SFD Lite Report

Natore Municipality
Bangladesh

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

Date of production/ last update: 12/10/2021
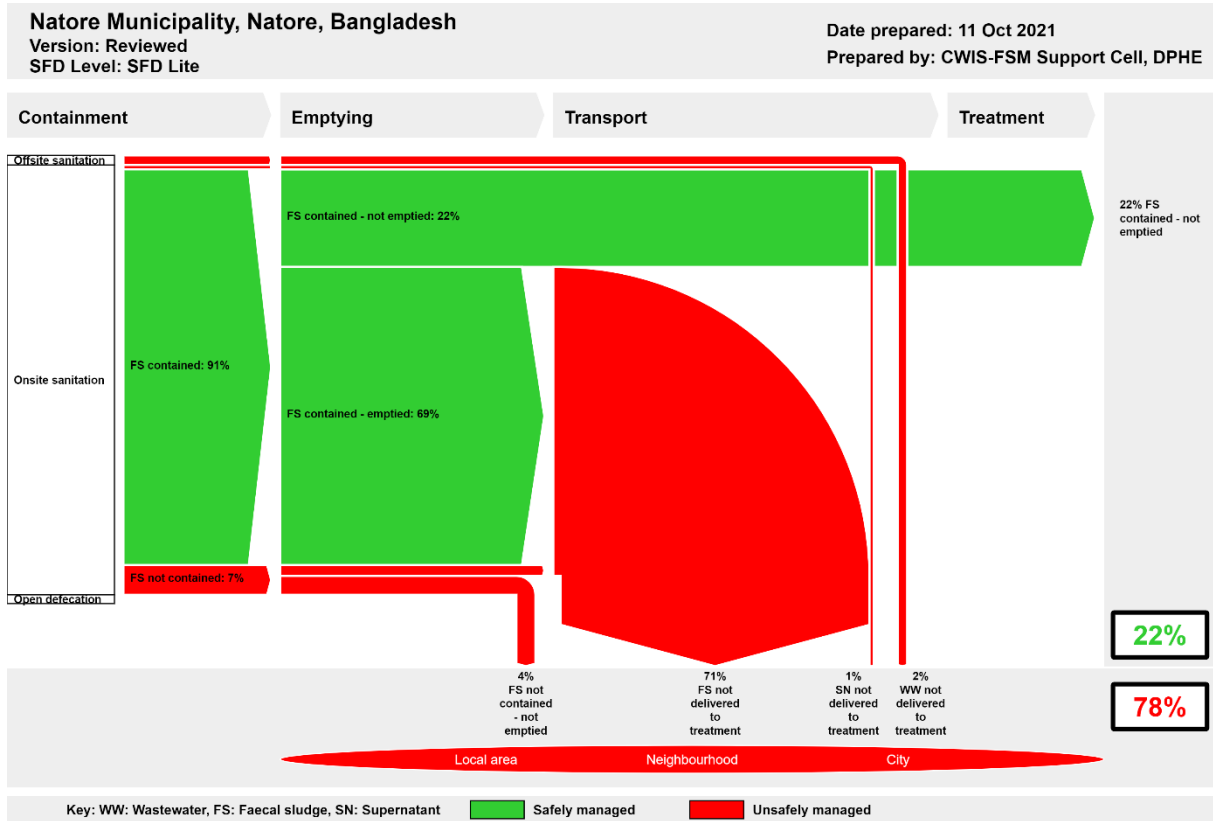
1 The SFD Graphic

Natore Municipality, Natore, Bangladesh
Version: Reviewed
SFD Level: SFD Lite

Date prepared: 11 Oct 2021
Prepared by: CWIS-FSM Support Cell, DPHE

Figure 1: SFD Graphic for Natore 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 Ms. Uma Chowdhury, Mayor, Natore Municipality, Mr. Md. Abdul Matin, Secretary, Natore Municipality; Md. Rejaul Karim, Urban Planner, Ms. Nazma Akter, Slum Development Officer, Natore 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.Uma Chowdhury, 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 Natore 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

Natore municipality under Natore district is one of the influential urban areas in northern Bangladesh and connecting hub of central and southwest parts of the country. The city is 207 km away from the capital Dhaka city. Natore is considered as the gateway for connecting divisional headquarters Rajshahi to Capital City Dhaka as well as Rangpur Division and Khulna Division. and well connected with road, water, and railways. It is one of the oldest towns in the sub-continent and was declared Municipality in 1869. Natore is one of the 53 district-level municipalities in the country.

