SFD Report

Bheri 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 Bheri Municipality, Nepal, 2025

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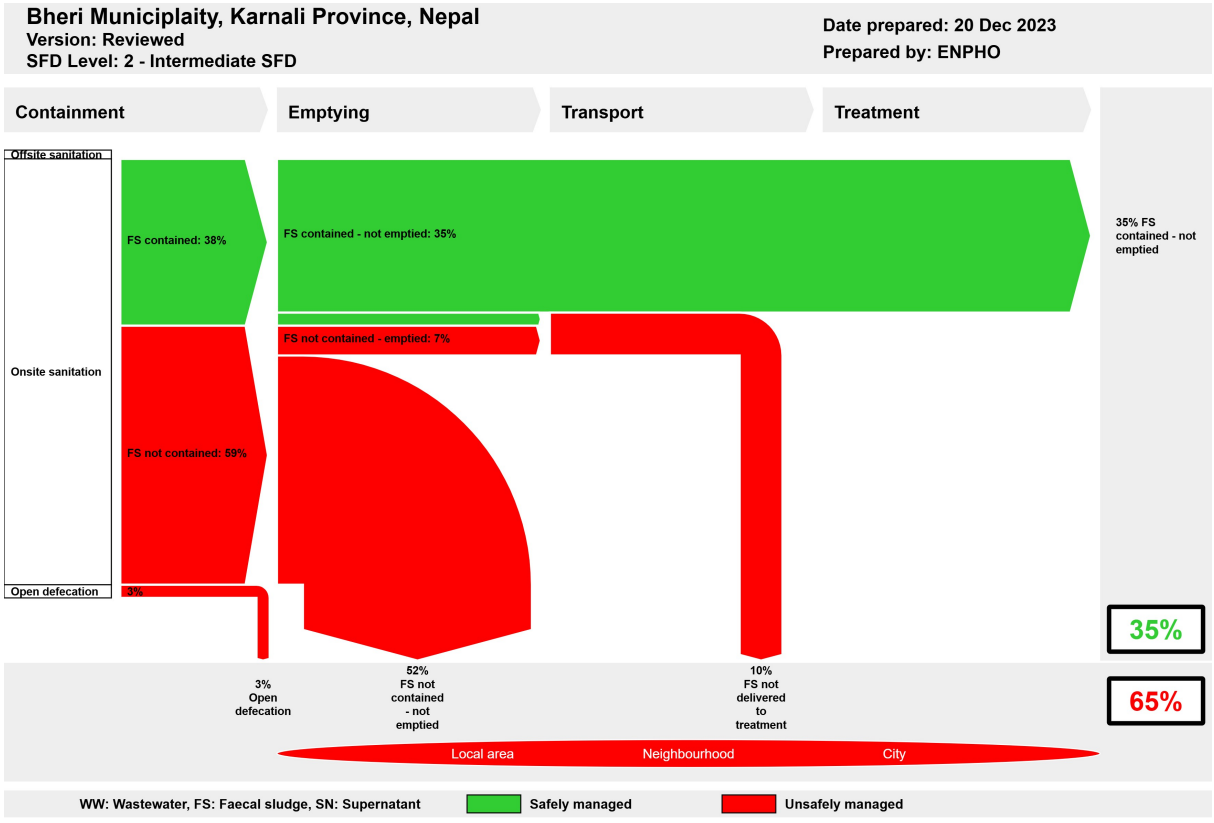
1. The SFD Graphic



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:

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

Status:

Final SFD report.

Date of production: 24/04/2024

3. General city information

Bheri is an urban muncipality located in Jajarkot district of Karnali Province of Nepal. The municipality comprises of 13 wards. The municipality covers an area of 219 .77 km^2. According to national population and housing census 2021, the municipality has a total population of 37,892 and 8,874 households (NSO, 2023).

The climate includes a subtropical monsoon along the Bheri River. According to data from the Department of Hydrology and Meteorology in 2016, the municipality experiences an average annual rainfall of 1,868.5 mm, with heightened intensity in June, July, and August. In the Bheri River plain area, the average maximum temperature peaks at 38°C, while the average minimum temperature falls to 0°C.

Bheri Municipality exhibits geological fragility.It spans elevations from 624 to 2,620 metres. The municipality features diverse terrains, presenting soil variations including loamy sand and sandy loam.

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) . 97% of the households in the municipality have a toilet. The 3% of the households without toilet defecate in nearby farmlands and use the toilet of neighbours. The municipality has public toilets in buspark area. The public toilets were constructed by the municipality and Buspark Management Committee and are operated by Buspark Management Committee and individual caretaker.

Containment:

All of the households with access to toilet in the municipality rely on onsite sanitation technologies. Unlined pits are most popular containment in the municipality. 90% of the households have constructed unlined pits. 5% of the households have constructed fully lined tanks. Only 2% of the households have constructed lined tanks with impermeable walls and open bottom.

Emptying and Transportation:

According to the assessment of the sanitation situation, only 13% of the households have emptied their containments at least once after used. The containments were emptied both manually and mechanically. 90% of these containments have been emptied manually while remaining have been emptied mechanically. There are no private desludging service providers within municipality however, the municipality is providing emptying and transportation services of faecal sludge within the municipality.

Treatment and Disposal:

There is no Faecal Sludge Treatment Plant (FSTP) within the municipality for FS treatment. The mechanically emptied FS is disposed to specific place at ward 4.

Water Supply:

According to the household survey conducted in Bheri Municipality, 72% of households rely on private taps, while only 7% depend on public or community taps. 20% of the households depend on spring sources and 1% depends on river water (ENPHO, 2023). The Jajarkot- Khalanga Sahalagani Water Supply System is major water supply sysetm in Bheri Municipality and other small water supply system is providing services in specific wards (KII_1, 2023).

The SFD graphic shows that 35% of the excreta generated are safely managed while 65% are unsafely managed. The safely managed excreta generated by 35% 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.

Bheri Municipal Council has endorsed the 2019 Health and Sanitation Policy, emphasizing access to health, nutrition, water, and sanitation. Priorities include achieving Total Sanitation, addressing pollution collaboratively, and managing solid waste through stakeholder coordination for a healthier, sustainable environment (Bheri Municipality, 2019).

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 Water Resource and Energy Development Water Supply and Sanitation Division Office (WSSDO)
Public Institutions at Local Government	Bheri Municipality Office Jajarkot- Khalanga Sahalagani Water Supply User's Committee
Non-governmental Organizations	Environment and Public Health Organization (ENPHO)
Private Sector	Public toilet operators
Development Partners, Donors	MuAN, BMGF, UCLG ASPAC, WASH Alliance International

7. Credibility of data

The major data were collected from random household sampling. Altogether, 368 households and 63 institutions were surveyed from 13 wards of the municipality on 25-26 April, 2023 (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 users and sanitation committee. The overall data and findings were shared with the stakeholders of the municipality and validated through a sharing program on 30 March, 2024.

8. Process of SFD development

Data on sanitation situation were collected through household and institutional survey. The local enumerators from each ward 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:

- Bheri Municipality. (2017). Profile of Bheri Municipality, Jajarkot District, Karnali Province.
- Bheri Municipality. (2019). Health and Sanitation Policy, Bheri Municipality, Municipal Council, Jajarkot District, Karnali Province.
- ENPHO. (2023). Assessment of Sanitation status of Bheri Municipality.
- 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

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
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
UCLG ASPAC	United Cities and Local Governments Asia Pacific
UNICEF	United Nations Children's Education Fund
WASH	Water, Sanitation and Hygiene
WUSC	Water Users and Sanitation Committee

1 City context

Bheri is an urban muncipality located in Jajarkot district of Karnali Province of Nepal. Initially it was named as Bherimalika Municipality which was established on 11 January, 2016. It was named as Bheri Municipality on 10 March, 2017. The municipality comprises of 13 wards. The municipality covers an area of 219 .77 square kilometres. It is surrounded by Kuse Rural Municipality and Nalagad Municipality in the North, Salyan District in the South, Rukum District in the East and Chhedagad Municipality in the West (Bheri Municipality, n.d).

