



SFD Lite Report

Narayanganj City Corporation Bangladesh

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

Date of production/ last update: 08/11/2021

1 The SFD Graphic

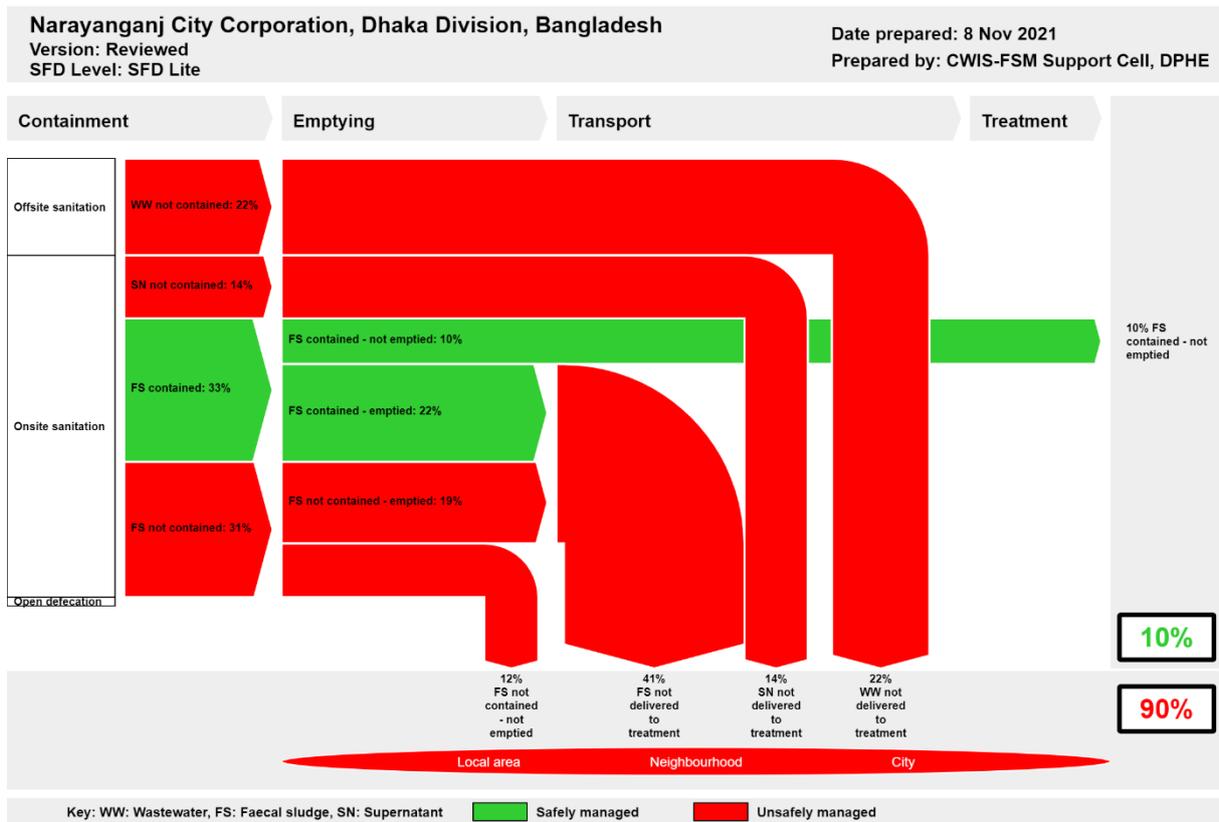


Figure 1: SFD Graphic for Narayanganj City Corporation.

