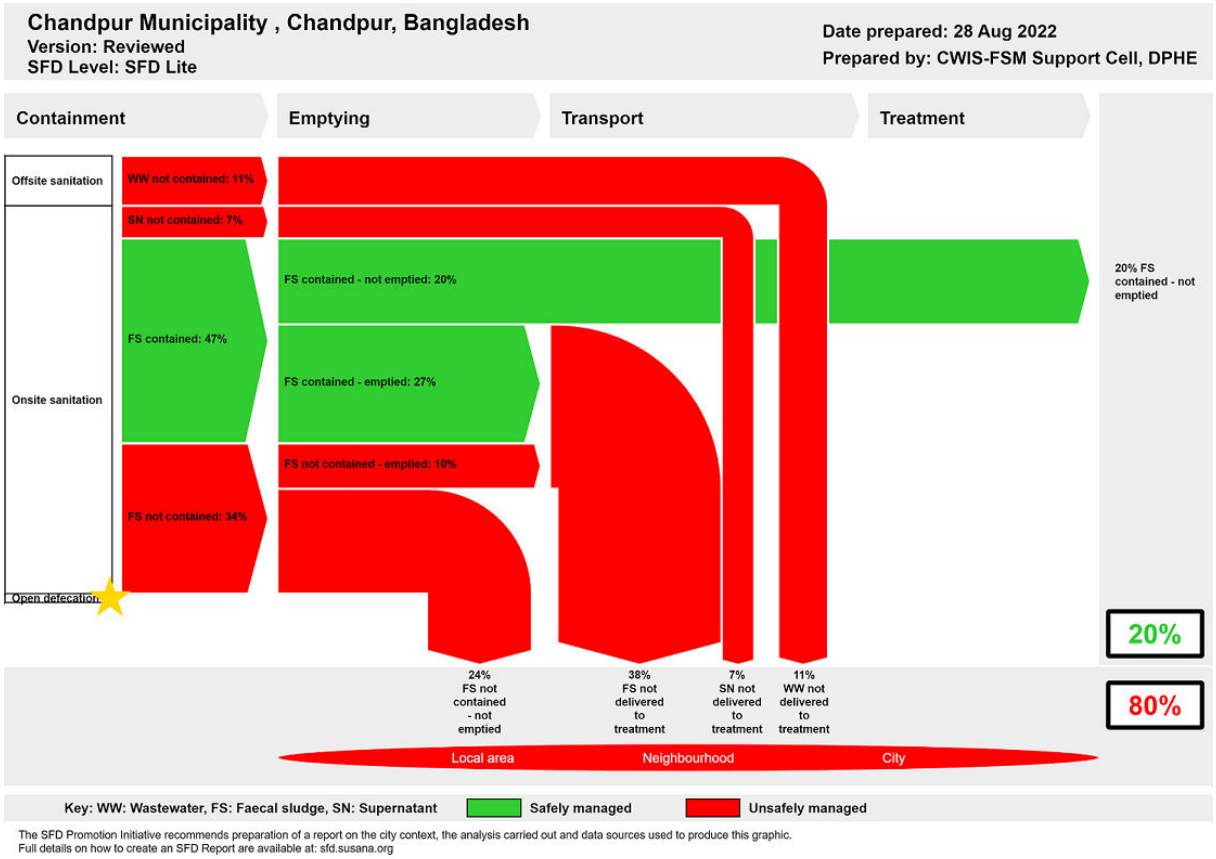

Figure 1: SFD Graphic for Chandpur Municipality.

2 SFD Lite information

Produced by:

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Collaborating partners:

- DevCon, Tiller and Chandpur 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

Chandpur is a fast-growing city located along the Dhaka- N1 and Gauripur - Kachua highway and 120 km South of Dhaka. It is beside the Dakatia and Meghna Rivers and it is well connected with road, water, and railways. It is one of the oldest towns in the sub-continent and was declared a municipality in 1896 and a Pourashava in 1986. Chandpur is one of the 53 district-level municipalities in the country (Figure 2).

Table 1: City profile (Source: KII with the Executive Engineer, Chandpur Municipality).

Population parameters	
Estimated population, 2020	238,402
Households, 2020	46,508
Area, sq.km	22.19
Total roads, km	78.77
Total drains, km	25.56

Figure 2: Chandpur Municipality Location Map (BBS/ GIS report 2017).

According to the population census in 2011 by the Bangladesh Bureau of Statistics (BBS), the population of Chandpur Municipality was 159,021. The urban population growth in Chandpur 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 238,402 (Table 1).

