SFD Report

Mithila Bihari Municipality
Nepal

Final Report

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

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SFD Report Mithila Bihari Municipality, Nepal, 2023

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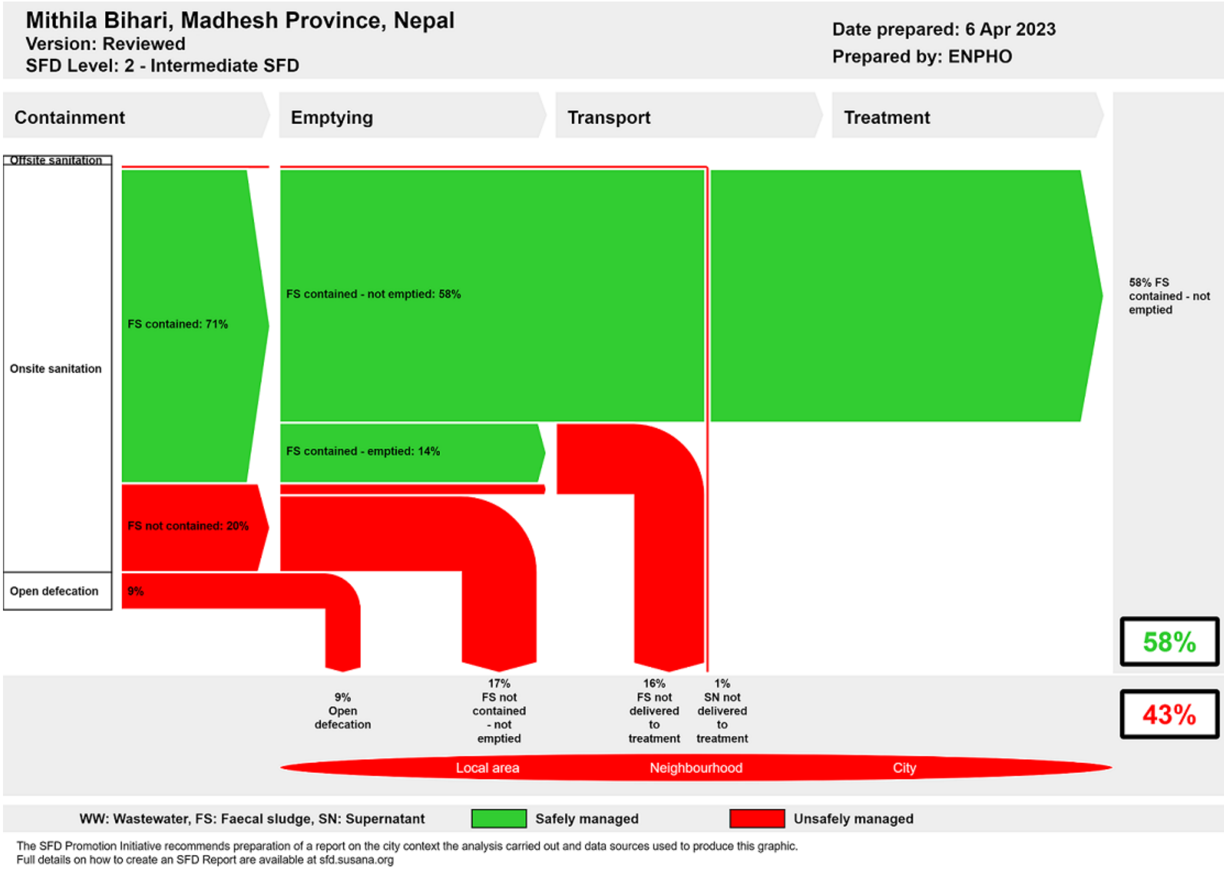
1. The SFD Graphic



2. Diagram information

SFD Level:

This SFD is a level 2 - Intermediate report.

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

Status:

Final SFD Report.

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3. General city information

Mithila Bihari is located in the Dhanusha district of Nepal (Madhesh Province). The municipality is covers an area of about 27 kilometres and is situated at an altitude of 87 metres above sea level. The municipality was restructured in 2017 by merging six Village Development Committees (VDCs), which are Bhuthahi Partewa, Mithileshwar Nikas, Andupatti, Tarapatti, Sirsiya, Mithileshwar Mouwahi, Thera Kachuri, and Kajra Ramoul (Municipality M. B., 2023).

The total population of the municipality is 38,273 living in 7,654 households (Statistics, 2021). Mithila Bihari's climate is classified as warm and temperate. The Köppen-Geiger climate classification is Cwa. The temperatures are highest on average in May, at around 29.7 °C | 85.5 °F. The lowest average temperatures in the year occur in January, when it is around 16.1 °C | 61.0 °F. The annual rainfall is 1,367 mm | 53.8 inch. The month with the highest relative humidity is September (83.62 %). The month with the lowest relative humidity is April (38.99%) (Climate Data, n.d.).

The municipality is in the Southern Terai Region of the country. The geographical coordinates of the municipality are approximately 27.1921° N, 85.5756° E. (Municipality M. B., 2023).

4. Service outcomes

The overview of different sanitation technologies across the sanitation value chain in the municipality is briefly explained in this section. Basic sanitation coverage in the municipality is 91.5%. The families without their own toilets defecate in open places or use a neighbour's toilet.

None of the households in the municipality has an offsite sanitation system.

46.3% of the Households (HHs) have a toilet connected to a lined tank with impermeable walls and open bottom, 0.6% to septic tank and 19.1% have constructed a toilet connected to a fully lined tank. HHs with a toilet have constructed a circular containment, specifically, 1.5% have constructed unlined pits, 28.1% have constructed single pits and 4.5% have constructed twin pits.

Public Toilets (PT) are installed for commuters to achieve and sustain open defecation-free status in the municipality. Altogether, four public toilets are installed to serve the floating population and travellers of the municipality. Only one public toilet located in the crowded area of the municipality is functional, but the state of the toilet is very poor with overflow and a foul smell.

Only 21.5% of containments have been emptied at least once since the installation. Both traditional manual scavenging and mechanical emptying of the containments are practised in the municipality. Among the containments that have been emptied at least once, 94.5% were mechanically emptied by private desludging service providers. The mechanical emptying facility is provided by private desludgers of Janakpurdham sub-metropolitan city who travel to Mithila Bihari municipality once or twice every year to provide the service.

Mithila Bihari does not have a treatment plant for wastewater or faecal sludge. Faecal Sludge (FS) emptied is not used in farmlands in the municipality because there is a cultural and religious taboo associated with the use of human waste as fertilizer as it is considered impure and unclean, and therefore not suitable for use in agriculture. FS emptied is dumped untreated into open land, forest areas and nearby water bodies.

Overall, the SFD graphic shows that 58% of the excreta generated are safely managed while 43% of the excreta generated are unsafely managed. The safely managed percentage of FS generated by 58% of the population is temporary until the tanks and pits become full and FS from the containment is emptied.

5. Service delivery context

The Constitution of Nepal 2015 in Article 35 related to right to health recognizes citizen's rights to 'access to clean drinking water and sanitation'. In addition, Right to Clean Environment, Article 30 recognizes that every person shall have the right to live in a healthy and clean environment. (GoN, 2015) To respect, promote and fulfil the provisions related to right on water and sanitation, Government of Nepal has billed Drinking Water and Sanitation Act, 2019 through Ministry of Water Supply. The act elaborates right to clean water as to receive affordable, sufficient, and quality drinking water regularly as well as access to sanitation as affordable access to quality sanitation services. (MoWS, 2017)

Several policies have been in place to accomplish the sanitation need of people. Particularly, the National Sanitation and Hygiene Master Plan (NSHMP) 2011 has proved as an important strategic document for all stakeholders to develop uniform programs and implementation mechanism at all levels. It strengthens institutional set up with the formation of water and sanitation coordination committee at every tier of government to actively engage into sanitation campaign. The document adopted sanitation facilities as improved, basic, and limited in line with WHO/UNICEF guideline. The sanitation campaign throughout the country focused to achieve universal access to improved sanitation. (NPC, 2020)

The draft Sector Development Plan (SDP) has envisioned the delineation of roles and responsibility of federal, provincial, and local government in an aim to initiate sustainability of Open Defecation Free (ODF) outcomes.

It is the duty and responsibility of the Mithila Bihari Municipality to improve access to accessible, safe and sustainable drinking water and sanitation services to the people of the municipal area as mentioned in chapter 3 of the Local Government Operation Act 2074 under the title of municipal work, duties and rights; the policy, laws, standards, plan implementation and regulation related to local water supply mentioned in sub-section D of section 11. In order to implement this responsibility, water supply, sanitation and hygiene plan and policy has become essential. Development without planning and estimation will not lead to the expected success in the areas of access to water and sanitation. (UNICEF, 2020).

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 Local Government	Mithila Bihari Municipality.
Non-governmental Organizations	Environment and Public Health Organization (ENPHO).
Private Sector	Private FS Emptying and Desludging facility providers, public toilet operators.
Development Partners, Donors	MuAN, BMGF, UCLG ASPAC.

7. Credibility of data

Primary data were collected from random household sampling. Altogether, 366 households and 32 institutions were surveyed from ten wards of the municipality. Primary data on emptying, transportation and current sanitation practices in the municipality were validated from Key Informant Interviews (KIIs) with private desludgers, public toilet management, sanitation, and environmental section. The overall data and findings were shared with the stakeholders of the municipality and validated through sharing program.

8. Process of SFD development

Data on sanitation situation were collected through household and institutional survey. 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 the survey. Along with this, KIIs were conducted with officers of municipality, private desludging service providers and engineer of International non-governmental organizations (INGO) to understand the situation practices across the service chain. Data were entered in the SFD graphic generator to produce the SFD graphic.