2 SFD Lite information

Produced by:

- Dr. Abdullah Al-Muyeed, Chief Operating Officer, CWIS-FSM Support Cell, Shishir Kumar Biswas, Project Director, *Feasibility for Implementing of Solid Waste and Faecal Sludge Management System in 53 District Level Municipalities and 8 City Corporations*, Department of Public Health Engineering (DPHE) and Suman Kanti Nath, Technical Expert, CWIS-FSM Support Cell, Department of Public Health Engineering (DPHE), Bangladesh.
- 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 Narayanganj City Corporation 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

Narayanganj City Corporation, established in 2011, is one of the 8 city corporations of Bangladesh. It was formed comprising Narayanganj Town, Siddhirganj Municipal area, and Kadamrasul Municipality. It consists of 27 wards. Before its establishment as a city corporation, it was a municipal corporation. The Narayanganj Municipality was incorporated on 8 September 1876. Narayanganj, a city in central Bangladesh, is the district headquarter of Narayanganj. The city is about 28 km south-east of the capital city Dhaka (Figure 2). It is the 6th largest city in Bangladesh and one of the major centres of business and industry, especially the jute trade and processing plants, and the textile sector of the country. The city is situated along both banks of the Sitalakhya River at its confluence with the Dhaleswari River. The chief river port for nearby Dhaka (north-west), the city has steamer connections with major inland ports and Chittagong.

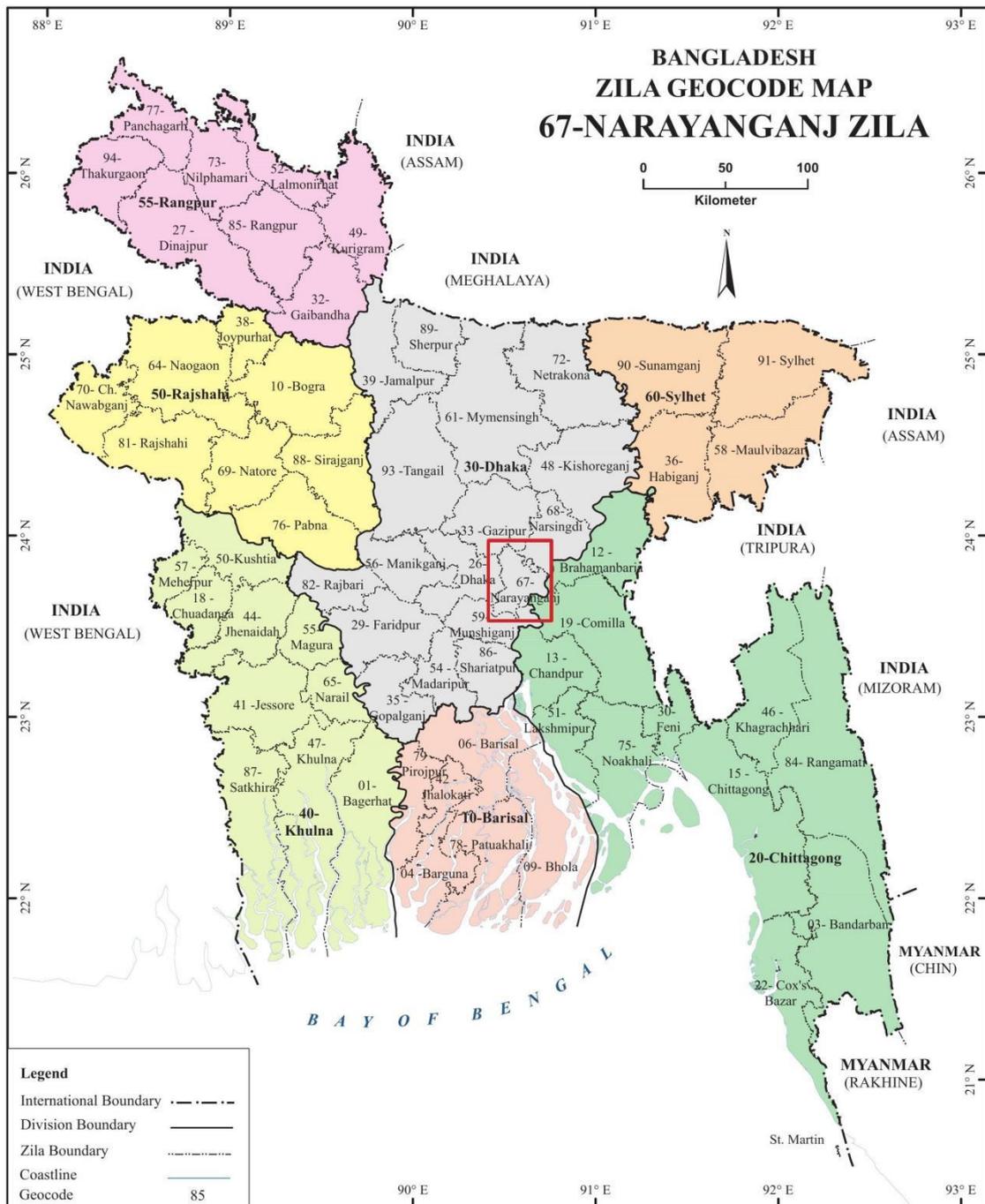


Figure 2: Narayanganj City Corporation location map (BBS/ GIS report 2017).

