SFD Report

Janakpurdham Sub-Metropolitan City
Nepal

Final Report

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

Date of production: 24/10/2023

Last update: 05/12/2023

SFD Report Janakpurdham Sub-Metropolitan City, Nepal, 2023

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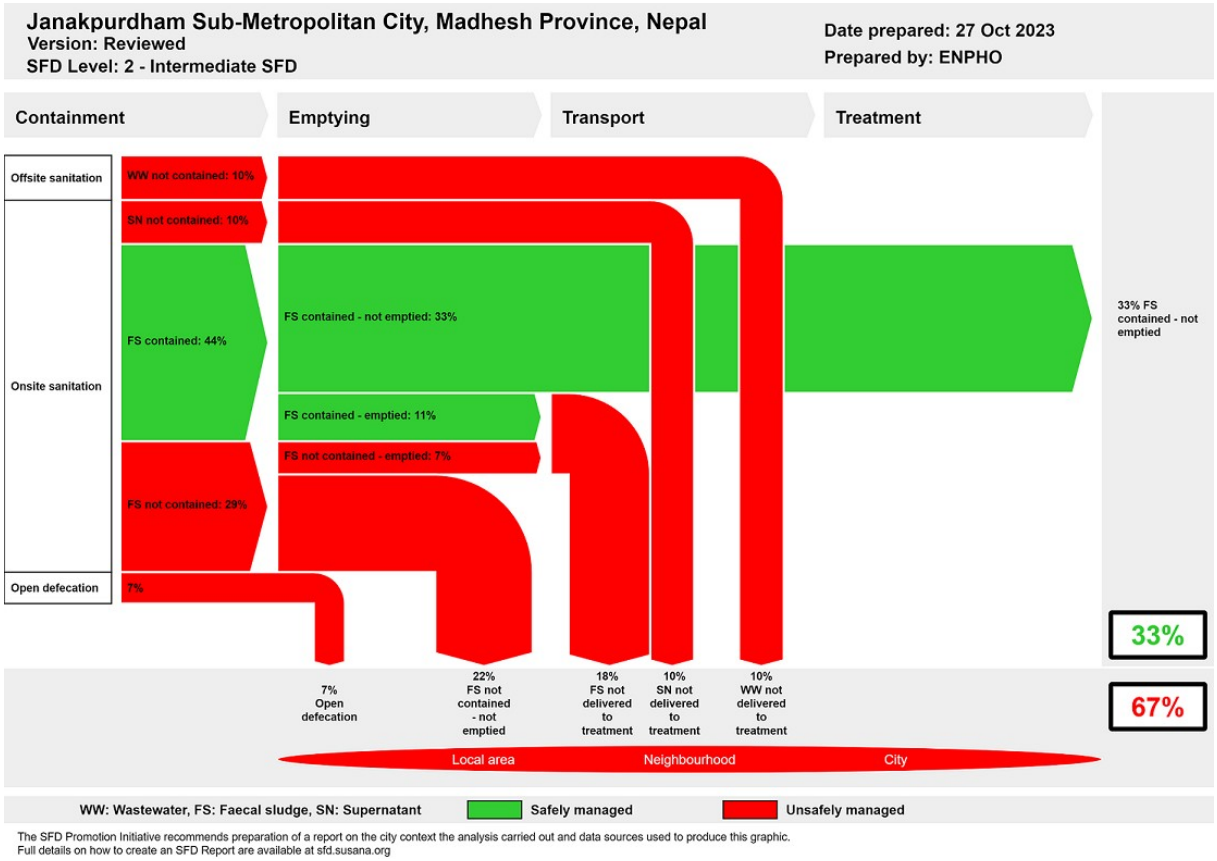
1. The SFD Graphic



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

2. Diagram information

SFD Level:

This SFD is level 2– Intermediate report.

Produced by:

Environment and Public Health Organization (ENPHO).

Collaborating partners:

Janakpurdham Sub-Metropolitan City, Municipal Association of Nepal (MuAN), United Cities and Local Government- Asia Pacific (UCLG- ASPAC).

Status:

Final SFD report.

Date of production: 24/10/2023

3. General city information

Janakpurdham Sub-Metropolitan City is situated in Dhanusa District of Madhesh Province in the southern region of Nepal. It is divided into twenty-five wards and covers an area of 91.97 sq. km.

It was established on 1960 as Janakpur Municipality and was re-named Janakpurdham Sub-Metropolitan City on 2014. It lies at 26°43'43"N latitude, 85°55'30"E longitude and at the altitude from 90 metres above sea level (masl) (Janakpurdham Sub-Metropolitan City, 2023).

A population of 194,556 is residing on 40,409 households in the municipality (National Statistics Office, 2023) . It has an annual population growth rate of 2.2%. The municipality have temperate climate with dry winter and hot summer. It has an average high temperature of 29.7°C and an average low temperature of 16.1°C while it receives 1,367 mm of rainfall per year (Climate-Data, 2021).

4. Service outcomes

The overview of different sanitation technologies across the sanitation value chain in the sub-metropolitan city is briefly explained in this section. All data in this section is from the household and institutional surveys conducted for this survey (ENPHO, 2023) . Dhanusa district was declared Open Defecation Free (ODF) on September 15, 2019. But, 7% of households do not have toilets whereas 93% of households have the coverage of improved sanitation facility. The households without improved sanitation facility opt for open defecation.

Containment:

About 10% of households with improved sanitation facilities rely on offsite sanitation systems and 83% rely on onsite sanitation systems. The municipality does not have a sewer network and thus, the households with offsite sanitation system have their toilets connected to an open/stormwater drain or water body.

Households with onsite sanitation systems have different sanitation technologies. About 16% of households have septic tanks, 37% have fully lined tanks, 15% have lined tanks with impermeable walls and open bottom, 14% have lined pits with semi-permeable walls and open bottom and 1% have unlined pits.

Similarly, all the institutional buildings have toilets. Among which, 40% of institutional buildings have septic tanks, 31% have fully lined tanks, 17% have lined tanks with semi-permeable walls and open bottom, 6% have lined pits with semi-permeable walls and open bottom and 2% have unlined pits.

During the observation, the public toilet in Baarah Bigha was inoperable. Shree Ramananda Youth Club built the toilet at *Ramananda Chowk*, the sub-metropolis built the toilet at *Pidari Chowk*, and Shree Janak Youth Club built the toilets at *Janaki Temple* and *Ganga Sagar*. Except for the one in *Pidari Chowk*, all public toilets have separate male and female compartments. Every day, about 1,100 people use these toilets. The restrooms at *Janaki Temple* and *Ganga Sagar* are used by religious tourists, while the toilets at *Ramananda Chowk* and *Pidari Chowk* are used by locals passing by. The users are charged Rs. 5 (USD 0.03) for urination and Rs. 10 (USD 0.08) for defecation.

Emptying and Transport:

Among the buildings with onsite sanitation system, 33% of households and 30% of institutional buildings have emptied their containment. A manual, mechanical and open emptying is practised in the sub-metropolis but mechanical emptying is more prevalent. In addition, households also practice open emptying that is discharged directly to an open drain. It has commercial desludging services only, among which, one service has desludging vehicles with tank capacities of 5,000 to 7,000 litres. It generally makes 14 trips per week and charges NRs.3,000 (USD 25.6) per trip to empty rectangular containments and charges NRs. 500 (USD 3.7) per ring to empty concrete ring containments.

Treatment and Disposal/Reuse:

Here, mechanically emptied Faecal Sludge (FS) is generally disposed of into farmlands but is also disposed of into the landfill site, open ground and water bodies. Manually emptied FS is composted, dug and dumped, applied to farmlands, disposed of into open drain and water bodies as well. However, all the emptied FS is disposed of unsafely into an open environment since all these practises are not considered as safely managed FS.

Nepal Water Supply Cooperation (NWSC) is providing drinking water service in Janakpurdham Sub-Metropolitan City. It has distributed 4,581 taps in the city and provides 5.6 Million Litres per Day (MLD) of water (NWSC, 2023) . However, 94% of households still rely on handpumps for drinking water supply.

The vulnerability of an aquifer depends on lateral spacing between sanitation systems, the groundwater sources, and the soil composition of the place. Since the city has thicker clay layer as top soil, the types of containments possesses very low risk to groundwater contamination. Only 4% of population using lined pits with semi-permeable walls and open bottom possesses the significant risk to groundwater pollution while no risk was found from the containment types lined tanks with impermeable walls and open bottom.

The SFD graphic shows that excreta generated from 33% of the population are safely managed while 67% of the population are unsafely managed. The safely managed FS generated from 33% of population is temporary as the FS has not been emptied. With the current practice of Faecal Sludge Management (FSM), the proportion of safely managed FS will 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 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, 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 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.

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 and Energy Development
Public Institutions at Local Government	Janakpurdham Sub-Metropolitan City Nepal Water Supply Cooperation
Non-governmental Organizations	Environment and Public Health Organization (ENPHO)
Private Sector	Private FS Emptying and desludging facility providers
Development Partners, Donors	MuAN, BMGF, UCLG ASPAC

7. Process of SFD development

Data on sanitation situation were collected through household and institutional surveys (ENPHO, 2023) . Enumerators of the sub-metropolitan city were mobilized after orientating on sanitation technologies and proper use of mobile application (KOBOCOLLECT) to collect data for survey. The Key Informant Interviews (KIIs) were conducted with WASH focal person of the sub-metropolis, NWSC, private desludger and caretakers of public toilets. Types of sanitation technologies used in various locations have been mapped using ARCGIS. For the Shit Flow Diagram (SFD) graphic production, initially, a relationship between sanitation technology used in questionnaire survey and Shit Flow Diagram Promotive Initiative (SFD PI) methodology was made. 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, 1,041 households and 70 institutions were surveyed from 25 wards of Janakpurdham Sub-Metropolitan City. Primary data on emptying, transportation and current sanitation practices in the sub-metropolis were validated from KII with public toilet management, sanitation and environmental section and water service providers. The overall data and findings were shared with the stakeholders of the sub-metropolitan city and validated through a sharing program.

9. List of data sources

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

- Climate-Data, 2021. Climate-Data. [Online] Available at: https://en.climate-data.org/asia/nepal/central-development-region/janakpur-51372/
- ENPHO, 2023. Sanitation Situation Assessment of Janakpurdham Sub-Metropolitan City. 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.

- NWSC, 2023. 34th Annual Report, Kathmandu: Nepal Water Supply Cooperation.

SFD Janakpurdham Sub-Metropolitan City, Nepal, 2023

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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
EPA	Environment Protection Act
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
masl	metres above sea level
MDG	Millennium Development Goal
mm	Millimetre
MoPIT	Ministry of Physical Infrastructure and Transport
MoWS	Ministry of Water Supply
MuAN	Municipal Association of Nepal
NPC	National Planning Commission
NSHMP	National Sanitation and Hygiene Master Plan
NWSC	Nepal Water Supply Cooperation
NWSSP	National Water Supply and Sanitation Policy
NWR	Non-Revenue Water
NUWSSSP	National Urban Water Supply and Sanitation Sector 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
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization
WSSDO	Water supply and Sanitation Divisional Office
WSUC	Water Supply and User's Committee
WW	Wastewater
WWTP	Wastewater Treatment Plant

1 City context

Janakpurdham Sub-Metropolitan City is situated in Dhanusa District of Madhesh Province in the southern region of Nepal. Formerly, it was established as Janakpur Sub-metropolitan City on 1960. Later on 2014, it was re-named as Janakpurdham and changed the sub-metropolitan city to sub-metropolitan city. It is divided into 25 wards. It shares its boundary with Aurahi Rural Municipality and Hansapur Municipality on the east, Mahottari district on the west, Laxshminiya Rural Municipality and Mithila Bihari Municipality on the north and Dhanauji Rural Municipality and Nagarain Municipality on the south (Janakpurdham Sub-Metropolitan City, 2023) . Figure 1 shows the ward boundary map of Janakpurdham Sub-Metropolitan City.

