SFD Lite Report

Narsingdi Municipality
Bangladesh

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

Date of production: 13/01/2022

1 The SFD Graphic

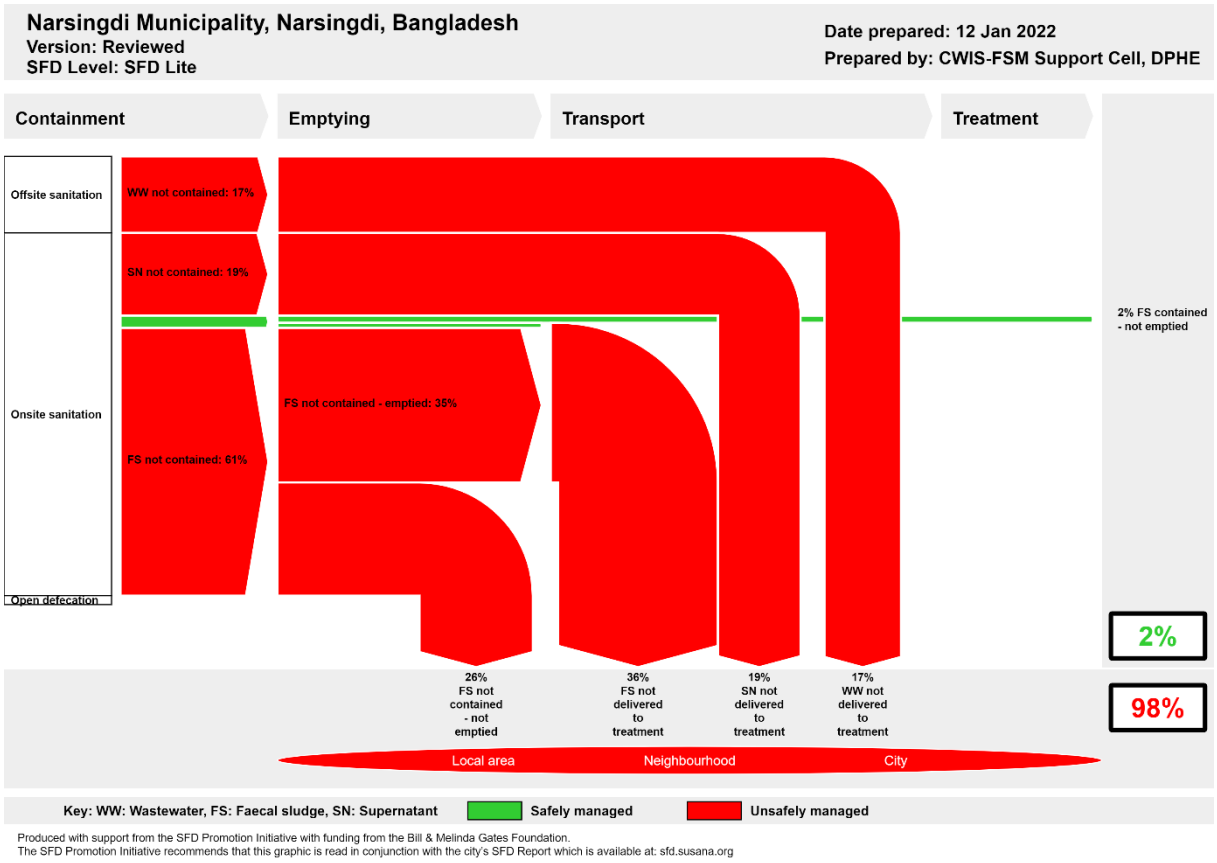

Figure 1: SFD Graphic for Narsingdi municipality

2 SFD Lite information

Produced by:

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- 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. Al-hajj Md. Kamruzzaman, Mayor, Narsingdi Municipality, Mr. Mahfuzur Rahman, Secretary, Narsingdi Municipality, Mr. Md. Tariqul Islam Bhuiyan, Executive Engineer, Mr. Md. Sohrab Hossen, Urban Planner, Ms. Selina Khatun, Slum development Officer, Narsingdi 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. Al-hajj Md. Kamruzzaman, Mayor, Narsingdi 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.

Collaborating partners:

- DevCon, Tiller and Narsingdi 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

Narsingdi municipality stands on the bank of the Branch of the River Meghna and is located adjacent to the Dhaka-Sylhet National Highway and 57 km East of the capital city Dhaka. It is well connected with road, water, and railways. The city is well known for its small and medium industries, like textile mills, dyeing mills, agro-industries and other processing mills which are the remarkable sources of water pollution. It was declared as a Municipality in 1972. Narsingdi is one of the 53 district-level municipalities in the country.

