SFD Lite Report

Nilphamari Municipality Bangladesh

This SFD Lite Report was prepared by

CWIS-FSM Support Cell, DPHE

Date of production/ last update: 10/01/2022

1 The SFD Graphic

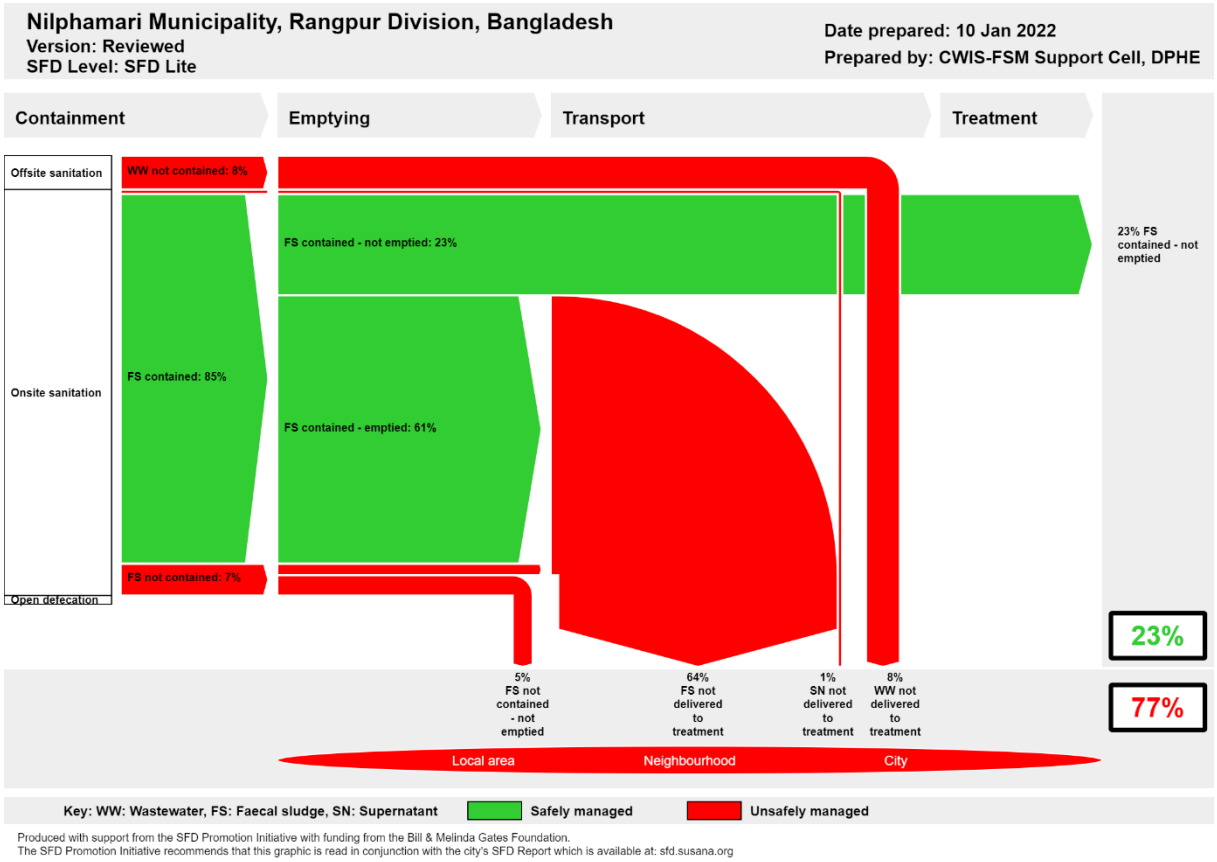

Figure 1: SFD Graphic for Nilphamari municipality.

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 would like to thank Mr. Dewan Kamal Ahmed, Mayor, Nilphamari Municipality, Mr. Moshiur Rahman, Secretary, Nilphamari Municipality; Mr.Md. Tarik Reza, Executive Engineer, Nilphamari Municipality for providing all the required primary and secondary data and cooperating for Key Informant Interviews (KIIs) & Focussed Group Discussions (FGDs). This report would not have been possible to produce without the constant support of Mr. Dewan Kamal Ahmed, Mayor, 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 Nilphamari 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

Nilphamari, a city of northwestern Bangladesh and the district headquarter of Nilphamari district is situated in Rangpur Division, Bangladesh. It is located 337.5 km north-west of Dhaka. It is beside the Tista, little Jumuna, Jumuneshwari River and it is well connected with road, and railways (Figure 2). Nilphamari is historically and culturally a very important city in North Bengal. The city is the commercial hub for the surrounding districts. The Nilphamari Municipality was established in 1972. Nilphamari is one of the 53 district-level municipalites in the country.

