

SFD Report

Siddhicharan Municipality Nepal

Final Report

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SFD Report Siddhicharan Municipality, Nepal, 2026

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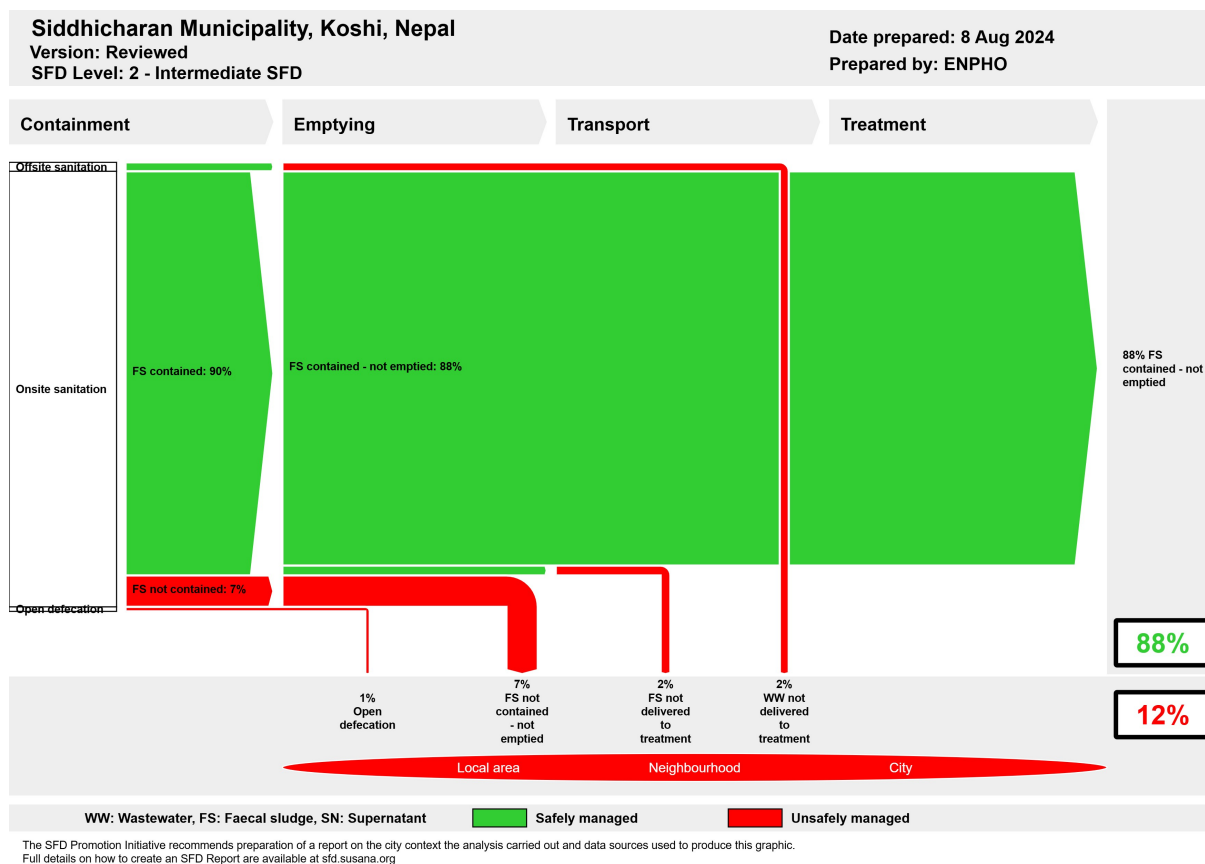
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1. The SFD Graphic



2. Diagram information

SFD Level:

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3. General city information

Siddhicharan Municipality is situated in Okhaldhunga District of Koshi Province of Nepal. It is divided into 12 wards and covers an area of 167.88 sq. km. It was established in May 2014 and was reformed in March 2017. It was reformed by merging 6 Village Development Committees (VDCs) namely Taluwa, Thulachhap, Jantankhani, Baruneshwor, Bigutar and Betini with former Siddhicharan Municipality. It ranges from 27°06'00" to 27°31'60" N latitude, 86°09'60" to 86°31'60" E longitude and at an average altitude of 1,841 meters above mean sea level (msl) (Siddhicharan Municipality, 2024).

A population of 27,351 is residing in 7,126 households in the municipality (National Statistics Office, 2023). This shows that the municipality has increasing out migration. The municipality has a temperate climate (Cwb) with warm summers and dry winters. The annual average temperature of the municipality is 16.4°C and receives 3,159 mm rainfall per year (Climate-Data, 2021).

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, 2024). Okhaldhunga district was declared Open Defecation Free (ODF) on 17 July 2017. But 1% of households do not have toilets, while 99% of households have the coverage of improved sanitation facility. The households without improved sanitation facility opt for open defecation.

Containment:

Among households with improved sanitation facilities, about 2% of households rely on an offsite sanitation system and 97% rely on onsite sanitation systems. In the municipality, scanty households have sewer network. Here toilets connected to a sewer network is taken as offsite sanitation systems. Households with onsite sanitation systems have different sanitation technologies. About 2%, have fully lined tanks, 5% have lined tanks with impermeable walls with open bottom and 90% have unlined pits.

Here, 98% of institutional buildings have toilets while 2% still lack toilets. Among institutional buildings with improved sanitation facilities, 95% have onsite sanitation systems and 3% have offsite sanitation systems. Among the institutional buildings with onsite sanitation systems, 5% have fully lined tanks, 15% have lined tanks with impermeable walls and open bottom, 3% have lined pits with semi-permeable walls and open bottom (single pit) and 72% have unlined pits.

Siddhicharan municipality has six public toilets. Among which one toilet located near *Army Camp* is non-functional. The toilets located at *Hatiya Bazaar*, *Siddhicharan Park* and *Milanchowk* were constructed by Siddhicharan Municipality while toilet located at *Rumjatar Haat Bazaar* was jointly constructed by local shopkeepers and a nearby school. Almost 200 people use these toilets per day. The restrooms are mostly used by public vehicle passengers, local shopkeepers and city dwellers.

Emptying and Transport:

Among the buildings with onsite sanitation systems, only 2% of households while none of institutional buildings have emptied their containment. Both manual and mechanical emptying is practiced at households and institutional buildings in the municipality. Moreover, manual emptying is prevalent in the municipality.

The municipality does not have desludging service provider. However, a private desludging service provider from Katari Municipality of Udayapur District serves as per demand for mechanical emptying in the municipality.

Treatment and Disposal/Reuse:

Here, mechanically emptied faecal sludge (FS) is applied to farmlands as per demand. While, manually emptied FS is dumped in a pit. Therefore, all the emptied FS is disposed unsafely into an open environment.

Approximately 52% of households have piped drinking water supply services in the municipality. Among other service providers, Okhaldhunga Water and Sanitation Users' Committee (WSUC) is one of the major drinking water services providers in the Siddhicharan Municipality. It serves wards 11 and 12. It has distributed more than 1,050 taps to households and institutions. Also, Rumjatar WSUC is another water supply service provider that serves in ward 4 and has distributed more than 753 taps in the ward. Apart from private taps, 1% of households rely on community taps and 47% rely on spring sources for drinking water supply.

Spring sources are vulnerable to contamination. The vulnerability of sources depends on lateral spacing between sanitation systems and the sources. As the water supply schemes treat water, HHs using water from private taps are at less risk of *E. coli* contamination.

The SFD graphic shows that excreta generated from 88% of the population is safely managed while 12% of the population is unsafely managed. However, safely managed FS generated from 88% of population is temporary as the FS has not been emptied. The proportion of safely managed FS will soon become unsafely managed once the containments start filling up.

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 enforced the Water Supply and Sanitation Law 2022 which emphasizes on the right to quality sanitation services and prohibits 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, NSHMP 2011 has proved to be an important strategic document for all stakeholders to develop uniform programs and

implementation mechanisms at all levels. It strengthened institutional set up with the formation of Water and Sanitation Coordination Committee (WASH-CC) to actively engage in sanitation campaigns. The sanitation campaign was implemented throughout the country mainly focusing on achieving universal access to improved sanitation.

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 (FSM) 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.

6. Overview of stakeholders

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

Table 1: Overview of Stakeholders

Key Stakeholders	Institutions / Organizations
Public Institutions at Federal Government	Ministry of Water Supply
Public Institutions at Provincial Government	Ministry of Water Supply, Irrigation and Energy
Public Institutions at Local Government	Siddhicharan Municipality
Non-governmental Organizations	Environment and Public Health Organization (ENPHO)
Private Sector	Water Supply Users Committee
Development Partners, Donors	MuAN, BMGF, UCLG ASPAC

7. Process of SFD development

Data on sanitation situation were collected through household and institutional surveys (ENPHO, 2024). Enumerators of the municipality were mobilized after orientating on sanitation technologies and proper use of mobile application (KOBOLLECT) to collect data for survey. The Key Informant Interviews

(KIIs) were conducted with WASH focal person of the municipality, Water and Sanitation Users' Committee and caretakers of public toilets. Types of sanitation technologies used in various locations have been mapped using ARCGIS. To produce the Shit Flow Diagram (SFD), initially, the relationship between sanitation technology used in questionnaire survey and Shit Flow Diagram Promotive Initiatives (SFD PI) methodology was mapped. Then, data were fed into SFD graphic generator to produce the SFD graphic.

8. Credibility of data

The major data were collected from random household sampling. Altogether, 365 households and 40 institutions were surveyed from 12 wards of Siddhicharan Municipality. Primary data on emptying, transportation and current sanitation practices in the municipality were validated from KII with public toilet management, municipal representatives, and water service providers. The overall data and findings were shared with the stakeholders of the municipality and validated through a sharing program.