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

Population parameters	
Estimated population, 2020	2,200,481
Households, 2020	97,731
Area, sq. km	72.43
Total roads, km	609.43
Total drains, km	207.21

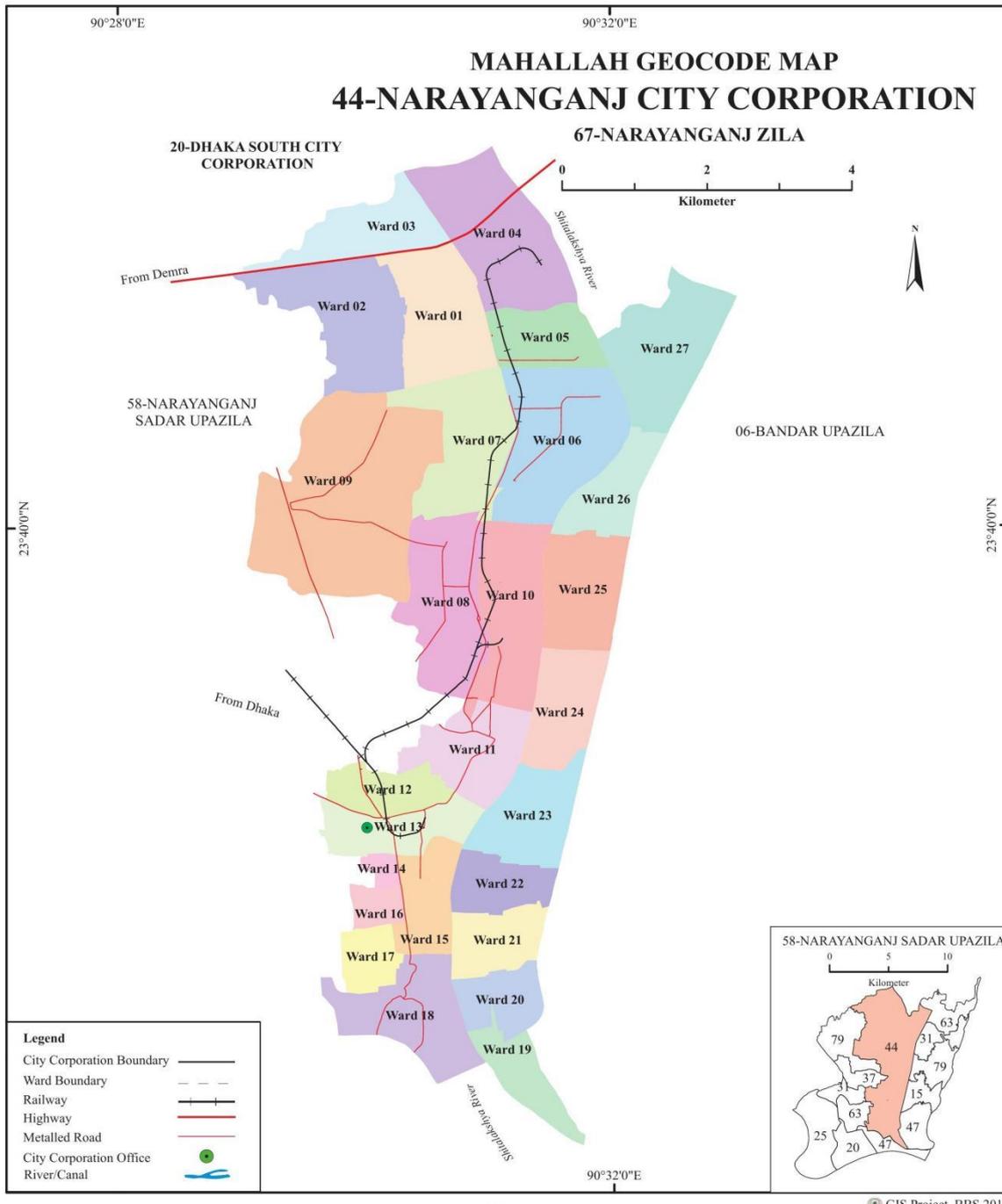


Figure 3: Narayanganj City Corporation ward boundary map (BBS/ GIS report 2017).