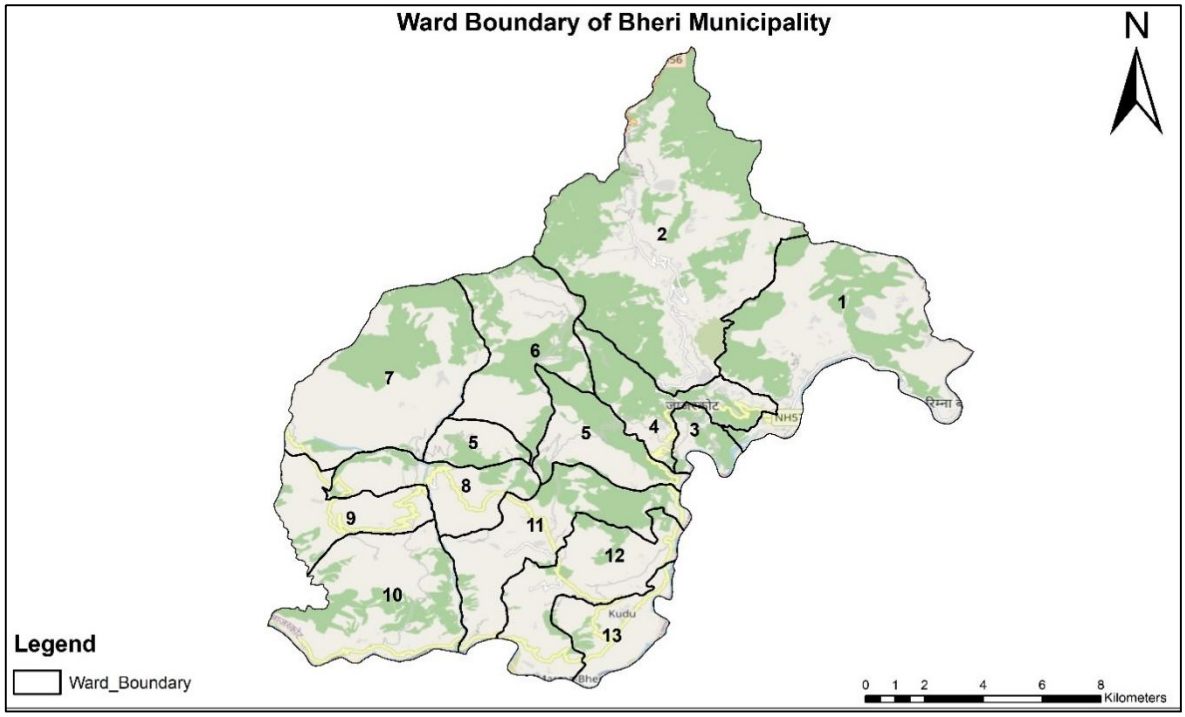


Figure 1: Map of Bheri Municipality with ward boundaries.

1.1. Population

According to national population and housing census 2021, the municipality has a total population of 37,892 and 8,874 households. The total male and female populations are 18,376 and 19,516 respectively. The population density is 172 people per square kilometre. A ward number 2 has the highest number of households with 1,143 and the highest population of 4,846 (2,409 male ad 2,437 female) and ward number 9 has the least households with 443 and ward 13 has the least population with 1,716 (795 male and 921 female) (NSO, 2023).

1.2. Climate

The climate along the Bheri River is characterized as subtropical monsoon, whereas the Siwalik and Hilly regions of the municipality experience a temperate climate. (Bheri Municipality, 2017) . As per the data acquired from the Department of Hydrology and

Meteorology in 2016, the average annual rainfall in the municipality is 1,868.5 mm. The months of June, July, and August experience higher rainfall intensity. In the Bheri River plain area, the average maximum temperature reaches 38°C, while the average minimum temperature drops to 0°C in the municipality.

1.3. Topography

Bheri Municipality is located in Mahabharata range and mountainous area. The region is geologically fragile and geomorphologically unstable and highly sensitive in terms of natural hazards like landslides, soil erosion and watershed degradation. It is extended from 82˚04'30" east to 82˚17'0" eastern longitudes and 28 36'30" north to 28.48'30" northern. Its elevation ranges from 624-2,620 metres (Bheri Municipality, 2017) . The municipality encompasses a river plain area (624 m to 1000 m), the Siwalik range (1,000 m to 1,500 m), and high hilly areas (1,500 m to 2,620 m), characterized by sloping and fragile terrain. The majority of the municipality's land is situated within the Siwalik range.Taking into account genetic horizons and soil characteristics, various soil types, including loamy sand, sandy loam, sandy clay silty loam, and sandy soils, were identified at the subgroup level in Bheri Municipality (Pokhrel, 2020).

2 Service Outcomes

2.1. Overview

Data on sanitation situation were collected by Environment and Public Health Organization (ENPHO) through household and institutional surveys (ENPHO, 2023) . A total of 372 households were sampled from 11,539 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) . Jajarkot District was declared Open Defecation Free District on 2 January 2015 which was first District in Bheri Zone The municipality was declared as an open defecation free municipality in 2014 (KII_1, 2023) . However, the household survey reveals that 3% of the households in the municipality do not have access to toilet and defecate in open spaces such as farmlands, open ground and wáter resources (ENPHO, 2023).

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 Bheri Municipality (ENPHO, 2023).

Containment	Wall construction Materials	Bottom of containment	Chamber	Number	Connected to	%	Recategorized as SFD	%
Fully lined tank	Cemented walls or cemented brick / stone wall	PCC or plastered	One orTwo	NA	No outlet/ overflow	5%	Fully lined tank	5%
Lined tank with impermeable wall and open bottom	Cemented walls or cemented brick / stone wall	Soiling / nothing	One ,Two or More than Two	NA	No outlet/ overflow	2%	Lined tank with impermeable wall and open bottom	2%
Unlined pit	Mud mortar stone/ brick wall/ dry stone wall/ no lining	Soiling / nothing	One	NA	No outlet/ overflow	90%	Unlined pit	90%
Open Defecation	NA	NA	NA	NA	NA	3%	Open Defecation	3%
Total						**100%**		**100%**

Unlined pits are most common containment type in the municipality. 90% of the households in the municipality have constructed unlined pits. Unlined pits are constructed with mud mortar brick / stone wall or dry-stone wall and soling or nothing at bottom as shown in Figure 2. There are permeable walls and base, through which infiltration can occur.

Figure 2: Toilets connected to unlined pits in Bheri Municipality.

Fully lined tanks, constructed by 5% of the households, A fully lined tank is an onsite sanitation technology which is used to safely store faecal sludge. The walls and bottom of tank are totally lined and sealed.

Figure 3: Toilets connected to fully lined tank in households.

Lined tank with impermeable walls and open bottom is an onsite sanitation technology where the walls of the tank are lined, and the bottom of tank is not lined and allows infiltration of leachate. The lined tanks with impermeable walls and open bottom are constructed by 2% of the households.

Figure 5 shows a map of the households with the types of containment observed in the survey.