9. List of data sources

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

- Siddhicharan Municipality, 2024. Siddhicharan Municipality. [Online] Available at: <https://www.siddhicharanmun.gov.np/> [Accessed 18 December 2024].
- Climate-Data, 2021. Climate-Data. [Online] Available at: <https://en.climate-data.org/asia/nepal/eastern-development-region/okhaldhunga-1025399/> [Accessed 18 December 2024].
- ENPHO, 2024. *Sanitation Situation Assessment of Siddhicharan Municipality*. Unpublished, s.l.: s.n.
- MoWS, 2020. *Open Defecation Free Nepal: Narration of the Journey*, Kathmandu: Secretariat of National Sanitation and Hygiene Coordination Committee, Nepal.
- National Statistics Office, 2023. *National Population and Housing Census 2021 National Report*, Kathmandu: National Statistics Office.

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Abbreviations

DWSSM	Department of Water Supply and Sewerage Management
DUDBC	Department of Urban Development and Building Construction
ENPHO	Environment and Public Health Organization
FS	Faecal Sludge
FSM	Faecal Sludge Management
FSTP	Faecal Sludge Treatment Plant
GoN	Government of Nepal
HH	Household
IRF	Institutional and Regulatory Framework
KII	Key Informant Interview
KM	Kilometre
msl	mean sea level
mm	Millimetre
MoWS	Ministry of Water Supply
MuAN	Municipal Association of Nepal
NPC	National Planning Commission
NSHMP	National Sanitation and Hygiene Master Plan
NWSSP	National Water Supply and Sanitation Policy
ODF	Open Defecation Free
PPP	Public Private Partnership
RWSSNP	Rural Water Supply and Sanitation National Policy
SDG	Sustainable Development Goal
SDP	Sector Development Plan
SFD	Shit Flow Diagram
SFD PI	Shit Flow Diagram Promotion Initiative
SN	Supernatant
SuSanA	Sustainable Sanitation Alliance
UCLG ASPAC	United Cities and Local Governments Asia-Pacific
VDC	Village Development Committee
WASH	Water, Sanitation and Hygiene
WSUC	Water and Sanitation Users Committee
WW	Wastewater
WWTP	Wastewater Treatment Plant

1 City context

Siddhicharan Municipality is situated in Okhaldhunga District of Koshi Province in eastern Nepal. It was established on May, 2014 and was reformed on March 2017 by merging Taluwa, Thulachhap, Jantankhani, Baruneshwor, Bigutar and Betini Village Development Committees (VDCs) with the former Siddhicharan Municipality. It shares its boundary with Chisankhugadhi Rural Municipality on the east, Molnug Rural Municipality on the west, Khijidemba Rural Municipality and Solukhumbu District on the north and Manebhanjyang Rural Municipality on the south (Siddhicharan Municipality, 2023). The municipality is divided into 12 wards; Figure 1 shows the ward boundary map of Siddhicharan Municipality.

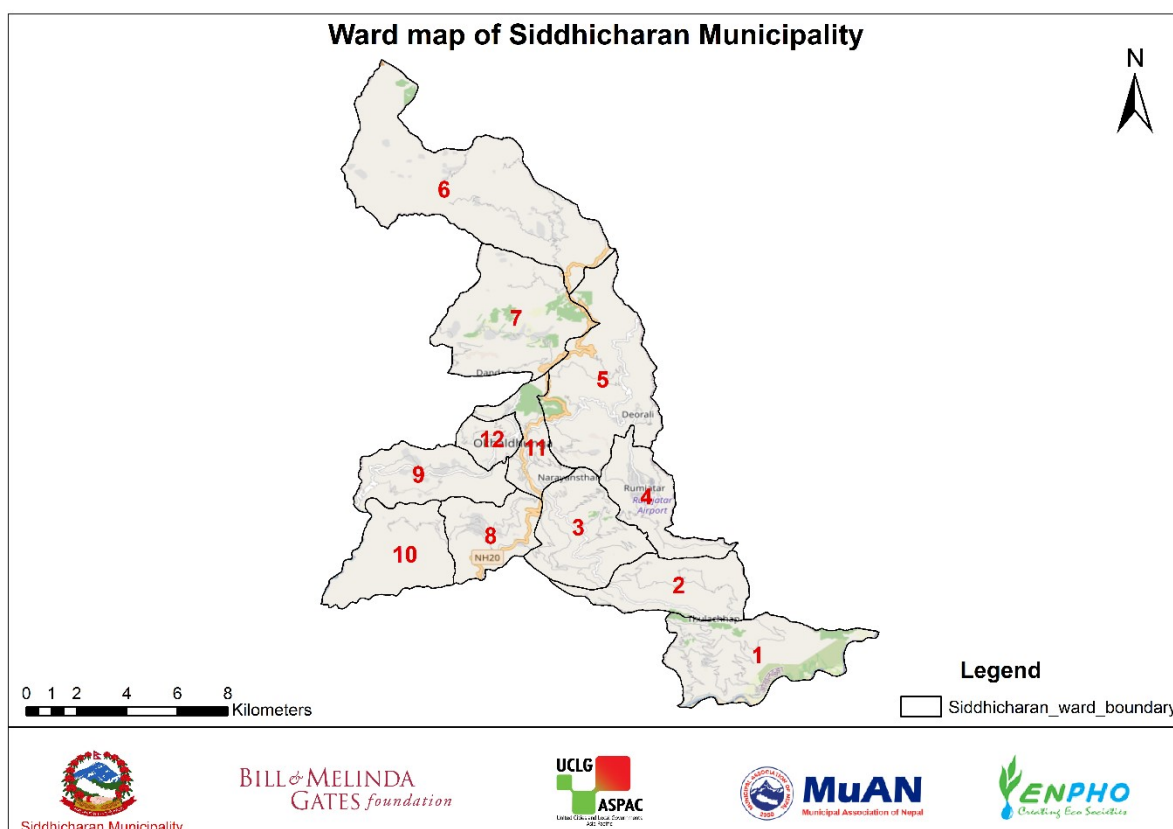


Figure 1: Ward boundary map of Siddhicharan Municipality.

1.1 Population

As per the national population and housing census conducted in 2021, Siddhicharan Municipality has a total population of 27,351 with 13,097 males and 14,254 females. There are altogether 7,126 households. The average household size is 3.84 (National Statistics Office, 2023) and population density is 163 persons per km². This shows that the municipality has increasing out migration, decreasing the overall population size.

1.2 Topography and Geography

Siddhicharan Municipality ranges from 27°06'00" to 27°31'60" N latitude, 86°09'60" to 86°31'60" E longitude and at an average elevation of 1,841 metres above mean sea level (msl). It covers a total area of 167.88 sq. km. of Okhaldhunga District (Siddhicharan Municipality, 2023). The municipality lies in the Mahabharat range based on the

physiographic division of Nepal. The region has a composition of Phyllites, Schist, gneiss, quartzite, granite and limestone as well as alluvial sediments i.e. sand, silt and clay along-with coarse gravels are found in the municipality (Upreti, 1999).

1.3 Climate

Köppen–Geiger classification is one of the most used systems for climatic categorization. This classification is a widely used method for portraying climates worldwide, based on monthly air temperature and precipitation. The climatic condition of Siddhicharan Municipality falls on temperate climate (Cwb) based on Köppen–Geiger classification. This climatic condition has warm summers and dry winters (Karki, et al., 2015). The warmest month of the year is June with an average temperature of 20.6°C and coldest month is January with average temperature of 9.4°C. The annual average temperature of the municipality is 16.4°C. It receives 3159 mm rainfall on average annually. The most rainfall occurs in July and the least in December (Climate-Data, 2021). Figure 2 shows the graph of the monthly average for precipitation and temperature of Siddhicharan Municipality.

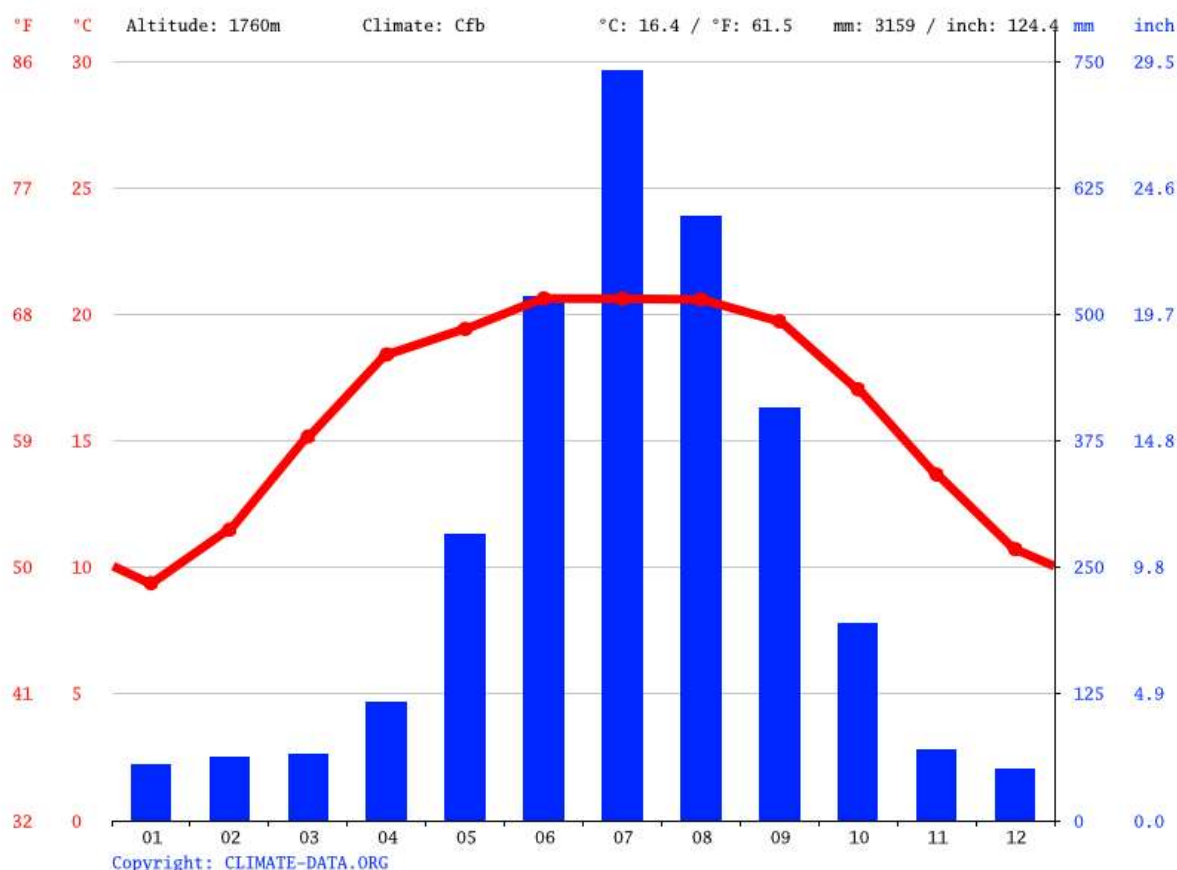


Figure 2: A graph showing the monthly average for precipitation and temperature of Siddhicharan Municipality.

