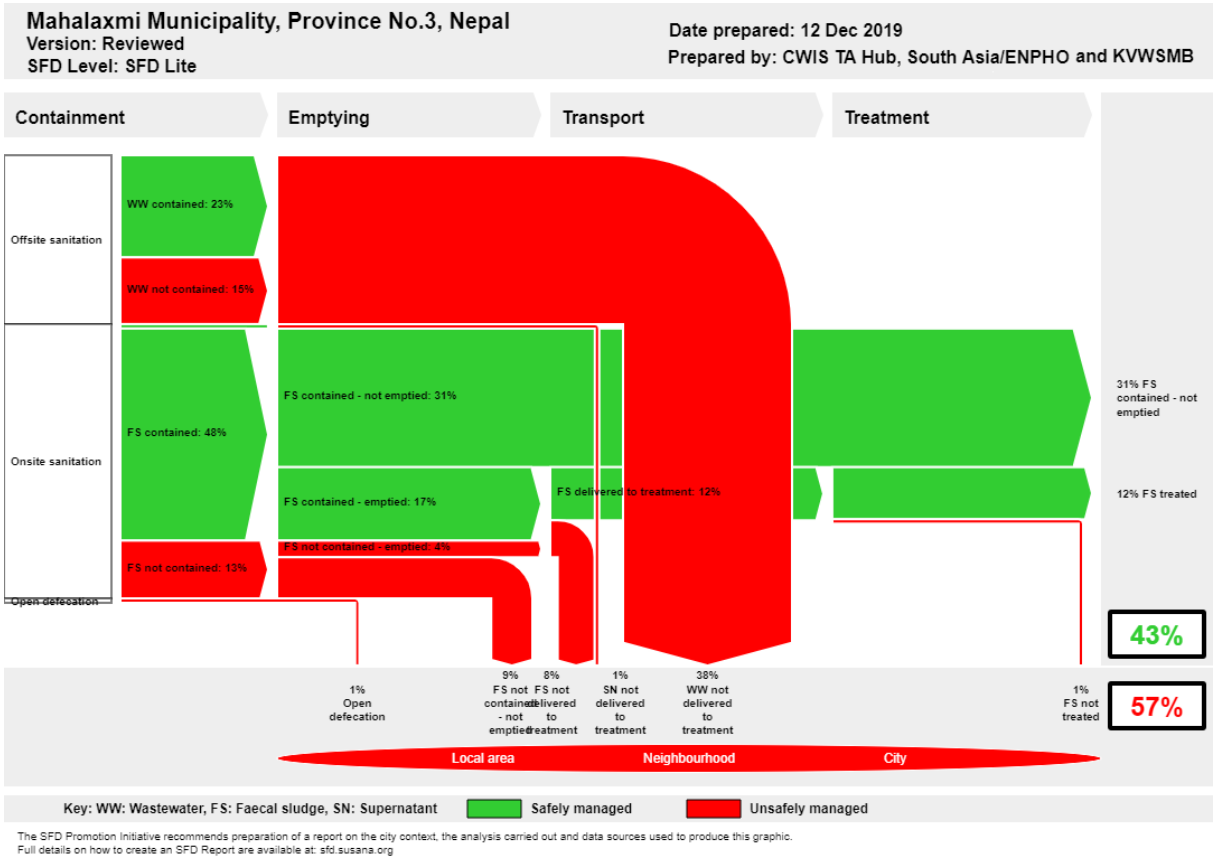
SFD Lite Report

Mahalaxmi Municipality Nepal

This SFD Lite Report was prepared by City-wide Inclusive Sanitation Technical Assistance Hub, South Asia (CWIS TA Hub, South Asia)/Environment and Public Health Organization (ENPHO) and Kathmandu Valley Water Supply Management Board (KVWSMB).

Date of production/ last update: 12/12/2019

1 The SFD Graphic



The SFD Promotion Initiative recommends preparation of a report on the city context, the analysis carried out and data sources used to produce this graphic.
Full details on how to create an SFD Report are available at: sfd.susana.org

2 SFD Lite information

Produced by:

- The Shit Flow Diagram for Mahalaxmi municipality was created by City-wide Inclusive Sanitation Technical Assistance Hub, South Asia (CWIS TA Hub, South Asia)/ Environment and Public Health Organization (ENPHO) and Kathmandu Valley Water Supply Management Board (KVWSMB) with the SFD graphic generator tool available on the SuSanA Website.