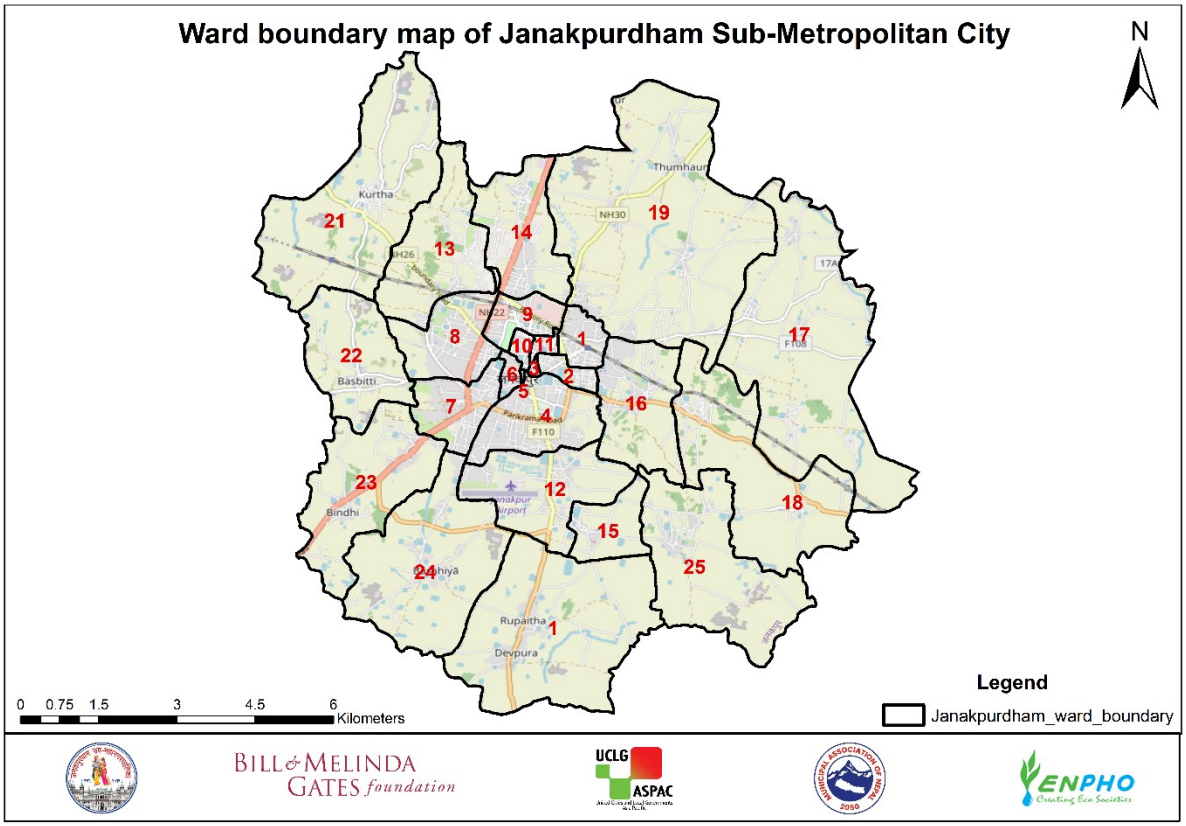

Figure 1: Ward boundary map of Janakpurdham Sub-Metropolitan City.

1.1 Population

As per the national population and housing census conducted in 2021, Janakpurdham Sub-Metropolitan City has a total population of 194,556 with 99,764 male and 94,792 female population. It has altogether 40,409 households (National Statistics Office, 2023). The annual population growth rate of Janakpurdham Sub-Metropolitan City is 2.2% (Janakpurdham Sub-Metropolitan City, 2023).

1.2 Topography and Geography

Janakpurdham Sub-Metropolitan City lies at 26°43'43"N latitude, 85°55'30"E longitude and at the altitude from 90 metres above sea level (masl). It covers a total area of 91.97 sq. km. (Janakpurdham Sub-Metropolitan City, 2023) in the Terai region of Nepal. The soil composition of the sub-metropolitan city consists of alluvial sediments i.e. sand, silt and clay along-with coarse gravels (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 Janakpurdham Sub-Metropolitan City falls on temperate climate based on Köppen–Geiger classification. This climatic condition has hot summers and dry winters (Karki, et al., 2015) . In the sub-metropolitan city, the warmest month of the year is May with an average temperature of 29.7°C and coldest month is January with average temperature of 16.1°C. The annual average temperature of the sub-metropolitan city is 24.7°C. It receives 1,367 mm rainfall annually. The most rainfall occurs in July and the least in November (Climate-Data, 2021). Figure 2 shows the graph of the monthly average for precipitation and temperature of Janakpurdham Sub-Metropolitan City.

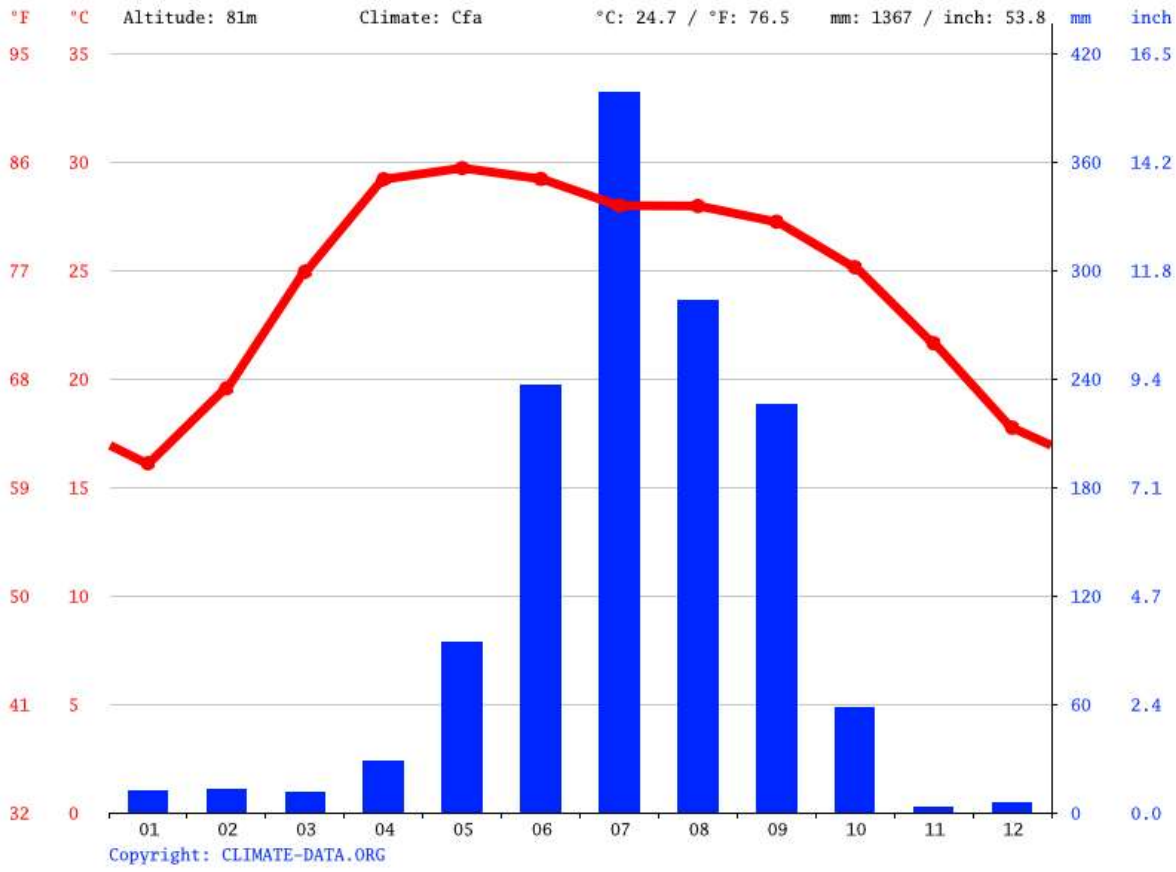

Figure 2: A graph showing the monthly average for precipitation and temperature of Janakpurdham Sub-Metropolitan City.

2 Service Outcomes

2.1 Overview

Data on sanitation situation were collected through household and institutional surveys (ENPHO, 2023). A total of 1,041 households were sampled from 40,409 households distributed in 25 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 toilet while 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).

2.3.1 Sanitation System in Household Buildings

Dhanusa district was declared Open Defecation Free (ODF) on September 16, 2019 (MoWS, 2020). The status of ODF indicates accessibility to basic sanitation on each household (HH). In Janakpurdham Sub-Metropolitan City, still 7% of the households do not have toilets and practice open defecation. Members of households practising open defecation go to an open ground and nearby water bodies. Figure 3 shows pictures of open defecation in an open ground and near water body.

Figure 3: Open defecation in an open ground and near water body.

The remaining 93% of the households have an improved sanitation facility 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 sub-metropolitan city, 10% of the households have offsite sanitation systems whereas 83% have onsite sanitation systems. Figure 4 presents the location map of households with status of access to improved sanitation.

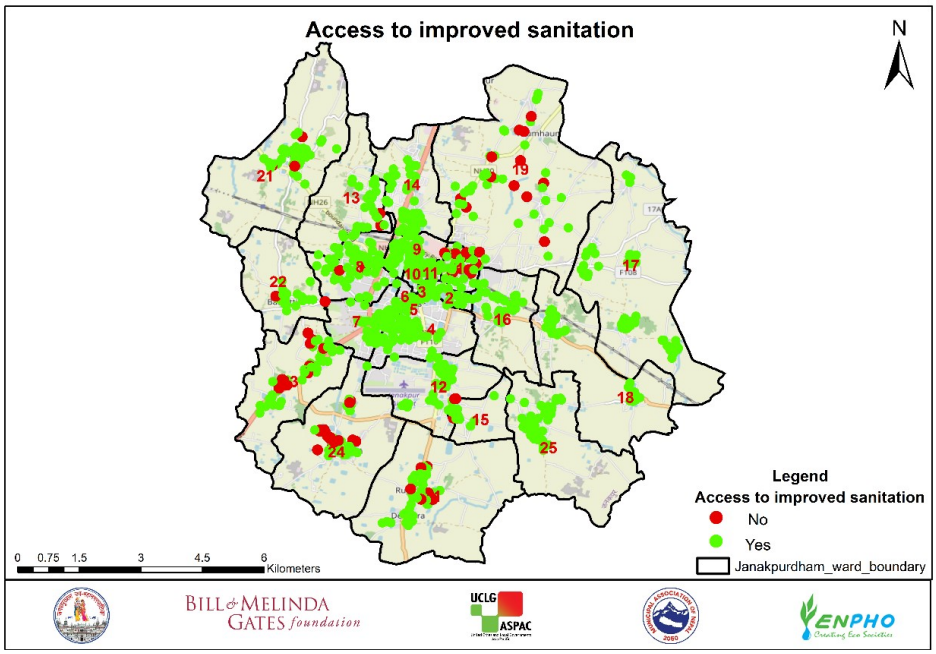

Figure 4: Location map of households with status of access to improved sanitation.

Types of Offsite Sanitation Systems

Janakpurdham Sub-Metropolitan City does not have a sewerage network, still 10% of the households have offsite sanitation systems. Here, households that have their toilet connected to an open drain/stormwater drain or water bodies is considered as offsite sanitation system. It is taken as a toilet with no onsite container for the SFD graphic. The drain is constructed for the transport of stormwater from roads and the buildings to minimize flooding in the city (ADB, 2021) . The outlet of the drain is in nearby river (KII-1, 2023) . Therefore, Faecal Sludge (FS) and wastewater transported through open drain is disposed of directly to an open environment or water bodies. Figure 5 shows the flow of blackwater in an open drain.

Figure 5: Flow of blackwater in an open drain.

Types of Onsite Sanitation Systems

In the sub-metropolitan city, 83% of the households have onsite sanitation systems. Table 1 shows the types of onsite sanitation technologies and percentage of households using it at Janakpurdham Sub-Metropolitan City.

Table 1: Types of onsite sanitation technologies at households of Janakpurdham Sub-Metropolitan City.

Containment	Wall construction materials	Bottom of containment	Chamber	Number	Connected to	%
Septic Tank	Concrete walls Or Cemented brick/ stone walls	PCC or plastered	Two or more than two	NA	Soak pit Sewer Open drain/ open ground	16%
Fully Lined Tank	Concrete walls Or Cemented brick/ stone walls	PCC or plastered	One or Two	NA	Soak pit Sewer Open drain/ open ground No outlet/ overflow	37%
Lined tank with impermeable walls and open bottom	Concrete walls Or Cemented brick/ stone walls	soiling Nothing	one two More than two	NA	Soak pit Sewer Open drain/ open ground No outlet/ overflow	15%
Single pit	Concrete rings piled one after other	soiling Nothing	NA	One	NA	12%
Twin pit	Concrete rings piled one after other	soiling Nothing	NA	Two	NA	2%
Unlined pit	Mud mortar brick wall/Mud mortar cement wall/ No lining/Dry stone wall	Nothing	NA	NA	NA	1%

Septic tank is a watertight rectangular chamber with two or more than two compartments for better storage and stabilization of faecal sludge (FS). The technology is properly sealed, and the effluent is discharged into soak pit (SuSanA, 2018) . 16% of households in the sub-metropolitan city have septic tanks.

