



SFD Lite Report

Kaliakair Municipality Bangladesh

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

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1 The SFD Graphic

Kaliakair Municipality, Gazipur, Bangladesh
Version: Reviewed
SFD Level: SFD Lite

Date prepared: 6 Mar 2023
Prepared by: CWIS-FSM Support Cell, DPHE

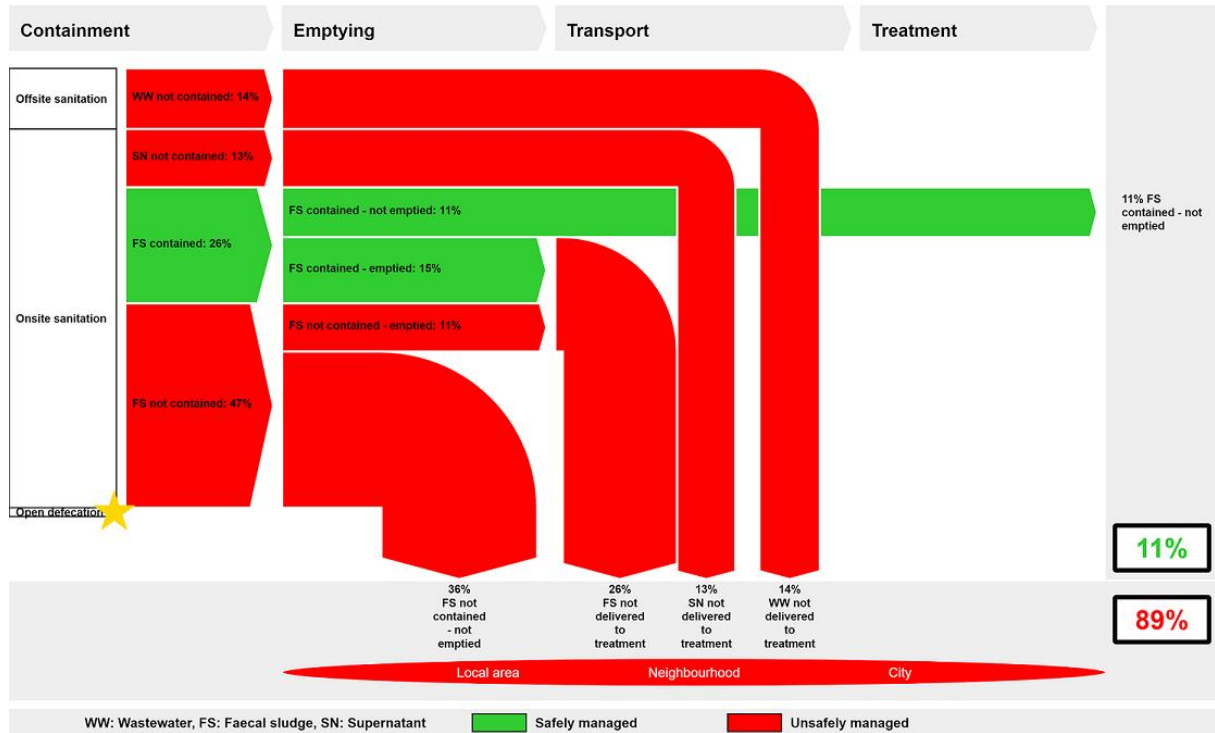


Figure 1: SFD Graphic for Kaliakair Municipality.

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 Kaliakair Municipality played vital roles in collecting and sharing data and producing this SFD graphic and SFD lite report.

Date of production: 06/03/2023

3 General city information

Geography: Kaliakair Municipality is situated within the Kaliakair Sub-District (Upazila) in Gazipur District (Zila), which is under Dhaka Division. The geographical coordinates of Kaliakair are 24° 4' 10.03" N and 90° 13' 19.64" E¹. It is bordered on the north by the Upazilas of Mirzapur and Sakhipur, on the south by the Upazilas of Savar and Dhamrai, on the east by the Upazilas of Gazipur Sadar and Sreepur, and on the west by the Upazila of Mirzapur² (Figure 2).

Kaliakair is a fast-growing municipality located in Gazipur District and 70 km far from North of Dhaka. It is about 15 km from the District Headquarter in Gazipur and it is well connected with road and railways. Kaliakair Municipality was established on 9 April 2001 as C class municipality and it became B class municipality in 14 September 2006 now it has upgraded as an "A" class municipality. Kaliakair is the second smallest Upazila of Gazipur district in terms of population (Figure 2).

