SFD Report

Jaleshwar Municipality
Nepal

Final Report

This SFD Report - SFD level 2 - was prepared by
Environment and Public Health Organization (ENPHO)

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SFD Report Jaleshwar Municipality, Nepal, 2023

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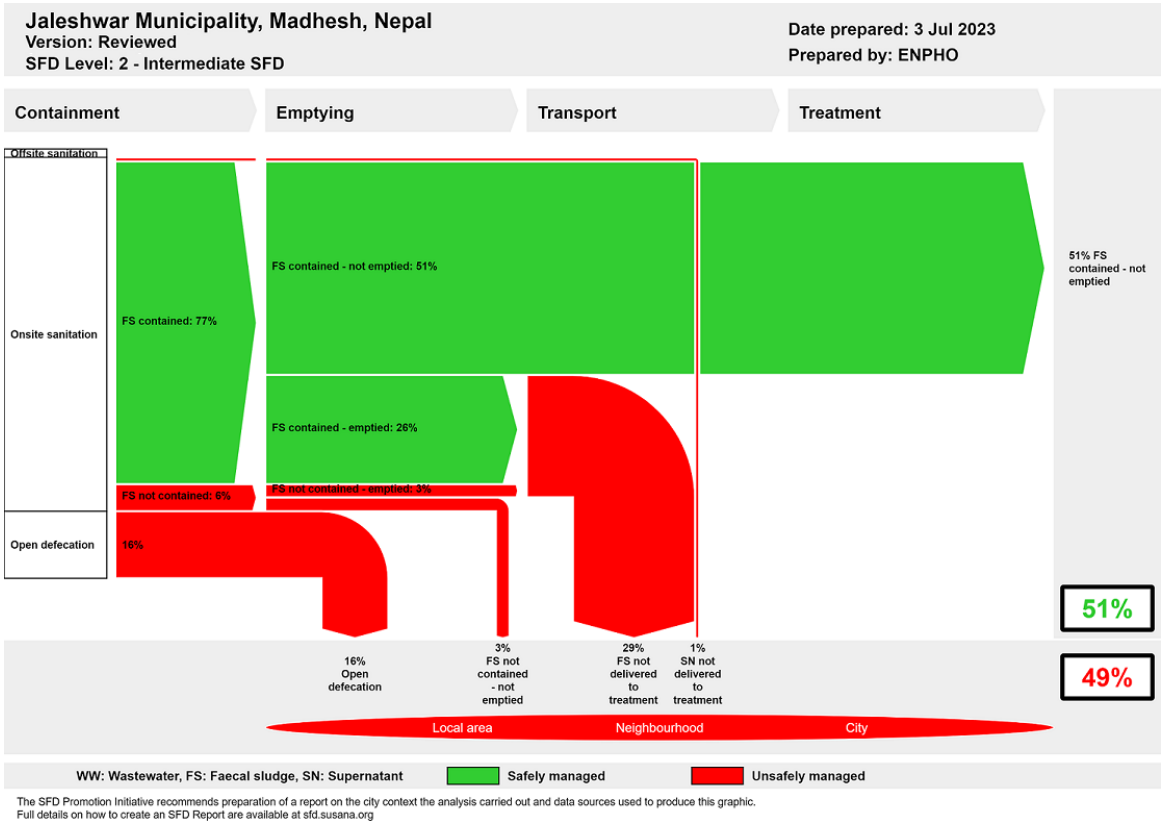
1. The SFD Graphic



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. Diagram information

SFD Level:

This SFD is a level 2- Intermediate report.

Produced by:

Environment and Public Health Organization (ENPHO)

Collaborating partners:

Jaleshwar Municipality, Municipal Association of Nepal (MuAN), United Cities and Local Government- Asia Pacific (UCLG- ASPAC).

Status:

Final SFD report.

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3. General city information

Jaleshwar Municipality is in Mahottari District, Madhesh Province of Nepal. It has a total of 12 wards and covers an area of 44.72 square kilometres. It shares its boundary with Mahottari District and Pipra Rural Municipality in the north, Sitamadi District of neighboring country India in the south, Matihani Rural Municipality in the east and Ekdara Rural Municipality in the west.

According to the national population and housing census 2021, Jaleshwar Municipality has a total population of 63,802 and 12,380 households. The total male and female are 31,391 and 32,411 respectively. The population density of the municipality is 1,442 people per square kilometre. Ward number 6 has the highest number of households with 1,422 and the highest population (7,553) and ward number 10 has the least number of households with 452 and the least population (2,422)(NSO, 2023).

The municipality has hot and wet summers and cool winters. The average annual temperature is

24.8 °C. The average annual rainfall is 587.66 mm.

4. Service outcomes

The overview of different sanitation technologies across the sanitation value chain in the Municipality is briefly explained in this section. All data in this section is from the household and institutional surveys conducted for this study (ENPHO, 2023). 84% of the households in the municipality have a toilet. The 16% of the households without toilet defecate in nearby farmlands. The municipality has public toilets in market areas and nearby temple. The public toilets were constructed by the municipality and are operated by individual service providers.

Containment:

All of the households with access to a toilet rely on onsite sanitation technologies. 40% of the households have constructed fully lined tanks and 36% of households have installed lined pits with semi-permeable walls and open bottom. Similarly, 7% of the households have constructed lined tanks with impermeable walls and open bottom. Only 1% of the households have a technically appropriate septic tank.

Emptying and Transportation:

According to the assessment of the sanitation situation, only 39% of the households have emptied their containments at least once after used. All of these containments were emptied mechanically. The private desludging service providers are engaged in emptying and transportation services of faecal sludge.

Treatment and Disposal:

There is no Faecal Sludge Treatment Plant (FSTP) within the municipality for FS treatment. Thus, all emptied Faecal Sludge (FS) ends up in the environment untreated.

94% of households in the municipality rely on hand pumps and tubewells while 6% of households have been connected to piped water supply (ENPHO, 2023) .The Nepal Water Supply Corporation Jaleshwar branch is the main water service provider in the municipality. The scheme serves approximately 1,205 households from ward number 1, 2 and 6. The water is chlorinated prior to distribution to provide safe drinking water to the customers.

The SFD graphic shows that 51% of the excreta generated are safely managed while 49% are unsafely managed. The safely managed excreta generated by 51% of the population is temporary. So, once the containments get filled and FS from the containments is emptied, the percentage of unsafely managed excreta would increase.

5. Service delivery context

Access to drinking water and sanitation has been defined as fundamental rights to every citizen by the constitution of Nepal. To respect, protect and implement the rights of citizen embedded in the constitution, the Government of Nepal (GoN) has passed the Drinking Water and Sanitation Act, 2022 which has emphasized on a right to quality sanitation services and prohibited direct discharge of wastewater and sewage into water bodies or public places.

Several policies have been in place to accomplish the sanitation needs of people. Particularly, the National Sanitation and Hygiene Master Plan (NSHMP) 2011 has proved as an important strategic document for all stakeholders to develop uniform programs and implementation mechanism at all levels. It strengthens institutional set up with the formation of water and sanitation coordination committee at every tier of government to actively engage in sanitation campaigns. The document adopted sanitation facilities as improved, basic, and limited in line with WHO/UNICEF guidelines. The draft Sector Development Plan (SDP) has envisioned the delineation of roles and responsibility of federal, provincial, and local government in an aim to initiate sustainability of Open Defecation Free (ODF) outcomes.

6. Overview of stakeholders

Based on the regulatory framework for Faecal Sludge Management (FSM), the major stakeholders for effective and sustaining service delivery in the municipality are as presented in Table 1.

Table 1: Overview of Stakeholders.

Key Stakeholders	Institutions / Organizations
Public Institutions at Federal Government	Ministry of Water Supply

	Department of Water Supply and Sewerage Management (DWSSM)
Public Institutions at Provincial Government	Ministry of Physical Infrastructure Development Water Supply and Sanitation Division Office (WSSDO)
Public Institutions at Local Government	Jaleshwar Municipality Office Nepal Water Supply Corporation, Jaleshwar branch
Non-governmental Organizations	Environment and Public Health Organization (ENPHO)
Private Sector	Public toilet operators, Desludging service providers
Development Partners, Donors	MuAN, BMGF, UCLG ASPAC

7. Credibility of data

The major data were collected from random household sampling. Altogether, 373 households and 43 institutions were surveyed from 12 wards of the municipality on 27-28 December 2022 (ENPHO, 2023). Primary data on current sanitation practices in the municipality were triangulated from Key Informant Interviews (KIIs) with municipal officials, public toilet operators, desludging service providers and water supply committee. The overall data and findings were shared with the stakeholders of the municipality and validated through a sharing program on February 28, 2023.

8. Process of SFD development

Data on sanitation situation were collected through household and institutional survey. The local enumerators from each wards of the municipality were trained on all aspects of sanitation service chain starting from user interface, containment, emptying, transport, treatment, end use or safe disposal of excreta and the use of mobile application; *KoboCollect* was used for collection of data from households and institutions. Moreover, KIIs were conducted with officers and the engineer of the municipality, public toilet operators, desludging service providers and water supply service provider to understand the situation practices across the service chain. Types of sanitation technologies used in different locations were mapped using ARCGIS. To produce the SFD graphic, initially a relationship between sanitation technology used in questionnaire survey and SFD PI methodology was made. Then, data were fed in SFD graphic generator to produce the SFD graphic.

8. List of data sources

The list of data sources to produce this executive summary is as follows:

- Climate Data. (n.d.). Climate data. Retrieved from https://en.climate-data.org/asia/nepal-26/
- Jaleshwar Municipality. (n.d.). Jaleshwar Municipality, Goverment of Nepal. Retrieved from http://jaleshwormun.gov.np/en
- MoWS. (2017a). Institutional and Regulatory Framework for Faecal Sludge Management in Urban Areas of Nepal. Kathmandu,Nepal: Ministry of Water Supply.
- MoWS. (2022a). Water Supply and Sanitation Act. Ministry of Water Supply; Government of Nepal.
- NSO. (2023). National Population and Housing Census 2021. National Statistics Office.

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Abbreviations

ADB	Asian Development Bank
AEPC	Alternative Energy Promotion Centre
CFU	Colony Forming Unit
DUDBC	Department of Urban Development and Building Construction
DWSSM	Department of Water Supply and Sewerage Management
ENPHO	Environment and Public Health Organization
FS	Faecal Sludge
FSM	Faecal Sludge Management
HH	Household
IRF	Institutional and Regulatory Framework
KII	Key Informant Interview
MoUD	Ministry of Urban Development
MoWS	Ministry of Water Supply
MuAN	Municipal Association of Nepal
NGO	Non-Governmental Organization
NPC	National Planning Commission
NSO	National Statistic Office
NUWSSSP	National Urban Water Supply and Sanitation Sector Policy
NWSC	Nepal Water Supply Corporation
NWSSP	National Water Supply and Sanitation Policy
ODF	Open Defecation Free
RVT	Reservoir tank
RWSSNP	Rural Water Supply and Sanitation National Policy
SDG	Sustainable Development Goal
SDP	Sector Development Plan
SFD PI	Shit Flow Diagram Promotion Initiative
SFD	Shit Flow Diagram
SN	Supernatant
STWSSSP	Small Towns Water Supply and Sanitation Sector Project
UCLG ASPAC	United Cities and Local Governments Asia Pacific
UNICEF	United Nations Children's Education Fund
WASH	Water, Sanitation and Hygiene

1 City context

Jaleshwar Municipality is in Mahottari District, Madhesh Province of Nepal. It has a total of 12 wards and covers an area of 44.72 square kilometres. It was established in 1982. It is surrounded by Mahottari and Pipra Rural Municipalities in the north, Sitamadi District of neighbouring country India in the south, Matihani Rural Municipality in the east and Ekdara Rural Municipality in the west. The Municipality shares the international border with India at Bhitthamore, Bihar (Figure 1).

