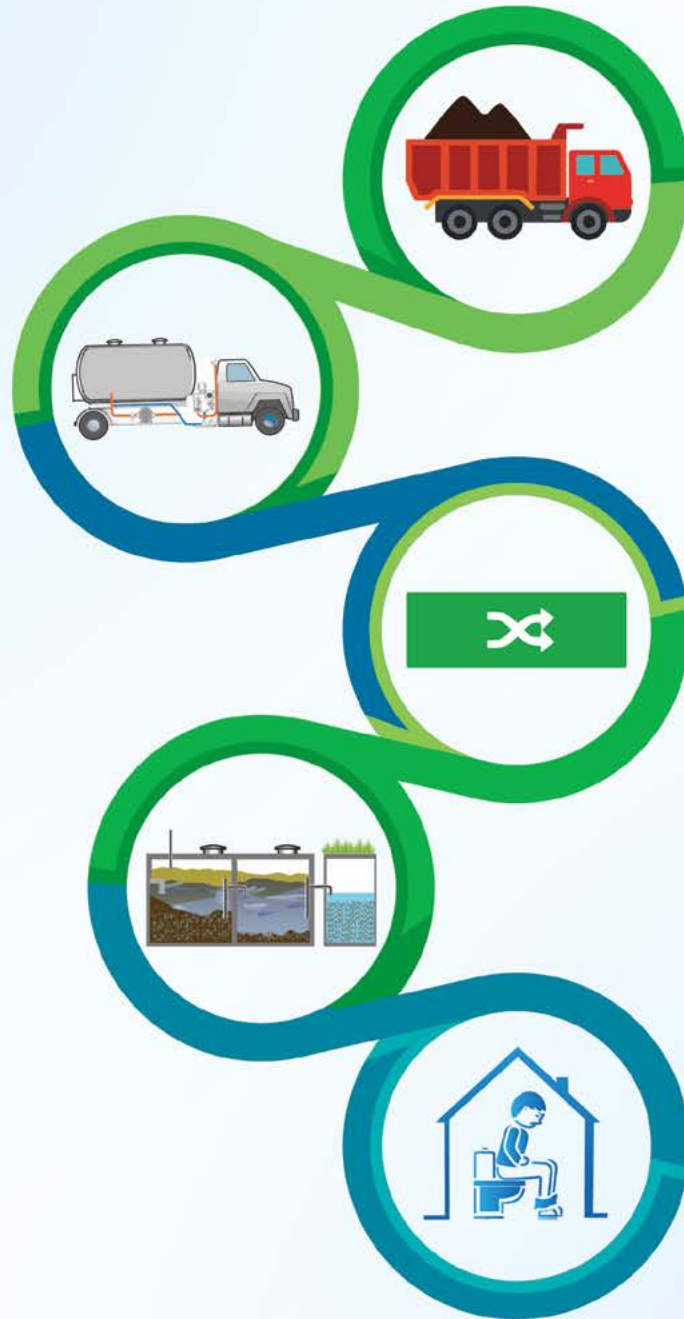


# Municipal Sanitation Synopsis of Bagmati Province, Nepal -2024



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

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Municipal Association of Nepal (MuAN)

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United Cities and Local Governments Asia-Pacific (UCLG ASPAC)

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**Disclaimer:** The content presented in the Municipal Sanitation Synopsis relies on the data available (on the date of the survey) and further validated with respective municipalities. Please note that the information and suggestions may be revised due to dynamic circumstances, updated surveys, or alterations in municipal policies. It is recommended that readers validate and compare the data with the most recent sources to ensure precision and accuracy. While the overviews strive to offer a broad perspective and recommendations, it is important to recognize that specific local conditions can differ, and stakeholders are encouraged to undertake additional research or seek guidance from local authorities for thorough decision-making.

# ACKNOWLEDGEMENT

We extend our sincere gratitude to Mr. Shanti Ratna Shakya, Mayor of Banepa Municipality; Mr. Rajan Shrestha, Mayor of Bidur Municipality; Mr. Ishwor Narayan Manandhar, Mayor of Bhimeshwor Municipality; Mr. Ghanashyam Giri, Mayor of Chandragiri Municipality; Ms. Mina Kumari Lama, Mayor of Hetauda Sub-Metropolitan City; Mr. Upendra Karki, Mayor of Kageshwori Manohara Municipality; Mr. Upendra Kumar Pokharel, Kamalamai Municipality; Mr. Chiribabu Maharjan, Mayor of Lalitpur Metropolitan City; Mr. Surendra Shrestha, Mayor of Madhyapur Thimi Municipality; Mr. Bhim Prashad Dhungana, Mayor of Neelakantha Municipality; Mr. Parlad Sapkota, Mayor of Ratnanagar Municipality along with all deputy mayors, ward chairpersons, and municipal staffs, for their unwavering support and valuable feedback throughout the study. Special thanks to respective Chief Administrative Officers (CAO), for efficiently coordinating and mobilizing team during the study.

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Furthermore, we are thankful to Mr. Bhim Prashad Dhungana, President of Municipal Association of Nepal (MuAN) for the gracious support.



Orientation program to conduct household survey for the enumerators appointed by the respective municipalities during SFD survey



Enumerator conducting household survey using mobile application

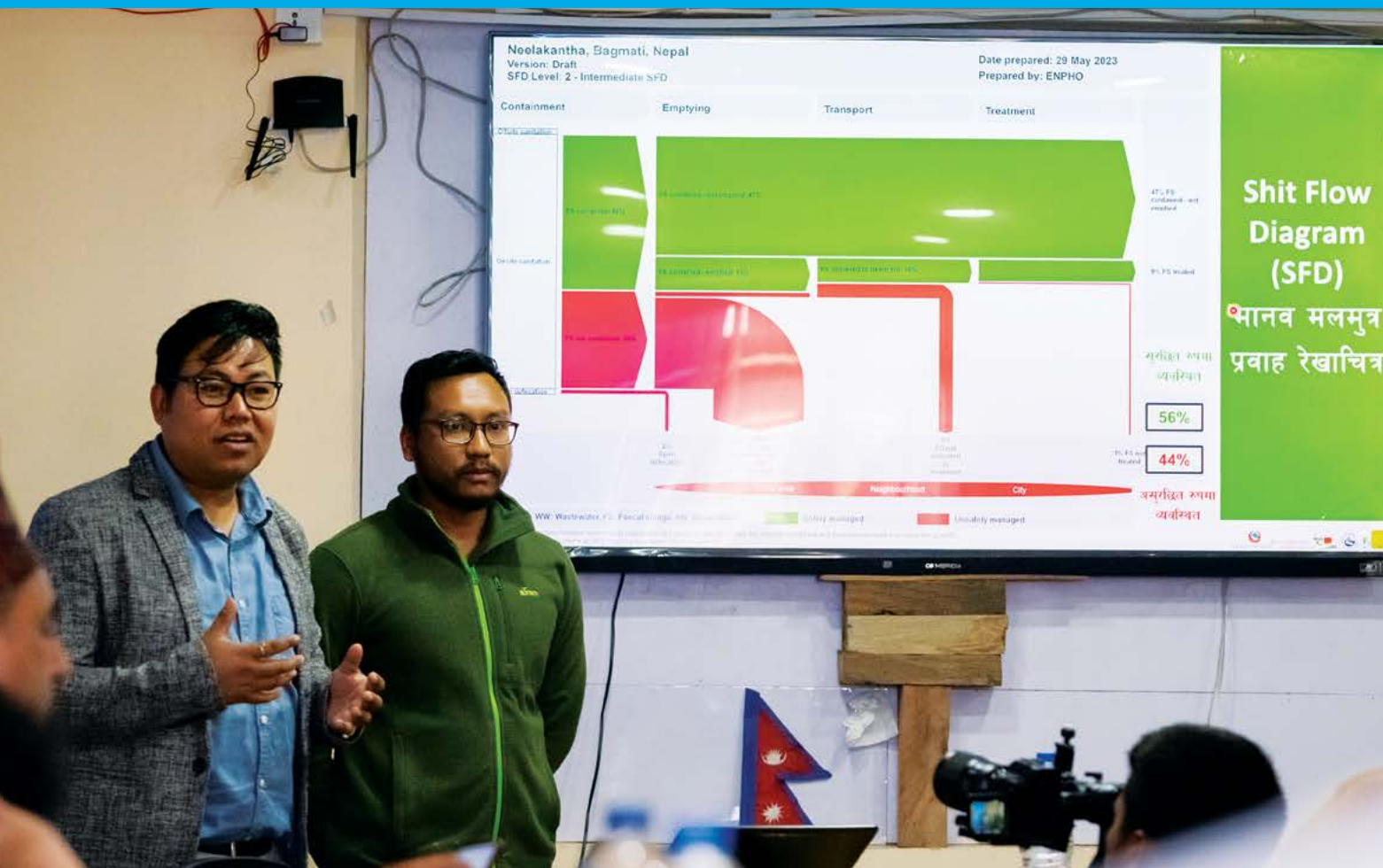
# CONTENTS

Sanitation Synopsis of Bagmati Province, Nepal -2023	1
Banepa Municipality	7
Bhimeshwor Municipality	11
Bidur Municipality	15
Chandragiri Municipality	19
Hetauda Sub-Metropolitan City	23
Kageshwori Manohara Municipality	27
Kamalamai Municipality	31
Lalitpur Metropolitan City	35
Madhyapur Thimi Municipality	39
Neelakantha Municipality	43
Ratnanagar Municipality	47

Conducting key informant interview with desludging service provider



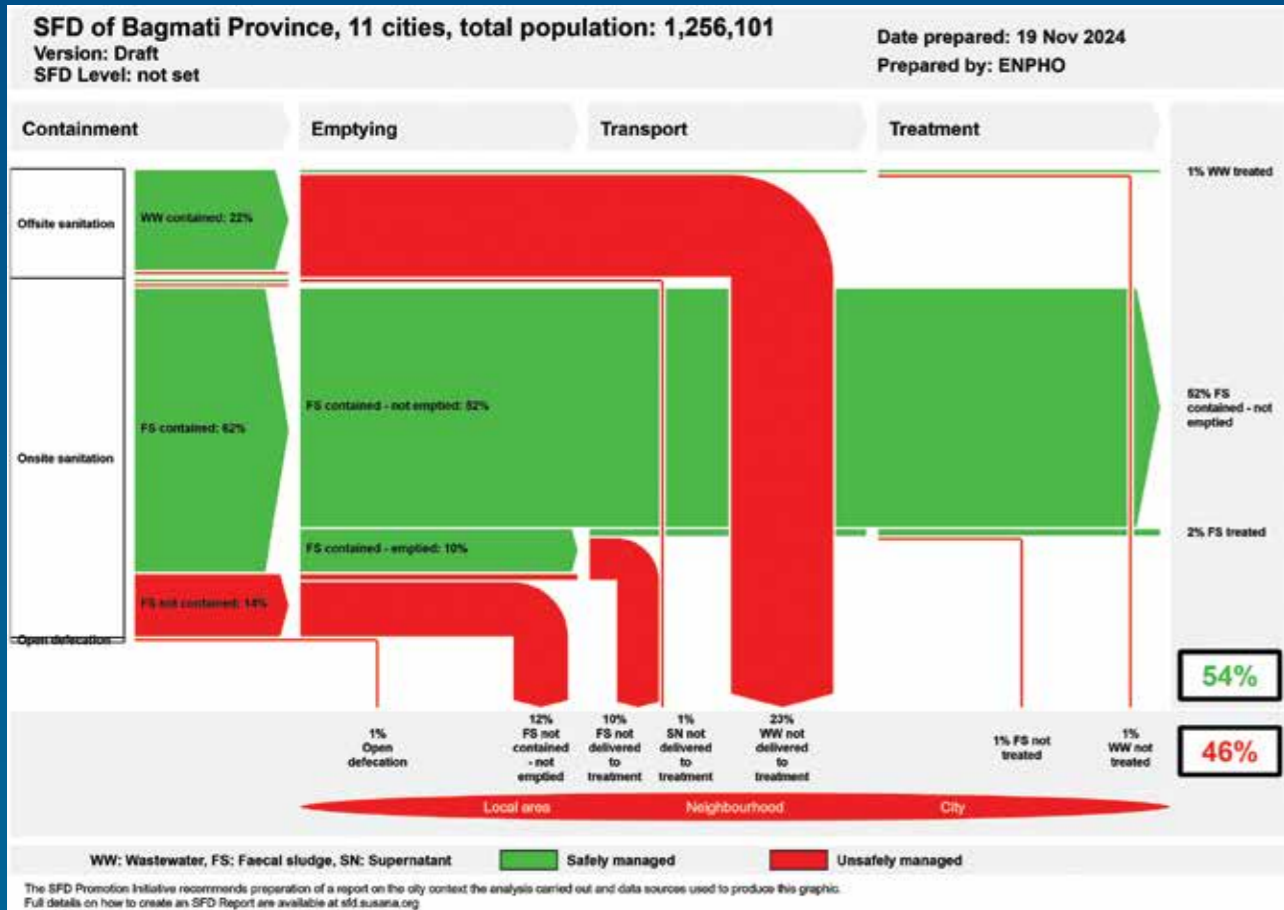
Municipal council members and stakeholders participating in SFD validation workshop to review and discuss findings.



## SHIT FLOW DIAGRAM (SFD)

The shit flow diagram (SFD) represents the sanitation status of the municipalities across the sanitation value chain. FS generated by 54% of the municipality's population is safely managed (Green). Initially, 62% of the FS is safely contained but the percentage decreases to 52% when FS generated by 10% of the population is emptied. This implies that 52% of FS are considered safely managed and remains safe until emptied. Furthermore, 2% of FS is considered treated, primarily from biogas digesters and FS treated in treatment plants at different municipalities in Bagmati Province. The emptied FS remains safe depending on the emptying mechanism and the available treatment options/facilities. Also, 1% of WW is transported to treatment plant and treated.

Further, FS generated by 46% of the population is managed unsafely (Red). This includes 1% WW not treated, 1% FS not treated, 23% of WW not delivered to treatment plant and 1% SN not delivered to treatment plant. Additionally, 10% FS is emptied (8% FS contained and 2% FS not contained) but not transported for treatment. Another 12% of FS is neither safely contained nor emptied, which has increased environmental risks. Similarly, 1% of the population still practice open defecation, exacerbating sanitation challenges. These findings highlight critical gaps that must be addressed to mitigate environmental contamination and public health risks associated with inadequate FS management practices.



## RECOMMENDATIONS

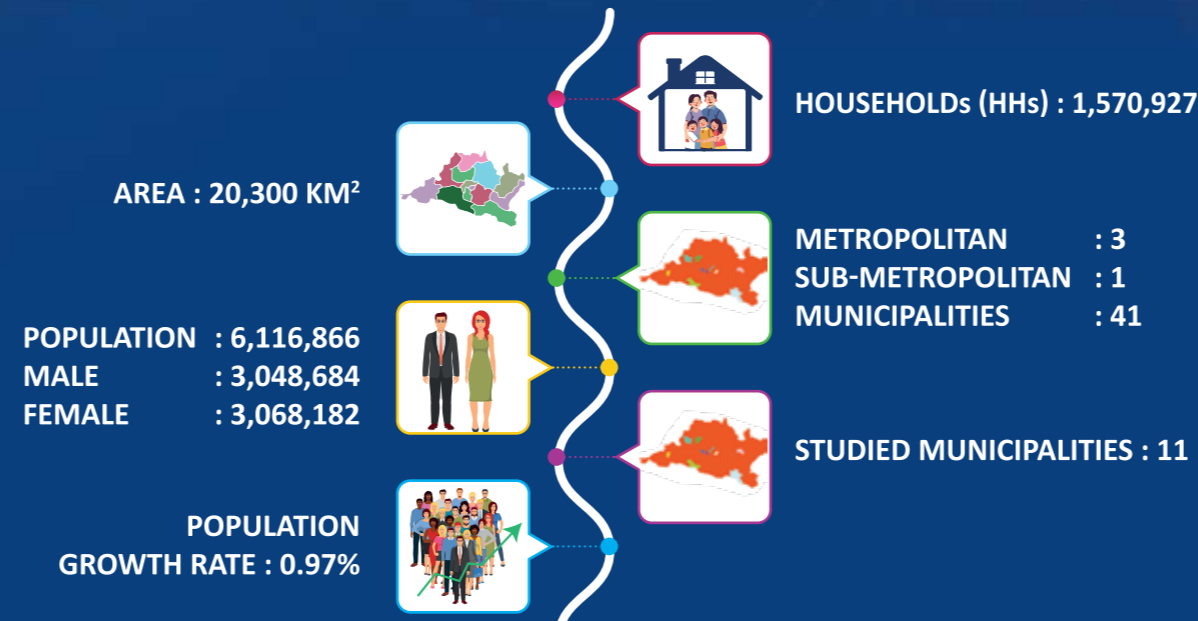
- Strengthen enforcement of ODF activities and provide targeted support to households without toilets to ensure complete access and eliminate open defecation.
- Infrastructure Upgrade:**
  - Retrofit and replace unsafe containment systems with appropriate techniques and technologies such as septic tanks, biogas digesters, and twin pits.
- Promote Mechanical Desludging:**
  - Advocate for providing desludging services within the municipality, along with its formal registration and proper regulation.

- Regulate Sanitation Service:**
- Promote regular emptying of containments, ideally at least once every 3 to 5 years, to prevent overflow and ensure proper functioning.
  - Formulate and enforce policies and regulations mandating the use of safe sanitation technologies in new construction or renovations.
  - Ensure safe disposal by establishing FS treatment facilities and ensuring proper operation and maintenance of the facilities.

# SANITATION SYNOPSIS OF BAGMATI PROVINCE, NEPAL -2024



## DEMOGRAPHICS



## ABOUT

A study on faecal sludge management is being conducted in 65 municipalities of Nepal as part of the Municipalities Network Advocacy on Sanitation in South Asia II (MuNASS II) program. The study was carried out in eleven municipalities i.e. Lalitpur Metropolitan City, Hetauda Sub-Metropolitan City, Banepa, Bidur, Bhimeshwar, Chandragiri, Kageshwori Manohara, Kamalamai, Madhyapur Thimi, Neelakantha and Ratnanagar Municipalities of Bagmati Province.