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

Population parameters	
Estimated population, 2020	196,708
Households, 2020	40,185
Area, sq.km	14.75
Total roads, km	104.70
Total drains, km	42.29

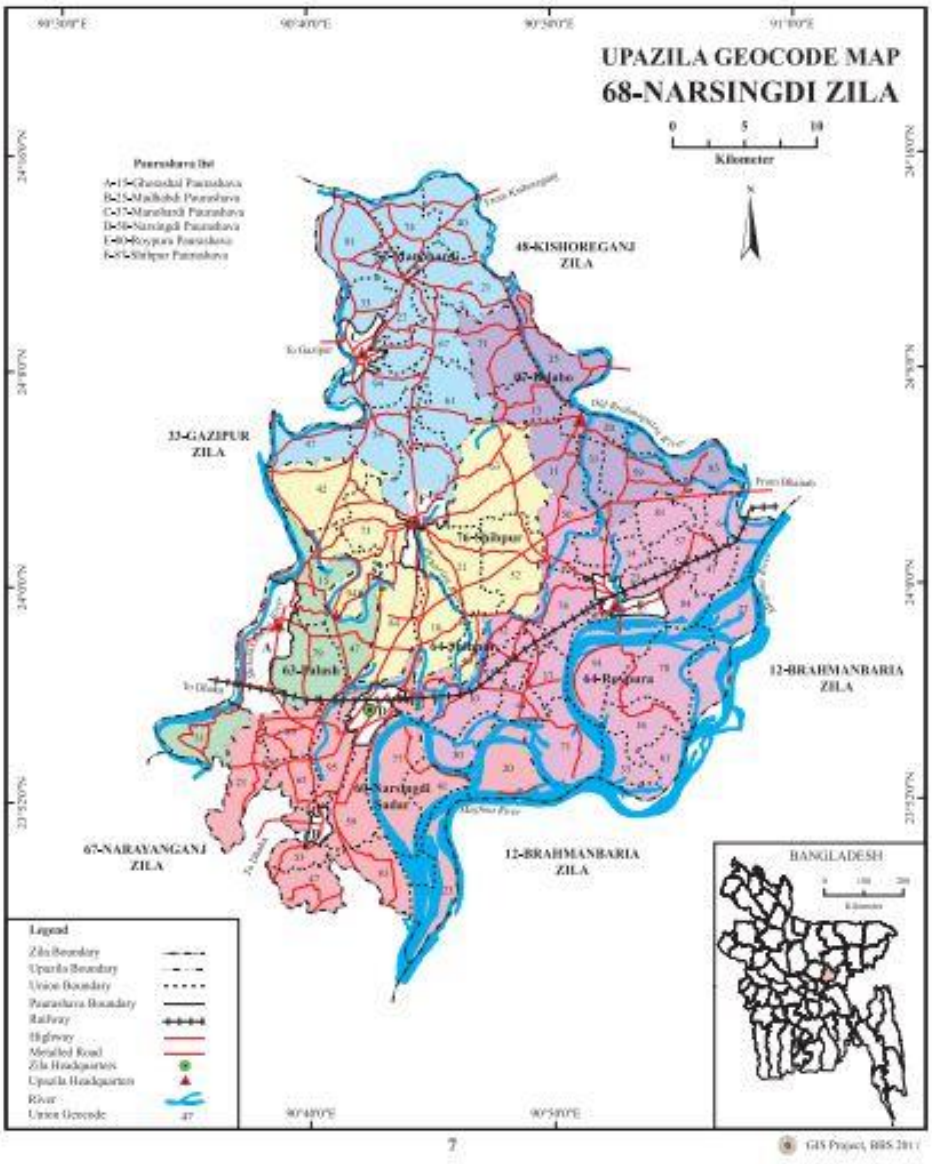

Figure 2: Narsingdi municipality Location Map (BBS/ GIS report 2017)

According to the population census in 2011 by the Bangladesh Bureau of Statistics (BBS), the Narsingdi Municipality population was 146,115. The urban population growth in Bangladesh is 3.5% per year and in Narsingdi it is 2.27%. Considering 10% floating population, such as farmers and traders, comes to the city every day, the present (2020) population is estimated to be around 196,708 (Table 1).