8. List of data sources

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

- Climate Data. (s.f.). Obtenido de Climate-Data.org: https://en.climate-data.org/asia/nepal/far-western-development-region/dipayal-silgadhi-1025266/
- GoN. (2015, September 30). Constitution of Nepal: Goverment of Nepal. Retrieved from https://lawcommission.gov.np/en/wp-content/uploads/2021/01/Constitution-of-Nepal.pdf
- 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/
- MoWS. (2017). Nepal Water Supply, Sanitation and Hygiene Sector Development Plan (2016-2030). Ministry of Water Supply.
- NPC. (2020). National Review of Sustainable Development Goal. Kathmandu Nepal: National Planning Commission.
- Municipality, M. B. (2023). Mithila Bihari Municipality. Obtenido de Mithila Bihari Municipality, Government of Nepal: https://mithilamun.gov.np/en

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Abbreviations

BMGF	Bill and Melinda Gates Foundation
CAO	Chief Administrative Officer
DUDBC	Department of Urban Development and Building Construction
DWSSM	Department of Water Supply and Sewerage Management
ENPHO	Environment and Public Health Organization
FS	Faecal Sludge
FSM	Faecal Sludge Management
FSTP	Faecal Sludge Treatment Plant
GDP	Gross Domestic Product
GON	Government of Nepal
HH	Household
IRF	Institutional and Regulatory Framework
JMP	Joint Monitoring Programme
KII	Key Informant Interview
KM	Kilometre
MDG	Millennium Development Goal
MICS	Multiple Indicator Cluster Survey
MoUD	Ministry of Urban Development
MTEF	Medium-Term Expenditure Framework
MuNASS-II	Municipalities Advocacy on Sanitation in South Asia – II
NGO	Non-Governmental Organization
NRS	Nepali Rupees
NWSC	Nepal Water Supply Corporation
NSHMP	Nepal Sanitation and Hygiene Master Plan
NUWSSSP	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
SDG	Sustainable Development Goal
SDP	Sector Development Plan
SFD	Shit Flow Diagram
SFD PI	Shit Flow Diagram Promotion Initiative
SMC	Sub-metropolitan City
UCLG ASPAC	United Cities and Local Governments Asia Pacific
UNICEF	United Nations Children's Education Fund
UCLG ASPAC	United Cities Local Government – Asia Pacific
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization

WSP	Water Service Providers
WSSDO	Water Supply and Sanitation Divisional Office
WSUC	Water and Sanitation Supply and User's Committee
WW	Wastewater

1. City context

Mithila Bihari is located in the Dhanusha district of Nepal, which is located in the Madhesh Province of Nepal. The municipality covers an area of about 27 kilometres and is situated at an altitude of 87 metres above sea level. The municipality was restructured in 2017 by merging six Village Development Committees (VDCs), which are Bhuthahi Partewa, Mithileshwar Nikas, Andupatti, Tarapatti, Sirsiya, Mithileshwar Mouwahi, Thera Kachuri, and Kajra Ramoul (Municipality M. B., 2023). Figure 1 shows the ward boundary map of Mithila Bihari Municipality.

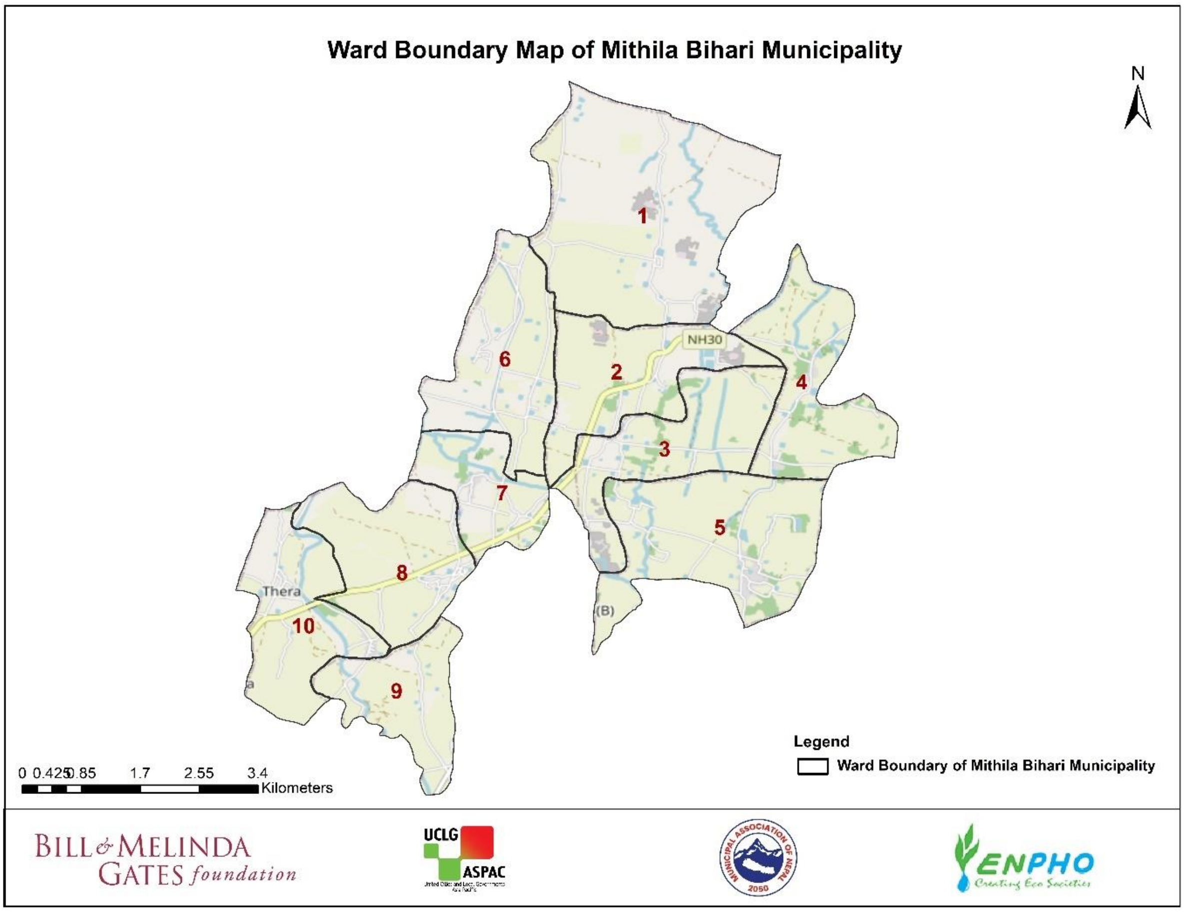

Figure 1: Map of Mithila Bihari Municipality with ward boundaries.

1.1 Population

The total population of the municipality is 38,273 living in 7,654 households, with male and female population percentage of 49.4% and 50.6%, respectively. The family size of the municipality is 5 (Statistics, 2021). Ward-wise population distribution in the municipality is shown in Table 1 (Statistics, 2021).

Table 1: Ward wise population of Mithila Bihari Municipality.

Ward No.	Population 2021	Male	Female
1	4,890	2,381	2,509
2	3,654	1,800	1,854
3	4,211	2,036	2,175
4	3,587	1,770	1,817
5	3,804	1,847	1,957
6	4,963	2,539	2,424
7	4,147	2,082	2,065
8	3,633	1,807	1,826
9	2,145	1,083	1,062
10	3,239	1571	1,668
Total	**38,273**	**18,916**	**19,357**

Figure 2 shows the population density in different wards of Mithila Bihari Municipality where it can be observed that wards number 3, 6 and 7 have high population density and wards number 1, 5, 9 and 10 have very low population density.

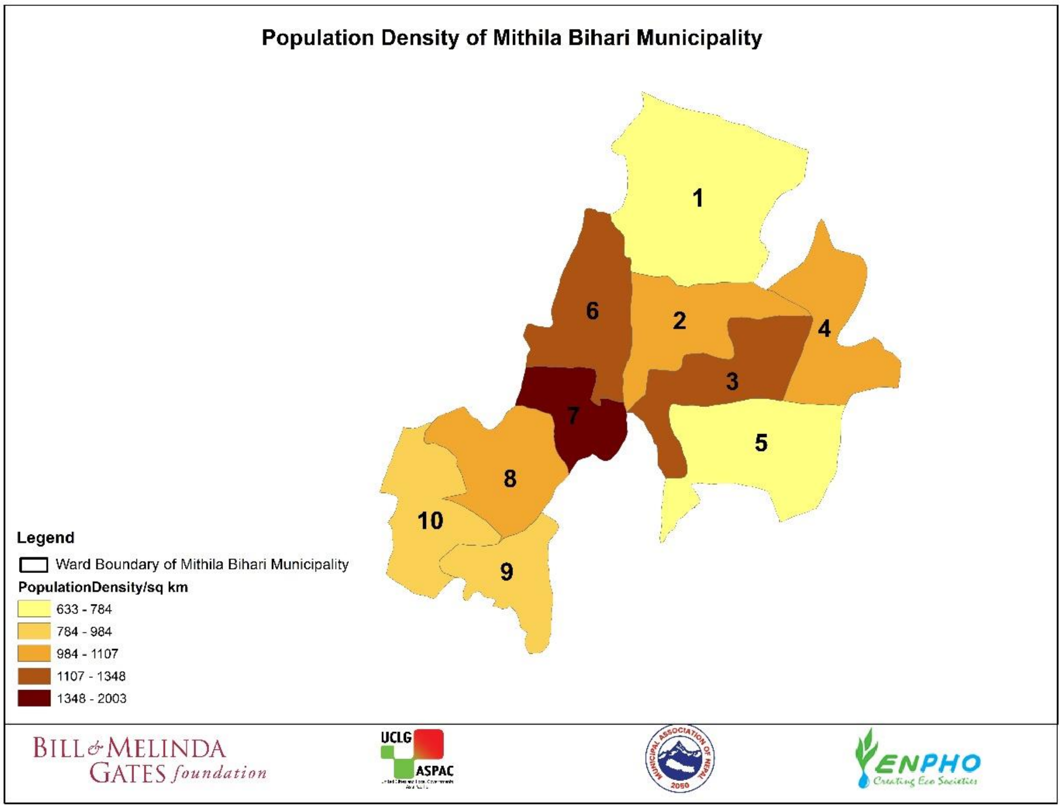

Figure 2: Population Density Map of Mithila Bihari Municipality.

