SFD Report

Pokhara Metropolitan City
Nepal

Final Report

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

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SFD Report Neelakantha Municipality, Nepal, 2026

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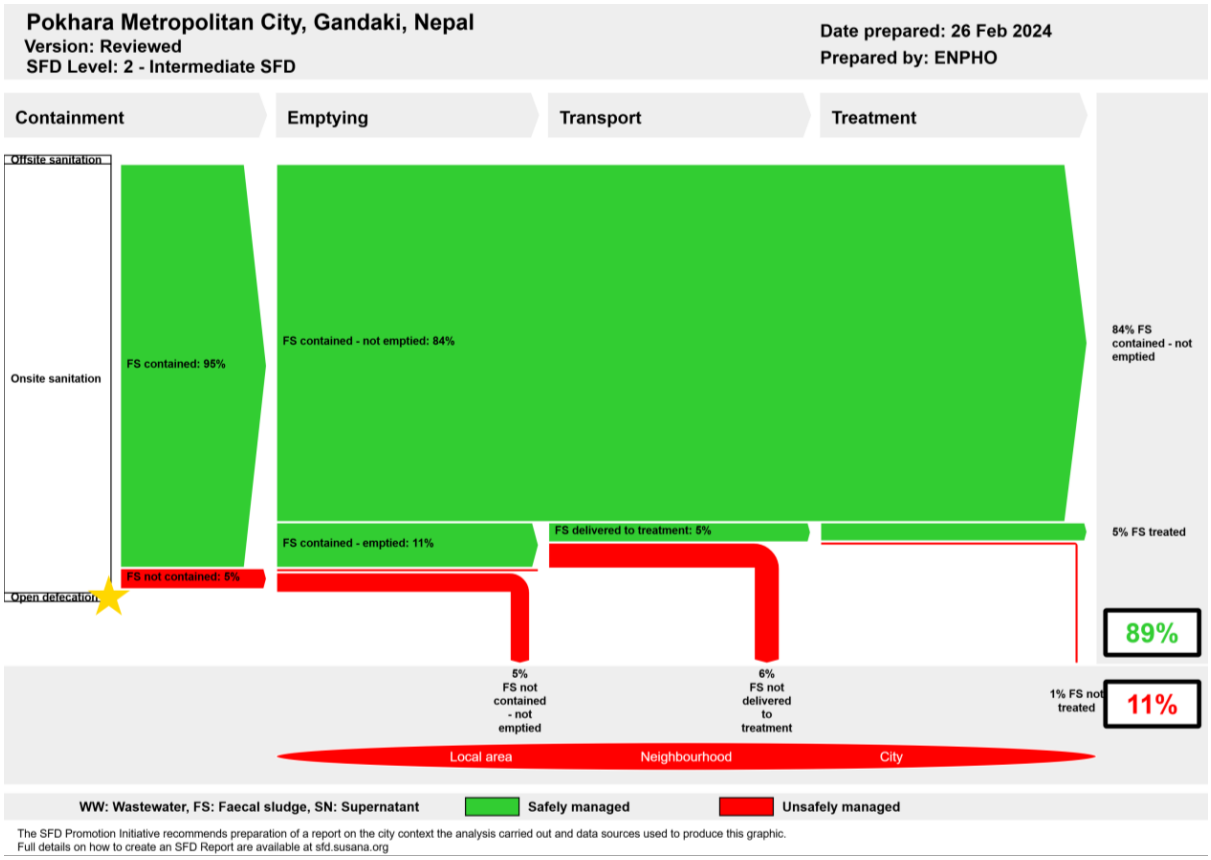
1. The SFD Graphic



2. Diagram information

SFD Level:

This SFD is a level 2- Intermediate report.

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

Status:

Final SFD report.

Date of production: 26/02/2024

3. General city information

Pokhara Metropolitan City was declared as municipality on 10th March 2017. It is in Kaski District, Gandaki Province in Nepal. It is divided into 33 political wards.

The municipality has a total population of 513,504 with 247,495 males and 266,009 females (Census 2021, n.d.) . Out of total wards, ward number 17 has the largest population (46,005) while ward number 20 has the least population with (3,936). The municipality has a total of 140,459 households. Ward number 17 has the most households with a total of 12,658, while ward number 20 has the least number of households with a total of 1,059.

The climate here is considered warm and temperate. The mean yearly temperature

recorded in Pokhara is 18.3 °C | 65.0 °F, as per the available data. The rainfall here is around 4,851 mm.

4. Service outcome

The overview of different sanitation technologies across the sanitation value chain in the municipality is briefly explained in this section (ENPHO, 2024). Basic sanitation coverage in the municipality is 100% where, basic sanitation is defined as having access to facilities for the safe disposal of human waste (faeces and urine), as well as having the ability to maintain hygienic conditions, through services such as garbage collection, industrial/hazardous waste management, and wastewater treatment and disposal. All the surveyed households in the municipality have access to basic toilet facilities and all these HHs rely on onsite sanitation systems.

Containment:

Different types of containment used to store faecal sludge in onsite sanitation systems are fully lined tanks (14%), lined tanks with impermeable walls and open bottom (82%), Septic tank (1%) and Unlined pits (3%).

Emptying and Transportation:

There are no regular emptying practices of the containments. However, 12% of the households had emptied the containment at least once since installation. Both manual and mechanical desludging mechanism is practiced.

Treatment and Disposal:

The municipality lacks a faecal sludge treatment facility. The majority of FS emptied is used in agricultural lands untreated. Households using biogas digesters utilize their energy in cooking and other purposes.

The SFD graphic shows that 89% of the excreta generated are safely managed while 11% of the excreta generated are unsafely managed. The safely managed percentage of FS generated by 84% of the population is temporary until the tanks and pits become full and FS from the containment is emptied.

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.

Nepal committed to the SDGs early on, and this commitment has been reaffirmed in key policy documents, such as the current 15th development plan and the 25-year long term vision 2100 that internalizes the Goals. SDGs codes are assigned for all national development programs through the Medium-Term Expenditure Framework. Further, Nepal has prepared the SDG status and roadmap to localize the SDG indicators with baselines and targets 2030.

6. Overview of stakeholders

The major stakeholders envisioned by the regulatory framework for faecal sludge management (FSM) in urban cities are presented in Table 1.

Table 1: Overview of Stakeholders.

Key Stakeholders	Institutions / Organizations
Public Institutions at Local Government	Pokhara Metropolitan City
Non-governmental Organizations	Nepal Water Supply Corporation (NWSC), Pokhara Branch Japan International Cooperation Agency (JICA) Asian Development Bank (ADB) Environment and Public Health Organization (ENPHO) Lekhnath Small Town Water Supply and Sanitation User Committee
Private Sector	Public Toilet Operators

	Desludging Service Providers
Development Partners, Donors	MuAN, BMGF, UCLG ASPAC

7. Credibility of data

The major data were collected from random household sampling (ENPHO, 2022). Altogether, 1,059 households and 101 institutions were surveyed from 33 wards of Pokhara Metropolitan City. Primary data on emptying, transportation and current sanitation practices in the municipality were triangulated with the data obtained from Key Informant Interviews (KIIs) with Municipal Officers, Engineer of Nepal water supply cooperation (NWSC), Pokhara branch and Engineer of Lekhnath Water Supply User Committee, Desludging service providers and the operator of the public toilet. Also, a data sharing and validation workshop with key stakeholders was performed.

8. Process of SFD development

Data on sanitation situations were collected through household and institutional surveys. Enumerators from the municipality were mobilized after providing orientation on sanitation technologies, objectives of the survey and proper use of mobile application, KOBOCOLLECT for collection of data for survey. Along with this, KIIs were conducted with officers and engineers of the municipality and Water Supply and Sanitation Users Committee. Types of sanitation technologies used in various locations were 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 was fed into SFD graphic generator to produce the SFD graphic.

8. List of data sources

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

- CBS. (2021). National Population and Housing Census 2021. Kathmandu, Nepal: Central Bureau of Statistics. Retrieved from chrome-extension:// https://censusnepal.cbs.gov.np/results/downloads/ward
- ENPHO. (2024). Sanitation Situtaion Assessment of Pokhara Metropolitan City: Unpublished.
- MoFAGA. (2017). Ministry of Federal Affairs & General Administration. Retrieved from Government of Nepal, Ministry of Federal Affairs & General Administration: https://www.sthaniya.gov.np/gis/.

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Abbreviations

DI	Ductile Iron
ENPHO	Environment and Public Health Organization
FS	Faecal Sludge
FSM	Faecal Sludge Management
FSTP	Faecal Sludge Treatment Plant
GoN	Government of Nepal
HH	Household
JMP	Joint Monitoring Programme
KII	Key Informant Interview
KM	Kilometres
mm	Millimetre
MoEST	Ministry of Education, Science and Technology
MoFAGA	Ministry of Federal Affairs and General Assembly
MoH	Ministry of Health
MoHP	Ministry of Health and Population
MoUD	Ministry of Urban Development
MoWS	Ministry of Water Supply
MuAN	Municipal Association of Nepal
NPC	National Planning Commission
NUWSSP	National Urban Water Supply and Sanitation Sector Policy
NWSSP	National Water Supply and Sanitation Policy
ODF	Open Defecation Free
RWSSNP	Rural Water Supply and Sanitation National Policy
SCEIS	Sector Coordination and Efficiency Improvement Section
SDG	Sustainable Development Goal
SDP	Sector Development Plan
SFD	Shit Flow Diagram
SFD PI	Shit Flow Diagram Promotion Initiative
SN	Supernatant
UCLG ASPAC	United Cities and Local Governments Asia Pacific
UNICEF	United Nations Children's Education Fund
VDC	Village Development Committee
WASH	Water, Sanitation and Hygiene
JICA	Japan International Cooperation Agency
WHO	World Health Organization
WSP	Water Supply Providers
WSUC	Water Supply and User's Committee
WW	Wastewater

1 City context

Pokhara Metropolitan City is in Kaski District, Gandaki Province of Nepal. It was declared as Metropolitan City in 10th march, 2017. The municipality is divided into Thirty-three political wards. It covers 464.24 square kilometres of area. It is surrounded by Madi Rural Muncipality and Rupa Rural Municipality on the east, Annapurna Rural Municipality, Parbat and Syanja District on the West, Machhapurchhre and Madi Rural Municipality on the north and Syanja and Tanahu District on the south.(Ministry Of Federal Affairs & General Administration, n.d.). Figure 1 shows the Geo-political map of Pokhara Metropolitan City.

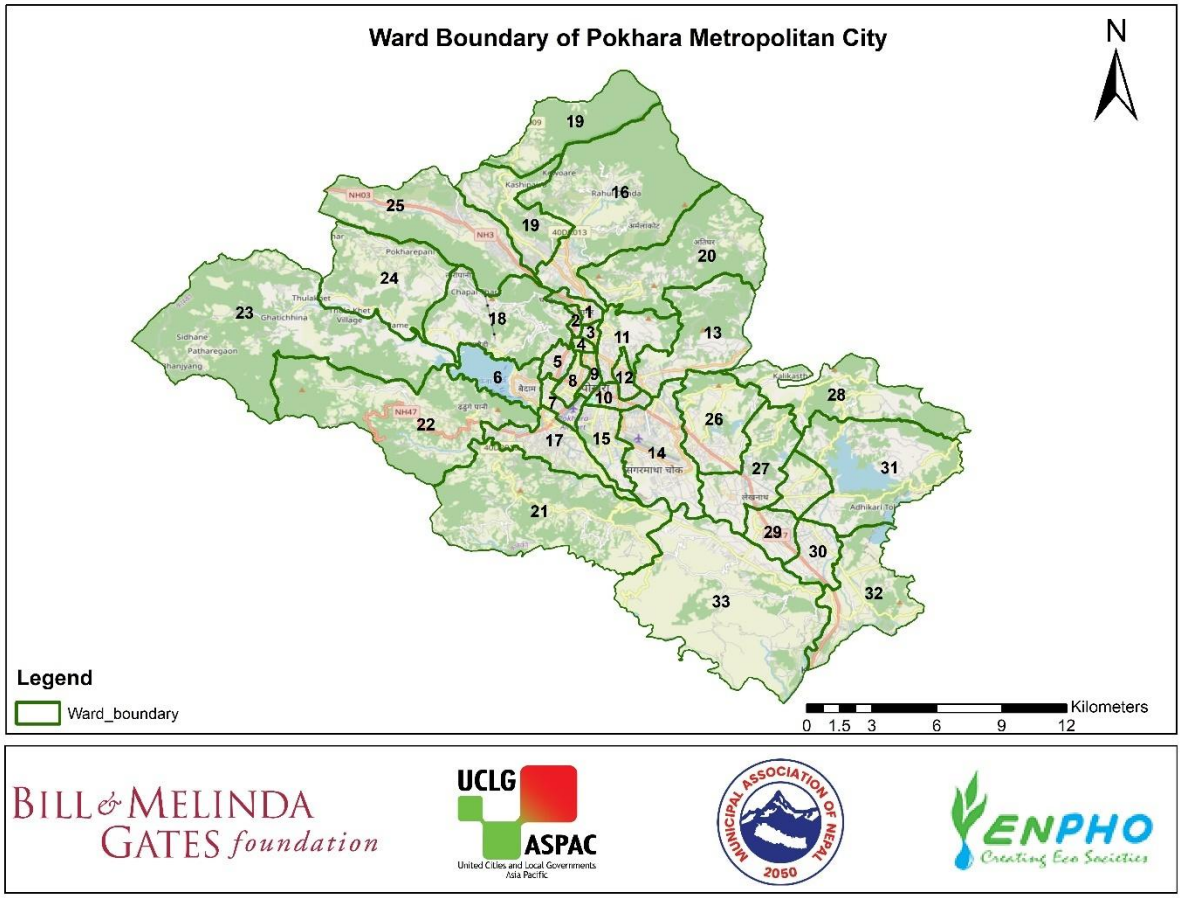

Figure 1: Map of Pokhara Metropolitan City with ward boundaries.