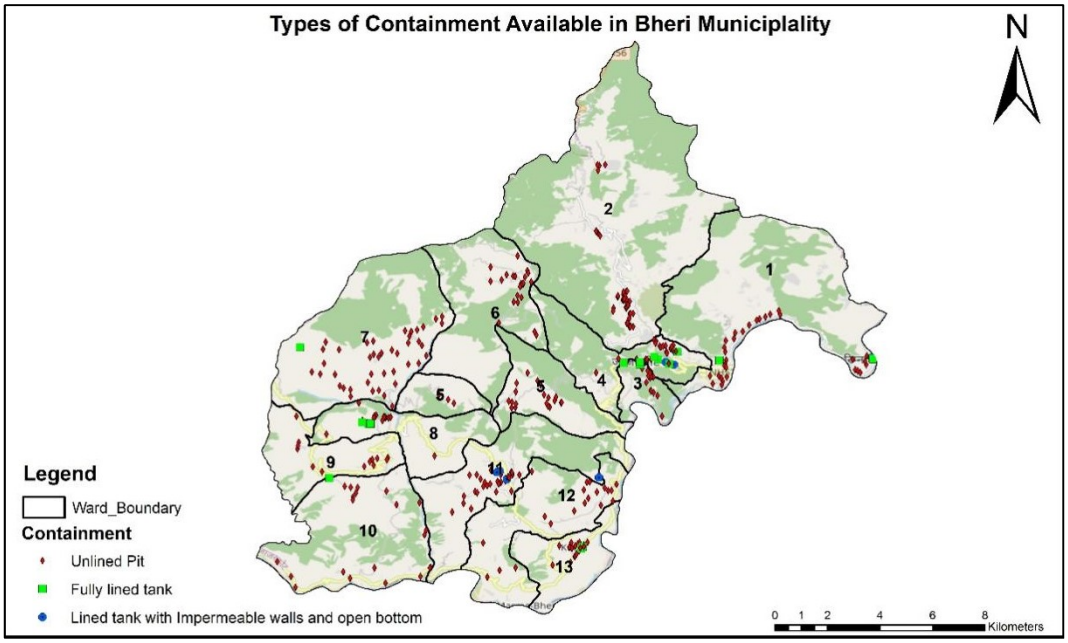


Figure 4: Map showing the households with the types of containments in Bheri Municipality.

2.1.2. Sanitation System in Institutional buildings

All institutional buildings (63 institutions) such as educational institutions, health institutions and government and non-government organizations surveyed have connected toilets to onsite sanitation technologies. The unlined pit is a popular onsite sanitation technology in the institutions. Figure 6 shows the different sanitation technologies available in the institutions of Bheri Municipality.

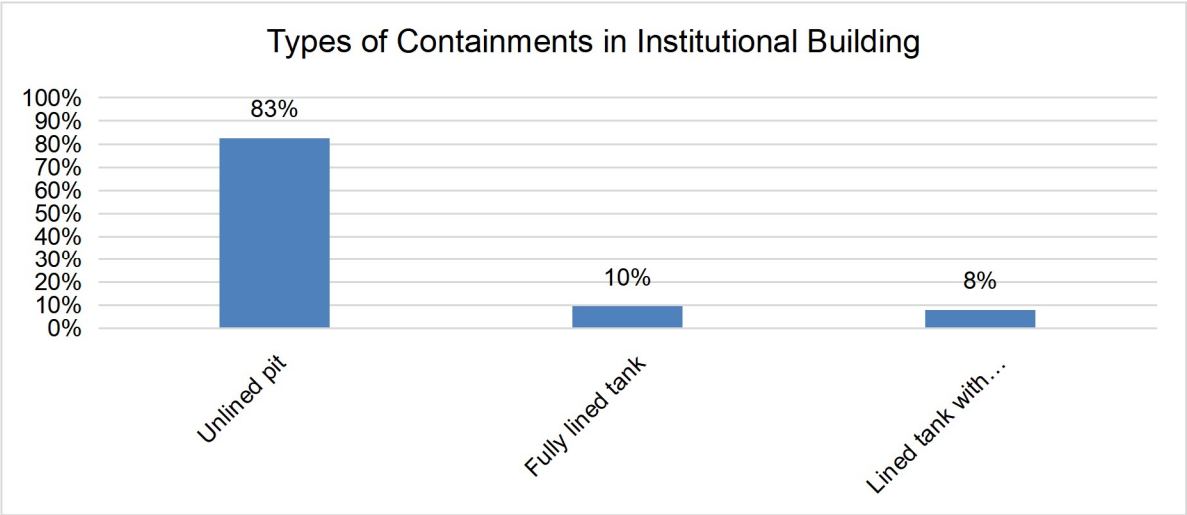


Figure 5: Types of containment in the institutional building of Bheri Municipality.

Figure 7 shows a map locating surveyed institutional buildings and types of sanitation technologies.

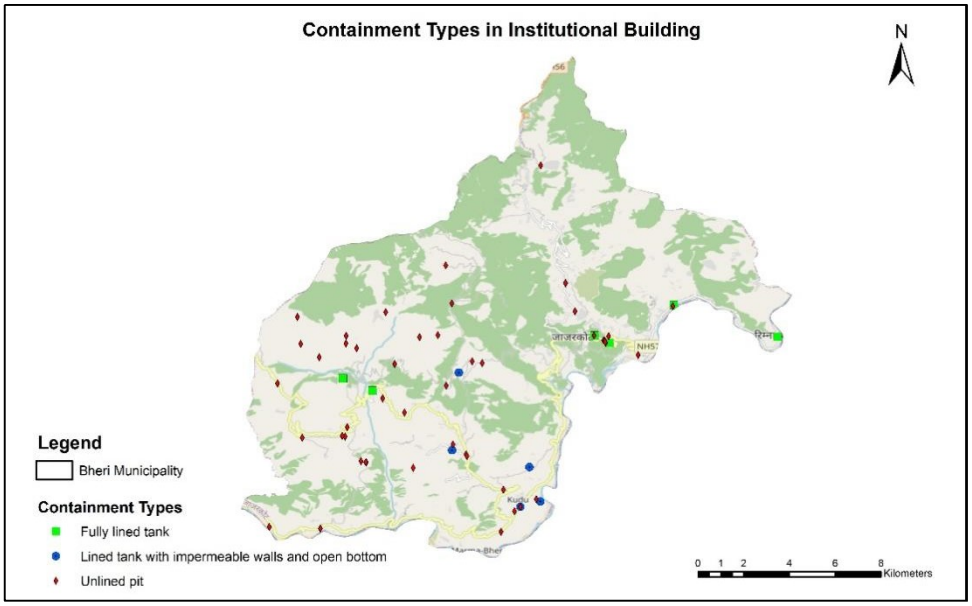


Figure 6: Map locating institutional building with types of sanitation technologies.

2.1.3. Public Toilets

There are five major public toilets existing in the municipality, and two of them were assessed. The public toilet (Figure 7) situated in Buspark Area (ward 4) was jointly constructed by the municipality and Buspark Management Committee. The operation and maintenance responsibilities have been handed over to Buspark Management Committee (KII_3, 2023). There are pan and urinal available for male users and female users. Approximately 200 individuals utilize these facilities on daily basis. The public toilet is connected to rectangular containment system. Notably, the containment has not reached full capacity. The water is stored in three tanks, each with a capacity of 1,000 litres. The public toilet has been non-operational for the past four months due to a lack of water supply. This water scarcity has hindered the daily functioning of the facility.

Figure 7: Public toilet in Buspark of Bheri Municipality.