1.2 Climate

Mithila Bihari’s climate is classified as warm and temperate. The summer is much rainier than winter. The Köppen-Geiger climate classification is Cwa. The temperatures is highest on average in May, at around 29.7 °C | 85.5 °F. The lowest average temperatures in the year occurs in January, when it is around 16.1 °C | 61.0 °F. The annual rainfall is 1,367 mm | 53.8 inch. The month with the highest relative humidity is September (83.62 %). The month with the lowest relative humidity is April (38.99 %) (Climate Data, n.d.).

1.3 Topography

The municipality is in the Southern Terai Region of the country. The geographical coordinates of the municipality are approximately 27.1921° N, 85.5756° E (Municipality M. B., 2023).

2. Service Outcomes

2.1 Overview

The Joint Monitoring Programme (JMP) defines improved sanitation facilities as those designed to hygienically separate excreta from human contact (WHO, n.d.).In Mithila Bihari municipality, people residing in 91.5% of households have access to a toilet. In the present context, the category of sanitation provision has seemingly improved from not having toilets in houses through to building a storage facility to contain Faecal Sludge (FS) produced at household level in the municipality. The municipality achieved Open Defecation Free (ODF) status in 2019. Despite being declared as ODF municipality, people residing in 8.5% of households in wards number 1, 2, 6 and 9 do not have access to basic sanitation facilities and defecate openly.

Data on sanitation situation were collected through household and institutional surveys (ENPHO, 2022). A total of 366 households were sampled from 7,654 households distributed in ten wards (further details are presented in section 4). The results obtained after the triangulation and validation of the data with all the data sources including literature reports, Key Informant Interviews (KIIs) and a validation workshop is presented in this section.

2.1.1 Household Level Sanitation System

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 Mithila Bihari municipality, 100% of the households have connection to onsite sanitation system.

Types of Onsite Sanitation Systems

Figure 3 shows the type of containments used in the household level in Mithila Bihari Municipality. It represents the percentage specifically pertaining to the different types of onsite sanitation systems, not including open defecation. 24.2% of households use fully lined tanks, septic tanks and twin pits for storage of FS which are safe onsite sanitation systems whereas all other households have onsite FS storage systems that are not sealed and can contribute to groundwater and soil contamination.

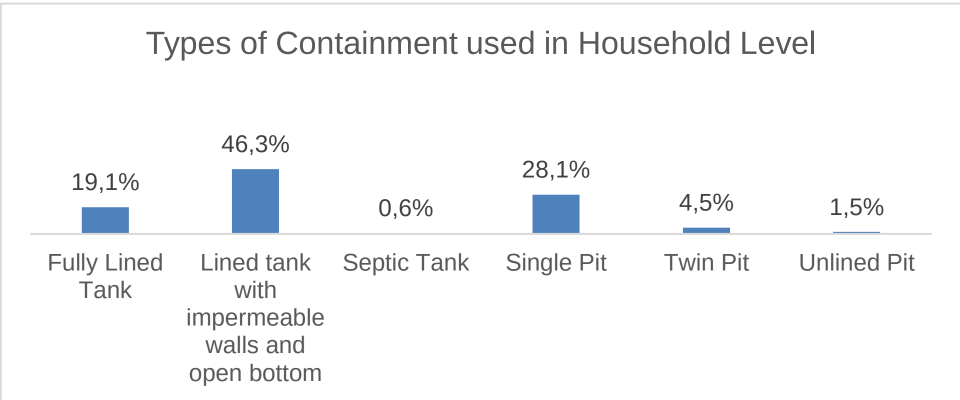

Figure 3: Types of onsite sanitation system used in household level in Mithila Bihari Municipality (ENPHO, 2022).

Different types of onsite sanitation systems used in households of Mithila Bihari municipality are described below:

Septic tank: Septic tank is a properly sealed watertight tank with at least two chambers. Most of the solids settle out in the first chamber. A correctly designed septic tank has an outlet from the second chamber to a sub-surface infiltration system (such as a soak pit) or to a sewer for further management of the liquid effluent. People residing in only 0.6% of the households have access to a correctly built septic tank. Figure 4 shows the top view of septic tank built in a household of Mithila Bihari municipality.

Figure 4: Top view of Septic tank in a household of Mithila Bihari Municipality.

Fully lined tank: Fully lined tank is a rectangular onsite sanitation technology which is used to safely store faecal sludge. There is no outlet or overflow to discharge effluent. The walls and bottom of tank is totally lined and sealed (Linda Strande, 2014). People residing in 19.1% of households with access to toilet in their houses in the municipality having onsite sanitation technology use fully lined tanks. Figure 5 shows the top view of a fully lined tank built in a house in a rural area of the municipality.

Figure 5: Top view of a fully lined tank in Mithila Bihari Municipality.

Lined tank with impermeable walls and open bottom: Population residing in 46.3% of households with a toilet in their houses in the municipality have built a lined tank with impermeable walls and open bottom, which are rectangular onsite technologies where the walls of the tank are lined and the bottom of tank is not lined and allows infiltration of effluents which could contaminate groundwater.

Single pit: Single pits are properly constructed and well-maintained pits with semi-permeable, honeycombed lined walls and an open, permeable base, through which infiltration can occur (Susana, 2018). Generally, single pits are circular in shape and do not have designed outlet. The population residing in 28.1% of households having access to basic sanitation in the municipality use single pit as onsite sanitation technology. Such type of pits is considered as lined pit with semi-permeable walls and open bottom in the SFD graphic. Figure 6 shows the top view of a single pit built in a house in a rural area of the municipality.

Figure 6: Top View of Single Pit in Mithila Bihari Municipality.

Twin Pits: Population residing in 4.5% of households with access to a toilet in their houses use twin pits as onsite sanitation technology in Mithila Bihari Municipality, which are two sets of properly constructed and well-maintained pits with semipermeable, honeycombed lined walls and an open, permeable base, through which infiltration can occur. Each pit is used alternatively after one is completely filled. FS is left to decompose after the pit is filled. Twin pits effectively treat FS if there is no exfiltration of water. Figure 7 shows the top view of a twin pits built in a house in a rural area of the municipality.

Unlined Pit: Unlined pits are a hole dug into the ground just beneath the toilet to store FS onsite. Population residing in 1.5% of households with access to toilet in their houses have built such type of onsite sanitation technology. There are no lining and the walls and bottom of such type of pits.

Figure 7: Top view of Twin Pits in Mithila Bihari Municipality.

Figure 8 shows the distribution of various types of sanitation technologies in different wards of Mithila Bihari Municipality.

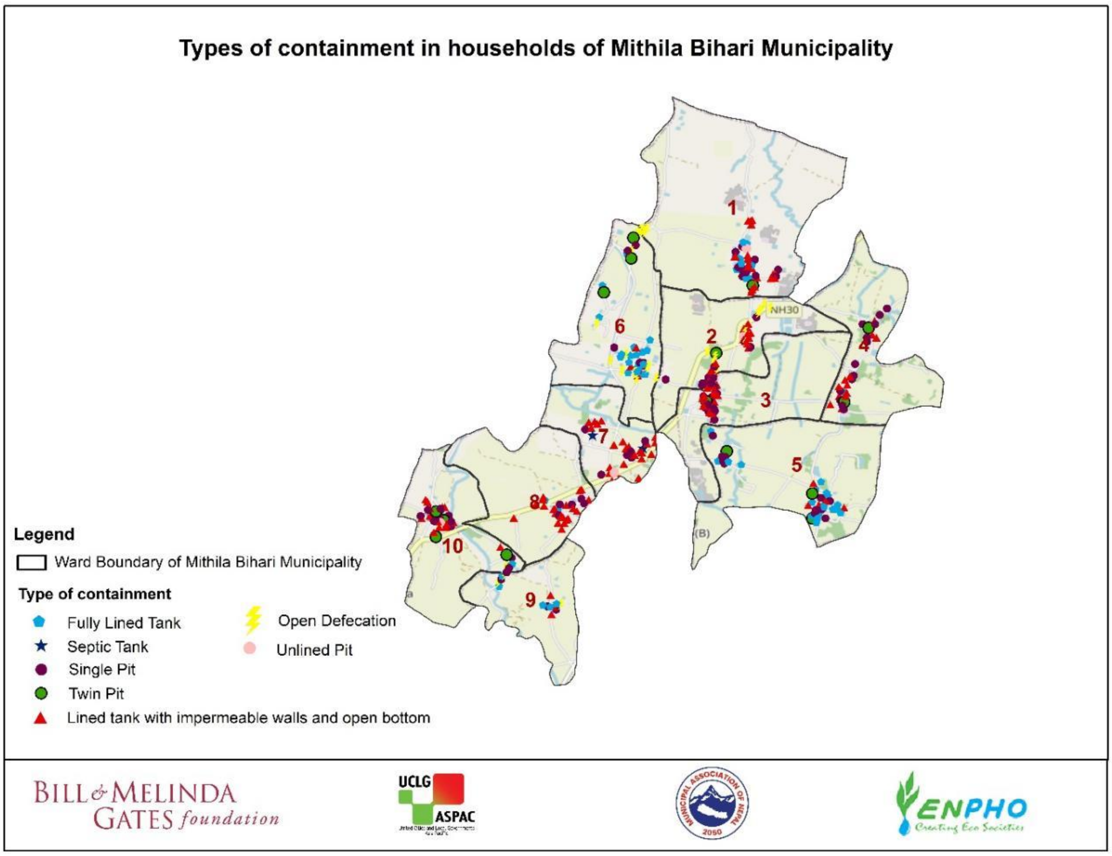

Figure 8: Sanitation technologies installed in household levels (ENPHO, 2022).

2.1.2 Percentage of FS emptied from onsite sanitation technologies.

Emptying is one of the major components of the sanitation value chain. It ensures the proper functioning of containment basically for the septic tanks which functioned well until the volume of sludge is one-third of the total volume of the tanks. Also, in other containments, regular emptying prevents overflow of the sludge and blockages. Regular emptying prevents overflow of the sludge and blockages (Linda Strande, 2014). However, only 21.5% of the households have emptied their containment due to overflow of faecal sludge.