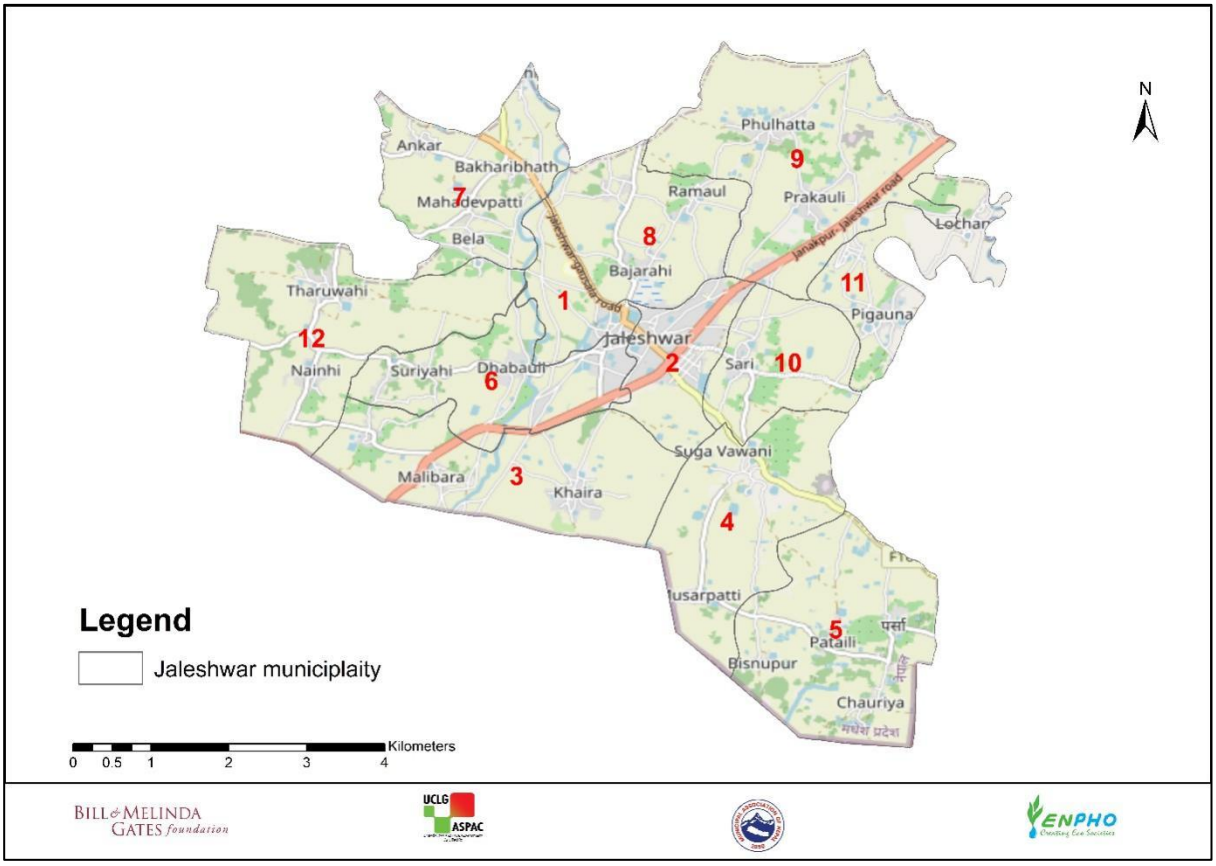

Figure 1: Map of Jaleshwar Municipality with ward boundaries.

1.1. Population

According to national population and housing census 2021, the municipality has a total population of 63,802 and 12,380 households. The total male and female populations are 31,391 and 32,411 respectively. The population density is 1,442 people per square kilometre. A ward number 6 has the highest number of households with 1,422 and the highest population of 7,553 (3,713 male and 3,840 female) and ward number 10 has the least households with 452 and the least population with 2,422 (1,193 male and 1,229 female) (NSO, 2023),

1.2. Climate

The municipality has hot and wet summers and cool winters. Under the Köppen–Geiger climate classification Jaleshwar features monsoon-influenced humid subtropical climate (Cwa). The average annual temperature in Jaleshwar is 24.8 °C (Climate Data, n.d.). The maximum temperature in the municipality is approximately 42°C and the minimum temperature is approximately 12°C. The average annual rainfall in the municipality is 587.66 mm (Jaleshwar Municipality, n.d.).

1.3. Topography

The Jaleshwar Municipality is located at latitude: 26° 38' 22" N to 26° 54' 30" N and longitude: 85° 48' 00" E to 86°00'35". The elevation ranges between 91 m to 160 m above mean sea level. A large area of the municipality consists of flat land. Soil analysis of samples for 365 different sites of Mahottari District including Jaleshwar Municipality shows that Jaleshwar has variable soil texture with dominant of sandy and loamy soil (Satya N Mandal, 2002).

2 Service Outcomes

2.1. Overview

Data on sanitation situation were collected through household and institutional surveys (ENPHO, 2023). A total of 373 households were sampled from 12,380 households distributed in fourteen wards (further details are presented in section 4). The results obtained after the triangulation and validation of the data with all the data sources including literature reviews, Key Informant Interviews (KIIs) and a validation workshop is presented in this section.

Particularly over the past 20 years, sanitation has been promoted in Nepal, which led to the nation as Open Defecation Free (ODF) nation on September 30, 2019, with the combine effort of the 3 tiers of the government (MoWS, 2020). The municipality was declared as an open defecation free municipality on September 13, 2019 (KII_1, 2022). However, the household survey reveals that 16% of the households in the municipality do not have access to toilet and defecate in open spaces such as farmlands.

2.1.1 Sanitation System in Households Building

The onsite sanitation refers to a sanitation technology or sanitation system in which excreta is collected and stored and emptied from or treated on the plot where they are generated (SuSanA, 2018). All the households with access to toilet in the municipality rely on onsite sanitation systems. Table 1 shows the percentage of households with different types of containment in the municipality.

Table 1: Types of containment in households building in Jaleshwar Municipality (ENPHO, 2023).

Containment	Wall construction Materials	Bottom of containment	Chamber	Number	Connected to	%	Recategorized as SFD	%
Septic tank	Cemented walls or cemented brick/ stone wall	PCC or plastered	Two or more than Two	NA	Open drain	1%	Septic tank	1%
Fully lined tank	Cemented walls or cemented brick/ stone wall	PCC or plastered	One	NA	No outlet or open ground or open drain	40 %	Fully lined tank	40%
			Two		No outlet or open ground			
Lined tank with impermeable walls and open bottom	Cemented walls or cemented brick / stone wall	Soiling/ nothing	One, Two or More than Two	NA	Open ground or No outlet	7%	Lined tank with impermeable wall and open bottom	7%
Single pit	Concrete rings piled one	Soiling/ nothing	NA	One	NA	32 %	Lined pit with semi-permeable wall and open bottom	36%
Twin pit	Concrete rings piled one	Soiling/ nothing	NA	Two	NA	4%		

Open Defecation	NA	NA	NA	NA	NA	16 %	Open Defecation	16%

A septic tank is installed in 1% of households. The septic tank is a properly designed technology with sealed wall and bottom having at least two chambers and the effluent discharged into a soak pit or sewer network or storm sewer.

Fully lined tanks, constructed by 40% of the households, are the most popular containment type in the municipality and lined tanks with impermeable walls and open bottom are constructed by 7% of the households.

Single pits are popular in the municipality as well. 32% of the households have single pits. The single pits are onsite technologies made from pre-cast concrete rings. There is no lining between rings and allows infiltration from both walls and bottom. These pits are categorized as lined pits with semi-permeable walls and open bottom for the preparation of the SFD graphic.

Twin-pits are an upgraded version of pit latrines that allow for the safe treatment and conversion of fecal sludge into a beneficial soil amendment. They basically consist of two pits which are linked, using a Y-junction at a minimum horizontal distance of 1.2 m. Only one pit is used at a time, with the other resting while the first is in use. During storage, excreta undergo decomposition through a combination of anaerobic digestion and composting processes. The end product is sanitized and can be utilized as compost to enhance soil quality, water retention capacity, and fertility. This process usually takes around two years (Elizabeth Tilley, 2014).

4% of the households have constructed twin pits (Figure 2). However, most twin pits installed by the households are not as per the design. The minimum distance between two sets of pits is not maintained. Also, the connection pipes to the pits are in series. Thus, these pits function only as lined tanks with semi-permeable walls and open bottom. Figure 2 shows the design of twin pits installed at household level. In areas where the groundwater table is high or there is a risk of frequent flooding, the twin pit system may not be appropriate since the leachate may hinder the dewatering process, particularly in the resting pit. Therefore, it is recommended to use this system only in areas with a low groundwater table (Elizabeth Tilley, 2014).

Figure 2: Inappropriate design of the twin pits.

Figure 3 shows a map of the households with the types of containment observed in the survey.

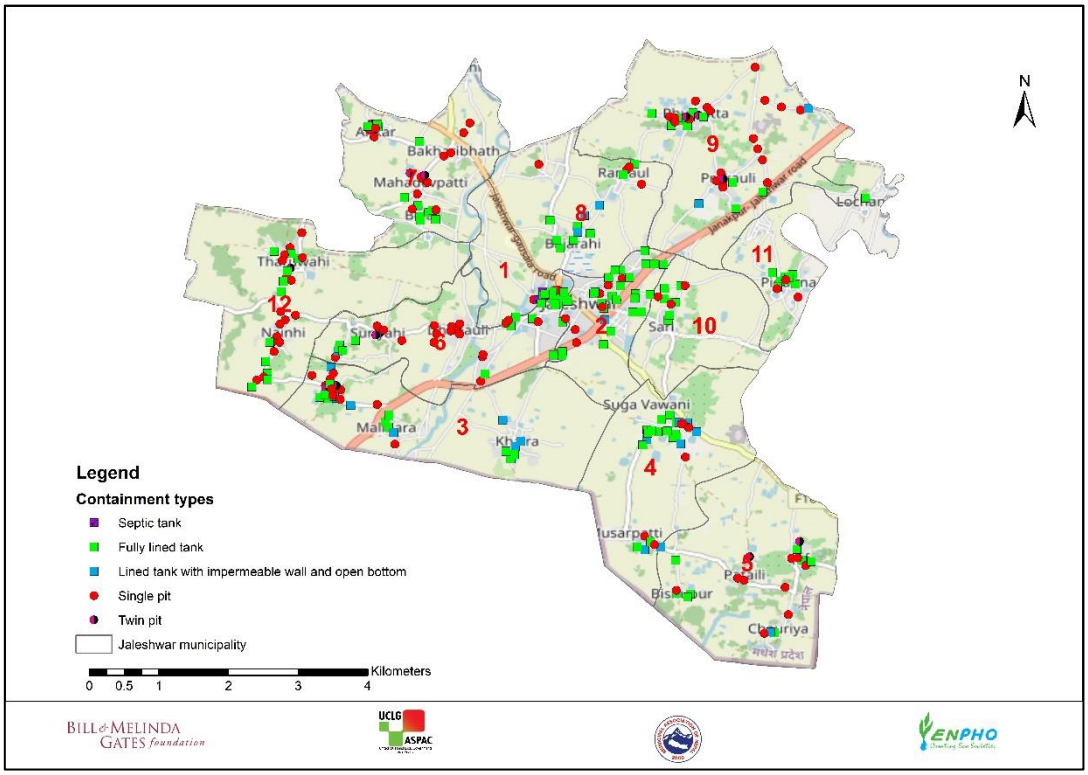

Figure 3: Map showing the households with the types of containments in Jaleshwar Municipality (ENPHO, 2023).