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). 37% 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) . 15% of households have these types of containments in the sub-metropolitan city.

Single Pit is a circular onsite technology made from concrete rings. There is no lining between rings, and it allows infiltration of effluents from walls and as well as bottom of the pit. No outlet or overflow for effluent is observed in this type of containment (SuSanA, 2018) .

12% of households have single pits in the sub-metropolitan city. Figure 6 shows pictures of a single pit found in the sub-metropolitan city.

Figure 6: Single pits found in Janakpurdham Sub-Metropolitan City.

Twin Pit is also a circular onsite sanitation technology with two sets of concrete rings. It has semi-permeable walls and a permeable base (SuSanA, 2018). Each pit is used alternatively after filled. This technology is ideally designed to safely store and treat FS. It effectively treats FS if there is no exfiltration of water (Saxena & Den, 2022). The facility consists of two sets of pits with the minimum horizontal distance of 1.2m. Both the pits are connected from diversion box. However, most twin pits installed by the households are not as per the design. 2% of households have twin pits. Figure 7 shows the inappropriate design of twin pits in the sub-metropolitan city.

Figure 7: Inappropriate design of twin pits, the distance between two pits is less than 1.2m.

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). 1% of households have unlined pits.

Table 2 shows the types of sanitation technologies recategorized according to the Shit Flow Diagram Promotion Initiative (SFD PI).

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

Sanitation System	Percentage
No toilet/Open defecation (T1B11 C7 TO C9)	7%
No onsite container (T1A1C6 and T1A1C7)	10%
Onsite Sanitation System	
Septic tank (T1A6C10)	16%
Fully lined tank (T1A6C10)	37%
Lined tank with impermeable walls and open bottom (T1A6C10)	15%
Lined pit with semi-permeable walls and open bottom (T1A6C10)	14%
Unlined pit (T1A6C10)	1%
Grand Total	**100%**

Here, single pits and twin pits are recategorized as lined pits with semi-permeable walls and open bottom. Thus, 14% of the households have lined pits with semi-permeable walls and open bottom.

Figure 8 shows location map of households with different types of containment at Janakpurdham Sub-Metropolitan City.

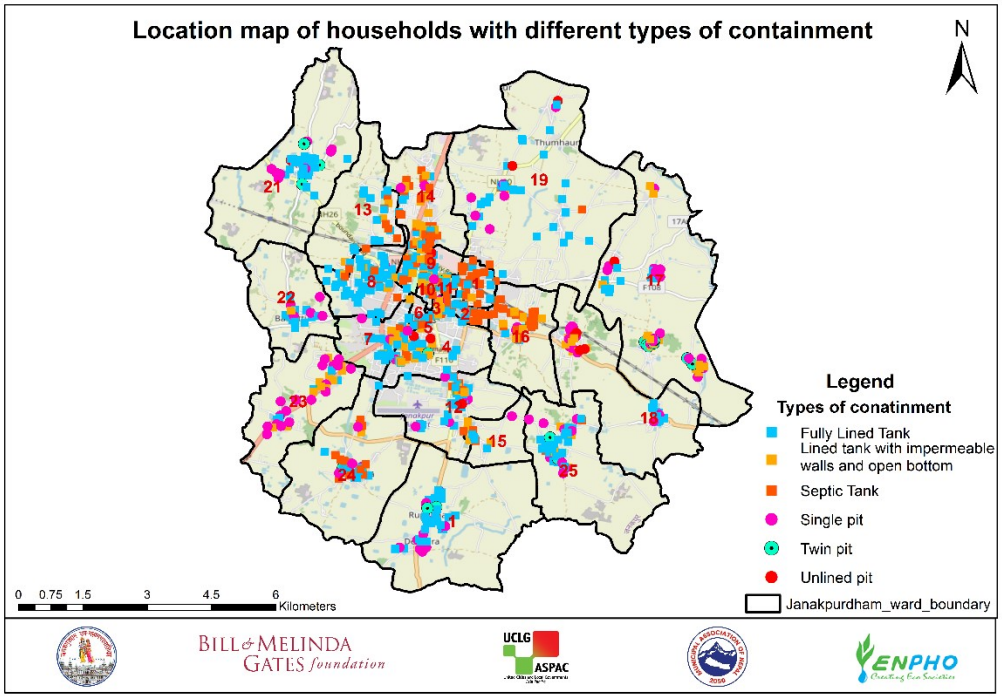

Figure 8: Location map of household with different types of containment.

2.3.2 Sanitation Systems in Institutional Buildings

Altogether 70 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
Commercial buildings	3
Educational Institution	28
Government /Non-government Office	24
Health care centre	13
Hotel/Home stay	2
Grand Total	**70**

All the institutional buildings in the sub-metropolitan city have toilets. Almost 96% of the buildings have onsite sanitation systems whereas 4% of the buildings have offsite sanitation systems. About 40% of the buildings have septic tanks, 31% have fully lined tanks, 17% have lined tanks with impermeable walls and open bottom, 6% have lined pits with semi-permeable walls and open bottom and 2% have unlined pits. The data show that most institutional buildings i.e. 71% of the institutional buildings safe FS collecting containments, among which, 40% have properly built septic tanks. However, still 25% of the institutional buildings have improperly built containments that possess risk to groundwater contamination. Figure 9 shows the location map of institutional buildings with different types of containments in Janakpurdham Sub-Metropolitan City.

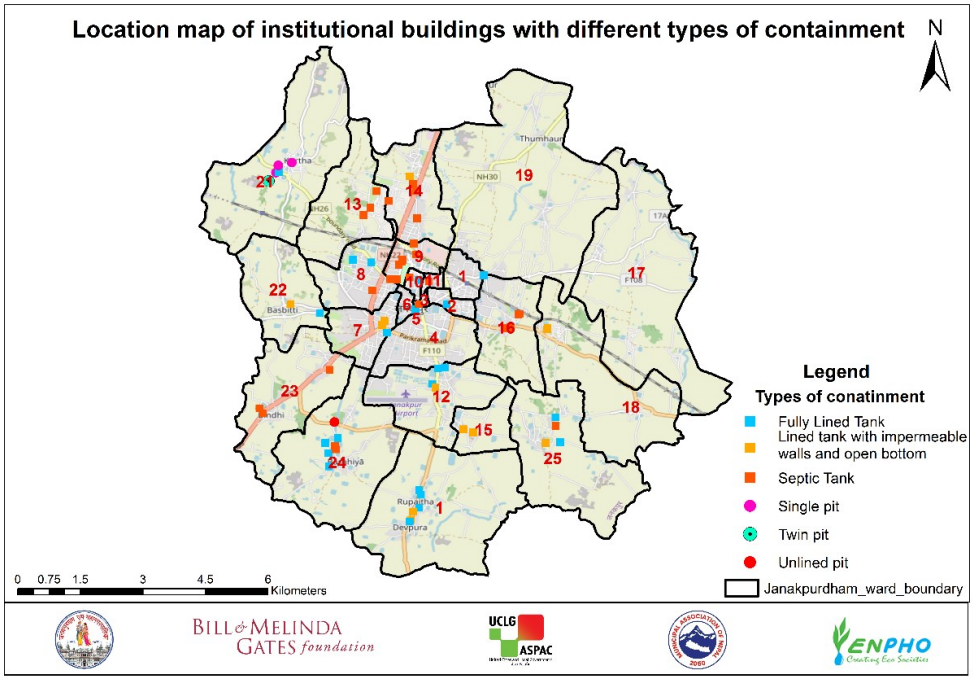

Figure 9: Location map of institutional buildings with different types of containment in Janakpurdham Sub-Metropolitan City.

2.3.3 Public Toilets

Among the public toilets in Janakpurdham Sub-Metropolitan City, five of them were observed for the study. It was observed that one toilet located at Baarah Bigha was non-functional. The information obtained about the public toilets are fed in this report.

Public toilet at *Ramananda Chowk*

The toilet located at *Ramananda Chowk* was constructed by Shree Ramananda Youth Club and is being managed with a support of caretaker. It has separate male and female compartments. It serves 5 users at a time with 2 pans but only a urinal in the male compartment. The public passing by the area is the service recipient of this toilet. Almost 500 users per day use the toilet. The users are charged Rs. 5 (USD 0.03) for urination and Rs. 10 (USD 0.08) for defecation.

The containment of the toilet is rectangular in shape with the tank capacity of about 16,000 litres. The containment gets filled every 1 to 1.5 years. It requires 3 trips from the service provider to empty the containment.

Groundwater is used for the supply of water to the tap in the toilet compartments. The toilet compartments lack proper ventilation but are cleaned regularly. Also, the toilet has a handwashing facility just outside the toilet with a handpump for a water supply (KII-4, 2023).

Figure 10 and Figure 11 show the picture of the public toilet at *Ramananda Chowk* and its status.

Figure 10: Public toilet located at *Ramananda Chowk* and its status.

Figure 11: Status of the public toilet at *Ramananda Chowk.*

Public toilet at *Pidari Chowk*

The toilet located at *Pidari Chowk* was constructed by Janakpurdham Sub-Metropolitan City on 2011. It serves 4 users at a time with 2 pans and 2 urinals. There is no separate compartments for male and female users. The outlet of the toilet is in open environment.

Groundwater is extracted from a nearby handpump for the supply of water. The toilet does not have proper ventilation and lacks cleanliness. The public passing by are the service recipients of the toilet. The users are charged Rs. 5 (USD 0.03) for urination and Rs. 10 (USD 0.08) for defecation (KII-4, 2023).

Figure 12 and Figure 13 show the picture of public toilet at *Pidari Chowk* and the outlet of the toilet.

Figure 12: Public toilet located at *Pidari Chowk*.

Figure 13: The outlet of the toilet at *Pidari Chowk.*

Public toilet at *Janaki Temple*

The toilet located at *Janaki Temple* was constructed by Shree Janak Youth Club on 2019. The youth club manages the toilet with support of a caretaker. It has separate male and female compartments. It serves 9 users at a time with altogether 6 pans and 3 commode compartments. The visitors at the temple are the main service recipient of this toilet. On regular days, it serves almost 500 users per day. The users are charged Rs. 10 (USD 0.08) for defecation.

Water is supplied to the tap in the toilet compartment. It is supplied from two 1,000-litre tanks placed over the roof of the toilet. Most of the time, the water supply is insufficient for the users. 4 handwashing basins are placed outside the toilet compartments for the handwashing facility. The caretaker is responsible for the overall cleaning of the toilet. For the work, the sub-metropolitan city provides financial support of Rs. 15,000 per month (USD 112.63) (KII-4, 2023). Figure 14 presents the structure and status of the public toilet at *Janaki Temple*.

Figure 14: Status of urinals and pans of toilet at *Janaki Temple.*

Public toilet at *Ganga Sagar*

The toilet located in the premises of a religious pond *Ganga Sagar* was also constructed by Shree Janak Youth Club. The youth club manages the toilet with support of a caretaker. It has separate male and female compartments. It serves 5 users at a time with 3 pans and 2 urinal compartments. The visitors at *Ganga Sagar* Pond are the main service recipient of this toilet. It serves about 100 users per day. The users are charged Rs. 5 (USD 0.03). for urination and Rs. 10 (USD 0.08) for defecation.

The toilet has its outlet connected to the containment which is further connected to an open drain. Moreover, the containment requires emptying, two times a year. The caretaker pays Rs. 4,000 (USD 30.08) per trip for emptying the containment.

The status of toilet is visibly clean with availability of ventilation for each compartment. Water required for the toilet use and cleanliness is supplied to the tap in toilet compartment. It is supplied from two 500-litre overhead. Moreover, groundwater is extracted to fill the overhead tanks. Despite the availability of water, there is no proper handwashing facility available in this toilet (KII-4, 2023).

Figure 15 and Figure 16 present the structure and status of public toilet at *Ganga Sagar*.

Figure 15: Public toilet located at *Ganga Sagar* premises.