The Municipality covers an area of 14.75 square kilometers. At present Narsingdi Municipality has 104.70 km road of which 77.55 km is bituminous road and 27.15 km earthen road. The city has about 42.29 km Reinforced concrete cement (RCC) drain (Table 1)[1].

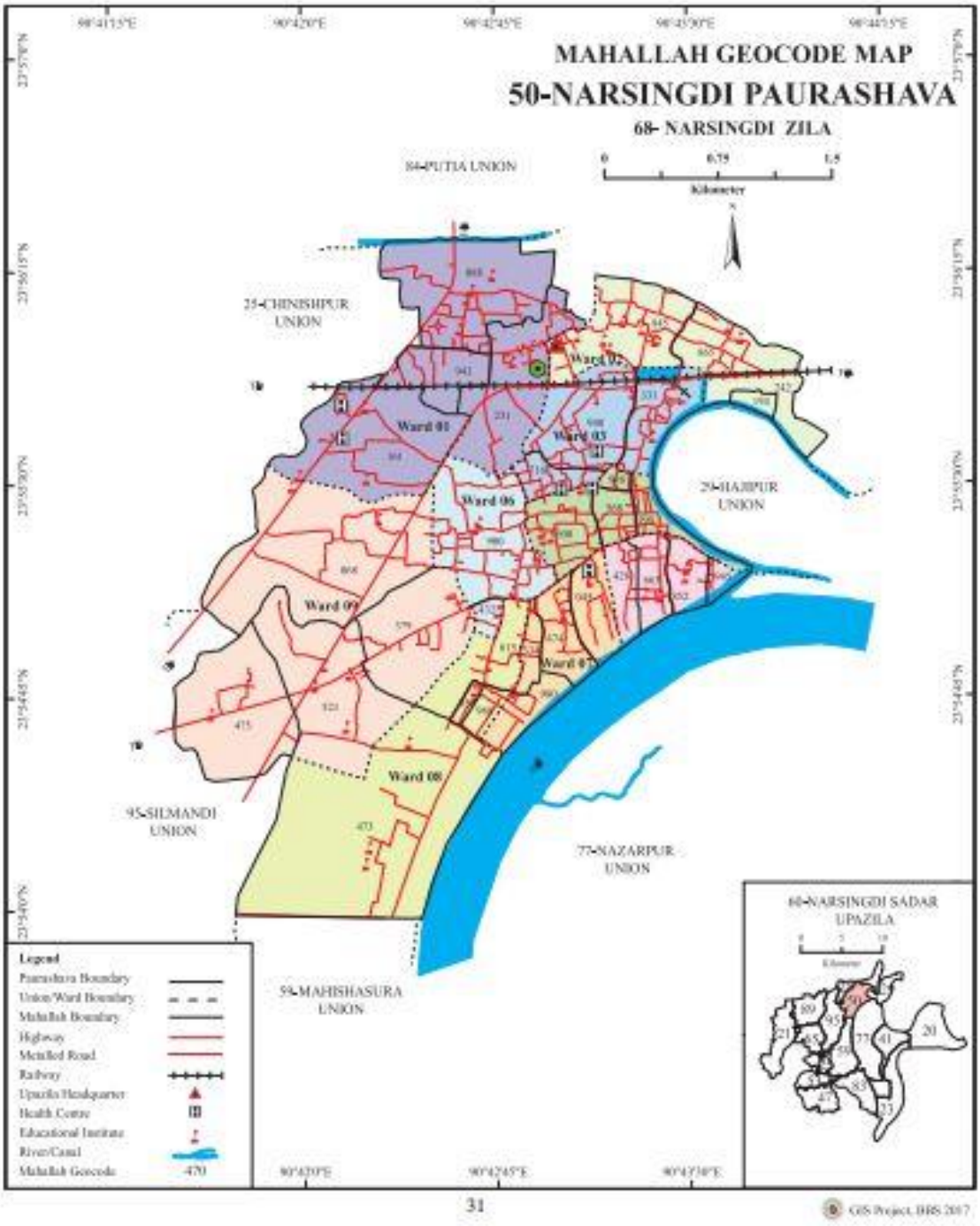

Figure 3: Narsingdi Ward Boundary Map (BBS/ GIS report 2017)

[1] *Source: 'At a Glance: Narsingdi Municipality', by municipal office*

The geographical coordinates of Narsingdi are 23°55'22.73"N 90°43'3.65"E[2]. In the context of Bangladesh, the Municipality area is low to moderately high. Meghna River passed by the northern-eastern boundary of the Municipality.