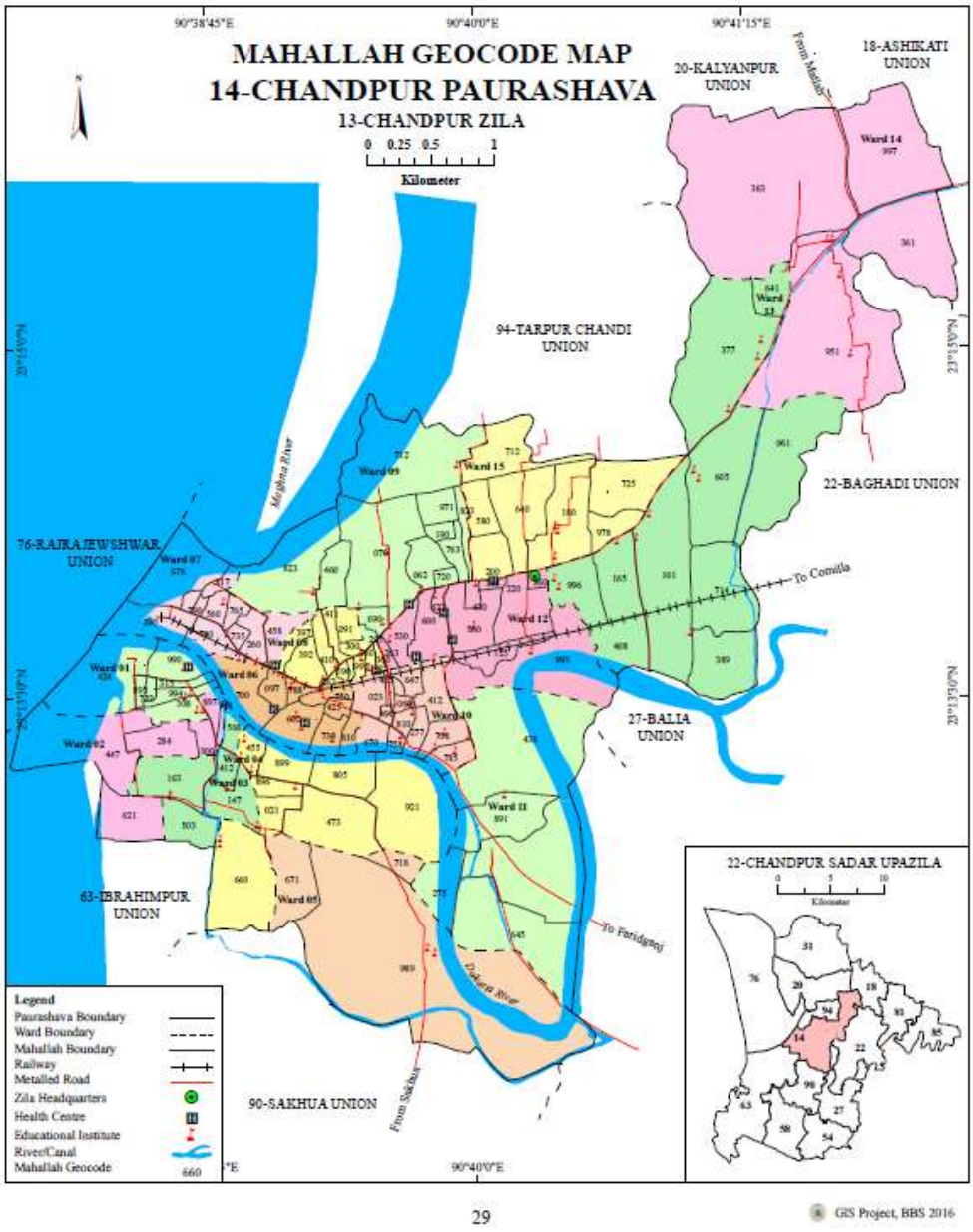

Figure 3: Chandpur Municipality Ward Boundary Map (BBS/ GIS report 2017).

The Municipality covers an area of 22.19 square kilometres. At present Chandpur Municipality has 78.77 km of road network and 25.56 km of drain network[1]. The geographical coordinates of Chandpur are 23° 13' 55.5600" N, 90° 39' 47.0808" E[2]. In the context of Bangladesh, the municipality area is relatively medium to low (Figure 3).

According to the Bangladesh Meteorological Department (1981-2017)[3], the city area and surrounding area are experiencing a tropical monsoon with hot summer and cool dry winter. The closest meteorological station of Bangladesh Meteorological Department is located in Chandpur. Weather data are collected from 1981 to 2017. Normally rainy season starts from May and ends in October. Especially there is heavy rainfall in June and July in comparison to other months. Dry season lasts

[1] Source: 'At a Glance: Chandpur Municipality', by municipal office
[2] https://www.latlong.net/place/chandpur-bangladesh-13499.html
[3] http://bmd.gov.bd/p/Rainfall-Situation-202

from November to April. The maximum mean temperature observed is 26-32.8°C between May-October, with the minimum temperatures found to be between 15-25.9°C in January. The annual average rainfall is about 2,147 mm, according to BMD (1981-2017).