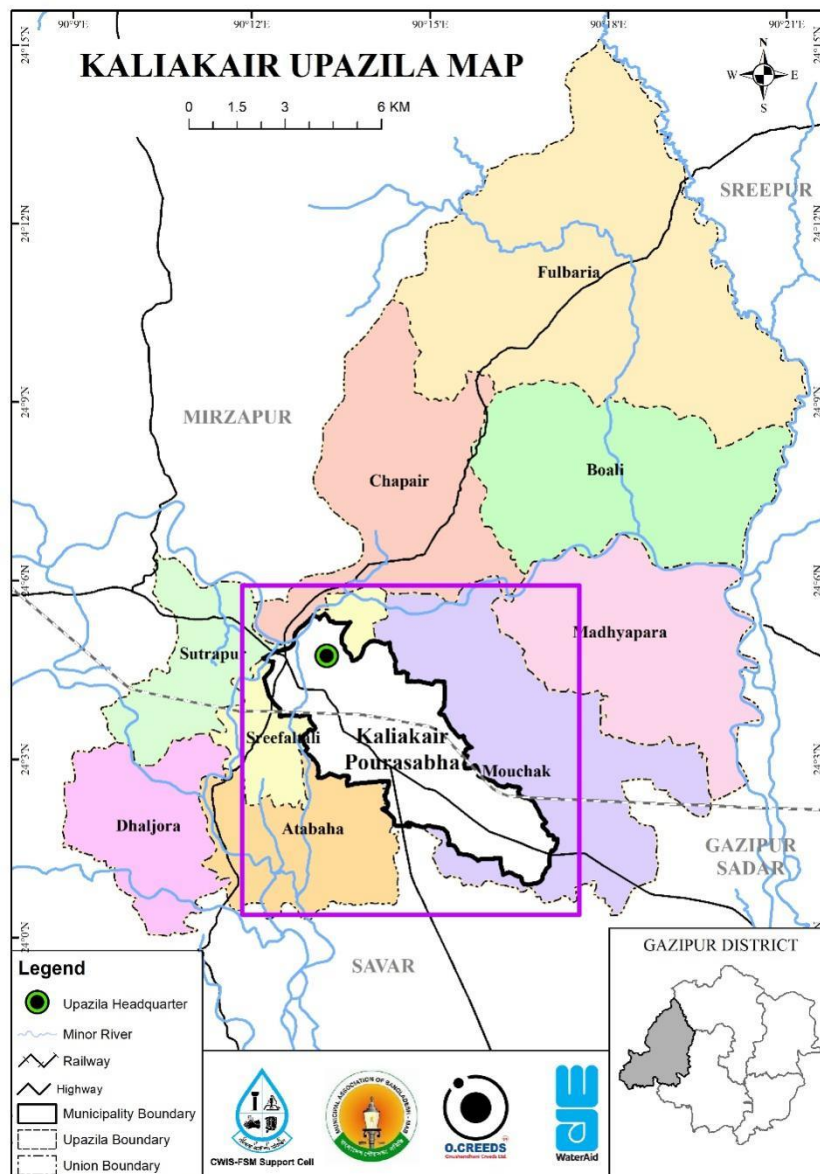


Figure 2: Kaliakair Municipality Location Map.

¹ <https://www.latlong.net/place/kaliakair-bangladesh-19737.html>

² https://en.banglapedia.org/index.php/Kaliakair_Upazila

Categorisation: The Local Government (Paurashava) Act of 2009 classifies Municipality of Bangladesh into A, B, and C classes based on their annual income. Kaliakair Municipality was established on 9 April 2001 as C class municipality and it became B class municipality in 14 September 2006. Now it has upgraded as an “A” class municipality. Kaliakair is the second smallest Upazila of Gazipur district in terms of population³ (Figure 3).