2.1.4. Emptying and Transport

Emptying and transporting faecal sludge are crucial services for the proper operation of onsite sanitation technologies (Linda Strande, 2014). Only 13% of households have engaged in the emptying of their containment systems at least once since their installation. Within this group, 90% have chosen manual emptying, 6% have employed mechanical methods, and 4% have resorted to open emptying. Primarily, household members have taken charge of emptying the fecal sludge (63%). Additionally, 30% of the emptied fecal sludge involved the participation of traditional sanitation workers. It is noteworthy that the municipality lacks private desludging service providers, prompting the municipality itself to initiate desludging services (KII_1, 2023).

Bheri Municipality (Figure 8) is providing services since 2022. It owns a vehicle of 3,500 L capacity that the a compartment is assembled with tractor. This service provider has emptied faecal sludge approximately 10 trips per month. Demand has sporadically arisen primarily from wards 3 and 4 within the municipality. To cover expenses, the service provider imposes a fee of NRS 3,500 (USD 26) (KII_4, 2023).

Figure 8: Compartment of vehicle for desludging service that is assembled with tractor.

2.1.5. Treatment and Disposal

The municipality does not have a faecal sludge treatment plant. The mechanically emptied faecal sludge has been disposed to specific disposal site to Tarke (Ward 3) which is approx. 3 km above the Bheri River (KII_4, 2023). Of the 90% of households that manually emptied faecal sludge, 82% have practised dig and dump, 13% disposed of it in farmland, and another 5% have disposed into wáter bodies (ENPHO, 2023).

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 72% of households in the municipality rely on private/ yard taps while 7% of households depends on public or community tap. 20% of the households depend on spring water and 1% depends on river water (ENPHO, 2023).

The Jajarkot- Khalanga Sahalagani Water Supply System is major water supply service providers in Bheri Municipality (KII_1, 2023). Moreover, small water supply schemes such as Radhakrishna, Kaphal Mela, Kunnik, Khopteli, Data Khola, Palte, Budbudhe, Bhur, Bhurunge, Kotkhola have been implemented for providing the water services within the municipality.

Jajarkot- Khalanga Sahalagani Water Supply System

The Jajarkot- Khalanga Sahalagani Water Supply System plays a crucial role in providing drinking water to wards 4 and 5. The committee has the water supply schemes from the water supply system is comprised six reservoir tanks, boasting a capacity of 0.3 million litres, 0.12 million litres and 90 thousand litres (2 tanks), 80 thousands litres and 40 thousand litres. Initially, the scheme included slow sand filter and chlorination units. As of the date of the interview, approximately 1,021 taps have been installed, areas (KII_2, 2023) .

Figure 9: Reservoir tank existing at the Khalanga Bazar.

b. Drinking Water Quality

While conducting field observations, it was noted that the drinking water pipelines for private taps have been openly distributed without being buried under the surface. Both pipeline leakages and open drains were observed in close proximity. This situation raises concerns about the potential for cross-contamination in the drinking water supply.

Figure 10: Open pipeline existing within municipality.

The conducted study reveals that diarrhea is a prevalent waterborne disease in Jajarkot District. Addressing the management of water tanks during prolonged winter droughts and initiating community awareness campaigns for the protection of spouts are urgent requirements to prevent the current prevalence of the disease (Paudel U and Panta KP, 2018).

Based on the literature review on water resources and water quality, prevalence of water-borne diseases and information obtained from stakeholders as well as observation, the risk of the water contamination has been assumed as shown in Table 2.

Table 2: Containment type and potential risk for water contamination.

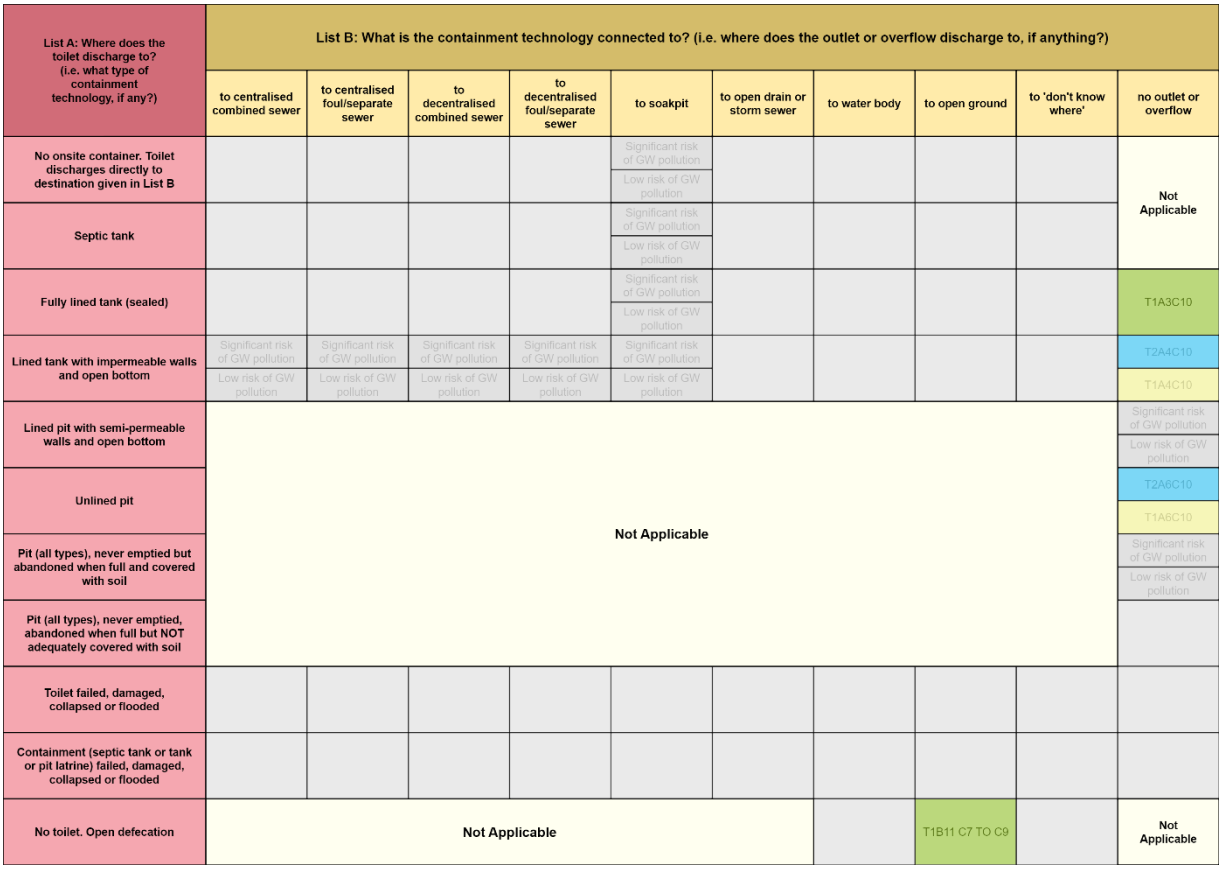
Containment Type	Drinking Water sources	High Risk	Low Risk
Lined tank with impermeable wall and open bottom (No outflow/outlet)	Private/Yard Tap	1%	1%
	Public/Community Tap	0%	0%
	Spring source	0%	0%
	Total	**1%**	**1%**
		T2A4C10	**T1A4C10**
Unlined pits (No outflow/outlet)	Private/Yard Tap	34%	32%
	Public/Community Tap	6%	0%
	Spring source	17%	0%
	River Water	1%	0%
	Total	**58%**	**32%**
		T2A6C10	**T1A6C10**

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.