Furthermore, lined tanks with impermeable walls and open bottom are emptied more than other types of containment in the household buildings. Among the households with emptied containment at least once, 34.7%, 13.9%, 4.2% and 4.2% of households with single pits, fully lined tanks, twin pits and unlined pits.

Emptying rate of the containment is determined by number of users, duration of use, types, and size of the containment. 98.2%, 86.5% and 73.1% of the containments installed 0 to 2 years, 3 to 5 years and 6 to 10 years ago have not been emptied respectively. During this period, 84.8% of the toilets were constructed. Also, the average number of users and average size of containments that are emptied are 8 and 5.3 m^3 and not emptied are 6 and 9.7 m^3, respectively.

The final values used for the proportion of faecal sludge emptied from each sanitation system (which accounts for variable F3 in the SFD matrix and shown in Figure 13) are derived from the data obtained in the household survey and consider all sanitation systems that have been emptied at least once.

Mechanical emptying is popular in the municipality. 94.5% of the emptied containment was mechanically emptied while manual emptying is still in practice. However, manual emptying practices were not observed in institutional buildings. The private desludging service providers from neighbouring municipality serve mechanical desludging in the municipality.

Onsite sanitation technologies that have and have not been emptied in different wards throughout different wards of the municipality is shown in Figure 9. Blue circle in the figure represents the containments that have not been emptied and the red circle represents containments that have been emptied at least once after construction.

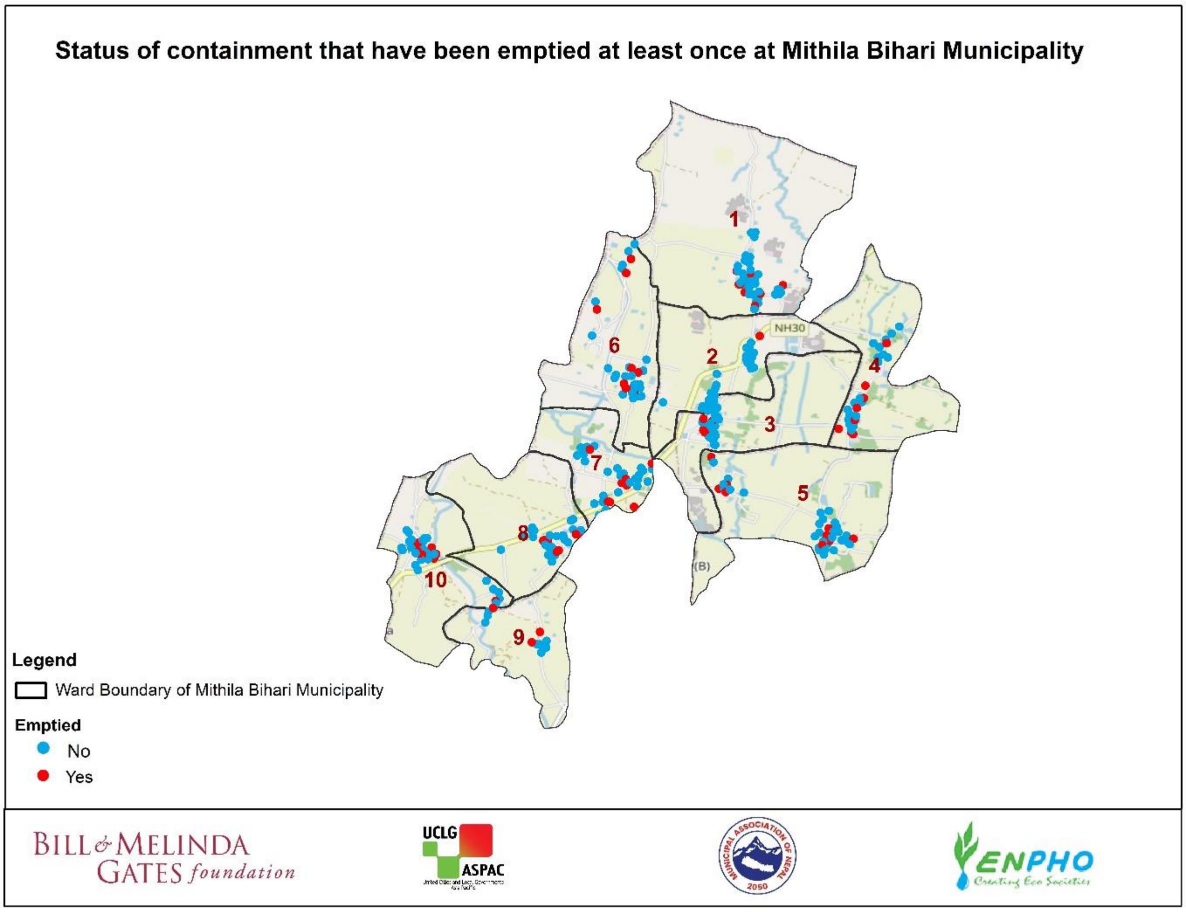

Figure 9: Status of onsite sanitation technologies that has been emptied at least once (ENPHO, 2022).

Table 2 shows the average emptying frequency of onsite sanitation technologies in the municipality. Frequency of emptying of sealed containments is higher than pits, which can be justified by the volume of onsite containments, which shows the size of sealed containments to be greater than the size of pits.

Table 2: Average emptying frequency of different types of onsite sanitation technologies in Mithila Bihari Municipality.

Onsite Sanitation Technology	Average Emptying Frequency
Fully Lined Tank	Once every one year and one month
Lined Tank with Impermeable Walls and Open Bottom	Once every seven months
Single Pits	Once every seven months
Twin Pits	Once every ten months
Unlined Pits	Once every one year and three months

2.2.2 *Treatment and Disposal/Reuse*

Mithila Bihari does not have any form of treatment plant for faecal sludge. The majority of FS emptied is applied in farmlands and a few percentage of the emptied FS is dumped into forest areas and nearby water bodies. FS emptied is not used in farmlands in the municipality because there is a cultural and religious taboo associated with the use of human waste as soil conditioner as it is considered impure and unclean, and therefore not suitable for use in agriculture.

2.1.2 Institutional Level Sanitation System

96.4% of the surveyed institutions have access to a safely managed sanitation system in the municipality. Population in the remaining 2.6% of institutions use toilets of neighbouring buildings. Institutional buildings such as community schools, health posts, government buildings, etc. were surveyed. The percentage of types of sanitation technologies in these buildings is shown in Figure 10.

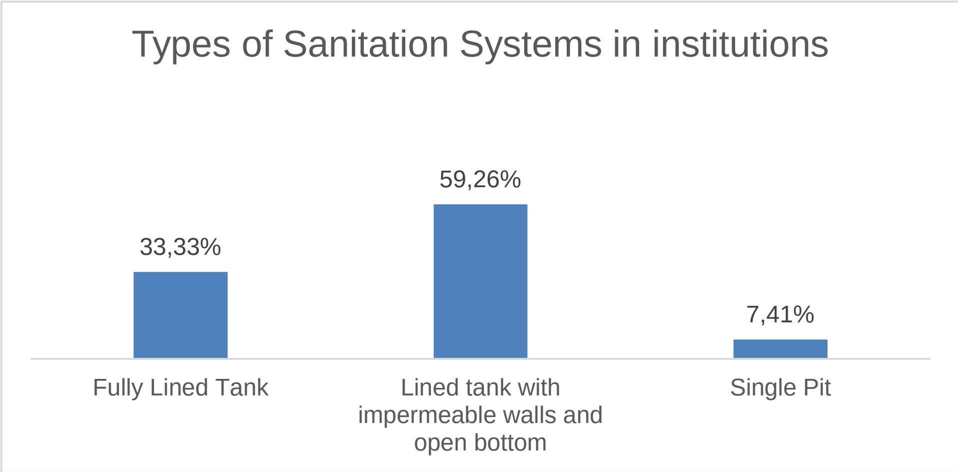

Figure 10: Types of containment in institutions of Mithila Bihari Municipality (ENPHO, 2022).

Only 23% of the institutions having an onsite sanitation system have emptied their containment at least once after construction. Rest of the institutions have never emptied their containment because it has never been filled. Distribution of different types of sanitation technologies of institutions in various wards of Mithila Bihari Municipality city is shown in Figure 11.

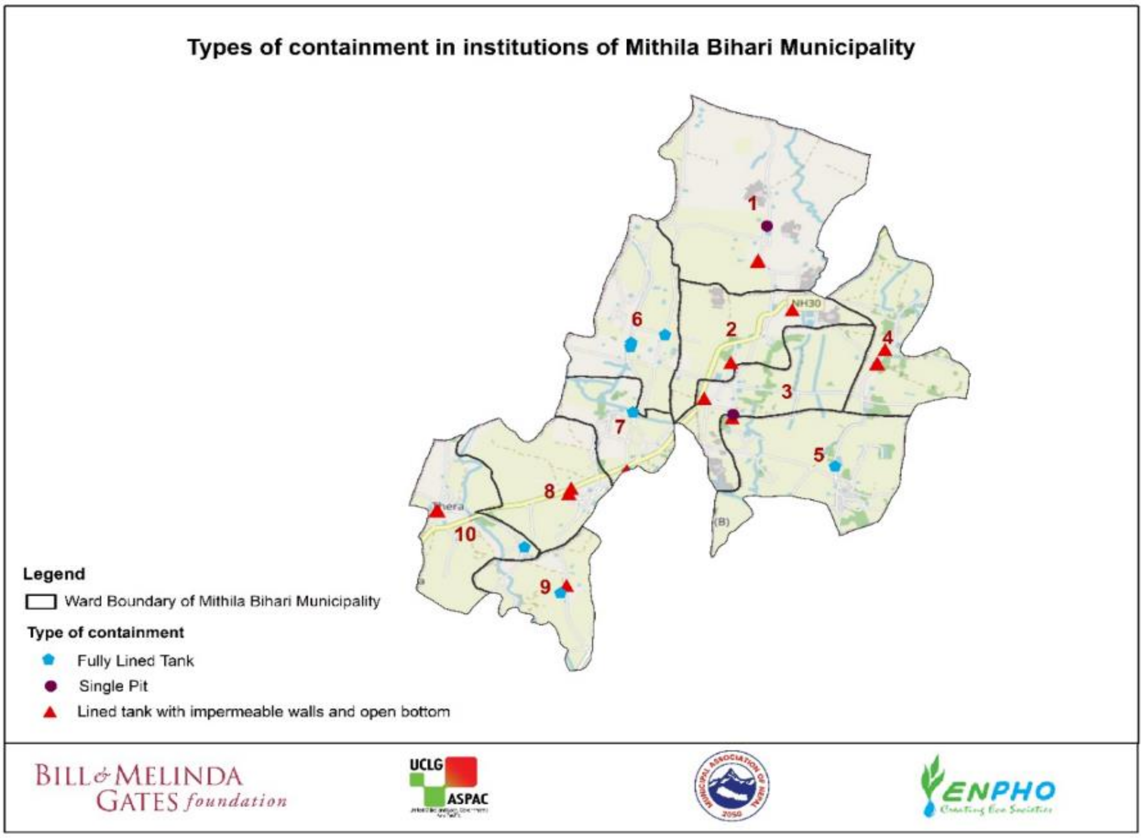

Figure 11: Types of onsite sanitation systems in institutions of Mithila Bihari Municipality (ENPHO, 2022).