## OBJECTIVE OF THE STUDY

The study aims to assess the sanitation conditions with a focus on the faecal sludge management (FSM) and develop Shit Flow Diagram (SFD) for these 65 municipalities in Nepal.

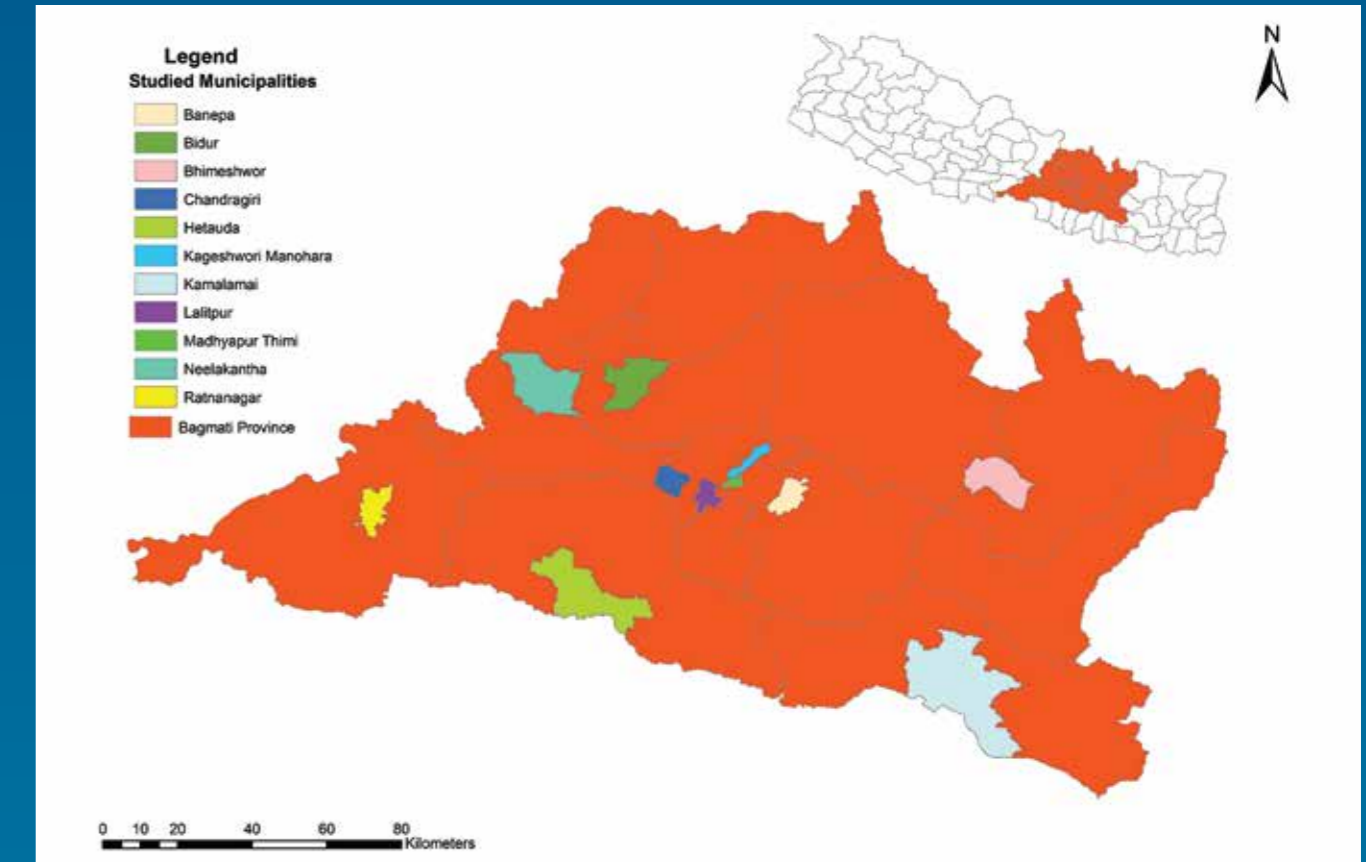
## METHODOLOGY OF THE STUDY

The methodology involved conducting a random questionnaire survey using the KOBO mobile application. Proportionate stratified random sampling was employed to determine the sample size of the households. Local enumerators selected by respective municipalities were mobilized for the survey. The enumerators, trained intensively for two days, were deployed by respective municipalities to collect survey data. Additionally, the Key Informant Interview (KII) was done with concerned stakeholders of the municipalities. Analysis included computing frequency distributions, means and cross tabulations.

## PROVINCE PROFILE

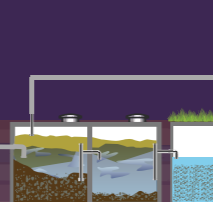
Bagmati Province is the most densely populated province with widely varied landscape of Nepal. It covers an area of 20,300 square km, which is 13.79% of the total area of the country. The geographical coordinates of the province approximately ranges from 26° 55' 48" to 28° 34' 48" N latitude and 84° 43' 48" to 86° 22' 12" E longitude. It is bordered by Koshi Province on the east, Gandaki Province on the west, China on the north and Madhesh Province and Bihar of India on the south.

## MAP LOCATING STUDIED MUNICIPALITIES IN BAGMATI PROVINCE





संकलन  
(User Interface)



भण्डारण  
(Containment)



रिचार्जने र ढुवानी  
(Emptying & Transportation)



प्रशोधन  
(Treatment)



पुनः प्रयोग वा सुरक्षित विसर्जन  
(Re-use or Safe Disposal)



The Sanitation Service Chain (SSC) is a comprehensive service framework delineating the sequential stages

of faecal sludge management from excreta generation to safe disposal. It encompasses five key phases:

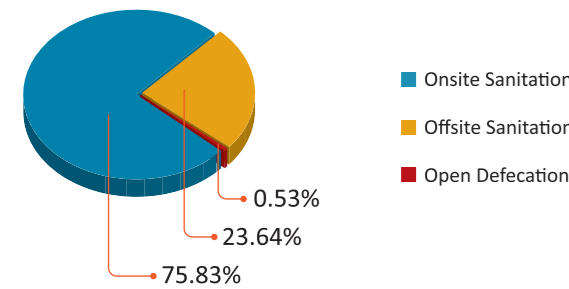
collection, containment, emptying and transportation, treatment, and reuse/safe disposal.

## USER INTERFACE FACILITY

The sanitation facility, commonly referred to as toilet, serves as collection point for human waste and directs it to either offsite or onsite sanitation system.

In Bagmati Province, 75.83% of the households (HHs) have their toilets connected to onsite sanitation systems and 23.64% of HHs have offsite sanitation systems. Certain settlements of Lalitpur Metropolitan City, Hetauda Sub-Metropolitan City, Banepa, Chandragiri, Kageshwori Manohara, Madhyapur Thimi and Ratnanagar Municipalities have sewer networks while few proportion of HHs have an illegal connection to an open/stormwater drains, open ground and water bodies, despite regulations prohibiting the direct connection of blackwater to these outlets. Meanwhile, 0.53% of HHs lack access to improved sanitation facilities, resorting to open defecation.

### Sanitation Facilities

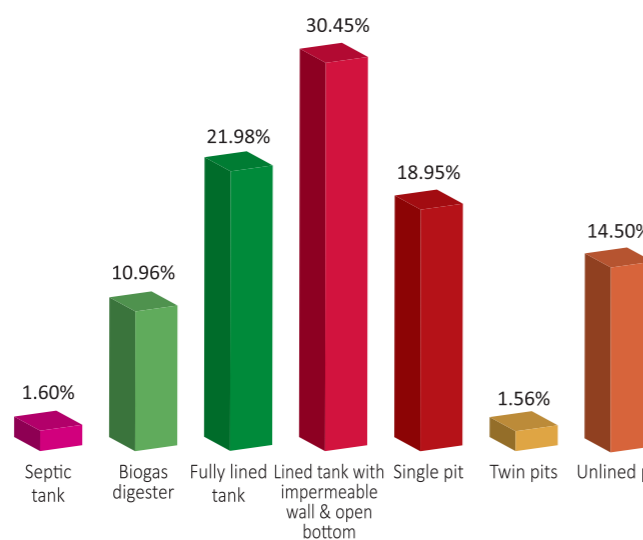


## CONTAINMENT

The human waste collected from toilet is stored in different types of tanks for certain time period, known as containment, and the accumulated human waste in it is termed as faecal sludge (FS).

In the province, most of the HH have built lined tanks with impermeable walls and open bottom. Similarly, a significant proportion of HHs have built single pit and unlined pit. These containments have permeable base, allowing leachate percolation and possessing a risk to groundwater contamination, thus are considered unsafe. However, a low proportion of safe containments, such as biogas digester, septic tanks and twin pits, are found in the province. Additionally, fully lined tanks are installed by significant proportion of the HH.

### Types of Containments

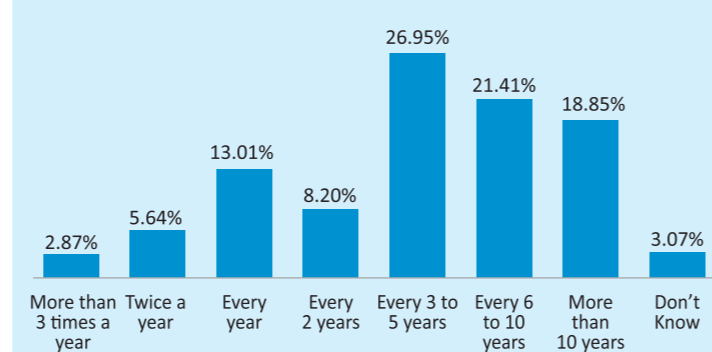


## EMPTYING AND TRANSPORTATION

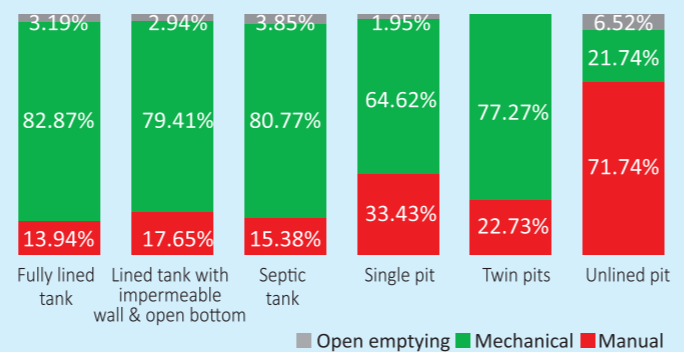
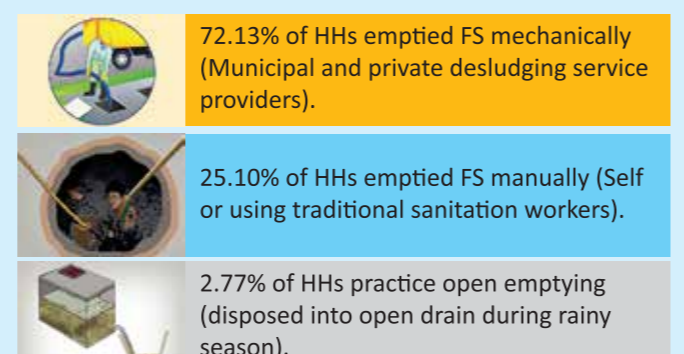
Regular emptying is essential for maintaining the functionality of the containments. The survey reveals that only 22.01% of the HHs have emptied their containments at least once since installation.

The containments are being emptied at different time intervals, where 26.95% of HHs have emptied at an interval of 3 to 5 years. Most unlined pits are being emptied manually while other containment types are emptied both manually and mechanically. The details are shown in the graph.

### Emptying Interval



### Emptying Mechanism



## TREATMENT

Biogas digesters, if functioning properly, are regarded as safe and considered capable of treating faecal sludge. However, FS stored in other types of containment requires treatment. Only Chandragiri Municipality has a very small scale decentralized faecal sludge treatment plant. While, Hetauda Sub-Metropolitan City, Banepa, Madhyapur Thimi and Ratnanagar Municipalities have wastewater treatment plants. However, most treatment plants in these municipalities were either non-functional or partially functional during the time of the study. Thus, emptied faecal sludge are either partially treated or disposed untreated into an open environment or water bodies.



Hetauda Sub-Metropolitan City and Ratnanagar Municipality both have municipal and private desludging services while Lalitpur Metropolitan City has private desludging services only. Moreover, Neelakantha and Kamalamai Municipalities have municipal desludging services only. In addition, there are more than 35 private desludgers operating within the Kathmandu valley that serves inside and outside valley as per demand.

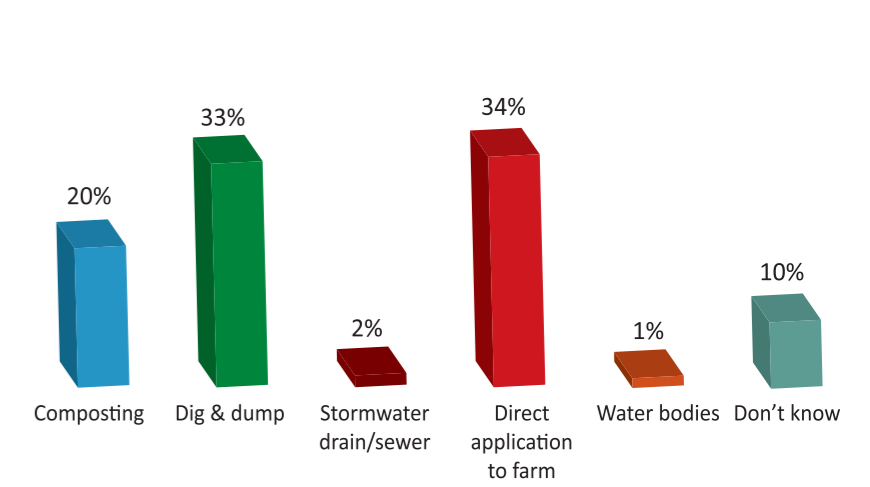
### Details of desludging service providers in surveyed municipalities

Service Provider	Municipality	Private
No. of service providers	4	43
No. of vehicles	4	54
Capacity of vehicles (litres)	3,000-3,500	3,000-6,000
Average number of trips per day per vehicle	1	2
Average service charge per trip (NPR)	3,500-6,000	For rectangular containments- 2,000-5,000 For circular pits- 500-1500

## SAFE DISPOSAL OR REUSE

Most of the HHs that have manually emptied apply it directly to farms possessing a risk to the environment and public health, followed by dig and dump practice. Moreover, significant proportion of HHs practice composting. Meanwhile, some HHs illegally dispose of the FS into nearby open/stormwater drains, and some dump it directly into water bodies, which exacerbates environmental pollution. Moreover, a small proportion of mechanically emptied FS is treated either at households in biogas digesters, at WWTPs or FSTPs. But, mostly, mechanically emptied FS is disposed of in an open environment.

### Disposal practice of FS after manual emptying



## ESTIMATION OF FAECAL SLUDGE

The estimation of faecal sludge production in the Bagmati Province was derived based on containment volume and average emptying frequency. Notably, faecal sludge from biogas digesters, which does not require emptying like other containments, was excluded from the calculation.

Total estimated volume of FS generation in the 45 municipalities of Bagmati Province: 1,397,207 m<sup>3</sup> per year which is 3827.97 m<sup>3</sup> per day.

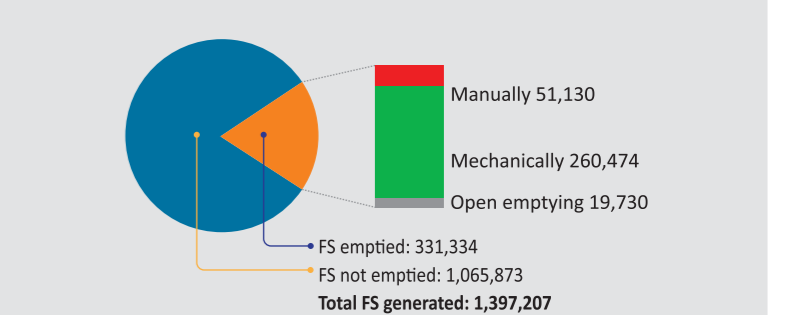
Total estimated volume of FS emptied: 331,334 m<sup>3</sup> per year which is 907.76 m<sup>3</sup> per day.

Total volume of FS emptied by mechanical desludging: 260,474 m<sup>3</sup> per year which is 713.63 m<sup>3</sup> per day.

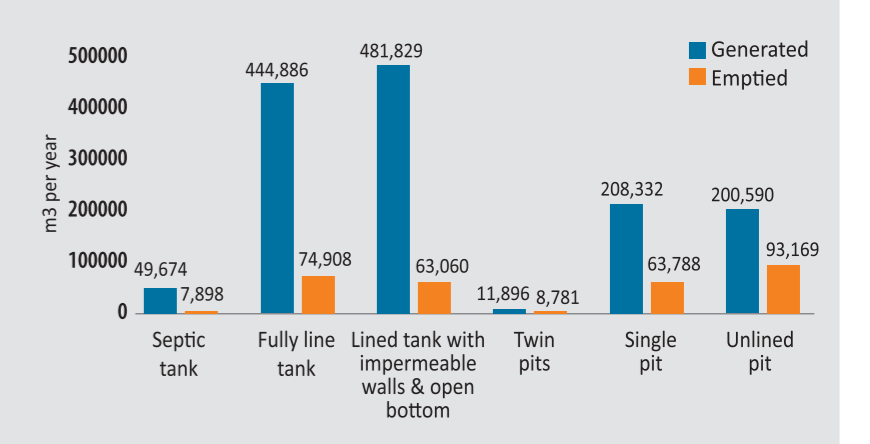
Total volume of FS emptied by manual desludging: 51,130 m<sup>3</sup> per year which is 140.08 m<sup>3</sup> per day.

Total volume of FS emptied by open emptying: 19,730 m<sup>3</sup> per year which is 54.06 m<sup>3</sup> per day.