According to the population census in 2011 by the Bangladesh Bureau of Statistics (BBS), the Narayanganj population was 1,405,481. The present population growth rate in Narayanganj town is 4% 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 2,200,481.

The City Corporation covers an area of 72.43 square kilometres. At present Narayanganj City Corporation has 609.43 km of road out of which, 316.15 km is Cement Concrete (CC) road, 210.51 km is Reinforced Cement Concrete (RCC) road, and 82.77 km is Herring-Bone-Bond (HBB) road. The city has about 207.21 km of drain which includes a 206.50 km of RCC drain and Brick Flat Soling (BFS) drain and 0.71 km is earthen drain¹ (Table 1).

The geographical coordinates of Narayanganj are 23.6238° N, 90.5000° E². In the context of Bangladesh, the City Corporation area is made of low and medium high land.

According to the Bangladesh Meteorological Department (BMD) (1981-2017)³, the city area and surrounding area are experiencing a tropical monsoon climate. It is characterized by warm, humid summers and cool, and dry winters. There is no climatological station within the city corporation. The closest meteorological station of Bangladesh Meteorological Department is located in Dhaka which is about 29 km away from the City Corporation area. Weather data from this station is collected from 1981 to 2017. About 90% of the total annual rainfall occurs in the period from May through October and the driest months of the years are November to March. The maximum mean temperature observed is 31.4-33.7°C between April-August, with the minimum mean temperatures found to be between 12.7-14.1°C in December-January. The annual average rainfall is about 2,148 mm, according to BMD (1981-2017).

Shitalakshya River passes the east side of the City Corporation. Several canals (Khanpur, Boubazar canal, Paikpara canal, Sonakanda, and Modongonj Khal) flow through the city. According to the flood zoning map of Bangladesh (BMD, 2012), the city is in flood-free zone (in the last 12 years no flooding event happened). However, the drainage network of the city is not adequate⁴. There are some secondary drains carrying storm water and domestic wastewater to the outfalls the rivers and canals.

¹ Source: 'At a Glance: Narayanganj City Corporation, by city corporation office

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

4 Service outcomes

Narayanganj City Corporation, Narayanganj, Bangladesh, 8 Nov 2021. SFD Level: SFD Lite

Population: 2200481

Proportion of tanks: septic tanks: 63%, 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	22.1	0.0	0.0					
T1A2C5 Septic tank connected to soak pit	8.0			56.0	0.0	0.0		
T1A2C6 Septic tank connected to open drain or storm sewer	38.8			66.0	0.0	0.0	0.0	0.0
T1A2C7 Septic tank connected to open water body	5.4			66.0	0.0	0.0		
T1A2C8 Septic tank connected to open ground	0.5			66.0	0.0	0.0		
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	5.6			17.0	0.0	0.0		
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	19.1			97.0	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'	0.5			0.0	0.0	0.0		

Table 2: SFD Matrix for Narayanganj City Corporation.

The outcome of the SFD graphic shows that only ten percent (10%) of the excreta flow is classified as safely managed, and the remaining ninety (90%) percent is classified as unsafely managed (Figure 1). The unsafely managed excreta originate from wastewater not delivered to treatment (22%), both the Faecal Sludge (FS) contained and not contained, hence emptied but not delivered to treatment (41%), FS not contained - not emptied (12%) and 14% of supernatant not delivered to treatment. The safely managed excreta originate from FS contained - not emptied (10%).

The percentages presented in Table 2 and discussed in the next section are based on data collected through the household (HH) surveys, Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) (Figure 5 and Figure 9).