2 Service Outcomes

2.1 Overview

Data on sanitation situation were collected through household and institutional surveys (ENPHO, 2024). A total of 365 households were sampled from 7,126 households distributed in 12 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 secondary data, Key Informant Interviews (KIIs) and a validation workshop is presented in this section.

Sanitation is defined as infrastructures, facilities or services provided for safe management of human excreta emanating from toilets for handling, storage, and treatment; onsite or offsite, conveying it safely to the end use or disposal to protect human health and environment (Affam & Ezechi, 2021).

2.1.1 Sanitation System in Household Buildings

Okhaldhunga district was declared Open Defecation Free (ODF) on 17 July 2017 (MoWS, 2020) while Siddhicharan Municipality was declared ODF a year prior to the declaration of the district (KII-1, 2024). The status of ODF indicates accessibility to basic sanitation in each household (HH). In Siddhicharan Municipality, still 1% of the households do not have toilets and practice open defecation. The households practising open defecation goes to an open space. Figure 3 shows sanitation technologies present at households in Siddhicharan Municipality.



Figure 3: Sanitation technologies at households of Siddhicharan Municipality.

The remaining 99% of the households have improved sanitation facilities either with offsite or onsite sanitation systems. Offsite sanitation refers to a sanitation system in which excreta (referred to as wastewater) is collected and transported away from the plot where they are generated. An offsite sanitation system relies on sewer technology for transport. Onsite sanitation refers to a sanitation technology or sanitation system in which excreta (referred to as faecal sludge) is collected and stored and emptied from or treated on the plot where they are generated (SuSanA, 2018). In the municipality, 2% of the households have offsite sanitation systems whereas 97% have onsite sanitation systems. Figure 4 presents the location map of households with status of access to improved sanitation.

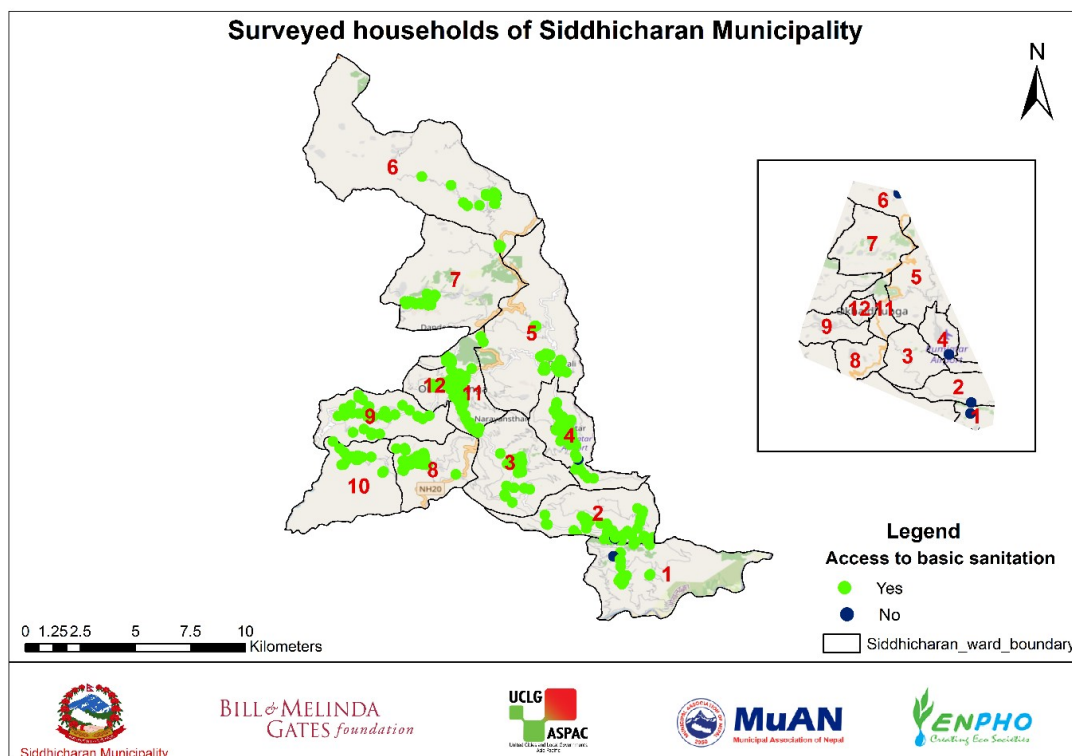


Figure 4: Location map of households with status of access to improved sanitation.

Types of Offsite Sanitation Systems

Siddhicharan Municipality does not have sewerage network but ward 11 and 12 has a sewer line connection with the outlet releasing wastewater into the Chandani River (KII-1, 2024). Thus, 2% of households in the municipality have offsite sanitation system. Moreover, the wastewater discharged through sewer networks are directly disposed of into the water body without any treatment. Thus, this could affect the natural environment of the water body. In the municipality, households that have the outlet of toilet to a sewer line is considered as offsite sanitation system and is taken as toilet with no onsite container for the SFD graphic. Figure 5 shows the toilet connection to a sewer network and sewer line in Siddhicharan Municipality.



Figure 5: Toilet connection to a sewer network and sewer line in Siddhicharan Municipality.

Types of Onsite Sanitation Systems

In Siddhicharan municipality, 97% of the households have onsite sanitation systems. Table 1 shows the types of onsite sanitation technologies and percentage of households using it in Municipality.

Table 1: Types of onsite sanitation technologies at household level in Siddhicharan Municipality

Containment	Wall construction materials	Bottom of containment	Chamber	Number	Connected to	%
Fully Lined Tank	Concrete walls OR Cemented brick/stone walls	PCC or plastered	One or Two	NA	No outlet/ overflow	2%
Lined tank with impermeable walls and open bottom	Concrete walls OR Cemented brick/stone walls	Soiling or Nothing	One, two, or More than two	NA	Soak pit Sewer Open drain/open ground No outlet/ overflow	5%
Unlined pit	Mud mortar brick wall/Mud mortar cement wall/No lining/Dry stone wall	Nothing	NA	NA	NA	90%

Fully lined tank is a rectangular tank with impermeable walls and base to safely store FS. It does not have outlet for the discharge of effluent (Strande, et al., 2014). 2% of households have fully lined tanks.

Lined tank with impermeable walls and open bottom is a rectangular onsite technology where the walls of the tank are lined and sealed, and a permeable base. The facility allows infiltration of effluents which could contaminate groundwater (Peal, et al., 2020). 5% of households have these types of containments in the municipality.

Unlined Pit is a dug pit in the ground. It has no lining in walls and a permeable base. It allows infiltration of effluents from walls and as well as bottom of the pit (SuSanA, 2018). 90% of households have unlined pits. Figure 6 shows unlined pits found in Siddhicharan Municipality.



Figure 6: Unlined pits found at households in Siddhicharan Municipality.

Table 2 shows the types of sanitation technologies recategorized according to SFD PI.

Table 2: Types of sanitation technologies recategorized according to Shit Flow Diagram (SFD) Promotion Initiatives (PI)

Sanitation System	Percentage
No toilet/Open defecation (T1B11 C7 TO C9)	1%
No onsite container (T1A1C1)	2%
Onsite Sanitation System	
Fully lined tank (T1A3C10)	2%
Lined tank with impermeable walls and open bottom (T1A4C10 and T2A4C10)	5%
Unlined pit (T1A6C10 and T2A6C10)	90%
Grand Total	100%

Figure 7 shows location map of households with different types of containment at Siddhicharan Municipality.