### Summary on faecal sludge produced, emptied, and transported in Bagmati Province (cubic metre)



### FS Generated and Emptied





# BANEPA MUNICIPALITY

Municipal Sanitation Synopsis, Study Year -2023



BP Highway along Banepa City

## DEMOGRAPHICS



Area : 54.59 km<sup>2</sup>



Household : 16,698



POPULATION : 67,690

Male : 33,172  
Female : 34,518



Wards : 14

Source: Census 2021

## CITY PROFILE

Banepa Municipality is in Kavrepalanchok District of Bagmati Province, Nepal. It is extended from 28°37'01" to 27°39'03" N latitude and 85°30'45" to 85°32'52" E longitude. The elevation of the municipality ranges between 1,400 metres to 1,800 metres above mean sea level.

### Types of sanitation technologies at households in Banepa Municipality

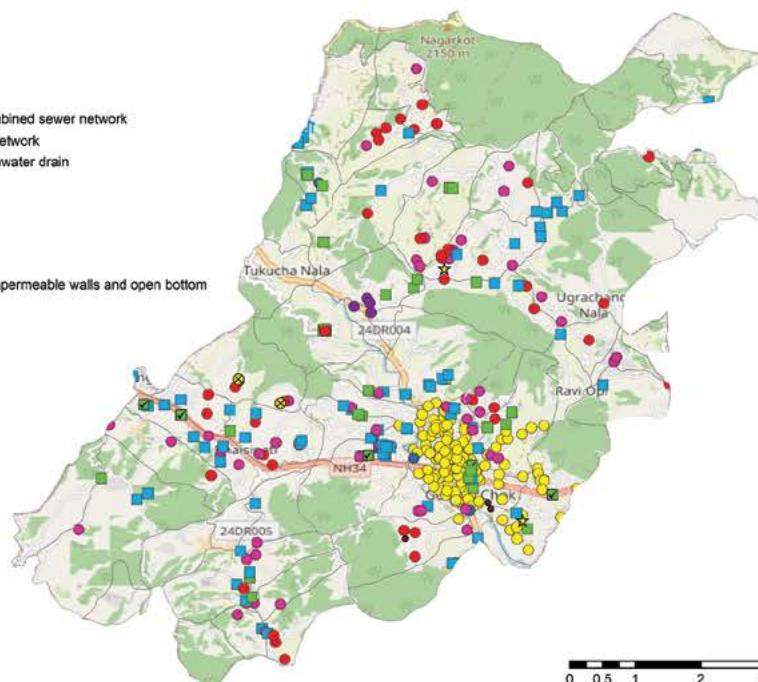
#### Legend

##### Offsite Sanitation

- Decentralized combined sewer network
- Simplified sewer network
- Open drain / stormwater drain

##### Onsite Sanitation

- ★ Biogas digester
- Septic tank
- Fully lined tank
- Lined tank with impermeable walls and open bottom
- Single pit
- Unlined pit
- ⊗ Open defecation





संकलन  
(User Interface)



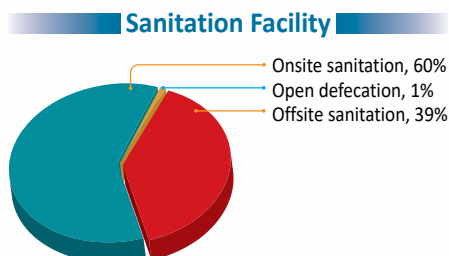
भण्डारण  
(Containment)



रिट्याउने र ढुवानी  
(Emptying & Transportation)

## USER INTERFACE FACILITY

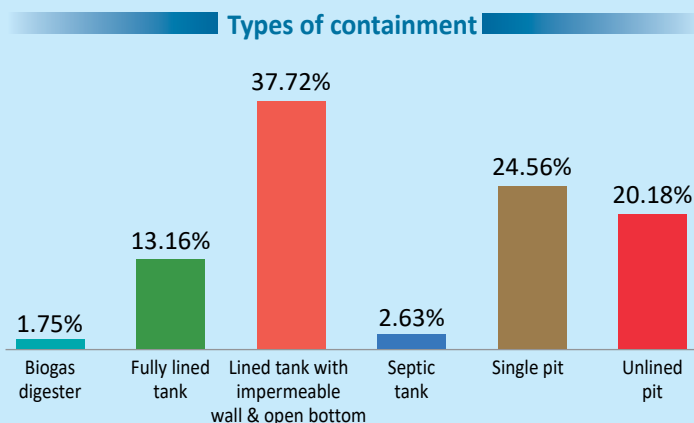
Approximately 1% of HHs still lack access to basic sanitation facilities and practice open defecation. 39% of HHs with offsite sanitation system have been connected to sewer network while 60% of HHs rely on onsite sanitation facilities.



Sewer network outlet to a river

## CONTAINMENT

The survey showed that the majority of the HHs in the municipality have opted for lined tanks with open bottom, single pits and unlined pits which possess high risk of leachate percolation and potential groundwater/spring source contamination. A significant proportion of HHs have installed biogas digesters which are onsite treatment technology and considered safe.

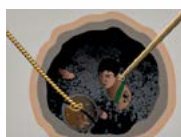


## EMPTYING AND TRANSPORTATION

Approximately 38.36% of HHs have emptied their containments. Usually, these containments are emptied every 3 to 5 years. The private service providers from neighbouring municipalities offer desludging services in municipality.



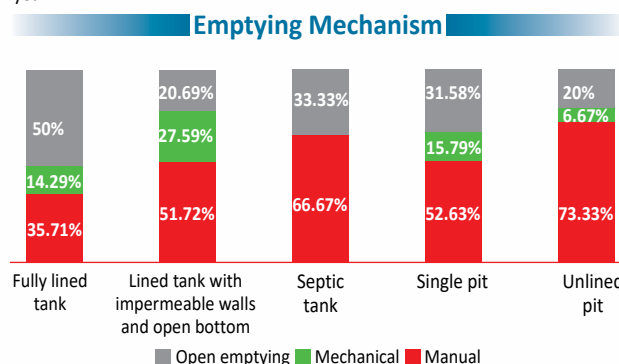
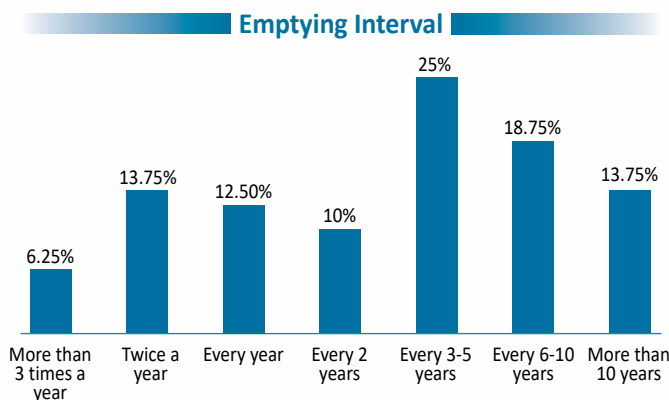
17.50% of HHs empty FS mechanically (Private desludging service providers-neighboring municipalities).



53.75% of HHs empty FS manually (Self or traditional sanitation workers).



28.75% of HHs practice open emptying (disposed into open drain during rainy season).





प्रशोधन  
(Treatment)

पुनः प्रयोग वा सुरक्षित विसर्जन  
(Re-use or Safe Disposal)

## ESTIMATION OF FAECAL SLUDGE

Total estimated volume of FS generation in the municipality: 33,148 m<sup>3</sup> per year which is 90.82 m<sup>3</sup> per day.

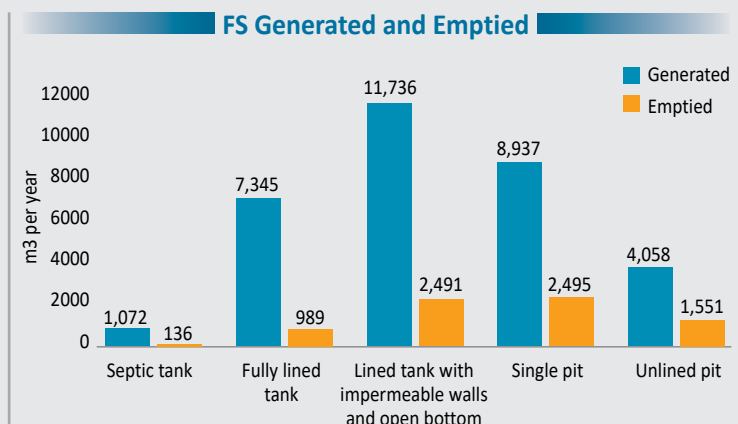
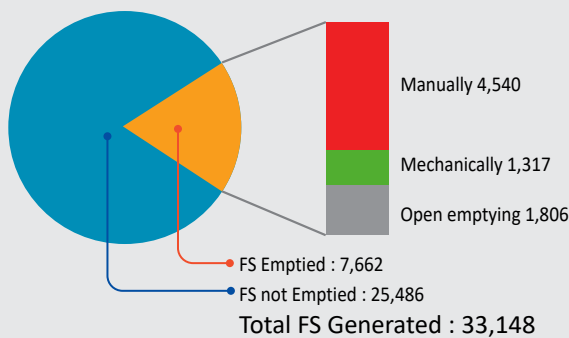
Total volume of FS emptied in the municipality: 7,662 m<sup>3</sup> per year which is 20.99 m<sup>3</sup> per day.

Total volume of FS emptied by mechanical desludging: 1,317 m<sup>3</sup> per year which is 3.6 m<sup>3</sup> per day.

Total volume of FS emptied by manual desludging: 4,540 m<sup>3</sup> per year which is 12.44 m<sup>3</sup> per day.

Total volume of FS emptied by open emptying: 1,806 m<sup>3</sup> per year which is 4.95 m<sup>3</sup> per day.

### Summary of faecal sludge produced, emptied and transported in Banepa Municipality (cubic meter)



## TREATMENT

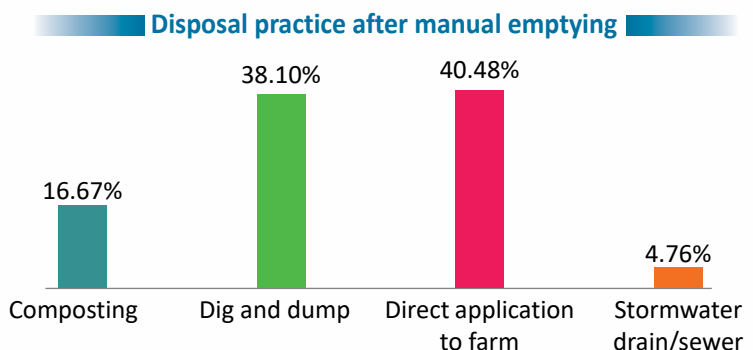
Three Wastewater Treatment Plants (WWTPs) were constructed at Chandeshwari, Budole and Shreekhandapur of the municipality. However, the treatment plant, at the time of survey, was not functional due to an issue on wastewater conveyance to the WWTP and damage to the infrastructure. Furthermore, a decentralized wastewater treatment system (DEWATS) of Nala has been operated by Nala Water Supply and Sanitation User's Committee.



DEWATS at Nala

## SAFE DISPOSAL OR REUSE

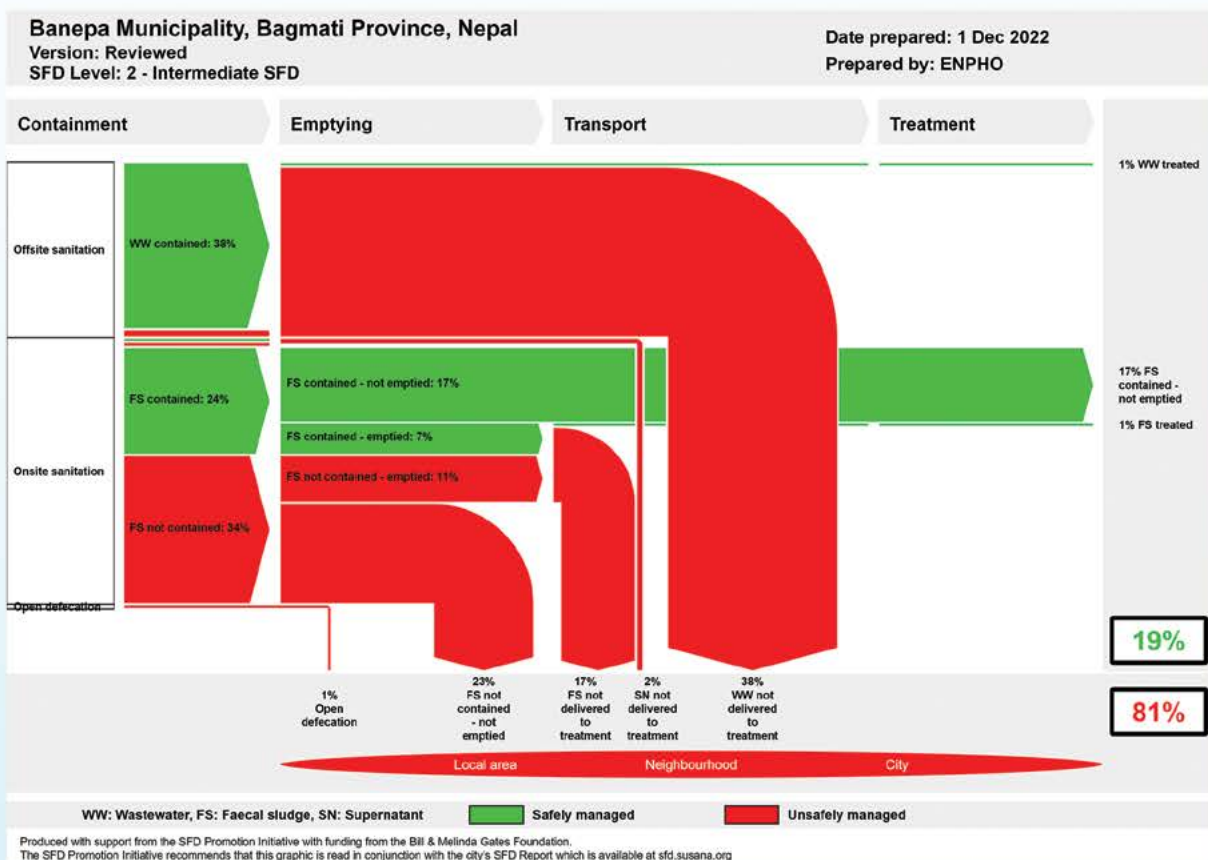
The municipality does not have a faecal sludge treatment plant. The mechanically emptied faecal sludge is disposed of in an open environment while manually emptied FS is directly applied on farmlands, dig and dump and composted. Few proportions are disposed in stormwater drain/sewer. However, direct application to farms possesses a risk to the environment and public health.



## SHIT FLOW DIAGRAM (SFD)

The SFD of Banepa Municipality visually represents the status of sanitation practices across the entire sanitation value chain. FS generated by 19% of the municipality’s population is safely managed (Green). Initially, 24% of the FS is safely contained and the percentage decreases to 17% when FS generated by 7% of the population is emptied. This implies that 17% of FS are considered safely managed and remains safe until emptied. Furthermore, of the 7% emptied FS, 1% is considered treated, primarily from biogas digesters. The emptied FS remains safe depending on the emptying mechanism and the available treatment options/facilities. Among 38% of WW contained, only 1% is transported and treated at the wastewater treatment plant.

Further, FS generated by 81% of the population is managed unsafely (Red). This includes 38% of WW and 2% SN not delivered to treatment. Additionally, 17% of FS is emptied (6% FS contained and 11% FS not contained) but not transported for treatment. Another 23% of FS is neither safely contained nor emptied which possess the increased environmental risks. Furthermore, 1% of the population still practice open defecation, exacerbating sanitation challenges. These findings highlight critical gaps that must be addressed to mitigate environmental contamination and public health risks associated with inadequate FS management practices.



## RECOMMENDATIONS

- Renovation of existing wastewater treatment plants to ensure treatment of wastewater from the system.
- Manage faecal sludge properly in non-sewered areas.
- Formalize and regulate the private desludging service within the municipality.
- Formulate and enforce sanitation policies and regulations to ensure the safe sanitation practices in the municipality.

# BHIMESHWOR MUNICIPALITY

Municipal Sanitation Synopsis, Study Year-2024



View of Dolakha bazaar and Charikot bazaar

## DEMOGRAPHICS



Area : 133 km<sup>2</sup>



Household : 10,164



POPULATION : 34,712

Male : 16,630

Female : 18,082



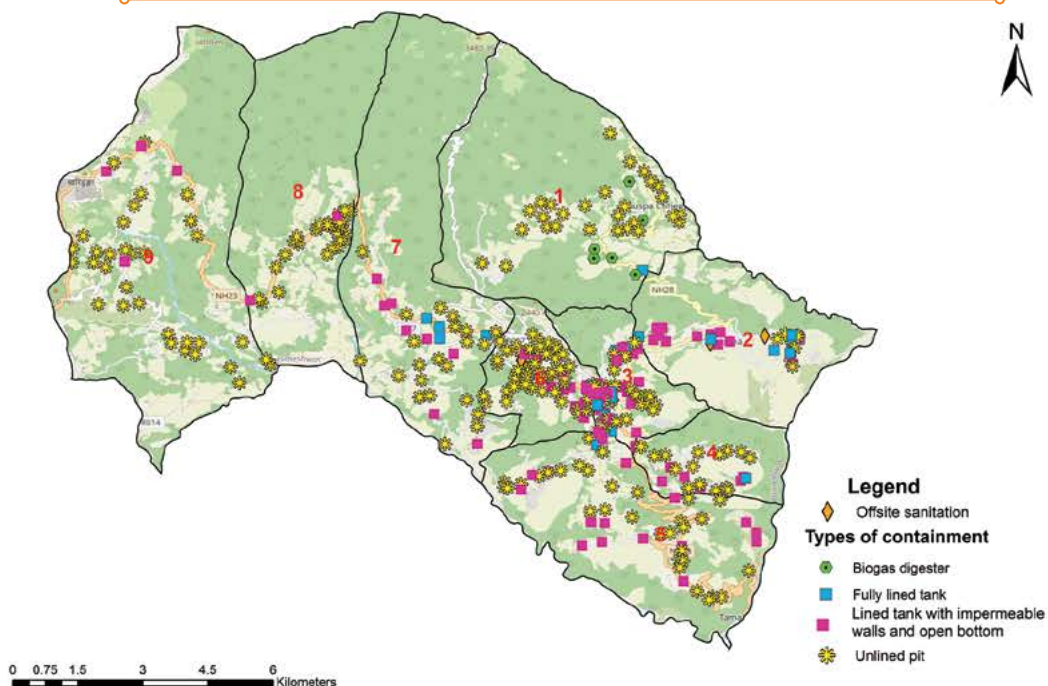
Wards : 9

Source: Census 2021

## CITY PROFILE

Bhimeshwor Municipality is located in Dolakha District of Bagmati Province, Nepal. It extends from 27°35'60" to 27°43'60" N latitude and 85°57'60" to 86°06'00" E longitude. It ranges at an altitude of 840 meters to 3,549 meters above mean sea level.