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

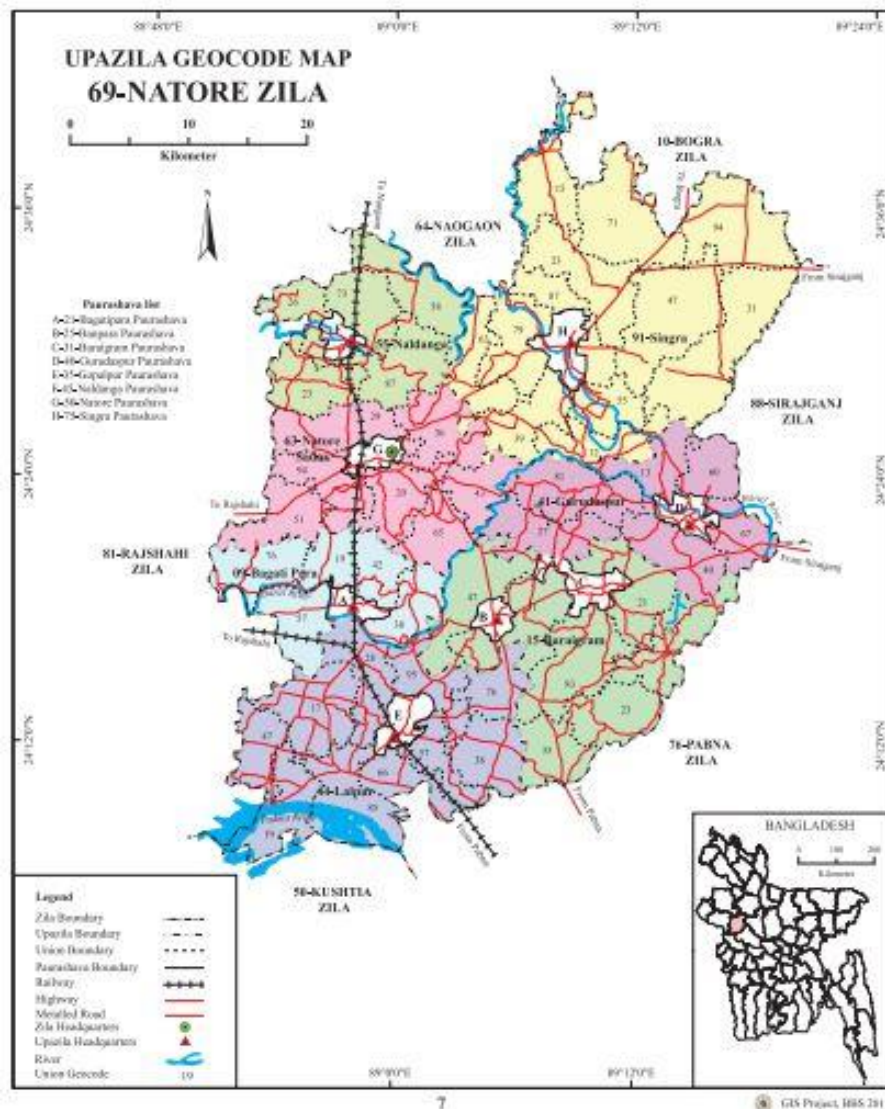| Population parameters	
Estimated population, 2020	111,553
Households, 2020	25,353
Area, sq.km	14.84
Total roads, km	81.15
Total drains, km	88.00