1.1 Population

The National housing and population census 2021 has reported 513,504 people who reside in the municipality. The total male and female population are 247,495 and 266,009 respectively (Table 1). The ward number 17 has the most residents (46,005), while ward number 20 has the fewest (3,936). The total number of households in the municipality is 140,459. Ward number 17 has the most households with a total of 12,658, while ward number 20 has the least number of households with a total of 1,059 (Census 2021, n.d.).

Table 1: Ward Wise Household and Population Data.

Wards	Households	Population	Male	Female	Average Household Size
1	4,274	13,947	6,776	7,171	3.26
2	3,075	10,100	4,984	5,116	3.28
3	2,365	8,284	4,055	4,229	3.50
4	2,597	9,152	4,706	4,446	3.52
5	6,232	22,325	11,082	11,243	3.58
6	3,984	14,455	7,364	7,091	3.63
7	4,672	16,139	7,916	8,223	3.45
8	7,380	25,439	12,796	12,643	3.45
9	4,376	15,981	8,072	7,909	3.65
10	5,128	18,435	8,789	9,646	3.59
11	4,808	17,594	8,531	9,063	3.66
12	3,493	12,710	6,039	6,671	3.64
13	5,758	22,399	10,407	11,992	3.89
14	8,428	31,561	14,960	16,601	3.74
15	6,536	24,406	11,282	13,124	3.73
16	6,654	24,465	11,894	12,571	3.68
17	12,658	46,005	22,066	23,939	3.63
18	3,318	12,945	6,376	6,569	3.90
19	3,639	13,855	6,596	7,259	3.81
20	1,059	3,936	1,851	2,085	3.72
21	2,494	9,070	4,351	4,719	3.64
22	2,088	7,596	3,678	3,918	3.64
23	1,200	4,276	2,018	2,258	3.56
24	1,618	5,950	2,850	3,100	3.68
25	4,592	17,597	8,401	9,,196	3.83
26	4,575	16,777	7,890	8,887	3.67
27	4,369	16377	7814	8563	3.75
28	1,200	4224	1991	2233	3.52
29	4,287	16257	7625	8632	3.79
30	4,307	16192	7702	8490	3.76
31	2,273	8702	4174	4528	3.83
32	3,872	14683	6919	7764	3.79
33	3,150	11670	5540	6130	3.70
Total	**140,459**	**513,504**	**247,495**	**266,009**	**3.66**

(Census 2021, n.d.)

1.2 Climate

The climate here is considered warm and temperate. The summers here have a good deal of rainfall, while the winters have very little. As per the Köppen-Geiger classification, the prevailing weather conditions in this region are categorized under Cwa. The mean yearly temperature recorded in Pokhara is 18.3 °C | 65.0 °F, as per the available data. The rainfall here is around 4851 mm. (Climate Data, n.d.)

1.3 Topography

It is located between 28.227421N/84.055926E to 28.224543N/83.856684E towards the East to West and 28.329535N/84.019180E to 28.131343N/84.002333E towards North to South. The highest elevation of Pokhara is 1,740 metres (5,710 ft.) and lowest elevation 827 metres (2,713 ft.) above sea level.

2 Service Outcomes

2.1 Overview

Data on sanitation situation were collected through household and institutional surveys (ENPHO, 2024). A total of 1,059 households were sampled from 140,459 households distributed in 33 wards. The results obtained after the triangulation and validation of the data with all the data sources including literature reports, Key Informant Interviews (KIIs) and a validation workshop is presented in this section.

2.1.1 Sanitation Status

Kaski District was declared an Open Defecation Free (ODF) zone on 24th June, 2011 (ODF Declaration, 2019). It suggests that everyone has access to basic sanitation facility, basic sanitation facilities are defined as functional improved sanitation facilities separated for males and females on or near the premises. Whereas Basic Sanitation is defined as having access to facilities for the safe disposal of human waste (feces and urine), as well as having the ability to maintain hygienic conditions, through services such as garbage collection, industrial/hazardous waste management, and wastewater treatment and disposal. However, the sanitation situation assessment conducted by ENPHO in 2024 showed that the municipality's basic sanitation coverage is 100% (ENPHO, 2024).

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 transport (Susana, 2018) whereas 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 a sewer technology for transport (Susana, 2018).

Onsite sanitation systems are prevalent in the municipality. 100% of surveyed households rely on onsite sanitation technologies in the municipality. Figure 2 shows the availability of basic sanitation coverage in the municipality.

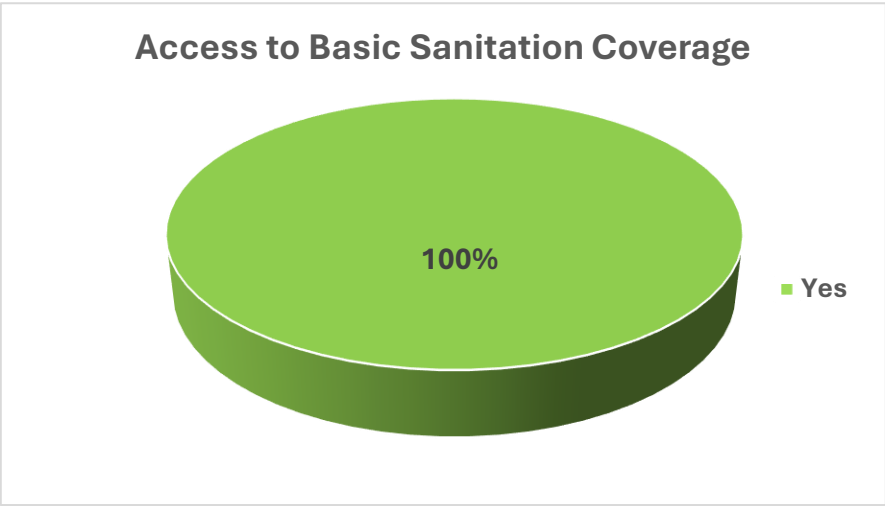

Figure 2: Availability of Basic Sanitation Coverage in Pokhara Metropolitan City.

2.1.2 Types of Containment

The different types of containment installed to store faecal sludge is explained as follows:

A well-designed septic tank is installed in only 1% of the households. 9% of households use fully lined tanks in their houses that are rectangular in shape with no outlets or overflow to discharge effluent which is used to safely store faecal sludge. The walls and bottom of the tanks are totally lined and sealed. Figure 3 shows the types of fully lined tanks constructed in a household at Pokhara Metropolitan City.

Figure 3: Fully Lined Tank.

Also, 5% of the households in the municipality connected their toilet to a biogas digester that uses natural anaerobic decomposition of organic matter under controlled conditions. The digester is usually a large, sealed container for organic matter such as manure from livestock, green waste from agriculture, sewage or food waste which is digested by bacteria in the absence of oxygen to produce a gas containing methane and carbon dioxide. The gas is piped away from the digestor and burnt to produce heat energy.

Figure 4 shows a biogas digester built in a household at Pokhara Metropolitan City.

Figure 4: Biogas Digester.

82% of the households in the municipality have built lined tanks with impermeable walls and open bottom, which are rectangular in shape where the walls of the tanks are lined with plaster or concrete wall and the bottom of the tanks is not lined, just left as it is or with soiling that allows infiltration of effluents. Figure 5 shows a Lined tank with impermeable wall and open bottom.

Figure 5: Lined tank with impermeable wall and open bottom installed in the household at Pokhara Metropolitan City.

3% of the households in the municipality use unlined pits. An unlined pit is a containment constructed with mud mortar stone or brick wall or dry-stone walls and open bottom or could be of no lining. An unlined pit with dry stone wall is popular in the rural areas of the municipality. Table 2 shows the percentage of households with different types of containments in the municipality.

Table 2: Types of containments available in households of Pokhara Metropolitan City (ENPHO, 2024).

Containments	Percentage of Households
Biogas Digester	5%
Fully Lined Tank	9%
Lined Tank with Impermeable walls and open bottom	82%
Septic Tank	1%
Unlined Pit	3%
Grand Total	**100%**

Figure 6 shows the distribution of various types of sanitation technologies in different wards of Pokhara Metropolitan City.

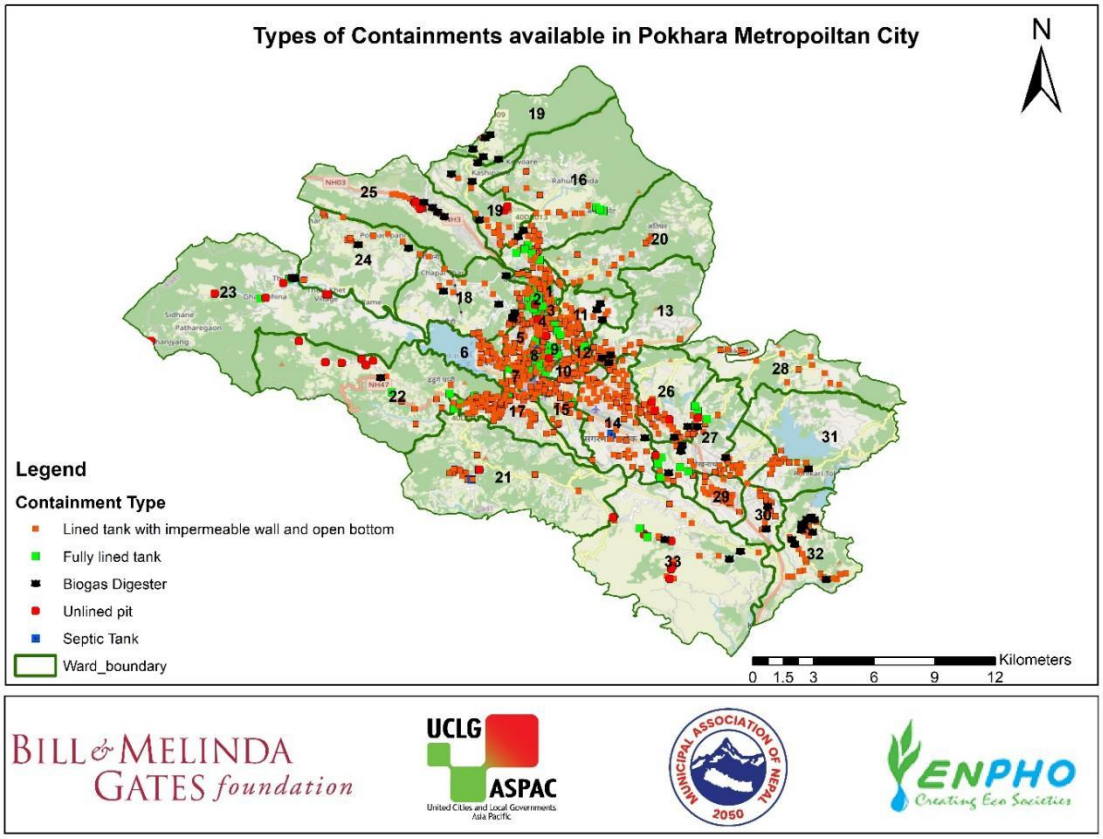

Figure 6: Sanitation Technologies installed in household levels (ENPHO, 2024)

The types of household containments in the municipality are re-categorized to match the containments defined by Shit Flow Diagram Promotive Initiative (SFD PI). The anaerobic biogas digester used to treat household organic waste is also utilized by households to store and treat their faecal sludge. For the purpose of generating the SFD graphic, the biogas digester is modelled as a fully lined tank. Table 3 show types of containment re-categorized according to the SFD PI.

Table 3: Types of containment re-categorized according to Shit Flow Diagram Promotion Initiative (SFD PI) (ENPHO, 2024).

Types of Containments	Percentage of Households
Septic Tank (T1A2C5)	1%
Fully Lined Tank (T1A3C10)	14%
Lined Tank with Impermeable walls and open bottom (T1A4C8, T1A4C10 and T2A4C10)	82%
Unlined Pit (T1A6C10)	3%
Grand Total	**100%**

2.1.3 Emptying and Transportation

Emptying is one of the major components of the sanitation value chain. It ensures proper functioning of containment basically for septic tank which functioned well until the volume of sludge is one-third of the total column of the tank. Also, in other containments, regular emptying prevents overflow of the sludge and blockages (Linda Strande, 2014).

12% of the surveyed households have emptied the containment at least once since installation through manually or mechanical emptying services, whereas 88% of the households did not empty their containment as it has not been filled yet.

Table 4 represents the overall emptying percentage of containment at least once since installation.

Table 4: Overall Emptying percentage of Containment at least once since installation (ENPHO, 2024).

Containment	Never emptied	Emptied at least once
Biogas Digester	0%	5%
Fully lined tank	7%	1%
Lined tank with impermeable wall and open bottom	77%	5%
Septic Tank	1%	0%
Unlined pit	3%	1%
Grand Total	**88%**	**12%**

Figure 7 represents the map of Pokhara Metropolitan City showing the status of sanitation technology that has been emptied at least once.