### Types of sanitation technologies at households in Bhimeshwor Municipality





संकलन  
(User Interface)



भण्डारण  
(Containment)



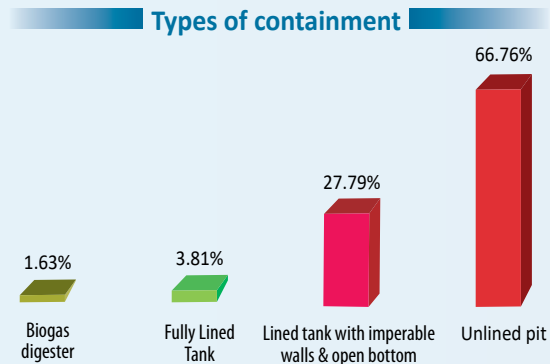
रिट्याउने र ढुवानी  
(Emptying & Transportation)

## USER INTERFACE FACILITY

Bhimeshwor Municipality attained Open Defecation Free (ODF) status in 2015 A.D. The survey revealed that all the households in the municipality have access to toilets. Moreover, 1% of HHs have illegal outlet to water bodies.

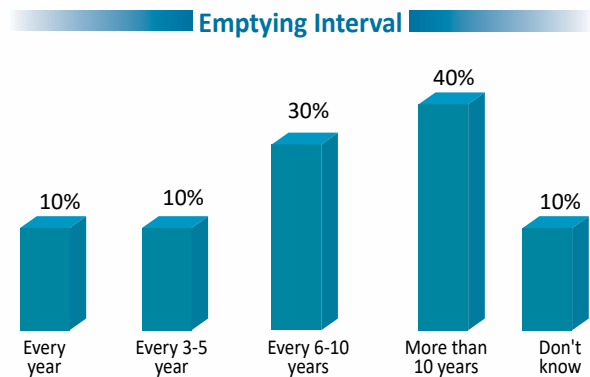
## CONTAINMENT

The survey showed that majority of the HHs use unlined pits followed by lined tanks with impermeable walls and open bottom. These type of containments have open bottom, allowing leachate percolation and possessing a risk to groundwater contamination. Thus, are considered as unsafe containments. Besides, only limited HHs use safer technologies such as biogas digester. Also, few HHs use fully lined tanks.

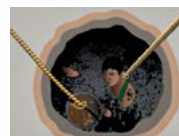


## EMPTYING AND TRANSPORTATION

Based on the survey, only 4% of HHs have emptied their containments at least once after installation. Most containments are emptied usually at an interval of more than 10 years. Majority of containments are emptied manually while private desludging service providers from Kathmandu valley serves in the municipality for mechanical emptying and transport of faecal sludge.



40% of HHs emptied FS mechanically (Private desludging service providers-neighboring municipalities).

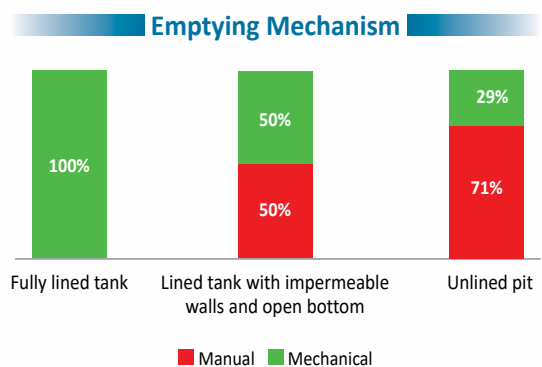


60% of HHs emptied FS manually (Self-emptying or traditional sanitation workers).

The municipality has a desludging vehicle but currently is not in use.



Desludging vehicle of Bhimeshwor Municipality





प्रशोधन  
(Treatment)

पुनः प्रयोग वा सुरक्षित विसर्जन  
(Re-use or Safe Disposal)

## ESTIMATION OF FAECAL SLUDGE

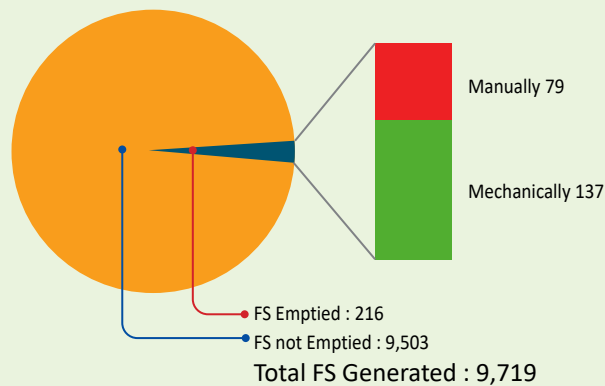
Total estimated volume of FS generation in the municipality: 9,719 m<sup>3</sup> per year which is 26.63 m<sup>3</sup> per day.

Total volume of FS emptied in the municipality: 216 m<sup>3</sup> per year which is 0.59 m<sup>3</sup> per day.

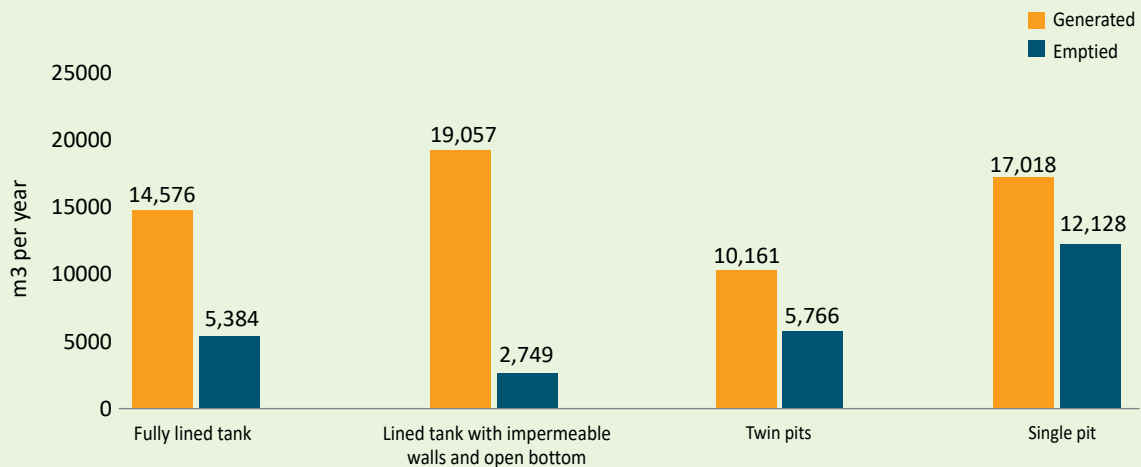
Total volume of FS emptied by mechanical desludging: 137 m<sup>3</sup> per year which is 0.38 m<sup>3</sup> per day.

Total volume of FS emptied by manual desludging: 79 m<sup>3</sup> per year which is 0.22 m<sup>3</sup> per day.

### Summary of faecal sludge produced, emptied and transported in Bhimeshwor Municipality (cubic meter)



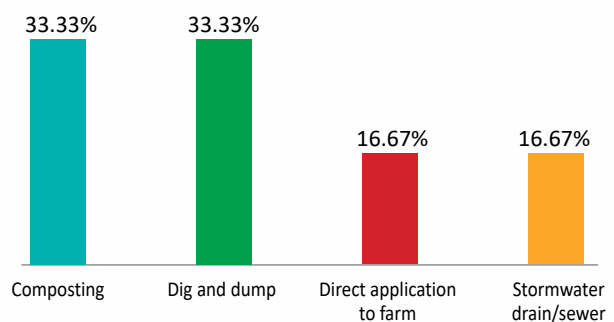
### FS Generated and Emptied



## SAFE DISPOSAL OR REUSE

Mechanically emptied FS are generally disposed of in the forest or applied to farmlands. While manually emptied FS is composted, directly applied to farms or dig and dump. However, direct application to farmland possesses significant risk to environment and public health.

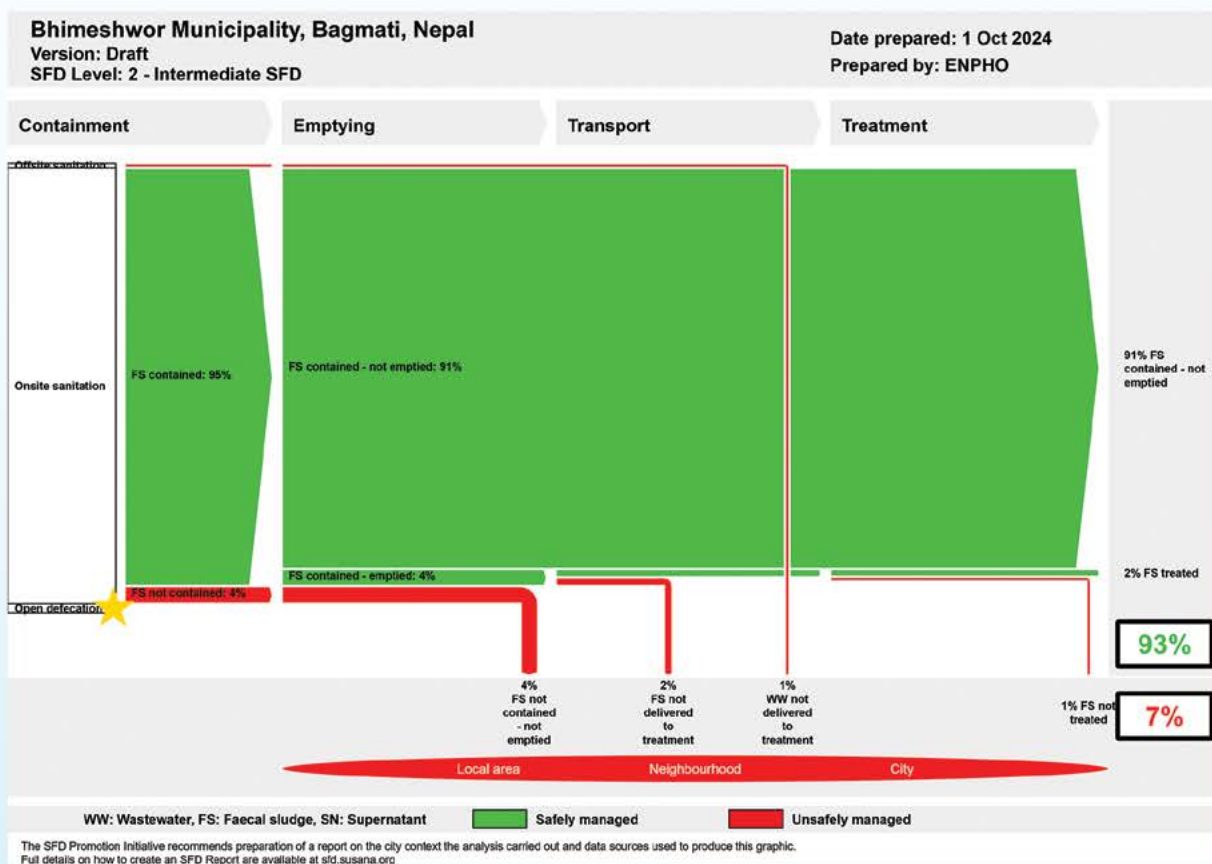
### Disposal practice after manual emptying



## SHIT FLOW DIAGRAM (SFD)

The SFD of Bhimeshwor Municipality visually represents the status of sanitation practices across the entire sanitation value chain. It shows that FS generated by 93% of the population is safely managed (Green). Initially, FS generated by 95% of the population is safely contained. However, this proportion drops to 91% which can be considered safe until emptied. The emptied FS remains safe depending upon the nature of the emptying mechanism and available treatment facilities. Out of the 4% safely contained FS which has been emptied, only 2% is delivered to treatment plant and treated, and this comes from a biogas digester. This highlights the necessity of safe emptying and treatment.

Overall, FS generated by 7% of the population is unsafely managed (Red). It includes 4% FS which is neither contained nor emptied, 2% of FS not delivered to treatment plant, 1% of wastewater (WW) not delivered to treatment plant and 1% of FS not treated. This highlights the significant gaps that must be addressed to mitigate environmental and public health risks associated with inadequate FS management practices.



## RECOMMENDATIONS

- Replace and retrofit the unsafe containment systems to safer techniques and technologies such as septic tanks, biogas digesters and twin pits.
- Promote and regulate mechanical desludging services in the municipality to address the current gap in sanitation value chain.
- Construct a faecal sludge treatment plant to manage FS effectively.
- Formulate and enforce sanitation policies and regulations to ensure safe sanitation practices in the municipality.



# BIDUR MUNICIPALITY

Municipal Sanitation Synopsis, Study Year -2023



Nuwakot Durbar

## DEMOGRAPHICS



Area : 130.01 km<sup>2</sup>



Household : 15,234



POPULATION : 59,227

Male : 28,449

Female : 30,778



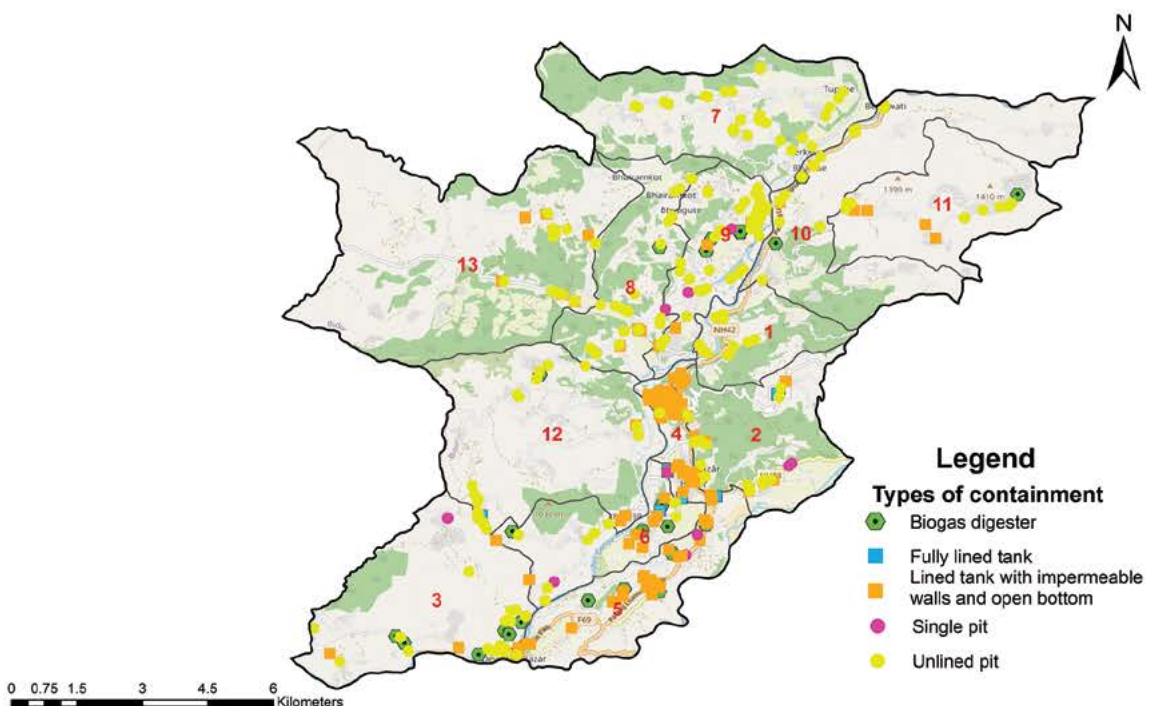
Wards : 13

Source: Census 2021

## CITY PROFILE

Bidur Municipality is situated in Nuwakot District of Bagmati Province, Nepal. It lies at 27°53'24" N latitude, 85°09'36" E longitude and at an average altitude of 700 metres above mean sea level.

### Types of sanitation technologies at households in Bidur Municipality





संकलन  
(User Interface)



भण्डारण  
(Containment)

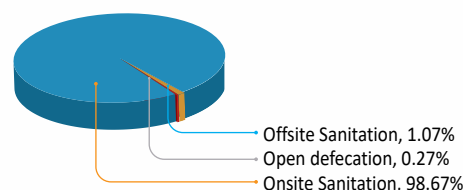


रिट्याउने र ढुवानी  
(Emptying & Transportation)

## USER INTERFACE FACILITY

Bidur Municipality attained Open Defecation Free (ODF) status in April 2018. However, the household (HH) survey reveals that 0.27% of HH still lack access to toilet and practice open defecation. Moreover, 1.07% have illegal connected to open drain and 98.67% have onsite sanitation technologies connected to different containments.

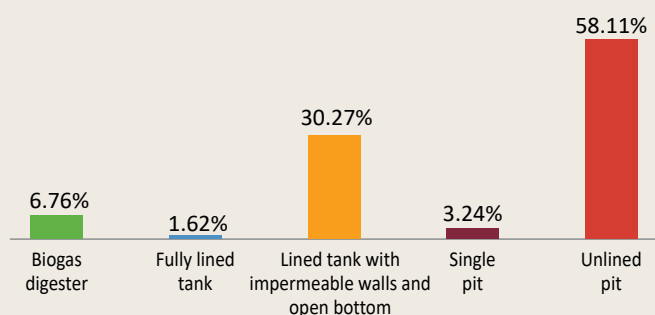
### Sanitation Facility



## CONTAINMENT

The majority of HHs rely on unlined pit followed by lined tank with impermeable walls and open bottom. Additionally, few HHs rely on single pit. These containments have open bottom, allowing leachate percolation and possessing a risk to groundwater contamination. The fully lined tank is installed by very small percentage of HH, while only 6.76% have installed biogas digester which can be considered safe as it treats faecal sludge and produces biogas as a by-product.