Collaborating partners:

- Eco- Concern Pvt. Ltd.
- DevCon.

Date of production: 12/12/2019

3 General city information

Mahalaxmi Municipality is one of the historic municipalities of Lalitpur district located in province no.3 of Nepal, formed by merging former Village Development Committees Lamatar, Lubhu, Siddipur, Tikathali and Imadol. The municipality is surrounded by Suryabinayak Municipality in east, Lalitpur Metropolitan city in the west, Godawari Municipality in the south and Kathmandu Metropolitan city and Madhyapur Thimi in the north (Figure 1) (Municipality Profile, 2019). The municipality consists of 10 wards with the total population of 112,157 people residing in 70,256 households and covering an area of 26.5 km^2 (ENPHO, 2019).

The main sources of drinking water in Mahalaxmi Municipality are public taps, household bores and wells. According to ENPHO (2019), 48% of the population are dependent on jar water, 36% are dependent on public water supply, 7% on private tanker, 4% on natural resources and 3% on wells (KII2, 2019).

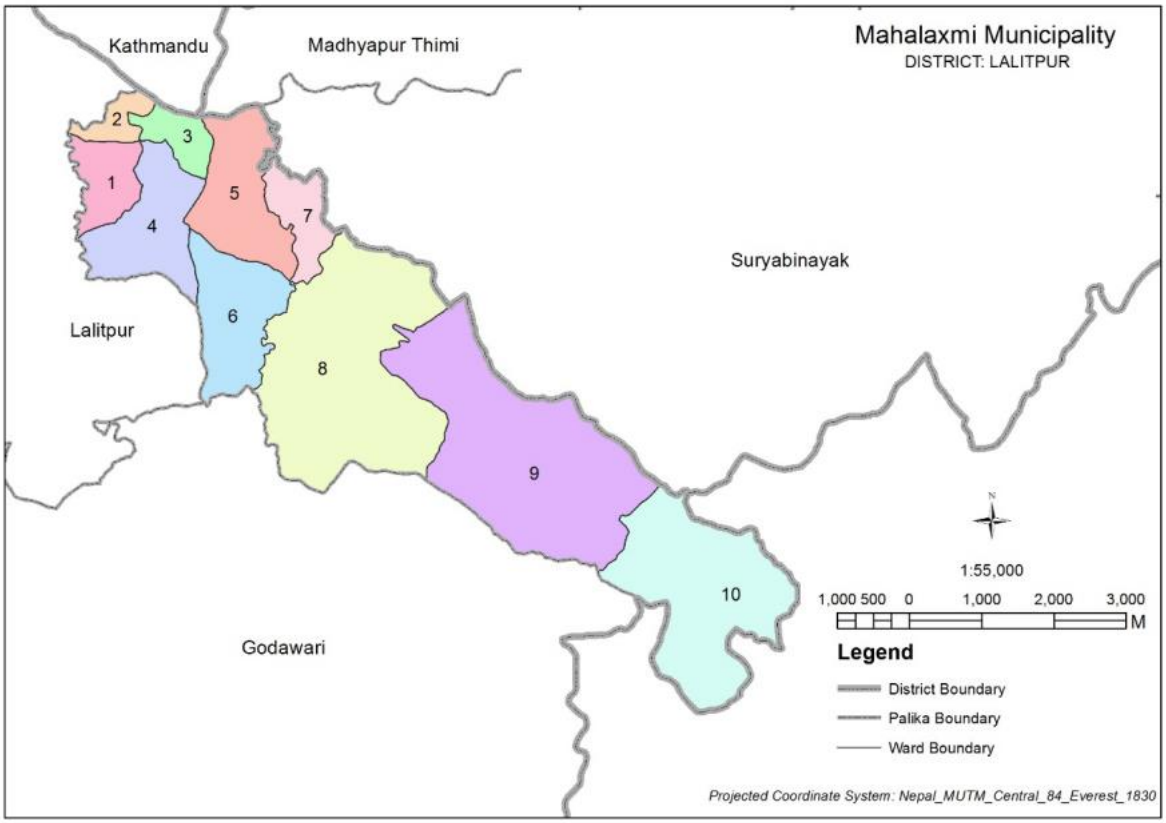


Figure 1: Map of Mahalaxmi Municipality (Source: Ministry of Federal Affairs and General Administration).