2.1.3 Public Toilets

Public Toilets (PT) are installed for commuters to achieve and sustain open defecation-free status in the municipality. Altogether, four public toilets are installed to serve the floating population and travellers of the municipality. Only public toilet A, as seen in Table 3 located in the crowded area of the municipality, is functional, but the state of the toilet is very poor with overflow and a foul smell. Public toilet C is under construction and public toilets B and D are not in use.

Table 3: List of Public Toilets in Mithila Bihari Municipality.

	
Public Toilet A	Public Toilet B
	
Public Toilet C	Public Toilet D
	
Effluent from containment of Public Toilet into open drainage	

2.2 SFD

2.2.1 SFD Selection Grid

Sanitation technologies selected in the SFD grid in Mithila Bihari Municipality are shown in Figure 12. 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 the outlet or overflow discharge from the toilet. Twin pits, unlined pits and single pits observed in the household survey are selected as lined pits with semi-permeable walls and open bottom in the SFD grid.

Thus, different types of sanitation systems in Mithila Bihari Municipality and their outlet are selected in the selection grid and the proportion of population using such type of systems is calculated further 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 Low risk of GW pollution	T1A2C6		T1A2C8		
Fully lined tank (sealed)					Significant risk of GW pollution T1A3C5		T1A3C7	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		T2A4C10 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 12: SFD selection grid for Mithila Bihari Municipality.

Sanitation technologies and/or systems which ensure safe level of protection from excreta i.e., pathogen transmission to the user or general public is limited, are considered to contain the FS. Similarly, sanitation technologies and/or sanitation systems which do not ensure safe level of protection from excreta. I.e., pathogen transmission to the user or general public, do not to contain FS (Susana, 2018).

Brief explanation of terms used to indicate different frame selected in the SFD selection grid in Figure 12 is explained in Table 4.

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

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.
T1A2C8	A correctly designed, properly constructed, fully functioning septic tank with an outlet connected to open ground. 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
T1A3C7	A correctly designed, properly constructed and well maintained fully lined tank with impermeable walls and base. Since the tank is fitted with a supernatant/effluent overflow connected to a water body the excreta in this system are considered not contained.
T1A3C5	A correctly designed, properly constructed and well maintained fully lined tank with impermeable walls and base. Since the tank is fitted with a supernatant/effluent overflow connected to a correctly designed, properly constructed and fully functioning soak pit the excreta in this system is considered contained.
T1A3C8	A correctly designed, properly constructed and well-maintained fully lined tank with impermeable walls and open bottom. Since the tank is fitted with a supernatant/effluent overflow connected to open ground the excreta in this system is considered not contained.
TA3C10	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.
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. 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. 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. Since the tank is fitted with a supernatant/effluent overflow connected to open ground, the excreta in this system is considered not 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 is therefore likely to be partially treated. The tank is not fitted with a supernatant/effluent overflow but since there is a 'significant risk' of groundwater pollution this system is considered not contained.
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. However, since the tank is not fitted with a supernatant/effluent overflow this system is considered contained.
T2A5C10 (High Risk)	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.
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.

2.2.3 *SFD proportion and matrix*

The second step in the process of developing the SFD graphic is the calculation the proportion of contents of each type of onsite container which is faecal sludge. A detailed instruction on how to calculate SFD proportion in SFD PI was used as guide to calculate SFD proportion. It stated that the default "100%" value is used where onsite containers are connected to soak pits, to water bodies or to open ground. This will model the contents as 100% faecal sludge and a proportion of this may be emptied periodically. The remaining not emptied fraction is made up of one or more of the following: faecal sludge which remains in the container, supernatant (when discharging to water bodies or to open ground), and infiltrate. Where onsite containers are connected to a sewer network or to open drains, a value of "50%" is used which means that half the contents are modelled as faecal sludge; a proportion of this may be emptied periodically. The remaining not emptied fraction will comprise faecal sludge which remains in the container and, in the case of open-bottomed tanks, infiltrate. The other half of the contents is modelled as supernatant discharging into the sewer network or to open drains. The formula used for 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 fully lined tanks (sealed) or lined tanks with impermeable walls and open bottom and all types of pits), is shown in column Population (Pop) of Figure 13. F3 is the proportion of the contents of each type of onsite container which is emptied at least once after its construction. Here, only 80% of the proportion of FS in the containment is emptied as suggested by data from household survey and interview with private desludgers.

Variable F4 accounts for FS emptied that is delivered to treatment plant, which is zero because FS emptied is not taken to treatment plant. FS emptied is not used in farmlands in the municipality because there is a cultural and religious taboo associated with the use of human waste as fertilizer as it is considered impure and unclean, and therefore not suitable for use in agriculture. Variable F5 accounts for FS delivered to treatment plant which is also zero. FS emptied in the municipality is mostly dumped of untreated in the water resources and forest areas away from the community.

Figure 13 shows the SFD matrix of Mithila Bihari Municipality.

Mithila Bihari, Madhesh Province, Nepal, 6 Apr 2023. SFD Level: 2 - Intermediate SFD
Population: 38273
Proportion of tanks: septic tanks: 75%, fully lined tanks: 100%, lined, open bottom tanks: 98%

Containment						
System type	Population	FS emptying	FS transport	FS treatment	SN transport	SN treatment
	Pop	F3	F4	F5	S4e	S5e
System label and description	Proportion of population using this type of system (p)	Proportion of this type of system from which faecal sludge is emptied	Proportion of faecal sludge emptied, which is delivered to treatment plants	Proportion of faecal sludge delivered to treatment plants, which is treated	Proportion of supernatant in open drain or storm sewer system, which is delivered to treatment plants	Proportion of supernatant in open drain or storm sewer system that is delivered to treatment plants, which is treated
T1A2C6 Septic tank connected to open drain or storm sewer	0.6	0.0	0.0	0.0	0.0	0.0
T1A2C8 Septic tank connected to open ground	0.6	0.0	0.0	0.0		
T1A3C10 Fully lined tank (sealed), no outlet or overflow	16.1	15.3	0.0	0.0		
T1A3C5 Fully lined tank (sealed) connected to a soak pit	0.6	0.0	0.0	0.0		
T1A3C7 Fully lined tank (sealed) connected to a water body	0.3	0.0	0.0	0.0		
T1A3C8 Fully lined tank (sealed) connected to open ground	0.6	0.0	0.0	0.0		
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	23.5	18.8	0.0	0.0		
T1A4C5 Lined tank with impermeable walls and open bottom, connected to a soak pit	0.8	0.0	0.0	0.0		
T1A4C6 Lined tank with impermeable walls and open bottom, connected to an open drain or storm sewer	3.5	0.0	0.0	0.0	0.0	0.0
T1A4C8 Lined tank with impermeable walls and open bottom, connected to open ground	13.9	14.1	0.0	0.0		
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	29.5	22.5	0.0	0.0		
T1A6C10 Unlined pit, no outlet or overflow	0.8	54.0	0.0	0.0		
T1B11 C7 TO C9 Open defecation	8.5					
T2A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	0.6	90.0	0.0	0.0		
T2A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	0.3	90.0	0.0	0.0		

Figure 13: SFD Matrix of Mithila Bihari Municipality.

2.2.2 Risk of Groundwater Pollution

The risk of groundwater pollution is assessed based on source of drinking water and the vulnerability of the aquifer with regards to lateral spacing between sanitation system 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, as a result 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).

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. Groundwater vulnerability is specific to containment type and pollution scenarios (Andreo, 2013). 98% of the households use groundwater as major source of drinking water in the municipality, among which, only 2% have depth below 100 ft (30.48 m). This percentage of households have constructed lined tanks with impermeable walls and open bottom at less than 10 ft (3.04 m) horizontal distance from the groundwater source. Mithila Bihari Municipality has geological setting of thick clay layer underlain by fine sand (Municipality M. B., 2023). This layer of clay act as a goof filtration barrier suggesting that the probability of groundwater pollution at household level is very low to none.

2.3 Summary of assumptions

Offsite sanitation systems:

✓ Offsite sanitation systems are not observed in the municipality.

Onsite sanitation systems:

✓ The proportion of FS in septic tanks was set to 75%, 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 98% according to the relative proportions of the systems in the municipality, as per the guidance given in the Frequently Asked Questions (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 the KIIs conducted.

2.4 SFD Graphic

Figure 14 shows the SFD graphic for Mithila Bihari Municipality where 58% of the excreta generated are safely managed while 43% are unsafely managed.