2.1.2. Sanitation System in Institutional buildings

All institutional buildings (43 institutions) surveyed have connected waste from toilets into onsite sanitation technologies. The fully lined tank is a popular onsite sanitation technology in institutions. 5% of the institutional buildings have constructed technically appropriate septic tanks. Figure 4 shows the different sanitation technologies available in the institutions of Jaleshwar Municipality.

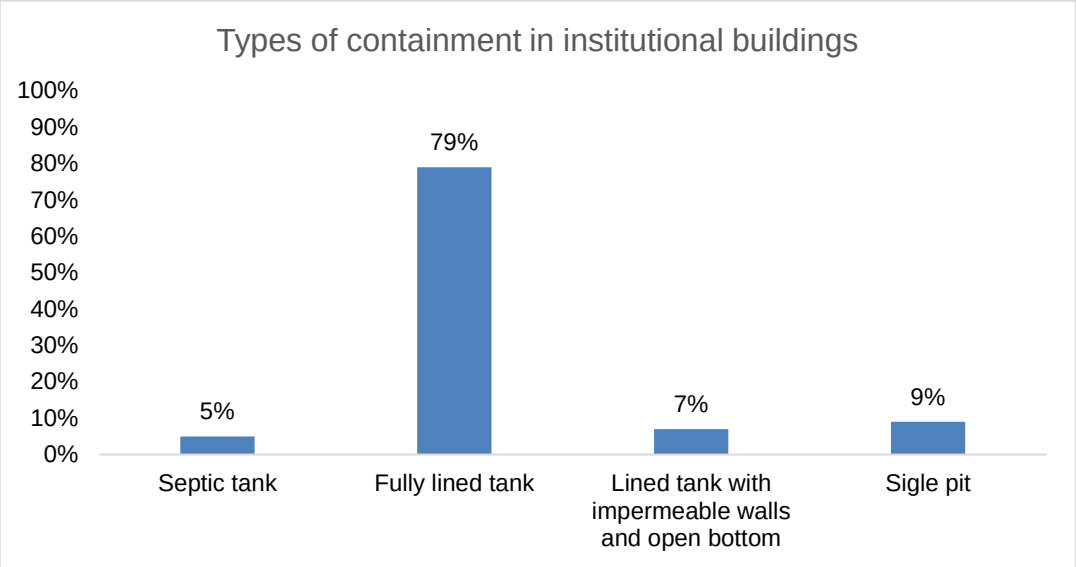

Figure 4: Types of containment in the institutional building of Jaleshwar Municipality (ENPHO, 2023).

Figure 5 shows a map locating surveyed institutional buildings and types of sanitation technologies.

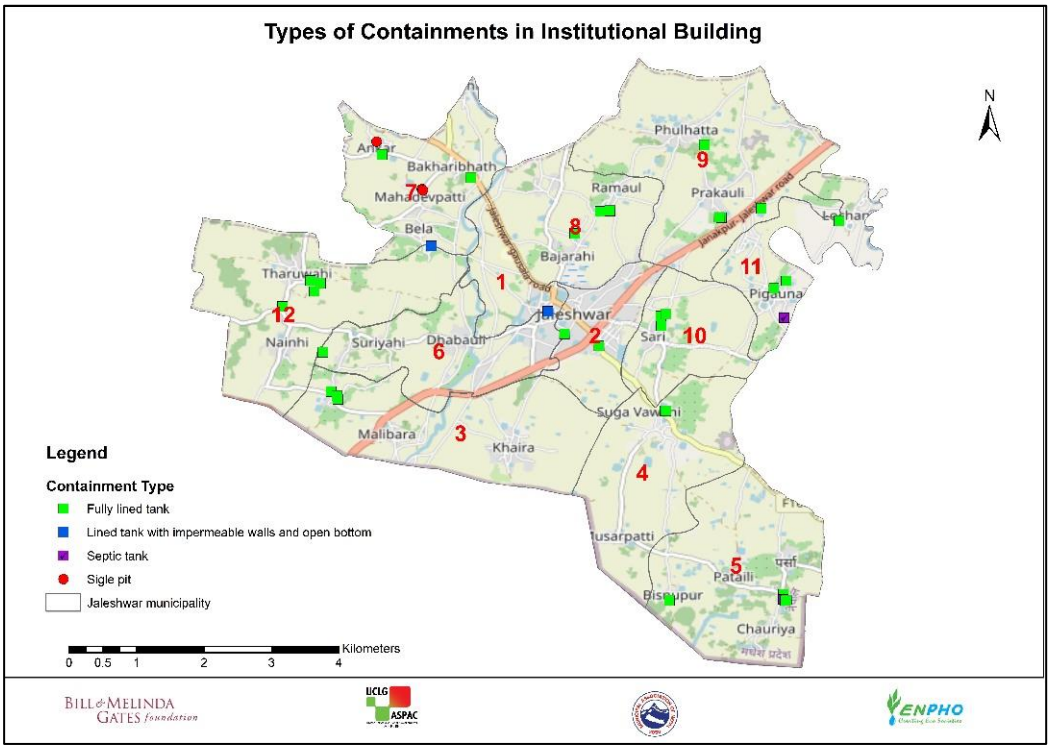

Figure 5: Map locating institutional building with types of sanitation technologies (ENPHO, 2023).

2.1.3. Public Toilets

There are 4 major public toilets in the municipality (Table 2 and Table 3). They were constructed by the municipality in collaboration with different stakeholders. The operation and maintenance of the toilets is leased to private sector and individual caretakers. All of the public toilets are connected to a fully lined tank. The average emptying frequency of the containment is 3 years. Moreover, the primary water sources utilized in these public toilets are groundwater by using hand pumps/ tube wells.

Table 2: Public toilets available in Jaleshwar Municipality.

Public Toilet						
Location of Public toilet	**No. of Urinal**	**No. of Toilet Seat/Pan in**		**No. of users per day**	**Size of Containments (m^3)**	**Constructed by**
		Male	**Female**			
Mahendra Market, Jaleshwar	0	2	2	250	25	Municipality
Mina Market, Jaleshwar	2	2	2	200	30	Municipality
Near Jaleshwar Temple	6	2	2	200 (up to 5000 during festival season)	40	Municipality
Near Mahadev Pond	2	1	1	150	20	Municipality
Source: (KII_2, 2022), (KII_6, 2022), (KII_7, 2022) and Field Observation						

Table 3: Photographs of public toilets in Jaleshwar Municipality.

Public toilet at Mahendra Bazar

Public toilet at Mina Bazar, Jaleshwar

Public toilet near Jaleshwar temple

Public toilet near Mahadev Pond

2.1.4. Emptying and Transport

Emptying and transporting faecal sludge is an essential service for proper functioning of onsite sanitation technologies (Linda Strande, 2014). Only 39% of the households have emptied their containments at least once since installation. Among these households, all of the households have emptied them mechanically. Private desludging service providers are engaged for empting and transport of faecal sludge.

Two private desludging service providers have their main service area in the municipality. Shushil desludging service provider (Figure 6) is the major private sector provider in the area. Additionally, the service providers also provide the services to neighbouring municipalities. Shushil desludging service provider is informal, as it is not registered in any government agencies. It owns a customized vehicle with a tracker and tank of 6,000 L capacity. This service provider empties the containment and makes 15-20 trips per month in Jaleshwar Municipality. For rectangular containments, this provider charges NRS 2,000-2,500 (USD 15-19), and for circular pits, this provider charges NRS 500 (USD 4) per ring (KII_4, 2022).

Suresh desludging service provider (Figure 7) is the service provider that belongs to Ekdara Rural Municipality. This service provider is informal, as it is not registered in any government agencies. It has customized vehicles with trackers and tanks of 6,000 L and 6,500 L capacity. This service provider owns 2 vehicles, empties the containments and makes 12 trips per month in Jaleshwar Municipality. For rectangular containments, this provider charges NRS 2,500-3,000 (USD 19-23), and for circular pits, this provider charges NRS 300-500 (USD 2-4) per ring (KII_3, 2022).

Figure 6: Vehicle of Shushil desludging service provider.

Figure 7: Suresh desludging service provider.

2.1.5. Treatment and Disposal

The municipality does not have a faecal sludge treatment plant. The mechanically emptied faecal sludge is disposed of untreated in farmlands mostly (Figure 8). Occasionally, the emptied FS is disposed of in open drains. The private sector receives complains from the community people. The have faced the challenges due to the lack of a proper place for the disposal of the faecal sludge (KII_3, 2022) (KII_4, 2022).

Figure 8: FS is disposed to farmland in Jaleshwar Municipality.

2.1.6. Risk Assessment of Groundwater Pollution

The risk of groundwater pollution is assessed based on the source of drinking water, secondary data on water quality and the vulnerability of the aquifer with regards to lateral spacing between sanitation systems and groundwater sources.

a. Sources of Drinking Water

The household survey conducted by ENPHO shows that 94% of households in the municipality rely on hand pumps/tube wells while 6% of households are connected to piped water supply (ENPHO, 2023).

Nepal Water Supply Corporation (NWSC), Jaleshwar branch is the major water supply service provider in the municipality. It is a public utility under the Ministry of Water Supply (MoWS). It has provided services to approximately 1,205 households in ward 1, 2 and 6 with 3 public taps. There is an overhead Reservoir Tank (RVT) in Jaleshwar office premises with a capacity of 450 m^3 and with deep boring. The water is chlorinated prior to distribution (KII_5, 2022). Figure 9 shows the RVT operated by NWSC, Jaleshwar branch.

Figure 9: RVT operated by NWSC, Jaleshwar branch.

b. The vulnerability of the aquifer and lateral spacing between sanitation systems and groundwater source

The term aquifer pollution vulnerability is intended to represent the varying level of natural protection afforded by the contaminant attenuation capacity of the unsaturated zone or semi-confining beds above an aquifer, because of physicochemical processes (filtration, biodegradation, hydrolysis, adsorption, neutralization, volatilization, and dispersion) all of which vary with their texture, structure, clay content, organic matter, pH, redox and carbonate equilibria. Groundwater vulnerability is specific to containment type and pollution scenarios (Andreao, 2013). Here, among the various types of onsite sanitation technologies, lined tanks with impermeable walls and open bottom and lined pits are more prone to aquifer pollution as the nature of such containments impose more containment load from the land surface to groundwater.

Key determinants of risk variation of the groundwater are the soil and geological setting. The size of pores in the soil determines the infiltration rate. In the sandy loam soil, the permeability is approximately 2.5 cm per hour (FAO, n.d.). Thus, between 25 and 50 days the pollutant could travel to the depth of approximately 30 metres (98.67 feet) in sandy loam soil. Soil analysis of of Mahottari District shows that Jaleshwar has variable soil texture with dominant of sandy and loamy soil (Satya N Mandal, 2002). Hence, the people using open bottom tanks and consuming water from the handpumps/ tubewells with the depth up to 100 feet (30.48 m) and horizontal distance of the pump within 25 feet (7.62 m) from the source of pollutants are assumed at significant risk to groundwater pollution.

Figure 10 demonstrates the depth of hand pumps and tube wells and horizontal distance of it with the containment type lined tank with impermeable walls and open bottom. Altogether 6%

of the households have installed lined tanks with impermeable walls and open bottom with no outlet or overflow. Among them, 100% of households rely on groundwater for drinking water. Upon assessing the depth of groundwater and horizontal distance of the hand pumps/ tube wells from the source of pollution, it was found that 12% of these households are at lower risk to consumption of contaminated water. The reason behind the lower risk is replacement of old hand pumps / tube wells with lower depth with new hand pumps and tube wells of depth above 100 feet (30.48 m) with the support of municipality for arsenic mitigation. (KII_1, 2022). Thus, the population with lined tanks with impermeable walls and open bottom without outlet or overflow with significant risk to groundwater pollution (T2A4C10) is 1% i.e (6% x 100% x 12% = 1%). Therefore, the remaining 5% of the people using lined tanks with no outlet or overflow are located in areas of low risk of groundwater contamination (T1A4C10).

