SFD Lite Report

Sonaimuri Municipality Bangladesh

Final Report

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

Date of production: 14/05/2023
Last update: 15/07/2025

1 The SFD Graphic

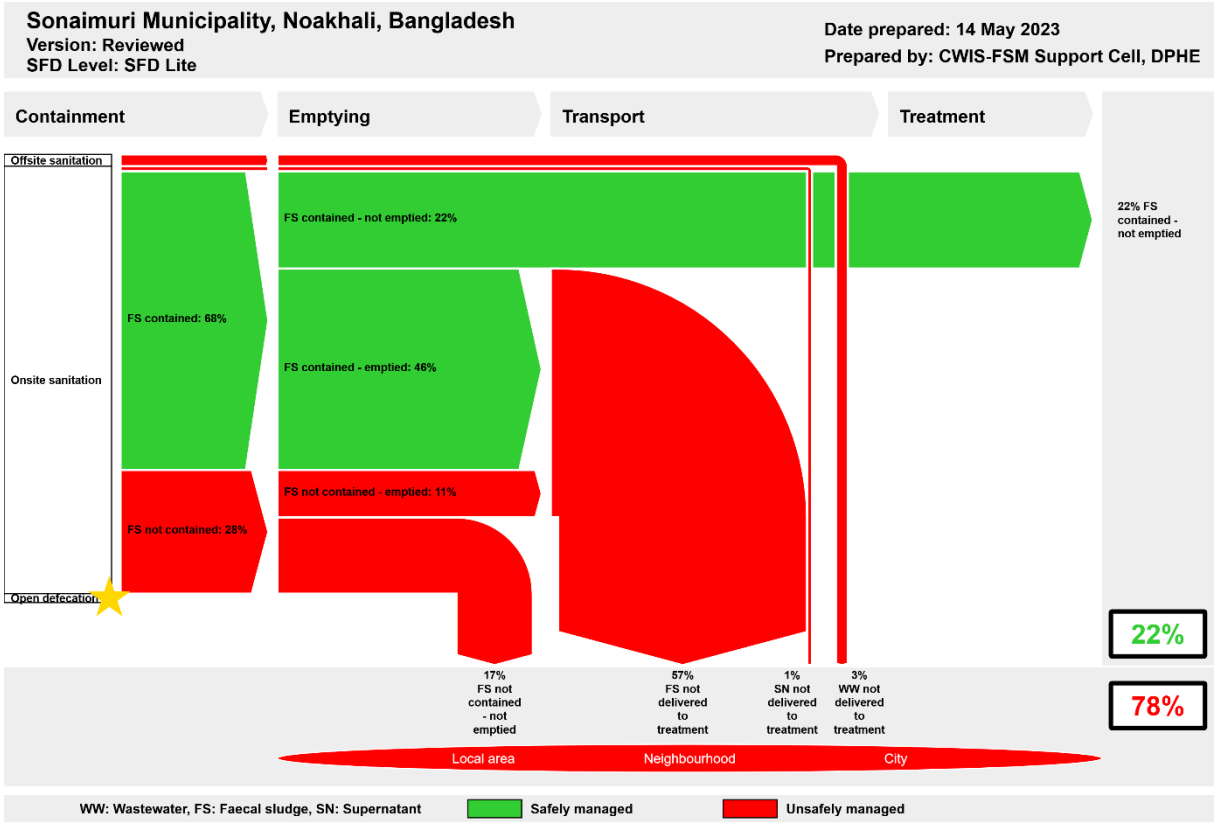

Figure 1: SFD Graphic for Sonaimuri Municipality.

2 SFD Lite information

Produced by:

Dr. Abdullah Al-Muyeed, Chief Operating Officer, CWIS-FSM Support Cell, Md. Tawhidur Rahaman, Technical Expert, CWIS-FSM Support Cell, Department of Public Health Engineering (DPHE), Bangladesh; Parimal Kumar Dev, CEO, Municipal Association of Bangladesh; Md. Tahmidul Islam, Technical Lead, WaterAid Bangladesh and Md Zarif Oeishik, Associate Officer, WaterAid Bangladesh.

Collaborating partners:

WaterAid Bangladesh, Municipal Association of Bangladesh (MAB), Onushandhani Creeds Ltd, and Sonaimuri Municipality played vital roles in collecting and sharing data and producing this SFD graphic and SFD lite report.