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

According to the population census in 2011 by the Bangladesh Bureau of Statistics (BBS), the population of Natore municipality was 81,203. The urban population growth in Natore is 2.5% per year. Considering 10% floating population, such as farmers and traders, comes to the city every day, the present (2020) population is estimated to be around 111,553 (Table 1).
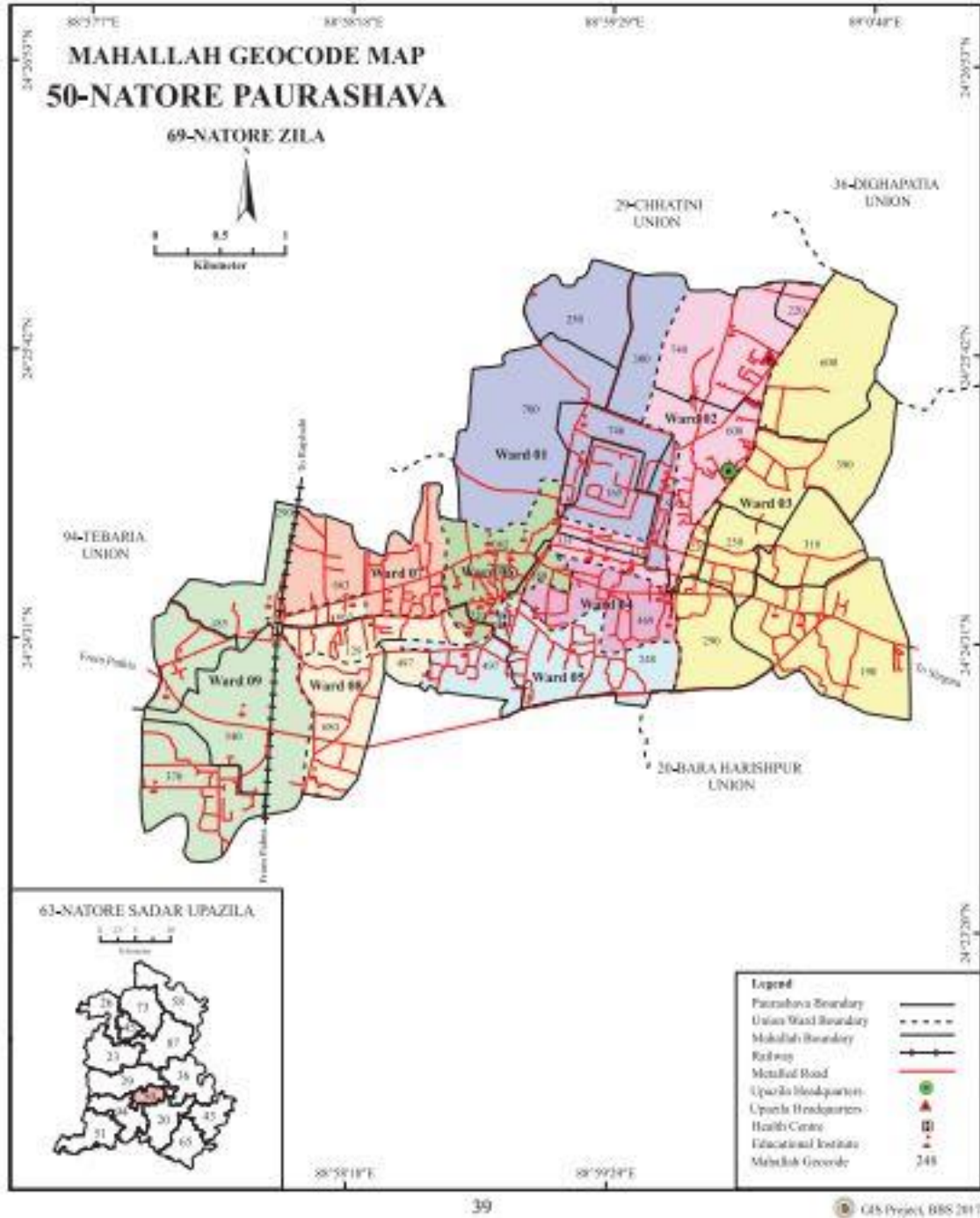

Figure 3: Natore municipality Ward Boundary Map (BBS/ GIS report 2017)

The Municipality covers an area of 14.84 square kilometers including nine administrative wards and 33 mahallahs. At present Natore Municipality has 81.15 km road of which 70.88 km reinforced cement

concrete (RCC) road and 10.27 km earthen road. The City has about 88.00 km drain which includes 19.60 km reinforced cement concrete (RCC) and 68.40 km earthen drain[1].