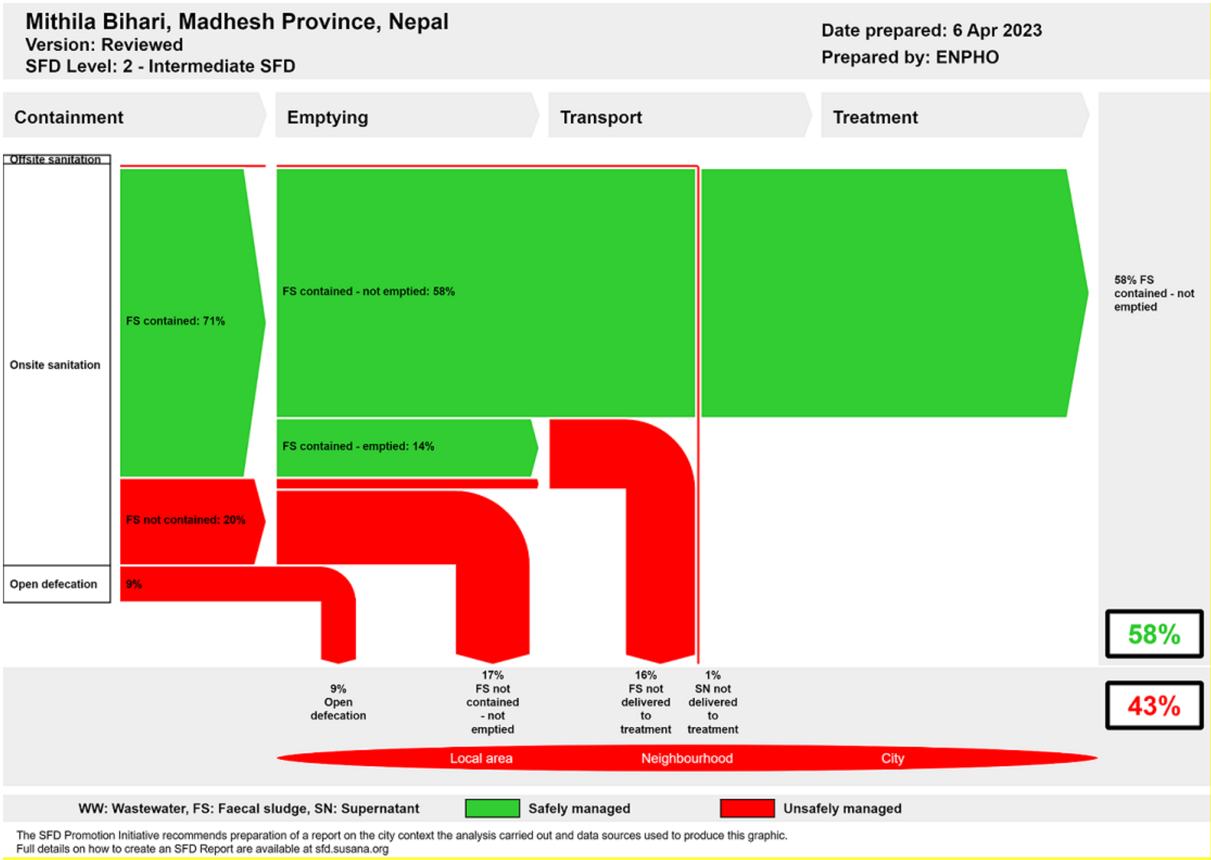

Figure 14: SFD graphic of Mithila Bihari Municipality.

71% of FS is contained i.e., FS kept in a container, either emptied or not, which is safe from human contact. 58% is FS contained - not emptied which is stored in septic tanks, fully lined tanks, lined tanks and pits which are in safe distance from sources of drinking water. This 58% 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.

All 14% of FS contained - emptied is represented as safely managed before emptying as it is stored safely but will act as unsafe after it is emptied and disposed of in open or forest areas or water resources. Likewise, 20% is FS not contained, that is, FS kept in containment which possess risk to human health through groundwater contamination or human contact. 3% of the FS not contained is emptied but not disposed of safely. Lack of a treatment facility in the municipality leads to disposal of FS in open land and water bodies.

Despite ODF status, people residing in 9% of the households still go for open defecation. This percentage of population going for open defecation are people from low-income families who are not financially sound enough to build toilets and containment.

3. Service Delivery Context

3.1 Policy, legislation, and regulation

3.1.1 *Policy*

The Constitution of Nepal 2015 in Article 35 related to right to health recognizes citizen's rights to 'access to clean drinking water and sanitation'. In addition, Right to Clean Environment, Article 30 recognizes that every person shall have the right to live in a healthy and clean environment (GoN, 2015). To respect, promote and fulfil the provisions related to right on water and sanitation, Government of Nepal has billed Drinking Water and Sanitation Act, 2019 through Ministry of Water Supply. The act elaborates right to clean water as to receive affordable, sufficient, and quality drinking water regularly as well as access to sanitation as affordable access to quality sanitation services (MoWS, 2019).

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

Recently, National Water, Sanitation and Hygiene Policy, 2022 has been drafted and undergone the process for endorsement. The draft policy is updated till date, including the wide range of sanitation services including treatment, reuse/safe disposal of faecal sludge/wastewater. It emphasizes on the preparation of the municipal level WASH plan with the local leadership to ensure the WASH services for all (MoWS, 2022).

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. In alignment, Ministry of Water Supply through its Department of Water Supply and Sewerage Management (DWSSM) articulated and endorsed Institutional and Regulatory Framework (IRF) for Faecal Sludge Management in Urban Areas of Nepal in 2017. The main objective of the IRF is to define the specific roles and responsibilities of key institutions for the effective management and regulation of Faecal Sludge Management (FSM). It is framed upon existing laws such as Environmental Protection Act (2019) and Environmental Protection Rules (2020), Self-Local Governance Act and Rules 1999, Environmental Standards on Effluent Discharge 2000, Nepal National Building Code 2003, and Land Acquisition Act amendment 2010 (MoWS, 2017). The framework primarily envisioned featuring FSM in the national policy and issuing policy directives into local government to incorporate FSM in their urban planning along with strengthening and enhancing the capacity of the local government to deliver effective services. A local government has been endowed with overall responsibility to plan, implement, and regulate the FSM services within its jurisdiction. The provision of the ability to engage the private sector and other relevant stakeholders such as Water and Sanitation User's Committee (WSUC) in the framework reflects a participatory approach that would help in sustaining the interventions.

The constitution of Nepal has provided the right for local government to form acts, rules and regulation based on the national policies and laws. Local Governance Operation Act 2017 has been formed to implement the right of local government and promote co-operation, co-existence, and co-ordination among federal, provincial, and local government. The act has mentioned the rights, roles, and responsibility of municipalities along with provision and procedure for approving laws and regulations at local level.

It is the duty and responsibility of the Mithila Bihari Municipality to improve access to accessible, safe, and sustainable drinking water and sanitation services to the people of the municipal area as mentioned in chapter 3 of the Local Government Management Act 2074 under the title of municipal work, duties, and rights; the policy, laws, standards, plan implementation and regulation related to local water supply mentioned in sub-section D of section 11. To implement this responsibility, water supply, sanitation and hygiene plan and policy has become essential. Development without planning and estimation will not lead to the expected success in access to water and sanitation (UNICEF, 2020).

3.1.2 *Institutional roles*

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

At Federal Level

National Planning Commission: At the federal government, the National Planning Commission is the specialized and apex advisory body for formulating a national vision, develop 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, facilitate and coordinate with federal, provincial, and local government for developing policy plan and implementation.

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

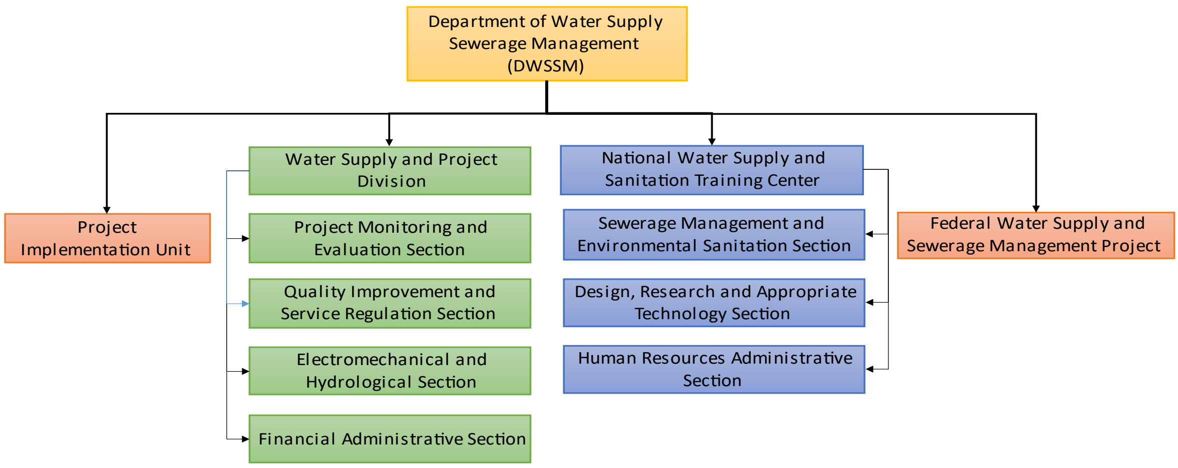

Figure 15: Organizational Structure Department of Water Supply and Sewerage Management (DWSSM).

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

At Provincial Level

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

i. Inter local government projects

ii. Beneficiaries between 5,000 to 15,000 in terai region, 3,000 to 5,000 in hilly region and 5,00 to 1,000 in Himalayan region.

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

Table 5: Sanitation Service Level and its Components.

S.N.	Service Components	Service Level		
		High	Medium	Basic
1	Health and Hygiene Education	✓	✓	✓
2	Household Latrine	✓	✓	✓
3	Public and School Toilets	✓	✓	✓
4	Septic tank sludge collection, transport, treatment, and disposal	✓	✓	✓
5	Surface drains for collection, transmission, and disposal of grewater	✓	✓	✓
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	✓	✓	✓

3.2 Planning

3.2.1 *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 Sustainable Development Goals (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 6.

Table 6: 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

3.3 Investments

A preliminary estimate of the annual investment requirement for the entire SDG period, 2016-2030 ranges between 42% to 54% of Gross Domestic Product (GDP). The average requirement is estimated to be about NPR 1,770 billion (USD 9.17 billion) per year, or nearly 49% of GDP over the entire duration of the SDGs (NPC, 2017).