The various types of sanitation technologies selected for the SFD graphic generator are shown in the SFD selection grid, as shown in Figure 11 and explained in Table 3.



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					
Fully lined tank (sealed)					Significant risk of GW pollution Low risk of GW pollution					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					T2A4C10 T1A4C10
Lined pit with semi-permeable walls and open bottom	Not Applicable									Significant risk of GW pollution Low risk of GW pollution
Unlined pit										T2A6C10 T1A6C10
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 11: SFD selection grid of Bheri Municipality.

Table 3: Explanation of different variables and containment technologies selected in SFD selection grid (SuSanA, 2018).

SN	Variable	Explanation
1	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.
2	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.
3	T1A6C10	This is 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 not fitted with a supernatant/effluent overflow, the excreta in this system are considered contained.
4	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.
5	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.
6	T2A6C10	This is a correctly designed, properly constructed and well-maintained unlined pit with permeable walls and base, through which infiltration can occur. Since there is a 'significant risk' of groundwater pollution, the excreta of this system are 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 the fully lined tanks, 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 12 shows the SFD matrix of Bheri Municipality. The sanitation technologies and the corresponding percentage of the population using such technologies are shown in Figure 12. These values are derived from the HH survey (ENPHO, 2023) and KIIs with desludging service providers (KII_4, 2023).

Bheri Municiplaity, Karnali Province, Nepal, 20 Dec 2023. SFD Level: 2 - Intermediate SFD Population: 37892 Proportion of tanks: septic tanks: 100%, fully lined tanks: 100%, lined, open bottom tanks: 1				
Containment				
System type	**Population**	**FS emptying**	**FS transport**	**FS treatment**
	Pop	**F3**	**F4**	**F5**
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
T1A3C10 Fully lined tank (sealed), no outlet or overflow	5.0	4.3	0.0	0.0
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	1.0	36.5	0.0	0.0
T1A6C10 Unlined pit, no outlet or overflow	32.0	7.5	0.0	0.0
T1B11 C7 TO C9 Open defecation	3.0			
T2A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	1.0	0.0	0.0	0.0
T2A6C10 Unlined pit, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	58.0	11.7	0.0	0.0

Figure 12: SFD matrix of Bheri 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_4, 2023)). In average, 73% 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 73% of the emptied containment. Hence, the proportion of FS emptied from the sanitation technology is calculated as 73% on the sanitation technology emptied (Table 4).

Table 4: 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	T1A3C10	Fully lined tank (sealed), no outlet or overflow	5.88%	73%	4.3%
2	T1A4C10	Lined tank with impermeable walls and open bottom, no outlet or overflow	50%	73%	36.5%
3	T1A6C10	Unlined pit, no outlet or overflow	10.26%	73%	7.5%
4	T1B11 C7 TO C9	Open defecation	NA	NA	NA
5	T2A4C10	Lined tank with impermeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	0%	73%	0%
6	T2A6C10	Unlined pit, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	15.96%	73%	11.7%
Source: ((ENPHO, 2023)[1,2]; (KII_4, 2023)[2])					

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

Currently, there is no Faecal Sludge Treatment Plant within the municipality for treating faecal sludge (KII_1, 2023). Mechanically emptied FS is transported to disposal site at ward 4 of the municipality. On the other hand, manually emptied FS is directly disposed of in farmlands and water bodies without undergoing any treatment. Thus, the percentages of FS transported to the treatment plant (F4) and FS treated (F5) for all containment systems have been designated as 0%.

2.3. Summary of Assumptions

Offsite sanitation System:

- ✓ There is not any sewer network hence all households in the municipality depend on onsite sanitation in Bheri Municipality.

Onsite Sanitation Systems

- ✓ The proportion of FS in fully lined tanks, 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 manually from the containments is dumped in farmlands and wáter bodies. Mechanically emptied FS is disposed without treatment. Thus, the percentages of FS transported to the treatment plant (F4) and FS treated (F5) for all containment systems have been designated as 0%.

2.4. SFD Graphic

Figure 13 represents the fate and flow of FS and supernatant through the sanitation service chain. It shows that FS generated from 35% of the population is safely managed and represented by “Green” colour arrowhead. However, 35% of the safely managed FS resembles the FS stored in the containment without significant risk to groundwater pollution. Thus, the safely managed percentage of FS generated by this 35% of the population is temporary until the FS from the containment is emptied. Consequently, these systems will require emptying services in the short and medium term as they fill up.

The FS from 65% of the population is unsafely managed, represented by “Red” arrow heads. The percentage of FS emptied but not delivered to treatment (10%), FS from containments where FS is not contained - not emptied (52%), and people practice open defecation (3%).

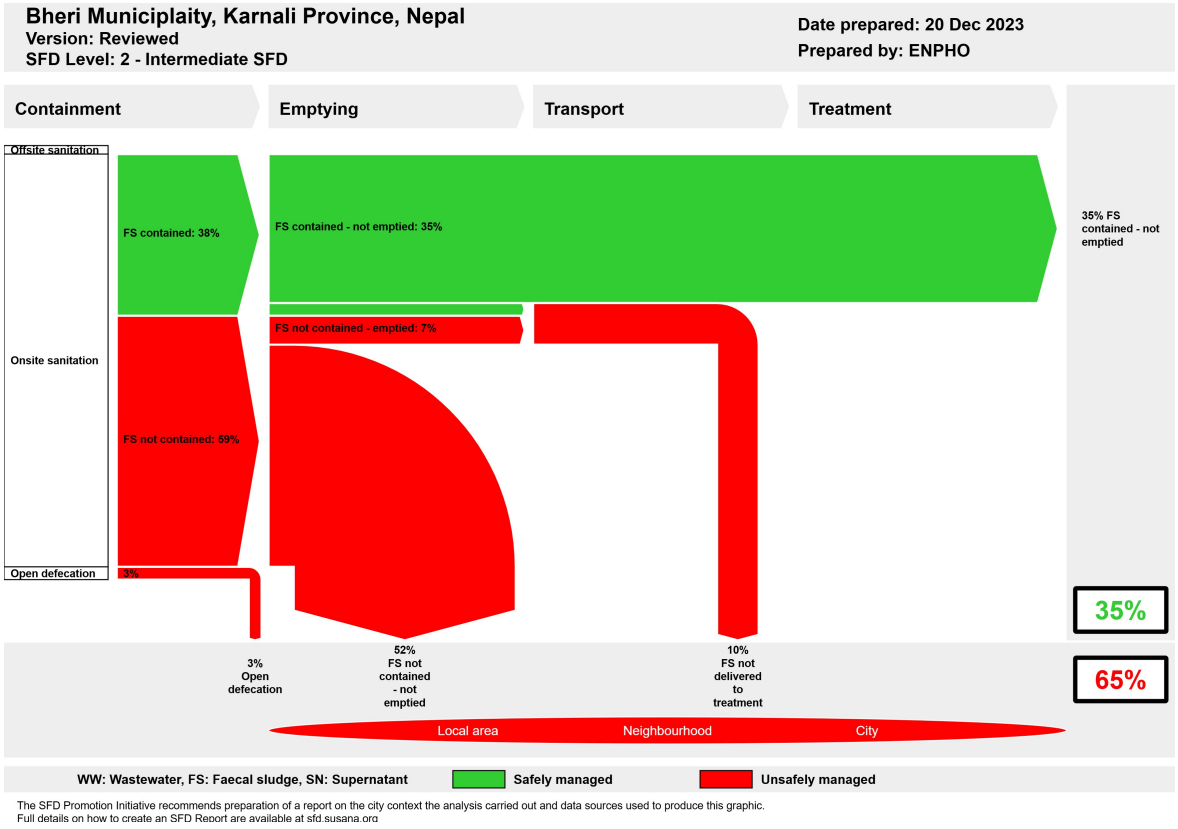


Figure 13: SFD graphic of Bheri Municipality.