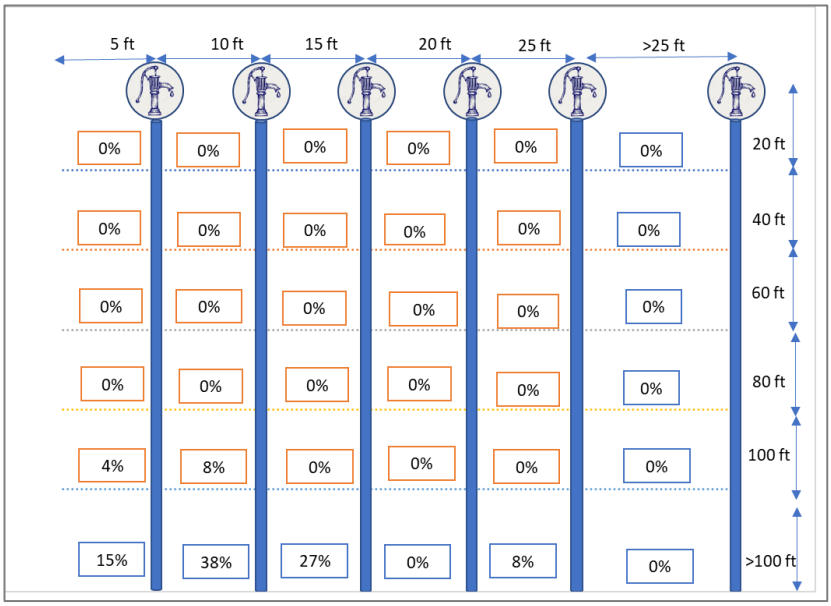

Figure 10: Depth of hand pumps and tube wells and lateral spacing of it with containment lined tank with impermeable walls and open bottom.

Figure 11 demonstrates the depth of hand pumps and tubewells and horizontal distance of it with the containment type lined pit with semi-permeable walls and open bottom. Altogether 36% of the households used lined pits with semi-permeable walls and open bottom. Among these, 98.5% of them use groundwater for drinking. Upon assessing the depth and horizontal distance between the source of water and the location of the containment, it was observed that 4% of these have higher potential on consuming contaminated groundwater. Thus, the population with lined pits with semipermeable walls and open bottom with significant risk to groundwater pollution (T2A5C10) is calculated as (36% x 98.5% x 4% = 1%.). Therefore, the remaining 35% of the pits are located in areas of low risk of groundwater contamination (T1A5C10).

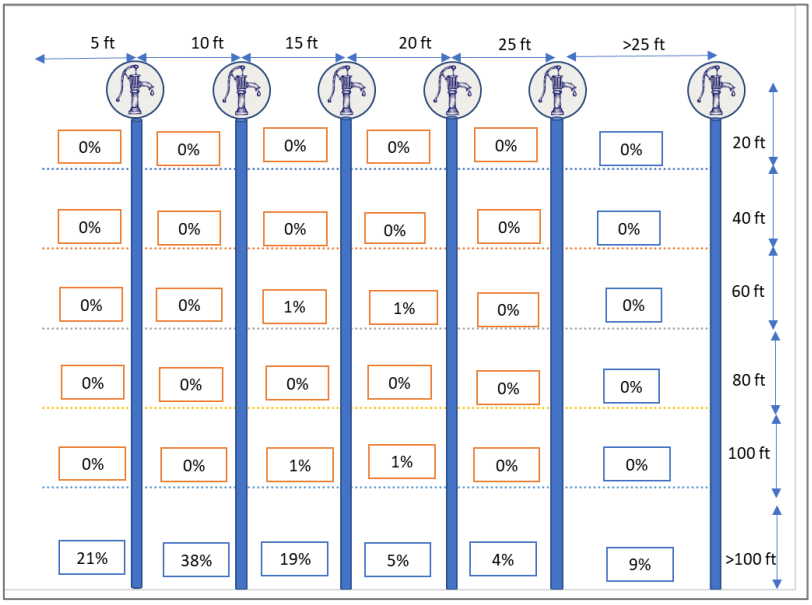

Figure 11: Depth of hand pumps and tube wells and lateral spacing of it with containment types lined pit with semi-permeable walls and open bottom.

2.2. SFD Matrix

2.2.1. SFD Selection Grid

The SFD selection grid consists of the types of containment technologies in vertical column in List A, while top horizontal row (List B) consists of a list where each of containment technologies are connected to. The existing containment technologies were classified to fit in the SFD grid.

Prior to selection of containment technologies, single pits constructed by assembling pre-cast concrete rings one above another were categorized as lined pits with semi-permeable walls and open bottom.

The various types of sanitation technologies selected for the SFD graphic generator are shown in the SFD selection grid, as shown in Figure 12 and explained in Table 4.

List A: Where does the toilet discharge to? (i.e. what type of containment technology, if any?)	List B: What is the containment technology connected to? (i.e. where does the outlet or overflow discharge to, if anything?)									
	to centralised combined sewer	to centralised foul/separate sewer	to decentralised combined sewer	to decentralised foul/separate sewer	to soakpit	to open drain or storm sewer	to water body	to open ground	to 'don't know where'	no outlet or overflow
No onsite container. Toilet discharges directly to destination given in List B					Significant risk of GW pollution Low risk of GW pollution					Not Applicable
Septic tank					Significant risk of GW pollution Low risk of GW pollution	T1A2C6				
Fully lined tank (sealed)					Significant risk of GW pollution Low risk of GW pollution	T1A3C6		T1A3C8		T1A3C10
Lined tank with impermeable walls and open bottom	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution			T1A4C8		T2A4C10 T1A4C10
Lined pit with semi-permeable walls and open bottom	Not Applicable									T2A5C10 T1A5C10
Unlined pit										Significant risk of GW pollution Low risk of GW pollution
Pit (all types), never emptied but abandoned when full and covered with soil										Significant risk of GW pollution Low risk of GW pollution
Pit (all types), never emptied, abandoned when full but NOT adequately covered with soil										
Toilet failed, damaged, collapsed or flooded										
Containment (septic tank or tank or pit latrine) failed, damaged, collapsed or flooded										
No toilet. Open defecation	Not Applicable							T1B11 C7 TO C9		Not Applicable

Figure 12: SFD selection grid of Jaleshwar Municipality.

Table 4: Explanation of different variables and containment technologies selected in SFD selection grid (SuSanA, 2018).

SN	Variable	Explanation
1	T1A2C6	This is a correctly designed, properly constructed, fully functioning septic tank with an outlet connected to an open drain or storm sewer. The supernatant/effluent flowing from the tank is only partially treated and is still hazardous, therefore all the excreta in this system is considered not contained.
2	T1A3C6	A correctly designed, properly constructed, and well maintained fully lined tank with impermeable walls and open bottom. Since the tank is fitted with a supernatant/effluent overflow connected to an open drain or storm sewer the excreta in this system are considered not contained.
3	T1A3C8	This is a correctly designed, properly constructed and well maintained fully lined tank with impermeable walls and base. The excreta is potentially more toxic than the excreta in a septic tank. Since the tank is fitted with a supernatant/effluent overflow connected to open ground the excreta in this system is considered not contained.
4	T1A3C10	A correctly designed, properly constructed and well maintained fully lined tank with impermeable walls and base. Since the tank is not fitted with a supernatant/effluent overflow this system is considered contained.

5	T1A4C8	A correctly designed, properly constructed and well-maintained lined tank with sealed, impermeable walls and an open, permeable base, through which infiltration can occur. Since the tank is fitted with a supernatant/effluent overflow connected to open ground, the excreta in this system is considered not contained.
6	T1A4C10	This is a correctly designed, properly constructed and well maintained lined tank with sealed, impermeable walls and an open, through which infiltration can occur. Since there is not a 'significant risk' of groundwater pollution, the excreta of this system are considered contained.
7	T1A5C10	This is a correctly designed, properly constructed and well maintained pit with semi-permeable, honeycombed lined walls and an open, permeable base, through which infiltration can occur. The tank is not fitted with a supernatant/effluent overflow so this system is considered contained.
8	T1B11 C7 TO C9	With no toilet, users defecate in water bodies, on open ground and to don't know where; consequently, the excreta is not contained.
9	T2A4C10	A correctly designed, properly constructed and well-maintained lined tank with sealed, impermeable walls and an open, permeable base, through which infiltration can occur - the excreta is therefore likely to be partially treated. The tank is not fitted with a supernatant/effluent overflow but since there is a 'significant risk' of groundwater pollution this system is considered not contained.
10	T2A5C10	A correctly designed, properly constructed and well-maintained pit with semi-permeable, honeycombed lined walls and an open, permeable base, through which infiltration can occur. The tank is not fitted with a supernatant/effluent overflow but since there is a 'significant risk' of groundwater pollution this system is considered not contained.

2.2.2. Proportion of the FS contents of each type of onsite container which is faecal sludge

A detailed instruction from the SFD PI was used as guide to calculate the proportion of the contents of each type of onsite container which is faecal sludge. It stated that the default "100%" value should be used where onsite containers are connected to soak pits, to water bodies or to open ground. This will model the contents as 100% faecal sludge and a proportion of this may be emptied periodically. The remaining not emptied fraction is made up of one or more of the following: faecal sludge which remains in the container, supernatant (when discharging to water bodies or to open ground), and infiltrate. Where onsite containers are connected to a sewer network or to open drains, a value of "50%" is used which means that half the contents are modelled as faecal sludge; a proportion of this may be emptied periodically. The remaining not emptied fraction will comprise faecal sludge which remains in the container and, in the case of open bottomed tanks, infiltrate. The other half of the contents is modelled as supernatant discharging into the sewer network or to open drains. The formula used for faecal sludge proportion calculation is shown below:

$$\frac{(onsite\ container\ connected\ to\ soak\ pit,\ \ no\ outlet\ ,\ \ water\ bodies\ or\ \ \ open\ ground) * 100 + (onsite\ container\ connected\ to\ sewer\ network\ or\ open\ drain) * 50}{onsite\ containner}$$

The proportion of FS in septic tanks was set to 50% as they are all connected to an open drain. The proportion of FS in the fully lined tanks was set to 98% and the proportion of FS in lined tanks with impermeable walls and open bottom and all types of pits was set to 100% according

to the relative proportions of the systems in the municipality, as per the guidance provided by SuSanA.

2.2.3. SFD matrix

SFD matrix is a table which contains the means to calculate the variables for each of the sanitation systems chosen in the SFD selection grid. It comprises of list of possible containment technologies in the first column and list of all possible places to which the containment technology could be connected in the top rows.

Figure 13 shows the SFD matrix of Jaleshwar Municipality. The sanitation technologies and the corresponding percentage of the population using such technologies are shown in Figure 13. These values are derived from the HH survey (ENPHO, 2023) and KIIs with desludging service providers (KII-3, KII-4, 2022).

