SFD Lite Report

Mirzapur Municipality, Tangail Bangladesh

This SFD Lite Report was prepared by
Onushandhani Creeds (O.CREEDS) Ltd.
and CWIS-FSM Support Cell, DPHE

Date of last update: 16/09/2021

1 The SFD Graphic

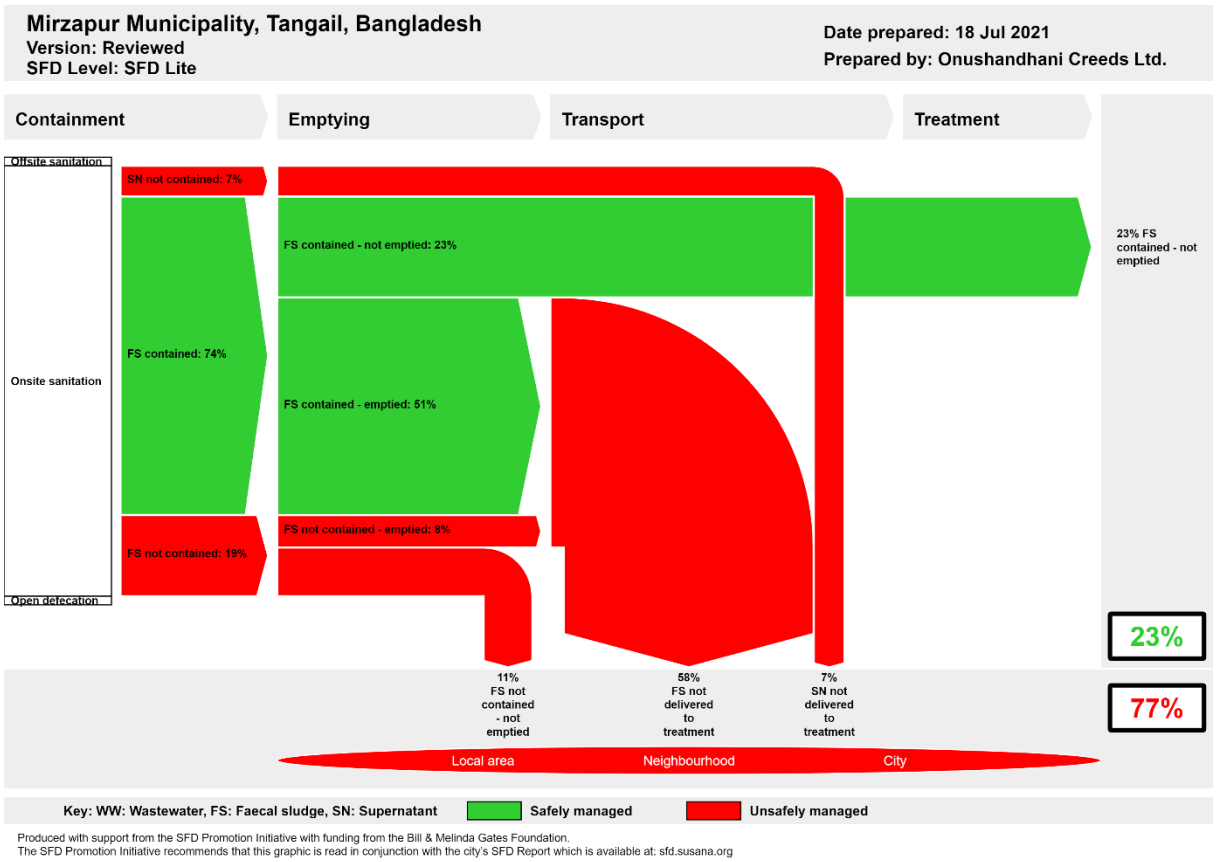

Figure 1: SFD Graphic for Mirzapur municipality

2 SFD Lite information

Produced by:

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- This report was compiled as part of the Rapid Assessment, conducted during the baseline data collection of the **'Arsenic Risk Reduction Project'** on 14-15 July 2021. The project was implemented under the supervision of the Department of Public Health Engineering (DPHE). Information and data were collected which included project documents, master plans and town information 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 rapid assessment was conducted from 14 July 2021 to 15 July 2021. It includes household surveys, Key Informant Interviews (KII), Focus Group Discussions (FGDs) and physical feature surveys. Total 120 households have been surveyed in the 9 wards of Mirzapur Municipality. KIIs were conducted with the Administrative Officer and Sanitary Inspector of the municipality.
- We would like to thank Mr.Shib Prosad Sutrodhar, Administrative officer, Mirzapur Municipality; Md. Bahar Uddin, Assistant Engineer, DPHE, Mirzapur Upazila Local Masons, Emptier of Mirzapur municipality for providing all the required primary and secondary data and cooperating for Key Informant Interviews (KIIs) & Focussed Group Discussions (FGDs). We would also convey our

gratitude to Md. Shahadat Hossain, CEO, O.CREEDS Ltd for his guidance and directions to prepare the report.

Collaborating partners:

- Mirzapur Municipality, Tangail District, Dhaka Division, Bangladesh
- Centre for Science and Environment (CSE), New Delhi, India
- CWIS-FSM Support Cell, DPHE, Bangladesh.

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3 General city information

Mirzapur municipality is one of the commercially significant towns under the Tangail District in Bangladesh. It is located about 54 Km northeast of Dhaka, the capital of Bangladesh. It has an administrative area of about 8.58 sq. km. There are 9 wards in Mirzapur municipality.

According to the population census in 2011 by the Bangladesh Bureau of Statistics (BBS), the population of Mirzapur municipality was 28,602 residing in 7625 households. The urban population growth in Mirzapur municipality is considered 1.3% per year. Considering 8%-10% floating population, such as