The geographical coordinates of Natore are 24°21'0.00" N, 89°04'59.88" E[2]. In the context of Bangladesh, the municipality area is a medium highland. The elevation of the land is approximately 17 m. Narod River passed through the municipality.

According to the Bangladesh Meteorological Department[3], the city area and surrounding area is experience 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 Ishwardi which is about 32 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 & the driest months of the years are November to March. The maximum mean temperature observed is 32.1-35.8°C between April-August, with the minimum mean temperatures of between 8.1-1.8°C in January. The annual average rainfall is about 1656 mm, according to BMD (1981-2017).
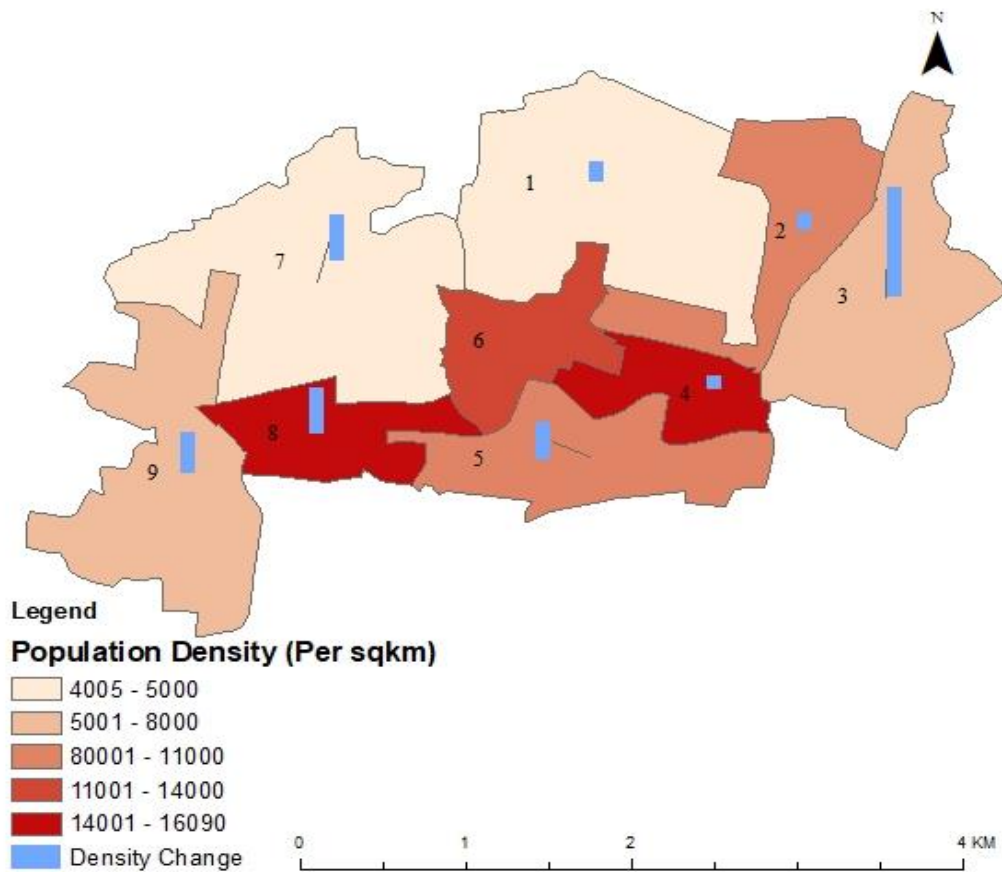

Figure 4: Population density in different Wards of Natore municipality

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

[2] *Source: https://www.gps-latitude-longitude.com/gps-coordinates*

[3] *http://bmd.gov.bd/p/Rainfall-Situation-202*

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. 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 south-east and south, ranging from 14,001 to 16,090 per sq km. The population density in the north is lower, ranging from 4,005 to 5,000 per sq km[5].