Figure 16: Status of urinals and pans of toilet at *Ganga Sagar.*

Public toilet at *Baarah Bigha*

The public toilets located at *Baarah Bigh* was constructed by the sub-metropolitan city. The toilet is open for all public. It was mostly used by people visiting the place. However, due to lack of cleanliness, the toilets located in the *Baarah Bigha* are non-functional. Figure 17 shows the picture of the toilet located at *Baarah Bigha.*

Figure 17: Picture of toilet at *Baarah Bigha.*

2.3.4 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 33% of the households have emptied their containment whereas 67% have not emptied them yet. Similarly, only 30% of the institutional buildings have emptied their containments. Mostly emptied containment types are septic tanks and fully lined tanks. As septic tanks require regular emptying and fully lined tanks are water sealed, these types of containments are emptied more frequently.

Both manual and mechanical emptying is practised in the sub-metropolitan city while mechanical emptying is more prevalent. Among the households that have emptied their containments, 94% of households have emptied mechanically, 5% have emptied manually and 1% practice open emptying. When the effluent from the containment is discharged to an open drain, it is known as open emptying method. This method is usually practised during rainy season. Among the institutional buildings that have emptied their containments, 95% have emptied mechanically while 5% have emptied manually. The mechanical emptying of containment is practised on on-demand basis.

The sub-metropolitan city has a desludging service but does not have its own desludging vehicle. The service is being provided by private entrepreneurs only. The desludging service providers are not registered but they provide services within the sub-metropolis and neighbouring municipalities. More than 8 private desludging service providers operate in Janakpurdham Sub-Metropolitan City (KII-2, 2023).

Nepal Sarsafai Sewa is one among the other desludging service provider in Janakpurdham Sub-Metropolitan City. It has been providing the service since 2012. It has 5 desludging vehicles with tank capacities of 5,000 to 7,000 litres. On average, it makes 14 trips per week. For the service, it charges NRs.3,000 (USD 25.6) per trip to empty rectangular containments and charges NRs. 500 (USD 3.7) per ring to empty concrete ring containments. The service provider involves one driver and two helpers at a time of desludging. Driver is paid NRs. 7,000 (USD 52.4) per month (KII-2, 2023).

2.3.5 Treatment and Disposal/Reuse

Janakpurdham Sub-Metropolitan City does not have a Faecal Sludge Treatment Plant (FSTP) but has a landfill site for dumping waste (KII-1, 2023) . Here, mechanically emptied FS is mostly disposed of into farmlands (KII-2, 2023). In case of no demand from farmers, the FS is also disposed of at the landfill site, open ground and water bodies as well (KII-1, 2023) (KII-2, 2023) . Manually emptied FS is dug and dumped, composted, applied to farmlands, disposed of into open drains and into water bodies.

All these practises are not considered as safely managed FS. Thus, in the sub-metropolitan city, the emptied FS is ultimately disposed of unsafely and untreated in an open spaces and water bodies.

2.3.6 Risk Assessment of Groundwater Pollution

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

a. Sources of drinking water and water production

Nepal Water Supply Cooperation (NWSC), Janakpur under Ministry of Water Supply (MoWS) is providing drinking water service in Janakpurdham Sub-Metropolitan City. It has 2 overhead tanks to collect drinking water from the source. Water is collected from 9 deep tubewells. In overhead tanks, the collected water is chlorinated before being supplied. Water is supplied through piped water supply system (NWSC, 2023). The system is installed in partial areas of ward 1 to ward 14 in the city. The system connects with altogether 4,531 (private and public) tap connections to supply drinking water in the city (KII-3, 2023).

NWSC produces about 5.5 million litres per day (MLD) of water in dry season and 5.8 MLD in wet season. It has almost 31% of Non-Revenue Water (NWR). Thus, it delivers only about 3.8 MLD of water in dry season and 4 MLD of water in wet season. However, Janakpurdham Sub-Metropolitan City has a water demand of 25.5 MLD (NWSC, 2023) . Therefore, almost 94% of households still rely on handpumps for drinking water supply. It shows that groundwater is the primary source of drinking water in the city.

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

The term aquifer pollution vulnerability is intended to represent the varying level of natural protection afforded by the contaminant attenuation capacity of the unsaturated zone or semi-confining beds above an aquifer, because of physicochemical processes (filtration, biodegradation, hydrolysis, adsorption, neutralization, volatilization, and dispersion)—all of which vary with their texture, structure, clay content, organic matter, pH, redox and carbonate equilibria. Groundwater vulnerability is specific to containment type and pollution scenarios (Foster, et al., 2013) . Among other anthropogenic activities, improperly designed and constructed and unmanaged sanitation technologies also contribute to the groundwater contamination (EPA, 2015). In addition to it, the key factor to risk of groundwater pollution is the soil type and geological structure. According to WHO, if the travel time of pollutant to groundwater source is less than 25 days, there is significant risk to contamination; low risk, if the travel time is between 25 and 50 days; and very low risk if the travel time is greater than 50 days. The size of pores in the soil determines the infiltration rate (Krishnan, 2011).

The soil composition of Janakpurdham Sub-Metropolitan City consists of alluvial sediments i.e. sand, silt and clay along-with coarse gravels (Upreti, 1999). But upper composition has about thicker clay layer. Thus, because of the soil composition in the city, it possesses very low risk to groundwater pollution. The people using open bottom tanks or pits and consuming water from the handpumps with the depth up to 80 feet (18.28 m) and horizontal distance of the pump within 25 feet (7.62 m) from the source of pollutants are assumed at significant risk to groundwater pollution (Figure 18).

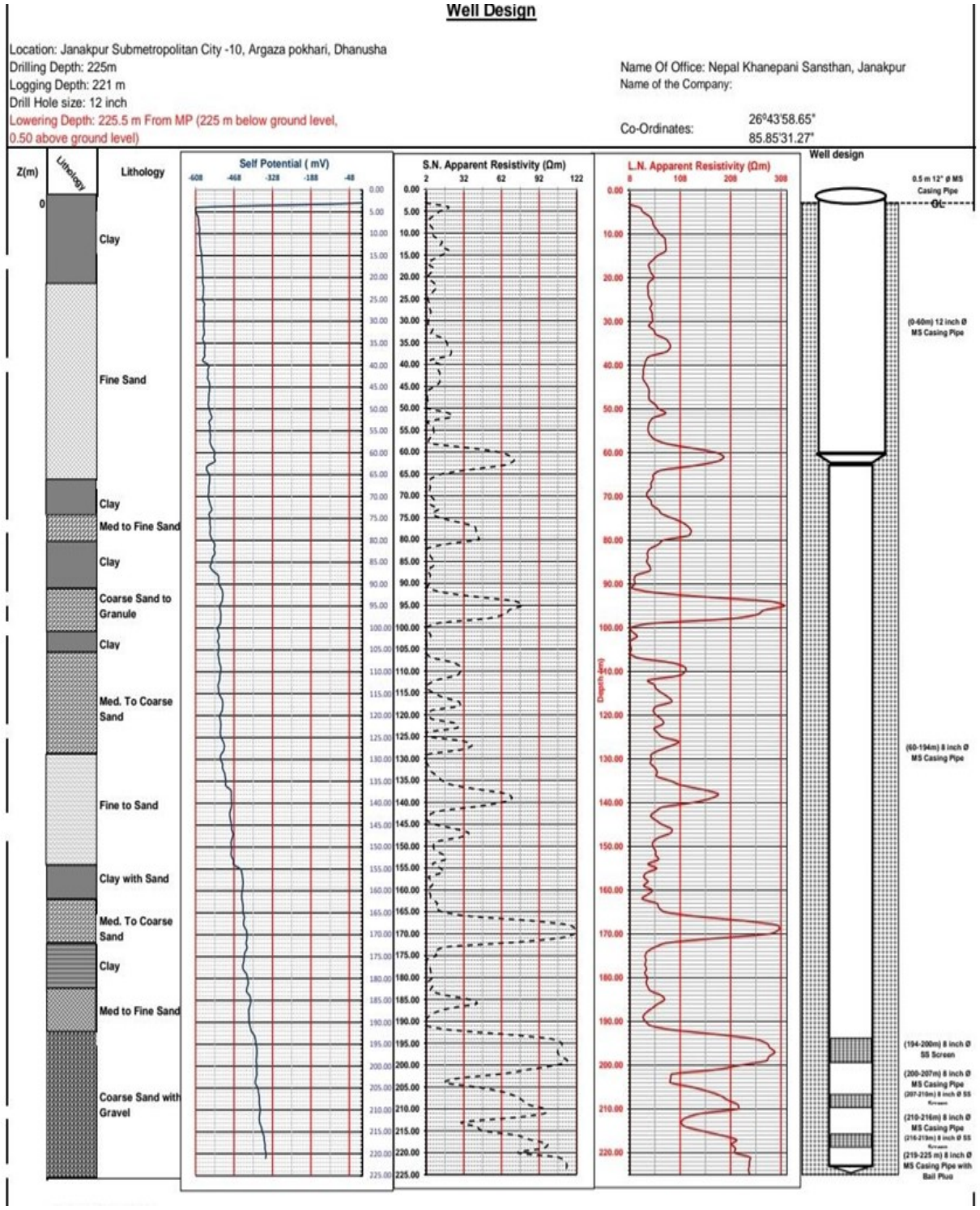

Figure 18: Well log profile with soil composition.

Figure 19 shows the depth of handpumps and horizontal distance of it from source of pollutant by lined tanks with impermeable walls and open bottoms. Due to the soil composition of the city, 0% of population using lined tanks with impermeable walls and open bottom with no outlet or overflow and groundwater as drinking water source are at risk to groundwater contamination.

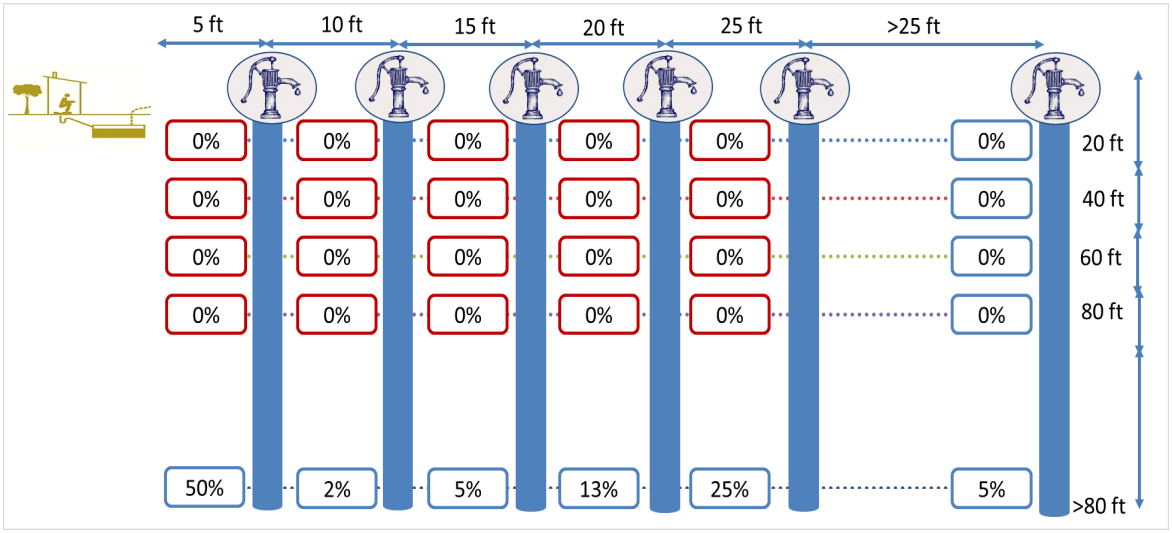

Figure 19: Depth of hand pumps and lateral spacing of it with containment type lined tank with impermeable walls and open bottom.

Figure 20 shows the depth of hand pumps and horizontal distance of it with the containment type lined pit with semi-permeable walls and open bottom and unlined pit. It shows that only 4% of the households (i.e.T2A5C10: 4% x 16% = 0.64% ≈ 1% of the overall population, where 16% is the percentage of population using lined pits with semi- permeable walls and open bottom with no outlet or overflow and using groundwater as drinking water source) using these types of containments possess significant risk to groundwater contamination.