Table 1: City profile (Source: KII with the Secretary, Nilphamari municipality).

Population parameters	
Estimated population, 2020	59,665
Households, 2020	11,791
Area, sq. km	19.28
Total roads, km	141.5
Total drains, km	54.044

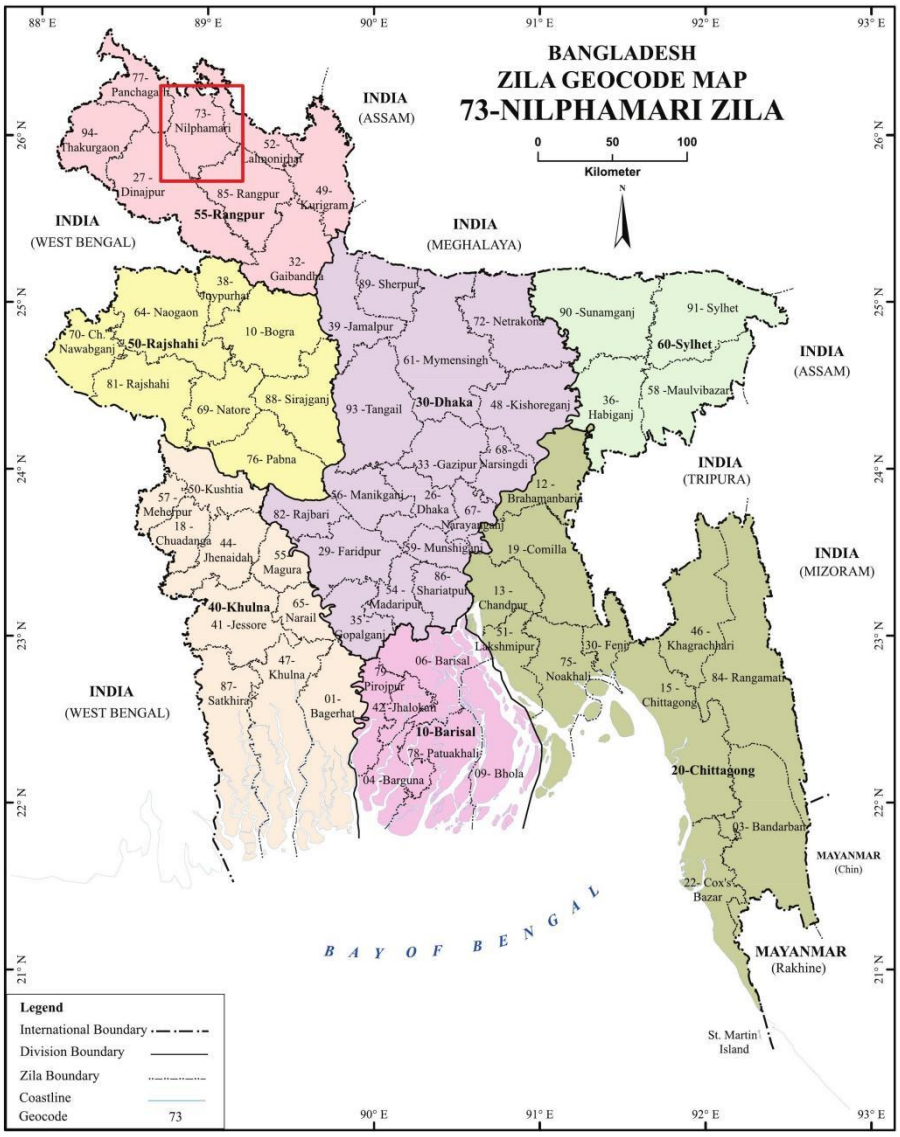

Figure 2: Nilphamari municipality location map (BBS/ GIS report 2017).

According to the population census in 2011 by the Bangladesh Bureau of Statistics (BBS), the Nilphamari population was 45,386. The present population growth rate in Nilphamari is 2% 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 59,665.