### Types of containment

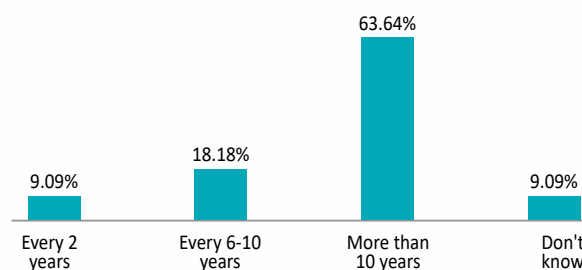


Toilet directly connected to an open drain.

## EMPTYING AND TRANSPORTATION

The finding shows that only 9.73% of the HHs have emptied their containment at least once since installation. The majority of HHs have emptied their containment at an interval of more than 10 years. The private desludging services are not available within the municipality but the desludgers from Kathmandu valley provides services on demand basis.

### Emptying Interval

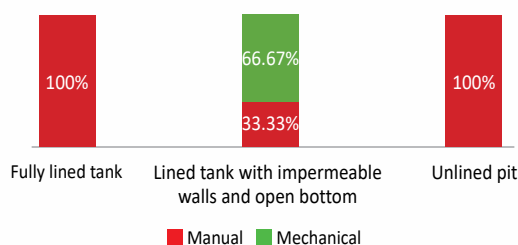


81.82% of HHs emptied FS mechanically (Private desludging service providers-neighboring municipalities).



18.18% of HHs emptied FS manually (Self or traditional sanitation workers).

### Emptying Mechanism





प्रशोधन  
(Treatment)



पुनः प्रयोग वा सुरक्षित विसर्जन  
(Re-use or Safe Disposal)

## ESTIMATION OF FAECAL SLUDGE

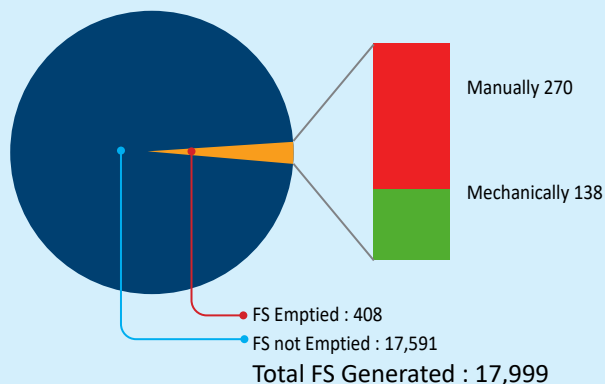
Total estimated volume of FS generation in the municipality: 17,999 m<sup>3</sup> per year which is 49.3 m<sup>3</sup> per day.

Total volume of FS emptied in the municipality: 408 m<sup>3</sup> per year which is 1.2 m<sup>3</sup> per day.

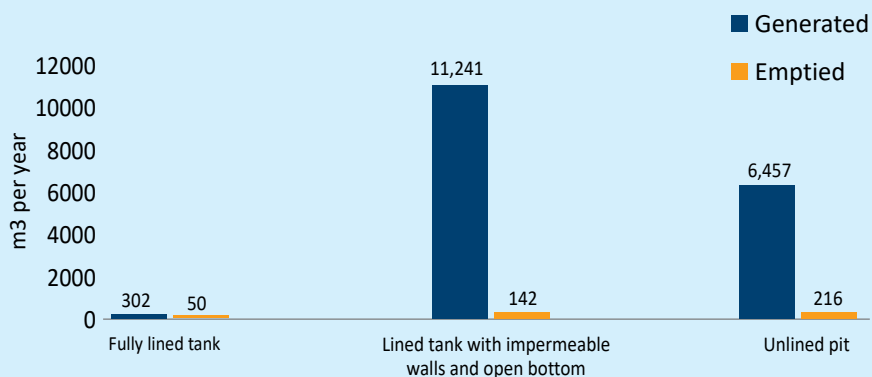
Total volume of FS emptied by mechanical desludging: 138 m<sup>3</sup> per year which is 0.4 m<sup>3</sup> per day.

Total volume of FS emptied by manual desludging: 270 m<sup>3</sup> per year which is 0.8 m<sup>3</sup> per day.

### Summary of faecal sludge produced, emptied and transported in Bidur Municipality (cubic meter)



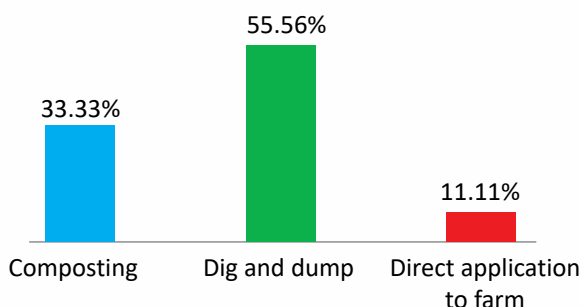
### FS Generated and Emptied



## SAFE DISPOSAL OR REUSE

The municipality does not have faecal sludge treatment plant (FSTP). Mechanically emptied FS is disposed of in private farmland, while the majority of manually emptied FS is dig and dump, and some are used as compost. Some are directly applied to farms that possess risk to the environment and public health.

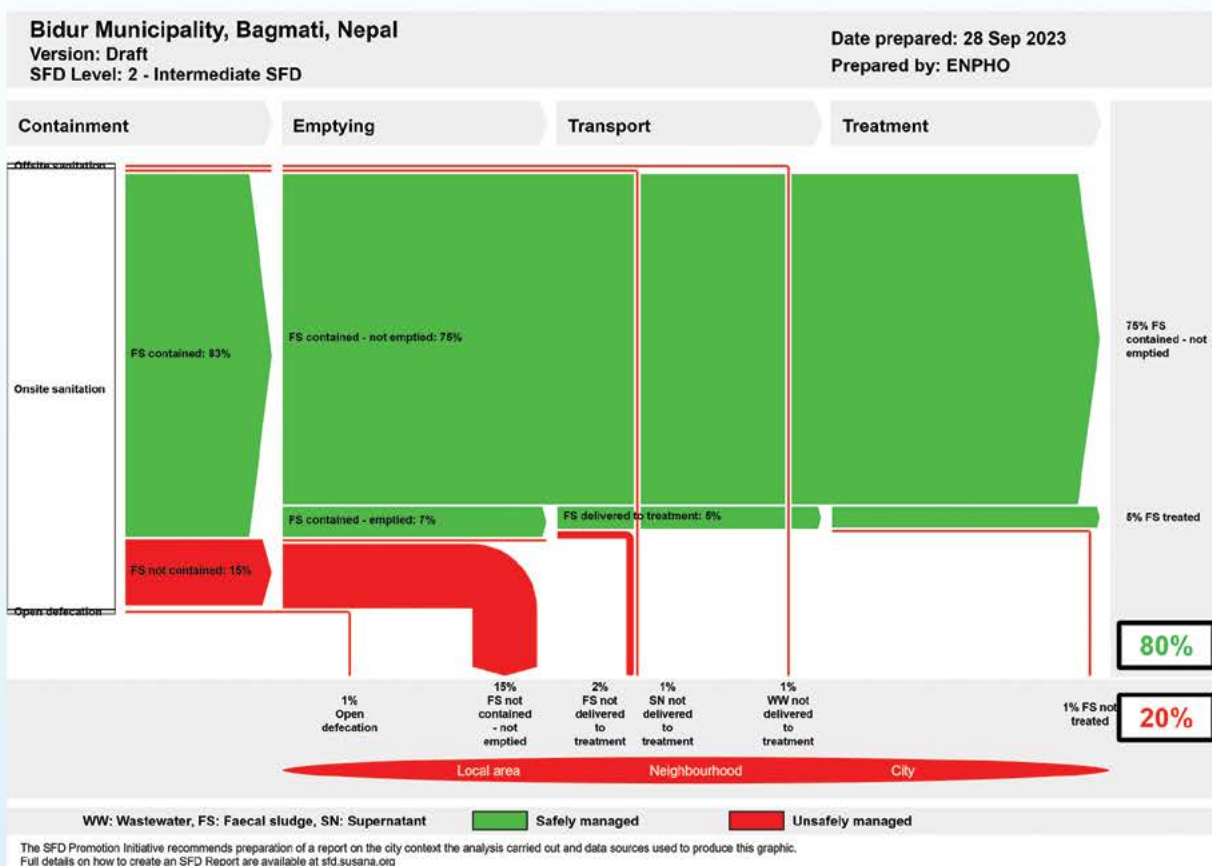
### Disposal practice after manual emptying



## SHIT FLOW DIAGRAM (SFD)

The SFD of Bidur Municipality visually represents the status of sanitation practices across the entire sanitation value chain. Faecal sludge (FS) generated by 80% of the population is safely managed (Green). Initially, 83% of FS is safely contained. However, this proportion drops to 75% after emptying while considering the unemptied FS is safe. The remaining 7% of FS which is contained and emptied, remains safe depending upon the nature of the emptying mechanism and available treatment facilities. Of the emptied FS, 5% are delivered to treatment plant and treated, primarily from biogas digesters. This points out the necessity of proper emptying and treatment of FS.

Further, FS generated by 20% of the population is unsafely managed (Red). It includes 1% of Wastewater (WW) discharged untreated into the environment, 1% SN not delivered to treatment plant, and 2% of FS emptied but not delivered to treatment plant. Additionally, 15% of FS is neither contained nor emptied, and 1% of the population still practices open defecation exacerbating sanitation challenges. These findings highlight the significant gaps that must be addressed to mitigate environmental and public health risks associated with inadequate FS management practices.



## RECOMMENDATIONS

- Replace and retrofit existing unsafe containment systems to safe techniques and technologies such as septic tanks, biogas digesters, and twin pits.
- Promote mechanical desludging services in the municipality to address the current gap in sanitation value chain.
- Construct a faecal sludge treatment plant to manage FS effectively.
- Formulate and enforce sanitation policies and regulations to ensure safe sanitation practices in the municipality.

# CHANDRAGIRI MUNICIPALITY

Municipal Sanitation Synopsis, Study Year -2024



View of mountain range and cable car from Chandragiri

## DEMOGRAPHICS



Area : 43.9 km<sup>2</sup>



Household : 35,994



POPULATION : 1,36,860

Male : 68,303  
Female : 68,557



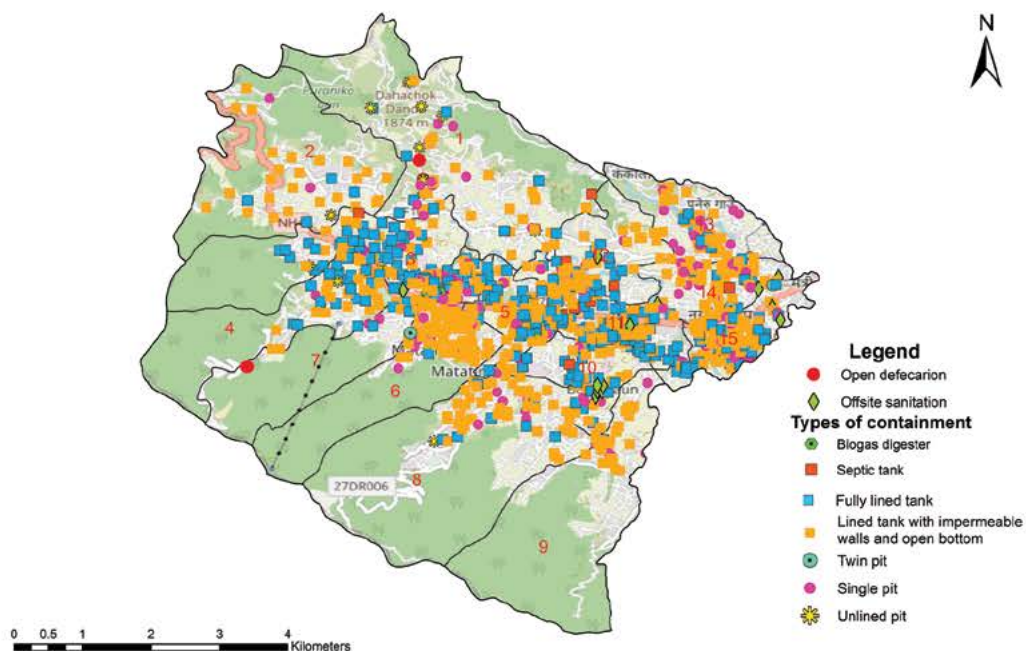
Wards : 15

Source: Census 2021

## CITY PROFILE

Chandragiri Municipality is located in north-west side of Kathmandu District of Bagmati Province in Nepal. It spans from 27°38'10" to 27°43'38" N latitude and 85°06'12" to 85°16'30" E longitude. The municipality's elevation ranges from 898 metres to 2,525 metres above mean sea level.

### Types of sanitation technologies at households in Chandragiri Municipality





संकलन  
(User Interface)



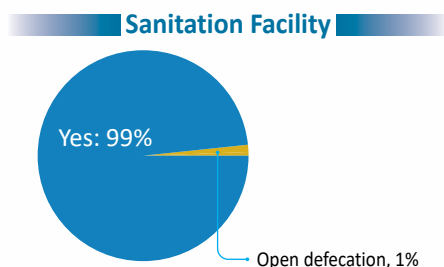
भण्डारण  
(Containment)



रिट्याउने र ढुवानी  
(Emptying & Transportation)

## USER INTERFACE FACILITY

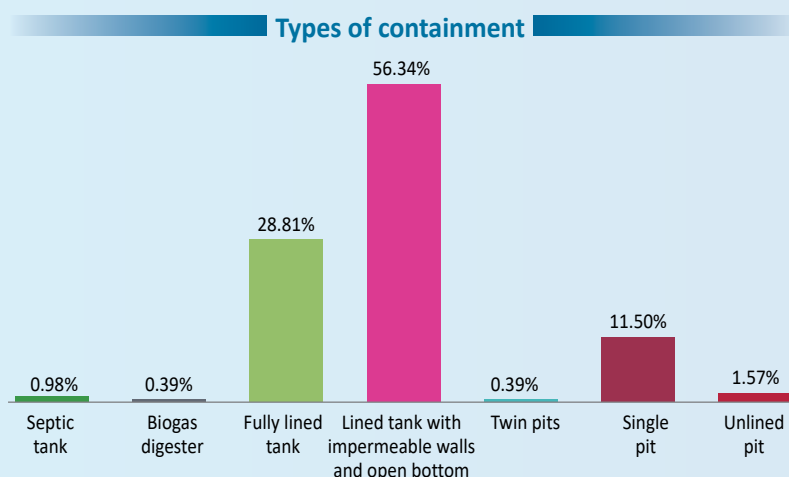
Chandragiri Municipality attained Open Defecation Free (ODF) status on 17 September 2019. However, a HH survey revealed that 1% of HHs still lack access to toilet and practice open defecation. While 98% of HHs have onsite sanitation systems and 1% of HHs is connected to decentralized combined sewer network for the discharge of wastewater.



Single pit at Chandragiri Municipality

## CONTAINMENT

The majority of HHs rely on lined tank with impermeable walls and open bottom. Also, few HHs rely on single pit and unlined pit. These containments have open bottom, allowing leachate percolation and possessing a risk to groundwater contamination. However, insignificant HHs opted for safe technologies such as septic tank, biogas digester and twin pits. Moreover, limited HHs use fully lined tank.



## EMPTYING AND TRANSPORTATION

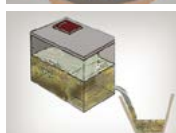
According to the survey, about 33% of the HHs have emptied their containment at least once since installation. HHs, typically empty their containment every 3 to 5 years or every 6 to 10 years. Private desludging service provider from neighbouring municipality serves for mechanical emptying in the municipality.



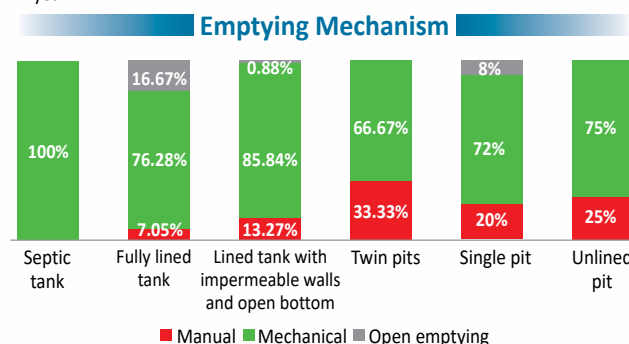
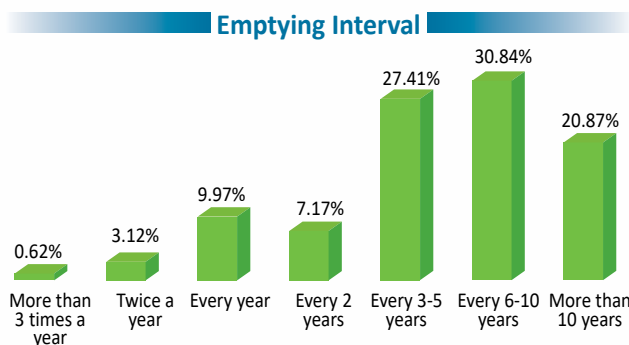
79% of HHs emptied FS mechanically (Private desludging service providers-neighboring municipalities).



12% of HHs emptied FS manually (Self or traditional sanitation workers).



9% of HHs practice open emptying (Disposed into open drain during rainy season).





प्रशोधन  
(Treatment)

पुनः प्रयोग वा सुरक्षित विसर्जन  
(Re-use or Safe Disposal)

## ESTIMATION OF FAECAL SLUDGE

Total estimated volume of FS generation in the municipality: 47,546 m<sup>3</sup> per year which is 130.26 m<sup>3</sup> per day.