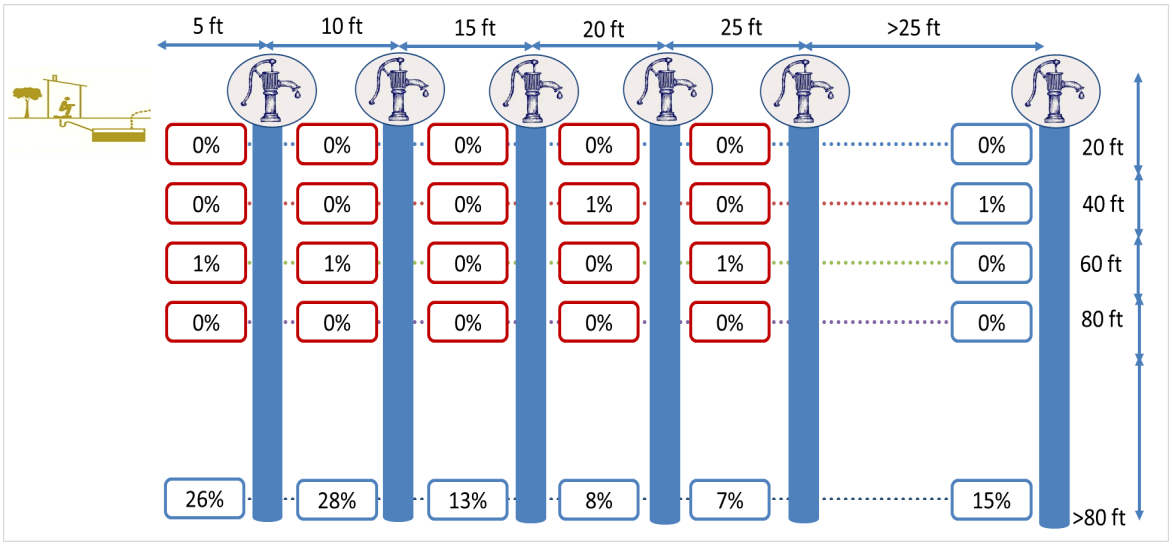

Figure 20: Depth of hand pumps and lateral spacing of it with containment type lined pit with semi-permeable walls and open bottom.

2.1 SFD Selection Grid

Figure 21 shows the types of sanitation technologies present in the Janakpurdham Sub-Metropolitan City 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 semi-permeable 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					Significant risk of GW pollution / Low risk of GW pollution	T1A1C6	T1A1C7			Not Applicable
Septic tank					Significant risk of GW pollution / Low risk of GW pollution	T1A2C6				
Fully lined tank (sealed)					Significant risk of GW pollution / Low risk of GW pollution	T1A3C6		T1A3C8		T1A3C10
Lined tank with impermeable walls and open bottom	Significant risk of GW pollution / Low risk of GW pollution	Significant risk of GW pollution / Low risk of GW pollution	Significant risk of GW pollution / Low risk of GW pollution	Significant risk of GW pollution / Low risk of GW pollution	Significant risk of GW pollution / T1A4C5	T1A4C6		T1A4C8		Significant risk of GW pollution / T1A4C10
Lined pit with semi-permeable walls and open bottom	Not Applicable									T2A5C10 / T1A5C10
Unlined pit										Significant risk of GW pollution / 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 21: SFD selection grid for Janakpurdham Sub-Metropolitan City.

The detail description of selected terms in the selection grid is provided in the table below:

Table 4: Explanation of terms used to indicate different frame selected in the SFD selection grid in Figure 21.

T1A1C6	A fully functioning toilet discharging directly to an open drain or storm sewer. The excreta is raw, untreated and hazardous and since it discharges directly to an open drain or storm sewer, all the excreta in this system is considered NOT contained.
T1A1C7	A fully functioning toilet discharges directly to a water body. The excreta are raw, untreated and hazardous and since it discharges directly to a water body, all the excreta in this system are considered NOT contained.
T1A2C6	A correctly designed, properly constructed, fully functioning septic tank with an outlet connected to an open drain or storm sewer. The supernatant/effluent flowing from the tank is only partially treated and is still hazardous, therefore all the excreta in this system is considered NOT contained.
T1A3C6	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 (consequently the excreta is potentially more toxic than the excreta in a septic tank). Since the tank is fitted with a supernatant/effluent overflow connected to an open drain or storm sewer the excreta in this system is considered NOT contained.

T1A3C8	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. Since the tank is fitted with a supernatant/effluent overflow connected to open ground the excreta in this system is considered NOT contained.
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.
T1A4C5	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 wall-lined but open bottomed tanks and containers which are sometimes mistakenly referred to as septic tanks. Since the tank is fitted with an effluent overflow connected to a correctly designed, properly constructed and fully functioning soak pit the excreta in this system is considered contained.
T1A4C6	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 wall-lined but open bottomed tanks and containers which are sometimes mistakenly referred to as septic tanks. Since the tank is fitted with a supernatant/effluent overflow connected to an open drain or storm sewer, the excreta in this system is considered NOT contained.
T1A4C8	A correctly designed, properly constructed and well-maintained lined tank with sealed, impermeable walls and an open, permeable base, through which infiltration can occur. It includes wall-lined but open bottomed tanks and containers which are sometimes mistakenly referred to as septic tanks. Since the tank is fitted with a supernatant/effluent overflow connected to open ground, the excreta in this system is considered NOT 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.
T1A5C10	A correctly designed, properly constructed and well-maintained pit with semi-permeable, honeycombed lined walls and an open, permeable base, through which infiltration can occur. The tank is NOT fitted with a supernatant/effluent overflow, so this system is considered contained.
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.
T2A5C10	A correctly designed, properly constructed and well-maintained pit with semi-permeable, honeycombed lined walls and an open, permeable base, through which infiltration can occur. The tank is NOT fitted with a supernatant/effluent overflow but since there is a 'significant risk' of groundwater pollution this system is considered NOT contained.

2.2 SFD Matrix

2.2.1 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:

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

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

i. The proportion of FS in septic tanks is 50%, since all the septic tanks are connected to open drain in the sub-metropolitan city. It implies that this type of containment is connected an open/stormwater drain.

ii. The proportion of FS in fully lined tanks is 89%, as the percentage of fully lined tanks which are connected to an open/stormwater drain is 8%.

iii. The proportion of FS from lined tanks with open bottom and all types of pits is 87%, as the proportion of lined tanks with impermeable walls and open bottom connected to an open/stormwater drain is 7%.

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 22 shows the SFD matrix of Janakpurdham Sub-Metropolitan City.

Janakpurdham Sub-Metropolitan City, Madhesh Province, Nepal, 27 Oct 2023. SFD Level: 2 - Intermediate SFD
Population: 194556
Proportion of tanks: septic tanks: 50%, fully lined tanks: 89%, lined, open bottom tanks: 87%

Containment								
System type	Population	WW transport	WW treatment	FS emptying	FS transport	FS treatment	SN transport	SN treatment
	Pop	W4c	W5c	F3	F4	F5	S4e	S5e
System label and description	Proportion of population using this type of system (p)	Proportion of wastewater in open sewer or storm drain system, which is delivered to treatment plants	Proportion of wastewater delivered to treatment plants, which is treated	Proportion of this type of system from which faecal sludge is emptied	Proportion of faecal sludge emptied, which is delivered to treatment plants	Proportion of faecal sludge delivered to treatment plants, which is treated	Proportion of supernatant in open drain or storm sewer system, which is delivered to treatment plants	Proportion of supernatant in open drain or storm sewer system that is delivered to treatment plants, which is treated
T1A1C6 Toilet discharges directly to open drain or storm sewer	2.0	0.0	0.0					
T1A1C7 Toilet discharges directly to water body	8.0							
T1A2C6 Septic tank connected to open drain or storm sewer	16.0			27.0	0.0	0.0	0.0	0.0
T1A3C10 Fully lined tank (sealed), no outlet or overflow	24.0			30.0	0.0	0.0		
T1A3C6 Fully lined tank (sealed) connected to an open drain or storm sewer	8.0			32.0	0.0	0.0	0.0	0.0
T1A3C8 Fully lined tank (sealed) connected to open ground	5.0			62.0	0.0	0.0		
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	5.0			22.0	0.0	0.0		
T1A4C5 Lined tank with impermeable walls and open bottom, connected to a soak pit	1.0			0.0	0.0	0.0		
T1A4C6 Lined tank with impermeable walls and open bottom, connected to an open drain or storm sewer	7.0			3.0	0.0	0.0	0.0	0.0
T1A4C8 Lined tank with impermeable walls and open bottom, connected to open ground	2.0			3.0	0.0	0.0		
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	13.0			22.0	0.0	0.0		
T1A6C10 Unlined pit, no outlet or overflow	1.0			14.0	0.0	0.0		
T1B11 C7 TO C9 Open defecation	7.0							
T2A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	1.0			0.0	0.0	0.0		

Figure 22: SFD Matrix of Janakpurdham Sub-Metropolitan City.

2.2.2 *Proportion of Faecal Sludge Emptied (F3)*

The proportion of faecal sludge emptied (F3) is calculated based on percentage of containment emptied (ENPHO, 2023) and amount of FS emptied during the process (KII-2, 2023). The information on FS emptied from containment is obtained from KII with desludging service providers. 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 (KII-2, 2023) . Hence, actual proportion of FS emptied from each containment is calculated as:

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

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

Table 5: Sanitation technologies and proportion of emptied faecal sludge (ENPHO[1], 2023; KII-2, 2023[(2)]).

Sanitation Technologies	SFD Reference Variable	Emptied Proportion of FS (1)	FS Emptied from Containment (2)	Actual Proportion of Emptied FS (F3)
Toilet discharges directly to open drain or storm sewer	T1A1C6	0%	0%	0%
Toilet discharges directly to water body	T1A1C7	0%	0%	0%
Septic tank connected to open drain or storm sewer	T1A2C6	34%	80%	27%
Fully lined tank (sealed) connected to open drain or storm sewer	T1A3C6	40%	80%	32%
Fully lined tank (sealed) connected to open ground	T1A3C8	78%	80%	62%
Fully lined tank (sealed), no outlet or overflow	T1A3C10	37%	80%	30%
Lined tank with impermeable walls and open bottom, connected to soak pit	T1A4C5	0%	80%	0%
Lined tank with impermeable walls and open bottom, connected to an open drain or storm sewer	T1A4C6	4%	80%	3%
Lined tank with impermeable walls and open bottom, connected to open ground	T1A4C8	4%	80%	3%
Lined tank with impermeable walls and open bottom, no outlet or overflow	T1A4C10	27%	80%	22%
Lined pit with semi-permeable walls and open bottom, no outlet or overflow	T1A5C10	27%	80%	22%
Unlined pit, no outlet or overflow	T1A6C10	17%	80%	14%
Open defecation	T1B11 C7 TO C9	0%	0%	0%
Lined pit with semi-permeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	T2A5C10	0%	0%	0%

2.2.3 Proportion of WW transported which is delivered to Treatment Plant (W4c and W5c)

Variable W4c is the proportion of wastewater in open sewer or storm drain that is delivered to treatment plant and variable W5c is the proportion of wastewater delivered to treatment plant and treated. The sub-metropolitan city does not have a Wastewater Treatment Plant (WWTP). Hence, discharged wastewater is not treated and thus, the value for variables W4c and W5c is set to 0% for system T1A1C6.

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

The sub-metropolitan city does not have a Faecal Sludge Treatment Plant (FSTP). Also, the people using twin pits reclassified as lined pits with semi-permeable walls and open bottom are not using them properly. Hence, the portion of FS delivered to treatment plant (F4) and treated (F5) is 0% in all systems.

2.2.5 Proportion of Supernatant in Open Drain or storm sewer delivered to treatment (S4e and S5e)

The variable S4e is the proportion of supernatant disposed in an open drain or storm sewer that is delivered to treatment plant and S5e is the proportion of supernatant that is delivered to treatment plant that is treated. As there is no WWTP or FSTP, the proportion delivered to treatment plant (S4e) and treated (S5e) is set to 0% for systems T1A2C6, T1A3C6 and T1A4C6.

2.3 SFD Graphic

Figure 23 shows the SFD graphic of Janakpurdham Sub-Metropolitan City. The graphic shows that excreta generated from the proportion of population that are safely managed is shown in green coloured whereas unsafely managed excreta are shown in red coloured arrowhead. It shows that excreta from 33% of the population are safely managed and excreta from 67% of the population are unsafely managed. It also represents the sanitation value chain going from left to right.