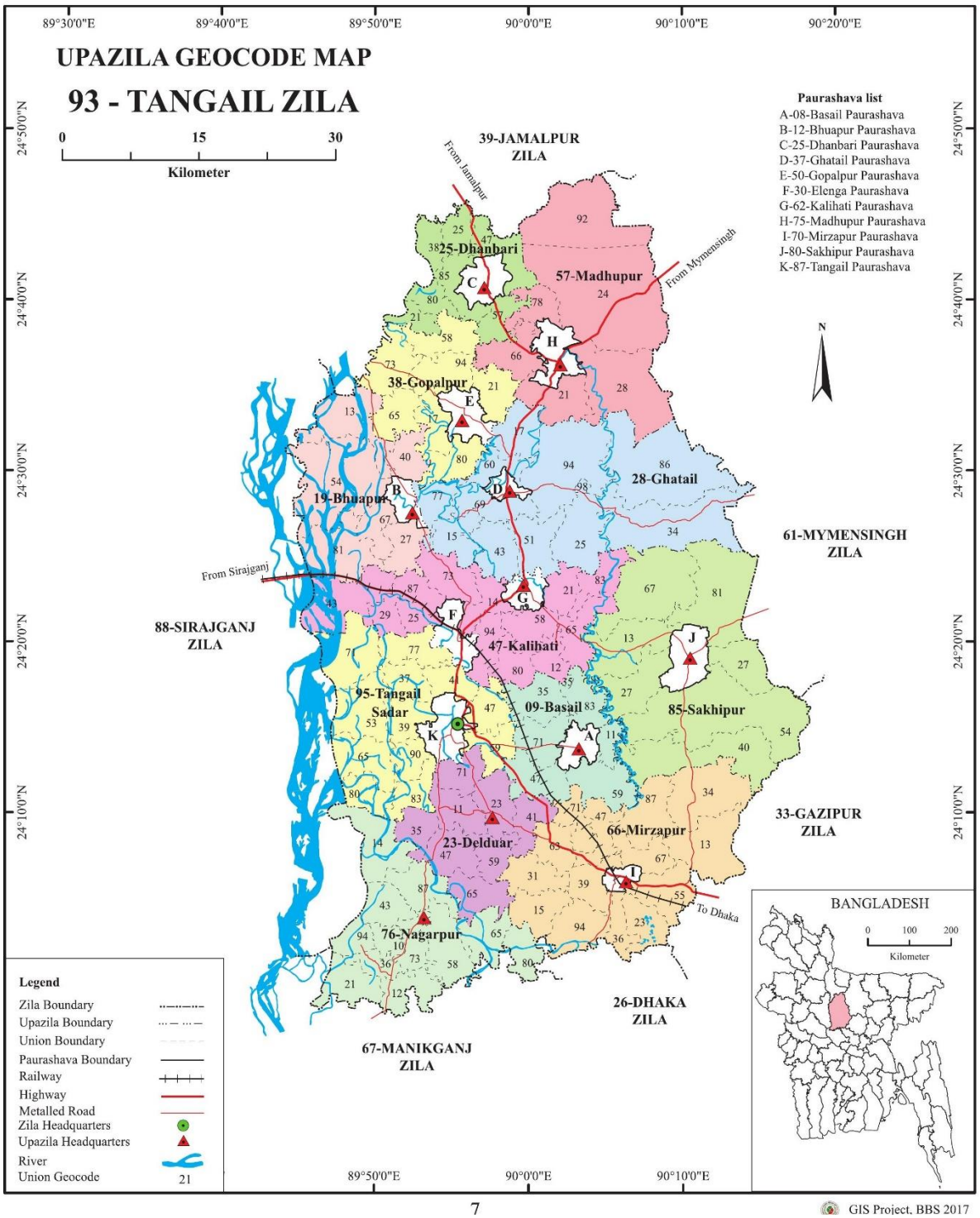

Figure 2: Mirzapur municipality Location Map (BBS/ GIS report 2017)

farmers and traders come to the city every day, the present (2021) population is estimated to be around 42,456 [1]. The population density within the city is 3300 per sq. km.

Table 1: City Profile
(Source: Mirzapur municipality at a glance & KII with Municipality Administrative Officer)

Population Parameters	
Estimated population, 2021	42456
Area	8.58 sq. km
Estimated Population density, 2021	3300 per sq.km
Total Road	44.78km
Total Drain	4 km