According to the Bangladesh Meteorological Department (1981-2017)[3], the city area and surrounding area is experiencing a tropical monsoon climate. It is characterized by warm, humid summers and cool, and dry winters. There is no climatological station within the Municipality. The closest meteorological station of Bangladesh Meteorological Department is located in Dhaka which is about 35 km away from the Municipality area. Weather data from these two stations is collected from 1981 to 2017. About 90% of the total annual rainfall occurs in the period from May through October & the driest months of the years are November to March. The maximum mean temperature observed is 31.4-33.7°C between April-August, with the minimum mean temperatures of between 12.7-14.1°C in December-January. The annual average rainfall is about 2148 mm, according to BMD (1981-2017).

Meghna River passed by the northern-eastern boundary of the Municipality. A tributary passed the northern-eastern side of the Municipality. According to the flood zoning map of Bangladesh, the city is in a flood-free zone (in the last 12 years no flooding event happens). However, the drainage network of the city is not adequate. Every year, many city areas face water logging during the monsoon for drainage congestion[4]. There are some secondary drains caring stormwater and domestic wastewater to the outfalls the rivers and canals.

The population density in the 9 Wards of the city is shown in Figure 4. The density is high in the north, ranging from 25,001 to 32,804 per sq km. The population density in the South-west is lower, ranging from 6,018 to 10,000 per sq km[5].

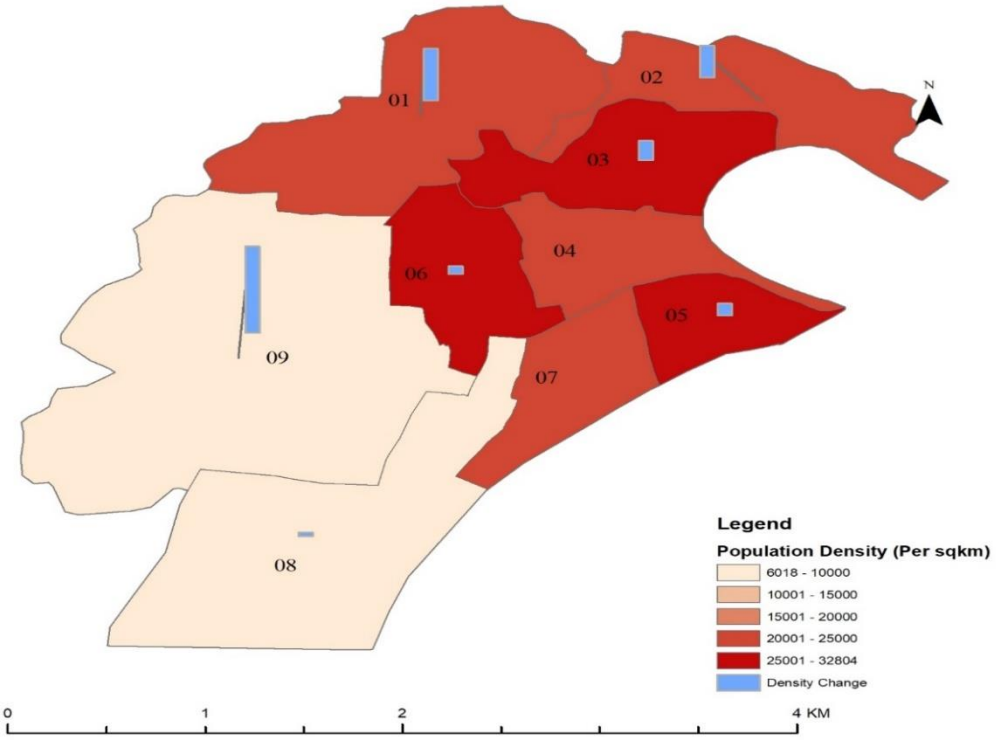

Figure 4: Population density in different Wards of Narsingdi Municipality

[2] Source: https://www.gps-latitude-longitude.com/gps-coordinates
[3] http://bmd.gov.bd/p/Rainfall-Situation-202
[4] KII and field visit during Baseline survey 2020
[5] KII and field visit during Baseline survey 2020

