



# SFD Lite Report

## Chapai Nawabganj Municipality Bangladesh

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

Date of production/ last update: 20/01/2022

# 1 The SFD Graphic

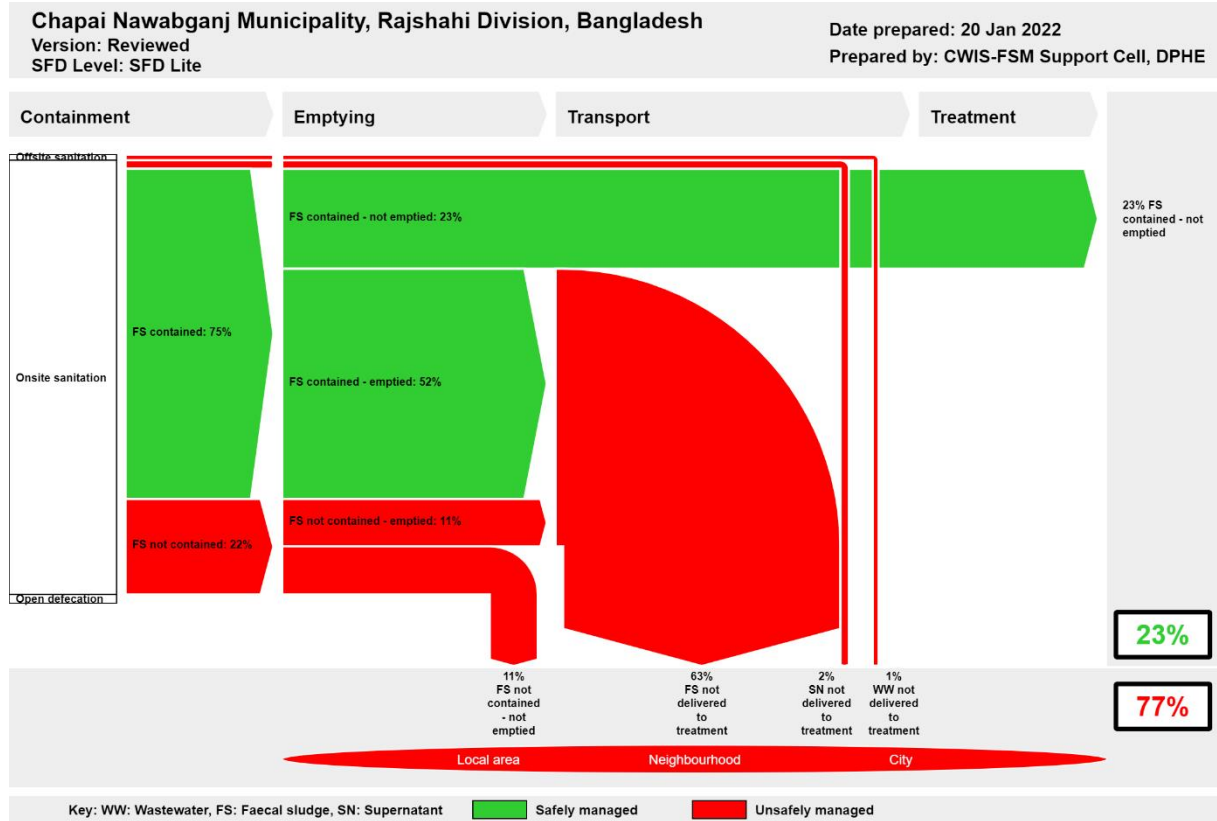


Figure 1: SFD Graphic for Chapai Nawabganj municipality.

## 2 SFD Lite information

### Produced by:

- Dr. Abdullah Al-Muyeed, Chief Operating Officer, CWIS-FSM Support Cell, Department of Public Health Engineering (DPHE), 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, DPHE, Bangladesh.

### Collaborating partners:

- DevCon, Tiller and Chapai Nawabganj 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

Chapai Nawabganj is a city and the district headquarters of Chapai Nawabganj District in the division of Rajshahi, Bangladesh. It is located in the north-western part of Bangladesh. Chapai Nawabganj is a fast-growing city, which is 297 km away from Dhaka, the capital of the country. It is beside the Mohananda River and it is well connected with roads and railways. It is one of the oldest towns in the sub-continent and was declared a municipality in 1903. It was promoted category 'A' municipality in 1985. Chapai Nawabganj is one of the 53 district-level municipalities in the country. The municipality consists of 15 wards and 70 *mahallas*.