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

4 Service outcomes

Natore Municipality, Natore, Bangladesh, 11 Oct 2021. SFD Level: SFD Lite
Population: 111553
Proportion of tanks: septic tanks: 91%, 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	2.2	0.0	0.0					
T1A2C5 Septic tank connected to soak pit	14.7			63.0	0.0	0.0		
T1A2C6 Septic tank connected to open drain or storm sewer	4.0			39.0	0.0	0.0	0.0	0.0
T1A2C7 Septic tank connected to open water body	2.0			39.0	0.0	0.0		
T1A2C8 Septic tank connected to open ground	1.0			39.0	0.0	0.0		
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	13.7			0.0	0.0	0.0		
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	62.7			96.0	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'	0.2			0.0	0.0	0.0		

Table 2: SFD Matrix for Natore municipality

The outcome of the SFD graphic shows that only twenty-two percent (22%) of the excreta flow is classified as safely managed, and the remaining seventy-eighty (78%) percent is classified as unsafely managed. (Figure 1). The unsafely managed excreta originate from wastewater not delivered to treatment (2%), Faecal Sludge (FS) not contained - emptied but not delivered to treatment (71%), FS not contained - not emptied (4%) 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 surveys, key informant interviews (KII) and focus group discussions (FGD) (Figure 3).

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. Similarly, a portion of septic tanks is directly connected to open drains or storm sewer. Therefore, T1A1C6 system is considered as 2.2% of the total population of the city to generate the SFD graphic. Similarly, the T1A2C6 system is considered as 4% of the total population of the city to generate the SFD graphic. In the absence of a sewerage system, the faecal sludge in T1A2C6 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 (98.51%) in the city have their own 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 (1.24%) and neighbor's toilets (0.25%). From a household survey, it is found that 21.7% of the city population uses septic tanks as the containment system, 62.7% of the toilets have single pit systems, and 13.7% of people use double pits in the city, 0.2% 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' and 2.2% 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: 14.7% population uses septic tanks connected to soak pits (T1A2C5), 4% population uses septic tanks connected to open drain (T1A2C6), 2% population uses septic tanks connected to open ground (T1A2C7), 1% population uses septic tanks connected to open ground (T1A2C8), 13.7% population uses lined tanks with impermeable walls and open bottom no outlet or overflow (T1A4C10), 62.7% of the population relies on lined pits with semi-permeable walls and open bottom with no outlet or overflow (T1A5C10). Nearly, 0.2% of the toilets have containments (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) that are 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 91% of the population are contained. Figure 5 shows pictures of these technologies in use.

Groundwater Pollution: The groundwater level below the ground surface is 6-7 m. The most common drinking water production technology is a borehole with a hand pump or motorized pump. 35% of the

households use their own tube well fitted with electric motor and 57% use own hand pump tubewell. Only a few households (8%) use pipe line supply water.

Fig 6 Soil profile in Natore district and location of tubewell screen
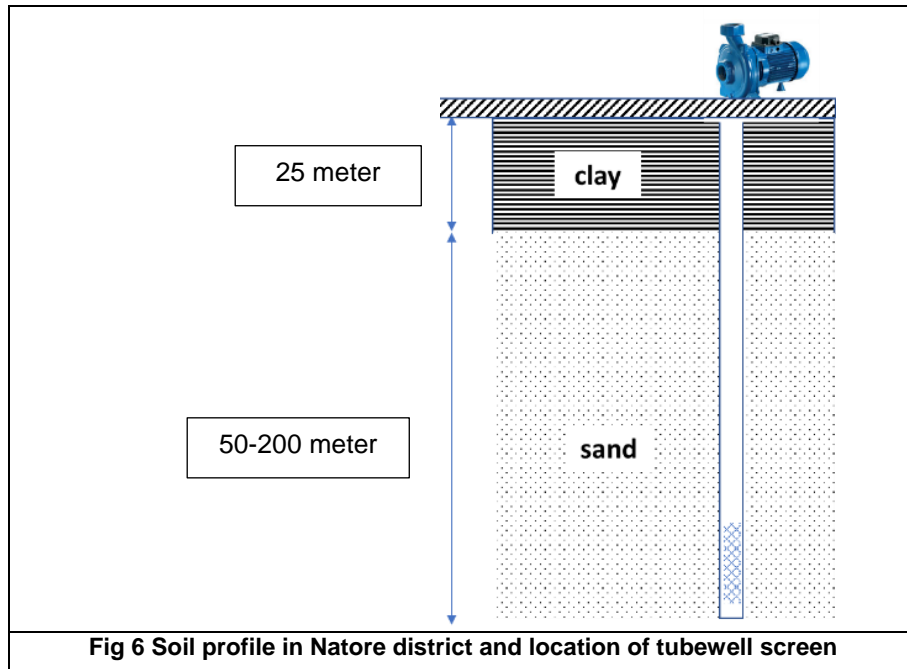
Lateral separation between sanitation facilities and water sources varies from one area to another. The main source of drinking water is tube well. Tube wells of different sizes and depths are generally used to pump water from the confined aquifers. During the household visit and FGDs, it is found that 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.