The 15th year sanitation sector road map has estimated NRP 696 billion (USD 5.45 billion) for implementing the sector development plan of WASH. The gap on the budget allocated and required on WASH sector as mentioned in SDP (2016-2030) is shown in Figure 16. This scale of investment needs a full mobilization of all national and international sources including both public and private sector (MoWS, 2017).

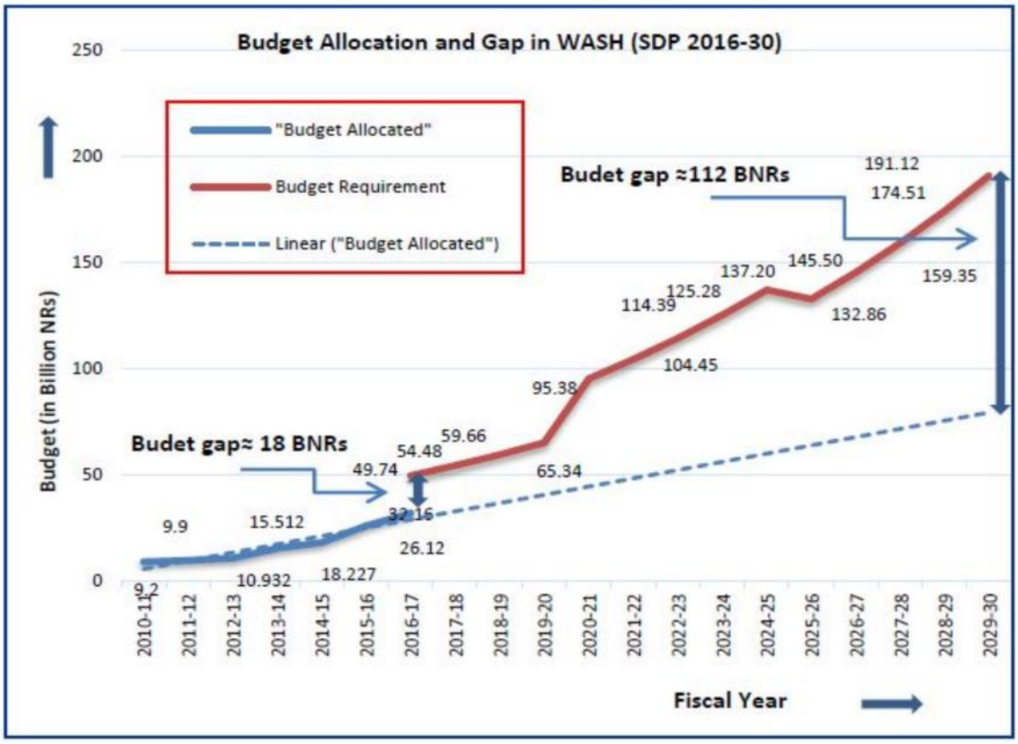

Figure 16: Budget allocation and GAP in WASH SDP 20016-2030.

3.4 Equity

3.4.1 *Current choice of urban poor*

The government has developed a Multiple Indicator Cluster Survey (MICS) for periodic monitoring of different sectors of SDG including water and sanitation service delivery (CBS, 2022). The program is supported by the Joint Monitoring Programme (JMP) from the WHO/UNICEF.

3.4.2 *Stimulating demand for services*

The mandatory provision of septic tanks during construction of building as per the National Building Code is major legal initiative for stimulating sanitation service demand in the city. Besides, the municipality must conduct awareness programs on sanitation at the community level for increasing the demand.

3.4.3 *Strengthening service provider roles*

Local government operation act 2017 and bill on drinking water and sanitation 2019 has entitled local government with authority for planning, implementation, monitoring and supervision of water and sanitation programs and services in the city. Similarly, institutional and regulatory framework on FSM has designated the local government with authority for planning, implementation, monitoring and supervision of sanitation programs (MoWS, 2017).

4. Stakeholder Engagement

4.1 Key Informant Interviews

Key Informant Interviews (KIIs) and objective sharing of the study were conducted with the major stakeholders of sanitation sector of the municipality. Interviews were performed with Mr. Rajendra Prasad Yadav, Mayor, Shova Devi Sah, Deputy Mayor, Mr. Ram Daras Yadav, Chief Administrative Officer (CAO) and Mukesh Kumar Mahato, *Nayak Subba* (Municipality Employee) of Mithila Bihari Municipality on current sanitation services practices with respect to technical, institutional and financial aspects of the municipality.

Similarly, private desludging service providers giving emptying service from Janakpurdham Municipality were interviewed to understand faecal sludge management practice and the business opportunities of the sector in the municipality. KIIs were also performed in context of public toilets with operators of the toilets. Table 7 shows a list of KIIs conducted to personnel and their designation in the organization they work for.

Table 7: List of Key Informant Interviews conducted to personnel.

S.N.	Name	Designation	Organization	Purpose of KII
1.	Rajendra Prasad Yadav (KII-1)	Mayor	Mithila Bihari Municipality	Sanitation status, Ongoing projects on Sanitation, Policies and plan for Sanitation development
2.	Shova Devi Sah (KII-2)	Deputy Mayor	Mithila Bihari Municipality	Sanitation status, Ongoing projects on Sanitation, Policies and plan for Sanitation development
3.	Ram Daras Yadav (KII-3)	Chief Administrative Officer	Mithila Bihari Municipality	Sanitation status, Ongoing projects on Sanitation, Policies and plan for Sanitation development
4.	Mukesh Kumar Mahato (KII-4)	*Nayak Subba* (Municipality Employee)	Mithila Bihari Municipality	Sanitation status, Ongoing projects on Sanitation, Policies and plan for Sanitation development

4.2 Household Questionnaire Survey

Random household questionnaire 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 on 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 visit 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= n_o/(1+ (n_o-1)/N). Where,

Z^2	1.96	At the confidence level of 95%
p	0.5	Assuming that about 50% of the population should have some sanitation characteristics that need to be studied (this was set at 50% since this percentage would yield the maximum sample size as the percentage of the population practising some form of sanitation is not known at the intervention sites).
q	1-p	
e	+/-5%	Level of precision or sampling error.
N		A total number of population (households in the municipality).

This is followed by proportionate stratification random sampling such that each ward in the municipality is considered as one stratum. The sample sized required in each ward is calculated as n_h= (N_h/N)*n, where N_h is a total population in each stratum.

Thus, a total of 366 households were sampled from 7,654 households distributed in ten wards with proportionate stratification random sampling which is shown in Figure 17.

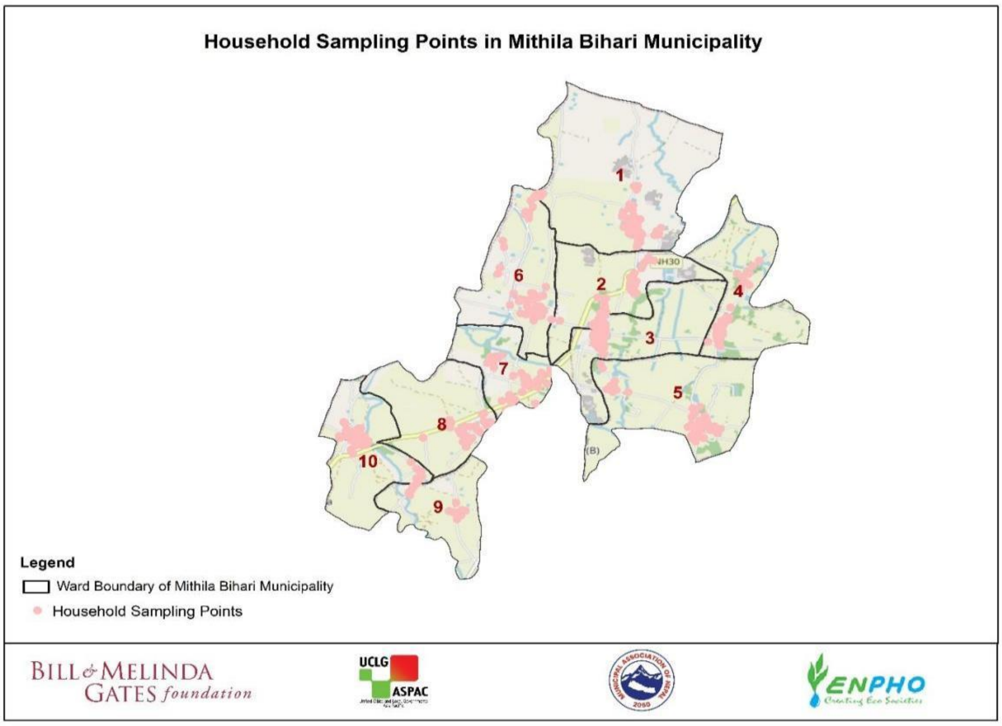

Figure 17: Distribution of sampling points in different wards of Mithila Bihari Municipality (ENPHO, 2022).

4.2.2 Direct Observation

Various sanitation technologies in the households in all the wards were observed and visual references were kept. Also, observation of the emptying of containments and transportation of faecal sludge were carried out. The disposal of private entrepreneur was observed during the usage.

4.2.3 Sharing and Validation of Data

The Shit Flow Diagram Sharing and Validation workshop was conducted in the municipality to share the findings of the sanitation situation survey and receive the suggestion from municipal stakeholders. Participants including the mayor, deputy mayor, ward chairpersons, other members from municipal executive council and sectoral staffs actively participated on the workshop and provided the valuable suggestions. Rajendra Prasad Yadav, mayor of the municipality agreed that the municipality needs to intervene from execution to policy level for faecal sludge management of the municipality. He also suggested promoting activities and campaigning for sustainability of ODF. Ram Daras Yadav, Chief Administrative Officer (CAO) recommended to study and understand the reason behind practice of open defecation in the respective wards. Deputy mayor and other local representatives realized the need for enhancement of the sanitation status in their municipality. They agreed on the data obtained from the households and institutional survey. The list of participants with their designation is attached in Appendix 2. Figure 18 shows participants in sharing and validation workshop in Mithila Bihari Municipality.