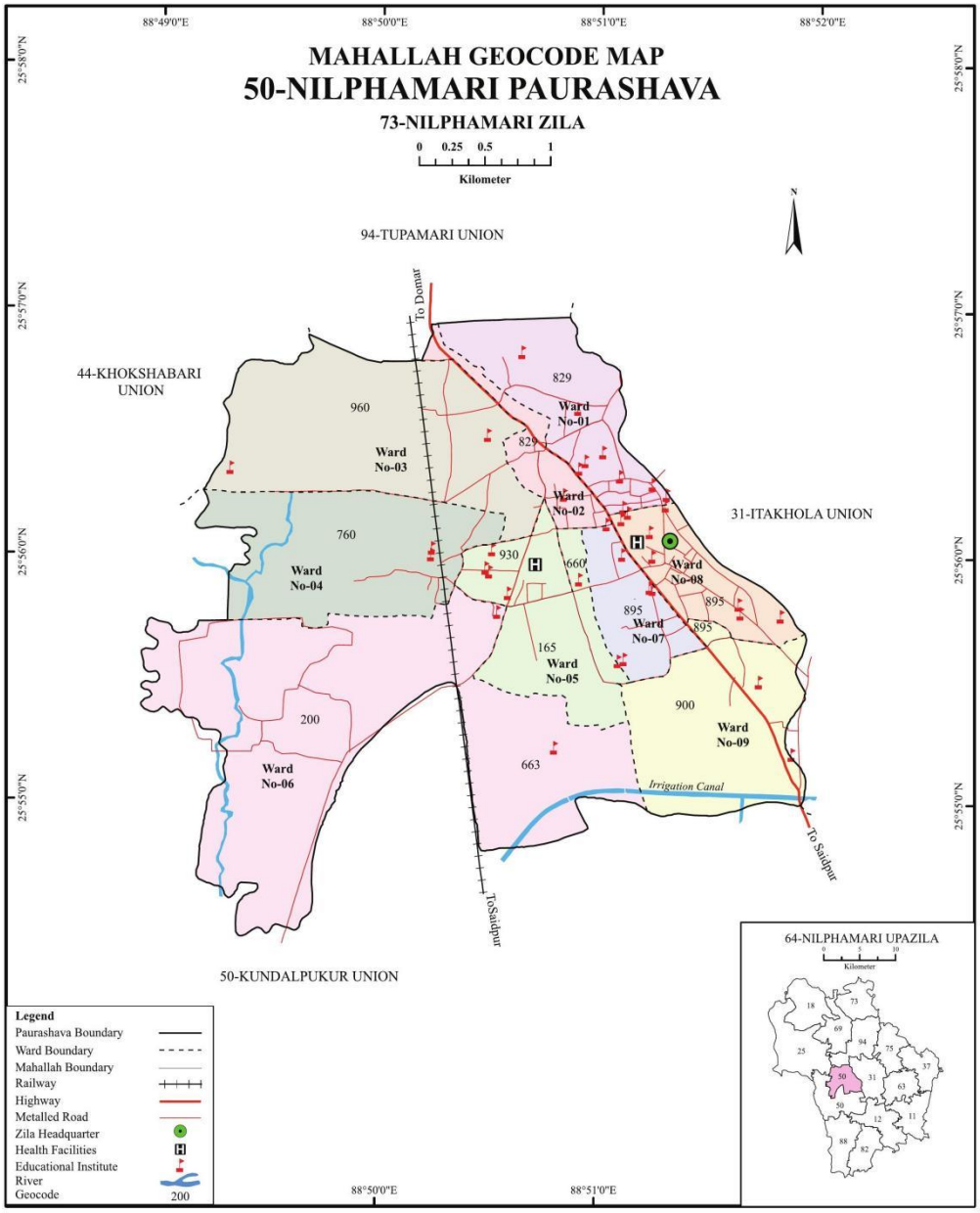

Figure 3: Nilphamari municipality Ward Boundary Map (BBS/ GIS report 2017)

The Municipality covers an area of 21.06 square kilometres. At present Nilphamari municipality has 141.5 km of road out of which 68.5 km is bituminous road, 23 km is Reinforced Cement Concrete (RCC) road and 50 km is earthen road. The city has about 54.044 km of drain which includes 6.715 km of brick drain, 19.829 km of Reinforced Cement Concrete (RCC) drain, and 27.50 km of earthen drain[1] (Table 1).

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

The geographical coordinates of Nilphamari are 25.9363° N, 88.8407° E[2]. In the context of Bangladesh, the city area is predominantly highland and medium highland. Most areas are almost flat. The elevation of land is approximately 53 m. Little Jamuna River passed west side of the Municipality.