Jaleshwar Municipality, Madhesh, Nepal, 3 Jul 2023. SFD Level: 2 - Intermediate SFD
Population: 63802
Proportion of tanks: septic tanks: 50%, fully lined tanks: 98%, 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
T1A2C6 Septic tank connected to open drain or storm sewer	1.0	23.0	0.0	0.0	0.0	0.0
T1A3C10 Fully lined tank (sealed), no outlet or overflow	37.0	19.0	0.0	0.0		
T1A3C6 Fully lined tank (sealed) connected to an open drain or storm sewer	2.0	60.0	0.0	0.0	0.0	0.0
T1A3C8 Fully lined tank (sealed) connected to open ground	1.0	23.0	0.0	0.0		
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	5.0	45.0	0.0	0.0		
T1A4C8 Lined tank with impermeable walls and open bottom, connected to open ground	1.0	90.0	0.0	0.0		
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	35.0	48.0	0.0	0.0		
T1B11 C7 TO C9 Open defecation	16.0					
T2A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	1.0	30.0	0.0	0.0		
T2A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	1.0	45.0	0.0	0.0		

Figure 13: SFD matrix of Jaleshwar Municipality.

2.2.4. Calculation of proportion of FS emptied from containment (Variable F3)

The proportion of faecal sludge emptied (F3) is calculated based on the percentage containment emptied (ENPHO, 2023) and the amount of FS emptied during the process (KII-3, KII-4, 2022). In average, 90% of total faecal sludge from the containment is emptied during emptying mechanism as per household survey conducted. Thus, actual emptied proportion of faecal sludge was taken as 90% of the emptied containment. Hence, the proportion of FS emptied from the sanitation technology is calculated as 90 % on the sanitation technology emptied. Table 5 shows the calculation of variable F3.

Table 5: Actual emptying proportion for existing containment technologies.

SN	Reference Variables	Containment technologies	Percentage of emptied containment (1)	Emptied proportion of FS (2)	Actual proportion of emptied FS (F3)
1	T1A2C6	Septic tank connected to open drain or storm sewer	25%	90%	23%
2	T1A3C6	Fully lined tank (sealed) connected to an open drain or storm sewer	66.67%	90%	60%
3	T1A3C8	Fully lined tank (sealed) connected to open ground	25%	90%	23%
4	T1A3C10	Fully lined tank (sealed), no outlet or overflow	21.58%	90%	19%
5	T1A4C8	Lined tank with impermeable walls and open bottom, connected to open ground	100%	90%	90%
6	T1A4C10	Lined tank with impermeable walls and open bottom, no outlet or overflow	50%	90%	45%
7	T1A5C10	Lined pit with semi-permeable walls and open bottom, no outlet or overflow	53.3%	90%	48%
8	T1B11 C7 TO C9	Open defecation	NA	NA	NA
9	T2A4C10	Lined tank with impermeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	33.3%	90%	30%
10	T2A5C10	Lined pit with semi-permeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	50%	90%	45%
Source: (ENPHO 2023[1]; KII-3 and KII-4, 2022[2])					

2.2.5. .Calculation of FS emptied delivered to treatment plant and treated (Variables F4 and F5)

FS is emptied both manually and mechanically. Since there is no Faecal Sludge Treatment Plant (FSTP) within the municipality for FS treatment (KII_1, 2022), the emptied FS is directly

disposed of in farmlands with no treatment. Sometimes, the emptied FS is disposed of into the storm water drain. Thus, all percentages of FS transported to treatment plant (F4) and FS treated (F5) have been set to 0% for all sanitation systems.

2.3. Summary of Assumptions

Onsite Sanitation Systems

- ✓ The proportion of FS in septic tanks was set to 50%, the proportion of FS in fully lined tanks was set to 98% and the proportion of FS in lined tanks with impermeable walls and open bottom and all types of pits was set to 100% according to the relative proportions of the systems in the municipality, as per the guidance given in the Frequently Asked Question (FAQs) in the sustainable Sanitation Alliance (SuSanA) website.
- ✓ Variables F3, F4 and F5 for all onsite sanitation systems were derived from the HH survey and cross-checked with KIIs conducted.
- ✓ The municipality does not have any form of treatment plant to treat faecal sludge. The FS emptied from the containments is dumped openly in farmlands or the storm water drain. Thus, variables F4 and F5 for all sanitation systems are set to 0%. Values for supernatant (S4e and S5e) are also set to 0% in septic tanks and lined tanks connected to drains (T1A2C6 and T1A3C6).

2.4. SFD Graphic

Figure 14 represents the fate and flow of FS and supernatant through the sanitation service chain. It shows that FS generated from 51% of the population is safely managed and represented by “Green” colour arrowhead. However, this 51% resembles the FS stored in the containment without significant risk to groundwater pollution. Thus, the safely managed percentage of FS generated by this 51% of the population is temporary until the FS from the containment is emptied. Therefore, these systems will require emptying services in the short and medium term as they fill up.

The FS and supernatant from 49% of the population is unsafely managed, represented by “Red” arrow heads. The percentage of unsafely managed FS is generated from FS emptied but not delivered to treatment plant (29%), FS from containments where FS is not contained - not emptied (3%), supernatant not delivered to treatment (1%) and people practising open defecation (16%).

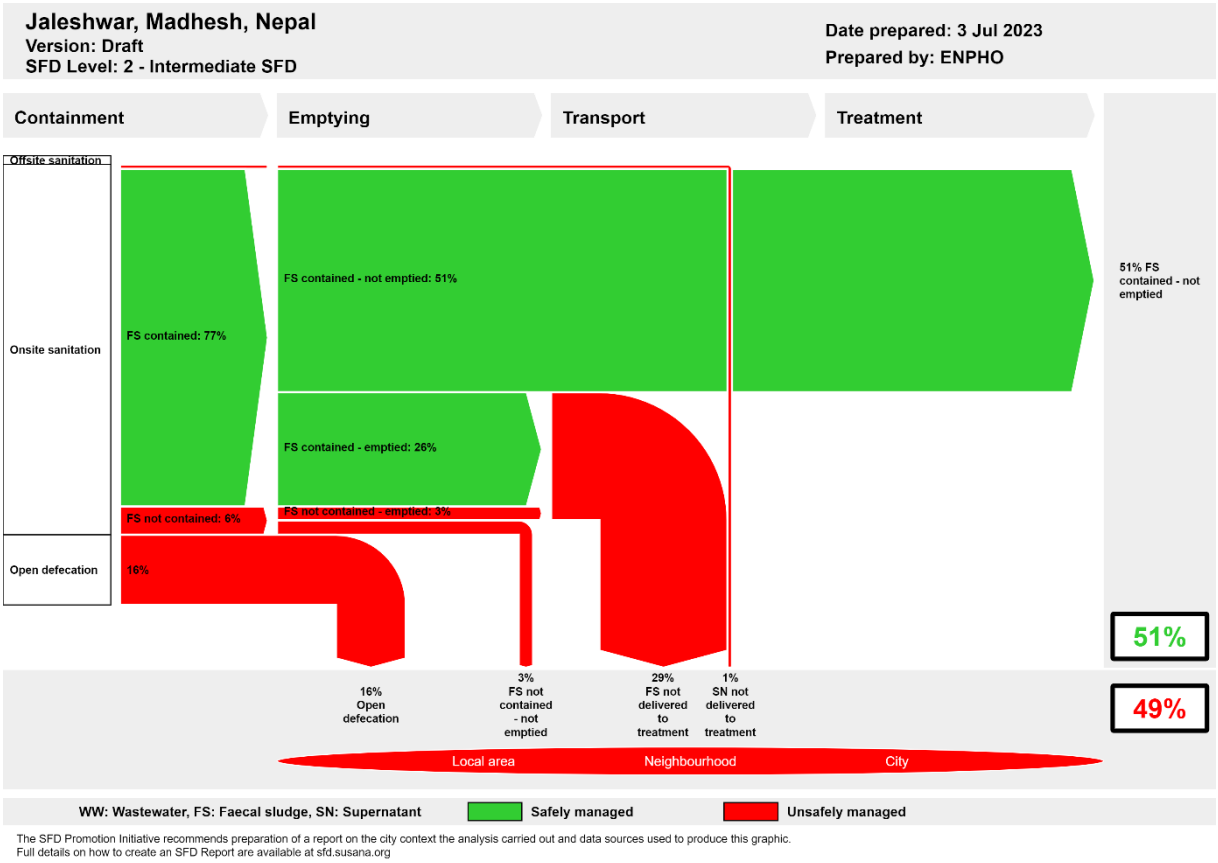

Figure 14: SFD graphic of Jaleshwar Municipality.

All of the population with access to toilets relies on onsite sanitation systems. As shown on the SFD graphic (Figure 14), it is estimated that 77% of the population uses systems where the FS is considered contained, while 6% of the population uses systems where the FS is considered not contained.

FS contained

The definition of 'FS contained' is faecal sludge contained within an onsite sanitation technology which ensures safe level of protection from excreta i.e. pathogen transmission to the user or general public is limited. These are tanks or pits that are correctly designed, properly constructed, fully functioning, and/or are causing no risk or only a 'low' risk of polluting groundwater used for drinking (SuSanA, 2018). The value is the summation of the percentage of population using fully lined tanks (sealed), no outlet or overflow (T1A3C10), lined tanks with impermeable walls and open bottom, no outlet or overflow (T1A4C10) and lined pits with semi-permeable walls and open bottom, no outlet or overflow (T1A5C10). Thus, the FS generated by 77% of the population is considered contained.

FS not contained

The definition of 'FS not contained' is faecal sludge contained within an onsite sanitation technology which does not ensure safe level of protection from excreta i.e. pathogen transmission to the user or general public is likely. These are tanks or pits that are incorrectly designed, or poorly constructed, or poorly functioning, and/or are causing a 'significant' risk of polluting groundwater used for drinking (SuSanA, 2018).

The value is obtained from the summation of percentage of population using septic tanks connected to open drain or storm sewer (T1A2C6), fully lined tanks (sealed) connected to an open drain or storm sewer (T1A3C6), fully lined tanks (sealed) connected to open ground (T1A3C8), lined tanks with impermeable walls and open bottom, connected to open ground (T1A4C8), lined tanks with impermeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution (T2A4C10) and lined pits with semi-permeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution (T2A5C10). Thus, the FS generated by 6% of the population is considered not contained.

FS contained - emptied

The proportion of FS contained - emptied is the summation of the proportion of FS emptied from fully lined tanks (sealed), no outlet or overflow (T1A3C10), lined tank with impermeable walls and open bottom, no outlet or overflow (T1A4C10, lined pit with semi-permeable walls and open bottom, no outlet or overflow (T1A5C10). Thus, the proportion of FS contained - emptied is 26%.

FS not contained - emptied

The proportion of FS not contained - emptied (3%) is FS that is not contained in onsite sanitation technologies and emptied either mechanically or manually.

FS not delivered to treatment

The municipality does not have treatment facility to treat faecal sludge. So, all the FS emptied from contained and not contained containments is disposed of into farmlands and open drain. The proportion of FS not delivered to treatment (29%) is the summation of FS contained - emptied and FS not contained - emptied.

Supernatant (SN) not delivered to treatment

The proportion of supernatant is obtained from containments connected to open drain or storm water sewer. The total proportion of supernatant (SN) not delivered to treatment is 1%. Since the municipality lacks a proper sewer network and treatment plant, the supernatant is disposed of directly into water bodies untreated.

Open Defecation

Jaleshwar Municipality was declared as an open defecation free municipality on September 13, 2019. However, 16% of the households are practising open defecation. The open defecation practices have been prevailed because cultural and behavioural and economic factors in the community (KII_1, 2022).

3. Service Delivery Context

3.1. Policy, Legislation and Regulation

3.1.1. Policy

The Constitution of Nepal 2015 in Article 35 related to right to health recognizes citizen's rights to 'access to clean drinking water and sanitation'. In addition, Right to Clean Environment, Article 30 recognizes that every person shall have the right to live in a healthy and clean environment (GoN, 2015). To respect, promote and fulfill the provisions related to right on water and sanitation, Government of Nepal (GoN) has passed Drinking Water and Sanitation Act in 2022 through Ministry of Water Supply. The act elaborates right to clean water as to receive affordable, sufficient, and quality drinking water regularly as well as access to sanitation as affordable access to quality sanitation services (MoWS, 2022a).