All the population with access to toilets relies on onsite sanitation systems. As shown on the SFD graphic (Figure 13), it is estimated that 38% of the population uses systems where the FS is considered contained, while 59% 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 unlined pits, no outlet or overflow (T1A6C10). Thus, the FS generated by 38% 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 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 lined tanks with impermeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution (T2A4C10) and unlined pit, no outlet or overflow, where there is a 'significant risk' of groundwater pollution (T2A6C10). Thus, the FS generated by 59% 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 and unlined pit, no outlet or overflow (T1A6C10). Thus, the proportion of FS contained - emptied is 3% and emptied either mechanically or manually.

FS not contained - emptied

The proportion of FS not contained - emptied (7%) is FS that is not contained in onsite sanitation technologies and emptied either mechanically or manually.

FS not delivered to treatment

The municipality don't have treatment facility to treat faecal sludge. Manually emptying practice is most popular within municipality. So, the FS emptied from contained and not contained containments is disposed off into farmlands. The proportion of FS not delivered to treatment (5%) is the summation of FS contained - emptied and FS not contained - emptied.

FS delivered to treatment

The municipality does not have a treatment facility to treat faecal sludge. Thus, the proportion of FS delivered to treatment is 0%.

FS treated

The proportion of FS obtained from containment which has been transported to treatment and treated is 0%.

Open Defecation

Bheri Municipality was declared as an open defecation free municipality in 2014. However, 3% of the households have no access to toilet and practiced open defecation.

3. Service Delivery Context

3.1. Policy, Legislation and Regulation

The constitution of Nepal 2015 has established right to access to clean drinking water and citizen as fundamental right. In Article 35 (4) 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 (1) recognizes that every person shall have the right to live in a healthy and clean environment (GoN, 2015). To respect and promote the right of citizens to wards accessing clean drinking water and sanitation services, the government has promulgated and amended necessary laws. The most relevant legislation for promotion of safe sanitation services is discussed here.

Local Government Operation Act, 2017

Local Governance Operation Act 2017 has promogulated to implement the rights of local government and promote co-operation, co-existence, and co-ordination among federal, provincial, and local government. The act defined roles and responsibility of municipalities along with provision and procedure for approving laws and regulations at local level. Regarding the management of sanitation, the act entitles local government to conduct awareness campaigns, design and implement sanitation programs at the local level.

Environment Protection Act, 2019

Environment protection act 2019 is promogulated to prevent and control pollution from different development activities. It defines "Pollution" as the activities that significantly degrade, damage the environment, or harm the beneficial or useful purpose of the environment, by changing the environment directly or indirectly because of wastes, chemical, heat, noise, electrical, electro-magnetic wave, or radioactive ray. It provides the mechanism for appointing environmental inspector to control pollution by federal, provincial, and local government.

Water Supply and Sanitation Act, 2022

The act was promogulated to ensure the fundamental right of citizen to easy access on clean and quality drinking water, sanitation services and management of sewerage and wastewater. It defines sewerage and wastewater management as construction of sewer networks and treatment plants to preserve sources of water. It has entitled federal, provincial, and local level for the operation and management of water and sanitation services. The act also explicitly defines the responsibility of every citizen to preserve, conserve and maintain the sources of water and use responsibly (MoWS, 2022a).

Environment Friendly Local Governance Framework 2013

The environment-friendly local governance framework 2013 has been issued to add value to environment-friendly local development concept encouraging environmental protection through local bodies. The framework has set basic and advanced indicators for households, settlement, ward, village, municipality, and district levels for declaration of environment friendly. The use of water sealed toilets in households as basic indicators for sanitation and

health. Provision of toilet with safety tank and use as advanced indicators for sanitation. Provision of gender, children and disabled friendly public toilets in parks, petrol pumps and main market as basic indicator for municipal level. Advance indicators such as drainage discharged only after being processed through biological or engineering technique. While it has failed to identify the necessity of faecal sludge treatment plants as it has assumed safety tank in the households is sufficient for treating faecal sludge.

Institutional and Regulatory Framework for Faecal Sludge Management, 2017

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 Faecal Sludge Management (FSM). 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 the Water Users and Sanitation Committee in the framework reflects a participatory approach that would help in sustaining the interventions (MoWS, 2017a).

3.1.1. Policy

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 to 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, the 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. Both these policies were limited to addressing emerging issues and challenges in the rural and urban areas. National Water, Sanitation and Hygiene Policy (NWASHP), 2023 resolves both Rural Water Supply and Sanitation National Policy, 2004 and National Urban Water Supply and Sanitation Sector Policy, 2009.

The National Water, Sanitation, and Hygiene Policy, endorsed by the Government of Nepal in 2023, aims to safeguard the universal right to access safe water and sanitation and

upholds the right to reside in a clean and healthy environment. This policy advocates for a sectoral distribution of responsibilities among the three tiers of government, grounded in the principles of collaboration, cooperation, and coexistence. The goal is to ensure the effective management of water, sanitation, and hygiene development across the nation. It emphasizes to formulate Water, Sanitation, and Hygiene plans at the federal, provincial, and municipal levels. The policy prioritizes the integration of climate and disaster-resilient development, along with a focus on research and institutional capacity building. It advocates for the delivery of WASH services that are of high quality, transparent, and accountable, with the goal of ensuring universal access to these services for all. Further, the policy encompasses a broad spectrum of sanitation services, incorporating the treatment and safe disposal or reuse of faecal sludge and wastewater (MoWS, 2023).

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 in the sector for effective planning, implementation, and service delivery. Nepal achieved the commendable milestone of being declared an Open Defecation Free nation on September 23, 2019. However, the overarching target of connecting 90% of households to either a sewer system or implementing proper FSM is yet to be achieved.

Total Sanitation Guideline was promulgated by the Ministry of Water Supply in April 2017 after the successful implementation of National Sanitation and Hygiene master Plan (NSHMP)

2011. It provides guidelines for sustaining ODF outcomes and initiating post-ODF activities through an integrated water, sanitation and hygiene plan at municipalities and districts. The guideline redefined sanitation as management of services and facilities to safely dispose of/reuse faecal sludge, collection and treatment of solid waste and wastewater to establish a hygienic environment and promote public health. Indicators are set to guide total sanitation movement with an arrangement for resource management, monitoring and evaluation, capacity building.

National Drinking Water Quality Standard 2022 has been published by Ministry of Water Supply in National Gazette with standards values for physical, microbiological, and chemical parameters. Altogether, 19 parameters have been set as mandatory parameters to be test by the water service providers (MoWS, 2022b) .

Local Acts, Policies and Procedures

Bheri Municipal Council has formally ratified the Health and Sanitation Policy of 2019, demonstrating its commitment to ensuring access to essential services such as health, nutrition, water, and sanitation for its citizens (Bheri Municipality, 2019). The key components of the policy related to sanitation are outlined as follows:

i. The municipality is dedicated to becoming a Total Sanitation oriented Municipality, with the ultimate goal of sustaining an Open Defecation Free environment.

ii. The Municipality will actively engage with various stakeholders to address and mitigate water and air pollution, underscoring its responsibility towards environmental sustainability.

iii. Collaborative efforts between the municipality and private sectors will be undertaken to implement activities that safeguard public health from environmental factors.

iv. Priority will be given to solid waste management, emphasizing collaboration with stakeholders in activities such as collection, segregation, and safe disposal of waste.