Chandpur Municipality is situated on the bank of Dakatia and Meghna Rivers. Several canals (Guingadhari canal, Balujhuri canal, Katakhal, and Nagguniya Khal) flow through the city. According to the flood zoning map of Bangladesh, the municipality is in a flood zone (in the last 12 years flooding event happened) and situated in Riverbank Erosion Prone area. However, the drainage network of the city is not adequate[4]. Every year, municipality areas face water logging during monsoon for drainage congestion. There are some secondary drains carrying stormwater and domestic wastewater to the outfalls the rivers and canals.

The population density is high in the centre of the municipality, ranging from 20,001-22,994 per sq km. The Central Business District (CBD) is located there together with large markets, shopping centres, and high raised buildings for commercial and residential purposes. The population density in the north-east is lower, ranging from 3,296-5,000 per sq km[5].

[4] *KII and field visit during Baseline survey 2020*
[5] *KII and field visit during Baseline survey 2020*

4 Service outcomes

Chandpur Municipality , Chandpur, Bangladesh, 28 Aug 2022. SFD Level: SFD Lite
Population: 238402
Proportion of tanks: septic tanks: 71%, 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	11.4	0.0	0.0					
T1A2C5 Septic tank connected to soak pit	3.0			33.0	0.0	0.0		
T1A2C6 Septic tank connected to open drain or storm sewer	25.7			35.0	0.0	0.0	0.0	0.0
T1A2C7 Septic tank connected to open water body	12.4			35.0	0.0	0.0		
T1A2C8 Septic tank connected to open ground	2.5			35.0	0.0	0.0		
T1A2C9 Septic tank connected to 'don't know where'	1.2			35.0	0.0	0.0		
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	6.7			67.0	0.0	0.0		
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	35.4			62.0	0.0	0.0		
T1A6C10 Unlined pit, no outlet or overflow	1.7			0.0	0.0	0.0		

Table 2: SFD Matrix for Chandpur Municipality.

The outcome of the SFD graphic shows that only twenty percent (20%) of the excreta flow is classified as safely managed, and the remaining eighty percent (80%) is classified as unsafely managed (Figure 1). The unsafely managed excreta originate from wastewater not delivered to treatment (11%), Faecal Sludge (FS) both contained and not contained - not delivered to treatment (38%), FS not contained - not emptied (24%) and 7% of supernatant not delivered to treatment. Thus, the safely managed excreta originate from FS contained - not emptied (20%).

The percentages presented in Table 2 and discussed in the next section are based on data collected through household (HH) surveys, Key Informant Interviews (KII) and Focus Group Discussions (FGDs) (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 11.4% of the total population of the city to generate the SFD graphic. Similarly, the T1A2C6 system is considered 25.7% of the total population of the city to generate the SFD graphic. In the absence of a sewerage system, the wastewater 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. Left: Household survey. Right: Consultation meeting (Source: *Feasibility study 2020-21/DPHE).*

Containment: Almost all the households (92%) 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 (7.7%) and neighbour's toilets (0.2%). From the household survey, it was found that 44.8% of the city population uses septic tanks as the containment system, 35% of the toilets have single pit systems, and 6.7% of people use double pits in the city. About 1.7% of the households use dug hole containment. About 11.4% 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: 3.0% of the population uses septic tanks connected to soak pits (T1A2C5), 25.7% of the population uses septic tanks connected to open drain (T1A2C6), 12.4% of the population uses septic tanks connected to water bodies (T1A2C7), 2.5% of the population uses septic tanks connected to open ground (T1A2C8), 1.2% of the population uses septic tanks connected to 'don't know where' (T1A2C9), 6.7% of the population uses lined tanks with impermeable walls and open bottom no outlet or overflow (T1A4C10), 35.4% of the population relies on lined pits with semi-permeable walls and open bottom with no outlet or overflow (T1A5C10) and 1.7% of the population uses unlined pits, no outlet or overflow (T1A6C10) (KII, FGDs, HH survey, 2020). Thus, at the containment stage, the city's excreta of only 47% 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 2-3 m. The most common drinking water production technology is a borehole with a hand pump or motorized pump. Among them, 25% of the households use their own tube well fitted with the electric motor, 18% use their own hand tube well and 46% of the households have a water supply facility.

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).