According to the Bangladesh Meteorological Department (1981-2017) [3], the city area experiences 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 Sayedpur which is about 15 km away from the Municipality 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 year are November to March. The maximum mean temperature observed is 31.8-33°C between April-August, with the minimum mean temperatures found to be between 10.5-12.7°C in December-January. The annual average rainfall is about 2,107 mm, according to BMD (1981-2017).

Little Jamuna River passed the west side of the Municipality. Jumuneshwari River passed east side of the Municipality. A *khal* passed the northern-eastern side of the Municipality. According to the flood zoning map of Bangladesh, the Municipality is in a flood-free zone (in the last 12 years no flooding event happened). However, the drainage network of the city is not adequate[4].

The ward boundary map and the population density in the 9 wards of the city are shown in Figure 3 and Figure 4. The density is high in the centre part of the Municipality, ranging from 4,001 to 7,677 per sq km. The population density in the West is lower, ranging from 957 to 1,000 per sq km[5].

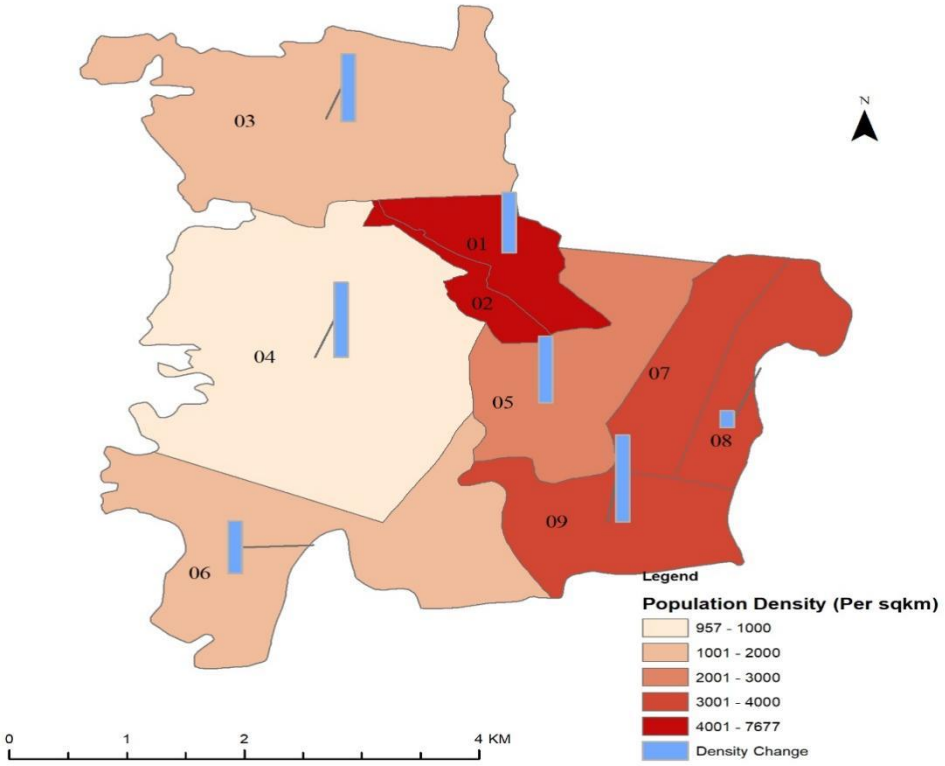

Figure 4: Population density in different wards of Nilphamari municipality.

[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

Nilphamari Municipality, Nilphamari, Bangladesh, 26 Dec 2021. SFD Level: SFD Lite
Population: 59665
Proportion of tanks: septic tanks: 89%, 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	7.8	0.0	0.0					
T1A2C5 Septic tank connected to soak pit	8.6			60.0	0.0	0.0		
T1A2C6 Septic tank connected to open drain or storm sewer	2.9			67.0	0.0	0.0	0.0	0.0
T1A2C7 Septic tank connected to open water body	1.5			67.0	0.0	0.0		
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	20.8			25.0	0.0	0.0		
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	53.3			97.0	0.0	0.0		
T1A6C10 Unlined pit, no outlet or overflow	2.0			0.0	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'	3.2			0.0	0.0	0.0		

Table 2: SFD Matrix for Nilphamari 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 originate from wastewater not delivered to treatment (8%), Faecal Sludge (FS) emptied but not delivered to treatment (64%), FS not contained - not emptied (5%) and 1% of supernatant not delivered to treatment. The safely managed excreta originate from FS contained - not emptied (23%).