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 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 14.

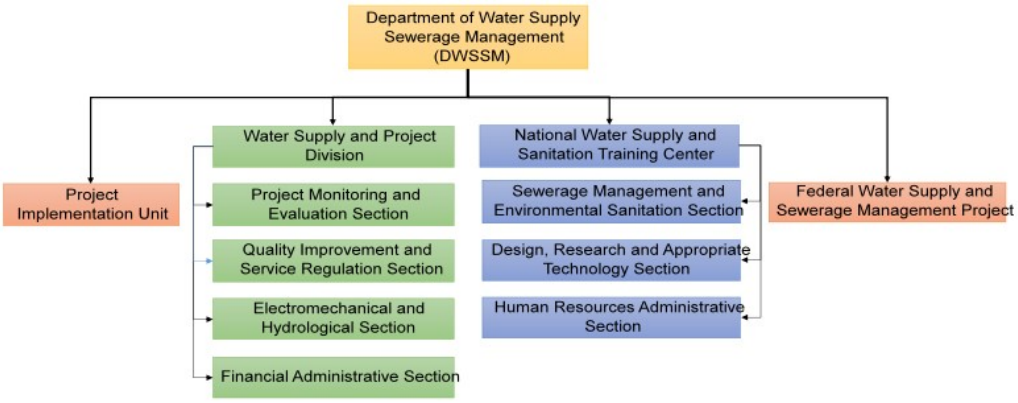


Figure 14: Organizational Structure Department of Water Supply and Sewerage Management.

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 Water Resource and Energy Development: Ministry of Water Resource and Energy Development of provincial government in Karnali province is major executing body in the province. The provincial government is working to ensure the access to safe water, sanitation and hygiene for public focusing on marginalized community. It emphasizes on the policy making, planning, monitoring and regulation. Planning and implementation of water supply and sanitation infrastructure in 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 is organized into divisions and sections. Municipality have no separate Water, Sanitation and Hygiene Unit. The municipality is providing desludging services within the municipality. The activities are undertaken by Environment section.

3.1.3. *Service Provision*

Urban Water Supply and Sanitation Policy 2009 has emphasized the Public-Private Partnership (PPP) in water supply and sanitation to improve service delivery (MoPIT, 2009). Also, Public-Private Partnership Policy, 2015 encourages private sector investment in the development and operation of public infrastructure services for comprehensive socioeconomic development. The policy has aimed to remedy challenges such as structuring of projects, land acquisition, coordination and approval, payments to private sectors and approval for environment impact (MoF, 2015).

While the Bheri Muncipality Health and Sanitation Policy of 2019 outlines collaboration with the private sector, the municipality has not yet implemented this for sanitation services. Currently, the municipality independently manages faecal sludge emptying and disposal services for the local community.

3.1.4. 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 5. However, FSM specific standards have yet to be developed and implemented.

Table 5: 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

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, water supply service provider, desludging service providers and public toilet service provider (Figure 15). 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 6.

Table 6: List of key stakeholders for KIIs.

KII code	Name	Designation	Organization	Purpose	Date
KII_1	Dal Bahadur Gharti	Acting CAO	Bheri Municipality	Sanitation Status of Bheri Municipality	24 April, 2023
KII_2	Kiran Kumar Bhandari Karna KC	Water Service provider	Jajarkot- Khalanga Sahalagani Water Supply System	Water supply, coverage, treatment, water quality	24 April, 2023
KII_3	Navaraj Sharma	Chairperson	Bus Park Management Committee (Public toilet Operator)	Status of Public Toilet	24 April, 2023
KII_4	Santosh Kumar Shahi	Driver	Desludging service providers, Bheri Municipality	Faecal sludge desluding service	24 April, 2023

Figure 15: Key informant interviews with public toilet operator and water service provider.

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 (Figure 16). 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.

Figure 16: Photos of enumerators during orientation on effective data collection techniques.

Determining Sample Size

The sample size for the household survey in Bheri 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, 368 households out of 8,874 households distributed in 13 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 17.

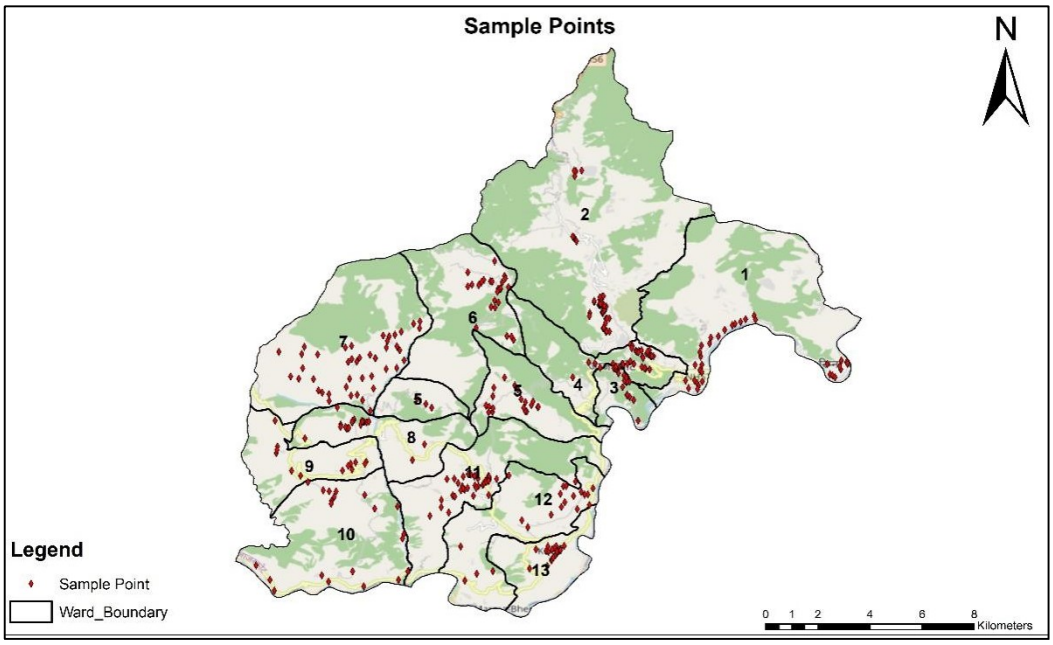


Figure 17: Distribution of sampling points in all wards of Bheri Municipality.

4.3. Direct Observation and Monitoring

Different sanitation technologies within households were observed, and visual documentation was maintained. Additionally, assessments were conducted on toilets, water sources, containment facilities, and the transportation of fecal sludge, public toilets. The overall process conducted by the enumerators were monitored by municipal official. Figure 18 illustrates the observation and monitoring of a household survey conducted.

Figure 18: Field observation and monitoring the households survey.

4.4. Sharing and Validation of Data

On 30 March 2024, an SFD validation workshop was organized at meeting hall of Bheri 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, 35 participants including the Mayor, Deputy Mayor, CAO, ward chairpersons, other members from municipal executive council, sectoral staffs etc. actively participated on the workshop and provided the valuable suggestions (Figure 19).

Mr. Chandra Prakash Gharti, the Mayor, has emphasized the importance of prioritizing solid waste management and has expressed enthusiasm for implementing faecal sludge management in the near future. He posited that the sanitation status may have experienced a slight degrading following the earthquake that struck on November 3, 2023.