Historically, the National Sanitation Policy (1994) was the guideline for the planning and implementation of sanitation programs. The policy had promoted sanitation issues together with issues on water supply in rural communities. Also, Rural Water Supply and Sanitation National Policy (RWSSNP) 2004, has set a new target to provide safe, reliable, and affordable water supply with basic sanitation facilities. The policy focused on delivering quality services on water and sanitation in the marginalized and vulnerable groups. Participatory approach, community leadership project development, optimization of local resources and installation of locally appropriate technologies were major principles in the policy (DWSSM, 2004). However, it was unable to address the complex operational issue of urban water supply and sanitation service delivery (DWSSM, 2009).Thus, National Urban Water Supply and Sanitation Sector Policy (NUWSSSP) was formulated and enforced in 2009. It focused on achieving coherent, consistent, and uniform approaches of development in urban areas with the involvement of different agencies and institutions. Cost recovery principles, public private partnership, and sector effectiveness for improved service delivery are key principles of the policy (DWSSM, 2009). Both these policies were limited to addressing emerging issues and challenges in the rural and urban areas. Thus, National Water Supply and Sanitation Policy (NWSSP) was formulated in 2014 by the GON to address the emerging challenges and issues with the adoption of new approaches and resolve the inconsistency in RWSSNP and NUWSSSP. The goal of the NWSSP was to reduce urban and rural poverty by ensuring equitable socio-economic development, improving health and the quality of life of the people and protection of environment through the provision of sustainable water supply and sanitation services. It adopted innovative technologies and knowledge emerged in the sector. Remarkably, it was the first official document that recognized discharge of untreated wastewater and dumping of septic sludge heavily polluted the surface water sources in urban areas.

Recently, National Water, Sanitation and Hygiene Policy, 2022 has been drafted and undergone the process for endorsement. The draft policy is updated policy till date which has included the wide range of the sanitation services including treatment, reuse/ safe disposal of faecal sludge/ wastewater. It emphasizes on the preparation of the municipal level Water

Sanitation and Hygiene (WASH) plan with the local leadership to ensure the WASH services for all (MoWS, 2022b).

Nepal is a signatory of the historical resolution of 2010 United Nations General Assembly on the Human Right to Water and Sanitation (UNGA, 2010). Nepal committed to Millennium Development Goals (MDGs) for 2000- 2015. The goal was accomplished through declaration of the country as free from open defecation on 30th September 2019. National Sanitation and Hygiene Master Plan, 2011 was developed for coordinated planning and implementation of National Sanitation Campaign. The campaign strengthened institutional setup tier of government in a participatory approach. In an alignment total sanitation campaign was initiated formally to sustain ODF. The guideline set various indicators to assess the sustainability of sanitation services. Remarkably, it extended sanitation definition as management of services and facilities to safely dispose of/reuse faecal sludge, collection and treatment of solid waste and wastewater to establish the hygienic environment and promote public health (NPC, 2017).

Together with a national commitment to pursuing and achieving the Sustainable Development Goals (SDGs) by 2030, National Planning Commission formulated targets and indicators for coordinated efforts to achieve the goals. This commitment has been reaffirmed in key policy documents, such as the current 15th Development Plan. Furthermore, Nepal has undertaken various initiatives to localize the SDG indicators by developing the SDG Status and Roadmap, which includes baselines and targets for 2030 (NPC, 2017).

Similarly, Nepal Water Supply, Sanitation and Hygiene Sector Development Plan (SDP 2016-2030) was formulated in 2016 for sector convergence, institutional and legal reforms, capacity development and establishing coordination and harmonization in the sector. The SDP classified service system and delineated roles and responsibilities for effective and sustainable service delivery. The SDP highlighted that majority of households rely on onsite sanitation system (70%) that requires effective treatment of faecal sludge. However, there is lack of concrete policies, guidelines, and indicators on Faecal Sludge Management (FSM) in the sector for effective planning, implementation, and service delivery. In alignment, Ministry of Water Supply through its Department of Water Supply and Sewerage Management (DWSSM) articulated and endorsed Institutional and Regulatory Framework (IRF) for Faecal Sludge Management in Urban Areas of Nepal in 2017. The main objective of the IRF is to define the specific roles and responsibilities of key institutions for the effective management and regulation of FSM. It is framed upon existing laws such as Environmental Protection Act (2019) and Environmental Protection Rules (2020), Self-Local Governance Act and Rules 1999, Environmental Standards on Effluent Discharge 2000, Nepal National Building Code 2003, and Land Acquisition Act amendment 2010 (MoWS, 2017a). The framework primarily envisioned featuring FSM in the national policy and issuing policy directives into local government to incorporate FSM in their urban planning along with strengthening and enhancing the capacity of the local government to deliver effective services. A local government has been endowed with overall responsibility to plan, implement, and regulate the FSM services within its jurisdiction. The provision of the ability to engage the private sector and other relevant

stakeholders such as Water and Sanitation Users Committee (WSUC) in the framework reflects a participatory approach that would help in sustaining the interventions.

The constitution of Nepal has provided the right for local government to form acts, rules and regulation based on the national policies and laws. Local Governance Operation Act 2017 has been formed to implement the right of local government and promote co-operation, co-existence, and co-ordination among federal, provincial, and local government. The act has mentioned the right, roles and responsibility of municipalities along with provision and procedure for approving laws and regulations at local level. Although the municipal council has the authority to formulate and approve local-level laws, regulations, and policies, they have yet to prepare and approve any sanitation-related policy documents.

3.1.2. Institutional Roles

Federal, provincial, and local government are entitled for implementation of water and sanitation programs to ensure the rights on access to safe water and sanitation.

At Federal Level

National Planning Commission: At the federal government, the National Planning Commission (NPC) is the specialized and apex advisory body for formulating a national vision, developing policy, periodic plans, and sectoral policies. The NPC assesses resource needs, identifies sources of funding, and allocates budget. It serves as a central agency for monitoring and evaluating development policy, plans and programs. It supports, facilitates and coordinates with federal, provincial, and local government for developing policy plans and implementation.

Ministry of Water Supply: Ministry of Water Supply is the lead ministry responsible for planning, implementation, regulation, and monitoring and evaluation of sanitation programs in the country (GoN, 2015). Under the MoWS, Department of Water Supply and Sewerage Management (DWSSM) plan and implement water and sanitation projects funded by foreign donors or inter provincial projects or serves at least 15,000, 5,000 and 1,000 people in terai, hilly and mountain region respectively (GoN, 2015). The organizational structure of DWSSM is shown in Figure 15.

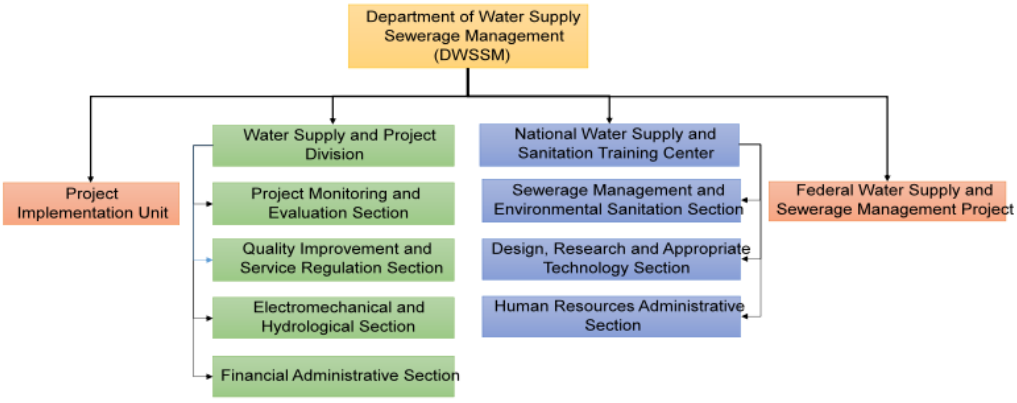

Figure 15: Organizational Structure Department of Water Supply and Sewerage Management.

Ministry of Urban Development: The Ministry of Urban Development (MoUD) works on integrated urban planning and development in municipalities, including faecal sludge management. DUDBC under MoUD is implementing body and sets standards for safe, affordable building construction and implementation for managed residential environment.

At Provincial Level

Ministry of Physical Infrastructure Development: Ministry of Physical Infrastructure Development of provincial government in Madhesh province is major executing body in the province. Planning and implementation of water supply and sanitation infrastructure is the province is executed through Water Supply and Sanitation Divisional Office (WSSDO). WSSDO implements the water and sanitation programs meeting the following criteria:

- Inter local government projects
- Beneficiaries between 5,000 to 15,000 in terai region, 3,000 to 5,000 in hilly region and 500 to 1,000 in Himalayan region.

At Local Government

Municipal council: The municipality consists of 16 sections including a Planning and Monitoring section. The water and sanitation activities lies under the Planning and Monitoring section (KII_2, 2022). Figure 16 shows the organizational structure of the municipality.

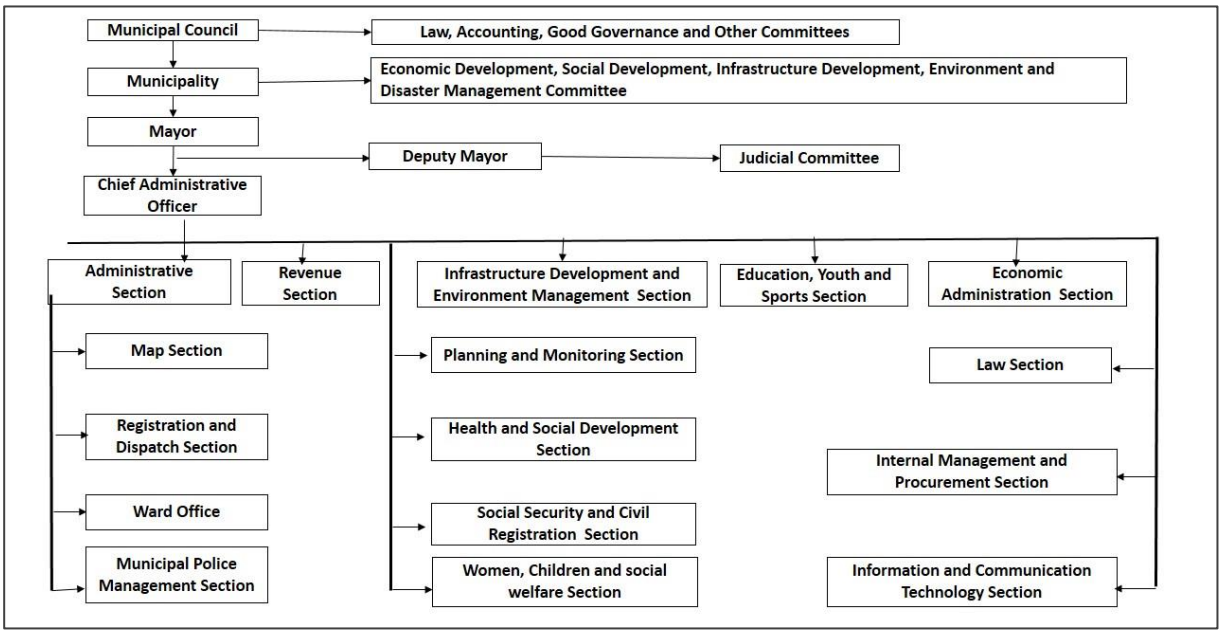

Figure 16: Organizational Structure of Jaleshwar Municipality.

3.1.3. Service Standards

The sanitation service standards have been set by Nepal Water Supply, Sanitation and Hygiene Sector Development Plan (2016-2030). It classifies sanitation services as high, medium, and basic based on sanitation facilities in place. The sanitation service levels with indicators are shown in Table 6. However, FSM specific standards have yet to be developed and implemented.