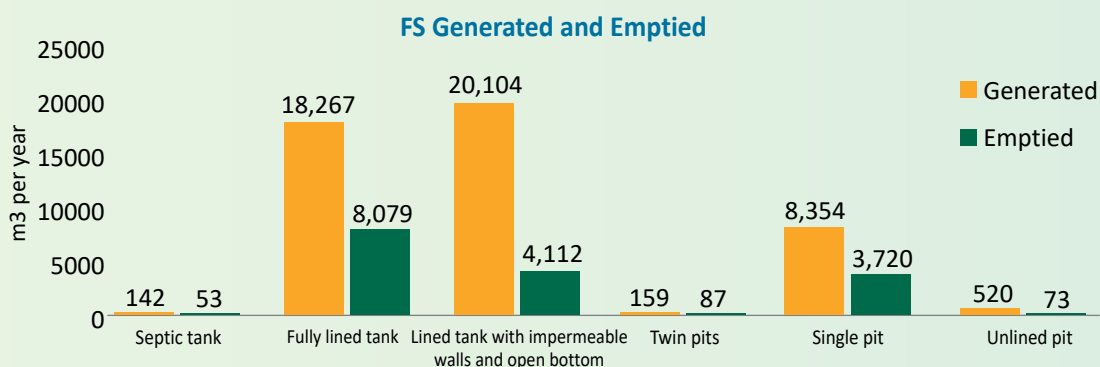
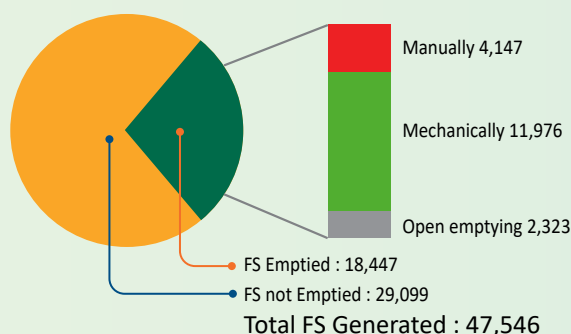
Total volume of FS emptied in the municipality: 18,447 m<sup>3</sup> per year which is 44.18 m<sup>3</sup> per day.

Total volume of FS emptied by mechanical desludging: 11,976 m<sup>3</sup> per year which is 32.81 m<sup>3</sup> per day.

Total volume of FS emptied by manual desludging: 4,147 m<sup>3</sup> per year which is 11.36 m<sup>3</sup> per day.

Total volume of FS emptied by open emptying: 2,323 m<sup>3</sup> per year which is 6.36 m<sup>3</sup> per day.

### Summary of faecal sludge produced, emptied and transported in Chandragiri Municipality (cubic meter)

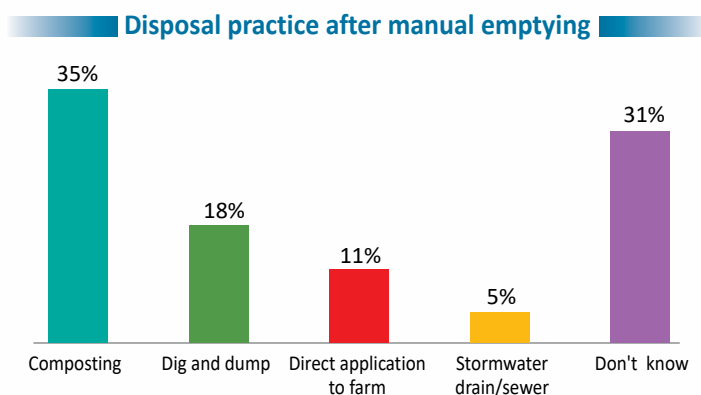


## TREATMENT

There is a small-scale decentralized Faecal Sludge Treatment Plant in Amarawati Colony located in ward 8. The FSTP treats FS generated from 85 households within the colony only. The construction of a Wastewater Treatment Plant (WWTP) for 250 households in ward-10 at Boshigaun was under planning during the study.

## SAFE DISPOSAL OR REUSE

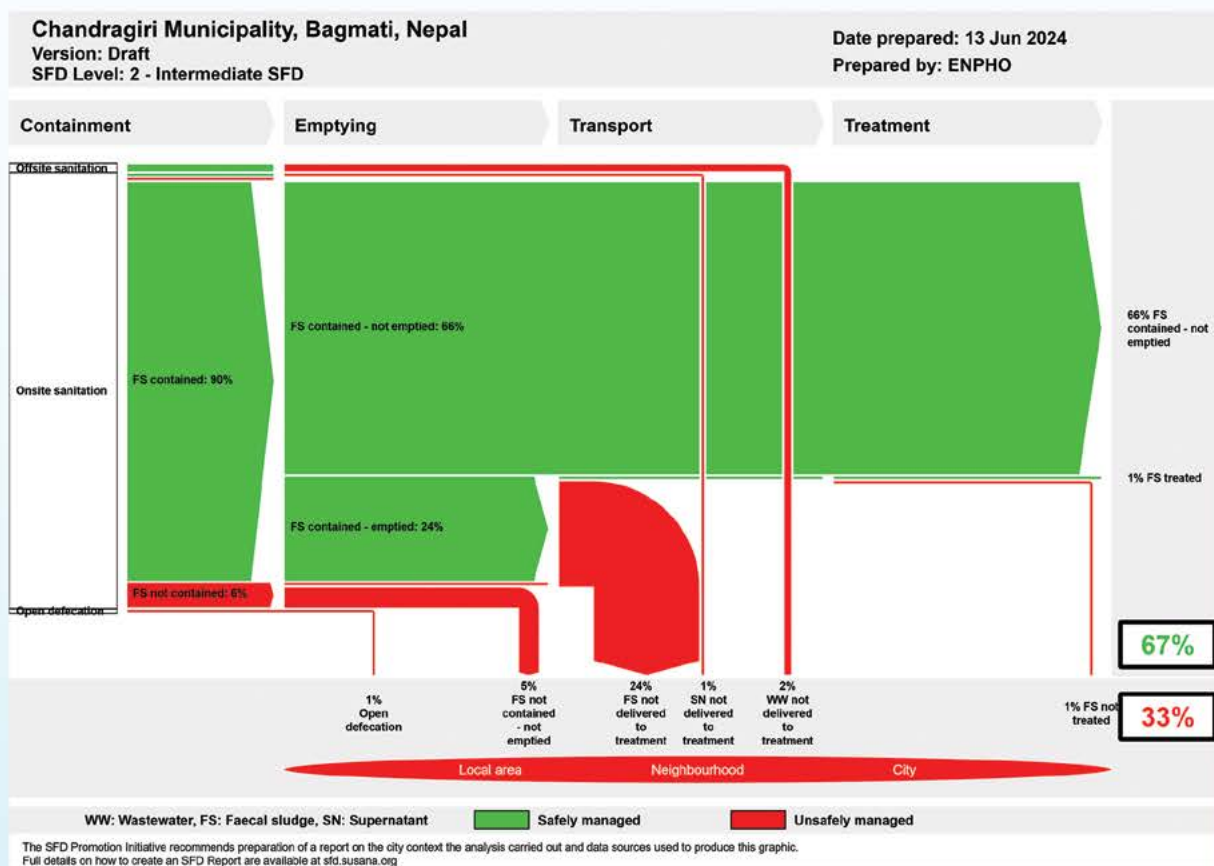
The municipality does not have any other faecal sludge treatment plant than the one at Amarawati Colony. However, a designated place is available for disposal of solid waste and FS in the municipality. Mechanically emptied FS is usually disposed of in the designated site. Manually emptied FS is often used as compost. Moreover, few proportion of HHs directly applied to farm, dig and dump, and some are discharged into stormwater drain/sewer without proper treatment which indeed possesses significant risk to environment and public health.



## SHIT FLOW DIAGRAM (SFD)

The SFD of Chandragiri Municipality visually represents the status of sanitation practices across the entire sanitation value chain. It shows that FS generated by 67% of the population is safely managed (Green). Initially, FS generated by 90% of the population is safely contained. However, this proportion drops to 66% which can be considered safe until emptied. The emptied FS remains safe depending upon the nature of the emptying mechanism and available treatment facilities. Out of the 24% safely contained FS which has been emptied, only 1% is delivered to treatment plant and treated, and this comes from biogas digester at HHs and FSTP. This highlights the necessity of safe emptying and treatment.

Overall, FS generated by 33% of the population is unsafely managed (Red). It includes 1% of FS not treated, 24% of FS not delivered to treatment plant, 5% FS which is neither contained nor emptied, 1% wastewater (WW) not delivered to treatment plant and 1% supernatant (SN) not delivered to treatment plant. Additionally, 1% of the population practice open defecation that exacerbates the environmental risks. This highlights the significant gaps that must be addressed to mitigate environmental and public health risks associated with inadequate FS management practices.



## RECOMMENDATIONS

- Replace and retrofit the unsafe containment systems to safer techniques and technologies such as septic tanks, biogas digesters and twin pits.
- Promote mechanical desludging services in the municipality to address the current gap in sanitation value chain.
- Construct a faecal sludge and wastewater treatment plant as required to manage FS and WW effectively.
- Formulate and enforce sanitation policies and regulations to ensure safe sanitation practices in the municipality.



# HETAUDA SUB-METROPOLITAN CITY

Municipal Sanitation Synopsis, Study Year -2023



Bhutan Devi Temple

## DEMOGRAPHICS



Area : 261.58 km<sup>2</sup>



Household : 46,566



POPULATION : 193,576

Male : 95,678  
Female : 97,898



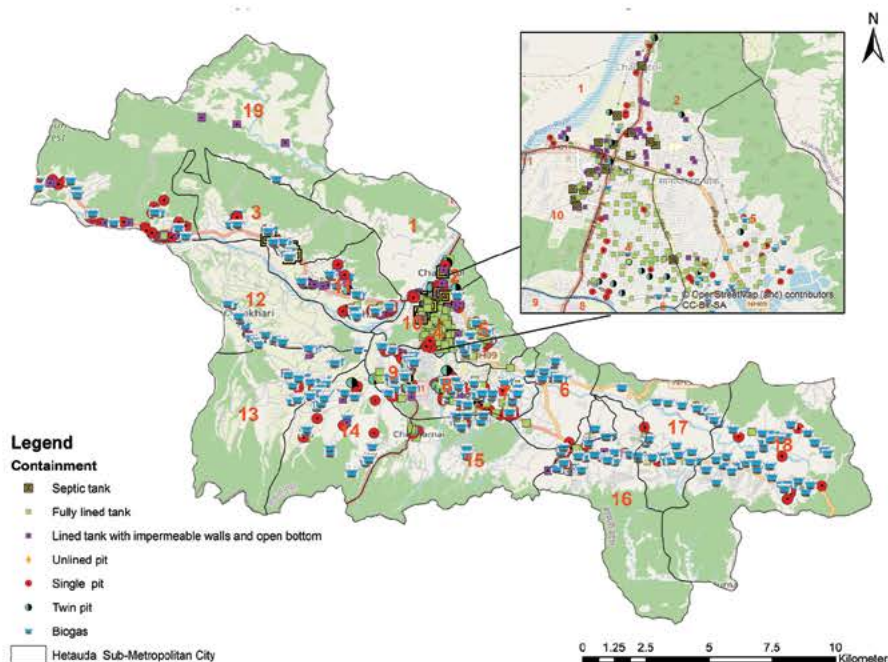
Wards : 19

Source: Census 2021

## CITY PROFILE

Hetauda Sub-Metropolitan City (SMC) is in Makawanpur District of Bagmati Province, Nepal. It is extended from 28°32'31" to 27°19'58" N latitude and 85°53'27" to 85°11'24" E longitude. The elevation of the SMC ranges between 300 metres to 390 metres above mean sea level.

### Types of sanitation technologies at households in Hetauda Sub-Metropolitan City





संकेतन  
(User Interface)



भण्डारण  
(Containment)



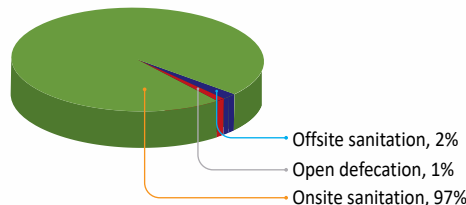
रिट्याउने र ढुवानी  
(Emptying & Transportation)

## USER INTERFACE FACILITY

Hetauda Sub-Metropolitan City achieved ODF status in 2013 A.D. Despite this achievement, approximately 1% of HHs still lack access to basic sanitation facilities and practice open defecation.

2% HHs with offsite sanitation systems have been connected to sewer network.

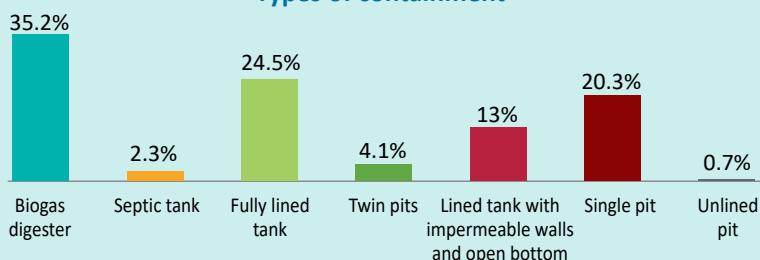
### Sanitation Facility



## CONTAINMENT

Among HHs with onsite sanitation facilities, 35.2% of HHs have opted for safe technologies such as biogas digester. Moreover, very few proportion of HHs have toilets connected to unlined pit.

### Types of containment



Biogas Digester

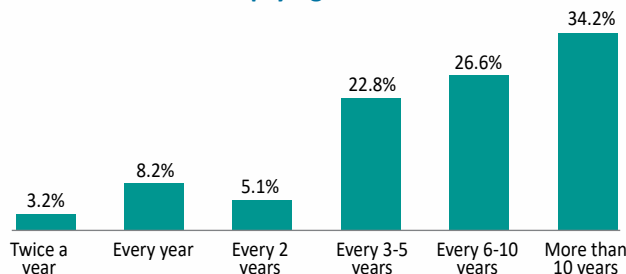
## EMPTYING AND TRANSPORTATION

Approximately 15.1% of HHs have emptied their containment. Usually, these containments are emptied after 10 years. Both the sub-metropolitan city and private service providers offer desludging services in city.

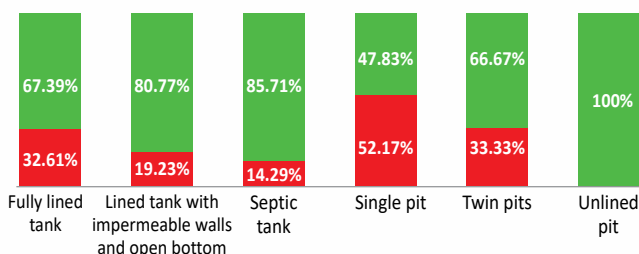
### Details of desludging service providers

Service Provider	Sub-Metropolitan City	Private
No. of service providers	1	2
No. of vehicles	1	2
Capacity of vehicle (litres)	3,500	3,000
Average no. of trips per day per vehicle	1	2
Average service charge per trip (NPR)	3,500	3,500

### Emptying Interval



### Emptying Mechanism



62% of HHs empty mechanically (Municipal or private desludging service providers).



38% of HHs empty manually (Self or traditional sanitation workers).



Desludging vehicle of Hetauda SMC



प्रशोधन  
(Treatment)

पुनः प्रयोग वा सुरक्षित विसर्जन  
(Re-use or Safe Disposal)

## ESTIMATION OF FAECAL SLUDGE

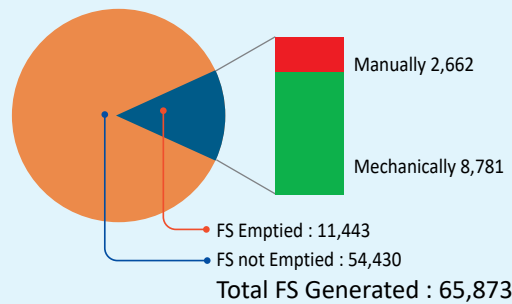
Total estimated volume of FS generation in the sub-metropolitan city: 65,873 m<sup>3</sup> per year which is 180.47 m<sup>3</sup> per day.

Total volume of FS emptied in the sub-metropolitan city: 11,443 m<sup>3</sup> per year which is 31.35 m<sup>3</sup> per day.

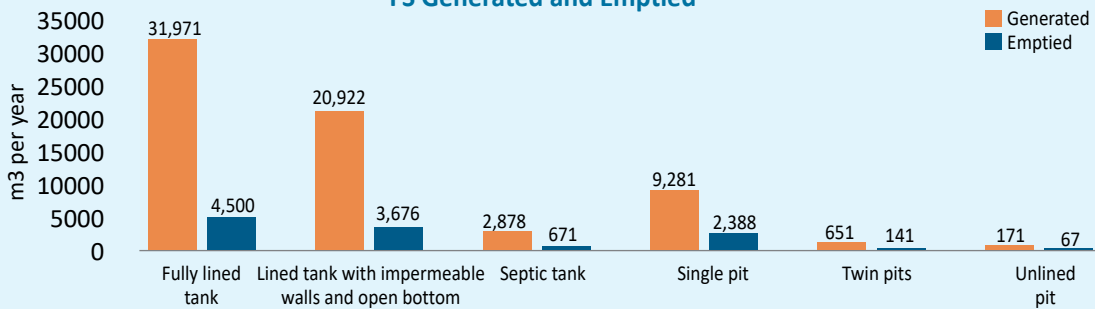
Total volume of FS emptied by mechanical desludging: 8,781 m<sup>3</sup> per year which is 24.06 m<sup>3</sup> per day.

Total volume of FS emptied by manual desludging: 2,662 m<sup>3</sup> per year which is 7.29 m<sup>3</sup> per day.

### Summary of faecal sludge produced, emptied and transported in Hetauda Sub-Metropolitan City (cubic meter)



### FS Generated and Emptied



## TREATMENT

Hetauda SMC has constructed 3 Wastewater Treatment Plants (WWTPs) on the banks of Rapti and Karra rivers to serve wards 1, 2, 4, 5 and 10. However, the treatment plant, at the time of survey, was not functional due to an issue on wastewater conveyance to the WWTP and damage on the infrastructure.