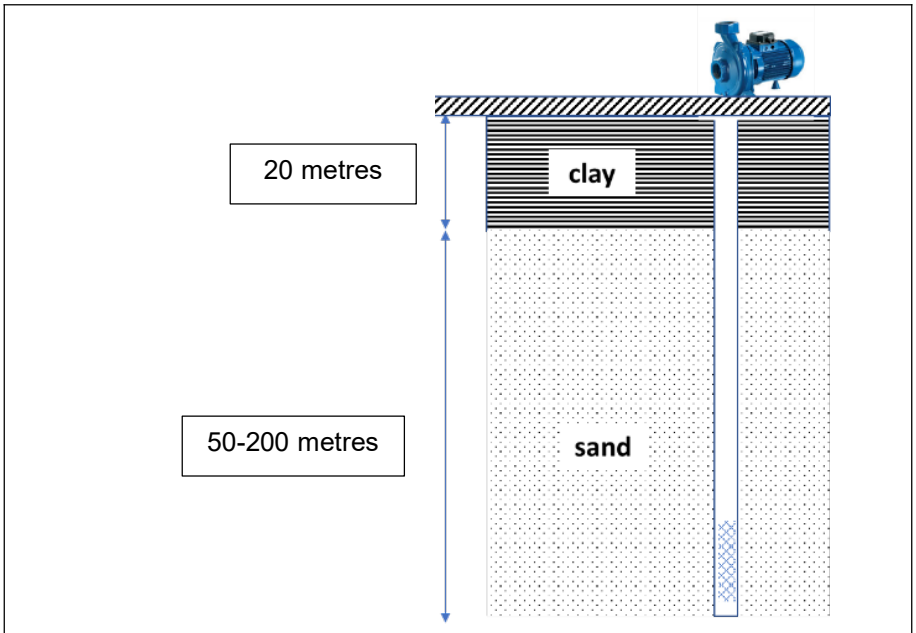

Figure 5. Soil profile in Chandpur district and location of tube well screen.

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) 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 Chandpur
Left: Toilet Pit open to a nearby water body, 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 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 33% of the septic tanks, connected to the soak pit are emptied within 2-5 years. About 35% of the septic tanks connected to open drains, open ground or water bodies are emptied within 4-5 years. Almost 62% 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 pit is mostly (86%) done by private sweepers. Only in a few households, de-sludging is done by municipal sweepers (5%) or family members (9%). Around 74% of this withdrawal is done manually using a bucket and rope. This method highly risks the health and safety of the workers. A substantial number (26%) use electric pumps, these reflecting the use of the higher level of technologies by some of the workers. Manual emptying is the common practice in this city. The municipal authority has one Vacutug, a mechanical collection tanker, that is not yet being used, [6]so there is no mechanical emptying service in this municipality.

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 54% 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, 46% of the faecal sludge is disposed of in the open environment like a drain, open ground, and water bodies.

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

4.3 Open Defecation:

From HH surveys, KIIs and FGDs, it was found that 100% of citizens use some 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 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 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 Chandpur municipality:

- ✓ The proportion of FS in septic tanks, fully line tanks, and line, open bottom tanks are considered 71%, 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 population of Chandpur Municipality was 159,021. The urban population growth in Chandpur 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 238,402.
- ✓ There are around 6.7% 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, 6.7%). Based on the household survey, variable F3 for system T1A4C10 is set to 67%.
- ✓ There are around 35.4% 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, where there is no ‘significant risk’ of groundwater pollution (system T1A5C10, 35.4%). 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 62%.
- ✓ 3% 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 33% 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 33%.
- ✓ There are 35% of septic tanks connected to the open drain, water bodies, open ground and ‘don’t know where which are empties within 2-5 years. Based on the household survey, variable F3 for systems T1A2C6, T1A2C7, T1A2C8 and T1A2C9 are set to 35%.
- ✓ 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: Chandpur Municipality', by municipal office.
- https://www.gps-latitude-longitude.com/gps-coordinateshttp://bmd.gov.bd/p/Rainfall-Situation-202

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

- KII with Mayor, Chandpur Municipality.
- KII with Conservancy Inspector, Chandpur Municipality.
- KII with Sanitary inspector, Chandpur Municipality.
- KII with Engineer, Chandpur Municipality.
- Facilitators: Md. Mynul Islam Hemel, Field Coordinator, Tiller.

Figure 7: KIIs with different stakeholders in Chandpur. (Source: *Feasibility study 2020-21/DPHE).*

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

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

Figure 8 : Focus Group Discussions in Chandpur. (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 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. Advocate Zillur Rahman Jewel, Mayor, Chandpur Municipality, Mr. AHM Shamsuddoha, Executive Engineer, Chandpur Municipality; Mr.Md. Abul Kalam Bhuyan, Secretary, Mr. Chandranath Ghosh, Slum Development Officer, Chandpur 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 Mr. Advocate Zillur Rahman Jewel, Mayor, Chandpur 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.

Chandpur Municipality, Bangladesh, 2022

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