4 Service outcomes

Narsingdi Municipality , Narsingdi, Bangladesh, 12 Jan 2022. SFD Level: SFD Lite
Population: 196708
Proportion of tanks: septic tanks: 60%, 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	17.4	0.0	0.0					
T1A2C5 Septic tank connected to soak pit	1.5			57.0	0.0	0.0		
T1A2C6 Septic tank connected to open drain or storm sewer	47.0			58.0	0.0	0.0	0.0	0.0
T1A2C7 Septic tank connected to open water body	3.5			58.0	0.0	0.0		
T1A2C8 Septic tank connected to open ground	4.8			58.0	0.0	0.0		
T1A2C9 Septic tank connected to 'don't know where'	2.0			58.0	0.0	0.0		
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	1.3			50.0	0.0	0.0		
T1B10 C7 TO C9 Containment (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) failed, damaged, collapsed or flooded - connected to water bodies, or open ground or 'don't know where'	3.0			0.0	0.0	0.0		
T1B8C10 Pit (all types), never emptied, abandoned when full but NOT adequately covered with soil, no outlet or overflow	2.0							
T2A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	16.0			95.0	0.0	0.0		
T2A6C10 Unlined pit, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	1.4			0.0	0.0	0.0		

Table 2: SFD Matrix for Narsingdi municipality

The outcome of the SFD graphic shows that only two percent (2%) of the excreta flow is classified as safely managed, and the remaining ninety-eight (98%) percent is classified as unsafely managed (Figure 1). The unsafely managed excreta originate from wastewater not delivered to treatment (17%), Faecal Sludge (FS) not delivered to treatment (36%), FS not contained - not emptied (26%) and 19% of supernatant not delivered to treatment. The safely managed excreta originate from FS contained - not emptied (2%).

The percentages presented in Table 2 and discussed in the next section are based on data collected through household surveys, key informant interviews (KII) and focus group discussions (FGDs) (Figure 5).

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 17.4% of the total population of the city to generate the SFD graphic. Similarly, the T1A2C6 system is considered 47% 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 into the river or the environment untreated.

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 (98%) 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 (1.1%) and neighbour's toilets (0.88%). From a household survey, it is found that over half of the city population (58.90%) uses septic tanks as the containment system, 16% of the toilets have single pit systems, and 1.3% of people use double pits in the city. About 1.4% of people have an unlined pit, 3% of toilets have containments (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) that are failed, damaged, collapsed or flooded and connected to water bodies, or open ground or 'don't know where', 2% of toilets have pit (all types), which are never emptied, abandoned when full but NOT adequately covered with soil, no outlet or overflow and 17.4% do not have any type of containment and discharge 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: 1.5% population uses septic tanks connected to soak pits (T1A2C5), 47% population uses septic tanks connected to open drain (T1A2C6), 3.5% population uses septic tanks connected to water bodies (T1A2C7), 4.8% population uses septic tanks connected to open ground (T1A2C8), 2% population uses septic tanks connected to 'don't know where' (T1A2C9), 1.3% population uses lined tanks with impermeable walls and open bottom, no outlet or overflow (T1A4C10), 16% of the population relies on the lined pit with semi-permeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution (T2A5C10). Nearly, 1.4% of the population uses unlined pit, no outlet or overflow, where there is a 'significant risk' of groundwater pollution (T2A6C10), 3% of toilets have containments (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) that are failed, damaged, collapsed or flooded and connected to water bodies, or open ground or 'don't know where' (T1B10 C7 TO C9), 2% of toilets have pits (all types), which are never

emptied, abandoned when full but NOT adequately covered with soil, no outlet or overflow (T1B8C10) (KII, FGDs, HH survey, 2020). Thus, at the containment stage, the city's excreta of only 3% of the population are contained. Figure 5 shows pictures of these technologies in use.

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

Groundwater Pollution: The groundwater level below the ground surface is 5-6 m. The most common drinking water production technology is a borehole with a hand pump or motorized pump. 44.18% of the households use their own tube well fitted with electric motor and 39.78% use own hand pump tubewell. Only 10% of households use supply water. 6.5% of the households rely on unsafe sources, like ponds, canals.