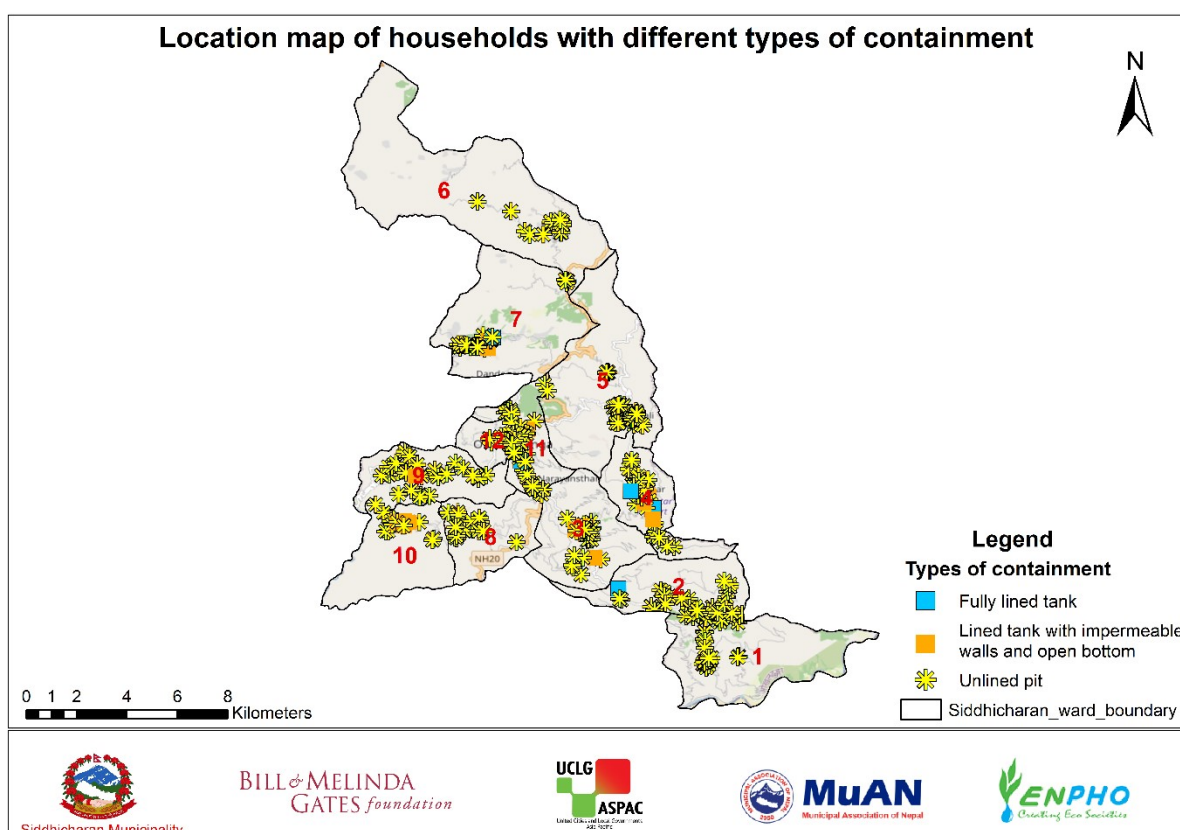


Figure 7: Location map of household with different types of containment.

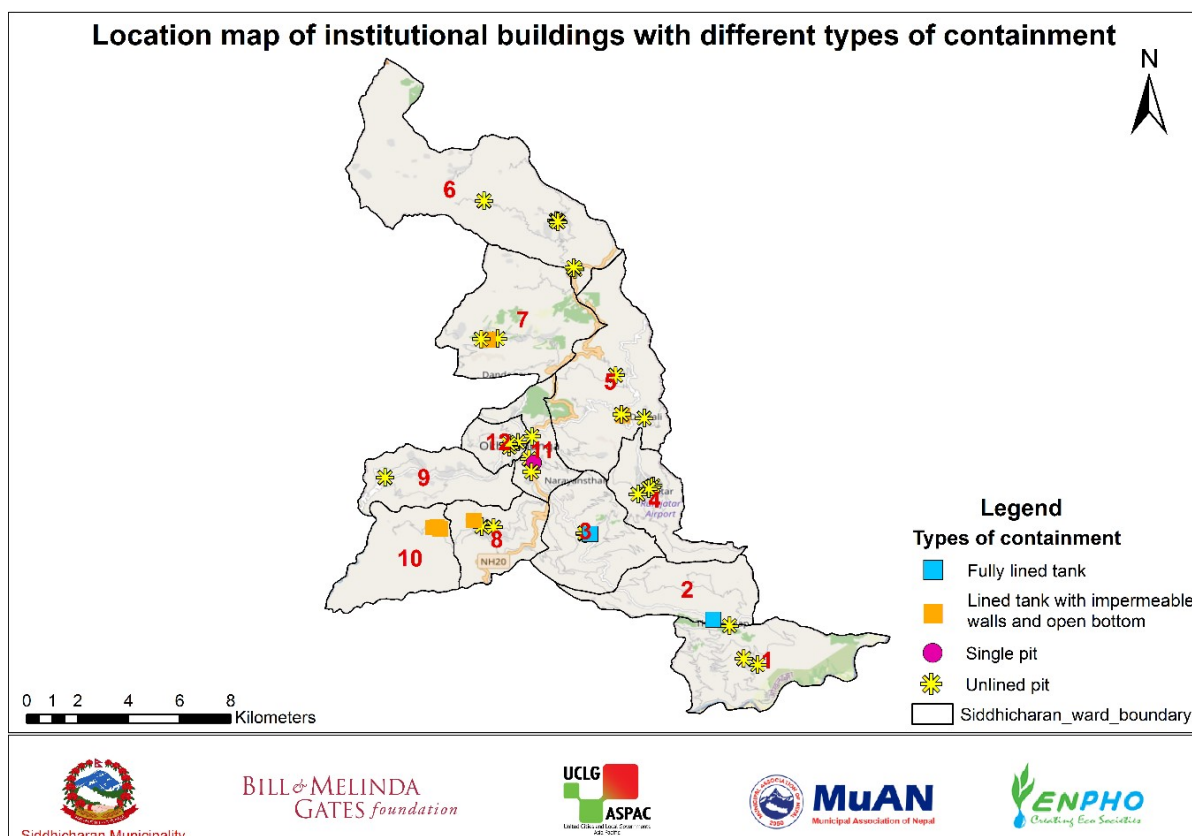
2.1.2 Sanitation Systems in Institutional Buildings

Altogether 40 institutional buildings were surveyed. The sanitation data of institutional buildings were obtained from different types of institutions. Table 3 shows the types and number of surveyed institutions.

Table 3: Type and number of surveyed institutions

Type of Institution	Number of Surveyed Institutions
Educational Institution	9
Government /Non-government Office	17
Health Care Centre	9
Hotel/Home stay	5
Grand Total	40

In the municipality 98% of the institutional buildings have toilets while 2% lack them. About 95% of institutional buildings have onsite sanitation systems and 3% have offsite sanitation systems. Different containment types are found in the institutional buildings. About 5% of the buildings have fully lined tanks, 15% have lined tanks with impermeable walls and open bottom, 3% have lined pits with semi-permeable walls and open bottom (single pit) and 72% have unlined pits. The data shows that only 5% of the institutional buildings have safer FS collecting containments whereas 90% of the institutional buildings have open bottom containments that possesses risk to groundwater contamination. Figure 8 shows the location map of institutional buildings with different types of containments in Siddhicharan Municipality.


Figure 8: Location map of institutional buildings with different types of containment in Siddhicharan Municipality.

2.1.3 Public Toilets

There are six public toilets in Siddhicharan Municipality. Among which one public toilet located near Army Camp is non-functional while most of the others are in poor condition. The information about public toilets obtained during KII and observation are presented below.

Public toilet near *Hatiya Bazaar*

The toilet located near *Hatiya Bazaar* was constructed by the Siddhicharan Municipality. It has a separate male and female compartments. It can serve 11 users at a time with 2 pans and 4 urinals in male compartment and 2 pans and 3 urinals in female compartment. The local shopkeepers and general public are the major users of this toilet. The users are charged NPR 5 (USD 0.04) for urination and NPR 10 (USD 0.08) for defecation.

The outlet of the toilet is connected to a rectangular containment. The toilet has poor sanitary condition. A 1000 litres overhead tank is placed for the supply of water on the taps of each compartment. The toilet compartments have a ventilation. Handwashing basin is not available.

Public toilet at *Siddhicharan Park*

The toilet located at *Siddhicharan Park* was constructed by the Municipality. It does not have a separate male and female compartments. It serves only 1 user at a time with available 1 pan. The visitors to the park are the only users of this toilet. It has a handwashing basin and an overhead tank. Moreover, the toilet is at poor condition and seem difficult to use it.

Public toilet at *Rumjatar Haat Bazaar*

The toilet located at *Rumjatar Haat Bazaar* was constructed by local shopkeepers and a nearby school. It does not have separate male and female compartments. It serves 2 users at a time with available 2 pans. The local shopkeepers and city dwellers are the major service recipients of this toilet. About 100-150 users use the toilet per day. Water required for the toilet is supplied from a 1000 litres overhead tank to. The toilet compartments do not have ventilation and the block lacks handwashing basin (KII-4, 2024).

Public toilet at *Rumjatar*

The toilet located at *Rumjatar* does not have a separate male and female compartments. It serves 2 users at a time with available 2 pans. The general public are the major users of this toilet. The outlet of the toilet is connected to a rectangular containment. A 500 litres overhead tank is connected to taps on toilet compartments for water supply. The toilet compartments are ventilated but lack handwashing basin.

Public toilet at *Milanchowk*

The toilet located at *Milanchowk* was constructed jointly by the Siddhicharan Municipality and the public of the locality on 19 September 2011 A.D. It has a separate male and female compartments. It serves 2 users at a time with available 2 pans. However, only 1 compartment is open for public while 1 compartment is used by the local police. The public vehicle passengers and public are the major users of this toilet. About 50-100 users use the toilet per day. The toilet is cleaned regularly. Water required for the toilet is supplied from two 1000 litres overhead tank (KII-4, 2024). The police team in the locality is responsible for overall management of the toilet.





Figure 9: Public toilets and its status Siddhicharan Municipality.

2.1.4 Emptying and Transport

Emptying is one of the key elements of sanitation service chain. It basically assures the proper operation of containment. Regular emptying of the containment prevents sludge overflow and blockages (Strande, et al., 2014) . Moreover, emptying of containment is determined by the number of users, duration of years and types and size of containment.

Among the households with onsite sanitation systems, only 2% of the households have emptied their containment whereas 98% have not emptied yet. Moreover, none of the institutional buildings have emptied their containments yet. Here, the emptying ratio of the containment is very less. Also, the emptying frequency of lined tanks with open bottom and unlined pits are less than fully lined tanks. This is the result from the choice of containment types. The majority of households have open bottom containment, the containment types with open bottom allows effluents to infiltrate (Peal, et al., 2020), preventing them from filling up quickly. Thus, this has resulted in insignificant proportion of containment emptying and the difference in emptying frequency of containment types. Figure 10 shows emptying status of different types of containment at households.