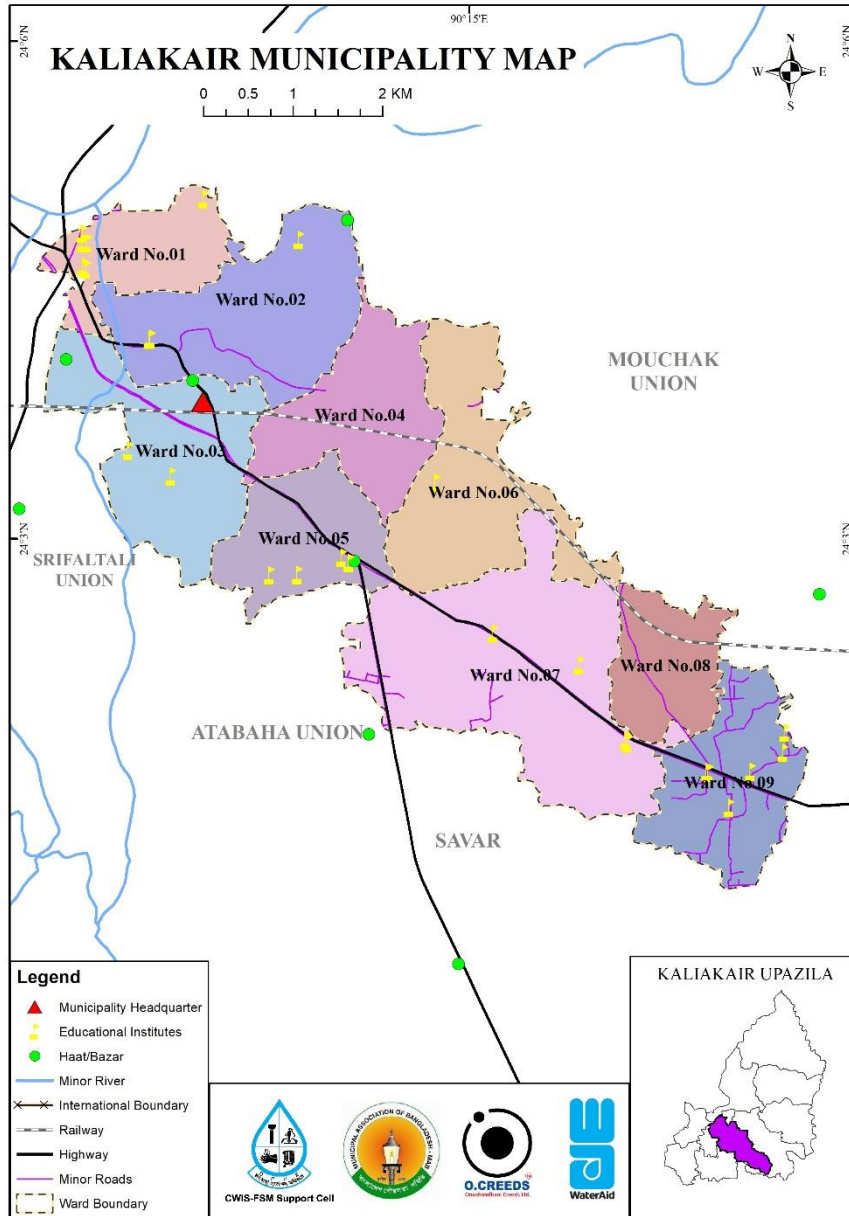


Figure 3: Kaliakair Municipality Ward Boundary Map.

Demography: According to the population census in 2011 by the Bangladesh Bureau of Statistics (BBS), the Kaliakair city population was 157,162. The population growth in the Municipality is 4.02% per year. Considering 10% floating population, such as farmers and traders comes to the city every day, the present (2023) population is estimated to be around 277,423 (Table 1). The household survey results show that majority of the occupation is business (42%), followed by private service (28%) and agriculture (4%)⁴.

³ Kaliakair Paurashava Master Plan 2011-2031.

⁴KII and field visit during Baseline survey 2023.

Table 1: City profile (Source: KII at Kaliakair Municipality and Kaliakair Paurashava Master Plan 2011-2031).

Population parameters	Value
Estimated population, 2023	277,423
Households, 2023	68,163
Area, sq.km	27.27
Total roads, km	199.89
Total drains, km	11.5

Climate: Kaliakair, which is located at 8 m (26 ft) above sea level, has a tropical savanna climate (Köppen climate classification: Aw)⁵. The maximum mean temperature observed is around 32.4°C- 36°C between March-August, with the minimum mean temperatures observed are between 15-17°C in January- February. The annual average rainfall is about 2,100 mm, according to BMD (2003-2019).