Offsite Sanitation

Janakpurdham Sub-Metropolitan City does not have a sewer network, however, 10% of households have offsite sanitation systems. The wastewater generated from these households is disposed of untreated into open drains or the storm sewer. Therefore, wastewater from 10% of the population is not treated and is unsafely managed.

Onsite Sanitation

In the sub-metropolitan city, 83% of households rely on onsite sanitation systems. Of the total households having an onsite sanitation system, 44% of the population uses containment where FS is contained and 29% of the population uses containment where FS is not contained.

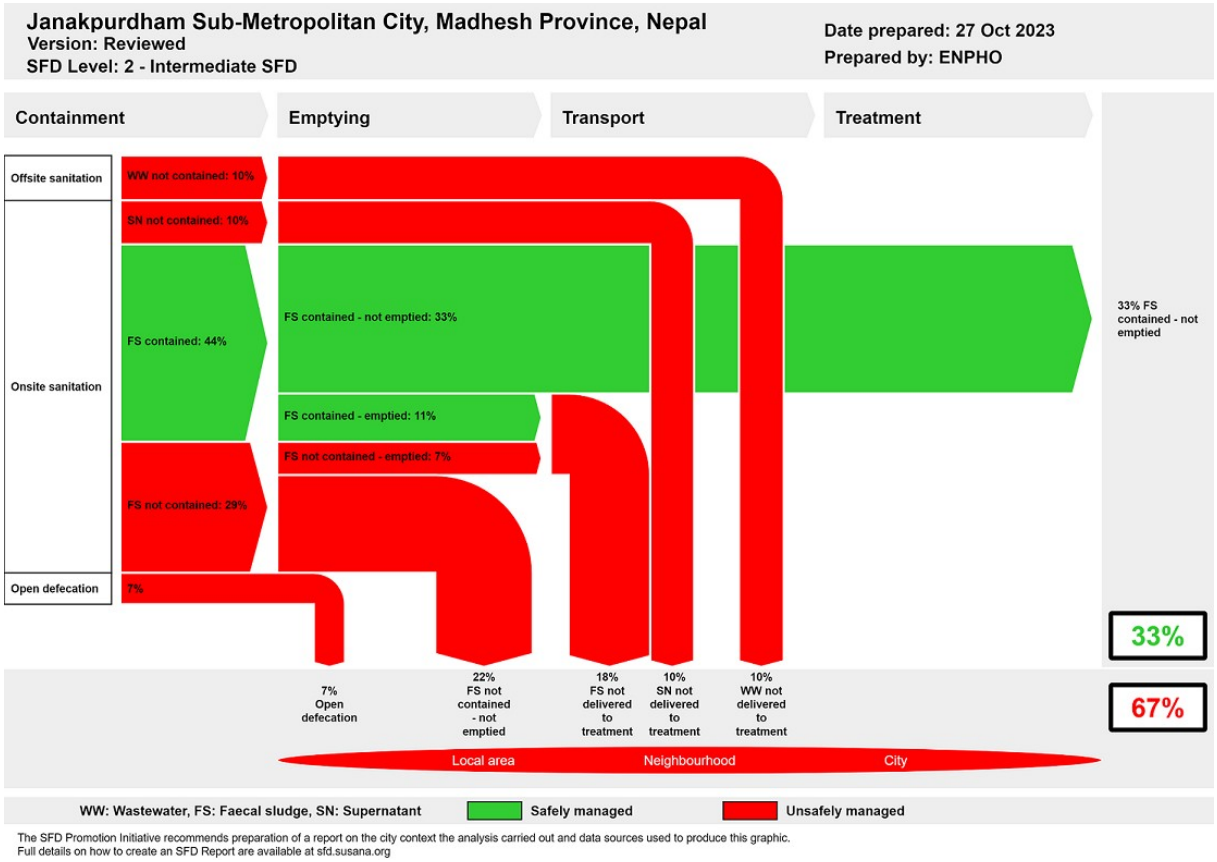

Figure 23: SFD Graphic of Janakpurdham Sub-Metropolitan City.

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. 44% 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 connected to soak pits and with no outlet or overflow (T1A4C5 and T1A4C10), lined pits with semi-permeable walls and open bottom with no outlet or overflow (T1A5C10) 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. 29% is obtained from the summation of population using septic tanks connected to open drain or storm sewer (T1A2C6), fully lined tanks connected to

an open/stormwater drain and open ground (T1A3C6 and T1A3C8), lined tanks with impermeable walls and open bottom connected to an open drain or storm sewer and to open ground (T1A4C6 and T1A4C8) and lined pits with semi-permeable walls and open bottom with no outlet or overflow with 'significant risk' to groundwater (T2A5C10).

FS contained not Emptied

The value of 33% is obtained from the proportion of the population using sanitation systems where the FS is contained and have not emptied their containment. However, this 33% of safely managed FS should be considered as only temporary, as most of the pits and tanks have not yet filled up and the FS generated remains 'not emptied'. Therefore, these systems will require emptying services in the short and medium term as they fill up.

FS contained - Emptied

The value of 11% is obtained from the proportion of population using sanitation systems where the FS is contained and have emptied their containment.

FS not contained - Emptied

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

FS not contained - not Emptied

The value of 22% 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. 18%, is the summation of FS contained emptied and FS not contained emptied. Since Janakpurdham Sub-Metropolitan City does not have FSTP, emptied FS is disposed of untreated to farmlands and forest. Therefore, this proportion of disposed FS possesses risk to local area and neighbourhood.

Supernatant (SN) not delivered to treatment

The proportion of supernatant is obtained from containments connected to open drain or stormwater sewer calculated as 50% of FS contained in each containment. The total proportion of supernatant (SN) is 10% of FS generated by the total population. Since the sub-metropolitan city lacks the sewer network and treatment plant, the supernatant is disposed of directly into water bodies. Hence, the proportion of SN not delivered to treatment is 10%.

Open Defecation

Despite Open Defecation Free (ODF) status, people residing in 7% of households still go for open defecation. Mostly, people living in poverty and who do not own land, do not have toilets and despite having toilets, lack in behaviour change have led to open defecation in the sub-metropolitan city.

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 promulgated 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 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 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.

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, sub-metropolitan city, 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 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 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 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.

3.2 Policies

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. However, it was unable to address the complex operational issue 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 recognized discharge of untreated wastewater and dumping of septic 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). Sanitation is prioritized on SDG 6. 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). 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).

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 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 24.

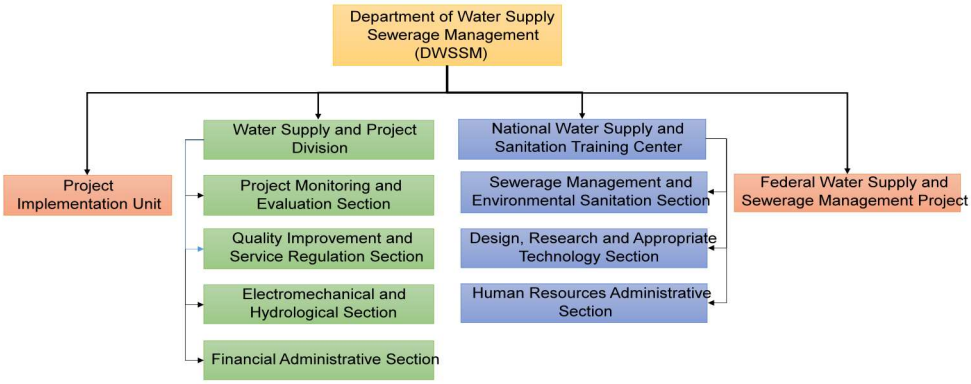

Figure 24: Organizational Structure Department of Water Supply and Sewerage Management (DWSSM).

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 and Energy Development: Ministry of Water Supply and Energy Development of provincial government in Madhesh 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 the province is executed through Water supply and Sanitation Divisional Office (WSSDO). WSSDO 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 500 to 1,000 in Himalayan region.

At Local Level

Janakpurdham Sub-Metropolitan City have a Social development and Sanitation Section for implementation of WASH related activities. The activities related to sanitation is managed under this section with major focus on solid waste management only. Therefore, the sub-

metropolitan city lacks focus on FSM and there is no provision for vehicle registration for private desludging services.

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 sub-metropolitan city 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 sub-metropolitan city 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 sub-metropolitan city. The focal person at the sub-metropolitan city was interviewed on current sanitation services with respect to technical, institutional, and financial aspects. Also, a KII was performed with the owner of private desludging service provider to understand the emptying practice, disposal and treatment of FS as well as finance requirement. Also, an interview was performed with the caretaker of public toilet along with observation to find sanitation status and management practice of public toilet (Figure 25).

Table 7: List of Key Informant Interviewed personnel.

S.N.	Name	Designation	Organization/Company	Purpose of KII	Date
1.	Manoj Kumar Sah (KII-1)	Mayor	Janakpurdham Sub-Metropolitan City	Sanitation status, Ongoing projects on Sanitation, Policies and plan for Sanitation development	28 December, 2022
2.	Rajan Kumar Singh (KII-1)	Former Personal Assistant of Mayor	Janakpurdham Sub-Metropolitan City	Sanitation status, Ongoing projects on Sanitation, Policies and plan for Sanitation development	28 December, 2022
3.	(KII-2)	Owner	Nepal Sarsafai Sewa	Emptying practices, finances, requirement, disposal and treatment	29 December, 2022
4.	Bishnu Dev Shah (KII-3)	Civil Sub-Engineer	Nepal Water Supply Cooperation, Janakpur	Water Supply Services	29 December, 2022
5.	Bibha Mallik (KII-4)	Caretaker	Public toilet-Ramananda Chowk	Public Toilet Services	30 December, 2022
6.	Shiv Kumar (KII-4)	Caretaker	Public toilet-Pidari Chowk	Public Toilet Services	30 December, 2022
7.	Shiva Mishra (KII-4)	Caretaker	Public toilet-Janaki Temple	Public Toilet Services	30 December, 2022
8.	Santosh Kumar Raya (KII-4)	Caretaker	Public toilet-Ganga Sagar	Public Toilet Services	30 December, 2022

Figure 25: KII with caretaker of public toilet at *Ramananda Chowk*.

4.2 Household Survey

A random household survey was conducted in all wards of the sub-metropolitan city. The local enumerators selected from the sub-metropolitan city were oriented prior to the survey and were mobilized for data collection. A mobile application "KOBOCOLLECT" was used for the household survey. 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 26).

Figure 26: SFD orientation to local enumerators of Janakpurdham Sub-Metropolitan City.

4.2.1 Determining Sample Size

The number of households to be sampled in the sub-metropolitan city was determined by using Cochran (1963:75) sample size formula $no = \frac{z2pq}{e2}$ 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	+/-3%	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 sub-metropolitan city 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 1,041 households were sampled from 40,409 households distributed in 25 wards with proportionate stratification random sampling. The household samples surveyed in the sub-metropolitan city is shown in Figure 27.