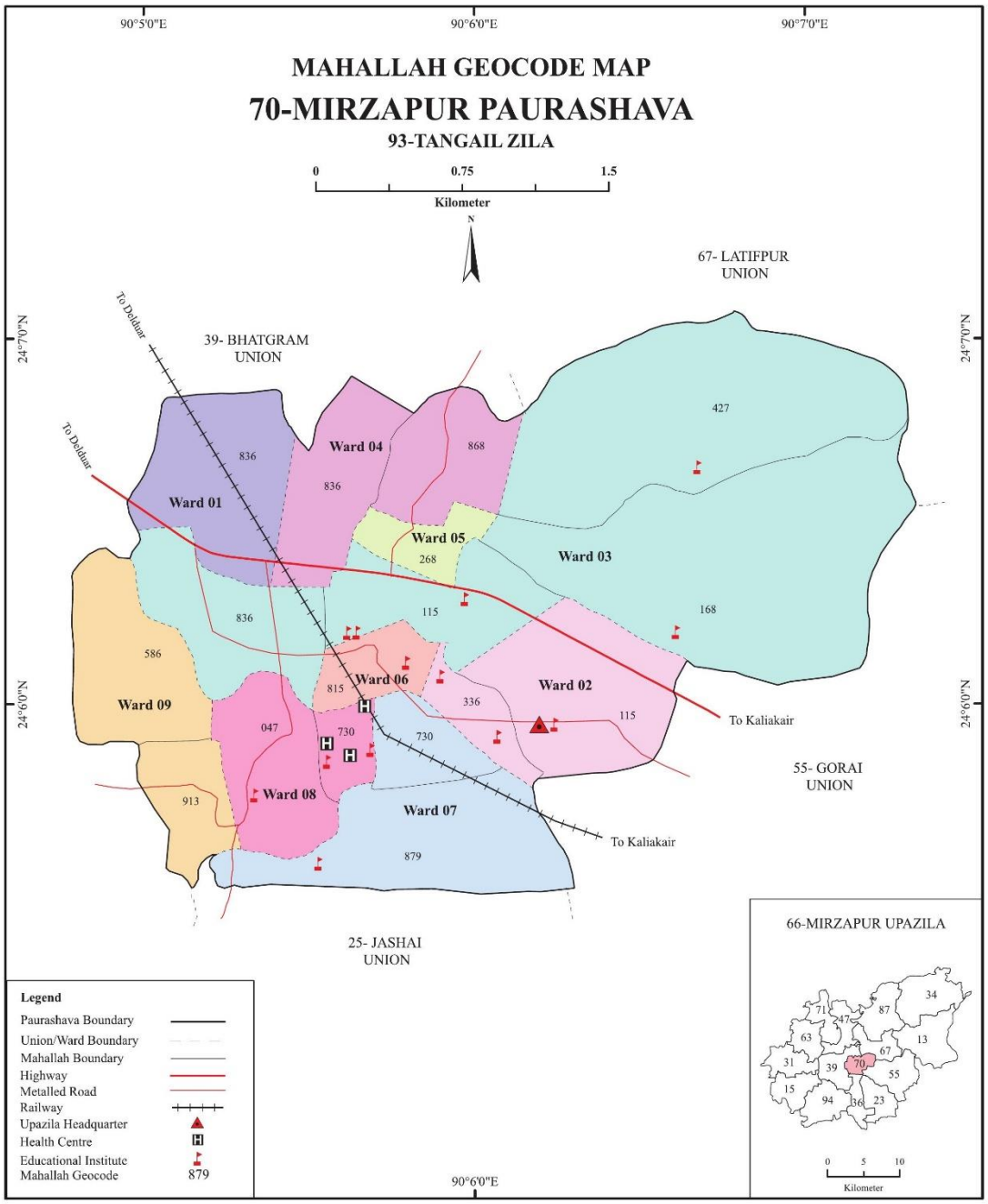

Figure 3: Mirzapur municipality Ward Boundary Map (BBS/ GIS report 2017)

[1] http://203.112.218.65/WebTestApplication/userfiles/Image/PopCen2011/C_Tangail.pdf

The Municipality covers an area of 8.58 square kilometers including nine administrative wards and 16 mahallahs. At present, the municipality has 44.78 km road of which 19.23 km reinforced cement concrete (RCC) road and 25.55 km earthen road. The City has about 4 km drain which includes 2.1 km reinforced cement concrete (RCC) and 2.1 km earthen drain[2] (Table 1).

The geographical coordinates of Mirzapur are 24.1083°N and 90.0917°E[3]. In the context of Bangladesh, the municipality area is a medium highland. The topography of Mirzapur municipality is mostly plain. It is elevated 16 m (52.5 feet) above sea level. Most of the land is used for agricultural purposes[4]. *(Source: KII with Administrative Officer, Mirzapur Municipality)*

According to the Bangladesh Meteorological Department (1981-2017)[5], the city area and surrounding area are experiencing a tropical monsoon climate. The average rainfall in the area is 324.2 mm during July. The maximum temperature is observed to be 27°C in April and the minimum temperature is observed to be 17°C in January.

The municipality is crossed over by Turag River. According to the flood zoning map of Bangladesh, the city is in a flood-prone zone (in the last 12 years flooding event happens). However, the drainage network of the city is not adequate[6].