Septic tank connected to a nearby water body   **Toilet pipe connected to open drain**
Figure 7 : Containment technologies and their connections in Natore
(Source: *Feasibility study 2020-21/DPHE)*

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 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 63% of the septic tanks, connected to the soak pit are emptied within 2-5 years. About 39% of the septic tanks connected to open drains, open ground or water bodies are emptied within 4-5 years. Almost 96% 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 (96%) done by private sweepers. Only in a few households, de-sludging is done by family members (4%). Around 94 % of this withdrawal is done manually using a bucket and rope. A substantial number (6%) 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 municipal authority has one Vacutug, a mechanical collection tanker, that is not yet being used, [6]so there is no mechanical emptying service in this municipality.

Transportation: The sludge withdrawn from the septic tanks and latrine pits by the cleaners is disposed of in various places. Based on the survey from 2020, it is observed that about 66% 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, 31% of sludge disposed into the open environment like a canal, river, drain and open ground.

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

4.3 Open Defecation:
From HH surveys, KIIs and FGDs, it was found that 100% of citizens use some kind of toilet in the Municipality. Thus, from the sanitation point of view, the town is considered an open defecation-free town.

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[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 Natore municipality:

✓ The proportion of FS in septic tanks, fully line tanks, and line, open bottom tanks are considered 91%, 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 Natore city population was 81,203. The urban population growth in Natore is considered 2.5% per year. Considering 10% floating population, such as farmers and traders, comes to the city every day, the present (2020) population is estimated to be around 111,553

✓ There are around 13.7% of twin pit latrines in the containment system. So, it is assumed that all these twin pit containment technologies are defined as a lined tank with impermeable walls and open bottom (system T1A4C10, 13.7%). Based on the household survey, variable F3 for system T1A4C10 is set to 0%.

✓ There are around 62.7% 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, 62.7%). 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 96%.

✓ 14.7% 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 63% 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 63%.

✓ There are 39% 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 systems T1A2C6, T1A2C7 and T1A2C8 are set to 39%.

✓ 0.2% of the toilets have containments (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) that are failed, damaged, collapsed, or flooded are connected to water bodies, or open ground or 'don't know where' (T1B10 C7 TO C9). Thus, variable F3 for system 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 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: Natore 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, Natore Municipality.
- KII with Secretary, Natore Municipality.
- KII with Conservancy Inspector, Natore Municipality.
- KII with Councilor, Natore Municipality.
- Facilitators: Md. Mynul Islam Hemel, Field Coordinator, Tiller

Figure 8: KIIs with different stakeholders in Natore Municipality

Figure 9: Focus Group Discussions in Natore Municipality

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

FSM Cleaner and Service Provider   Mason
Solid Waste Collector   Market People
First Stage Solid Waste Collector   Slum Dwellers

SFD Promotion Initiative

sustainable sanitation alliance

gíz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

On behalf of Federal Ministry for Economic Cooperation and Development

UNIVERSITY OF LEEDS

WORLD BANK GROUP Water

GWSP GLOBAL WATER SECURITY & SANITATION PARTNERSHIP

WEDC Loughborough University

CSE

eawag aquatic research

BILL & MELINDA GATES foundation