Status:

Final SFD

Date of production: 14/05/2023
Last update: 15/07/2025

3 General city information

Geography: Sonaimuri Municipality is located at the Sonaimuri Upazila, which is situated in Noakhali District under Chattogram Division. It is situated 19 km from the district centre (Zila Sadar). The geographical coordinates of Sonaimuri are 23° 3' 13" N and 91° 6' 56" E [1]. Noakhali District is bordered on the north by Monoharganj Upazila (Cumilla), on the south by Begumganj Upazila, on the east by Senbagh Upazila, and on the west by Chatkhil Upazila [2] (Figure 2).

Categorisation: The Local Government (Municipality) Act of 2009 classifies Municipalities of Bangladesh into A, B, and C classes based on their annual income. Sonaimuri Municipality was established in 30th September, 2003, It is divided into 18 mahallas and 9 wards. The Municipality is 'A' category (Figure 3).

Demography: According to the population census in 2011 by the Bangladesh Bureau of Statistics (BBS), the population of Sonaimuri Municipality was 34,218. The urban population growth in Sonaimuri is 2.30% per year. Considering 10% floating population, such as farmers and traders coming to the city every day, the present (2023) population is estimated to be around 49,449 (Table 1). The household survey results show that majority of the occupation is business (30%), followed by self-employment (23%), private service (17%) and agriculture (10%).[3]

Climate: Sonaimuri, which at 29.53 feet (9 meters) above sea level, has a tropical monsoon climate (Classification: Am). [4,5] The maximum mean temperature observed is around 32 - 38.9°C between March-August, with the minimum mean temperature of 13°C – 15°C in December-January. The annual average rainfall is about 2010 mm, according to BMD (2003-2019).

Hydrology: Dakatia River is a well-known river in the study area. [6]

Housing: The household survey included the different types of residential structures in the Municipality which are pucca, semi-pucca, tin-shed and kacha/jhupri houses.

- Pucca: houses single or multi-storied built with substantial materials such as brick, cement, and concrete,
- Semi pucca: houses either the roof or the walls, but not both, are not made of pucca materials,
- Tin-shed: roof of the house made of corrugated iron sheets,
- Kacha/Jhupri: roof and walls made of temporary materials like bamboo, paper boards, polyethylene sheets, and the floor made of mud etc. [7]

Water status: The main sources of water for drinking and for household activities include plain tube well and tube well with pump.[8]

Table 1: City profile (Source: KII at Sonaimuri Municipality).

Population parameters	Value
Estimated population, 2023	49,449
Households, 2023	8,027
Area, sq.km	13.13
Total roads, km	113
Total drains, km	4.50

[1] *http://www.maplandia.com/bangladesh/chittagong-div/noakhali-zl/sonaimuri/*
[2] *https://en.banglapedia.org/index.php/Sonaimuri_Upazila*
[3] *KII and field visit during Baseline survey 2023*
[4] *https://elevationmap.net/dauti-sonaimuri-noakhali-bd-1000106934*
[5] *https://www.mindat.org/feature-11282346.html*
[6] *https://en.banglapedia.org/index.php/Sonaimuri_Upazila*
[7] *KII and field visit during Baseline survey 2023*
[8] *KII and field visit during Baseline survey 2023*