The population density in the 9 wards of the city is shown in Table 2. Ward no. 3 is a highly-populated area. The low-income group resides in wards no. 4 and 5. There are three (03) slums in the municipality, named *Kankhali Rishi Para* in ward no. 9 and *East Sadagarpara* and *West Sadagarpara* in ward no 4. There are three public toilets within the municipality- near the old bus stand, near the new bus stand and inside the *katcha Bazar* (marketplace) *(Source: KII with Administrative Officer, Mirzapur Municipality).*

Table 2: Population in 9 Wards of Mirzapur municipality
(Source: KII with Administrative Officer, Mirzapur Municipality)

Ward No	Population
Ward 1	3699
Ward 2	8271
Ward 3	8657
Ward 4	4222
Ward 5	3102
Ward 6	4881
Ward 7	2677
Ward 8	4159
Ward 9	2788

In Mirzapur municipality, there is no piped water supply system. The main source of water for drinking and household use is either hand tubewell or tubewell with a submersible pump or electric pump. The depth of these tube wells varies from 30 meters to 55 meters in different areas *(Source: KII with Assistant Engineer of Department of Public Health Engineering (DPHE) at Mirzapur Upazila).*

There is no solid waste collection and disposal facility operated by the conservancy department of the municipality in the town. However, in most areas, solid waste is dumped in nearby dustbins or water bodies or open ground. There is no sewerage system within the city.

[2] Source: 'At a Glance: Mirzapur Municipality', by municipal office
[3] Source: https://www.gps-latitude-longitude.com/gps-coordinates
[4] https://www.floodmap.net/Elevation/ElevationMap/?gi=1185165
[5] http://bmd.gov.bd/p/Rainfall-Situation-202
[6] KII and field visit during Rapid ssessment 2021

4 Service outcomes

Mirzapur Municipality, Tangail, Bangladesh, 18 Jul 2021. SFD Level: SFD Lite
Population: 42456
Proportion of tanks: septic tanks: 69%, fully lined tanks: 0%, lined, open bottom tanks: 100%

Containment						
System type	Population	FS emptying	FS transport	FS treatment	SN transport	SN treatment
	Pop	F3	F4	F5	S4e	S5e
System label and description	Proportion of population using this type of system (p)	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
T1A2C5 Septic tank connected to soak pit	10.0	75.0	0.0	0.0		
T1A2C6 Septic tank connected to open drain or storm sewer	23.0	42.0	0.0	0.0	0.0	0.0
T1A2C9 Septic tank connected to 'don't know where'	3.0	42.0	0.0	0.0		
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	10.0	17.0	0.0	0.0		
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	48.0	91.0	0.0	0.0		
T1B7C10 Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow	6.0					

Table 3: SFD Matrix for Mirzapur municipality

The outcome of the SFD graphic shows that only twenty-three percent (23%) of the excreta flow is classified as safely managed, and the remaining seventy-seven (77%) percent is classified as unsafely managed (Figure 1). The unsafely managed excreta origínate from Faecal Sludge (FS) not delivered to treatment (58%), FS not contained - not emptied (11%) and 7% of supernatant (SN) not delivered to treatment.

The percentages proportion of the overall population is presented in Table 3 and discussed in this section are based on data collected through household surveys, key informant interviews (KIIs) and Focus Group Discussions (FGDs) (*Figure 3*). Total 120 households' questionnaire survey was conducted in the 9 wards of Mirzapur municipality. An FGD with the sweepers at the Sweeper colony was conducted. KIIs were done with the Municipality Administrative Officer and Assistant Engineer of DPHE of Mirzapur Municipality.

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 septic tanks are directly connected to open drains or storm sewer. Therefore, the T1A2C6 system is considered as 23% of the total population of the city to generate the SFD graphic. In the absence of a sewerage system, the supernatant in T1A2C6 is directly discharged into the river or the environment untreated.

4.2 On-site Sanitation Systems

Figure 3: Household survey and consultations; (Left: Household survey; Right: Consultation meeting with Municipality Administrative Officer) (Source: Field visit in Mirzapur Municipality, 14 July 2021)

Containment: All the households (100%) in the city have their own latrine which is connected to single pits, twin pits, or septic tanks. From the rapid assessment, it was found that only 36% of the city population uses septic tanks as the containment system, 48% of the toilets have single pit systems, 10% of people use double pits in the city and 6% of the toilets have pits (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow (KII, FGDs, Household visit and rapid assessment, 2021).