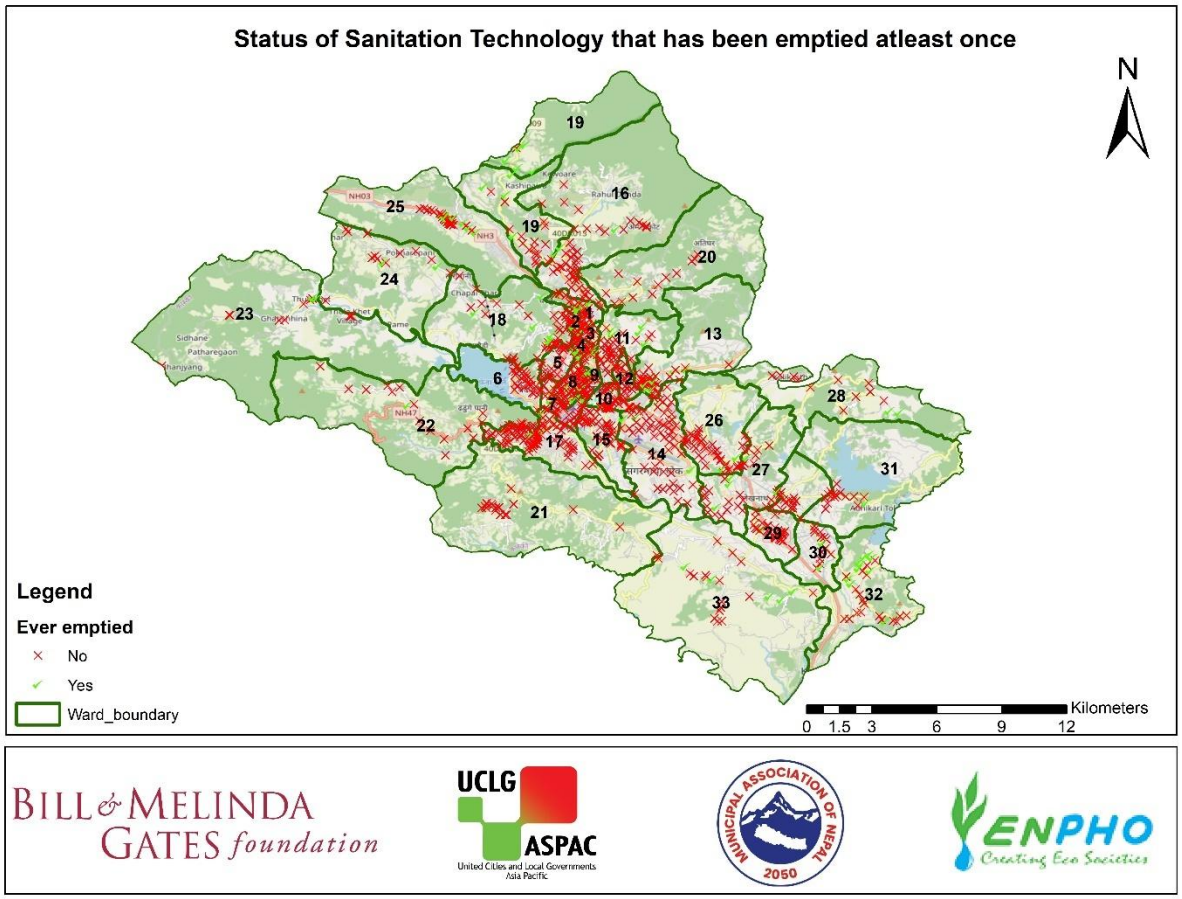

Figure 7: Status of household which have emptied their containment at least once.

The municipality does not have its own desludging vehicle; instead, Solid Waste and Faecal Sludge management services are handled by a private company called Bhadrakali Waste Management Private Limited, which was chosen by the municipality after a bidding process. It has been offering services to the urban areas of Pokhara Metropolitan City since 2009.

The company owns five desludging vehicles, however only two of them are currently being employed for Faecal Sludge (FS) service, with capacities of 5,000 and 5,200 litres. Fourteen employees assist with both solid waste and faecal sludge desludging services. The employees do not wear uniforms, but they are provided with gloves, boots, and masks for safety while working. It charges NPR 5,500 (USD 39) per trip for rectangular or circular containments, which vary depending on travel distance. The municipality sets the standard fee for FS desludging (KII-4, 2024). Figure 8 shows the desludging vacuum truck available in Pokhara Metropolitan.

Figure 8: Mechanical Desludging Vehicle available in Pokhara Metropolitan City.

2.1.4 Treatment and Disposal/Reuse

Pokhara Metropolitan City used to have one Faecal Sludge Treatment Plant. There used to be one, but since the opening of the newly constructed Pokhara International Airport, the treatment plant's operation has been halted because it is located near a solid waste dumping site, which attracts various species of birds and may disrupt air traffic. Currently, a few amount of emptied faecal sludge from houses is delivered to Gandaki Urja Pvt. Ltd. for treatment, which includes Nepal's largest commercial biogas facility, which can produce 11,000 kg of organic fertilizer and 1,600 kg of compressed natural gas per day from 45 tons of organic waste. The factory is built to handle organic waste, therefore faecal sludge treatment is still in the experimental phase. As a result, only a fewe amount of FS emptied is sent to the plant. This demonstrates that the majority of FS discharged is applied to farmlands after emptying, which is considered as unsafely managed practice. Some houses in the city have illegally connected toilets to open drainage (KII-1, Interview with Municipal Officers, 2023).

After the manual emptying, the majority of FS emptied is disposed of through dig and dump method, while the remaining percentage of FS emptied is applied in farmlands, which are both considered as an unsafely managed practice. Figure 9 shows the Faecal Sludge Treatment Plant that has been dismantled after the construction of new Airport and Biogas Digester of Gandaki Urja Private Limited.

Figure 9: Dismantled Faecal Sludge Treatment Plant (Left) and Gandaki Urja Pvt. Ltd. (Right).

2.1.5 Sanitation System at Institutional Level

Altogether 101 institutions from educational institutions, governmental and non-governmental offices, health care centres and hotels were assessed randomly. It was revealed that 100% of such buildings had connected their toilet to onsite sanitation technologies. The percentage of types of onsite sanitation technologies in these buildings are shown in Figure 10.

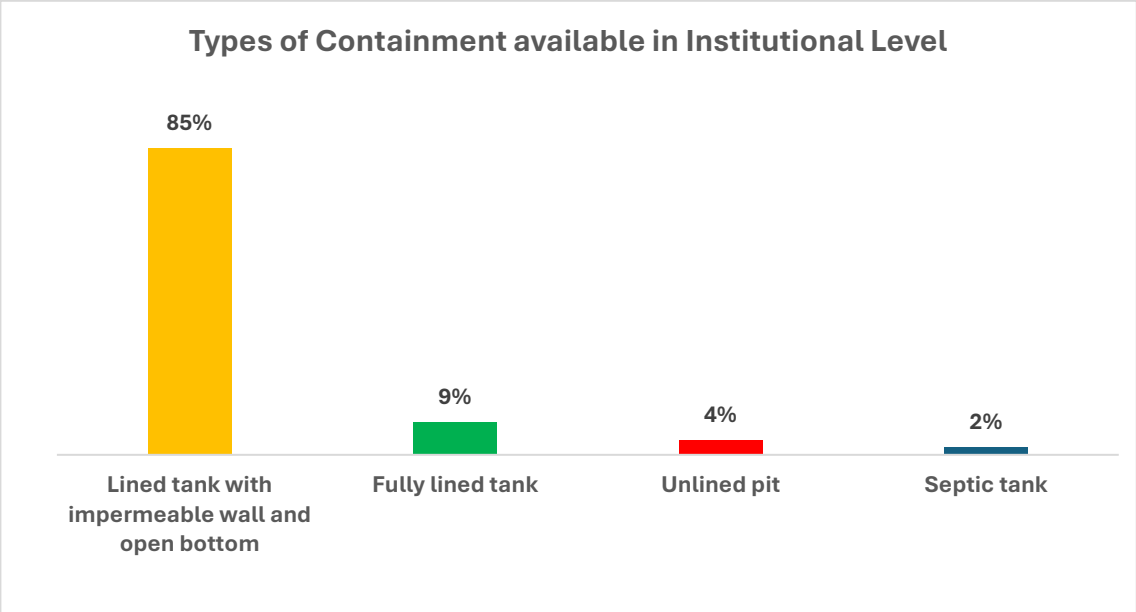

Figure 10: Types of containment available in institutions of Pokhara Metropolitan City (ENPHO, 2024).

From institutional survey, 11.88% of institutions in Pokhara Metropolitan City have emptied their containments and 88.12% of institutions have not emptied because they were never filled.

Distribution of different types of onsite sanitation technologies of institutions in various wards of Pokhara Metropolitan City is shown in Figure 11.

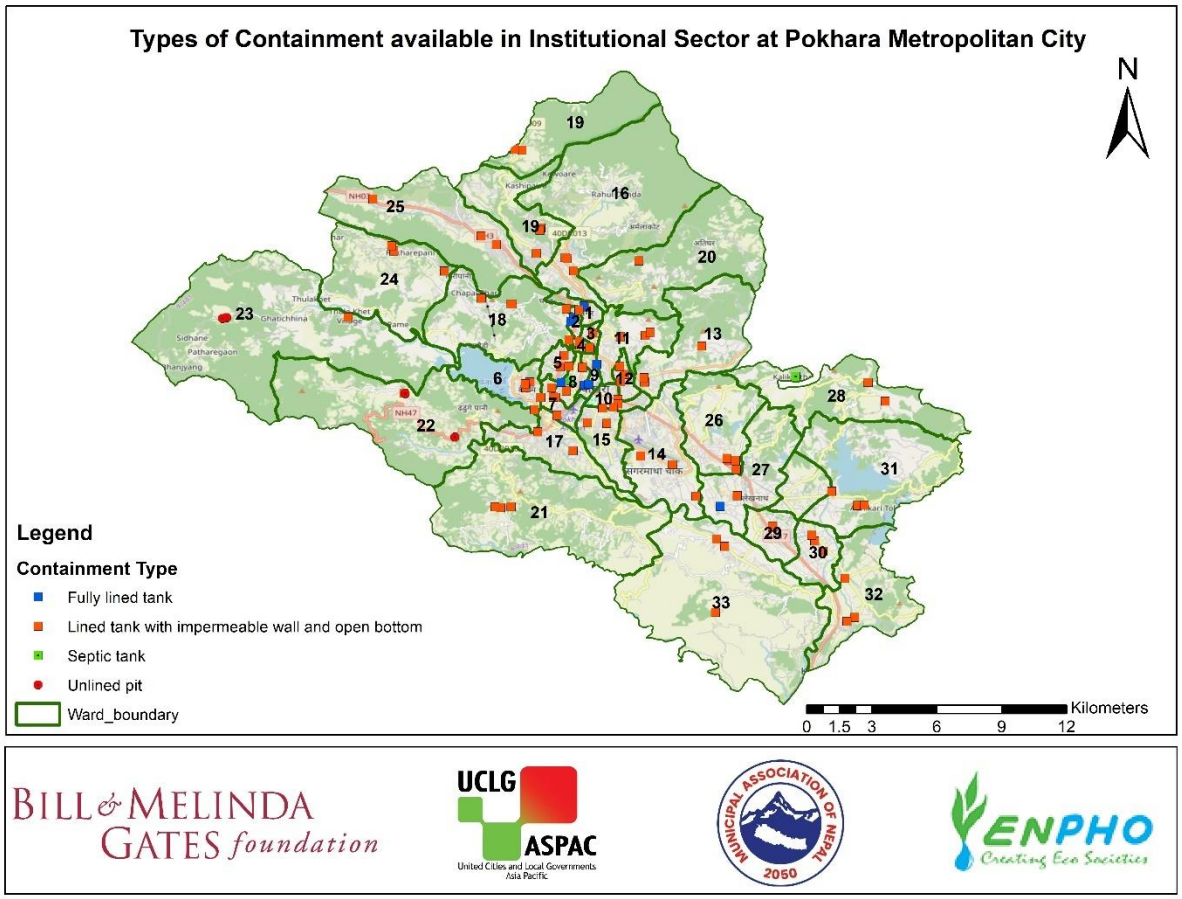

Figure 11: Types of onsite sanitation systems available in institutions of Pokhara Metropolitan City (ENPHO, 2024).

2.1.6 Public Toilets

The Pokhara Metropolitan City has many public toilets. Only 5 significant public toilets were examined during the survey. The majority of public toilets are located near lake side area. The last picture from the table lies near the bus park. Private operators are responsible for collecting fees, operating and maintaining all public toilet. (KII-1, KII with Municipal officers, 2023). Figure 12 shows the pictures of the public toilets during the survey.

Figure 12: Public Toilets available in Pokhara Metropolitan City.

2.1.7 Risk 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 the aquifer with regards to lateral spacing between sanitation system and groundwater sources (KII-2-3, 2024).

2.1.8 Source of Drinking Water and Water Production

a) Water Supply:

Nepal Water Supply Corporation (NWSC) and Lekhnath Water Supply User Committee are the major water service providers in Pokhara Metropolitan City. Details about the service providers are listed in Table 5 below.

Table 5: Details of Water Service Providers available in Pokhara Metropolitan City.

Name	Nepal Water Supply Corporation (NWSC)	Lekhnath Water Supply User Committee
		
Established Date:	2046 B.S (1989 A.D)	2058/59 B.S (2001A.D) (fully operational from 2008)
Sources:	Mardi Khola, Baldhara Muhan, Bhoti Khola, and Deep Boring Water	Giunje Khola located in Madi Gaupalika.
Catchment Area:	Ward: 1 to 19	Ward: 26 and 31
Tap numbers:	Around 50,000 HHs	Around 16,635 HHs (including 124 community tap)
Treatment Units:	Chlorination before distribution and Construction of treatment units going under Japan International Corporation Agency (JICA) project that includes Sedimentation Unit, Slow Sand Filter and others.	Sedimentation Unit, Roughing Filter, Pressure Filter, Distribution Chamber (Lekhnath Water Supply User Committee, n.d.)
Reservoirs:	5 nos of Reservoir Tanks: - 4000 m^3, 500 m^3, 2 nos of 250 m^3 Tank - 450 m^3 overhead tank	All together reservoir capacity: - 2,100 m^3
Pipeline:	Transmission Line: 16 km Distribution Line: 100 km Construction for further transmission and distribution mains is going on various wards (KII-2-3, 2024)	Transmission Line: 355 mm dia. HDPE pipe to 200 mm dia. Ductile Iron (D.I) pipes Distribution Line: 315 km

Figure 13 shows Distribution Network of the piped drinking water supply system from NWSC in municipality.