Figure 18: Validation workshop at Mithila Bihari Municipality.

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 municipality.

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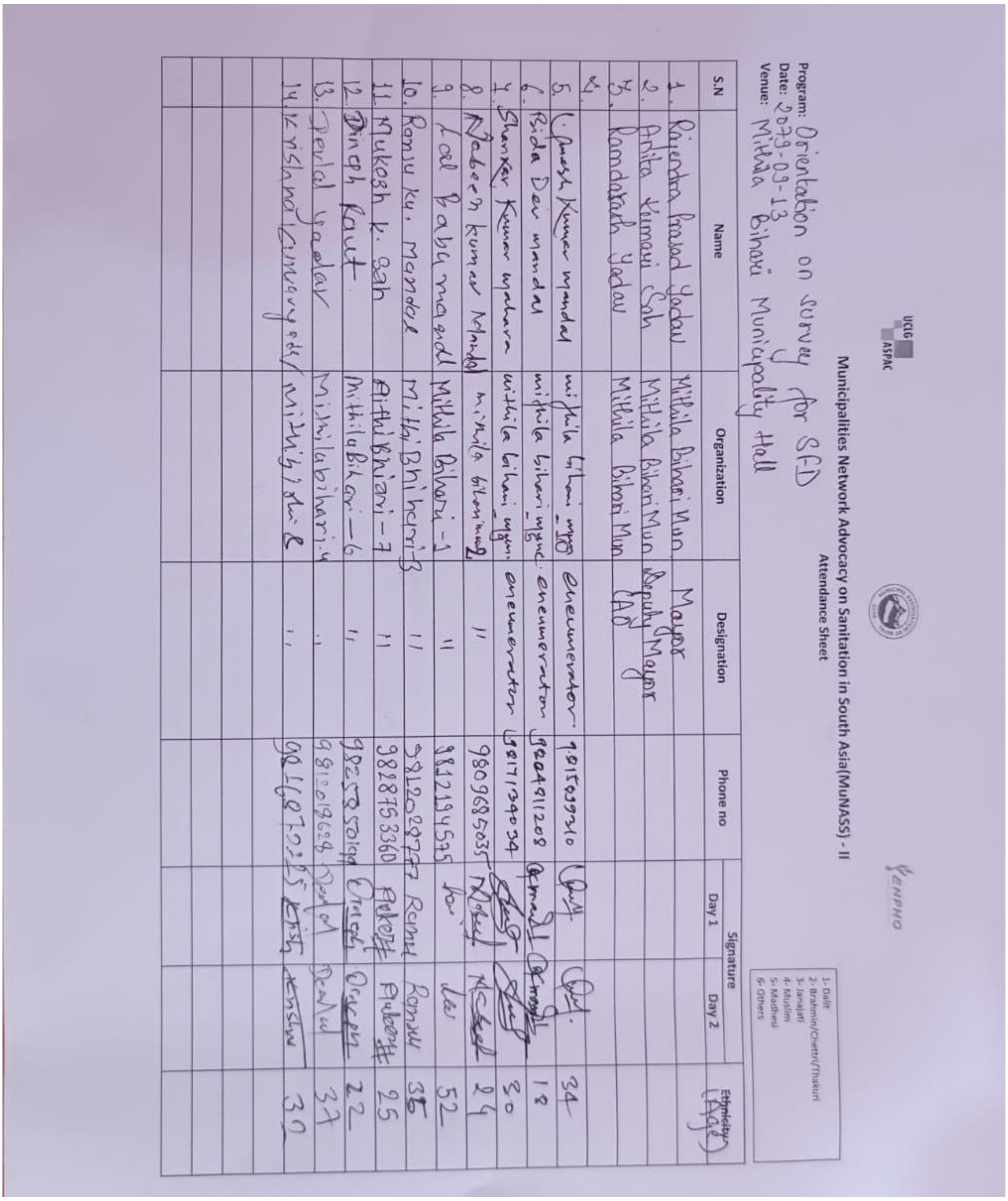
7. Appendix

7.1 Appendix 1: List of participants on orientation on survey for SFD



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

Attendance Sheet

Program: Orientation on survey for SFD

Date: 2079-09-13

Venue: Mithila Bihari Municipality 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 (Age)
1.	Rajendra Prasad Yadav	Mithila Bihari Mun.	Mayor				
2.	Anita Kumari Sah	Mithila Bihari Mun	Deputy Mayor				
3.	Ramdayal Yadav	Mithila Bihari Mun	CAO				
4.							
5.	Umesh Kumar Mandal	mithila bihari mun-10	Enumerator	9815039710			34
6.	Rida Dev Mandal	mithila bihari mun-15	Enumerator	9804911208			18
7.	Shankar Kumar Mahara	mithila bihari mun	Enumerator	9817134034			30
8.	Nabeen Kumar Mandal	mithila bihari mun-12	"	9809685035			24
9.	Lal Babu Mandal	Mithila Bihari-1	"	9812194575			52
10.	Ramu Ku. Mandal	Mithila Bihari-13	"	9812028777			35
11.	Mukesh K. Sah	Mithila Bihari-7	"	9828753360			25
12.	Dinesh Raut	Mithila Bihari-6	"	9825350169			22
13.	Devlal yadav	Mithila bihari-4	"	9810019659			37
14.	Krishna Kumar yadav	Mithila bihari-8	"	9816872225			39

7.2 Appendix 2: Attendance sheet of sharing and validation workshop

आज मिति २०८१।११।१४ गतेका दिन नेपाल नगरपालिका संघको आयोजनामा वातावरण र जनस्वास्थ्य संस्था (एन्फो) को प्राविधिक सहयोग तथा The United Cities and Local Goverment Asia Pasific (UCLG-ASPAC) को सहकार्यमा Municipalities Network Advocacy on Sanitation in South Asia (MuNASS-II) कार्यक्रम अन्तर्गत मिथिला बिहारी नगरपालिकामा संचालन गरिएको Shit Flow Diagram (SFD) सम्बन्धि अन्तरक्रिया र प्रमाणीकरण गोष्ठीमा निम्न अनुसार मुख्य सरोकारवालाहरुको सहभागिता रह्यो।

उपस्थिति

क्र.स	नाम	पद	फोन नं:	हस्ताक्षर
१	राजेन्द्र प्रसाद यादव	प्रमुख	९८४४०२३४८६	[illegible]
२	शोभा देवी साह	उप-प्रमुख	९८२६८६६४२४	[illegible]
३	रामदरश यादव	प्रमुख प्रशासकीय अधिकृत	९८४४०२६८६६	[illegible]
४	श्री रामशोभित [illegible]	वडाध्यक्ष - १	९८०४८२९९२८	[illegible]
५	श्री सुरेश कुमार मण्डल	वडाध्यक्ष - 2	9851111640	[illegible]
६	श्री कृष्ण कुमार बसन्त	" -३	९८०९६६२४०४	[illegible]
७	श्री प्रदिप कुमार यादव	" -४	९८१२१४९८०६	[illegible]
८	श्री सुरेन्द्र कुमार मण्डल	" -५	९८१३०४४६६९	[illegible]
९	श्री विमलेश कुमार यादव	" -६		
१०	श्री संजय कुमार शर्मा	" -7	9804825260	[illegible]
११	श्री जीवछ यादव	" -८		
१२	श्री विन्देश्वर यादव	" -९		
१३	श्री ललित ना. झा	" -१०	9804814673	[illegible]
१४	श्री नन्दन कुमार झा	योजना अधिकृत ([illegible])	९८६०-४८४९६६	[illegible]
१५	श्री उपेन्द्र यादव	फोहोर शाखा	९८०४८४४०३२	[illegible]
१६	श्री जीवछ यादव	योजना शाखा	९८२४३५९७५३	[illegible]
१७	श्री राजेश कुमार यादव	पोषण शाखा	९८१४३४२६२३	[illegible]
१८	[illegible]	[illegible]	९८०४८९४२१०	[illegible]

क्र.स	नाम	पद	फोन नं.	हस्ताक्षर
१९.	सुनिता यादव	कृषि प्राविधिक	९८४४०५४८३४०	[illegible]
२०.	सीमा कुमारी झा	अधिकृत छैटौं	९८४९२९८०५६	[illegible]
२१.	आदि नारायण झा	M&E Officer	९८४४९२९६५९	[illegible]
२२	विनय यादव	जन स्वा. अधिकृत	9841903242	
२३.	चन्द्र देवी यादव	सहायक		चन्द्र
२४.				पुजा
२५	खुश्बु खातुन	सहायक		अनिता
२६.	अनिता देवी यादव	सहायक		[illegible]
२७.	रामउदगार दास	सामाजिक विकास शाखा प्रमुख	9804886590	[illegible]
२८.	अनुराग कु. झा	खोलापाला	९८०७८३६२९३.	उर्मिला
२९.	उर्मीला पण्डीत			[illegible]
३०	मुकेश कुमार महतो	प्रशासन	९८०४८२३४६२	[illegible]
३१.	लक्ष्मी नं० यादव	IT Officer	९८४१६६३८१४	[illegible]
३२	सुशील कुमार यादव		7982B168L76	[illegible]
३३	उर्मिला			उर्मिला
३४	अनिता देवी	यादव		अनिता
३५	चन्द्र देवी यादव			चन्द्र
३६	नर्मदा साहा		९८४९८०६८७६३	नर्मदा साह
३७	चन्द्र देवि	सरसफाइ कर्मचारी		चन्द्र देवी
३८	इन्दु डोम	״		इन्दु देवी
३९	सज्जन कुमार थापा		9801890062	[illegible]
४०	गोविन्द कु. यादव	कार्य शाखा	9801637263	[illegible]
४१	सबुना गजाल	रक्षा	९८४३४९२५९६	[illegible]
४२	दीपक शाह	״	9849463840	[illegible]

7.3 Appendix 3: SFD orientation to enumerators for household and institutional survey


KoBoCollect
ENPHO

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SFD Mithila Bihari Municipality, Nepal, 2023

Produced by:

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SFD Promotion Initiative