**Table 1: City profile (Source: KII with the Secretary, Chapai Nawabganj municipality).**

Population parameters	
Estimated population, 2020	237,589
Households, 2020	47,470
Area, sq. km	32.90
Total roads, km	190.14
Total drains, km	131.63



**Figure 2: Chapai Nawabganj municipality location map (BBS/ GIS report 2017).**

According to the population census in 2011 by the Bangladesh Bureau of Statistics (BBS), the Chapai Nawabganj city population was 180,731. The urban population growth in Chapai Nawabganj is 2% per year. Considering 10% floating population, such as farmers and traders, comes to the city every day, the present (2021) population is estimated to be around 237,589.

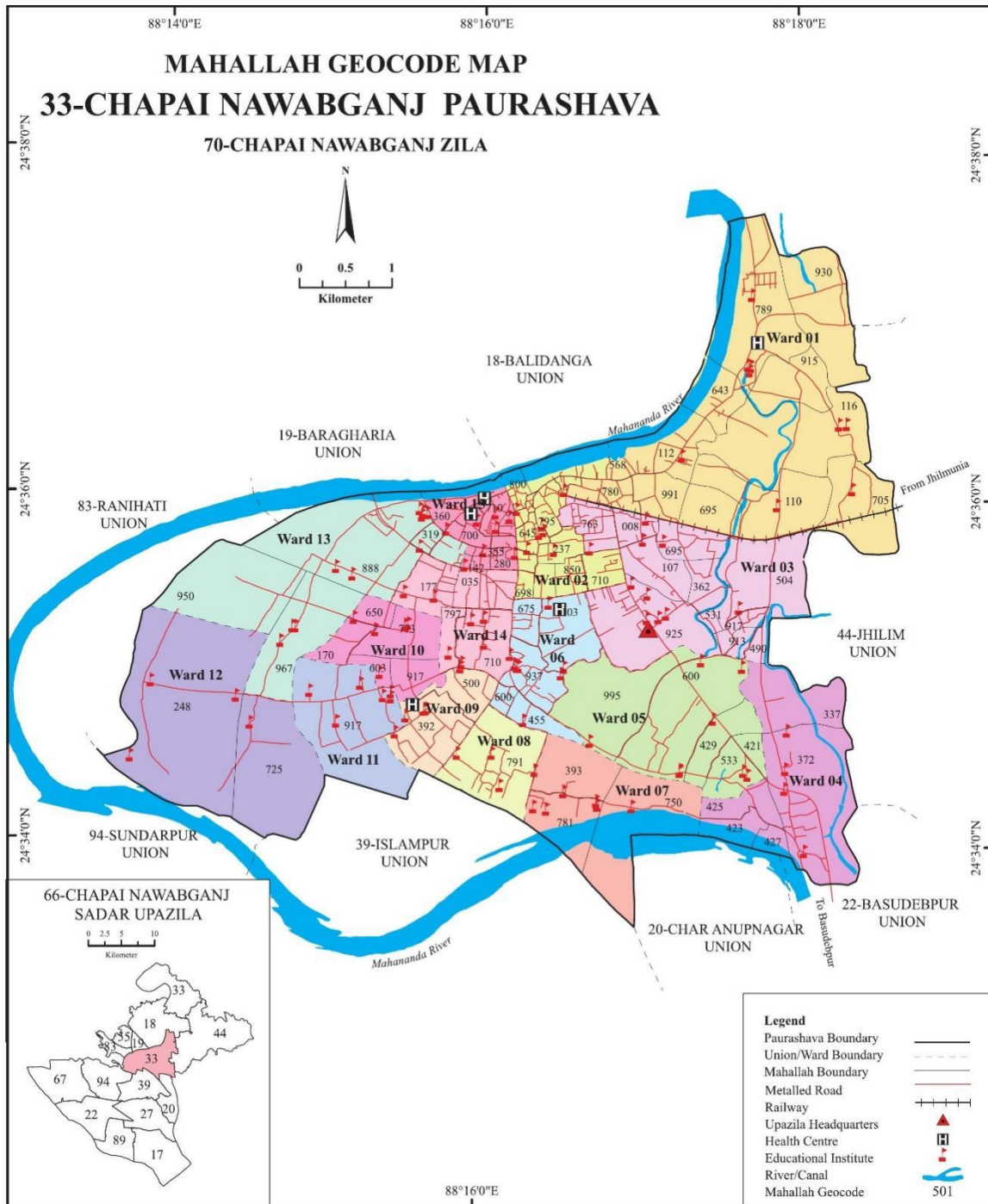


Figure 3: Chapai Nawabganj municipality ward boundary map (BBS/ GIS report 2017).