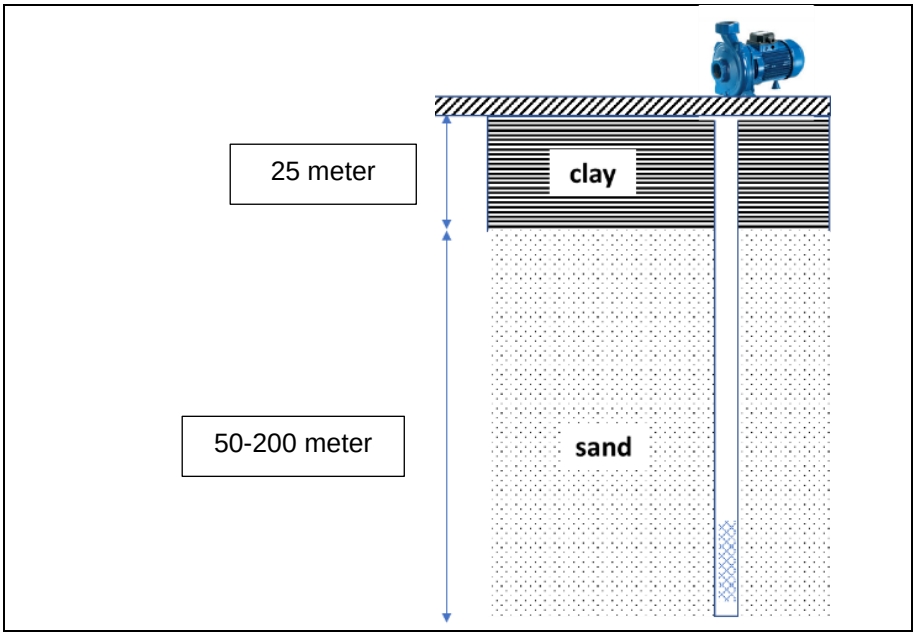

Fig 7 Soil profile in Narsingdi district and location of tubewell screen

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 (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 is 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 57% of the septic tanks, connected to the soak pit are emptied within 2-5 years. About 58% of the septic tanks connected to open drains, open ground or water bodies are emptied within 4-5 years. Almost 97% 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 (91%) done by private sweepers. Only in a few households, desludging is done by municipal sweepers (2%), family members (6%), and private agencies (1%). Around 65.8 % of this withdrawal is done manually using a bucket and rope. Besides 23% of the withdrawal is done by electric pumps, The manual method has high risks for the health and safety of the workers. These reflect the absence of safe and improved technologies for sludge emptying. The municipal authority has one Vacutug, a mechanical collection tanker, that is not yet being used, [6]hence there is no mechanical emptying service in this municipality.

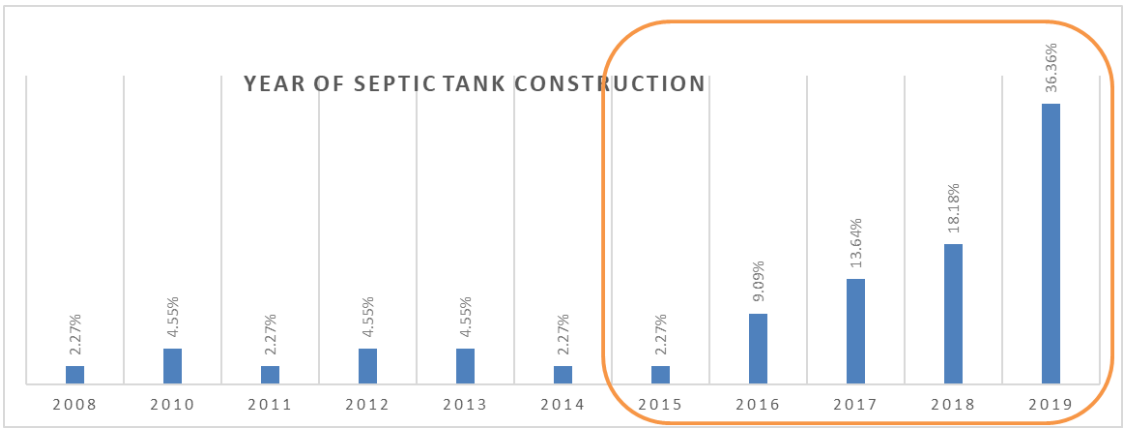

Fig 8 Year of septic tanks construction

Transportation: The sludge withdrawn from the septic tanks and latrine pits by the cleaners is disposed of in various places. Based on the survey from 2020, it is observed that about 35% 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. Besides, the sludge disposed into the canal and river is 10%, into the drain is 31%, open ground 4%, whereas 19% of respondents did not have any idea about sludge disposal.