The percentages presented in Table 2 and discussed in the next section are based on data collected through household (HH) surveys, Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) (Figure 5, Figure 8 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 7.8% of the total population of the city to generate the SFD graphic. Similarly, the T1A2C6 system is considered 2.9% 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

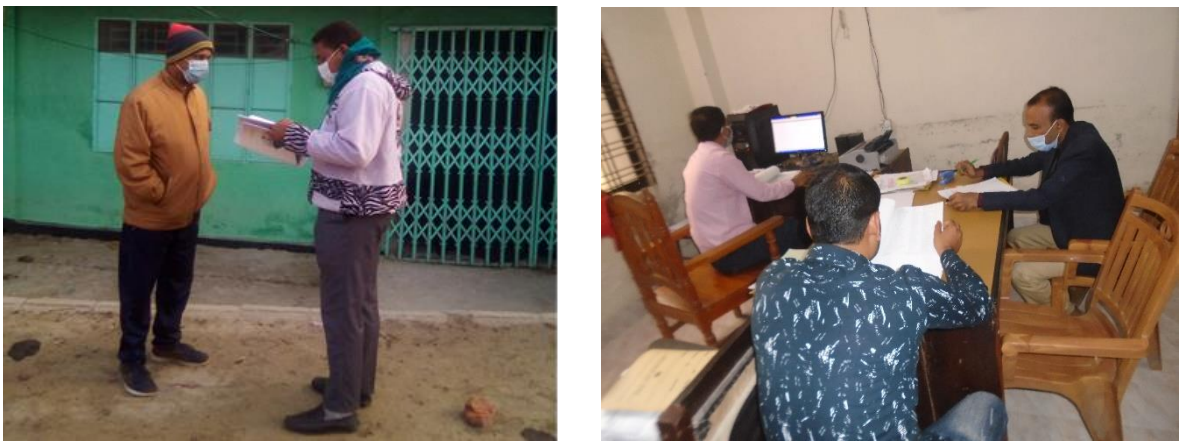

Figure 5: Household survey and consultations. Left: Household survey. Right: Consultation meeting. (Source: *Feasibility study 2020-21/DPHE).*

Containment: Almost all the households (96%) 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%) and neighbour's toilets (3%). From a household survey, it was found that over half of the city population (12.96%) uses septic tanks as the containment system, 53.3% of the toilets have single pit systems, and 20.8% of people use double pits in the city. About 2% of people have an unlined pit, 3.2% has a containment (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) that has failed, damaged, collapsed or flooded - connected to water bodies, or open ground or 'don't know where' (T1B10 C7 TO C9) and 7.8% 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: 8.6% of the population uses septic tanks connected to soak pits (T1A2C5), 2.9% of the population uses septic tanks connected to open drain (T1A2C6), 1.5% of the population uses septic tanks connected to water bodies (T1A2C7), 20.8% of the population uses lined tanks with impermeable walls and open bottom, no outlet or overflow (T1A4C10), 53.3% of the population relies on the lined pit with semi-permeable walls and open bottom, no outlet or overflow (T1A5C10). Nearly, 2% of the population uses the unlined pit (T1A6C10) and 3.2% of the population has a containment (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) that has failed, damaged, collapsed or flooded - 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 84.7% of the population are contained. Figure 6 shows pictures of these technologies in use.

Figure 6: Containment technologies and their connections in Nilphamari. 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 7-8 m. The most common drinking water production technology is a borehole with a hand pump or motorized pump. 34.9% of the households use their own tube well fitted with electric motor and 63.4% use their own hand pump tube well. 1.7% of households are supplied with piped water.

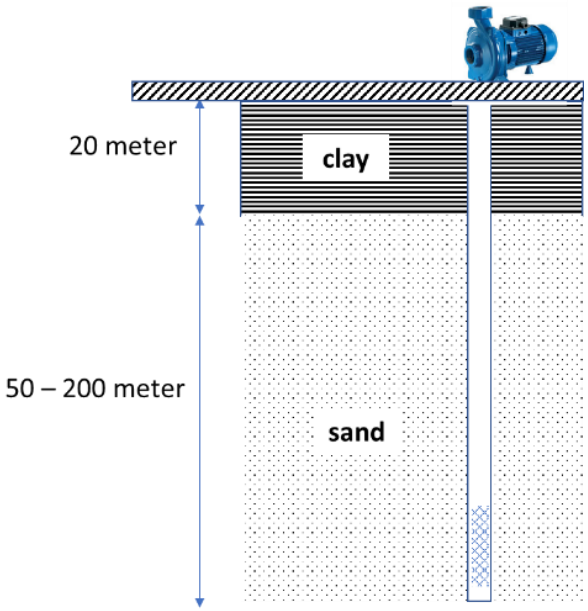

Figure 7: Soil profile Nilphamari city and location of tube well screen.