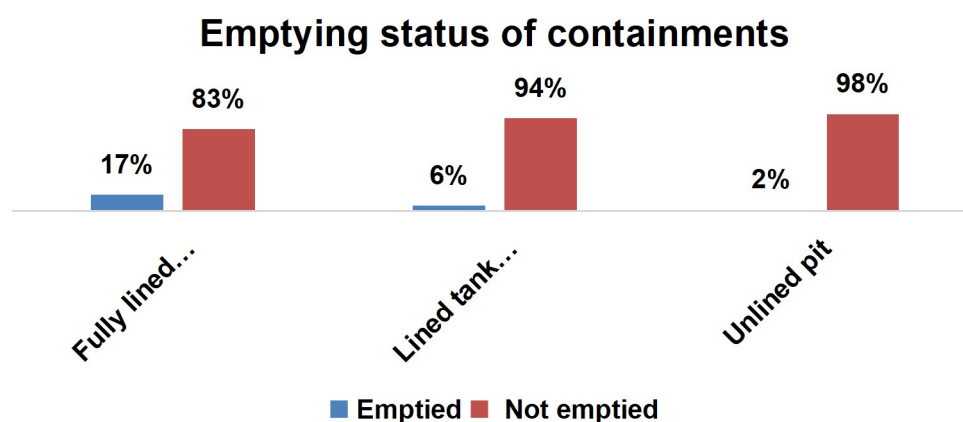


Figure 10: Status of emptying of different types of containment.

The municipality does not have regular containment emptying practice as most containments are with open bottom and does not get filled in standard time as per the containment size.

Thus, on-demand emptying practice is found in the municipality (KII-1, 2024). Here, both manual and mechanical emptying is practiced; manual emptying is more prevalent. Among the households that have emptied their containments, 57% were emptied manually while 43% were emptied using mechanical equipment (ENPHO, 2024). The unavailability of desludging services within the municipality and unavailability of motorable road networks are the reasons for fewer mechanical emptying practice in the municipality.

The municipality does not provide and manage desludging services. Also, there is no provision for registration of the service. However, private desludging service providers from Katari Municipality of Udayapur district provide the service in the municipality (KII-1, 2024).

2.1.5 Treatment and Disposal/Reuse

Siddhicharan Municipality does not have a Faecal Sludge Treatment Plant (FSTP). Also, the municipality does not have any further plan to construct any kind of treatment plant. Here, the mechanically emptied FS are being applied to farmlands as per demand (KII-1, 2024) while manually emptied FS is dumped in pits dug for the purpose (ENPHO, 2024). Thus, in the municipality, all the emptied FS is disposed of unsafely and untreated in an open environment

2.1.6 Risk Assessment of Water Source Pollution

The risk of water source pollution was assessed based on source of drinking water, secondary data on water quality and the vulnerability of water source in regard to lateral spacing between sanitation system and the sources.

a. Sources of drinking water and water production

Approximately 52% of households in the Siddhicharan Municipality have piped drinking water supply services while 1% of households get drinking water from community taps and 47% of households rely on spring sources. About 16 Water and Sanitation Users' Committee (WSUCs) are providing drinking water supply service at households and institutions in the municipality (ENPHO, 2024). Figure 11 shows groundwater and community tap in the municipality.



Figure 11: Picture showing groundwater and community tap in Siddhicharan Municipality.

Okhaldhunga Water and Sanitation Users' Committee is one of the major water service providers in the municipality. It was established in 2001 and was upgraded on 3 July 2005. It provides water in wards 11 and 12 of the municipality. It serves drinking water services to 970 households, 75 government organizations and 6 public taps. The scheme supplies water from Bhujapate, Tarebhir, Hyakule and Pakhale spring sources. The collected water is supplied to a treatment plant consisting of sedimentation, slow sand filter and chlorine dosing. Further, the treated water is stored in 4 reservoir tanks of capacities 250 m³, 100 m³, 20 m³ and 20 m³. Later water is distributed through pipeline at private taps in households, institutions and public taps. The WSUC tests water quality of the scheme regularly. The sample water from source, reservoir tank and final outlet is taken for the testing (KII-3, 2024).

Similarly, Rumjatar Water and Sanitation Users' Committee is another water service provider in the municipality. It was established in 1994. It provides water in ward 4. It supplies drinking water to 745 households and 13 institutes. The scheme collects water from Sisne Khola and is collected in reservoir tanks and distributed on taps at households (KII-3, 2024).

Apart from this water service provider, Asine, Jambote, Charkhu, Jyamire and Thotne are some WSUC among others in the municipality (ENPHO, 2024). The water supply service is not uniformly distributed in the municipality thus, locals are obliged to rely on spring sources for drinking water supply.

b. The vulnerability of spring source and water pollution

The households using drinking water directly from springs have their source located in less than 5 meters to more than 25 meters horizontally from their containment. Almost 50% of households have their source located in less than 25 meters (ENPHO, 2024). A study suggests that *E. coli* can travel up to hundreds of meters horizontally in fractured rocks and gravels (Krishnan, 2011). As the geology of Siddhicharan Municipality consists of rocky landscape, such as quartzite, granite and limestone as well as alluvial sediments i.e. sand, silt and clay along-with coarse gravels (Upreti, 1999), *E. coli* contamination of groundwater and spring sources is very likely. Moreover, many study suggests that humic matter such as microorganisms in water can be removed naturally, in a period of time and in continuous flow of water (Balke & Zhu, 2008) (Odling, et al., 2020). Thus, it can be said that population consuming water from spring source are at risk of *E. coli* consumption and have adverse health effects.

Thus, it was estimated that 5% of the population uses lined tanks with impermeable walls and an open bottom, comprising T1A4C10 (4%, low risk of contamination) and T2A4C10 (1%, high risk of contamination). In addition, 90% of the population uses unlined pits, comprising T1A6C10 (84%, low risk of contamination) and T2A6C10 (6%, high risk of contamination).

2.2 SFD Selection Grid

Figure 12 shows the types of sanitation technologies present in the Siddhicharan Municipality selected in the Shit Flow Diagram (SFD) selection grid. The vertical column on the left side of grid represents sanitation technologies to which toilet is connected to, and horizontal row at top is connection of the technologies. The households with single pit and twin pits are selected as lined pit with semipermeable walls and open bottom in this selection grid.

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			T1A1C3		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	Significant risk of GW pollution	Significant risk of GW pollution	Significant risk of GW pollution	Significant risk of GW pollution					T2A4C10
	Low risk of GW pollution	Low risk of GW pollution	Low risk of GW pollution	Low risk of GW pollution	Low risk of GW pollution					T1A4C10
Lined pit with semi-permeable walls and open bottom	Not Applicable									Significant risk of GW pollution
Unlined pit										Low risk of GW pollution
Pit (all types), never emptied but abandoned when full and covered with soil										T2A6C10
Pit (all types), never emptied, abandoned when full but NOT adequately covered with soil										T1A6C10
Pit (all types), never emptied, abandoned when full but NOT adequately covered with soil										Significant risk of GW pollution
Toilet failed, damaged, collapsed or flooded										Low risk of GW pollution
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 for Siddhicharan Municipality.

The detail description of selected terms in the selection grid is provided in Table 4:

Table 4: Explanation of terms used to indicate different frame selected in the SFD selection grid in Figure 12.

T1A1C3	A fully functioning toilet discharging directly to a correctly designed, properly constructed, fully functioning decentralised combined sewer. The excreta is raw, untreated and hazardous, but since it is captured in the sewer, all the excreta in this system will contribute to variable W3.
T1A3C10	A correctly designed, properly constructed and well maintained fully lined tank with impermeable walls and base. It includes poorly designed and/or constructed and/or maintained septic tanks that, because of these faults or deficiencies, are NOT performing as septic tanks, instead they are acting as sealed vaults. However, since the tank is NOT fitted with a supernatant/effluent overflow this system is considered contained.
T1A4C10	A correctly designed, properly constructed and well maintained lined tank with sealed, impermeable walls and an open, permeable base, through which infiltration can occur. It includes all lined but open bottomed tanks and containers which are sometimes mistakenly referred to as septic tanks (e.g. cubluks in Indonesia). However, since the tank is NOT fitted with a supernatant/effluent overflow this system is considered contained.
T1A6C10	A correctly designed, properly constructed and well maintained unlined pit with permeable walls and base, through which infiltration can occur. The tank is NOT fitted with a supernatant/effluent overflow so this system is considered contained.
T1B11C7 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.
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. It includes all lined but open bottomed tanks and containers which are sometimes mistakenly referred to as septic tanks (e.g. cubluks in Indonesia). 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.

T2A6C10	A correctly designed, properly constructed and well maintained unlined pit with permeable walls and 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.
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2.3 SFD Matrix

2.3.1 Proportion of Faecal Sludge from types of sanitation technologies

The second step in the process of developing the SFD graphic is the calculation of the proportion of contents of each type of onsite container which is faecal sludge. SFD matrix calculates the proportion of people using each type of system and the proportion of each system, from which FS and supernatant is emptied, transported and treated. A detailed instruction on how to calculate SFD proportion in SFD PI was used as guide to calculate SFD proportion. As stated on SFD PI, the default "100%" value is used for onsite containers which are connected to soak pits, 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. The value for onsite containers that are connected to a sewer network or to open drains is used as "50%" which means half of the contents are modelled FS and 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 obtained from SFD PI used for FS proportion calculation is shown below:

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

The calculated FS proportion in each type of sanitation technologies are:

- The proportion of FS in septic tank is 0%, as there is no septic tank in the municipality.
- The proportion of FS in fully lined tank is 100%, as all the fully lined tanks have no outlet or overflow.
- The proportion of FS from lined tanks with open bottom and all types of pits is 100%, as all the lined tanks with impermeable walls and open bottom and any pits have no outlet or overflow.

Upon calculation of proportion of FS in each type of sanitation technologies, the population using the system selected in the SFD selection grid are fed in. The column Population (Pop) gives the proportion of population using type of sanitation system.

Figure 13 shows the SFD matrix of Siddhicharan Municipality.