Figure 4: Left: Septic tank connected to a nearby drain. Right: Septic tank connected to soak pit (Source: Field Visit, 14 July 2021)

According to the type of connectivity and features of containment technologies, the discharging points of the toilets are categorized as 10% of the population uses septic tanks connected to soak pits (T1A2C5), 23% uses septic tanks connected to open drain (T1A2C6), and 3% utilizes septic tanks connected to 'don't know where' (T1A2C9), 10% of the population uses lined tank with impermeable walls and open bottom, no outlet or overflow (T1A4C10), 48% of the population rely on the lined pit with semi-permeable walls and open bottom, no outlet or overflow (T1A5C10) and 6% of population use pit (all types), which are never emptied but abandoned when full and covered with soil, no outlet or overflow

(T1B7C10). Thus, at the containment stage, the city's excreta of only 74% of the population are contained. Figure 5 and 6 shows pictures of some of these sanitation technologies in operation. (KII, household visit and rapid assessment, 2021).

Left: Single Pit Latrine

Right: Double Pit Latrine

Left: Single Pit

Right: Double Pit

Left: Outlet connected to an uncovered drain

Right: Outlet connected to an uncovered drain

Figure 5: Containment technologies and their connections in Mirzapur (Source: Field Visit, 14 July 2021).

Groundwater Pollution: The groundwater level below the ground surface is 30-55 meters (Source-DPHE). The most common drinking water production technology is a borehole with a hand pump or motorized pump. Over 58% of the households use their own tubewell fitted with an electric motor and 42% use own hand pump tubewell. There is no pipeline supply water system in Mirzapur Municipality.

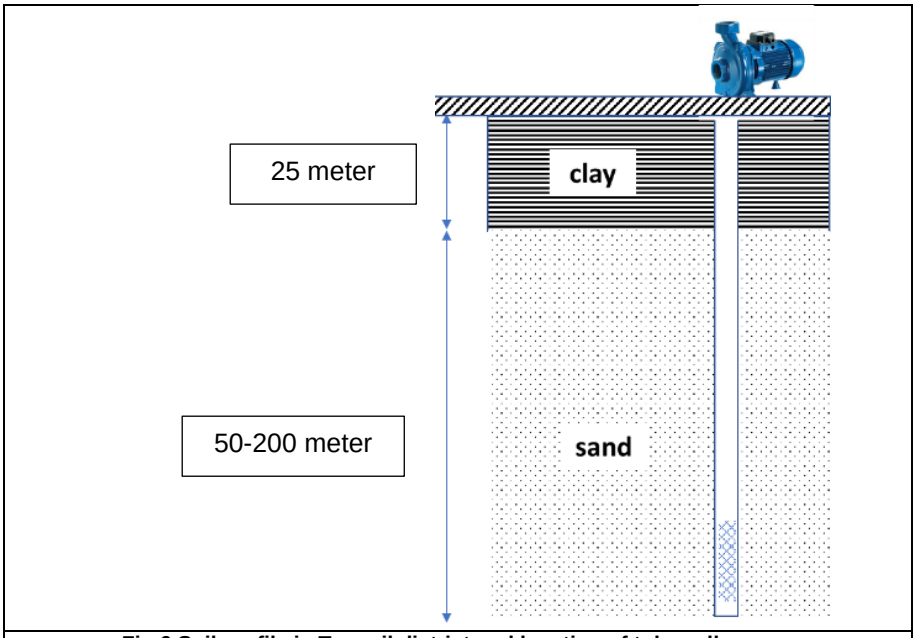

Fig 6 Soil profile in Tangail district and location of tubewell screen

Lateral separation between sanitation facilities and water sources varies from one area to another. The main source of drinking water is tube well. Tube wells of different sizes and depths are generally used to pump water from the confined aquifers. During the household visit and FGDs, it is found that less than 25% of sanitation facilities are located within 10 meters from the groundwater source. Besides, due to the geographical situation, sanitation facilities are not located uphill of the groundwater sources. According to a survey report on 'Hydrogeological screening, slug test and geophysical logging on observation well units', conducted by the Department of Public Health Engineering (DPHE), drinking water is collected from the confined aquifer (20 m – 200 m) through pumps. Therefore, a low risk of groundwater contamination is considered in the city.