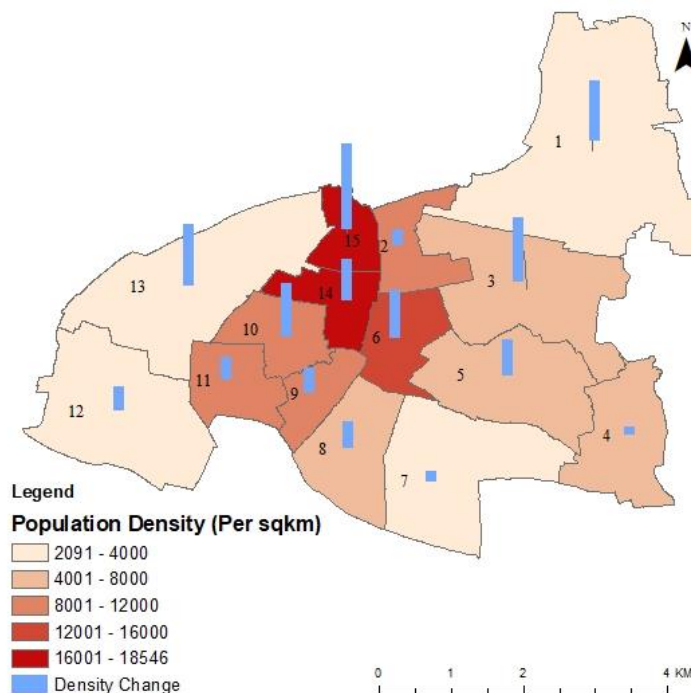
The Municipality covers an area of 32.90 square kilometres. At present Chapai Nawabganj Municipality has 190 km of the road out of which 106 km is bituminous road, 25 km is Reinforced Cement Concrete (RCC) road, 40 km is Herring-Bone-Bond (HBB) road and 19 km is earthen road.

The city has about 131 km of drain which includes 30 km of RCC drain, 32 km of brick drain, 12 km of pipe drain and 57 km of earthen drain<sup>1</sup> (Table 1).

The geographical coordinates of Chapai Nawabganj are 24.5964855N, 88.2775577E<sup>2</sup>. In the context of Bangladesh, the municipality area is moderately high. The elevation of the land is approximately 25 metres. According to the Bangladesh Meteorological Department (BMD) (1981-2017), the city area and surrounding area are characterized by 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 Rajshahi which is about 41 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 years are November to March. The maximum mean temperature observed is 32.1-35.7°C between April-August, with the minimum mean temperatures found to be between 11-12.6°C in December-January. The annual average rainfall is about 1,542 mm, according to BMD (1981-2017)<sup>3</sup>.

Mohananda River passed by the western boundary of the Municipality. According to the flood zoning map of Bangladesh, the Municipality area 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<sup>4</sup>. There are some secondary drains carrying storm water and domestic wastewater to the outfalls of the rivers and canals.

The population density in the 15 wards of the city is shown in Figure 4. The density is high in the centre and north part, ranging from 16,001 to 18,546 per sq. km. The population density in the north and west is lower, ranging from 2,091 to 4,000 per sq. km<sup>5</sup>.



**Figure 4: Population density in different Wards of Chapai Nawabganj municipality. Source: Population Census (2011) by the Bangladesh Bureau of Statistics (BBS).**

<sup>1</sup> Source: 'At a Glance: Chapai Nawabganj Municipality', by municipal office

<sup>2</sup> Source: <https://www.gps-latitude-longitude.com/gps-coordinates>

<sup>3</sup> <http://bmd.gov.bd/p/Rainfall-Situation-202>

<sup>4</sup> KII and field visit during Baseline survey 2020

<sup>5</sup> KII and field visit during Baseline survey 2020

## 4 Service outcomes

Chapai Nawabganj Municipality, Chapai Nawabganj, Bangladesh, 20 Jan 2022. SFD Level: SFD Lite