Siddhicharan Municipality, Koshi, Nepal, 8 Aug 2024. SFD Level: 2 - Intermediate SFD

Population: 27351

Proportion of tanks: septic tanks: 0%, fully lined tanks: 100%, lined, open bottom tanks: 100%

Containment						
System type	Population	WW transport	WW treatment	FS emptying	FS transport	FS treatment
	Pop	W4b	W5b	F3	F4	F5
System label and description	Proportion of population using this type of system (p)	Proportion of wastewater in sewer system, which is delivered to decentralised treatment plants	Proportion of wastewater delivered to decentralised treatment plants, which is treated	Proportion of this type of system from which faecal sludge is emptied	Proportion of faecal sludge emptied, which is delivered to treatment plants	Proportion of faecal sludge delivered to treatment plants, which is treated
T1A1C3 Toilet discharges directly to a decentralised combined sewer	2.0	0.0	0.0			
T1A3C10 Fully lined tank (sealed), no outlet or overflow	2.0			14.0	0.0	0.0
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	4.0			6.0	0.0	0.0
T1A6C10 Unlined pit, no outlet or overflow	84.0			2.0	0.0	0.0
T1B11 C7 TO C9 Open defecation	1.0					
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	6.0			0.0	0.0	0.0

Figure 13: SFD Matrix of Siddhicharan Municipality.

2.3.2 Proportion of Faecal Sludge Emptied (F3)

The proportion of faecal sludge emptied (F3) is calculated based on percentage of containment emptied (ENPHO, 2024) and amount of FS emptied during the process (KII-2, 2024). The information on FS emptied from containment is obtained from the survey. In an average 20% of the FS in the containment which is very thick and does not dissolve in water, is not removed during emptying. Hence, actual proportion of FS emptied from each containment is calculated as:

$$\begin{aligned}
 &\text{Actual Proportion of FS emptied (F3)} \\
 &= \text{percentage of containment emptied} \\
 &\times \text{proportion of FS removed during emptying}
 \end{aligned}$$

Table 5 shows the actual proportion of FS emptied from each containment.

Table 5: Sanitation technologies and proportion of emptied faecal sludge (ENPHO¹, 2024).

Sanitation Technologies	SFD Reference Variable	Percentage of Population using	Emptied Proportion of FS ¹	FS Emptied from Containment ¹	Actual Proportion of Emptied FS (F3) ¹
Toilet discharges directly to a decentralised combined sewer	T1A1C3	2%	0%	0%	0%
Fully lined tank (sealed), no outlet or overflow	T1A3C10	2%	17%	80%	14%
Lined tank with impermeable walls and open bottom, no outlet or overflow	T1A4C10	4%	7%	80%	6%
Unlined pit, no outlet or overflow	T1A6C10	84%	2%	80%	2%
Open defecation	T1B11 C7 TO C9	1%	0%	0%	0%
Lined tank with impermeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	T2A4C10	1%	0%	80%	0%
Unlined pit, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	T2A6C10	6%	0%	80%	0%

2.3.3 Proportion of WW transported which is delivered to Treatment Plant (W4b and W5b)

The variable W4b is the proportion of wastewater in decentralised sewer network that is delivered to treatment plant and variable W5b is the proportion of wastewater delivered to treatment plant and treated. The amount of wastewater (WW) generated could not be measured and the municipality does not have wastewater treatment plant (WWTP). Therefore, the wastewater is not treated and the value for variables W4b and W5b is set to 0%.

2.3.4 Proportion of FS emptied which is delivered to Treatment Plant (F4 and F5)

The variable F4 is the proportion of FS that is delivered to treatment plant and F5 is the proportion of FS that is treated. The municipality does not have a Faecal Sludge Treatment Plant (FSTP). Also, there are no biogas digester or twin pits, which treats FS at households. Hence, the portion of FS delivered to treatment plant (F4) and treated (F5) is 0%.

2.4 SFD Graphic

Figure 14 shows the SFD graphic of Siddhicharan Municipality. The graphic shows that excreta generated from the proportion of the population that are safely managed is shown in green coloured arrowhead whereas unsafely managed excreta are shown in red coloured arrowhead. It shows that excreta from 88% of the population are safely managed and

excreta from 12% of the population are unsafely managed. It also represents the sanitation value chain going from left to right.

Offsite Sanitation

Siddhicharan Municipality does not have proper sewerage network but ward 11 and 12 has a sewer line connection with the outlet directly to the Chandani River. Thus, 2% of households have offsite sanitation systems. The wastewater generated from these households is disposed to water bodies. Therefore, wastewater from 2% of the population is not treated and is unsafely managed.

Onsite Sanitation

In the municipality, 97% of households rely on onsite sanitation systems. Of the total households having an onsite sanitation system, FS from 90% of the population is contained, while FS from 7% of population is not contained.

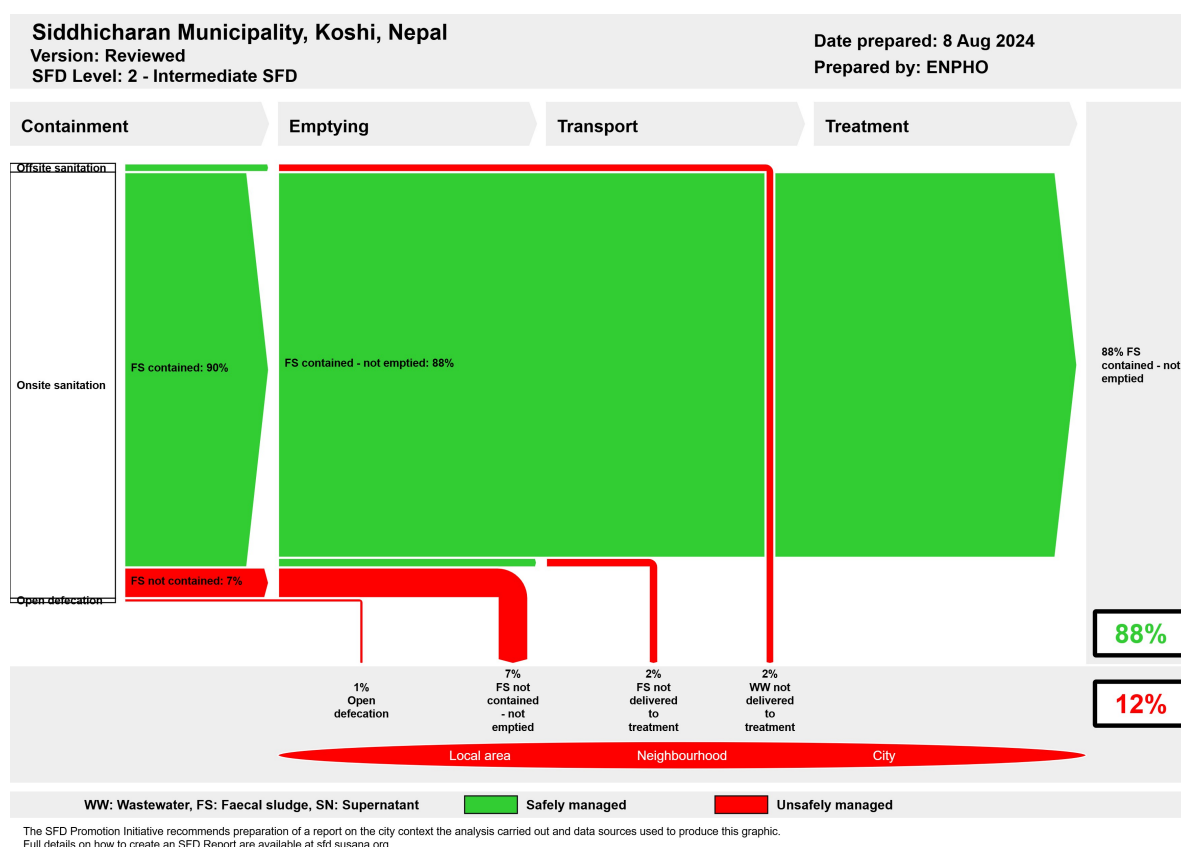


Figure 14: SFD Graphic of Siddhicharan Municipality.

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 of FS contained i.e. 90% is obtained from the summation of population using fully lined tanks with no outlet or overflow (T1A3C10), lined tanks with impermeable walls and

open bottom with no outlet or overflow (T1A4C10), and unlined pit with no outlet or overflow (T1A6C10) without posing a significant risk to groundwater.

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 of FS not contained i.e. 7% is obtained from the population using lined tanks with impermeable walls and open bottom with no outlet or overflow with 'significant risk' to groundwater (T2A4C10) and unlined pit with no outlet or overflow with 'significant risk' to groundwater (T2A6C10).

FS contained not Emptied

The value of 88% is obtained from the proportion of the population using sanitation systems where the FS is contained and have not emptied their containment. However, safely managed FS generated from 88% of population is temporary as the FS has not been emptied. The proportion of safely managed FS will soon become unsafely managed once the containments start filling up.

FS contained Emptied

The value of 2% is obtained from the proportion of population using sanitation systems where the FS is contained and have emptied their containment.

FS not contained not Emptied

The value of 7% is obtained from the proportion of the population using sanitation systems where the FS is not contained and have not emptied their containment.

FS not delivered to treatment

The proportion of FS not delivered to treatment, i.e. 2%, is obtained from the FS contained emptied which have not been delivered to biogas digester and FSTP.

Open Defecation

Despite Open Defecation Free (ODF) status, people residing in 1% of households still go for open defecation. Mostly, people living in poverty and who do not own land, do not have toilets.

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 sanitation as fundamental rights. In Article 35 (4) related to right to health recognizes citizen's rights to access to clean drinking water and sanitation. In addition, the constitution also bestows upon citizens the 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 are discussed here.

Local Government Operation Act, 2017

Local Governance Operation Act 2017 has promulgated to implement the rights of local government and promote co-operation, co-existence, and co-ordination among federal, provincial, and local governments. 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 governments to conduct awareness campaigns, design and implement sanitation programs at the local level.

Environment Protection Act, 2019

Environment protection act 2019 is promulgated 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 promulgated to ensure the fundamental right of citizens to easy access to 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.