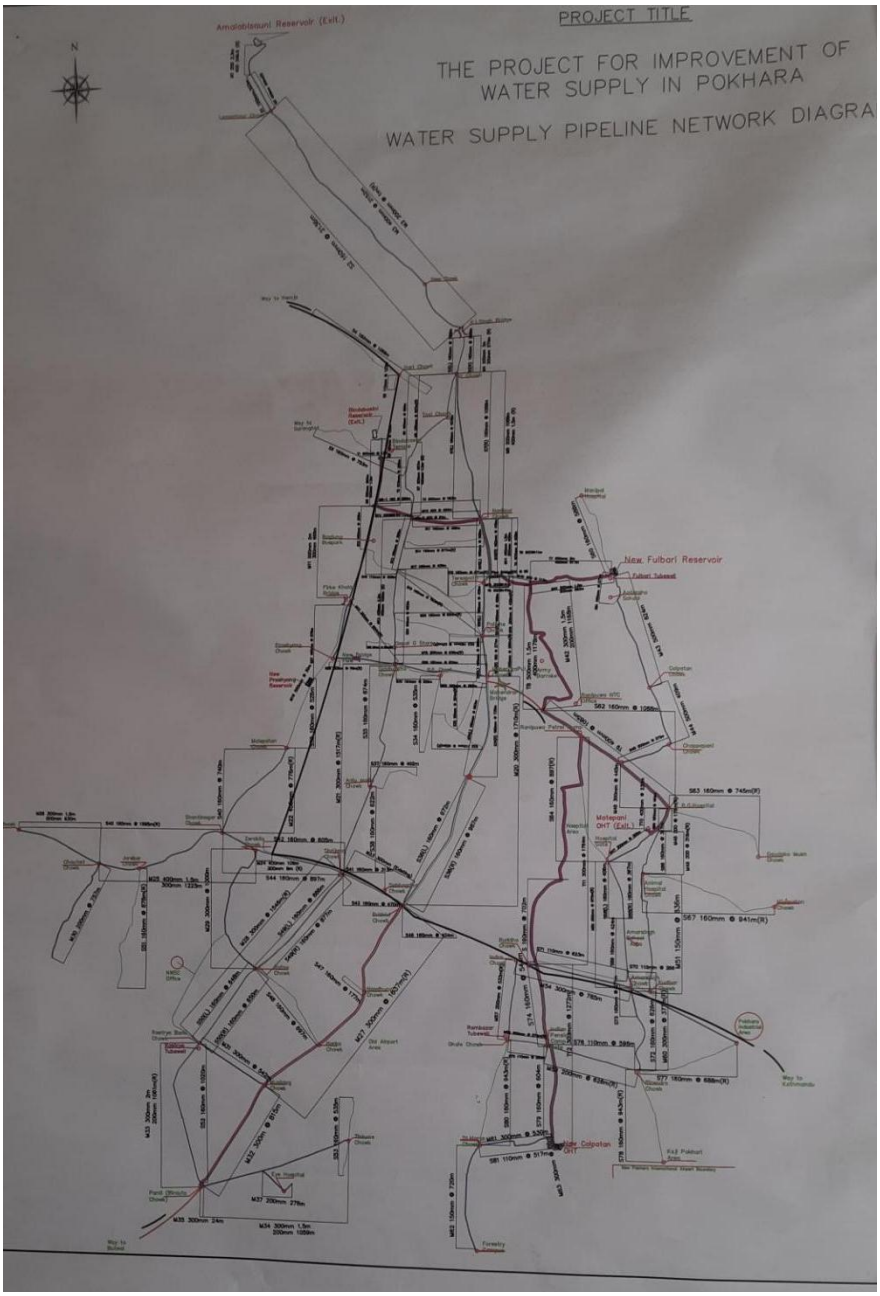

Figure 13: Transmission and Distribution Lines.

b) The vulnerability of the aquifer and lateral spacing between sanitation system and groundwater source

The term aquifer pollution vulnerability is intended to represent the varying level of natural protection afforded by the contaminant attenuation capacity of the unsaturated zone or semi-confining beds above an aquifer, because of physicochemical processes (filtration, biodegradation, hydrolysis, adsorption, neutralization, volatilization, and dispersion)—all of

which vary with their texture, structure, clay content, organic matter, pH, redox and carbonate equilibria. Groundwater vulnerability is specific to containment type and pollution scenarios (Andreo, 2013) Here, among the various types of onsite sanitation technologies, lined tanks with impermeable walls and open bottom and lined pits are more prone to contribute to aquifer pollution as the nature of such containments impose more containment load from the land surface to groundwater.

A key determinant of risk variation is the soil and geological setting. Especially for consolidated hard rock sediments with poor soil cover and shallow water tables, the risk is higher. According to WHO criteria, 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 (Krishnan, 2011). The size of pores in the soil determines the infiltration rate. In the sandy loam soil, the permeability is approximately 2.5 cm per hour. Thus, between 25 and 50 days the pollutant could travel to the depth of approximately 30 metres (98.67 feet) in sandy loam soil. Hence, the people using open bottom tanks and consuming water from the handpumps with the depth up to 98.67 feet (30 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.

However, most households in the municipality rely on Private Taps for drinking water supply. 82% of the households in the municipality depend on Private Tap water for drinking and other daily activities. The remaining households depend on Jar water and Spring sources for drinking and a small percentage of the population depend on public tap water as well. Nepal Water Supply Corporation (NWSC) is major water service provider in the municipality. Currently Japan International Cooperation Agency (JICA) alongside with Nepal Government is supporting NWSC for implementing a project to improve water supply in the municipality with a treatment plant, reservoirs as well as rehabilitation of water supply network. Figure 14 shows the various sources of drinking water available in the municipality.

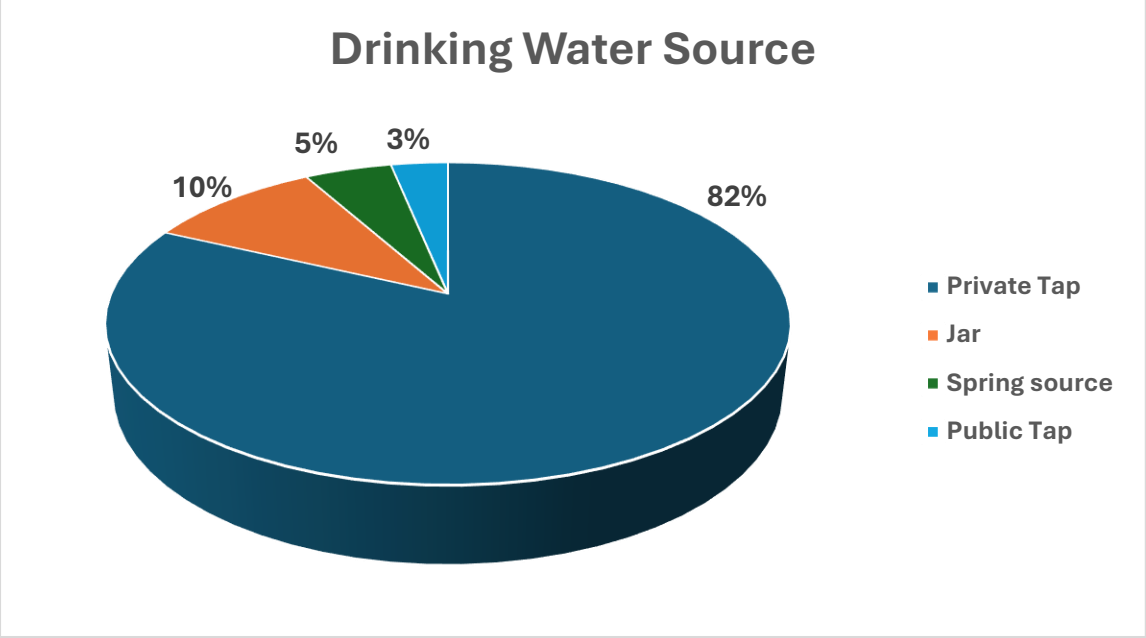

Figure 14: Types of Sources of Drinking Water in the Municipality (ENPHO, 2024).

Nevertheless, population using spring sources (located near residential areas with high percentage of households having lined tanks with open bottom) as major source of drinking water without using any form of point of use options are considered at significant risk. Therefore, 4% of the population use lined tanks with impermeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution (T2A4C10).

2.2 SFD Selection Grid

Types of sanitation technologies selected in the SFD selection grid in the municipality are shown in Figure 15. The vertical column in the left side of the SFD selection grid has a list of technologies to which the toilet is connected to and open defecation in case of households without toilet. Similarly, horizontal row at the top of the selection grid shows options for connection for outlet or overflow discharge from toilet.

Thus, different types of sanitation systems and their outlet are selected in the selection grid and the proportion of the population using such types of systems is calculated in the SFD graphic generation process.

List A: Where does the toilet discharge to? (i.e. what type of containment technology, if any?)	List B: What is the containment technology connected to? (i.e. where does the outlet or overflow discharge to, if anything?)									
	to centralised combined sewer	to centralised foul/separate sewer	to decentralised combined sewer	to decentralised foul/separate sewer	to soakpit	to open drain or storm sewer	to water body	to open ground	to 'don't know where'	no outlet or overflow
No onsite container. Toilet discharges directly to destination given in List B					Significant risk of GW pollution Low risk of GW pollution					Not Applicable
Septic tank					Significant risk of GW pollution T1A2C5					
Fully lined tank (sealed)					Significant risk of GW pollution Low risk of GW pollution					T1A3C10
Lined tank with impermeable walls and open bottom	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution			T1A4C8		T2A4C10 T1A4C10
Lined pit with semi-permeable walls and open bottom	Not Applicable									Significant risk of GW pollution Low risk of GW pollution
Unlined pit										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									Not Applicable

Figure 15: SFD selection grid for Pokhara Metropolitan City

A brief explanation of terms used to indicate different frames selected in the SFD selection grid in Figure 15 is explained in Table 6.

Table 6: Explanation of terms used to indicate different frame selected in the SFD selection grid in Figure 15.

T1A2C5	A correctly designed, properly constructed, fully functioning septic tank with an effluent outlet connected to a correctly designed, properly constructed, fully functioning soak pit. The supernatant/effluent flowing from the tank is only partially treated and is still hazardous, but since it is captured in the soak pit, all the excreta in this system is considered contained.
T1A3C10	A correctly designed, properly constructed and well maintained fully lined tank with impermeable walls and base. Since the tank is not fitted with a supernatant/effluent overflow this system is considered contained.
T1A4C8	A correctly designed, properly constructed and well-maintained lined tank with sealed, impermeable walls and an open, permeable base, through which infiltration can occur. Since the tank is fitted with a supernatant/effluent overflow connected to open ground, the excreta in this system are considered not contained.
T1A4C10 (Low Risk)	A correctly designed, properly constructed and well-maintained lined tank with sealed, impermeable walls and an open, permeable base, through which infiltration can occur. 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.
T2A4C10 (High Risk)	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 are 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. 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.

2.2.1 SFD Matrix

SFD matrix is the second step to generate SFD graphics. The 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:

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

Here, data for each selected sanitation system on the SFD Matrix is entered. The proportion of the contents of each type of onsite container (either septic tanks; or fully lined tanks (sealed); or lined tanks with impermeable walls and open bottom and all types of pits), is shown in Figure 16. The proportion of FS emptied (F3) is obtained from KIIs. The FS delivered to treatment and treated is shown in columns F4 and F5, respectively.

The municipality does not have any form of treatment plant to treat faecal sludge. The FS emptied from the containments is dumped openly in farmlands or water bodies. Thus, values for variables F4 and F5 for all sanitation systems are set to 0%. However, FS from anaerobic biogas digesters, classified as fully lined tanks (system T1A3C10) that accounts for 81% (F4=81%) of the total fully lined tanks, is considered as transported and treated with a treatment efficiency estimated at 95% (F5=95%). Figure 16 shows the SFD matrix of Pokhara Metropolitan City.

Pokhara Metropolitan City, Gandaki, Nepal, 26 Feb 2024. SFD Level: 2 - Intermediate SFD
Population: 513504
Proportion of tanks: septic tanks: 100%, fully lined tanks: 100%, lined, open bottom tanks: 1

Containment				
System type	Population	FS emptying	FS transport	FS treatment
	Pop	F3	F4	F5
System label and description	Proportion of population using this type of system (p)	Proportion of this type of system from which faecal sludge is emptied	Proportion of faecal sludge emptied, which is delivered to treatment plants	Proportion of faecal sludge delivered to treatment plants, which is treated
T1A2C5 Septic tank connected to soak pit	1.0	0.0	0.0	0.0
T1A3C10 Fully lined tank (sealed), no outlet or overflow	14.0	42.0	81.0	95.0
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	77.0	6.0	0.0	0.0
T1A4C8 Lined tank with impermeable walls and open bottom, connected to open ground	1.0	0.0	0.0	0.0
T1A6C10 Unlined pit, no outlet or overflow	3.0	9.0	0.0	0.0
T2A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	4.0	4.0	0.0	0.0

Figure 16: SFD Matrix of Pokhara Metropolitan City.

2.2.2 SFD Matrix Explanation

The sanitation technologies and the corresponding percentage of the population using such technologies are shown in Figure 16 (SFD Matrix). These values are derived from the household survey (ENPHO, 2024).

2.2.3 Proportion of FS Emptied and Transported

The proportion of faecal sludge emptied (F3) is calculated based on percentage containment emptied (ENPHO, 2024) and amount of FS emptied during the process (KII-1, interview with municipal officers, 2023). The information on FS emptied from containment is obtained from Key Informant Interviews (KIIs) with desludging service providers. As per the desludging service provider portion of liquid in the FS is high which can be easily pumped out by the desludging vehicle. So, almost 90% of the FS content in the containment is removed during emptying. Hence, actual proportion of FS emptied from each containment is calculated as:

$$FS\ proportion\ emptied\ from\ containment = percentage\ of\ containment\ emptied \times proportion\ of\ FS\ emptied$$

The proportion of FS emptied from different types of sanitation technologies are shown in Table 7.

Table 7: Sanitation Technologies and Proportion of Faecal Sludge Emptied (ENPHO, 2024[1]; KII-1, 2023[2]).