4 Service outcomes

Table 1: SFD Matrix for Mahalaxmi Municipality.

Mahalaxmi Municipality, Province No.3, Nepal, 12 Dec 2019. SFD Level: SFD Lite
Population: 112157
Proportion of tanks: septic tanks: 100%, fully lined tanks: 75%, lined, open bottom tanks: 98%

System label	Pop	W4a	W5a	W4c	W5c	F3	F4	F5	S4d	S5d
System description	Proportion of population using this type of system	Proportion of wastewater in sewer system, which is delivered to centralised treatment plants	Proportion of wastewater delivered to centralised treatment plants, which is treated	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 sewer system, which is delivered to treatment plants	Proportion of supernatant in sewer system that is delivered to treatment plants, which is treated
T1A1C1 Toilet discharges directly to a centralised combined sewer	23.0	0.0	0.0							
T1A1C6 Toilet discharges directly to open drain or storm sewer	15.0			0.0	0.0					
T1A2C5 Septic tank connected to soak pit	4.0					41.0	59.0	98.0		
T1A3C1 Fully lined tank (sealed) connected to a centralised combined sewer	1.0					0.0	0.0	0.0	0.0	0.0
T1A3C5 Fully lined tank (sealed) connected to a soak pit	1.0					41.0	59.0	98.0		
T1A4C1 Lined tank with impermeable walls and open bottom, connected to centralised combined sewer	2.0					0.0	0.0	0.0	0.0	0.0
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	30.0					37.0	59.0	98.0		
T1A4C5 Lined tank with impermeable walls and open bottom, connected to a soak pit	8.0					41.0	59.0	98.0		
T1A4C8 Lined tank with impermeable walls and open bottom, connected to open ground	2.0					43.0	59.0	98.0		
T1A4C9 Lined tank with impermeable walls and open bottom, connected to 'don't know where'	11.0					27.0	59.0	98.0		
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	2.0					25.0	59.0	98.0		
T1B11 C7 TO C9 Open defecation	1.0									

4.1 Containment

As presented in Table 1, 23% of the population are dependent on sewer system (T1A1C1, 23%). The most common containment technology in Mahalaxmi Municipality is lined tanks with impermeable walls and open bottom (T1A4C10, 30%; T1A4C9, 11%; T1A4C5, 8%; T1A4C1, 2% and T1A4C8, 2%) followed by user interface directly connected to drain (T1A1C6, 15%), septic tanks connected to soak pit (T1A2C5, 4%), fully lined tanks (T1A3C1, 1% and T1A3C5, 1%), lined pits with semi-permeable walls and open bottom (T1A5C10, 2%) and 1% of population who practice open defecation. Mahalaxmi Municipality has standard design guidelines for the construction of septic tanks (KII1, 2019). As per the household survey (2019), the average size of the containment is 7.5 m^3.

4.2 Emptying and transportation

The emptying frequency for different types of containment connected to different technologies (variable F3) is estimated on the basis of the household survey and key Informant Interviews. Emptying of the onsite sanitation facilities is either mechanical (39%), provided by a private desludging service provider, or manual (61%) in Mahalaxmi Municipality (HHs Survey, 2019). The transport of the mechanically emptied faecal sludge is done by a private desludging vehicle, which consists of a tank equipped with movable centrifugal pump on a truck (KII2, 2019). Whereas, the manual emptying is done by a household member or labour. In case of offsite sanitation system, the wastewater and supernatant is transported through the sewer system.