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 at the household level. 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 to local governments to incorporate FSM in their urban planning along with strengthening and enhancing the capacity of the local governments to deliver effective services. Local governments have 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 and Sanitation Users Committee (WSUC) in the framework reflects a participatory approach that would help in sustaining the interventions.

Total Sanitation Guideline, 2017

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 municipality and district levels. 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.

Please add a summary of the legislations and regulations, and conclude if they cover all components of the FSM service chain or have gaps that need to be plugged.

3.2 Policies

Historically, the National Sanitation Policy (1994) was the guideline for the planning and implementation of sanitation programs. The policy promoted sanitation issues together with issues of water supply in rural communities. Also, Rural Water Supply and Sanitation National Policy (RWSSNP) 2004, set the 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. However, it was unable to address the complex operational issues of urban water supply and sanitation service delivery. 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. Thus, the National Water Supply and Sanitation Policy (NWSSP) was formulated in 2014 by 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 acknowledged that the discharge of untreated wastewater and dumping of faecal sludge heavily polluted the surface water sources in urban areas.

Nepal is a signatory of the historical resolution of 2010 United Nations General Assembly on the Human Right to Water and Sanitation. 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. After the MDGs, United Nations General Assembly set 17 global goals as Sustainable Development Goals (SDGs). The target 6.2 of SDG 6 majorly focuses on sanitation. It mentioned to achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations by 2030. In line with SDG 6.2, Nepal has targeted to provide improved sanitation to 95% households that are not shared and urban households with toilets connected to sewer system or proper FSM to 90% by 2030 (NPC, 2017). The National Sanitation and Hygiene Master Plan, 2011 was developed for coordinated planning and implementation of National Sanitation Campaign. The campaign strengthened institutional setup in a participatory approach. In alignment, the total sanitation campaign was initiated formally to sustain ODF. The guideline set various indicators to assess the sustainability of sanitation services. Remarkably, it extended the definition of sanitation to include the 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).

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 systems (70%) that require effective treatment of faecal sludge. However, there is lack of concrete policies, guidelines, and indicators for FSM that can guide effective planning, implementation, and service delivery. Nepal was declared ODF nation on September 23, 2019 (MoWS, 2020) however, the target of 90% households with toilets connected to sewer system or proper FSM is yet to be achieved.

3.3 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 Government

National Planning Commission: At the federal government, the National Planning Commission 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.

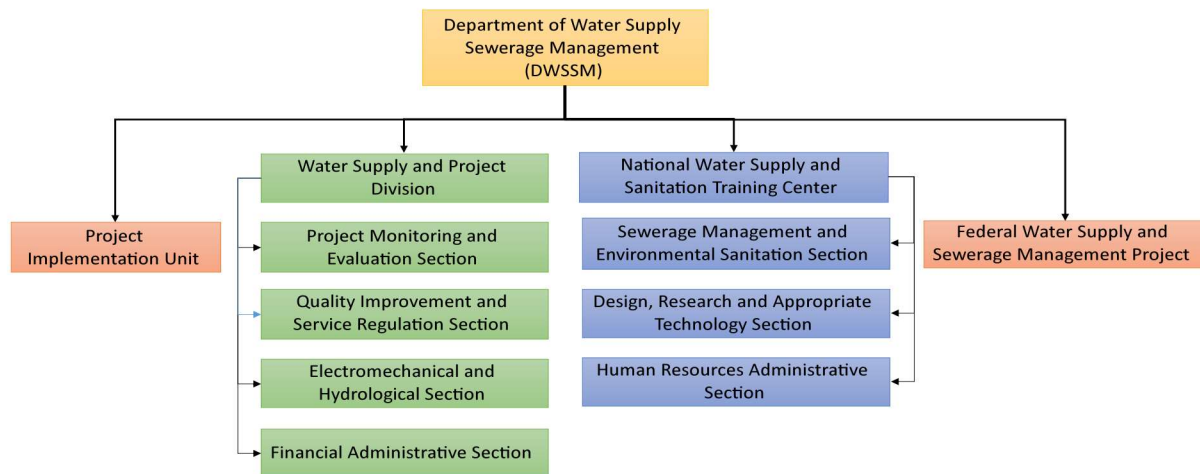


Figure 15: Organizational Structure Department of Water Supply and Sewerage Management (DWSSM).

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

At Provincial Level

Ministry of Water Supply, Irrigation and Energy: Ministry of Water Supply, Irrigation and Energy of provincial government in Koshi Province is major executing body in the province for planning, developing, and implementing water supply and sanitation programs. Planning and implementation of water supply and sanitation infrastructure in Siddhicharan is executed through Water Resource and Irrigation Development Division (WRIDD), Okhaldhunga. WRIDO implements the water and sanitation programs meeting the following criteria:

- i. Inter local government projects.
- ii. Beneficiaries between 5,000 to 15,000 in terai region, 3,000 to 5,000 in hilly region and 5,00 to 1,000 in Himalayan region.

At Local Level

Siddhicharan Municipality does not have specific section responsible for overall management of water supply and sanitation. However, the overall planning and operation related to water supply and sanitation is managed under Administrative section while infrastructures are overseen by Water and Sanitation section.

3.4 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).

The municipality does not have a sewer network. The toilet system is directly connected to open drain, water bodies or open ground. The toilets that are connected to containments are emptied mechanically by desludging suction truck from municipality or private service providers whereas manually emptied by traditional desludgers.

3.5 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

The Key Informant Interviews (KIIs) and objective sharing of the study were conducted with major stakeholders of the sanitation sector in the municipality. The focal person at the municipality was interviewed on current sanitation services with respect to technical, institutional, and financial aspects. Similarly, information related to drinking water supply was obtained from Water Supply Users' Committee. Also, an interview was conducted with caretaker of public toilets along with observations of the public toilets. The list of stakeholders and pictures of KIIs are presented in the Table 7 and Figure 16 respectively.

Table 7: List of Key Informant Interviewed personnel.

S.N.	Name	Designation	Organization/Company	Purpose of KII	Date
1.	Tejan Khanal (KII-1)	Mayor	Siddhicharan Municipality	Sanitation status, ongoing projects on sanitation, policies and plan for sanitation development	26 June, 2024
2.	Nilkantha Biswokarma (KII-1)	Chief Administrative Officer	Siddhicharan Municipality	Sanitation status, ongoing projects on sanitation, policies and plan for sanitation development	26 June, 2024
3.	Kiran Rajbhandari (KII-3)	Office Secretary	Okhaldhunga Water and Sanitation Users' Committee	Water supply services and water quality	26 June, 2024
4.	Padma Kumar Dahal (KII-3)	Manager	Rumjatar Water and Sanitation Users' Committee	Water supply services and water quality	26 June, 2024
5.	Rohit Kumar Adhikari (KII-4)	User	Public toilet – Rumjatar Haat Bazaar	Quantitative and qualitative management on public toilet and public toilet operation	26 June, 2024
6.	Hemanta Kulung (KII-4)	User	Public toilet- Milanchowk	Quantitative and qualitative management on public toilet and public toilet operation	29 June, 2024



Figure 16: KII with Mayor of Siddhicharan Municipality and representatives of Okhaldhunga WSUC.

4.2 Household Survey

A random household survey was conducted in all wards of the municipality. The local enumerators selected from the municipality were oriented prior to the survey and were mobilized for data collection. A mobile application “KOBOLLECT” was used for data collection from the households. In the orientation, enumerators were clarified on survey objectives, technical terms concerning sanitation, use of the mobile application and procedure of random sampling survey based on the provided map (Figure 17).



Figure 17: SFD orientation to local enumerators for data collection.

4.2.1 Determining Sample Size

The number of households to be sampled in the municipality was determined by using Cochran (1963:75) sample size formula $n_o = \frac{z^2pq}{e^2}$ and its finite population correction for the proportion $n = n_o / (1 + (n_o - 1)/N)$.

Where,

Z ²	1.96	At the confidence level of 95%
p	0.5	Assuming that about 50% of the population should have some sanitation characteristics that need to be studied (this was set at 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 sites).
q	1-p	
e	+/-5%	Level of precision or sampling error.
N		A 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 as one stratum. The sample sized required in each ward is calculated as

$n_h = (N_h/N) * n$, where N_h is a total population in each stratum.

A total of 365 households were sampled from 7,126 households distributed in 12 wards with proportionate stratification random sampling. The household samples surveyed in the municipality is shown in Figure 18.

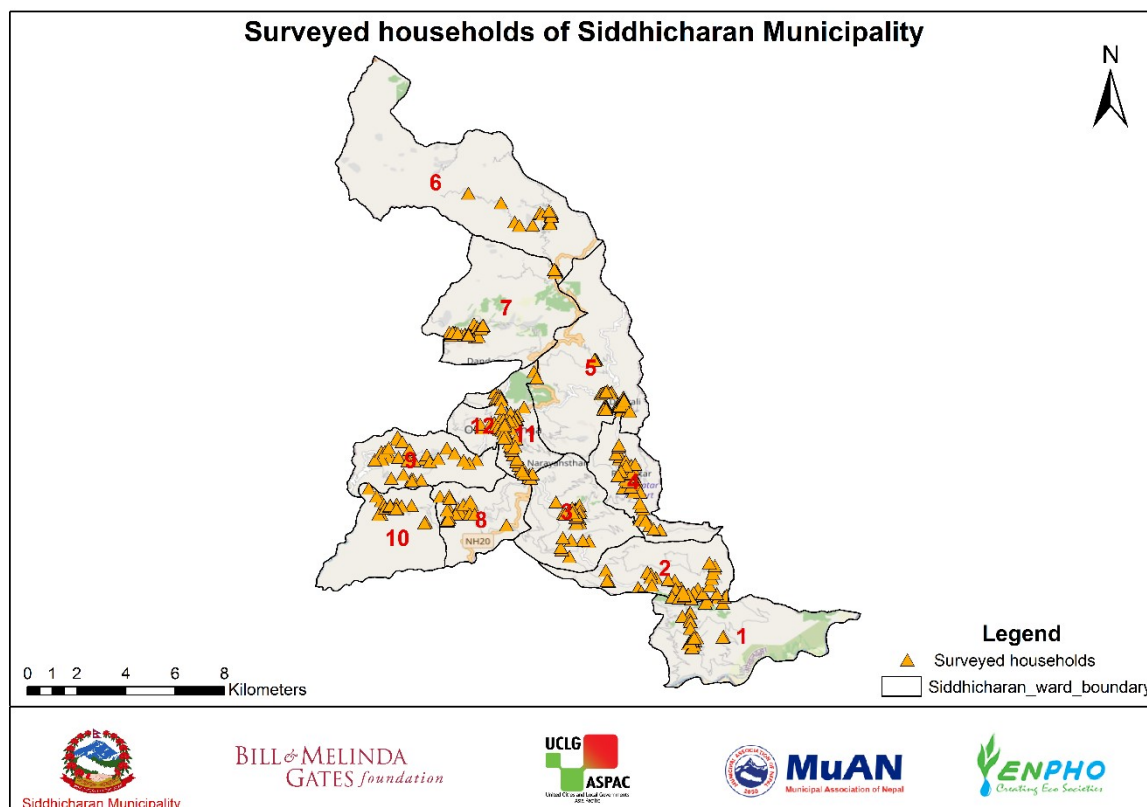


Figure 18: Location map of surveyed households.