Figure 19: SFD Sharing and Validation Workshop in Bheri 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 | ENPHO

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

Program: SFD orientation
Date: 12 and 13 Baisakh, 2080
Venue: Bheri Municipality

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	Age	Ethnicity
1.	Krishna Pd. Oad	Bheri municipality	CEO	9858080357				
2.								
3.	Dal Bdr Gharti	Mayor Nagarpalika	officer	9848056585			44	
4.	Lalita Thapa	5	enumerator	9841040570			30	
5.	Rupa Dhushal (B.K)	3	"	9868960694			30	
6.	Binita Sawad	9	"	9744520256[illegible]			21	
7.	Sujan K. S.	1	"	9825501326			29	
8.	Keshab Khatri	6	"	9848373396			19	
9.	Ganesh chand	7	"	9868010500			34	
10.	Santosh dangi	4	"	9742236[illegible]			29	
11.	Dipesh Rana	10	"	9840346882			27	
~~12~~				9748334251				
12	Prem Sunar	13	"	974833425[illegible]			34	
13.	Sunida Acharya	11	"	9865002980			19	
14.	Kalpana puri	2	"	9866221585			20	
15.	Armila Bhandari	12	"	98459557[illegible]			21	
16.	Pabitra Rayki	2	"	986807939[illegible]			22	
17	Rajendra puri	B6	PA/secretary	9868690310				

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4- Muslim
5- Madhesi
6- Others

S.N	Name	Organization	Designation	Phone no	Signature Day 1	Signature Day 2	Age	Ethnicity
17	Surya Lamsal	Bheri mun	IT officer	9848131381			29	
18	sisam shahi	Bheri mun		9866778506			21	
19	Sabitra shahi	Bheri mun		9849344978				
20	Sabina Gamal	ENPHO	APO	9843412596				
21	Rupak Shrestha	ENPHO	Engineer	9849463840				

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

Ward No.	Population (NSO, 2023)	Households (NSO, 2023)	Proportion	Required sample HH	Sample difference
1	3,712	852	10	35	24
2	4,846	1,143	13	47	24
3	2,812	781	9	32	24
4	3,159	881	10	37	24
5	2,227	550	5	23	24
6	2,813	589	7	24	24
7	3,962	793	9	33	24
8	2,350	512	6	21	24
9	2,116	443	5	18	24
10	2,109	521	6	22	24
11	3,547	719	8	30	24
12	2,523	601	7	25	24
13	1,716	489	6	21	24
Total	**37,892**	**8874**		**368**	

7.4. Appendix 4: List of pparticipants present in SFD sharing and validation workshop

आज मिति २०८० साल चैत्र १७ गते भेरी नगरपालिकामा नेपाल नगरपालिका संघको आयोजनामा वातावरण र जनस्वास्थ्य संस्था (एन्फो)को प्राविधिक सहयोग, The United Cities - Local Government Asia Pacific (UCLG-ASPAC) को सहकार्यमा र Bill and Mellanda Gates foundation (BMGF) को आर्थिक सहयोगमा सम्पन्न मलमुत्र रेखा प्रवाह चित्र (Shit flow Diagram - SFD) सम्बन्धि छलफल तथा प्रमाणीकरण कार्यक्रममा निम्न अनुसारको सरोकारवालाहरुको उपस्थिति रहेको छ।

क्र.सं.	नाम	पद	कार्यालय	फो. नं.	हस्ताक्षर
१.	चन्द्र प्रकाश घर्ती	नगर प्रमुख	भेरी. न. पा.	9851135595	[illegible]
२.	सीता जैसी	नगर उप-प्रमुख	,,	9868019567	[illegible]
३.	दल बहादुर घर्ती	नि. प्र. प्र. अ.	,,	9848056915	[illegible]
४.	विर बहादुर चन्द	वडा अध्यक्ष	भेरी-८	9866161688	[illegible]
५.	भरत बहादुर मल्ल	वडा अध्यक्ष	भेरी १२	9868169262	[illegible]
६.	दिपक रावत	वडा अध्यक्ष	भे.न.पा.-१	[illegible]	[illegible]
७.	श्रृजना बुढा	वडा अध्यक्ष	भेरी [illegible]	[illegible]	[illegible]
८.	गोपाल लोहार	कार्यपालिका	भे न पा [illegible]	[illegible]	[illegible]
९.	मतीराम परियार	कार्यपालिका	भे न पा [illegible]	[illegible]	[illegible]
१०.	अमृता [illegible]	वडा [illegible] अध्यक्ष	भे.न.पा.९	[illegible]459555469	[illegible]
११.	ओम बहादुर कार्की	वडा अध्यक्ष	भे.न.पा.२	98662213[illegible]	[illegible]
१२	यज्ञ बहादुर बहाला	वडा अध्यक्ष	भे.न.पा.१३	985805[illegible]555	[illegible]
१३	कमल प्रसाद शर्मा	— ,, — ,,	भे.न.पा.४	[illegible]	[illegible]
१४	लाल बहादुर चन्द	— ,, — ,,	भे.न.पा. ५	[illegible]	[illegible]
१५.	प्रेम प्रकाश के.सी.	स्रोत व्यक्ति	मिडिया [illegible]	[illegible]	[illegible]
१६	लिला देवि गौतम	कार्यपालिका सदस्य	भे.न.पा. १	[illegible]	लिला
१७	मोती नेपाली	कार्यपालिका सदस्य	भे.न.पा.३	[illegible]	मोती
१८	दिप बहादुर शाही	वडा अध्यक्ष	भे.न.पा.६	[illegible]	[illegible]
१९	काली खत्री	वडा १३.	,,		काली

क्र.सं.	नाम	पद	कार्यालय	फो.नं.	हस्ताक्षर
२०.	यज्ञनाथ गौतम	[illegible]	भेरी न.पा. वि.शाखा	९८५८०४५९७८	[illegible]
२१.	केदारबहादुर कार्की	सहायक चौथो	भेरी न.पा.	९८६८८२६०५०	[illegible]
२२.	विपना पाँडेल	म.वि.नि.	भेरी न.पा.	९८४४८६६८८३०	[illegible]
२२.	दिप बहादुर वली	सी.स्वा.नि.	भेरी न.पा. स्वास्थ्य	९८५८०३५५५	[illegible]
२४.	ई. सूर्य प्रसाद लम्साल	IT officer	भेरी न.पा.	9848131381	[illegible]
२५	क्रान्ति बहादुर थापा	स.पाँचौं	भेरी न.पा.	९८३८२९२८६	[illegible]
२६	भिम बहादुर कुमाल	जो.स्व.अ	पो.न.पा.-३	9849216962	[illegible]
२७	सृजना घर्ती	कार्यपालिका सदस्य	भे.न.पा.	९८३८९१०९३	[illegible]
२८	लक्ष्मी प्रसाद जोशी	वडाअध्यक्ष ११	भेरी न.पा. कार्यालय	९८६८००३०८३	[illegible]
२९	राजेन्द्र पुन	सहायक पाँचौं	भे.न.पा. कार्यालय	९८३८३५०३१०	[illegible]
३०	सुवास चन्द्र घिमिरे	सा.वि.वि.	काठमाडौं-१६	९८२१९२५४८६	[illegible]
३१	कृष्ण काफ्ले	समाजशास्त्री	〃	९८४९२८११०	[illegible]
३२	टेकेन्द्र बहादुर [illegible]	Environmental expert	[illegible]	९८६३६८२८१९	[illegible]
३३	भरत नेपाली	का.स.	भेरी न.पा.	९८४८०८०	[illegible]
३४	प्रेम ब. रुक्मी	— 〃 —	— 〃 —	९८४८६५२८३४४	[illegible]
३५	सावित्रा शाही	— 〃 —	— 〃 —		

SFD Bheri Municipality, Nepal, 2025

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