S.N.	Sanitation Technologies	SFD Reference Variable	Percentage of Emptied Containment [1]	A Proportion of FS emptied during emptying. [2]	F3
1	Septic tank connected to soak pit	T1A2C5	0.00%	90%	0%
2	Fully lined tank (sealed), no outlet or overflow	T1A3C10	46.54%	90%	42%
3	Lined tank with impermeable walls and open bottom, connected to open ground	T1A4C8	0.00%	90%	0%
4	Lined tank with impermeable walls and open bottom, no outlet or overflow	T1A4C10	6.38%	90%	6%
5	Unlined pit, no outlet or overflow	T1A6C10	9.44%	90%	9%
6	Lined tank with impermeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	T2A4C10	4.72%	90%	4%

2.3 Summary of Assumptions

Onsite Sanitation System:

- ✓ The proportion of FS in septic tanks was set to 100%, the proportion of FS in fully lined tanks was set to 100% and the proportion of FS in lined tanks with impermeable walls and open bottom and all types of pits was set to 100% according to the relative proportions of the systems in the municipality, as per the guidance given in the Frequently Asked Question (FAQs) in the sustainable Sanitation Alliance (SuSanA) website.
- ✓ Variables F3, F4 and F5 for all onsite sanitation systems were derived from the HH survey and cross-checked with KIIs conducted.
- ✓ The municipality does not have any form of treatment plant to treat faecal sludge. The FS emptied from the containments is dumped openly in farmland or water bodies. Thus, variables F4 and F5 for all sanitation systems are set to 0%. However, FS from anaerobic biogas digesters, classified as fully lined tanks (system T1A3C10), is considered as transported (F4 = 81%) and treated with a treatment efficiency estimated at 95% (F5 = 95%).

2.4 SFD Graphic

Figure 17 shows the SFD graphic for Pokhara Metropolitan City. In the graphic, the percentage of FS and wastewater (WW) indicated by colour green represents safely managed excreta (89%) whereas the percentage in colour red represents unsafely managed excreta (11%). Figure also represents the sanitation value chain going from left to right.

FS contained, i.e., FS kept in a container which is safe from human contact, in onsite sanitation, whether emptied or not is safe. The FS contained - not emptied is also FS stored in tanks and pits which are in safe distance from sources of drinking water. Further, FS not contained is FS kept in containment which possesses risk to human health through groundwater contamination. The lack of a faecal Sludge Treatment Plant (FSTP) in the Municipality leads to disposal of FS in farmlands and water bodies.

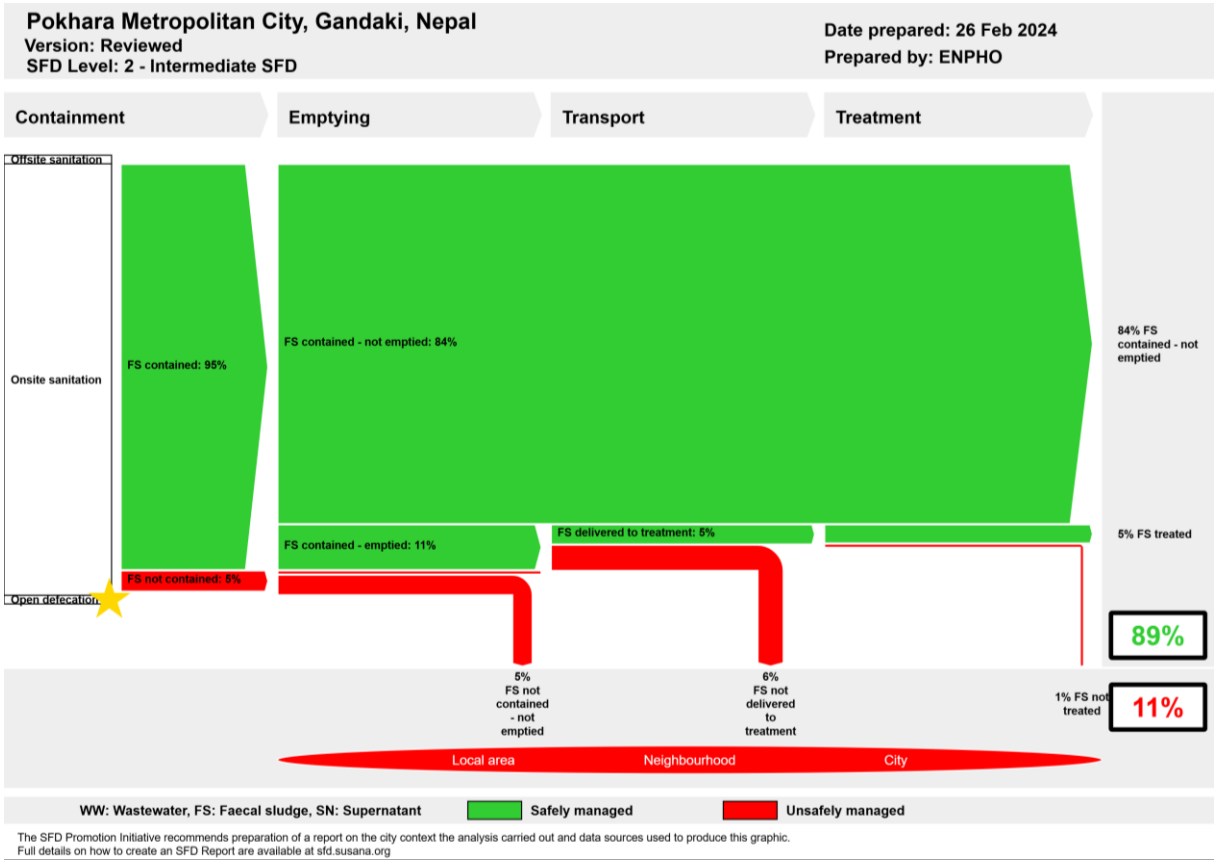

Figure 17: SFD graphic of Pokhara Metropolitan City.

The faecal sludge that is safely managed (89%) is further segregated as 84% of FS which is safely collected in the containment which has not been emptied. This 84% 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 service in the short and medium term as they fill up. The remaining 5% corresponds to FS safely treated and managed in the biodigesters.

The FS that is unsafely managed (11%) is divided into: FS emptied but not delivered to treatment (6%) which is unsafely disposed of into the environment and FS not contained - not emptied (5%), having a risk of groundwater contamination through seepage. A further 1% corresponds to FS not treated by the biogas digesters.

Lack of FSTP in the Municipality leads to disposal of FS in farmland and water bodies. Considering the SFD graphic, FS management is a concern for the municipality even through FS which is safely collected but emptied will eventually be emptied in future and will require safe management.

Off-site Sanitation

Nepal Multiple Indicator Survey (MICS) reported that among the total households in Nepal, 10.7% of households has a toilet connected to sewer network and in Gandaki province it is 3% (CBS, 2020). All the surveyed households depend on onsite sanitation systems. There is no sewer network available in the municipality.

Onsite Sanitation

100% of the population relies on onsite sanitation systems. Pokhara Metropolitan City does not have a treatment plant, which was confirmed by the information collected during the KII with the municipal officer (KII-1, interview with municipal officers, 2023). The majority of FS emptied is delivered to the farmland after mechanical emptying few FS is transported to Gandaki Urja Private Limited for treatment whereas manual emptied FS is disposed to open land or farmlands. The description on the fate of FS from the onsite sanitation systems as shown in the SFD graphic is explained in Table 8.

Table 8: Description of the percentages of the SFD graphic (Susana, 2018).

Variables	Description	Percent
FS contained	Faecal sludge that is contained within an onsite sanitation technology which is technically effective.	95%
FS not contained	Faecal sludge that is stored in an unsafe onsite sanitation technology.	5%
FS contained - not emptied	FS that is contained within an onsite sanitation technology and not removed where there is no significant risk to groundwater pollution. These containments are fully lined tanks (sealed), no outlet or overflow (T1A3C10), fully lined tanks with impermeable walls and open bottom without outlet or overflow (T1A4C10) and unlined pits (T1A6C10) without significant risk to groundwater.	84%
FS contained - emptied	FS that is contained in onsite sanitation technology and emptied either mechanically or manually.	11%
FS not contained -not emptied	FS that is not contained within an onsite sanitation technology and not removed which may either remain in the containment or infiltrate to ground polluting groundwater.	5%
FS - treated	FS treated in a well functioned anaerobic biogas digester.	5%
FS not delivered to treatment	FS emptied from an onsite sanitation system is either FS contained or not but is not delivered to the treatment plant.	6%
FS not treated	FS emptied from an onsite sanitation system but is not delivered to the treatment plant.	1%

Open Defecation

Nepal Multiple Indicator Survey (MICS) reported that among the total households in Nepal, 5% of households still practice open defecation and only in Gandaki Province it is 1% (CBS, 2020). However, sanitation situation assessment conducted by ENPHO in 2023 showed that 100% of surveyed households in the municipality have access to basic sanitation coverage. (ENPHO, 2024).

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 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. Provision of gender, children and disabled friendly public toilets in parks, petrol pumps and

main market as basic indicator for municipal level. Advance indicators such as drainage discharged only after being processed through biological or engineering technique. While it has failed to identify the necessity of faecal sludge treatment plants as it has assumed safety tank in the households is sufficient for treating faecal sludge.

Institutional and Regulatory Framework for Faecal Sludge Management, 2017

Ministry of Water Supply through its Department of Water Supply and Sewerage Management (DWSSM) articulated and endorsed Institutional and Regulatory Framework (IRF) for Faecal Sludge Management in Urban Areas of Nepal in 2017. The main objective of the IRF is to define the specific roles and responsibilities of key institutions for the effective management and regulation of Faecal Sludge Management (FSM). The framework primarily envisioned featuring FSM in the national policy and issuing policy directives into local government to incorporate FSM in their urban planning along with strengthening and enhancing the capacity of the local government to deliver effective services. A local government has been endowed with overall responsibility to plan, implement, and regulate the FSM services within its jurisdiction. The provision of the ability to engage the private sector and other relevant stakeholders such as the Water 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 the 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 (DWSSM, 2009).Thus, National Urban Water Supply and Sanitation Sector Policy (NUWSSSP) was formulated and enforced in 2009. It focused on achieving coherent, consistent, and uniform approaches of development in urban areas with the involvement of different agencies and institutions. 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 (UNGA, 2010). Nepal committed to Millennium Development Goals (MDGs) for 2000- 2015. The goal was accomplished through declaration of the country as free from open defecation on 30th September 2019. National Sanitation and Hygiene Master Plan, 2011 was developed for coordinated planning and implementation of National Sanitation Campaign. The campaign strengthened institutional setup tier of government in a participatory approach. In an alignment total sanitation campaign was initiated formally to sustain ODF. The guideline set various indicators to assess the sustainability of sanitation services. Remarkably, it extended sanitation definition as management of services and facilities to safely dispose of/reuse faecal sludge, collection and treatment of solid waste and wastewater to establish the hygienic environment and promote public health (NPC, 2017).

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.

3.2.1 Institutional Roles

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

At Federal Level

National Planning Commission: At the federal government, the National Planning Commission 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 18.

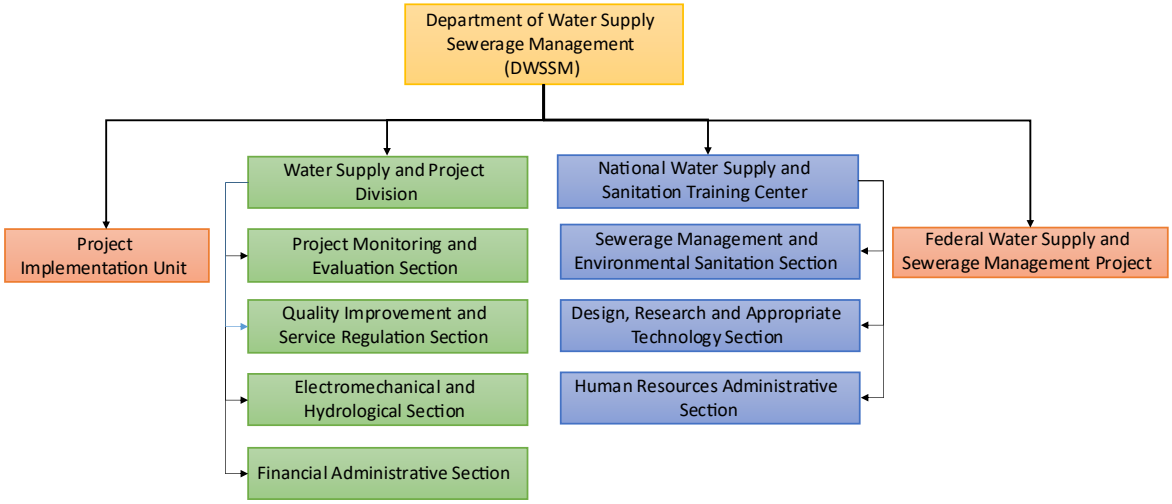

Figure 18: Organizational Structure Department of Water Supply and Sewerage Management (DWSSM).

At Provincial Level

Ministry of Physical Infrastructure: Ministry of physical infrastructure of provincial government in Madesh Province is the major executing body in the province. 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 the terai region, 3,000 to 5,000 in hilly region and 500 to 1,000 in Himalayan region.

3.2.2 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, the Public-Private Partnership Policy, 2015 encourages private sector investment in the development and operation of public infrastructure services for comprehensive socio-economic 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).

3.2.3 Service Standards

The sanitation service standards have 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 9. However, FSM specific standards have yet to be developed and implemented.

Table 9: 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	✓	✓	✓
5	Surface drains for collection, transmission, and disposal of	✓	✓	✓
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	✓	✓	✓

3.3 Planning

3.3.1 Service Targets

The plans and programs for development in Nepal is guided by a national development framework formulated by the national planning commission in coordination with sectoral ministries. The ministry of finance allocates budgets and releases them to executing agencies and coordinates with development partners to address resource gaps. Nepal is committed to the SDGs which has been reaffirmed in key documents such as the current 15th development plan and the 25-year long-term vision 2100 that internalizes the sustainable development goals (NPC, 2020). The SDGs codes are assigned for all national development programs through the Medium-Term Expenditure Framework (MTEF). The MTEF sets out three-year spending plans of the national and provincial governments which aims to ensure that budgets reflect social and economic priorities and give substance to reconstruction and development commitments (NPC, 2020). Further, Nepal has prepared the SDG status and roadmap to localize the SDG indicators with baselines and targets for 2030. Nepal has set the following target and indicator focused on sanitation based on global SDGs as shown in Table 10.