Hydrology: The Bangshi River passes by north side and crosses through the municipality area. Main notable rivers are Turag, Bangshi, Salda, Boalia, Hawla, Ujan and Markaj Beels and Goala and Betjhuri canals⁶. Every year, many areas within the municipality face water logging during monsoon for drainage congestion⁷.

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 etc⁸.

⁵ <https://en.db-city.com/Bangladesh--Dhaka--Gazipur--Kaliakair>.

⁶ Kaliakair Paurashava Master Plan 2011-2031.

⁷ Kaliakair Paurashava Master Plan 2011-2031.

⁸ KII and field visit during Baseline survey 2023.

4 Service outcomes

The city does not have a dedicated sewerage system and most sanitation systems available are classified as onsite systems (86.1%). 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 summarizes 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.

Kaliakair Municipality, Gazipur, Bangladesh, 6 Mar 2023. SFD Level: SFD Lite								
Population: 277423								
Proportion of tanks: septic tanks: 68%, 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	9.6	0.0	0.0					
T1A1C7 Toilet discharges directly to water body	3.0							
T1A1C8 Toilet discharges directly to open ground	1.2							
T1A2C5 Septic tank connected to soak pit	5.9			25.0	0.0	0.0		
T1A2C6 Septic tank connected to open drain or storm sewer	41.5			27.0	0.0	0.0	0.0	0.0
T1A2C7 Septic tank connected to open water body	7.2			27.0	0.0	0.0		
T1A2C8 Septic tank connected to open ground	11.1			27.0	0.0	0.0		
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	1.2			100.0	0.0	0.0		
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	16.3			79.0	0.0	0.0		
T1A6C10 Unlined pit, no outlet or overflow	3.0			0.0	0.0	0.0		

Table 2: SFD Matrix for Kaliakair Municipality.

The figures shown in Table 2 and elaborated in the following section are derived from information obtained through household (HH) survey, Key Informant Interviews (KIIs), and Focus Group Discussions (FGDs) (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, T1A1C6 system is considered as 9.6% of the total population of the city to generate the SFD graphic. Similarly, the T1A2C6 system is considered as 41.5% of the total population of the city 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. (Source: *Field Survey, 2023/ O.CREEDS_ WaterAid Bangladesh*).

Containment: Almost all the households (86.1%) 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 65.5% of the city population uses septic tanks as the containment system, 16.4% of the toilets have single pit systems, and 1.2% of people use double pits in the city, 3% of the people use dug hole as the containment system. About 13.9% do not have any type of containment and discharges 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 categorized as: 5.9% of the population uses septic tanks connected to soak pits (T1A2C5), 41.5% of the population uses septic tanks connected to open drain (T1A2C6), 7.2% of the population uses septic tanks connected to water bodies (T1A2C7), 11.1% of the population uses septic tanks connected to open ground (T1A2C8), 1.2% of the population uses lined tanks with impermeable walls and open bottom, no outlet or overflow (T1A4C10), 16.3% of the population relies on lined pits with semi-permeable walls and open bottom with no outlet or overflow (T1A5C10) and 3.0% 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 26% 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 3-10 metres⁹. The most common drinking water production technology is a tube well with a hand pump or motorized pump. Among them, 93.1% of the households use their own tube well fitted with electric motor and 5.5% use their own hand pump tube well. There is no supply water system within the municipality. Lateral separation between sanitation facilities and water sources varies from one area to another. 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 less than 5% 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. 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.

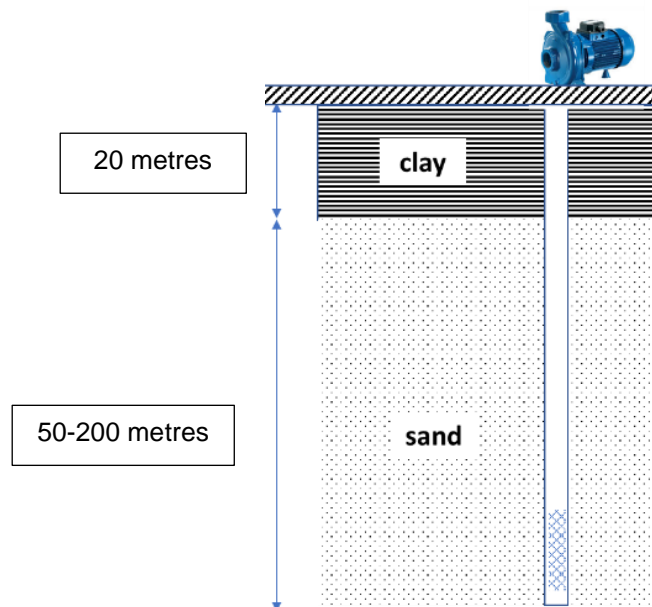


Figure 5: Soil profile in Kaliakair Upazila and location of tube well screen.