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

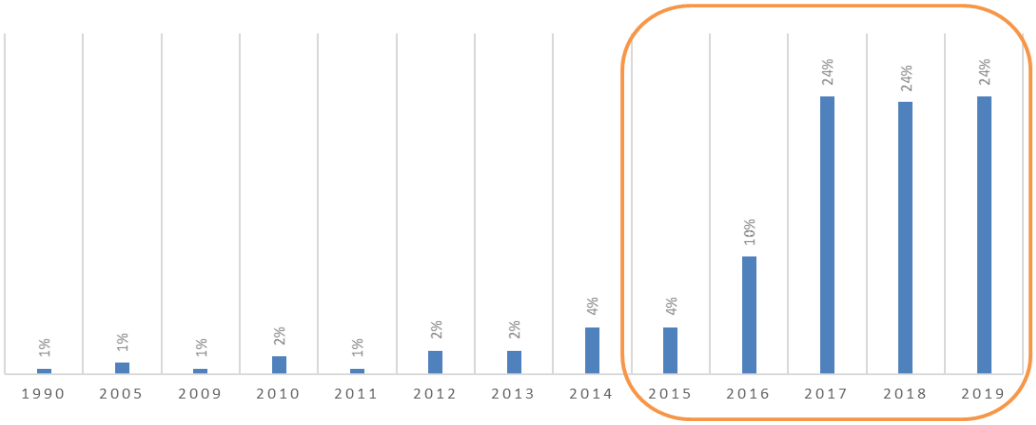

Figure 8: Year of septic tanks construction.

However, about 60% of the septic tanks, connected to the soak pit are emptied within 2-5 years. About 67% of the septic tanks connected to open drains or water bodies are emptied within 2-5 years. Almost 97% of single pit latrines and 25% 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 (91%) done by private sweepers. Only in a few households, desludging is done by municipal sweepers (6%) and family members (3%). Around 88% of this withdrawal is done manually using a bucket and rope. A limited number (3%) use electric pumps, and some (9%) use manual 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 conservancy department has one mechanical vacuum trucks, but municipality does not provide any service[6].

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 75% 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, the sludge disposed into drain, open ground and water bodies is 25%.

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

4.3 Open Defecation:

From HH surveys, KIIs and FGDs, it was found that 100% of citizens use any 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 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 pit emptying. Due to all these data gaps, some assumptions have been made to produce the SFD graphic. These assumptions were shared with key informants at the municipality and accepted by them.

Following assumptions were made for developing the SFD graphic for Nilphamari municipality:

- ✓ The proportion of FS in septic tanks, fully line tanks, and line, open bottom tanks are considered 89%, 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 Nilphamari population was 45,386. The present population growth rate in Nilphamari is 2% 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 59,665.
- ✓ There are around 20.8% 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, 20.8%). Based on the household survey, variable F3 for system T1A4C10 is set to 25%.
- ✓ There are around 53.3% 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, 53.3%). All of the single pit latrines are found to be emptied within 1-2 years. Based on the household survey, variable F3 for system T1A5C10 is set to 97%.
- ✓ 8.6% 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 60% 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 60%.
- ✓ There are 67% of septic tanks connected to the open drain and water bodies, which are emptied within 2-5 years. Based on the household survey, variable F3 for systems T1A2C6 and T1A2C7 is set to 67%.
- ✓ 2% of containments are found as unlined pits with no outlet or overflow (T2A6C10). These systems are never emptied (variable F3 set to 0% and hence, variables F4 and F5 are also both set to 0%).
- ✓ 3.2% of containments (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) are found as failed, damaged, collapsed or flooded - 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%).
- ✓ 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: Nilphamari Municipality', by municipal office
- https://www.gps-latitude-longitude.com/gps-coordinateshttp://bmd.gov.bd/p/Rainfall-Situation-202

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

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

Figure 8: KIIs with different stakeholders.

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.

Figure 9: Focus Group Discussions.

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.

Nilphamari Municipality, Bangladesh, 2022

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 Paurashavas and 8 City Corporations

Suman Kanti Nath, Technical Expert, CWIS-FSM Support Cell

Department of Public Health Engineering (DPHE), Bangladesh

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