Table 10: National SDG target and indicator on sanitation.

National SDG Target and Indicator		2015	2019	2022	2025	2030
Target 6.2 By 2030, 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						
6.2.1 Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water						
1	Households using improved sanitation facilities which are not shared (%)	60	69.3	78.7	85.7	95
2	Proportion of population using latrine (%)	67.6	75.7	83.8	90	98
3	Sanitation coverage (%)	82	86.5	89.9	93.3	99
4	Urban households with toilets connected to sewer systems/ proper FSM (%)	30	46	62	74	90

4 Stakeholder Engagement

4.1 Key Informant Interviews (KIIs)

KIIs and objective sharing of the study were conducted with the major stakeholders of sanitation sector of the municipality. Interviews were performed with Mrs. Kalpana Baral and Mr. Netra Timalsena, Sanitation Head and Engineer of Pokhara Metropolitan City for sanitation and desludging activities, planning and other activity that is going on sanitation sector, Mr. Prakash Silwal, Sub-Engineer of Nepal Water Supply Corporation (NWSC), Mr. Ramesh Giri, Engineer of Lekhnath Drinking Water Users Committee and Similarly, Mr. Arjun Tamang, manager of Desludging service provider were interviewed to understand faecal sludge management practice and business opportunities of the sector in the municipality. Table 11 shows the KIIs with the Municipal officers, Water Users committee and Desludging Service providers (Figure 19).

Table 11: List of Key Informant Interviewed personnel.

S.N.	Name	Designation	Organization	Purpose of KII	Date
1.	Kalpana Baral, Netra Timalsena, (KII-1)	Sanitation Section Head and Engineer	Pokhara Metropolitan City	Sanitation status, Ongoing projects on Sanitation, Policies and plan for Sanitation development	1st Oct, 2023
2.	Prakash Silwal (KII-2)	Sub-Engineer	Nepal Water Supply Corporation (NWSC)	Supply and demand of water, water sources, groundwater contamination risk	29th Jan, 2024
3.	Ramesh Giri (KII-3)	Engineer	Lekhnath Drinking Water Users Committee	Supply and demand of water, water sources, groundwater contamination risk	1st Oct, 2023
4.	Arjun Tamang (KII-4)	Manager (Desludging Servicer Provider)	Bhadrakali Waste Management Pvt. Ltd.,	Emptying practices, finances, requirement, disposal and treatment	29th Jan, 2024

Figure 19: KII with Municipal officers and Manager of Lekhnath Drinking Water Users Committee.

4.2 Household Survey

Household survey was conducted in all wards of the municipality through mobilization of enumerators selected by the municipality. The enumerators were given two days orientation about sanitation and methods for conducting HH survey. The household survey was conducted using mobile application "KOBOCOLLECT" after orientation. SFD team members along with municipal focal person went on field visits in households to encourage enumerators and observe household sanitation status.

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 $no = \frac{z2pq}{e2}$ and its finite population correction for the proportion n= no/(1+ (no-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 practicing 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

nh= (Nh/N)*n, where Nh is the total population in each stratum.

Thus, a total of 1,059 households were sampled from 140,459households distributed in 33 wards with proportionate stratification random sampling which is shown in Figure 20.

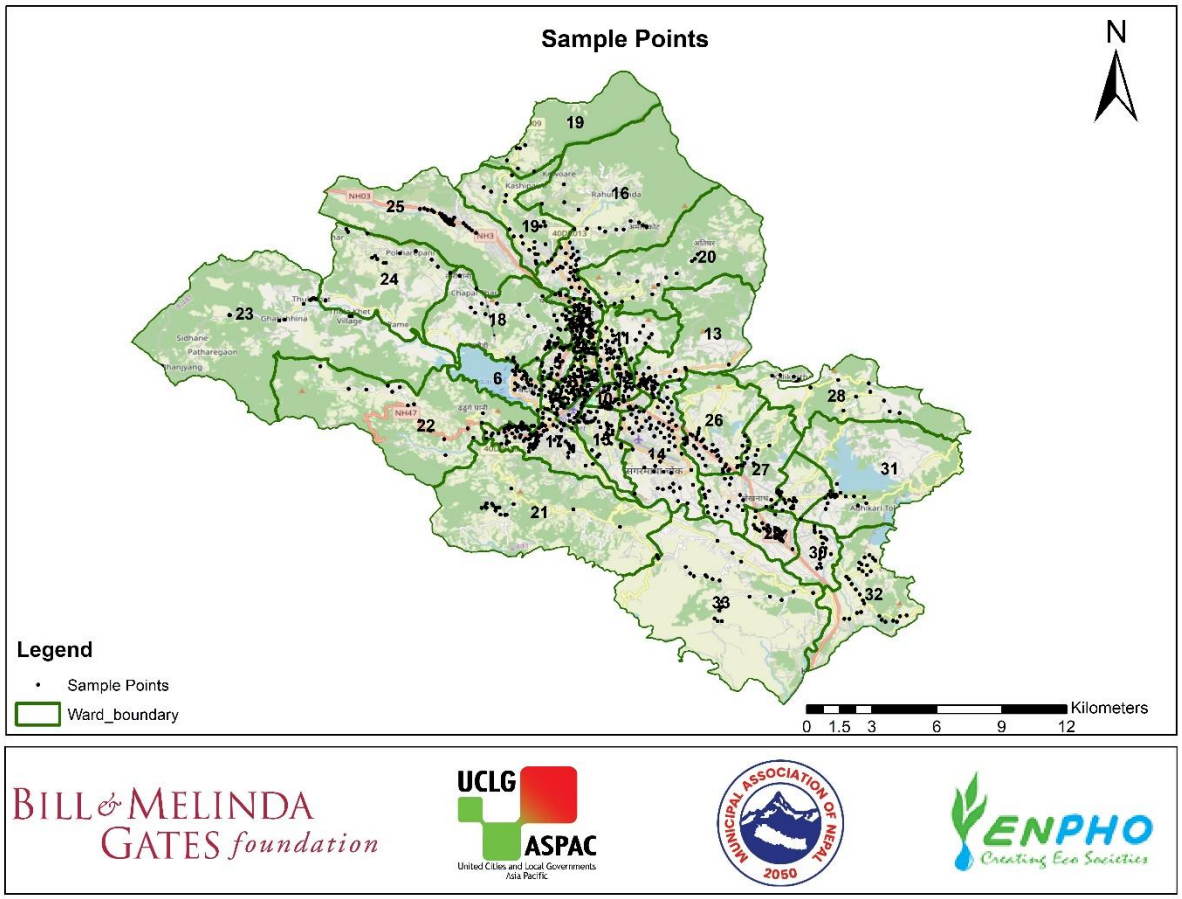

Figure 20: Distribution of sampling points in different wards of Pokhara Metropolitan City.

4.2.2 Direct Observation

Various sanitation technologies in the households in all the wards were observed and visual references were kept in Figure 21. Also, observation of the toilets, water sources, storm water drainage, containments and transportation of faecal sludge were carried out.

Figure 21: Direct Observation Survey in the Municipality.

4.3 Sharing and Validation of Data

The sharing and validation of findings on sanitation status were conducted in the municipality hall in participation of the Mayor, Deputy Mayor, Ward Chairpersons, Chief Administrative Officer (CAO), Municipal Officers, General members of the municipal council and other relevant stakeholders. The participants agreed upon the findings of this study that showed the current sanitation status of the municipality and provided valuable suggestions (Figure 22). The list of participation with their designation is attached in the Appendix section.

Figure 22: Sharing and Validation at Pokhara Metropolitan City.

5 Acknowledgements

We would like to acknowledge United Cities Local Government – Asia Pacific (UCLG ASPAC) for funding the Municipalities Advocacy on Sanitation in South Asia – II (MuNASS-II) and Municipal Association of Nepal (MuAN) for coordination with the Municipality.

We offer our sincere gratitude to Mr. Dhana Raj Acharyal, Mayor, Mrs. Manju Devi Gurung, Deputy Mayor, Mr. Shyam Krishna Thapa, Chief Administrative Officer of Pokhara Metropolitan City. We would also like to thank Mrs. Kalpana Baral, Sanitation Section Head, Mr. Netra Timalsena, Engineer, Mr. Ashok Duware, IT officer and staff of Pokhara Metropolitan City for their remarkable support during the study.

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 UCLG ASPAC. Similarly, we are very much obliged to Mr. Bhim Prasad Dhungana, President, Mr. Ashok Kumar Byanju Shrestha, Former President. Mr. Kalanidhi Devkota, Executive Director and Mr. Muskan Shrestha, Sanitation Advocacy Specialist from MuAN for their support during the study.

We are very grateful to Ms. Bhawana Sharma, Executive Director and Mr. Rajendra Shrestha, Program Director in 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 gracious support and MuNASS-II team without whom the study would not have been possible.

We are grateful to the enumerators, Mrs. Pramila Palikhe Shrestha, Mrs. Babita Gurung, Mrs. Dil Devi Pun, Mrs. Anita Jalari, Mrs. Kesh Kumari Chaudhari, Mr. Bharat GC, Mrs. Preeti Acharya, Mrs. Jyoti Adhikari Pahari, Mrs. Sanjaya Sigdel, Mrs. Ranjana Dhugana, Mrs. Anita Pokhrel, Mrs. Roshani Gayek, Mrs. Bina Nepali, Mrs. Bina Paudel, Mr. Kishor Dhoj K.C, Mr. Min Bahadur Kunwar, Mrs. Manisha Dhakal, Mrs. Manisha Bishwokarma, Mrs. Anuska Pahari, Mrs. Kanchan Shrestha, Mrs. Indira Karki, Mrs. Krisha Sewa, Mrs. Suman Devi Sapkota Paudel, Mrs. Anjali Pandit Sigdel, Mrs. Pashupati Khadka, Mrs. Aarati Phayal, Mrs. Ujeli Tripathi, Mrs. Indira B.K, Mrs. Sangita G.T, Mrs. Durga Tiwari and Mrs. Laxmi Gurung.

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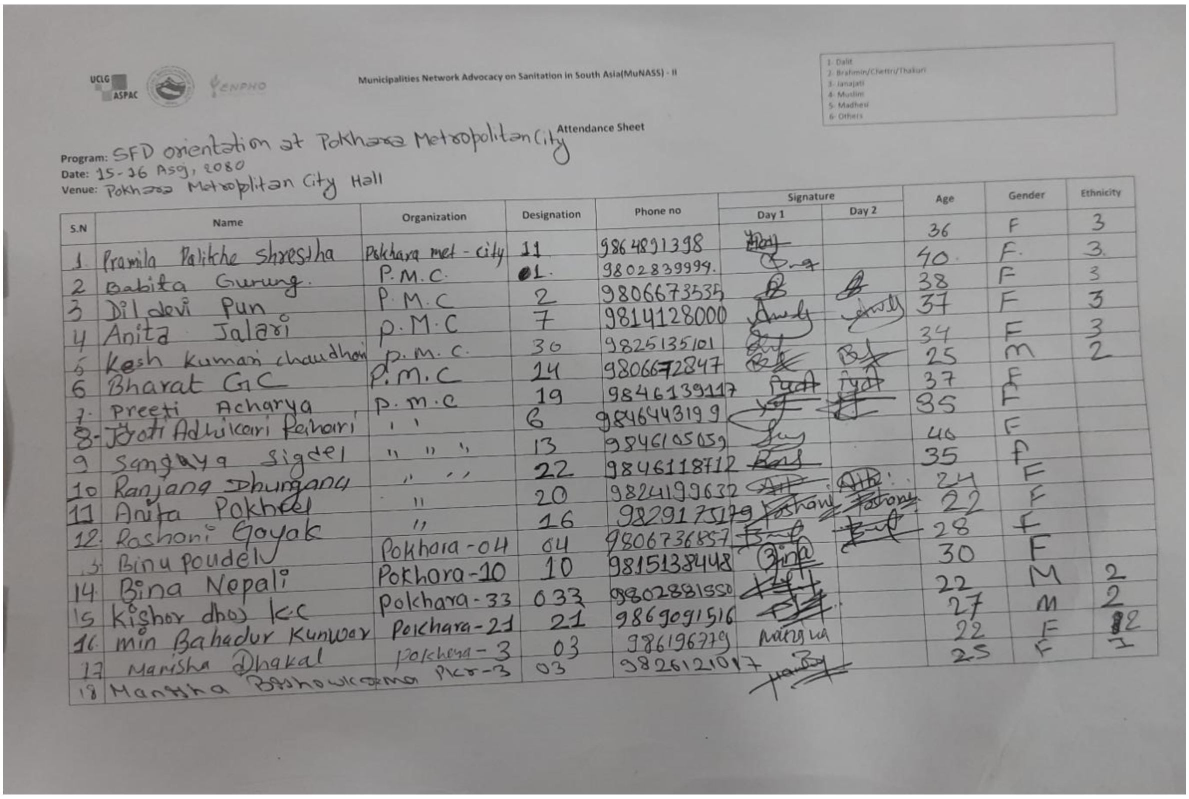
7 Appendix