Table 6: Sanitation Service Level and its Components.

S.N.	Service Components	Service Level		
		High	Medium	Basic
1	Health and Hygiene Education	✓	✓	✓
2	Household Latrine	✓	✓	✓
3	Public and School Toilets	✓	✓	✓
4	Septic tank sludge collection, transport, treatment, and disposal	✓	✓	✓
5	Surface drains for collection, transmission, and disposal of greywater	✓	✓	✓
6	Small-bore sewer collection for toilet and septic tank effluent, low-cost treatment and disposal		✓	
7	Sanitary sewers for wastewater collection, transmission, non-conventional treatment, and disposal	✓		
8	Sanitary sewers for wastewater collection, the transmission of conventional treatment and disposal	✓		
9	Limited solid waste collection and safe disposal	✓	✓	✓

4. Stakeholder Engagement

4.1. Key Informant Interviews (KIIs)

Key Informant Interviews (KIIs) are qualitative in-depth interviews with people who know what is going on in the community. The purpose of key informant interviews is to collect information from a wide range of people who have first-hand knowledge about the concerned topic. KIIs were conducted with environment and sanitation related stakeholders. The KIIs were conducted with municipal officials, local elected bodies, water supply service provider, desludging service providers and public toilet service provider (Figure 17). Face-to-face interviews were conducted to get the required information. The information was collected with key stakeholders about the status of sanitation services and water supply schemes. List of key informant stakeholders from the municipalities along with their organization and purpose are as shown in Table 7.

Table 7: List of key stakeholders for KIIs.

KII code	Name	Designation	Organization	Purpose	Date
KII_1	Rajesh Kumar Pathak	Administration Section Head	Jaleshwar Municipality	Sanitation Status of Jaleshwar Municipality	27 December, 2022
KII_2	Dhirendra Shah	Planning and Monitoring Section Head	Jaleshwar Municipality	Sanitation Status of Jaleshwar Municipality	27 December, 2022
KII_3	Suresh Mandal	Desludging service providers	Private Sector	Faecal sludge desluding service	28 December, 2022
KII_4	Pramod Mestar	Desludging service providers	Private Sector	Faecal sludge desluding service	28 December, 2022
KII_5	Sunita Singh	Accountant	Nepal Water Supply Corporation , Jaleshwar Branch	Water supply, coverage, treatment, water quality	29 December, 2022
KII_6	Pappu Mestor	Public toilet Operator	Private sector Mina Bazar	Status of Public Toilet	29 December, 2022
KII_7	Bikra Mester	Public toilet Operator	Private sector Mahendra Bazar	Status of Public Toilet	29 December, 2022

Figure 17: Key informant interviews with desludging service provider and public toilet operator.

4.2. Household Survey

In each ward of the municipality, a random household survey was conducted. The two-day orientation was provided to local enumerators chosen by Municipality representing each ward. They were oriented on each component of the sanitation service chain, starting from user interface to reuse/ safe disposal along with the use of mobile application for data collection. They were mobilized in the community level to gather data from households and institutional level. The list of the enumerator has been attached in appendix 2. The data were collected using the *KoboCollect* application.

Determining Sample Size

The sample size for the household survey in Jaleshwar Municipality was determined by using Cochran (2963:75) sample size formula $n_0 = \frac{z^2pq}{e^2}$ and its finite population correction for the proportions:

$$n = \frac{n_0}{1+\frac{(n_0-1)}{N}}$$

Where,

n_0		Sample size
z	1.96	z value found in z table at 95 % of the confidence level
p	0.5	Assuming that about 50% of the population should have some sanitation characteristics that need to be studied (this was set as 50% since this percentage would yield the maximum sample size as the percentage of the population practising some form of sanitation is not known at the intervention)
q	1-p	
e	± 5 %	desired level of precision or sampling error
n		Reduced sample size
N		Total number of population (households in the municipality)

This is followed by proportionate stratification random sampling such that each ward in the municipality is considered one stratum. The sample size required in each ward of the municipality was calculated as $n_h = \frac{N_h}{N} \times n$ where, N_h is total population of each ward of municipality.

Thus, 373 households out of 12,380 households distributed in 12 wards were sampled using proportionate stratification random sampling. The number of ward wise sample size has been attached in appendix 3. The distribution of sampling points in the municipality are shown in Figure 18.

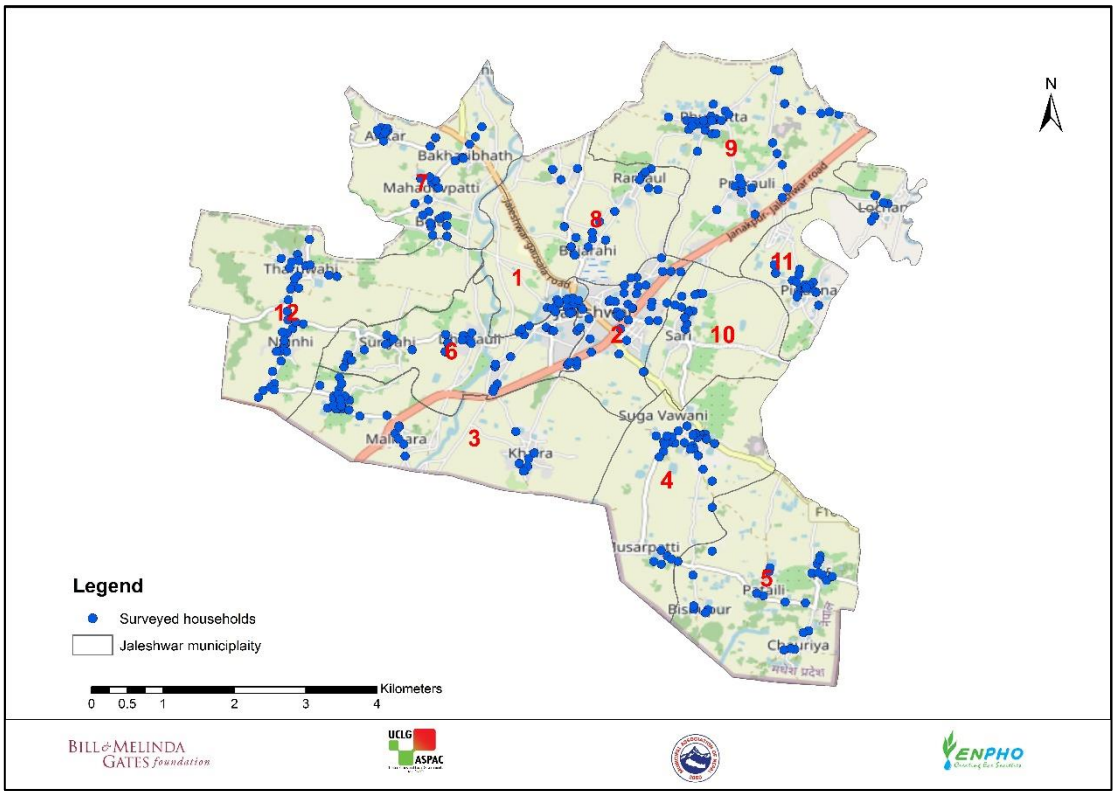

Figure 18: Distribution of sampling points in all wards of Jaleshwar Municipality.

4.3. Sharing and Validation of Data

On 28 February 2023, an SFD validation workshop was organized at meeting hall of Jaleshwar Municipality. The results of households and institutional survey in the municipality were presented to Mayor, Deputy Mayor, elected officials and relevant stakeholders. In the workshop, the results including sanitation status of the municipality, containment types in the municipality, emptying, transport, treatment and re-use or disposal practice of faecal sludge in the Municipality were presented and discussed Altogether, 36 participants including the Mayor, ward chairpersons, other members from municipal executive council, sectoral staffs etc. actively participated on the workshop and provided the valuable suggestions (Figure 19).

Mr. Suresh Shah Sonar, Mayor of Jaleshwar Municipality agreed on the sanitation status of the municipality and expressed the deep concern on the open defecation practices existing within the municipality despite the declaration of ODF. He further emphasized the need of the proper faecal sludge management in the municipality. Ms. Roshan Khatun, Deputy Mayor of the municipality also emphasized on the proper operation and maintenance of the public toilets within the municipality. The list of participants with their designation is attached in Appendix 4.


Figure 19: SFD Sharing and Validation Workshop in Jaleshwar Municipality.

5. Acknowledgements

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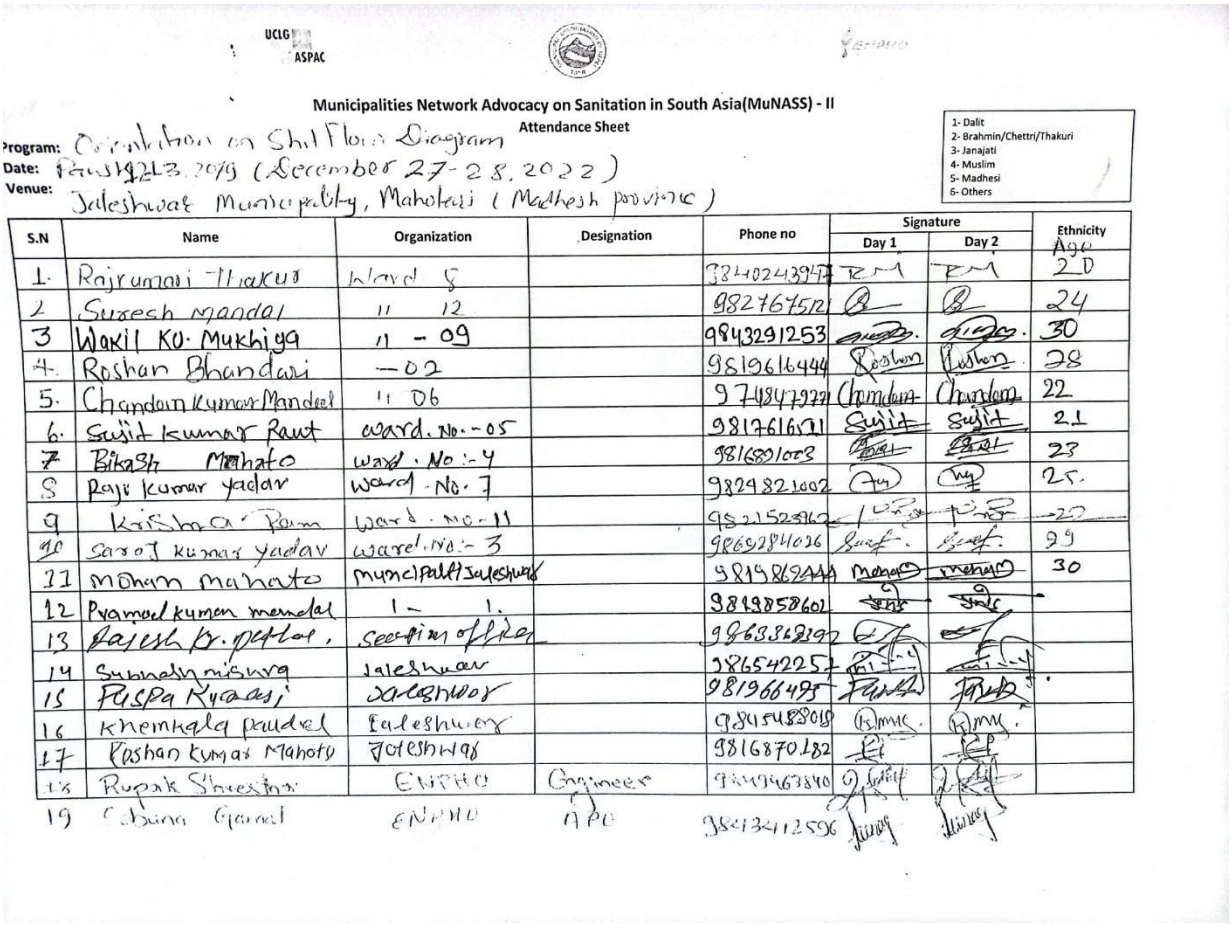
7. Appendix