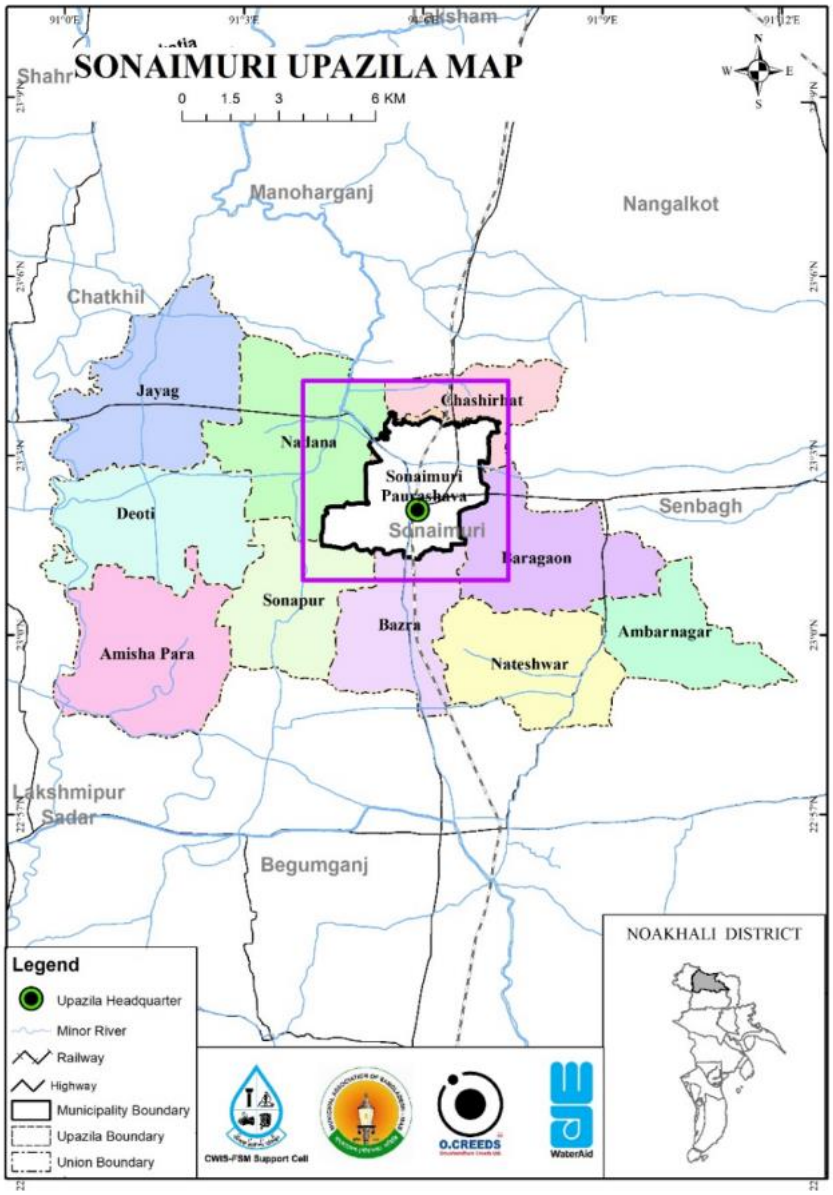

Figure 2: Sonaimuri Municipality Location Map.