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 22.1% of the total population of the city to generate the SFD graphic. Similarly, the T1A2C6 system is considered 38.8% 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 (99%) 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 (0.50%) and neighbour's toilets (0.50%). From the household survey, it was found that 52.71% of the city population uses septic tanks as the containment system, 19.10% of the toilets have single pit systems, and 5.60% of people use double pits in the city. 0.50% of the city population uses containments (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) that have failed, damaged, collapsed or flooded which are connected to water bodies, or open ground or 'don't know where'. About 22.10% of the population 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: 8.0% of the population uses septic tanks connected to soak pits (T1A2C5), 38.8% of the population uses septic tanks connected to open drain (T1A2C6), 5.4% of the population uses septic tanks connected to water bodies (T1A2C7), 0.5% of the population uses septic tanks connected to open ground (T1A2C8), 5.6% of the population uses lined tanks with impermeable walls and open bottom, no outlet or overflow (T1A4C10), 19.1% of the population relies on the lined pit with semi-permeable walls and open bottom, no outlet or overflow (T1A5C10). Nearly, 0.5% of the population uses containments (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) that have failed, damaged, collapsed or flooded which are connected to water bodies, or open ground or 'don't know where' (T1B10 C7 TO C9) (KII, FGDs, HH survey, 2020). Thus, at the containment stage, the city's excreta of only 32.7% of the excreta are contained. Figure 6 shows pictures of these technologies in use.



Figure 6: Containment technologies and their connections in Narayanganj. Left: Septic tank connected to the nearby water body. Right: Toilet pipe connected to open drain (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. 53% of the households use their own tube well fitted with electric motor and 8% use their own hand pump tube well. 33% of the households are supplied with piped water.

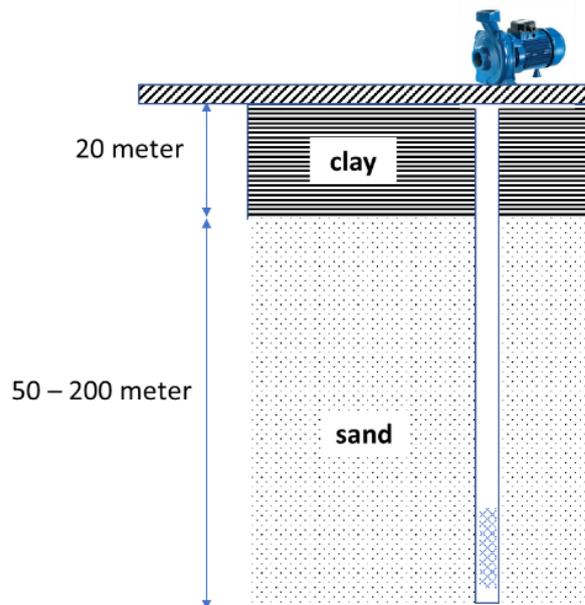


Figure 7: Soil profile and location of tube well screen.

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) on March 2017, drinking water is collected from the confined aquifer (25 m – 200 m) through pumps (Figure 7). 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 (Figure 8). 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 56% of the septic tanks, connected to the soak pit are emptied within 2-5 years. About 66% of the septic tanks connected to open drains, open ground or water bodies are emptied within 2-5 years. Almost 97% of single pit latrines and 17% of the double 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 (93%) done by private sweepers. Only in a few households, desludging is done by family members (7%). Around 46% of this withdrawal is done manually using a bucket and rope. 42% use manual pumps and 10% use 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 City Corporation authority has 5 mechanical vacuum trucks (capacities of 3,500, 2,000 and 1,500 litres) but presently they do not provide regular emptying service.