4.3 Direct Observations

Various sanitation technologies in the households were observed and visual references were recorded. Also, observations of the public toilets and water supply scheme were carried out. Figure 19 shows enumerators during the household survey of Siddhicharan Municipality.



Figure 19: Enumerators during household survey at Siddhicharan Municipality.

4.4 Sharing and Validation of Data

The Shit Flow Diagram Sharing and Validation Workshop was conducted at Siddhicharan Municipality to share the findings on sanitation situation survey and receive the suggestions from the municipal stakeholders. Altogether, 42 participants including Mayor, Deputy Mayor, CAO, ward chairpersons, municipal council members, sectoral staffs and other relevant stakeholders actively participated on the workshop and provided valuable suggestions. Participants recognized the pressing need on FSM in the municipality and agreed to keep it as an agenda for municipal planning meeting. Figure 20 shows the picture of SFD findings sharing to the participants. The list of participants with their designation is attached in Appendix 4.



Figure 20: Sharing of findings during validation workshop.

5 Acknowledgements

We would like to acknowledge the executing agency, United Cities and Local Governments Asia-Pacific (UCLG ASPAC) and implementing agency Municipal Association of Nepal (MuAN) of the Municipalities Advocacy on Sanitation in South Asia – II (MuNASS-II) for coordination with the municipality.

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7 Appendix Annexes

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: Total number of population and household in each ward and number of surveyed households

Wards	Total Population	Total Household	No. of Surveyed Households
1	1,889	443	23
2	2,766	751	38
3	2,203	615	31
4	2,682	751	38
5	2,918	734	38
6	2,022	462	24
7	2,285	577	30
8	1,571	423	22
9	1,982	564	29
10	1,814	472	24
11	3,341	838	43
12	1,878	496	25
Total	2,7351	7,126	365

7.3 Appendix 3: List of Participants on SFD Survey Orientation


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

Program: SFD Orientation of Siddhicharan Municipality
 Date: 2081-03-13
 Venue: Municipality Hall

S.N	Name	Organization	Designation	Phone no	Signature		Age	Gender	Ethnicity
					Day 1	Day 2			
1.	Pramila Tamang	Ward- 11	Enumerator	9841479349			22	F	3
2.	Sapana Dahal	" 5	"	9745462583			22	F	2
3.	Perndiki Sherpa	" 7	"	976244333			22	F	3
4.	Aslim Majar	Ward 6	Enumerator	9762443188			18	M	3
5.	Tulasi Karki	" 2	"	986303899			21	F	2
6.	Hemanta Rai	" 4	"	9862921548			28	F	3
7.	गुनारि.स.	1	"	974699246			22	F	1
8.	डा.छानु शिवा	5	"	982552260			22	M	3
9.	डा.बहादुर राय	9	"	972272488			27	M	3
10.	Suman Dhamala	10		9841479688			23	M	2
11.	Yubraj Tamang	8		9849840879			31	M	3
12.	Sajan Majar	3		9746992133			22	M	3
13.	Tulasi Karki	2		986303899					
14.	Sapana Dahal	5		97					
	Aslim								

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

7.4 Appendix 4: List of Participants in Sharing and Validation Workshop

आज मिति २०७१/०७/२५ गतेको दिन नेपाल नगरपालिका संघको आयोजनामा वातावरण र जनस्वास्थ्य संस्था (स्वच्छा) को प्रातिष्ठिक 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 सिद्धिचरण नगरपालिकामा सञ्चालन गरिएको Shit-flow Diagram (SFD) सम्बन्धित दस्तावेज र प्रमाणिकरण कार्यशाला कार्यक्रममा निम्न अनुसार मुख्य सहभागीहरूको सहभागिता रहेको छ।

उपस्थिति :

क्र.सं.	नाम	कार्यालय	पद	फोन नं.	हस्ताक्षर
१.	नेशनल स्तर	सिद्धिचरण न.पा.	नगर-प्रमुख	९८५१३१२३५९	
२.	वेदराजु खेत	" "	उप-प्रमुख	९८६२६०५१८८	
३.	निलकाण्ठ विश्वकर्मा	" "	प्रमुख प्रशासकीय अधिकृत	९८५२८२३१११	
४.	एडराज तामाङ	" " १२	वडा अध्यक्ष	९८०८३४३४६४	
५.	उमेश श्रेष्ठ	" " १२	वडा अध्यक्ष	९८५२८५९२२२	
६.	मेखराज श्रेष्ठ	" " ६	वडा अध्यक्ष	९८५०६४४४	
७.	निर्धर कछिमरे	सि.न.पा.९	" "	९८८२८५५५५	
८.	तिल्ली शेर शर्मा	सि.न.पा.५	" "	९८६६४४६४३४	
९.	कुल बहादुर नेपाली	सि.न.पा.१२	व.पा.सदस्य	९८४२९०६६३	
१०.	महाप्रसाद खत्री	सि.न.पा.४	व.पा.सदस्य	९८४२८५५५	
११.	गुणवत्तवत्त	सि.न.पा.५	वडा अध्यक्ष	९८५१९०६२०३	
१२.	रामेश्वर शर्मा	सि.न.पा.५	व.पा.स.	९८५१२५५१३४	
१३.	पवन कुमार लामा	सि.न.पा.३	व.पा.स.	९८५२८२५२००	
१४.	मल बहादुर खत्री	सि.न.पा.७	वडा अध्यक्ष	९८४२८५०६६५	
१५.	सुवेता तामाङ	सि.न.पा.५	व.पा.स.	९८४२८५०६०६	
१६.	अरुण शर्मा	सि.न.पा.५	व.पा.स.	९८४२८५३५५	
१७.	सुदमा आचार्य	सिद्धिचरण न.पा.	प्रमुख प्रशासकीय अधिकृत	९८६२८५५५	
१८.	सुदमा आचार्य	सिद्धिचरण न.पा.	प्रमुख प्रशासकीय अधिकृत	९८४२८५५५	
१९.	रमेश्वर शर्मा	सि.न.पा.५	व.पा.स.	९८४२८५०६५३	
२०.	फणिन्द्र केवाल	सि.न.पा.५	व.पा.स.	९८४२८५०६५३	

क्र.सं.	नाम	कार्यालय	पद	फोन नं.	ईमेल आईडी
२०	दिपेन्द्र पहाडी	सिद्धिचरण न.पा.	सूचना प्रविधि अधिकारी	९८४००३०२३६	dpdendr
२१	निर्जना पौडेल	सि. न. पा.	नेत्रनाथ पाल	९८०६६८९७३०	निर्जनापौडेल
२२	लारा राई	सि. न. पा.	एम.आइ.एस. अपरेटर	९८६२८०५९२४	lara
२३	सुमित्रा बुनाइ	सि. न. पा.	उद्यम विकास सहायक	९८६८५०६९२८	sumitra
२४	हिरा परिवार	" " "	पं.सं. प्रा.	९८४९५०१५६३	hira
२५	सुजता श्रेष्ठ	" " "	CPW-coordinator	९९४२९९९९७९	suja
२६	देव कुमार दाहाल	सि. न. पा.	न.स.स.नि.	९८५२८४०४०२	devkumar
२७	बसन्त कटवाल	सि. न. पा.	संयोजक	९८५२८४०४०२	basant
२८	सुमित्रा राई	सि. न. पा.	का.स.	९८६११५९७३५	sumitra
२९	लामे राई	सि. न. पा.	नगर प्रमुख	९८६२५०६९६६	lame
३०	सरोज थापा	सि. न. पा.	आधिकारिक सचिव	९८४२९९९९७९	saroj
३१	नेत्रनाथ पाल	सि. न. पा.	सहायक सचिव	९८४२९९९९७९	netra
३२	पद्म राई	" "	का.स.	९८५२९९९९७९	padda
३३	केसरी बिष्ट	" "	" "	" "	kesari
३४	विनायक राई	" "	" "	९८४२९९९९७९	vinayak
३५	मदन राई	" "	" "	" "	madan
३६	नयन राई	" "	" "	९८४२९९९९७९	nyan
३७	अश्विनी विष्ट	सिद्धिचरण न.पा.	सवारी माली	९८४२९९९९७९	ashwini
३८	लिला दाहाल	" "	गु.स.	९८४२९९९९७९	lila
४०	सुजन भोडा	" "	सवारी माली	९८४२९९९९७९	sujan
४१	विनोद कुटवाल	" "	" "	९८५०६९९९७९	vinod
४२	रुपा कुटवाल	" "	नगर प्रमुख	" "	rupa

SFD Promotion Initiative



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