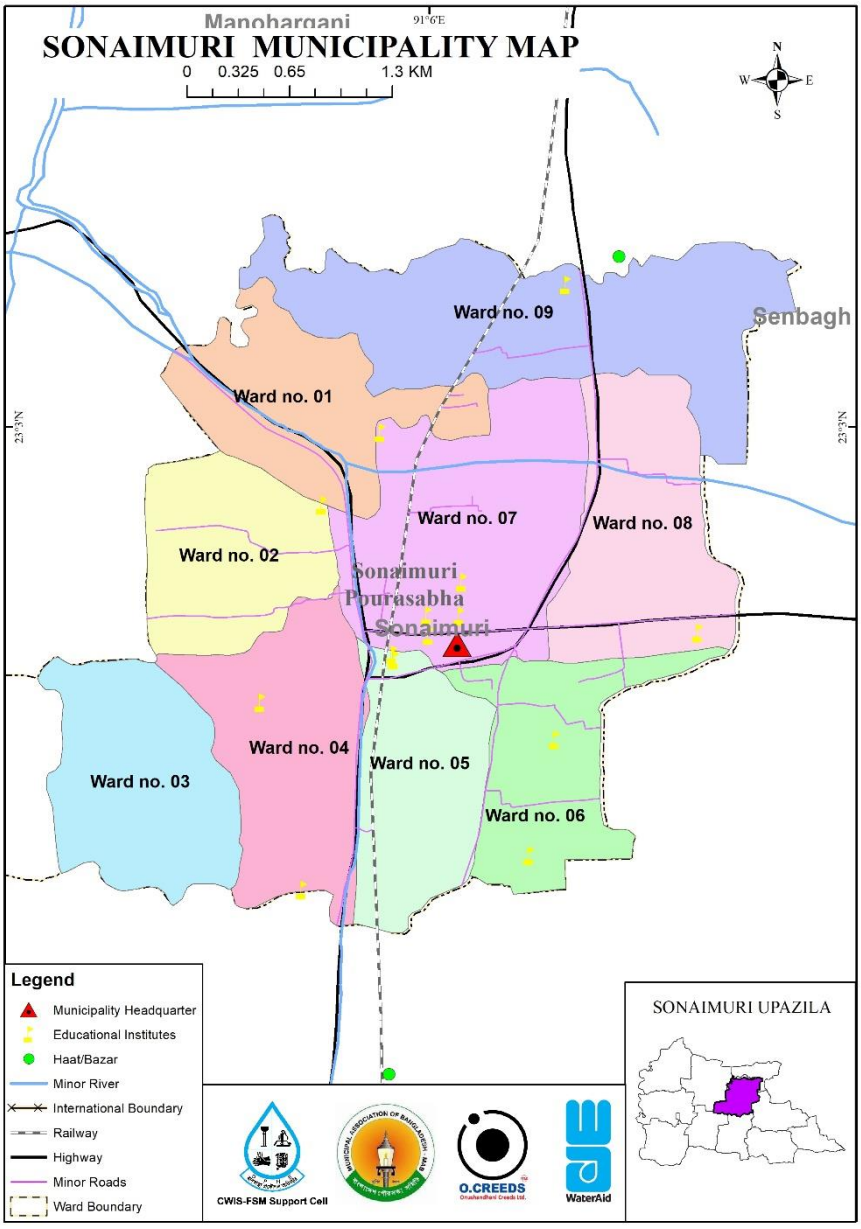

Figure 3: Sonaimuri Municipality Ward Boundary Map.

4 Service outcomes

The city does not have a dedicated sewerage system and most sanitation systems available in the town are classified as onsite systems (97.3%). The main types of toilet facilities are septic tanks connected to a soak pit, to an open drain, to a water body or to open ground, lined tanks or lined pits, with no outlet or overflow and unlined pits.

Table 2 summarises the sanitation systems in use, as well as estimates of the population connected to each system. For the onsite sanitation systems, it shows the proportions of each from which faecal sludge is then emptied, transported to treatment and treated. For the offsite systems (toilet discharging to open drain), it shows the proportion of wastewater delivered to treatment and treated.

Table 2: SFD Matrix for Sonaimuri Municipality.

Sonaimuri Municipality, Noakhali, Bangladesh, 14 May 2023. SFD Level: SFD Lite
Population: 49449
Proportion of tanks: septic tanks: 90%, fully lined tanks: 0%, lined, open bottom tanks: 100%

Containment						
System type	Population	FS emptying	FS transport	FS treatment	SN transport	SN treatment
	Pop	F3	F4	F5	S4e	S5e
System label and description	Proportion of population using this type of system (p)	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
T1A1C7 Toilet discharges directly to water body	2.7					
T1A2C5 Septic tank connected to soak pit	26.3	58.0	0.0	0.0		
T1A2C6 Septic tank connected to open drain or storm sewer	11.2	41.0	0.0	0.0	0.0	0.0
T1A2C7 Septic tank connected to open water body	16.4	41.0	0.0	0.0		
T1A2C8 Septic tank connected to open ground	1.7	41.0	0.0	0.0		
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	2.5	90.0	0.0	0.0		
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	37.5	79.0	0.0	0.0		
T1A6C10 Unlined pit, no outlet or overflow	1.7	14.0	0.0	0.0		

The figures shown in Table 2 and elaborated in the following section are derived from information obtained through household surveys (HH), interviews with key informants (KII), and discussions in focus groups (FGD) (as shown in Figure 4).

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 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, the T1A2C6 is considered as 11.2% of the total population to generate the SFD graphic. In the absence of a sewerage system, the faecal sludge and the supernatant in T1A2C6 are directly discharged into open water body or the environment untreated.

4.2 On-site Sanitation Systems

Figure 4: Household survey and consultations at Sonaimuri Municipality. (Source: *Field Survey, 2023/ O.CREEDS_WaterAid Bangladesh).*

Containment: Almost all the households (97.3%) 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). From the household survey, it was found that 55.6% of the city population use septic tanks as the containment system, 37.5% of the toilets have single pit systems, and 2.5% of people use double pits in the city, 1.7% of the people use dug hole as the containment system. About 2.7% do not have any type of containment and discharge directly to the environment (KII, FGDs, HH survey, 2023).