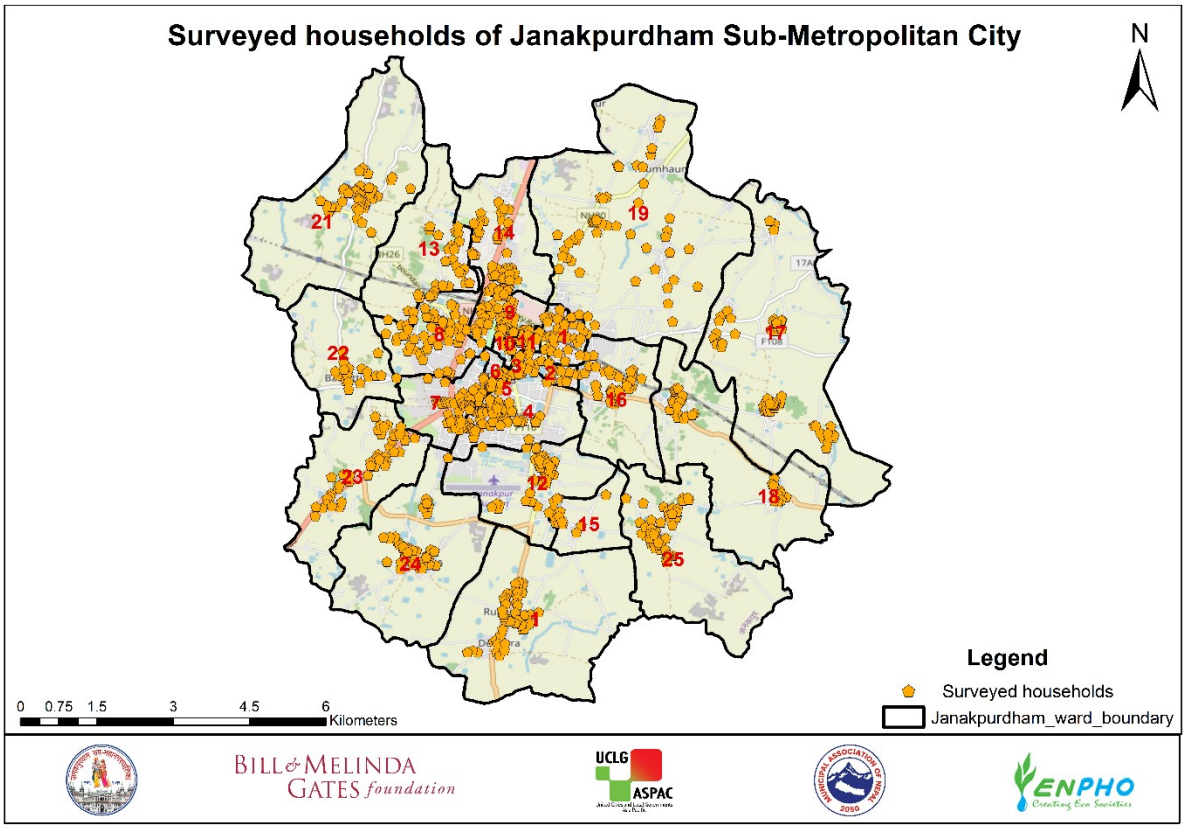

Figure 27: Location map of surveyed households.

4.3 Direct Observation

Various sanitation technologies in the households were observed and visual references were kept. Also, observation of the toilet, water source, containments and transportation of faecal sludge were carried out. Figure 28 shows the outlet of containment to an open drain in Janakpurdham Sub-Metropolitan City.

Figure 28: Outlet of a containment connected to an open drain found during field observation at Janakpurdham Sub-Metropolitan City.

4.4 Sharing and Validation of Data

The Shit Flow Diagram Sharing and Validation Workshop was conducted at Janakpurdham Sub-Metropolitan City Hall to share the findings on sanitation situation survey and receive the suggestions from the municipal stakeholders. Altogether, 32 participants including ward chairpersons, municipal council members, sectoral staffs and other relevant stakeholders actively participated on the workshop and provided valuable suggestions. The participants expressed their interest on FSM at policy level and infrastructure development. Figure 29 shows the picture of SFD findings sharing to the participants. The list of participants with their designation is attached in Appendix 4.

Figure 29: Sharing of findings during validation workshop.

5 Acknowledgements

We would like to acknowledge the executing agency, United Cities Local Government – 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 sub-metropolitan city.

We offer sincere acknowledgement to Mr. Manoj Kumar Sah, Mayor, Mr. Rajan Kumar Singh, former Personal Assistant and Mr. Birod Yadav, Personal Assistant of the sub-metropolitan city for providing valuable time and information during study. Similarly, we would like to thank all the respective staffs of the sub-metropolitan city and key stakeholders involved during the study, without whose help this study would not have been completed.

We would like to appreciate Dr. Roshan Raj Shrestha, Deputy Director of Bill and Melinda Gates Foundation (BMGF), Dr. Bernadia Irawati Tjandradewi, Secretary General and Mr. Satish Jung Shah, Knowledge Management Officer, UCLG ASPAC. Similarly, we are very much obliged to Mr. Ashok Kumar Byanju Shrestha, Former President. Mr. Bhim Prasad Dhungana, President, Mr. Kalanidhi Devkota, Executive Director and Mr. Muskan Shrestha, Sanitation Advocacy Specialist from MuAN for their support during the study.

We are grateful to Ms. Bhawana Sharma, Executive Director and Mr. Rajendra Shrestha, Program Director of Environment and Public Health Organization (ENPHO) for tremendous support and guidance during the whole process of the study. Together, we would like to thank the entire team of ENPHO for their support and MuNASS-II team without whom the study would not have been possible.

We are grateful towards the enumerators, Mr. Rishi Kumar Sah, Mr. Sujit Kumar Pandit, Mr. Roshan Kumar Sah, Mr. Shivshankar Mandal, Mr. Rahul Kumar Sah, Ms. Shivani Jha, Ms. Anju Kumari, Mr. Ram Prabesh Sah, Mr. Dipak Kumar Sinha, Ms. Neha Das, Mr. Prabin Kumar Das, Ms. Minu Sah, Ms. Anju Kumari Sah, Ms. Kiran Sah, Mr. Indra Kumar Pandit, Mr. Krishan Dev Pal and Mr. Dipak Kumar Mandal for their support during the survey.

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7 Appendix

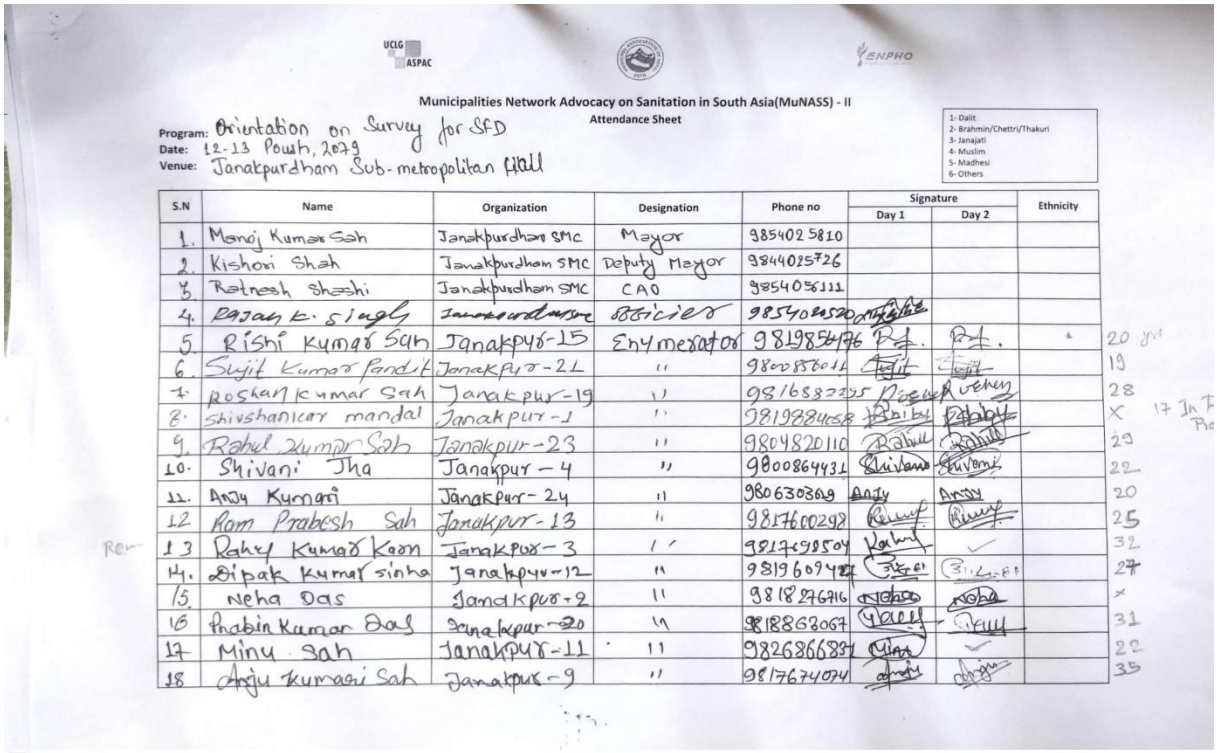
7.1 Appendix 1: Roles and Responsibility of Various Tiers of Governments Delineated in Drafted SDP 2016 – 2030

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

Ward No.	Number of Surveyed households
1	57
2	29
3	10
4	97
5	14
6	24
7	47
8	63
9	46
10	22
11	30
12	38
13	36
14	52
15	20
16	41
17	65
18	37
19	54
20	51
21	50
22	19
23	45
24	49
25	44
	1,041

7.3 Appendix 3: List of Participants on SFD Survey Orientation

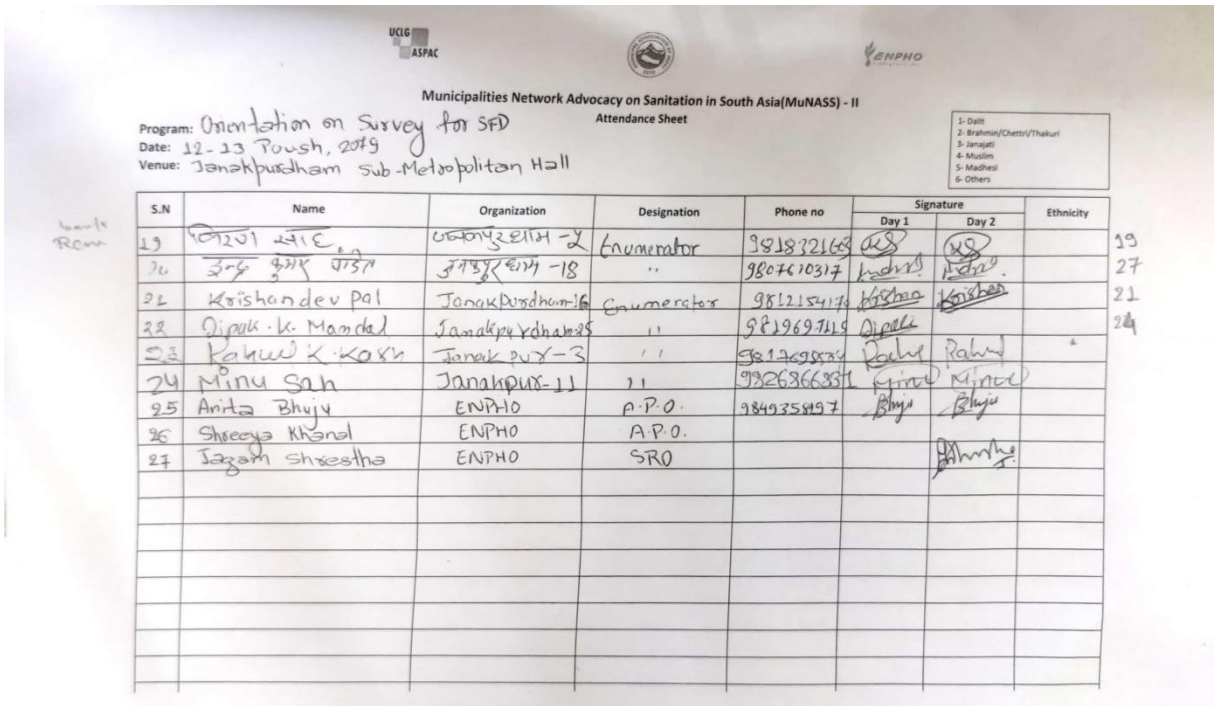


Municipalities Network Advocacy on Sanitation in South Asia(MuNASS) - II
Attendance Sheet

Program: Orientation on Survey for SFD
Date: 12-13 Poush, 2079
Venue: Janakpurdham Sub-metropolitan Hall

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

S.N	Name	Organization	Designation	Phone no	Signature Day 1	Signature Day 2	Ethnicity
1.	Manoj Kumar Sah	Janakpurdham SMC	Mayor	9854025810			
2.	Kishori Shah	Janakpurdham SMC	Deputy Mayor	9844025726			
3.	Ratnesh Shashi	Janakpurdham SMC	CAO	9854058111			
4.	Rajan K. Singh	Janakpurdham SMC	Officier	9854025820			
5.	Rishi Kumar Sah	Janakpur-15	Enumerator	9819854196			
6.	Sujit Kumar Pandit	Janakpur-21	"	9800858014			
7.	Roshan Kumar Sah	Janakpur-19	"	9816837295			
8.	Shivshankar mandal	Janakpur-1	"	9819884058			
9.	Rahul Kumar Sah	Janakpur-23	"	9804820110			
10.	Shivani Jha	Janakpur-4	"	9800864431			
11.	Anju Kumari	Janakpur-24	"	9806303809			
12	Ram Prabesh Sah	Janakpur-13	"	9817600298			
13	Rahul Kumar Kaon	Janakpur-3	"	9817698504			
14.	Dipak Kumar sinha	Janakpur-12	"	9819609427			
15.	Neha Das	Janakpur-2	"	9818276916			
16	Rabin Kumar Das	Janakpur-20	"	9818863067			
17	Minu Sah	Janakpur-11	"	9826866834			
18	Anju Kumari Sah	Janakpur-9	"	9817674074			