Emptying: Households relying on septic tanks and pits have to arrange themselves for emptying of the faecal sludge. It is observed from the baseline survey that most of the septic tanks have been constructed in the last 5-6 years. According to the rapid assessment, the frequency of emptying of septic tanks or covered pits varies from 1 to 10 years depending upon the size, uses, etc.

In Mirzapur Municipality, about 75% of the septic tanks, connected to the soak pit are emptied within 2-5 years. About 42% of the septic tanks connected to open drains, open ground or water bodies are emptied within 4-5 years. The single pit latrines are emptied more frequently. Almost 91% of single pit latrines and 17% of double 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 pits is fully (100%) done by private sweepers. Around 25 % of this withdrawal is done manually using a bucket and rope. This manual method has high risks for the health and safety of the workers. A significant number (75%) of emptying are done using electric pumps – this reflects the use of safe and improved technologies for sludge

emptying. The municipal authority has no mechanical emptying truck for sludge emptying and transportation[7]. (*Data source: Field survey, 2021*).

Transportation: The sludge withdrawn from the septic tanks and latrine pits by the cleaners is disposed of in various places. Based on the rapid assessment of July 2021, it is observed that most of the sludge (95%) is withdrawn from the septic tanks and latrine pits by the private sweepers is disposed of either in open drains or nearby water bodies (locally known as "khals"). According to the sweepers, they have a motorized pump, they withdraw the sludges and transport them to the nearby drains or water bodies with pipes. Only a small portion (5%) is disposed of in a dug hole and covered with soil away from the house. *(Data source: Field survey, 2021)*

Treatment/Disposal: There is no faecal sludge treatment plant or facilities in Mirzapur municipality.

4.3 Open Defecation

From the Household visit, rapid assessments, 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.

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

5 Data and assumptions

The rapid assessment conducted in July 2021 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 Mirzapur municipality:

- The proportion of FS in septic tanks, fully line tanks and lined, open bottom tanks were considered 69%, 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 Municipality population was 28,602. The urban population growth in Mirzapur is considered 1.3% per year. Considering the floating population, such as farmers and traders, comes to the city every day, the present (2020) population is estimated to be around 42,456.
- 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 a lined tank with impermeable walls and open bottom (system T1A4C10, 10%). Based on the household survey, variable F3 for system T1A4C10 is set to 17%.
- There are around 48% 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, 48%). 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 91%.
- 10% 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 75% 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 75%.
- There were 42% of septic tanks connected to the open drain and ‘don’t know where' which got emptied within 4-5 years. Based on the household survey, variable F3 for systems T1A2C6 and T1A2C9 are set to 42%.
- Supernatant in T1A2C6 is 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)
- 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: Mirzapur Municipality', by municipal office
- https://www.gps-latitude-longitude.com/gps-coordinateshttp://bmd.gov.bd/p/Rainfall-Situation-202
- https://www.floodmap.net/Elevation/ElevationMap/?gi=1185165

Key Informant Interviews (KII) on 14-15 July 2021

- KII with Municipality Administrative Officer, Mirzapur Municipality.
- KII with Assistant Engineer, DPHE, Mirzapur Municipality.
- Facilitators: Maria Abdullah Tarin, Assistant Research Officer, Onushandhani Creeds (O.CREEDS) Limited.

Other sources of information

- The household survey, FGD conducted by Maria Abdullah Tarin, Assistant Research Officer, Onushandhani Creeds (O.CREEDS) Limited and Md. Ashifur Rahaman, Junior GIS Specialist, O.CREEDS Ltd. The survey was carried out on 14-15 of July, 2021.
- Physical observation by O.CREEDS Ltd. Team

Figure 7: FGD with the Sweepers at Sweeper colony

Figure 8: O.CREEDS Ltd. Team at DPHE, Mirzapur

(Source: Field Visit, 14-15 July 2021)

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