According to the type of connectivity and features of containment technologies, the discharging points of the toilets are categorised as: 26.3% of the population uses septic tanks connected to soak pits (T1A2C5), 11.2% of the population uses septic tanks connected to open drain (T1A2C6), 16.4% of the population uses septic tanks connected to water bodies (T1A2C7), 1.7% of the population uses septic tanks connected to open ground (T1A2C8), 2.5% of the population uses lined tanks with impermeable walls and open bottom, no outlet or overflow (T1A4C10), 37.5% of the population relies on lined pits with semi-permeable walls and open bottom with no outlet or overflow (T1A5C10) and 1.7% of the population uses unlined pit, no outlet (T1A6C10) (KII, FGDs, HH survey, 2023). Thus, at the containment stage, the city's excreta of only 68% of the population are contained. Figure 6 shows pictures of these technologies in operation.

Groundwater Pollution: The depth to groundwater in the city ranges from 3-6 metres.[9] The most common drinking water production technology a tube-well with a hand pump. Among the households, 54% use their own tube- well fitted with electric motor and 27% use their own hand pump tube-well. The remaining 19% use neighbour's tap/tube-well or water gallons provided by NGOs, or other organisations. Tube wells of different sizes and depths are generally used to pump water from the subsurface confined aquifers.

During the household visit and FGDs, it was found that around 74% 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 (25m – 200m) through pumps (Figure 5). Hence, considering all these factors, it is considered that there is not any significant risk of groundwater contamination in the city. Therefore, a low risk of groundwater contamination is considered in the city.

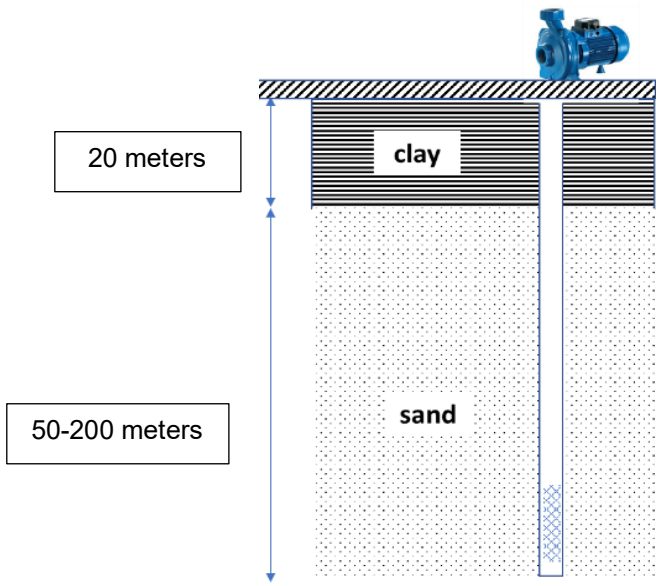

Figure 5: Soil profile in Sonaimuri Upazila and location of tubewell screen.

Figure 6: ***Containment technologies and their connections in Sonaimuri Municipality (Source: Field Survey 2023/ O.CREEDS_WaterAid Bangladesh).***

[9] *Survey Report on 'Hydrogeological screening, slug test and geophysical logging on observation well units', conducted by the Department of Public Health Engineering (DPHE)*

Emptying: 68% households relying on septic tanks get service from private sweepers for emptying of the septic tank. It was observed from the survey that 42% septic tanks have been constructed in the last 5 years. According to the survey from 2023, the frequency of emptying of septic tanks or covered pits varies from 1 to 7 years depending upon the size, uses, etc.

However, about 58% of the septic tanks, connected to the soak pit are emptied within 6 years. About 41% of the septic tanks connected to open drains, open ground or water bodies are emptied within last 10 years. Almost 79% of single pit latrines emptied within 1-5 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 and pit is mostly (99.5%) done by private sweepers. In some households, desludging is done my family members. Around 36% of this withdrawal is done manually using a bucket and rope. 41% use electric pumps and some use (23%) manual pump– these reflect the use of the higher level of technologies by some of the workers. The Municipality has no Vacutug in operation[10].

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 2023, it was observed that almost 26% 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 open ground covered with soil away from the house. Besides, 74% of the faecal sludge is disposed of in the open environment like a drain, open ground, and water bodies.

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.

4.4 SFD Graphic

[10] KII at 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 eight percent (78%) is classified as unsafely managed (Figure 7).