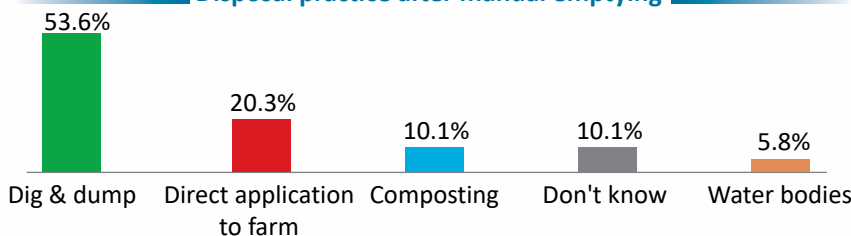


Constructed wetland

## SAFE DISPOSAL OR REUSE

The SMC does not have a faecal sludge treatment plant. The mechanically emptied FS is disposed of at Sisaughari, nearby a solid waste landfill site which is situated at the bank of Rapti River. While the manually emptied FS is dig and dump into land, directly applied on farmlands, practice composting and disposed in water bodies. However, direct application to farms and discharged into water bodies possess risks to environment and public health.

### Disposal practice after manual emptying

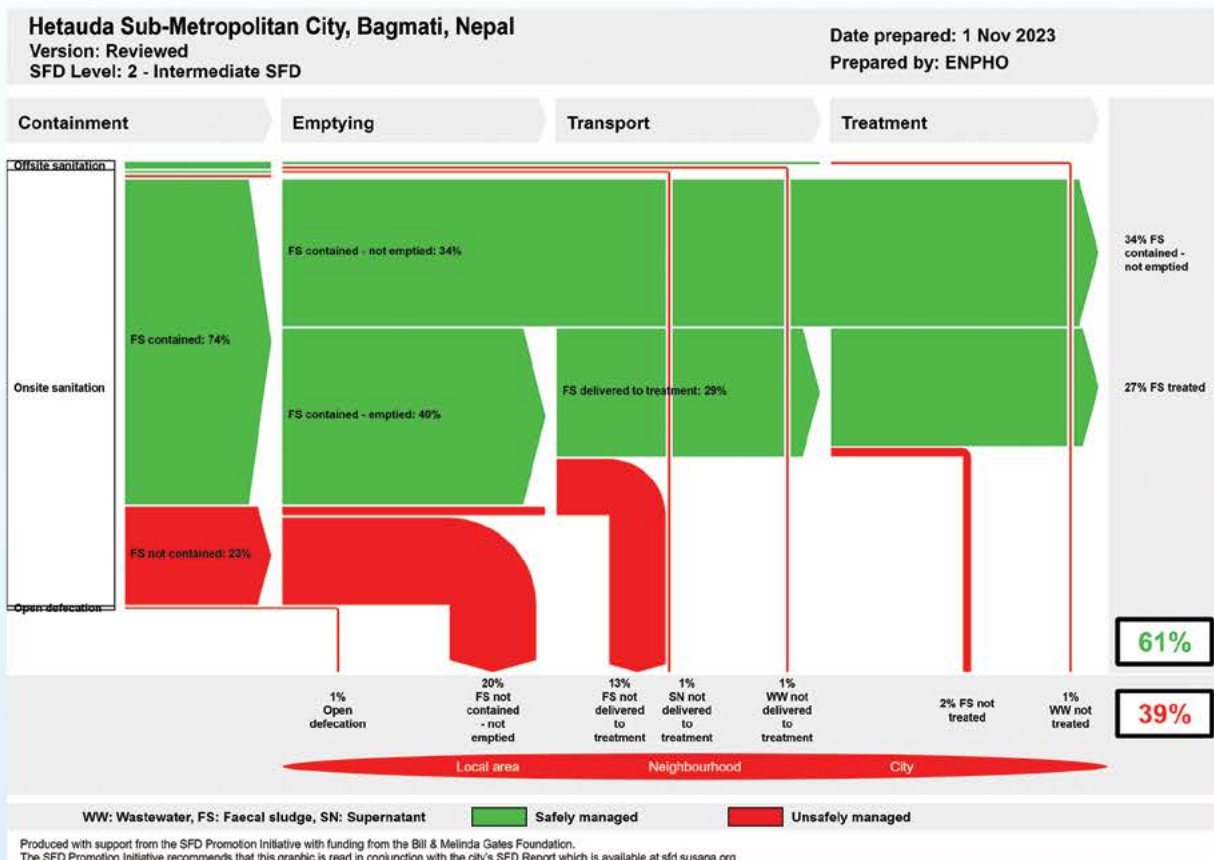


FS disposal at disposal site

## SHIT FLOW DIAGRAM (SFD)

The SFD of Hetauda Sub-Metropolitan City visually represents the status of sanitation practices across the entire sanitation value chain. FS generated by 61% of the sub-metropolitan city's population is safely managed (Green). Initially, 74% of the FS is safely contained and the percentage decreases to 34% when FS generated by 40% of the population is emptied. This implies that 34% of FS are considered safely managed and remains safe until emptied, furthermore, of the 40% emptied FS, 27% is considered treated, primarily from biogas digesters. The emptied FS remains safe depending on the emptying mechanism and the available treatment options/facilities.

Further, FS generated by 39% of the population is managed unsafely (Red). This includes 1% of WW and 1% SN not delivered to treatment plant. 1% WW and 2% FS not treated. Additionally, 13% FS is emptied (10% FS contained and 3% FS not contained) but not transported for treatment. Another 20% of FS is neither safely contained nor emptied which possesses the increased environmental risks. Furthermore, 1% of the population still practice open defecation, exacerbating sanitation challenges. These findings highlight critical gaps that must be addressed to mitigate environmental contamination and public health risks associated with inadequate WW and FS management practices.



## RECOMMENDATIONS

- Connect existing sewerage system to the Wastewater Treatment Plant to ensure treatment of wastewater from the system.
- Manage faecal sludge properly in non-sewered areas.
- Formalize and regulate the private desludging service within the sub-metropolitan city.
- Formulate and enforce sanitation policies and regulations to ensure safe sanitation practices in the sub-metropolitan city.

# KAGESHWORI MANOHARA MUNICIPALITY

Municipal Sanitation Synopsis, Study Year -2023



Statue of crow at Kageshwori Mahadevi temple

## DEMOGRAPHICS



Area : 27.38 km<sup>2</sup>



Household : 33,764



**POPULATION** : 130,433

Male : 65,031

Female : 65,402



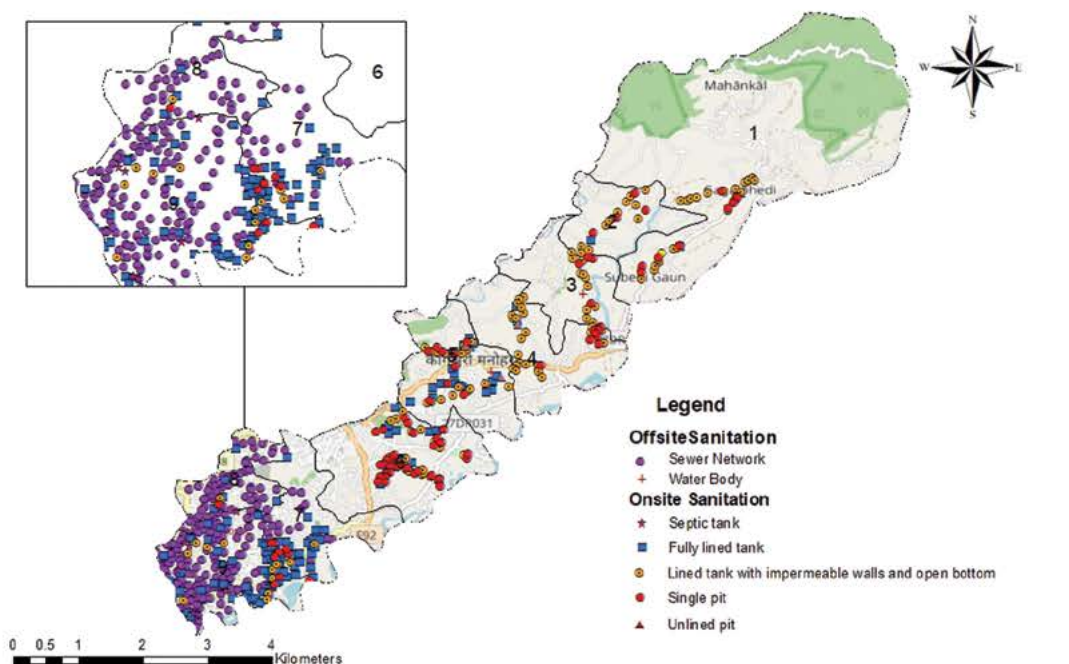
Wards : 9

Source: Census 2021

## CITY PROFILE

Kageshwori Manohara is a municipality situated in Kathmandu District, Bagmati Province of Nepal. It lies at geographical coordinates of 27°43'33" N latitude, 85°24'42" E longitude and at an elevation of 1,297 metres to 2,258 metres above mean sea level.

### Types of sanitation technologies at households in Kageshwori Manohara Municipality





संकलन  
(User Interface)



भण्डारण  
(Containment)

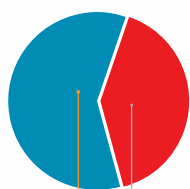


रिट्याउने र ढुवानी  
(Emptying & Transportation)

## USER INTERFACE FACILITY

Kageshwori Manohara Municipality has already attained ODF status on 6 July 2017 A.D. Further, the survey reveals that all sampled households (HHs) have access to toilet. Among the HHs with offsite sanitation system, 0.34% are connected to water bodies and 40.07% are connected to centralized combined sewer network (particularly ward 7, 8 and 9), while 59.59% of the households rely on onsite sanitation systems.

### Sanitation Facility



Offsite Sanitation, 40.41%  
Onsite Sanitation, 59.59%



Discharging WW in a river

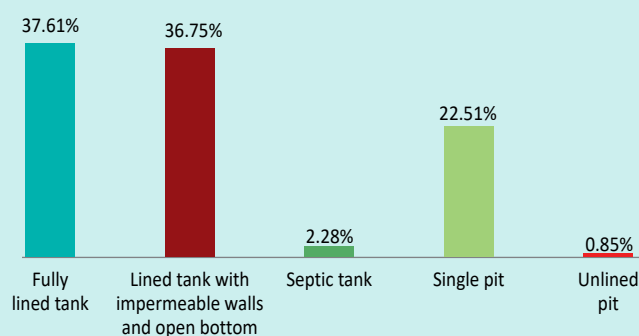


Manhole of sewer network

## CONTAINMENT

Among the HHs with onsite sanitation system, most of the HHs have built fully lined tank, whereas safe containment such as septic tank is installed by only small proportion of HHs. Moreover, unsafe containments such as lined tank with impermeable walls and open bottom, and single pit are installed by significant proportion of HH, while unlined pit is installed in few HHs. These containments are considered unsafe as they allow leachate percolation and contaminate the groundwater sources.

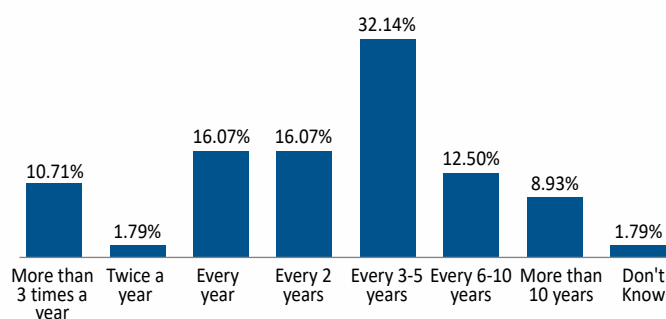
### Types of containment



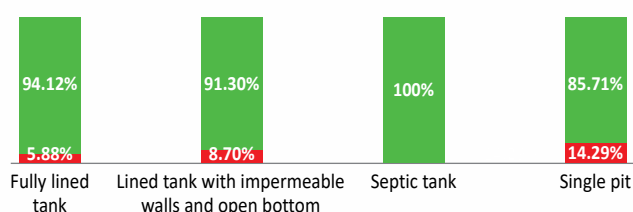
## EMPTYING AND TRANSPORTATION

The survey reveals that 15.14% of the HHs have emptied their containments at least once since installation. The containments are usually emptied at an interval of every 3 to 5 years. The emptying mechanism varies as per the types of containment. The private desludging service providers from neighbouring municipalities serve for mechanical emptying in the municipality.

### Emptying Interval



### Emptying Mechanism



Manual Mechanical



91.07% of HHs empty FS mechanically (Private desludging service providers-neighbouring municipalities).



8.93% of HHs empty FS manually (Self-emptying or traditional sanitation workers).



प्रशोधन  
(Treatment)



पुनः प्रयोग वा सुरक्षित विसर्जन  
(Re-use or Safe Disposal)

## ESTIMATION OF FAECAL SLUDGE

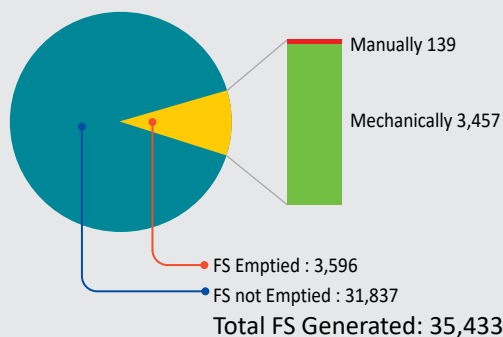
Total estimated volume of FS generation in the municipality: 35,433 m<sup>3</sup> per year which is 97.1 m<sup>3</sup> per day.

Total volume of FS emptied in the municipality: 3,596 m<sup>3</sup> per year which is 9.9 m<sup>3</sup> per day.

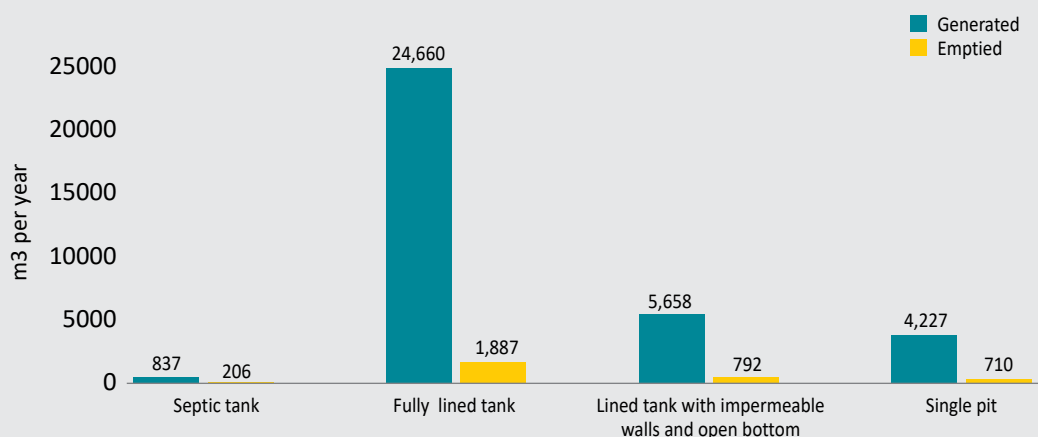
Total volume of FS emptied by mechanical desludging: 3,457 m<sup>3</sup> per year which is 9.5 m<sup>3</sup> per day.

Total volume of FS emptied by manual desludging: 139 m<sup>3</sup> per year which is 0.4 m<sup>3</sup> per day.

### Summary of faecal sludge produced, emptied and transported in Kageshwori Manohara Municipality (cubic meter)



### FS Generated and Emptied



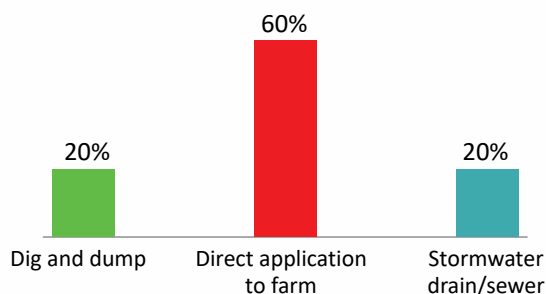
## TREATMENT

The municipality does not have any treatment plants however, a small proportion of WW (from ward 9) connected to centralized combined sewer network, is delivered to Guheshwori Wastewater Treatment Plant (WWTP). The WWTP is located on the bank of Bagmati River in ward 8 of Kathmandu Metropolitan City and has a capacity of treating 32.4 MLD.