7.1. Appendix 1: Roles and Responsibility of Various Tiers of Governments Delineated in Drafted SDP 2016 – 2030

System Classification		Minimum Key HR Required	Regulation & Surveillance	Financing & Construction	Ownership of System	Service Delivery	
Size	Sanitation					Provision	Production
Small	Onsite sanitation	Water Supply and Sanitation Technician (WSST)	Federal and or Provincial Government	User+/ community+/ other			
Medium	Septage Management	Sub-engineer	Federal and or Provincial Government	Provincial+/ Local Govt+/ Community+/ Private Sector		Local Govt	Users committee/ Utility manager
Large	Septage or FSM Management	WASH Engineer + finance & admin staff	Federal and or Provincial Government	Provincial+/ Local Govt+/ Community+/ Private Sector		Local Govt	Utility Manager
Mega	Septage/ FSM Management	WASH Engineer + finance & admin staff	Federal and or Provincial Government	Provincial+/ Local Govt+/ Community+/ Private Sector		Local Govt	Utility Manager

7.2. Appendix 2: List of Participants of SFD orientation



UCLG ASPAC

Municipalities Network Advocacy on Sanitation in South Asia(MuNASS) - II

Attendance Sheet

Program: Orientation on Shit Flow Diagram
Date: Paush 12-13, 2079 (December 27-28, 2022)
Venue: Jaleshwar Municipality, Mahotari (Madhesh province)

1- Dalit
2- Brahmin/Chettri/Thakuri
3- Janajati
4- Muslim
5- Madhesi
6- Others

S.N	Name	Organization	Designation	Phone no	Signature Day 1	Signature Day 2	Ethnicity Age
1.	Rajkumari Thakur	Ward 5		9742024397			20
2	Suresh Mandal	" 12		9827675121			24
3	Wakil Ko. Mukhiya	" - 09		9843291253			30
4.	Roshan Bhandari	- 02		9819616444			28
5.	Chandan Kumar Mandal	" 06		9748479271			22
6.	Sujit kumar Raut	ward. No. - 05		9817616731			21
7	Bikash Mahato	ward. No :- 4		9816891003			23
8	Raju kumar yadav	ward. No. 7		9829821002			25.
9	Krishna Ram	ward. No - 11		9822152862			20
10	Saroj kumar yadav	ward. No :- 3		9869241026			29
11	Mohan Mahato	municipality Jaleshwar		9819862444			30
12	Pramod kumar mandal	1 - 1.		9819858602			
13	Rajesh Pd. Pathak.	Section officer		9863862897			
14	Sunaina Mishra	Jaleshwar		9865422574			
15	Pushpa Kyaasi	Jaleshwor		9819664957			
16	Khemkala Paudel	Jaleshwor		9845488018			
17	Roshan kumar Mahoto	Jaleshwor		9816870182			
18	Rupak Shrestha	ENPHO	Engineer	9849463840			
19	Sabina Gamal	ENPHO	NPO	9841341259			

7.3. Appendix 3: Ward Wise Sample Size Distribution in Jaleshwar Municipality

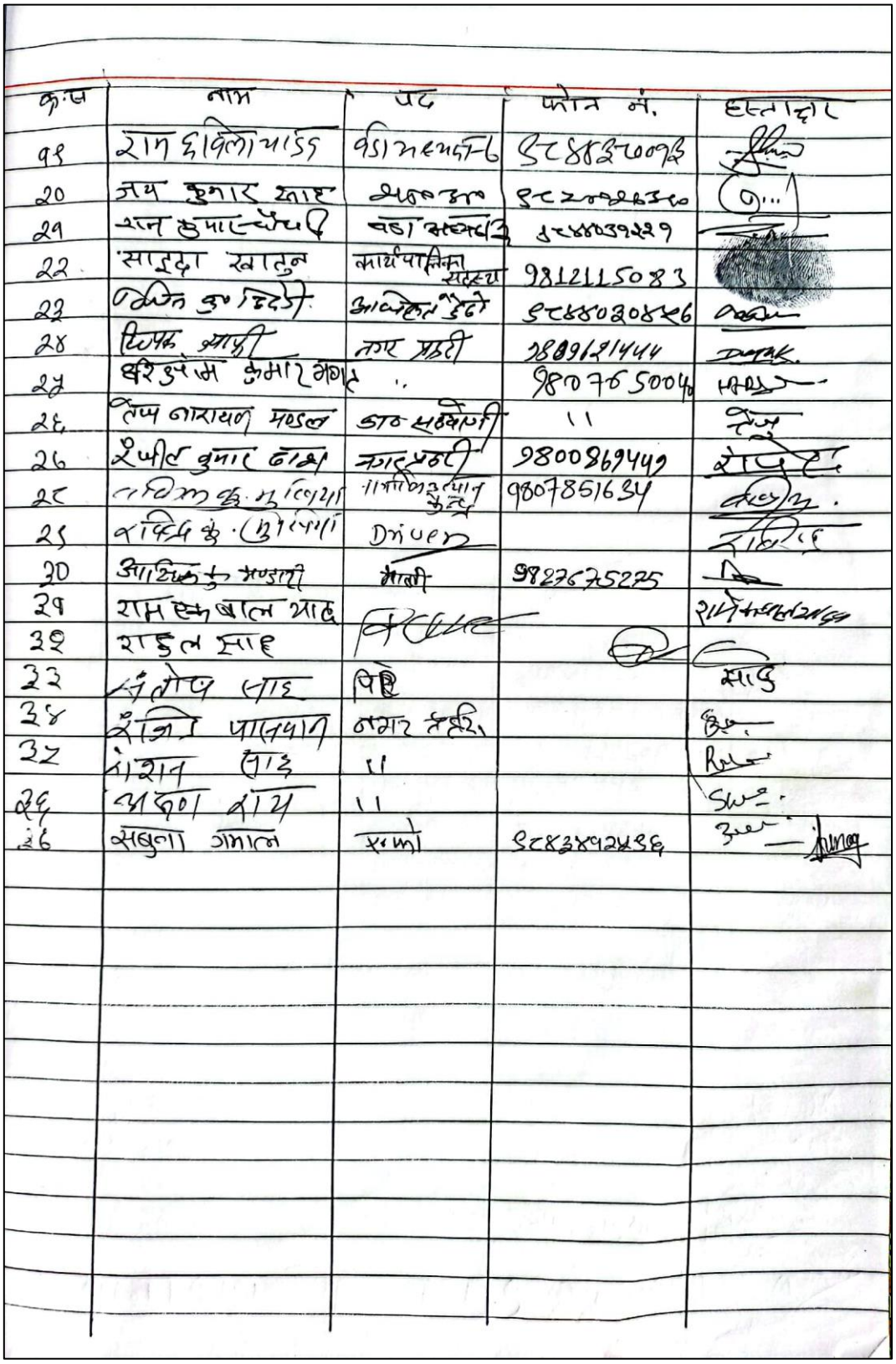
Ward	Households	Population	Proportion	Required Sample
1	886	4,626	7%	27
2	1,411	7,005	11%	42
3	1,261	6,652	10%	38
4	1,176	5,760	9%	35
5	784	3,940	6%	24
6	1,422	7,553	11%	43
7	1,159	6,372	9%	35
8	692	3,526	6%	21
9	1,233	6,396	10%	37
10	452	2,422	4%	14
11	806	3,989	7%	24
12	1,098	5,561	9%	33
Total	**12,380**	**63,802**	**100%**	**373**

7.4. Appendix 4: List of Participants Present in Sharing and Validation Meeting

आज मिति २०६९/११/१४ गतेका दिन नेपाल नगरपालिका संघको आयोजनामा वातावरण र जनस्वास्थ्य संस्था (इन्फो) को प्राविधिक सहयोग तथा The United Cities and Local Government Asia Pacific (UCLG-ASPAC) को सहकार्यमा Municipalities Network Advocacy on Sanitation in South Asia (MuNASS-II) कार्यक्रम अन्तर्गत जलेश्वर नगरपालिकामा संचालन गरिएको Shit Flow Diagram (SFD) सम्बन्धी अन्तरक्रिया र प्रमाणीकरण गोष्ठीमा निम्न अनुसार सरोकारवालाहरूको सहभागिता रहयो ।

उपस्थिति,

क्र.सं	नाम	पद	फोन नं.	हस्ताक्षर
१	सुरेश साह सोनार	नगर प्रमुख	९८४४०२३६५०	[illegible]
२	रौशन खातुन	नगर उपप्रमुख	९८४९८०१७३०	[illegible]
३	मित्रलाल ढकाल	प्रमुख प्रशासकीय अधिकृत	९८९९६८२६७८	[illegible]
४	मनोज कुमार [illegible]	वडा अध्यक्ष ११	९८१६८२९२६४	[illegible]
५	अनिल कुमार झा	वडा अध्यक्ष-१	9844056593	[illegible]
६				
७	[illegible]	वडा अध्यक्ष-१०	९८४४५२८३२	[illegible]
८	नितेश चौधरी	सु.प्र.अ.	9844167621	[illegible]
९	[illegible]	[illegible]	9804897486	[illegible]
१०	आदित्य कुमार चौधरी	स्व.ले.पा.	9844421940	Aditya
११	संजय कुमार शर्मा	खा.शा. प्रमुख	9844426122	[illegible]
१२	सिया प्रसाद [illegible]	[illegible]	9844057306	[illegible]
१३	[illegible]	कार्यपालिका सदस्य		[illegible]
१४	[illegible]	,,		[illegible]
१५	[illegible]	,,		[illegible]
१६	[illegible]	स सचिव उपनिर्वाचन	9741871590	[illegible]
१७	राजेश कुमार पाण्डे	आर्किटेक्ट	—	[illegible]
१८	[illegible]	वडा अध्यक्ष	9854030900	[illegible]
१९	हरिश्चन्द्र महतो	,,	9817614530	[illegible]



क्र.स	नाम	पद	फोन नं.	हस्ताक्षर
१९	राम दिलो साह	वडा सदस्य-६	९८४४२०७१६	
२०	जय कुमार साह	वडा अध्यक्ष	९८२०४४३८०	
२१	रत्न कुमार चौधरी	वडा सदस्य	९८४४०३९२२१	
२२	साइदा खातुन	नगरपालिका सदस्य	९८१२११५०८३	
२३	अजित कु. रिदेरी	अधिवक्ता	९८४४०३०४२६	
२४	दिपक आयुरी	नगर प्रहरी	९८०१२१४४४	
२५	हरिकुमार कुमार मण्डल	..	९८०७६५००५	
२६	तेज नारायण मण्डल	वार्ड सदस्यणी	11	
२७	ईकील कुमार दास	नगर प्रहरी	९८००८६९४५१	
२८	दिनेश कु. मुखिया	नगरपालिका कर्मचारी	९८०४८६१६३५	
२९	दिनेश कु. मुखिया	Driver		
३०	आशिक कु. मण्डारी	मेयर	९८२७६७५२२५	
३१	राम लखन लाल यादव			
३२	राहुल साह			
३३	संतोष साह	विष्णु		
३४	इंजिनि पासवान	नगर प्रहरी		
३५	संजय साह	11		
३६	अरुण राय	11		
३७	सबुना खातुन	स्वमो	९८४३४९२४३६	

SFD Jaleshwar Municipality, Nepal, 2023

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