7.1 SFD Orientation Program and Participants of the Orientation Program

7.2 List of Participants of Orientation on Survey for Shit Flow Diagram



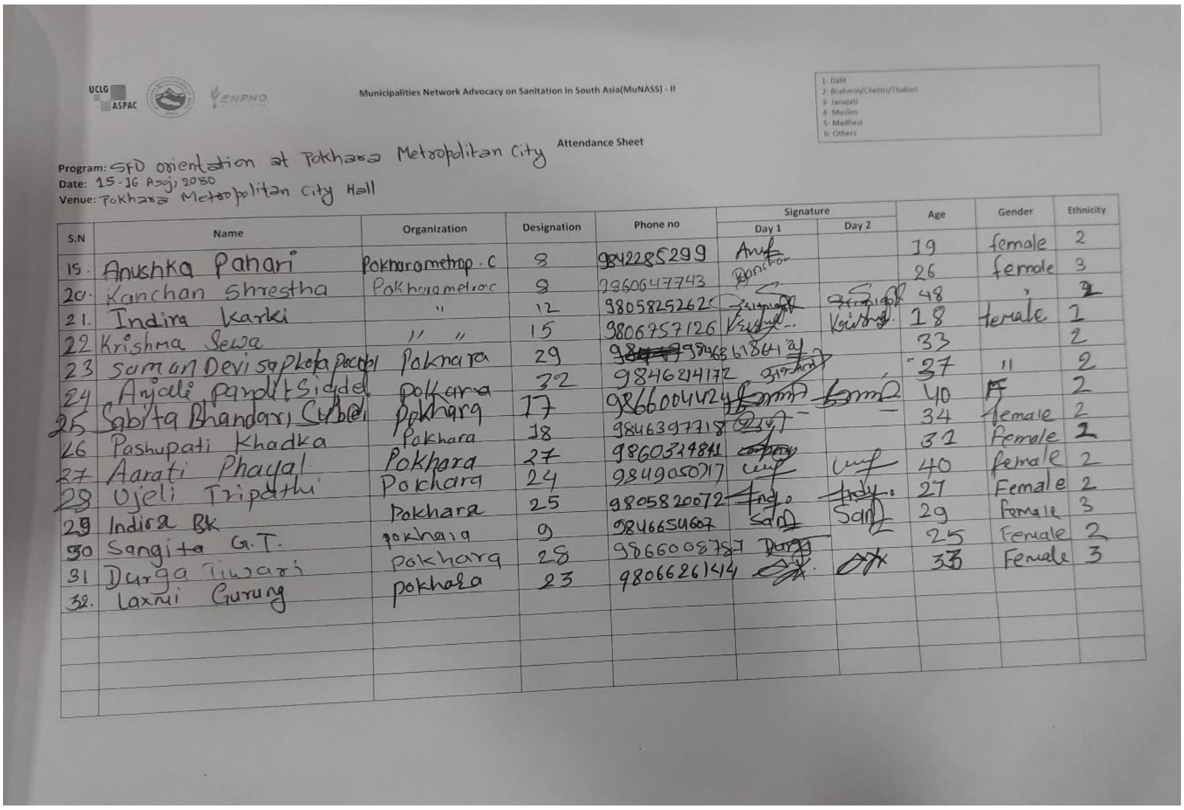
Municipalities Network Advocacy on Sanitation in South Asia(MuNASS) - II

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

Attendance Sheet

Program: SFD orientation at Pokhara Metropolitan City
Date: 15-16 Asoj, 2080
Venue: Pokhara Metropolitan City Hall

S.N	Name	Organization	Designation	Phone no	Signature Day 1	Signature Day 2	Age	Gender	Ethnicity
1	Pramila Palikhe Shrestha	Pokhara met - city	11	9864891398			36	F	3
2	Babita Gurung	P.M.C	01	9802839994			40	F	3
3	Dil devi Pun	P.M.C	2	9806673535			38	F	3
4	Anita Jalari	P.M.C	7	9814128000			37	F	3
5	Kesh kumari chaudhari	P.M.C	30	9825135101			34	F	3
6	Bharat GC	P.M.C	24	9806672847			25	m	2
7	Preeti Acharya	P.M.C	19	9846139117			37	F	
8	Jyoti Adhikari Pahari	"	6	9846443199			35	F	
9	Sangaya Sigdel	" " "	13	9846105059			46	F	
10	Ranjana Dhungana	" "	22	9846118712			35	F	
11	Anita Pokhrel	"	20	9824199632			24	F	
12	Rashoni Goyak	"	16	9829175179			22	F	
13	Binu Poudel			9806736857			28	F	
14	Bina Nepali	Pokhara-04	04	9815138448			30	F	
15	Kishor dhoj K.C	Pokhara-10	10	9802881550			22	M	2
16	Min Bahadur Kunwar	Pokhara-33	033	9869091516			27	M	2
17	Manisha Dhakal	Pokhara-21	21	986196779			22	F	82
18	Manisha Bishowkarma	Pokhara-3 / Pkr-3	03 / 03	9826121017			25	F	1



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

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5- Madhesi
6- Others

Attendance Sheet

Program: SFD orientation at Pokhara Metropolitan City
Date: 15-16 Asoj, 2080
Venue: Pokhara Metropolitan City Hall

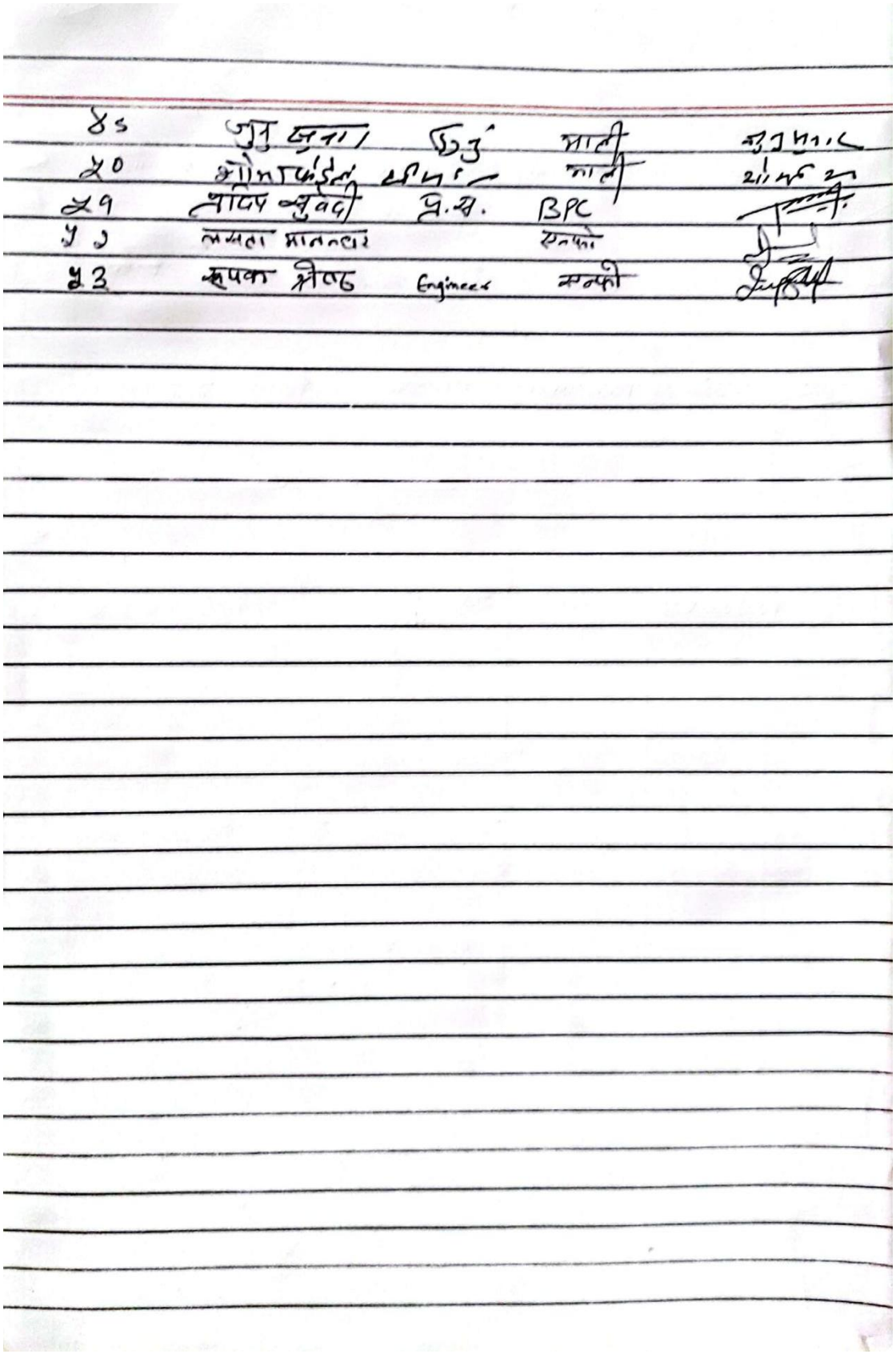
S.N	Name	Organization	Designation	Phone no	Signature Day 1	Signature Day 2	Age	Gender	Ethnicity
19	Anushka Pahari	Pokharametrop. C	8	9842285299			19	female	2
20	Kanchan Shrestha	Pokharametro.c	9	9860647743			26	female	3
21	Indira Karki	"	12	9805825262			48	"	2
22	Krishma Sewa	" "	15	9806757126			18	female	1
23	Suman Devi Sapkota Paudel	Pokhara	29	9846361864			33		2
24	Anjali Pandit Sigdel	Pokhara	32	9846214172			37	"	2
25	Sabita Bhandari Subedi	Pokhara	17	9866004424			40	F	2
26	Pashupati Khadka	Pokhara	18	9846397718			34	female	2
27	Aarati Phayal	Pokhara	27	9860324841			31	Female	2
28	Ujeli Tripathi	Pokhara	24	9849050717			40	female	2
29	Indira Bk	Pokhara	25	9805820072			27	Female	2
30	Sangita G.T.	Pokhara	9	9846654607			29	Female	3
31	Durga Tiwari	Pokhara	28	9866008787			25	Female	2
32	Laxmi Gurung	Pokhara	23	9806626144			33	Female	3

7.3 List of Participants in Sharing and Validation Workshop

आज मिति २०८० साल चैत्र ६ गतेका दिन पोखरा महानगरपालिकामा नेपाल नगरपालिका संघको आयोजनामा वातावरण र जनस्वास्थ्य संस्था (इन्फो)को प्राविधिक सहयोग, The United cities - Local Government Asia Pacific (UCLG - ASPAC)को सहकार्यमा र Bill and Mellanda Gates foundation (BMGF) को आर्थिक सहयोगमा मानव मलमूत्र रेखा प्रवाह चित्र (Shit flow Diagram - SFD) सम्बन्धि छलफल तथा प्रमाणीकरण कार्यक्रममा निम्न अनुसारको सरोकारवालाहरूको उपस्थिति रहेको छ ।

क्र.सं.	नाम	पद	कार्यालय	फोन	हस्ताक्षर
१.	धनराज आचार्य	नगर प्रमुख	पोखरा म.न.पा	9856003034	
२.	मञ्जुदेवी गुरुङ	नगर उपप्रमुख	"	9856003039	
३.	श्याम कृष्ण थापा	प्र.प्र.अ.	"	9856007111	
४.	निर्मला कोइराला	कार्यपालिका सदस्य	" २५	९८४६६६६३३३	
५.	निर्मल दियाली	कार्यपालिका सदस्य	-२८	९८५६०३२३१८	
६.	विष्णु बहादुर गहतराज	वडा अध्यक्ष	-६	985602022	
७.	तोरा बहादुर बानियाँ	वडा अध्यक्ष	" १८	९८५६००३०१८	
८	नेत्र प्र. तिमिल्सिना	इन्जिनियर	पो.म.न.पा.	९८५६०२४१११	
९	राजेश गुरुङ	अध्यक्ष	पो.म.न.पा. १०	९८५६००३०१०	
१०	कृष्ण हरि काफ्ले	वडा सदस्य	पो.म.न.पा. १४	९८५६०३५०३०	
११	हिरालाल ढकाल	वडा अध्यक्ष	" -22	9856003022	
१२	कृष्ण प्रसाद तिवारी	उप सचिव	पो.म.न.पा	9856011833	
१३	गणेमान गुरुङ	वडा सदस्य	" -20	9817127220	
१४	रनसुवा गुरुङ	" "	पोखरा-११	9846030125	Gurung
१५	भरतराज पौडेल	अधिकृत	पो.म.न.पा	9856058288	
१६	तिर्थ बहादुर कुँयाल	वडा सदस्य	पोखरा २९	9846056214	
१७	गोविन्द दुलाल	कार्यपालिका	पोखरा -S	९८४६०१८६१६	
१८	राम मोहन आचार्य	वडा अध्यक्ष	पो.म.न.पा-७	९८५६००३०१७	
१९.	जयराम पौडेल	उपसचिव	PMC	९८५६०३४३९२	

क्र.सं.	नाम	पद	कार्यालय	फोन नं.	हस्ताक्षर
२०	कृपा रंजीत	इन्जिनियर	पोखरा महानगरपालिका		
२१	विवेक कुमार रवनी	इन्जिनियर	"	९८६६०१८११९	
२२.	अल्का प्रजापति	"	"	९८४३८००५२८	
२३	नवराज अधिकारी	प्रउप (BPC)	"	9856034934	
२४	ई. अशोक हाटे	IT officer (PMLC Focal Person – MUAH)	"	९८१६०४११[illegible]	
२५.	नारायण प्रसाद अधिकारी	अधिकृत व्यक्ति	पोखरा महानगरपालिका	९८५६०[illegible]	
२६	हर्क बहादुर गायक	अधिकृत व्यक्ति	पो.म.न.पा.	९८४६०२१८६५	
२७.	देवेन्द्र मसल्दी	वडा-८ अध्यक्ष	पो " "	९८५६०२१६०२	
२८.	अशोक कुमार पुनार	अधिकृत व्यक्ति	पो.म.न.पा.	९८४६६३८४६२	
२९	शिवप्रसाद तिमिल्सिना	वडा अध्यक्ष ११	पो म न पा	९८५६००२०१८	
३०	हरिप्रसाद गुरुङ	" " २५	"	९८५६००३०२५	
३१	शाहारा प्रधान	वडा अध्यक्ष ९	"	९८५६००३००९	
३२	विमला के.सी.	का.वा. अध्यक्ष	"	९८५६०६०८२	
३३	रंजित ओझा	सि.डि.ई.	खानेपानी तथा ढल निकास विभाग	९८५११४४३२०	
३४	Noboru OZAKI	Expert	JICA	9851126871	
३५	Vivek Shrestha	Engineer	JICA WASH Advisor office	9849138135	
३६.	दुर्गा मुजेल	ना.प्र.मु.	पो.म.न.पा.	९८५६०८२५१८	
३६.	ध्रुव गायक	सहायक प्रशासक	"	९८४३०५८९१	
३८	साधना कुमारी शाही	का. अधिकृत	पो.म.न.पा.-१६	९८[illegible]-१६	
३९	सुरेन्द्र पौडेल	इन्जिनियर	"	985602145[illegible]	
४०	रुद्र नाथ बराल	वडा अध्यक्ष	पो.म.न.पा.	9856025037	
४१	कल्पना बराल	सरसफाई शाखा प्रमुख	पो.म.न.पा.	9846087179	
४२	शारदा पौडेल	कार्यपालिका	" " २५	985600303[illegible]	
४३	विष्णु थापा	सहयोगी	पो.म.न.पा.		
४४	कमल मल्ल	सहयोगी	पो.म.न.पा.		
४५	डल्लु ढकाल	चौकीदार	पो.म.न.पा.	९८५६०८२६६६	
४६	बुद्ध थापा	चौकीदार	पो.म.न.पा.		
४७	हिरा बराल	अधिकृत का.	पो.म.न.पा.	9867917518	
४८	कविर क्षेत्री	सहायक पाँचौं	पो.म.न.पा.		