Population: 237589

Proportion of tanks: septic tanks: 86%, 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
<b>T1A1C6</b> Toilet discharges directly to open drain or storm sewer	1.3	0.0	0.0					
<b>T1A2C5</b> Septic tank connected to soak pit	24.9			55.0	0.0	0.0		
<b>T1A2C6</b> Septic tank connected to open drain or storm sewer	13.7			53.0	0.0	0.0	0.0	0.0
<b>T1A2C7</b> Septic tank connected to open water body	4.2			53.0	0.0	0.0		
<b>T1A2C8</b> Septic tank connected to open ground	1.5			53.0	0.0	0.0		
<b>T1A2C9</b> Septic tank connected to 'don't know where'	4.2			53.0	0.0	0.0		
<b>T1A4C10</b> Lined tank with impermeable walls and open bottom, no outlet or overflow	7.2			24.0	0.0	0.0		
<b>T1A5C10</b> Lined pit with semi-permeable walls and open bottom, no outlet or overflow	40.4			96.0	0.0	0.0		
<b>T1A6C10</b> Unlined pit, no outlet or overflow	2.5			0.0	0.0	0.0		

**Table 2: SFD Matrix for Chapai Nawabganj 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 (1%), Faecal Sludge (FS) emptied but not delivered to treatment (63%), FS not contained - not emptied (11%) and 2% of supernatant not delivered to treatment. The safely managed excreta originate from FS contained - not emptied (23%).

The percentages presented in Table 1 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 10).

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 certain areas where toilets 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 1.3% of the total population of the city to generate the SFD graphic. Similarly, T1A2C6 system is considered as 13.7% 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. (Source: Feasibility study 2020-21/DPHE).

Containment: Almost all the households (99%) 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 (0.50%) and neighbour's toilets (0.50%). From a household survey, it was found that 48.63% of the city population uses septic tanks as the containment system, 40.40% of the toilets have single pit systems, 7.2% of people use double pits in the city, 2.5% of toilets have unlined pits, no outlet or overflow and 1.3% do not have any type of containment and discharges directly to the environment (KII, FGDs, HH survey, 2020).

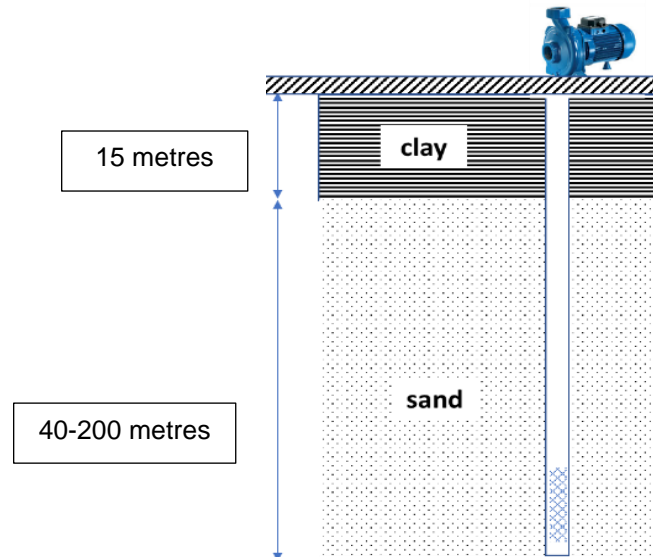
According to the type of connectivity and features of containment technologies, the discharging points of the toilets are categorized as: 24.9% of the population uses septic tanks connected to soak pits (T1A2C5), 13.7% of the population uses septic tanks connected to open drain (T1A2C6), 4.2% of the population uses septic tanks connected to open water bodies (T1A2C7), 1.5% of the population uses septic tanks connected to open ground (T1A2C8), 4.2% of the population uses septic tanks connected to 'don't know where' (T1A2C9), 7.2% of the population uses lined tanks with impermeable walls and open bottom no outlet or overflow (T1A4C10) and 40.4% of the population relies on lined pits with semi-permeable walls and open bottom with no outlet or overflow (T1A5C10). Nearly, 2.5% of toilets have unlined pits, no outlet or overflow (T1A6C10) and 1.3% of toilets discharge directly to open drain or storm sewer (T1A1C6) (KII, FGDs, HH survey, 2020). Thus, at the containment stage, the city's excreta of only 75% of the population are contained. Figure 6 shows pictures of these technologies in use.



**Figure 6: Containment technologies and their connections in Chapai Nawabganj. Left: Septic tank connected to a 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. 26% of the households use their own tube well fitted with the electric motor and 30% use their own hand pump tube well. Only a few households (44%) are supplied with piped water.

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 (15 m – 200 m) through pumps (Figure 7). Therefore, a low risk of groundwater contamination is considered in the city.