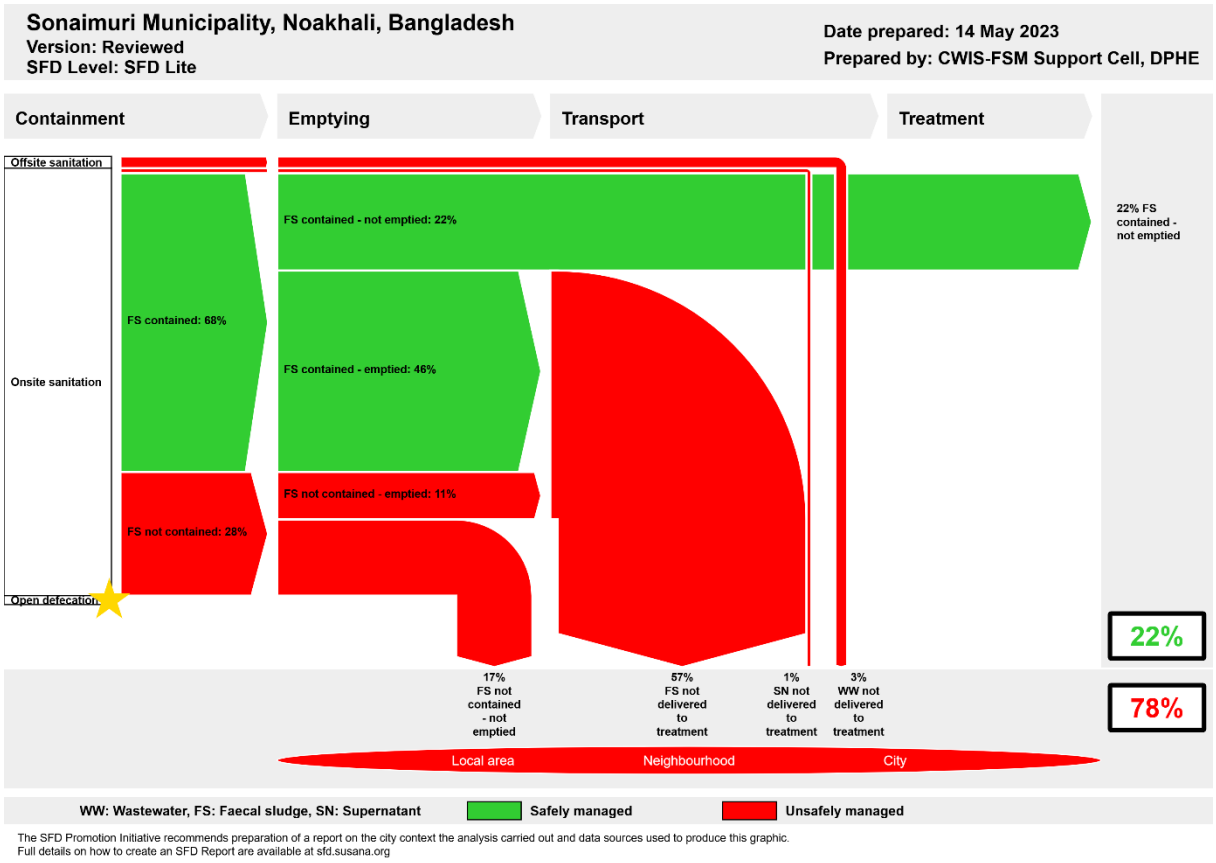

Figure 7: SFD Graphic for Sonaimuri Municipality.

The unsafely managed excreta originated from wastewater and not delivered to treatment (3%), Faecal Sludge (FS) both contained and not contained - not delivered to treatment (57%), FS not contained - not emptied (17%) and 1% of supernatant not delivered to treatment.

Thus, the safely managed excreta originate from FS contained - not emptied (22%). The safely managed excreta generated from this 22% of the population is temporary as the FS has not been emptied. This proportion of safely managed FS will soon become unsafely managed once the containments start filling up.

5 Data and assumptions

The baseline survey conducted in April 2023 contains detailed data on different stages of the sanitation value chain. The SFD matrix is generated from this data, collected during sample household surveys, along with informal interviews, open-ended consultations, key informant interviews and focus group discussions with the Municipality officials, educational institutions, health complex and general public. The SFD matrix was generated from this 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 12 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 Sonaimuri Municipality:

- ✓ The proportion of FS in septic tanks, fully lined tanks, and lined, open bottom tanks are considered 90%, 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 population of Sonaimuri Municipality was 34,218. The urban population growth in Sonaimuri is 2.30% per year. Considering 10% floating population, such as farmers and traders coming to the city every day, the present (2023) population is estimated to be around 49,449 (Table 1).
- ✓ There are around 2.5% 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, 1.0%). Based on the household survey, variable F3 for system T1A4C10 is set to 90%.
- ✓ There are around 37.5% 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, where there is no 'significant risk' of groundwater pollution (system T1A5C10, 31.8%). 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 79%.
- ✓ 26.3% 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. Based on the household survey, variable F3 for system T1A2C5 is set to 58%.
- ✓ 29.3% of the population uses septic tanks connected to the open drain, water bodies and open ground, 31% of which are emptied within 2-5 years. Based on the household survey, variable F3 for systems T1A2C6, T1A2C7 and T1A2C8 is set to 41%.
- ✓ Supernatant in T1A2C6 is directly discharged into the river or the environment untreated. Therefore, variables 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 References

Reports, literature and website

- Population and Housing Census, Bangladesh Bureau of Statistics (BBS), 2011.
- http://www.maplandia.com/bangladesh/chittagong-div/noakhali-zl/sonaimuri/
- https://elevationmap.net/dauti-sonaimuri-noakhali-bd-1000106934
- https://www.mindat.org/feature-11282346.html
- Bangladesh Meteorological Department, BMD (2003-2019)
- Survey Report on 'Hydrogeological screening, slug test and geophysical logging on observation well units', conducted by the Department of Public Health Engineering (DPHE)

Key Informant Interviews (KIIs) (April 2023)

- KII with Sanitary Inspector, Sonaimuri Municipality.
- KII with Conservancy Inspector, Sonaimuri Municipality.
- KII with Assistant Engineer, Sonaimuri Municipality
- KII with DPHE Official, Sonaimuri Municipality.

Facilitators: Md. Fazlul Haque (Project Manager), Shariar Seam (Research Assistant), O. CREEDS Ltd.

Figure 8: KIIs with Assistant Engineer, DPHE and Sanitary Inspector at Sonaimuri Municipality (Source: *Field study 2023/O.CREEDS_WaterAid Bangladesh).*

Focus Group Discussions (FGDs) (April 2023)

- Educational Institution
- Public Place
- Municipality
- Health Complex


Figure 9: Focus Group Discussions with Mayor, at Public Place and at Educational Institute, Sonaimuri Municipality. (Source: *Field survey 2023/ O.CREEDS_WaterAid Bangladesh).*

Additional information

- To accelerate actions toward CWIS approach, WaterAid launched the project titled 'National and Bilateral WASH Advocacy (NaBWASHA)' funded by Bill and Melinda Gates Foundation (BMGF). WaterAid along with Municipal Association of Bangladesh (MAB) and Citywide Inclusive Sanitation-Faecal Sludge Management (CWIS-FSM) Support Cell of Department of Public Health Engineering (DPHE) commissioned the study 'Assess the flow of waste and develop Excreta Flow Diagram (SFD) and Waste Flow Diagram (WFD) for fifty municipalities of Bangladesh' to analyse the current state of faecal sludge management (FSM) and solid waste management (SWM) practices.

- In-depth information and data were collected for the towns which included project documents, master plans and baseline reports from the municipalities 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 6th April to 9th April, 2023. The field survey includes household surveys, key informant interviews, focus group discussions. A KOBO 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 Md. Nurul Haque Chowdhury, Mayor, Sonaimuri Municipality; Mohammad Saifur Rob, Sanitary Inspector; Md. Nur Alam Manik, Assistant Engineer; Md. Masudur Rahman, Conservancy Inspector; Md. Anwar Hossain, Assistant Engineer, DPHE, Sonaimuri Municipality for providing all the required primary and secondary data and cooperating for Key Informant Interviews (KIIs) & Focused Group Discussions (FGDs). This report would not have been possible to produce without the constant support of Md. Nurul Haque Chowdhury, Mayor, Sonaimuri 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.

Sonaimuri Municipality, Bangladesh, 2025

Produced by:

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

Parimal Kumar Dev, CEO, Municipal Association of Bangladesh

Md. Tawhidur Rahaman, Technical Expert, CWIS-FSM Support Cell, Department of Public Health Engineering (DPHE), Bangladesh

Md. Tahmidul Islam, Technical Lead, WaterAid Bangladesh

Md Zarif Oeishik, Associate Officer- Technical, WaterAid Bangladesh

This SFD lite report is available from:

www.sfd.susana.org

SFD Promotion Initiative