१९	[illegible]	[illegible]	[illegible]	[illegible]
२०	[illegible]	[illegible]	[illegible]	[illegible]
२१	[illegible]	इ.स.	BPC	[illegible]
२२	[illegible]		[illegible]	[illegible]
२३	[illegible]	Engineer	[illegible]	[illegible]

7.4 Water Quality Result outside the building of Lekhnath Water Supply User Committee

Lekhnath Water Supply User Committee

Pokhara-30, Khudi, Dhungepatan, Kaski

Dhungepatan Deep Boring

Water Test Report

Year 2080 Month 6 Date 14

S.No.	Category	Parameters	Units	Test Value	Concentration Limits
1		Turbidity	NTU	0.88	5(10)
2		Ph		7.9	6.5 - 8.5
3		Color	TCU		5(15)
		Taste & Odor			Non Objectionable
5		TDS	mg/L		1000
6		Electrical Conductiviti (EC)	µS/cm	665	1500
7		Iron	mg/L		0.3(3)
8		Total Hardness	mg/L	125	500
9		Calcium	mg/L	115	200
10	Chemical	Residual Chlorine	mg/L	0.4	0.1-0.2
11		Manganese	mg/L		0.2
12		Ammonia	mg/L	0.01	
13		Fluoride	mg/L	0.66	1.5
14	Microbiological	E-Coli	MPN/100ml	0	0.5-1.5 0

Govt. Reg. 108/047/048
SWC Reg. 283/047/048

ENVIRONMENT AND PUBLIC HEALTH ORGANIZATION

ENPHO LABORATORY

DRINKING WATER ANALYSIS REPORT

Lab. Reg. No.: 877(072-073)

Client: Lekhnath Sana Shahari Khanepani Tatha Sarsafai Upovokta Samitha
Sample Location/Area: Lekhnath, Kaski
Client Address: Lekhnath, Kaski

Source: Ground water
Sampled By: Client
Received On: 2015-12-24
Completed On: 2016-01-07

PHYSICO-CHEMICAL AND MICROBIOLOGICAL ANALYSIS

Parameters	Unit	Sample ID 877(072-073)	NDWQS	Test Methods
pH	-	8.3	6.5-8.5	APHA, AWWA, WEF (2012), 4500-H B
Electrical Conductivity	µS/cm	370	1500	APHA, AWWA, WEF (2012), 2510 B
Colour	TCU	ND(< 5)	5(15)	APHA, AWWA, WEF (2012), 2120 B
Odour	-	Non objectionable	-	APHA, AWWA, WEF (2012), 2150 B
Turbidity	NTU	14	5(10)	APHA, AWWA, WEF (2012), 2130 B
Total Dissolved Solids (TDS)	mg/L	208	1000	APHA, AWWA, WEF (2012), 2540 C
Total Hardness as $CaCO_3$	mg/L	232	500	APHA, AWWA, WEF (2012), 2340 C
Calcium (Ca)	mg/L	48	200	APHA, AWWA, WEF (2012), 3500-Ca B
Chloride	mg/L	1	250	APHA, AWWA, WEF (2012), 4500-Cl^- B
Fluoride	mg/L	0.85	0.5-1.5	APHA, AWWA, WEF (2012), 4500-F D
Sulphate	mg/L	1.65	250	APHA, AWWA, WEF (2012), 4500-SO_4^{2-} D
Free Residual Chlorine (FRC)	mg/L	ND(< 0.1)	0.1-0.2	APHA, AWWA, WEF (2012), 4500-Cl B
Ammonia	mg/L	1.13	1.5	APHA, AWWA, WEF (2012), 4500-NH_3 F
Nitrate	mg/L	ND(< 0.2)	50	APHA, AWWA, WEF (2012), 4500-NO_3^- B
Iron (Fe)	mg/L	1.73	0.3(1)	Standard Method 3111 B
Manganese (Mn)	mg/L	ND(< 0.05)	0.2	APHA, AWWA, WEF (2012), 3111 B
Copper (Cu)	mg/L	ND(< 0.02)	1	APHA, AWWA, WEF (2012), 3111 B
Zinc (Zn)	mg/L	0.05	3	APHA, AWWA, WEF (2012), 3111 B
Cadmium (Cd)	mg/L	ND(< 0.003)	0.003	APHA, AWWA, WEF (2012), 3111 B
Chromium (Cr)	mg/L	ND(< 0.02)	0.05	APHA,AWWA,WEF (2012), 3111 B
Lead (Pb)	mg/L	ND(< 0.01)	0.01	APHA,AWWA,WEF (2012), 3111 B
Mercury (Hg)	mg/l	ND(< 0.001)	0.001	APHA,AWWA,WEF (2012), 3112 B
Arsenic (As)	mg/L	ND(< 0.005)	0.05	APHA,AWWA,WEF (2012), 3114 B
Aluminium (Al)	mg/L	ND(< 0.05)	0.2	APHA,AWWA,WEF (2012), 3500-Al B
Total Coliform	CFU/100ml	574	0	APHA,AWWA,WEF (2012), 90,9222H
E. coli	CFU/100mL	8	0	APHA,AWWA,WEF (2012), 90,9222H

NDWQS = National Drinking Water Quality Standard (2062).

References: Standard Methods for the Examination of Water and Wastewater (APHA, AWWA & WEF) 22nd Edition (2012)
ND: Not Detected ( ): Maximum Concentration Limit TNTC-Too Numerous To Count (>8000)

Remarks: Among the tested physico- chemical parameters, Turbidity and Iron contents exceeded the NDWQS value at the time of analysis.
Bacteriologically, the provided water sample was found to be contaminated with Total Coliform and E. coli at the time of analysis.

ANALYZED BY | CHECKED BY | AUTHORIZED SIGNATURE

Note: (1) The results refer only to the parameters tested of the samples provided/collected for analysis. Endorsement of products is neither inferred nor implied.
(2) In order to ensure the confidentiality, the report will be released to the person who produces the registration slip.
(3) All the samples are disposed of 7 days after the report date unless the laboratory has received special request.
(4) Total liability of our organization is limited to the invoiced amount only.

Govt. Reg. 108/047/048
SWC Reg. 283/047/048

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Accredited Laboratory
Accreditation No: Pra- 056/17-18

DRINKING WATER ANALYSIS REPORT

Lab. Reg. No.: 877(072-073)

Client: Lekhnath Sana Shahari Khanepani Tatha Sarsafai Upavokta Samstha
Sample Location/Area: Lekhnath, Kaski
Client Address: Lekhnath, Kaski

Source: Ground water
Sampled By: Client
Received On: 2015-12-24
Completed On: 2016-01-07

PHYSICO-CHEMICAL AND MICROBIOLOGICAL ANALYSIS

Parameters	Unit	Sample ID 877(072-073)	NDWQS	Test Methods
pH	-	8.3	6.5-8.5	APHA, AWWA, WEF (2012), 4500-H+ B
Electrical Conductivity	µS/cm	370	1500	APHA, AWWA, WEF (2012), 2510 B
Colour	TCU	ND(< 5)	5(15)	APHA, AWWA, WEF (2012), 2120 B
Odour	-	Non objectionable	-	APHA, AWWA, WEF (2012), 2150 B
Turbidity	NTU	14	5(10)	APHA, AWWA, WEF (2012), 2130 B
Total Dissolved Solids (TDS)	mg/L	208	1000	APHA, AWWA, WEF (2012), 2540 C
Total Hardness as $CaCO_3$	mg/L	232	500	APHA, AWWA, WEF (2012), 2340 C
Calcium (Ca)	mg/L	46	200	APHA, AWWA, WEF (2012), 3500-Ca B
Chloride	mg/L	1	250	APHA, AWWA, WEF (2012), 4500-Cl⁻ B
Fluoride	mg/L	0.85	0.5-1.5	APHA, AWWA, WEF (2012), 4500-F D
Sulphate	mg/L	1.65	250	APHA, AWWA, WEF (2012), 4500-SO_4^{2-} D
Free Residual Chlorine (FRC)	mg/L	ND(< 0.1)	0.1-0.2	APHA, AWWA, WEF (2012), 4500-Cl B
Ammonia	mg/L	1.33	1.5	APHA, AWWA, WEF (2012), 4500-NH_3 F
Nitrate	mg/L	ND(< 0.2)	50	APHA, AWWA, WEF (2012), 4500-NO_3^- B
Iron (Fe)	mg/L	1.71	0.3(1)	Standard Method 3111 B
Manganese (Mn)	mg/L	ND(< 0.05)	0.2	APHA, AWWA, WEF (2012), 3111 B
Copper (Cu)	mg/L	ND(< 0.02)	1	APHA, AWWA, WEF (2012), 3111 B
Zinc (Zn)	mg/L	0.05	3	APHA, AWWA, WEF (2012), 3111 B
Cadmium (Cd)	mg/L	ND(< 0.003)	0.003	APHA, AWWA, WEF (2012), 3111 B
Chromium (Cr)	mg/L	ND(< 0.02)	0.05	APHA,AWWA,WEF (2012), 3111 B
Lead (Pb)	mg/L	ND(< 0.01)	0.01	APHA,AWWA,WEF (2012), 3111 B
Mercury (Hg)	mg/L	ND(< 0.001)	0.001	APHA,AWWA,WEF (2012), 3112 B
Arsenic (As)	mg/L	ND(< 0.005)	0.05	APHA,AWWA,WEF (2012), 3114 B
Aluminium (Al)	mg/L	ND(< 0.05)	0.2	APHA,AWWA,WEF (2012), 3500-Al B
Total Coliform	CFU/100mL	574	0	APHA,AWWA,WEF (2012), 9Q,9222H
E. coli	CFU/100mL	8	0	APHA,AWWA,WEF (2012), 9Q,9222H

NDWQS = National Drinking Water Quality Standard (2062)

References: Standard Methods for the Examination of Water and Wastewater (APHA, AWWA & WEF) 22nd Edition (2012)
ND: Not Detected ( ): Maximum Concentration Limit TNTC-Too Numerous To Count (>8000)

Remarks: Among the tested physico- chemical parameters, Turbidity and Iron contents exceeded the NDWQS value at the time of analysis. Bacteriologically, the provided water sample was found to be contaminated with Total Coliform and *E. coli* at the time of analysis.

ANALYZED BY

CHECKED BY

AUTHORIZED SIGNATURE

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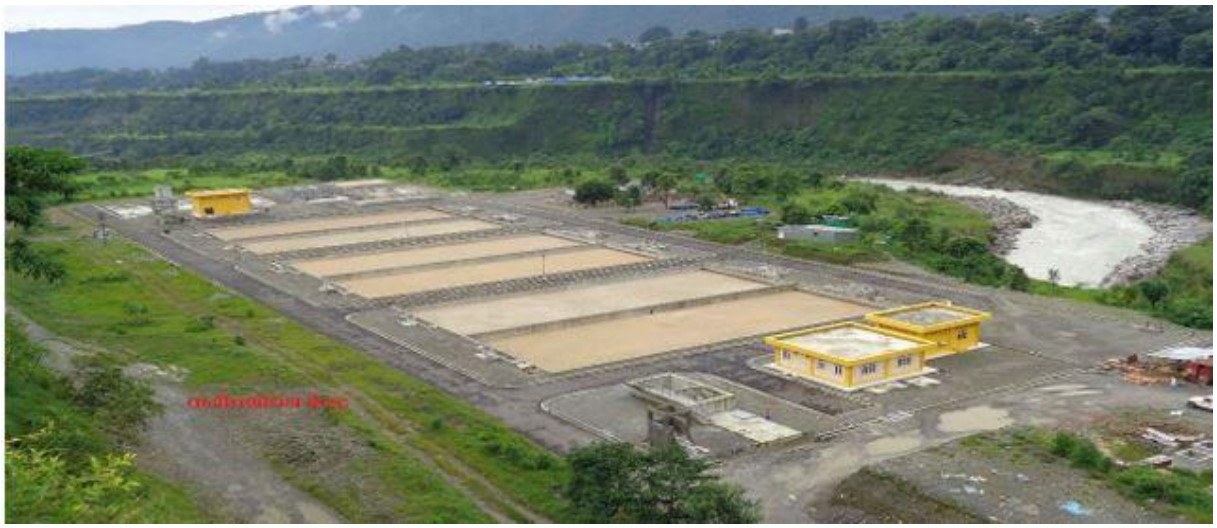
7.5 Construction of Water treatment plant JICA- Pokhara Water Supply Improvement Project (SOURCE: NWSC)



SFD Pokhara Metropolitan City, Nepal, 2026

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SFD Promotion Initiative