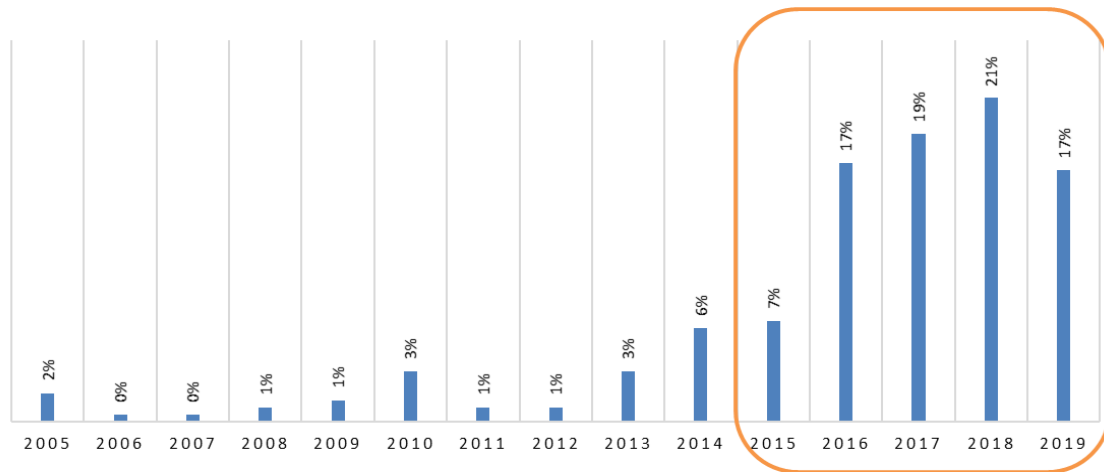


**Figure 7: Soil profile in Chapai Nawabganj district and location of tube well screen.**



**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. 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 55% of the septic tanks, connected to the soak pit are emptied within 2-5 years. About 53% of the septic tanks connected to open drains, open ground, water bodies and 'don't know where' are emptied within 4-5 years. Almost 96% of single pit latrines and 24% of 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 (89%) done by private sweepers. Only in a few households, desludging is done by family members (7%) and by municipal sweepers (4%). Around 81% of this withdrawal is done manually using a bucket and rope. Besides, 7% use electric pumps and 11% use manual pumps. There is one vacuum truck available in the municipality. Only 1% of the withdrawal is done by the vacuum truck. 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<sup>6</sup>.



**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 about 64% 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, 44% of sludge is disposed into the open environment like a canal, river, drain and open ground.

**Treatment/Disposal:** Presently, one faecal sludge treatment plant is under construction which will be in operation from 2022 (Figure 9). Hence, there is no treatment or any reuse facilities available in the town.

<sup>6</sup> 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.



Figure 9: FSTP construction site.

### 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.

## 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 Chapai Nawabganj municipality:

- ✓ The proportion of FS in septic tanks, fully line tanks, and line, open bottom tanks are considered 86%, 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 Chapai Nawabganj city population was 180,731. The urban population growth in Chapai Nawabganj is 2% per year. Considering 10% floating population, such as farmers and traders, comes to the city every day, the present (2021) population is estimated to be around 237,589.
- ✓ There are around 7.2% 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, 7.2%). A portion of the twin pit latrines is found to be emptied within 1-2 years. Based on the household survey, variable F3 for system T1A4C10 is set to 24%.
- ✓ There are around 40.4% 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, 40.4%). 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%.
- ✓ 24.9% 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 55% 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 55%.
- ✓ There are 23.6% of septic tanks connected to the open drain, water bodies, open ground and 'don't know where', which are emptied within 2-5 years. Based on the household survey, variable F3 for systems T1A2C6, T1A2C7, T1A2C8 and T1A2C9 are set to 53%.
- ✓ Nearly, 2.5% of toilets have unlined pits, no outlet or overflow (T1A6C10). Based on the household survey, variable F3 for this 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 are 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-UI-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: Chapai Nawabganj 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, Chapai Nawabganj Municipality.
- KII with Secretary, Chapai Nawabganj Municipality.
- KII with Conservancy Inspector, Chapai Nawabganj Municipality.
- KII with Councilor, Chapai Nawabganj Municipality.
- 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).



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

### 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” DPHE*** (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 Alhaj Md. Mokhlesur Rahman, Mayor, Chapai Nawabganj Municipality, Md. Mamun Aur-Rashid, Secretary, Md. Selim Uddin, Executive Engineer, Md. Imran Hossain, Urban Planner, Chapai Nawabganj 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 Alhaj Md. Mokhlesur Rahman, Mayor, Chapai Nawabganj 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.

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2022

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