4.3 Treatment

The municipality has implemented a pilot faecal sludge treatment plant with an anaerobic treatment approach at Lubhu (Figure 2). The faecal sludge treatment plant is a gravity-based system with a designed capacity of 6m^3 per week. The treatment plant efficiency is nearly 98%, meaning that almost all the faecal sludge delivered to the treatment plant has been considered as treated and therefore, safely managed (ENPHO, 2019a).

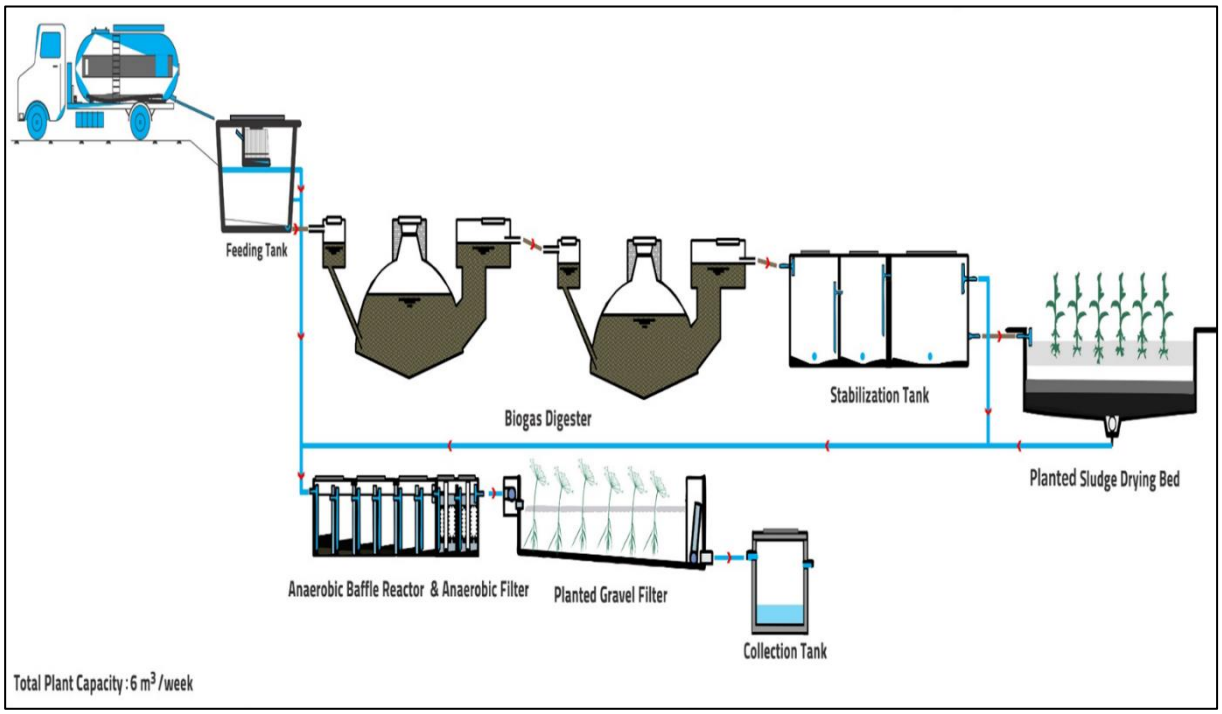


Figure 2: Overview of FS treatment technology of Lubhu FSTP (source: ENPHO).

4.4 Reuse and Disposal

Manually emptied faecal sludge is disposed by a household member or labour themselves in their household premises or in field. All wastewater, supernatant and the emptied faecal sludge not reaching treatment are finally discharged in Hanumante River and other rivers of Kathmandu valley (KII2, 2019). In case of the faecal sludge treatment plant, the biogas obtained as a by-product is used for cooking and lighting by the treatment plant care taker. The treated wastewater is used for irrigation and bio solids are used as a soil conditioner by the treatment plant care taker and is sold every six months (KII3, 2019).

Figure 3: Vegetable grown using biosolids by treatment plant care taker.