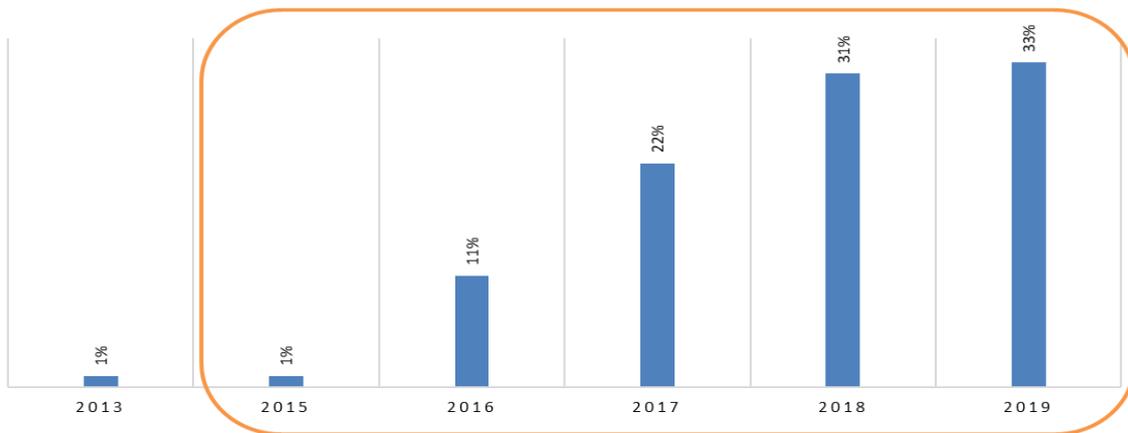


Figure 8: Year of septic tanks construction.

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 was observed that only 36% 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. The major portion (48%) is disposed into the drain. Besides, the sludge disposed into the water bodies is 15%. Since there are no treatment facilities in the town, vacuum trucks also discharge contained sludge to drain, water bodies, or open ground.

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

4.3 Open Defecation:

From HH surveys, KIs and FGDs, it was found that 100% of citizens use some 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 City Corporation and accepted by them. Following assumptions were made for developing the SFD graphic for Narayanganj City Corporation:

- ✓ The proportion of FS in septic tanks, fully line tanks, and line, open bottom tanks are considered 63%, 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 Narayanganj population was 1,405,481. The present population growth rate in Narayanganj town is 4% 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 2,200,481.
- ✓ There are around 5.60% 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, 5.6%). Based on the household survey, variable F3 for the system T1A4C10 is set to 17%.
- ✓ There are around 19.1% 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, 19.1%). All of the single pit latrines are found to be emptied within 1-2 years. Based on the household survey, variable F3 for the system T1A5C10 is set to 97%.
- ✓ 8.0% 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 56% 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 this system T1A2C5 is set to 56%.
- ✓ There are 44.7% of septic tanks connected to the open drain, water bodies and open ground, which are emptied within 2-5 years. Based on the household survey, variable F3 for the systems T1A2C6, T1A2C7, and T1A2C8 are set to 66%.
- ✓ Nearly, 0.5% of the population uses containments (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) that have failed, damaged, collapsed or flooded which are connected to water bodies, or open ground or 'don't know where' (T1B10 C7 TO C9). Since these containments are not emptied, variable F3 is 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%.

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: Narayanganj City Corporation’, by Narayanganj City Corporation office
- <https://www.gps-latitude-longitude.com/gps-coordinates>
- <http://bmd.gov.bd/p/Rainfall-Situation-202>



Figure 9: Left: KIIs with different stakeholders. Right: Focus Group Discussions (Source: *Feasibility study 2020-21/DPHE*).

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

- KII with Mayor, Narayanganj City Corporation.
- KII with Secretary, Narayanganj City Corporation.
- KII with Conservancy Inspector, Narayanganj City Corporation
- KII with Councilor, Narayanganj City Corporation.
- Facilitators: Md. Mynul Islam Hemel, 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).

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, 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 Dr. Salina Hayat Ivy, Mayor, Narayanganj City Corporation, Mr. Md. Abul Amin, Chief Executive Officer, Mr. MD. Asgor Hossain, Executive Engineer, Mr. MD. Moinul Islam, Urban Planner, Mr. Shyamal Paul, Coservancy Inspector, Narayanganj City Corporation for providing all the required primary and secondary data and cooperating for Key Informant Interviews (KIIs) & Focused Group Discussions (FGDs). This report would not have been possible to produce without the constant support of Dr. Salina Hayat Ivy, Mayor, City Corporation, who helped in conducting sample surveys and FGDs in the field.

Narayanganj City Corporation, Bangladesh,
2022

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