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



Figure 6: Containment technologies and their connections in Kaliakair Municipality. Left: Toilet outlet connected to open drain, Right: Toilet outlets direct connected to waterbodies. (Source: Field Survey 2023/ O.CREEDS_ WaterAid Bangladesh).

Emptying: 27% of households relying on septic tanks get service from private sweepers for emptying of the septic tank. It was observed from the survey that 30% of 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 8 years depending upon the size, uses, etc.

However, about 25% of the septic tanks, connected to the soak pit are emptied within 2-5 years. About 27% of the septic tanks connected to open drains, open ground or water bodies are emptied within 2-5 years. Almost 79% of single 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 and pits is mostly (86%) done by private sweepers. In few households, desludging is done by municipal sweepers (9%) and family members (5%). Around 42% of this withdrawal is done manually using a bucket and rope. 35% 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 one vacutug available but not in operation¹⁰.

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 16% 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, 84% 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 the HH survey, KII 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.

¹⁰ KII with Mayor and Conservancy Inspector.

4.4 SFD Graphic

The outcome of the SFD graphic shows that only eleven percent (11%) of the excreta flow is classified as safely managed, and the remaining eighty nine percent (89%) is classified as unsafely managed (Figure 7).

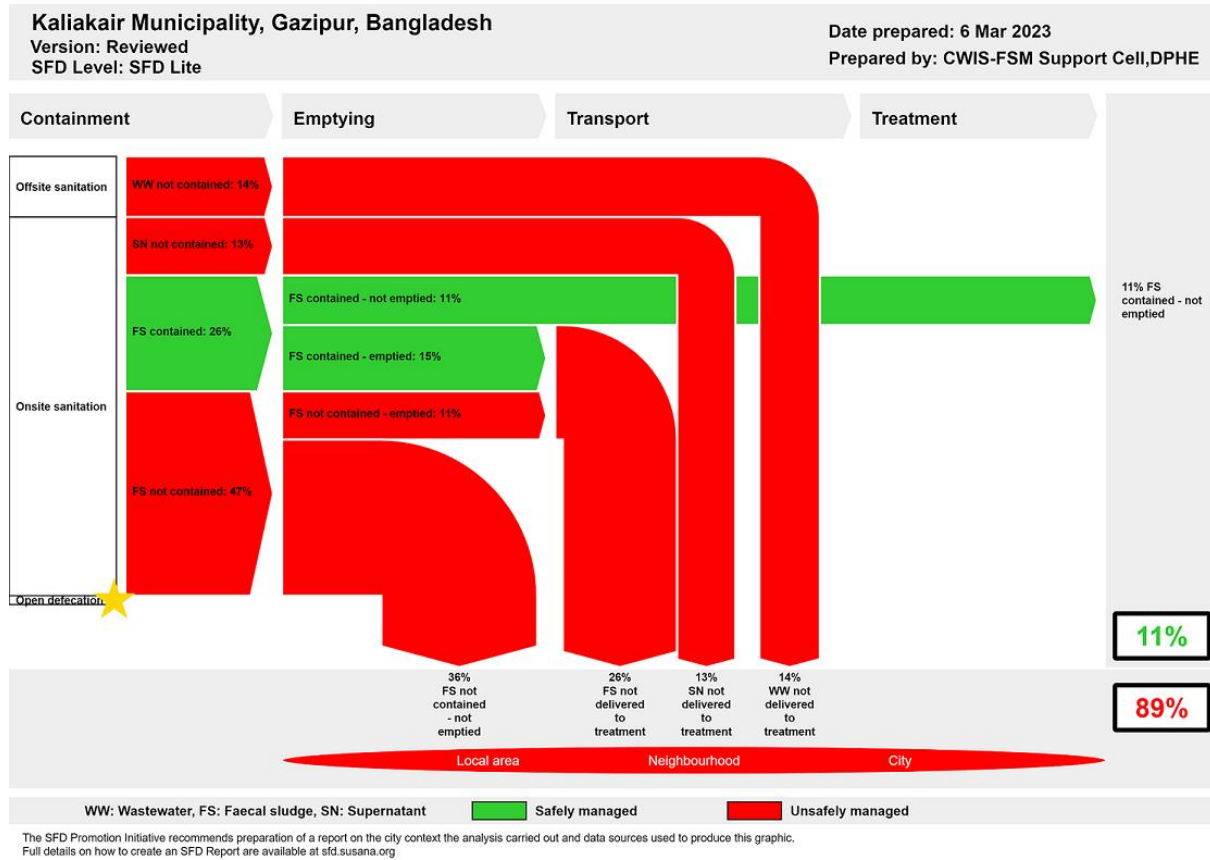


Figure 7: SFD Graphic for Kaliakair Municipality Municipality.

The unsafely managed excreta originate from wastewater and not delivered to treatment (14%), Faecal Sludge (FS) both contained and not contained - not delivered to treatment (26%), FS not contained - not emptied (36%) and 13% of supernatant not delivered to treatment.

Thus, the safely managed excreta originate from FS contained - not emptied (11%). This 11% resembles the FS stored in containments without significant risk to groundwater pollution. Thus, the safely managed percentage of FS generated by this 11% of the population is temporary until the FS from the containments is emptied. Therefore, these systems will require emptying services in the short and medium term as they fill up.

5 Data and assumptions

The baseline survey conducted in February 2023 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, educational institutions, health complex and general public. 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 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 Kaliakair Municipality:

- ✓ The proportion of FS in septic tanks, fully lined tanks, and lined, open bottom tanks are considered 68%, 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 Kaliakair Municipality was 157,162. The urban population growth in Kaliakair is 4.02% per year. Considering 10% floating population, such as farmers and traders, comes to the city every day, the present (2023) population is estimated to be around 277,423.
- ✓ There are around 1.2% 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, 1.2%). Based on the household survey, variable F3 for system T1A4C10 is set to 100%.
- ✓ There are around 16.3% 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, where there is no 'significant risk' of groundwater pollution (system T1A5C10, 16.3%). 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 is set to 79%.
- ✓ 5.9% 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 25% 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 25%.
- ✓ There are about 59.8% of septic tanks connected to the open drain, water bodies and open ground. Based on the household survey, variable F3 for systems T1A2C6, T1A2C7 and T1A2C8 is set to 27%.
- ✓ 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 References

Reports, literature and website

- Population and Housing Census, Bangladesh Bureau of Statistics (BBS), 2011.
- Kaliakair Paurashava Master Plan 2011-2031.
- <https://www.latlong.net/place/kaliakair-bangladesh-19737.html>
- <http://bmd.gov.bd/p/Rainfall-Situation-202>
- https://en.banglapedia.org/index.php/Kaliakair_Upazila
- <https://en.db-city.com/Bangladesh--Dhaka--Gazipur--Kaliakair>
- 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) (February 2023)

- KII with Conservancy Inspector, Kaliakair Municipality.
- KII with DPHE Official, Kaliakair Municipality.
- KII with Executive Engineer, Kaliakair Municipality.

Facilitators: Md. Atiqur Rahman Mollick (Environment Specialist), Md. Hasibur Rahman (Team leader), O. CREEDS Ltd.



Figure 8: KIIs with Executive Engineer (Left) and Conservancy Inspector (Right) at Kaliakair Municipality. (Source: *Field study 2023/O.CREEDS_WaterAid Bangladesh*).

Focus Group Discussions (FGDs) (February 2023)

- At school
- At Bazar
- At Municipality



Figure 9: Focus Group Discussions at Latifpur Govt. Primary School at Kaliakair 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 12 February to 19 February 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. Mojibor Rahman, Mayor, Kaliakair Municipality; Mr. Haripad Roy, Executive Engineer; Ms. Md. Rawshan Akter Rubi, Conservancy Inspector and Ms. Nasrin Ara Pushon, Assistant Engineer, DPHE, Kaliakair 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. Mojibor Rahman, Mayor, Kaliakair 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.

SFD Promotion Initiative



Kaliakair Municipality, Bangladesh, 2023

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;

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