Treatment/Disposal: Presently, there is a faecal sludge treatment plant in the town which is abandoned. The municipality authority was responsible to operate this plant.

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. 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 baseline survey conducted in October 2020 contains detailed data on different stages of the sanitation value chain. The SFD matrix is generated from these data, collected during sample household surveys, along with informal interviews, open-ended consultations, key informant interviews and focus group discussions with the municipality officials, town level coordination committee, households, social workers, business persons, pit emptiers and the citizens including women in all the wards of the municipality. The SFD matrix was generated from these data. Finally, data from all these sources were triangulated to produce the SFD matrix, the SFD graphic and the SFD lite report.

The last census was carried out about 10 years ago. So, the actual population, household, and sanitation data are not updated yet. Most of the households with septic tanks do not know the actual type, size, and design desludging periods. Also, a large number of pit users are unaware of the emptying events and frequency of their 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 Narsingdi municipality:

- ✓ The proportion of FS in septic tanks, fully line tanks, and line, open bottom tanks are considered 60%, 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 Narsingdi Municipality population was 146,115. The urban population growth in Narsingdi is 2.27% 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 196,708
- ✓ There are around 1.3 % of twin pit latrines in the containment system. So, it is assumed that all these twin pit containment technologies are defined as Lined tank with impermeable walls and open bottom, no outlet or overflow (system T1A4C10, 1.3%). Based on the household survey, variable F3 for system T1A4C10 is set to 0%.
- ✓ There are around 16% of single pit latrines in the containment systems. So, it is assumed that all these single pit containment technologies are defined Lined pit with semi-permeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution (system T2A5C10, 16%). All of the single pit latrines are found to be emptied within 1-2 years. Based on the household survey, variable F3 for system T2A5C10 was set to 95%.
- ✓ 1.5% 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 57% 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 57%.
- ✓ There are 58% of septic tanks connected to the open drain, open ground, water bodies 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 58%.
- ✓ 1.4% of containments are found as Unlined pit, no outlet or overflow, where there is a 'significant risk' of groundwater pollution (T2A6C10), These systems are never emptied (variable F3 set to 0% and hence, variables F4 and F5 are also both set to 0%).
- ✓ 3% of the populations have containments (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) that are failed, damaged, collapsed or flooded and connected to water bodies,

or open ground or 'don't know where' (T1B10 C7 TO C9). These systems are never emptied (variable F3 set to 0% and hence, variables F4 and F5 are also both set to 0%).

- ✓ 2% of toilets have pits (all types), which are never emptied, abandoned when full but NOT adequately covered with soil, no outlet or overflow (T1B8C10). 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 were set to 0%.
- ✓ Since there are no operational wastewater or faecal sludge treatment plant in the town and all the collected FS is disposed untreated into the environment, variables F4 and F5 for all systems are considered to be 0%.

6 List of Sources

Reports, literature and website

- Bangladesh Bureau of Statistics (BBS), 2011.
- Population and Housing Census, 2011.
- Baseline Survey of the project "Feasibility for Implementing of Solid Waste and Faecal Sludge Management System in 53 District Level Municipalities and 8 City Corporations", Department of Public Health Engineering (DPHE), Dhaka, Bangladesh. (December 2020)
- Report on 'Hydrogeological Screening, Slug Test And Geophysical Logging on Observation Well Units' under *Bangladesh Rural Water Supply And Sanitation Project (BRWSSP),* Arsenic Management Division, Department Of Public Health Engineering (DPHE) (March 2017)
- MANAGING MUNICIPAL WASTE: APPLICATION OF SPATIAL TOOLS AND TECHNIQUES Showmitra Kumar Sarkar* and Md. Esraz-Ul-Zannat; Department of Urban and Regional Planning, Khulna University of Engineering & Technology, Bangladesh; Journal of Engineering Science 10(1), 2019, 113-122
- The revised 'National Strategy for Water Supply and Sanitation, 2021'
- 'At a Glance: Narsingdi Municipality', by municipal office
- https://www.gps-latitude-longitude.com/gps-coordinateshttp://bmd.gov.bd/p/Rainfall-Situation-202

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

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

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

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

- FSM Cleaner and Service Provider
- Solid Waste Collector
- Primary Collector of Solid Waste
- Masons
- School representatives
- Bazar Committee

- Slum Dwellers
- Medical representatives

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

Narsingdi Municipality, Bangladesh, 2022

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SFD Promotion Initiative