4.5 SFD Graphic

As shown in SFD graphic, 43% of all the excreta generated are safely managed and 57% are unsafely managed. 23% of the wastewater contained in the technology and 15 % of the wastewater discharged from open drain, which is not contained in the technology, gets discharged into the open environment untreated. 1% of supernatant released from the fully lined tanks connected to sewer system is discharged into the environment without any treatment, as well. Out of 13% of faecal sludge which is not contained in the technology, 4% corresponds to faecal sludge emptied but discharged in the environment untreated whereas 9% corresponds to faecal sludge not emptied which remains in the containment as not contained. The 43% of the safely managed faecal sludge originates from faecal sludge contained - emptied out of which only 12% is delivered to treatment and treated and faecal sludge contained - not emptied from tanks and pits (31%). However, in the medium- to long- term, for example as the population and population density increases, this latter practise may not be sustainable and improved sanitation management services may be required since those tanks and pits, eventually, will require emptying services.

4.6 Groundwater Contamination

There are no published data available regarding groundwater table and soil profile of Mahalaxmi Municipality. So, the information was collected from KII1 (2019). Less than 25% of population rely on underground sources of water which are from protected boreholes extracted from a depth of greater than 10 metres and consisting of fine sand, silt and clay in unsaturated zone. The lateral separation between sanitation facilities and groundwater sources with less than 10 metres is considered greater than 25% and the percentage of sanitation facilities that are located uphill of groundwater sources was estimated less than 25% (KII1, 2019). So, it has been estimated that there is low risk of groundwater pollution in Mahalaxmi Municipality.

5 Data and assumptions

The data for the SFD Matrix were estimated using the data collected from the household survey carried out by CWIS TA Hub, South Asia in 2019. The collected data were further discussed and finalized with key informants of Mahalaxmi Municipality.

The proportion of faecal sludge in septic tanks, fully lined tanks and lined tanks with impermeable walls and open bottom were set to 100%, 75% and 98%, respectively according to the relative proportions of the systems in the municipality, as per the guidance given in the Frequently Asked Questions (FAQs) in the Sustainable Sanitation Alliance (SuSanA) website.

The proportion of emptied faecal sludge for different types of containment connected to different technologies (variable F3) was estimated on the basis of the data collected from the household survey and Key Informant Interviews.

According to the report prepared by ENPHO (2020), the total estimated volume of faecal sludge emptied per day is 1.7 m^3 per day, whereas the capacity of the treatment plant is 1 m^3 per day. So, the proportion of emptied faecal sludge that has been delivered to the treatment plant (variable F4) was calculated as 59%.

BOD levels are one of the primary control parameters of the treatment process. BOD levels at two different points of the treatment plant were selected to calculate BOD removal: inlet at biogas digester (5,400 mg/l) and outlet at planted gravel filter (76 mg/l). Thus, treatment plant efficiency is nearly 98%. Hence, as per the lab test report prepared by ENPHO (2019b), the proportion of treated faecal sludge that has been delivered to treatment plant, which is treated (variable F5) was set to 98%.

6 List of data sources

- *Mahalaxmi Municipality, 2019/2020, Municipality Profile, 2019.*
- *Household Survey, 2019, City-Wide Inclusive Sanitation Technical Assistance Hub, South Asia.*
- *MoFALD, 2019, Ministry of Federal Affairs and General Administration.*
- *ENPHO, 2019a, Environment and Public Health Organization, Report on Situational Assessment of Faecal Sludge Management in Mahalaxmi municipality.*
- *ENPHO, 2019b, Environment and Public Health Organization, Sample analysis report.*
- *ENPHO, 2020, Environment and Public Health Organization, Report on Conceptual Design of Feacal Sludge Treatment Plant at Mahalaxmi Municipality.*
- *KII1, November 2019, Interview with Municipal Engineer Mahalaxmi Municipality.*
- *KII2, November 2019, Interview with Municipal officer Mahalaxmi Municipality.*
- *KII3, September 2019, Interview with care taker of faecal sludge treatment plant, Mahalaxmi Municipality.*
- *KII4, September 2019, Interview with Private desludging service provider, Lalitpur Municipality.*

SFD Mahalaxmi Municipality, Nepal, 2019

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This Executive Summary and the SFD Report are available from:

www.sfd.susana.org

SFD Promotion Initiative