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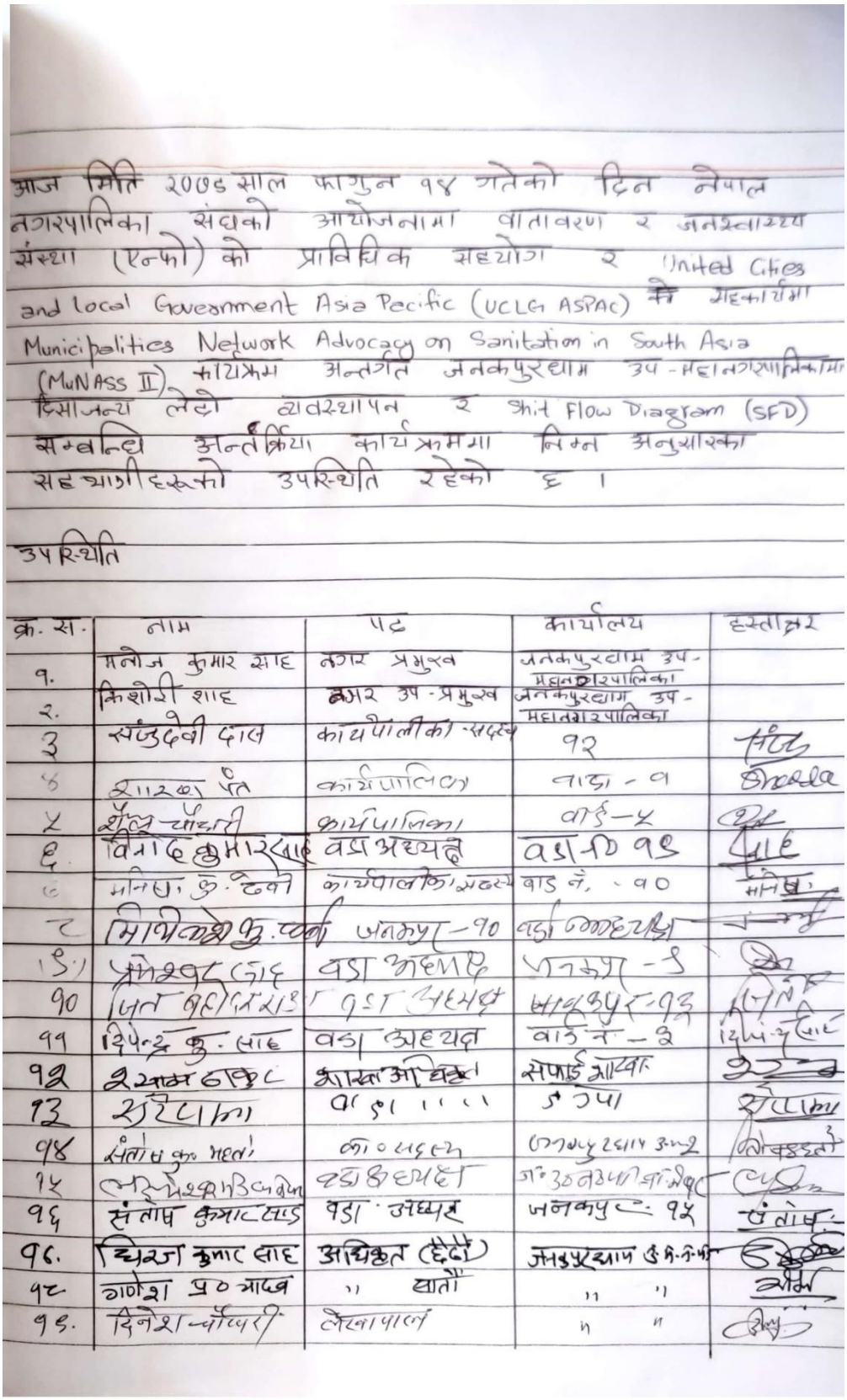
3- Janajati
4- Muslim
5- Madhesi
6- Others

S.N	Name	Organization	Designation	Phone no	Signature Day 1	Signature Day 2	Ethnicity
19	[illegible]	[illegible] -2	Enumerator	9818321669			
20	[illegible]	[illegible] -18	"	9807610317			
21	Krishandev pal	Janakpurdham-16	Enumerator	9812154176			
22	Dipak K. Mandal	Janakpurdham-25	"	9819697119			
23	Rahul K. Kaon	Janakpur-3	"	9817698504			
24	Minu Sah	Janakpur-11	"	9826866834			
25	Anita Bhuju	ENPHO	P.P.O	9849358497			
26	Shreeya Khanal	ENPHO	A.P.O.				
27	Jazam Shrestha	ENPHO	SRO				

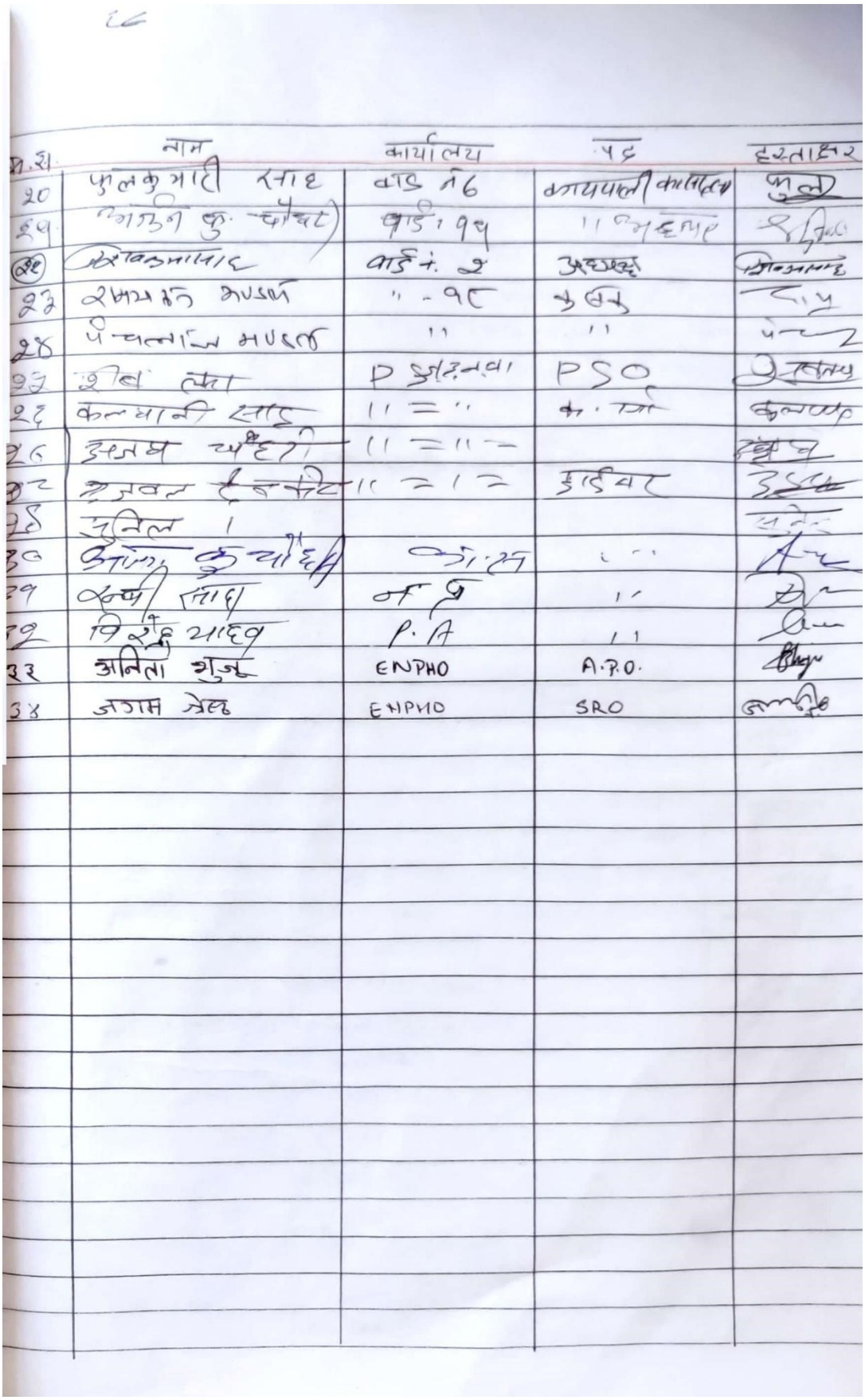
7.4 Appendix 4: List of Participants in Sharing and Validation Workshop



आज मिति २०७९ साल फागुन १४ गतेको दिन नेपाल नगरपालिका संघको आयोजनामा वातावरण र जनस्वास्थ्य संस्था (एन्फो) को प्राविधिक सहयोग र United Cities and Local Government Asia Pacific (UCLG ASPAC) को सहकार्यमा Municipalities Network Advocacy on Sanitation in South Asia (MuNASS II) कार्यक्रम अन्तर्गत जनकपुरधाम उप-महानगरपालिकामा डिसिजन्स लेट्रो व्यवस्थापन र Shit Flow Diagram (SFD) सम्बन्धि अन्तर्क्रिया कार्यक्रममा निम्न अनुसारका सहभागीहरुको उपस्थिति रहेको छ ।

उपस्थिति

क्र. स.	नाम	पद	कार्यालय	हस्ताक्षर
१.	मनोज कुमार साह	नगर प्रमुख	जनकपुरधाम उप-महानगरपालिका	
२.	किशोरी शाह	नगर उप-प्रमुख	जनकपुरधाम उप-महानगरपालिका	
३	सञ्जुदेवी दास	कार्यपालीका सदस्य	१२	
४	शारदा पंत	कार्यपालिका	वडा - ७	
५	शैलु चौधरी	कार्यपालिका	वडा-५	
६	विनोद कुमार राउत	वडा अध्यक्ष	वडा नं १९	
७	मनिषा के.सी.	कार्यपालिका सदस्य	वडा नं. - १०	
८	मिथिलेश कु. चर्मकार	जनकपुर-१०	वडा अध्यक्ष	
९	प्रमोद कुमार यादव	वडा अध्यक्ष	जनकपुर-१	
१०	जित बहादुर राउत	१९ वडा अध्यक्ष	धनुषा-१९	
११	विपेन्द्र कु. साह	वडा अध्यक्ष	वडा नं - २	
१२	[illegible]	आमा समुह	सफाई आमा	
१३	[illegible]	वडा [illegible]	[illegible]	
१४	संतोष कुमार महतो	का० सदस्य	जनकपुरधाम उप-[illegible]	
१५	[illegible]	वडा अध्यक्ष	[illegible]	
१६	संतोष कुमार साह	वडा अध्यक्ष	जनकपुर - १५	
१७.	चिरञ्जी कुमार साह	अधिकृत (हेर्दै)	जनकपुरधाम उ.म.न.पा.	
१८	गणेश प्र० यादव	" खातो	" "	
१९.	दिनेश चौधरी	लेखापाल	" "	



क्र.सं.	नाम	कार्यालय	पद	हस्ताक्षर
२०	फुलकुमारी यादव	वडा नं 6	कार्यपालीका कार्यालय	फुलकुमारी
२५	गंगुना कु. चौधरी	वडा नं. १५	" सदस्य	गंगुना
२६	शेखमोहम्मद	वडा नं. २	अध्यक्ष	शेखमोहम्मद
२७	[illegible]	" - १८	[illegible]	[illegible]
२८	पंचलाल मण्डल	"	"	[illegible]
२९	शिव लोहा	P प्रदेशवा	PSO	[illegible]
३०	कल्याणी यादव	" = "	[illegible]	[illegible]
३१	[illegible]	" = "		[illegible]
३२	[illegible]	" = "	[illegible]	[illegible]
३३	[illegible]			[illegible]
३४	[illegible]	[illegible]	[illegible]	[illegible]
३५	[illegible]	[illegible]	"	[illegible]
३६	[illegible]	P. A	"	[illegible]
३७	अनिता शुजल	ENPHO	A.P.O.	[illegible]
३८	जगत सेल्ह	ENPHO	SRO	[illegible]

SFD Janakpurdham Sub-Metropolitan City, Nepal, 2023

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