### Disposal practice after manual emptying

## SAFE DISPOSAL OR REUSE

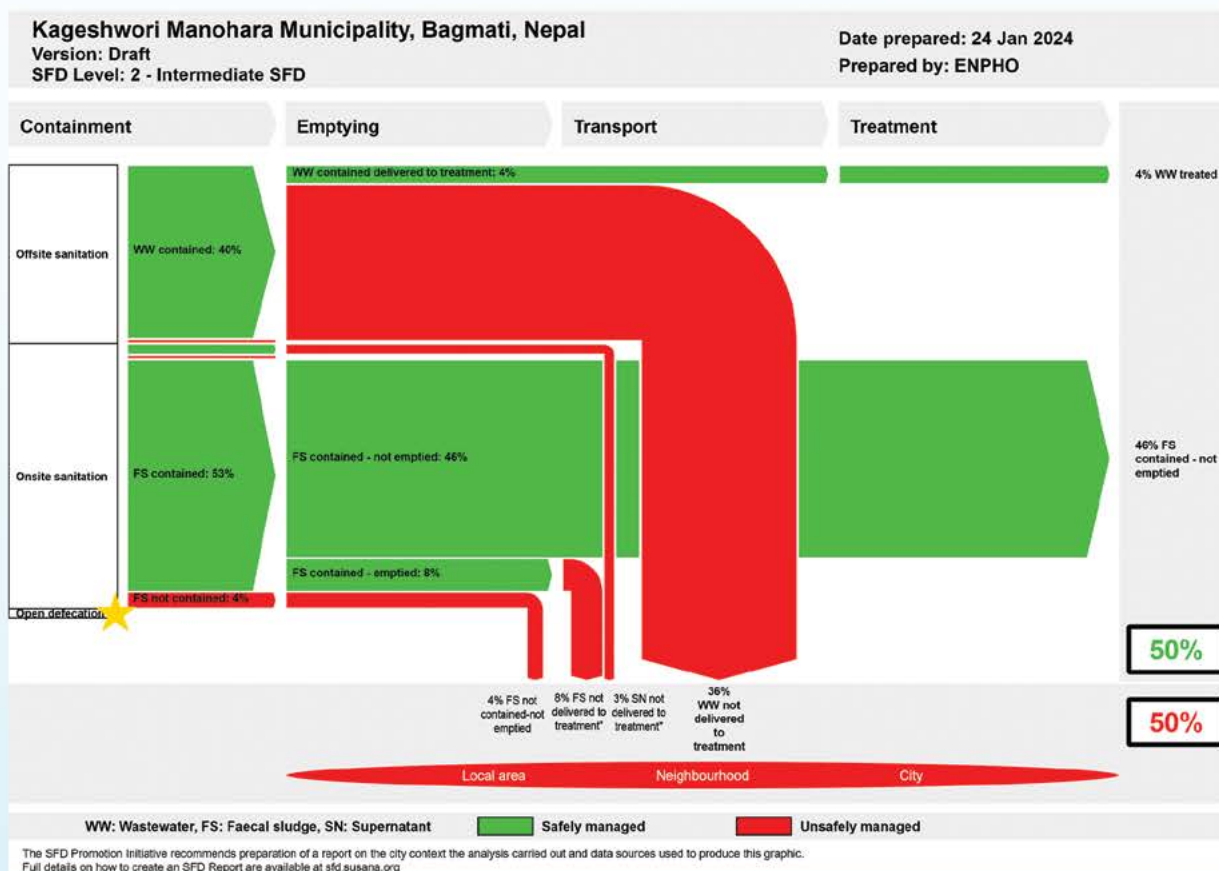
The WW from sewer network which is not connected to Guheshwori WWTP is discharged into nearby river. Moreover, mechanically collected FS is illegally disposed in water bodies. Meanwhile, majority of manually emptied FS is directly applied in farm, and some illegally disposed in water bodies. These practices have direct risks to environment and public health.



## SHIT FLOW DIAGRAM (SFD)

The SFD of Kageshwori Manohara Municipality visually represents the status of sanitation practices across the entire sanitation value chain. FS generated by 50% of the population is safely managed (Green). Initially, 53% of FS generated from onsite sanitation technology is safely contained, but this proportion drops to 46% when 8% of safely contained FS are emptied. The emptied FS remains safe depending upon the emptying mechanism and available treatment options/facilities. Likewise, 40% of WW is safely contained, out of which only 4% is only delivered to treatment plant.

Overall, FS generated by 50% of the population is unsafely managed (Red). It includes 36% of WW not delivered to treatment plants. This highlighted the necessity of safe emptying and its subsequent treatment. Additionally, 3% of SN not delivered to treatment plant, 8% of FS not delivered to treatment plant, FS generated by 4% of the population is neither safely contained nor emptied, exacerbating sanitation challenges. This highlights the critical gaps that must be addressed to mitigate environmental contamination and public health risks associated with inadequate FS management practices.



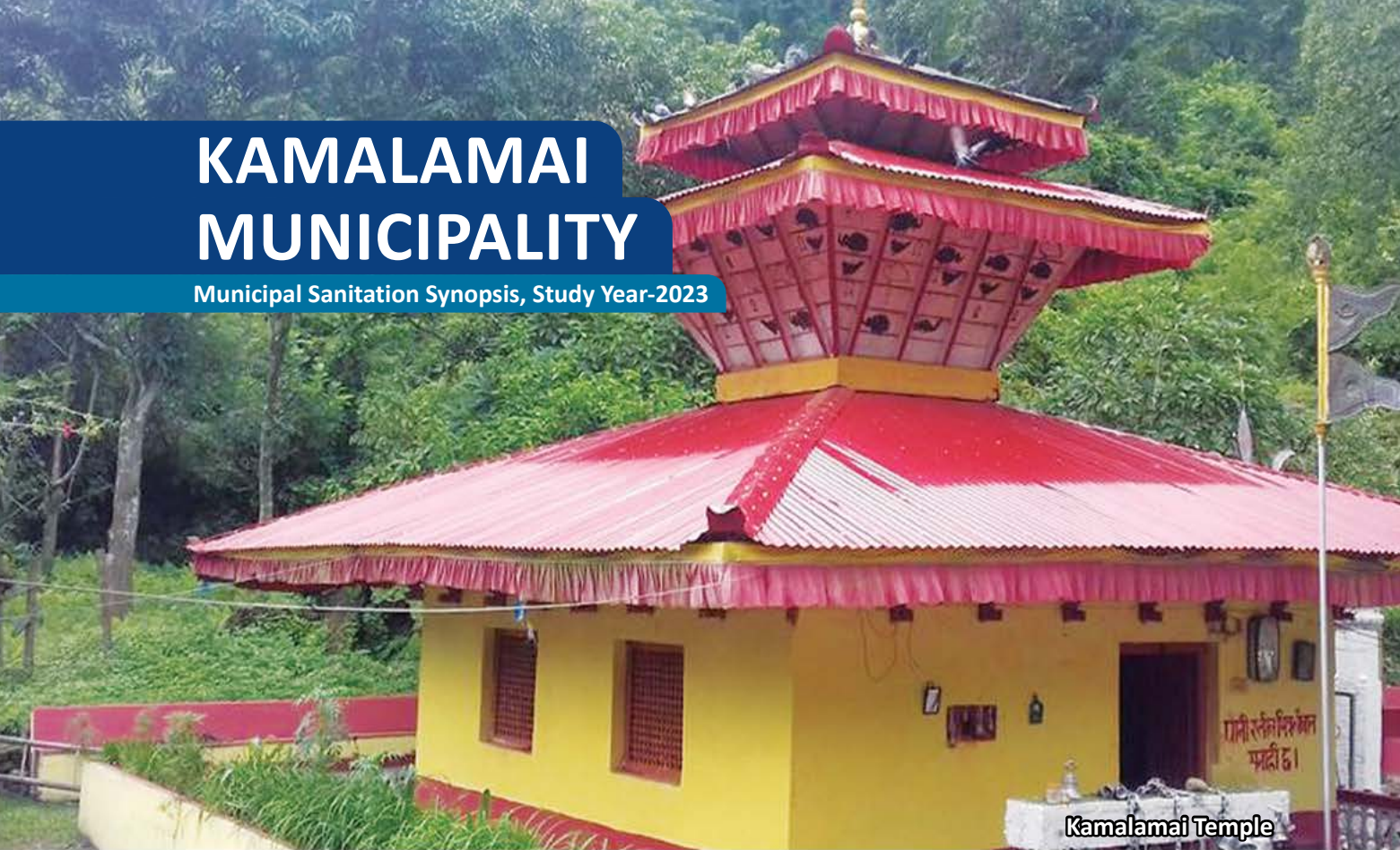
## RECOMMENDATIONS

- Replace and retrofit the unsafe containments to safe techniques and technologies such as septic tanks, biogas digesters and twin pits.
- Expand the sewered network connections to treatment facilities in other wards where a sewer system already exists.
- Advocate for formal registration and proper regulations of desludging services in non-sewered area.
- Formulate and enforce sanitation policies and regulations to ensure safe sanitation practices in the municipality.
- Enforce strict penalties for illegal disposal of FS in water bodies.
- Establish protocols for FS collection and transport, ensuring that FS is managed safely from the point of emptying to the treatment facility.



# KAMALAMAI MUNICIPALITY

Municipal Sanitation Synopsis, Study Year-2023



Kamalamai Temple

## DEMOGRAPHICS



Area : 482.6 km<sup>2</sup>



Household : 18,135



POPULATION : 71,016

Male : 34,316  
Female : 36,700



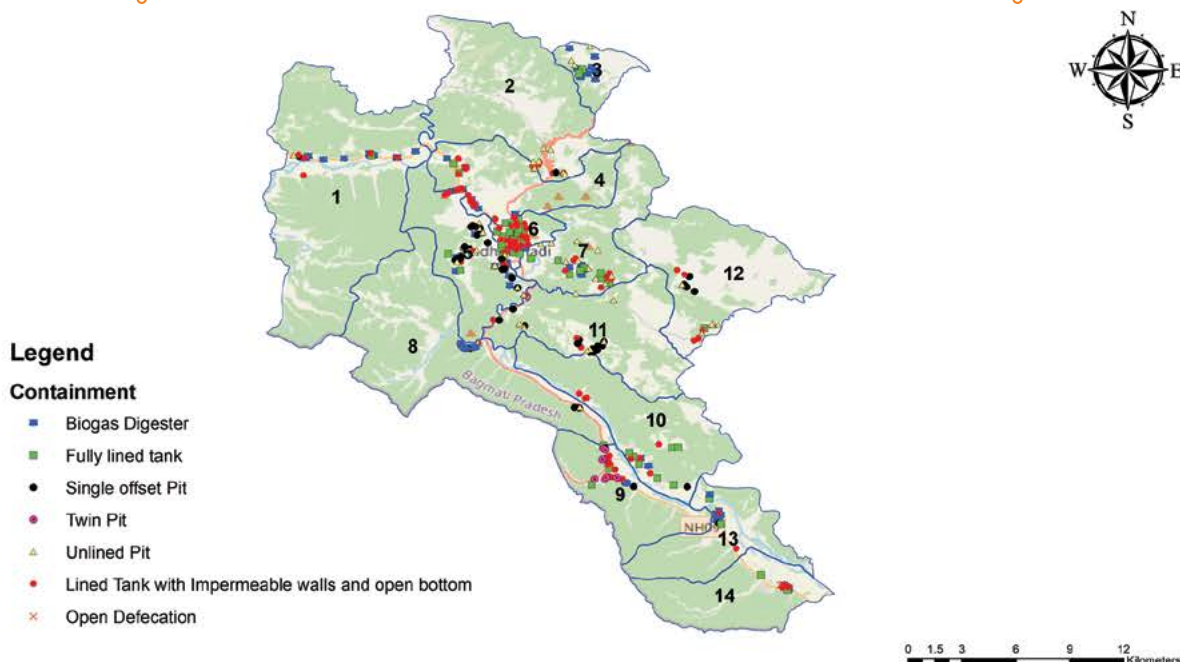
Wards : 14

Source: Census 2021

## CITY PROFILE

Kamalamai Municipality is in Sindhuli District, Bagmati Province, Nepal. It ranges between 26°54'60" to 27°21'60" N latitude and 85°14'60" to 86°24'60" E longitude. It lies at an average elevation of 510 metres above mean sea level.

### Types of sanitation technologies at households in Kamalamai Municipality





संकलन  
(User Interface)



भण्डारण  
(Containment)

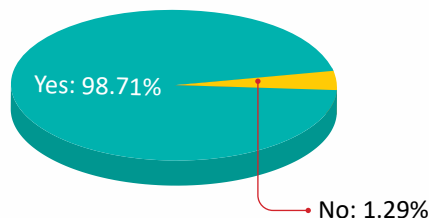


रिट्याउने र ढुवानी  
(Emptying & Transportation)

## USER INTERFACE FACILITY

Kamalamai Municipality was declared an Open Defecation Free (ODF) zone in March 2011 A.D. The survey showed that 98.71% of households in the municipality have access to basic sanitation coverage whereas still 1.29% of household lacks toilet.

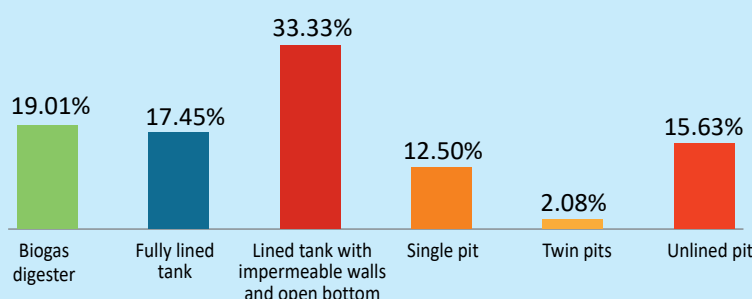
### Sanitation Facility



## CONTAINMENT

Most HHs in the municipality rely on lined tank with impermeable walls and open bottom allowing leachate percolation, possessing a risk to groundwater contamination. Moreover, a few proportion of HHs have opted for safe technologies such as biogas digester, fully lined tank and twin pits.

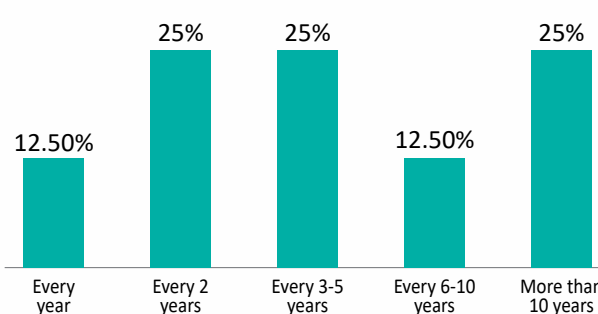
### Types of containment



## EMPTYING AND TRANSPORTATION

Only 21.88% of the surveyed households have emptied the containment at least once since installation through manual or mechanical emptying services. Mostly the containments are emptied at an interval of every 2 years, every 3 to 5 years and every 6 to 10 years period. The detail of the emptying mechanism is shown in the graph.

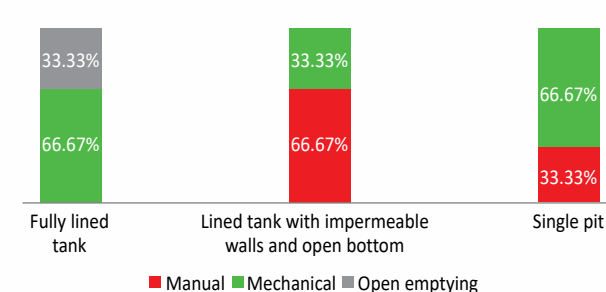
### Emptying Interval



### Details of desludging service providers

Service Provider	Municipality
No. of service providers	1
No. of vehicles	1
Capacity of vehicle (litres)	3,500
Average no. of trips per week per vehicle	1 to 2
Average service charge per trip (NPR)	4,500

### Emptying Mechanism



55.56% of FS are emptied mechanically (Municipal desludging vehicle)



33.33% of FS are emptied manually (Self-emptying or traditional sanitation workers).



11.11% of HHs practice open emptying (disposed into open drain during rainy season).



Desludging vehicle of Kamalamai Municipality



प्रशोधन  
(Treatment)

पुनः प्रयोग वा सुरक्षित विसर्जन  
(Re-use or Safe Disposal)

## ESTIMATION OF FAECAL SLUDGE

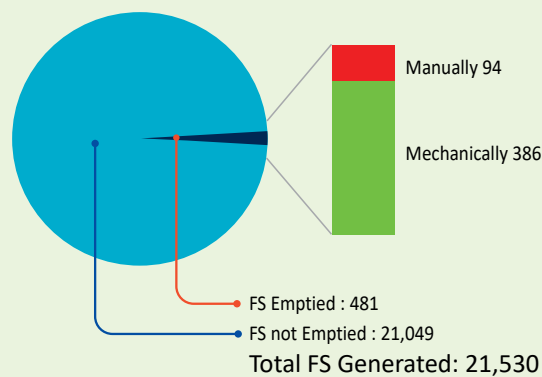
Total estimated volume of FS generation in the municipality: 21,530 m<sup>3</sup> per year which is 59 m<sup>3</sup> per day.

Total volume of FS emptied in the municipality: 481 m<sup>3</sup> per year which is 1.32 m<sup>3</sup> per day.

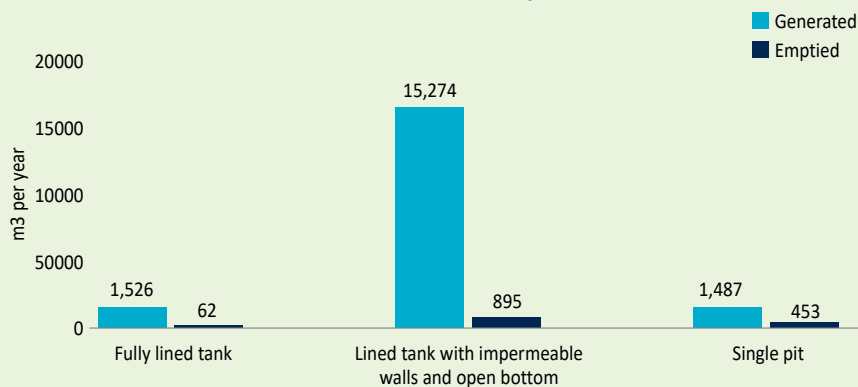
Total volume of FS emptied by mechanical desludging: 386 m<sup>3</sup> per year which is 1.06 m<sup>3</sup> per day.

Total volume of FS emptied by manual desludging: 94 m<sup>3</sup> per year which is 0.26 m<sup>3</sup> per day.

### Summary of faecal sludge produced, emptied and transported in Kamalamai Municipality (cubic meter)



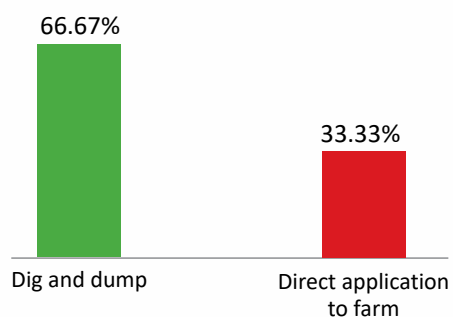
### FS Generated and Emptied



## SAFE DISPOSAL OR REUSE

Municipality does not have faecal sludge treatment plant. The FS emptied from the households are applied directly into the farmlands. Meanwhile, the majority of manually emptied FS are managed by dig and dump method. However, direct application to farmland possesses significant risk to environment and public health.

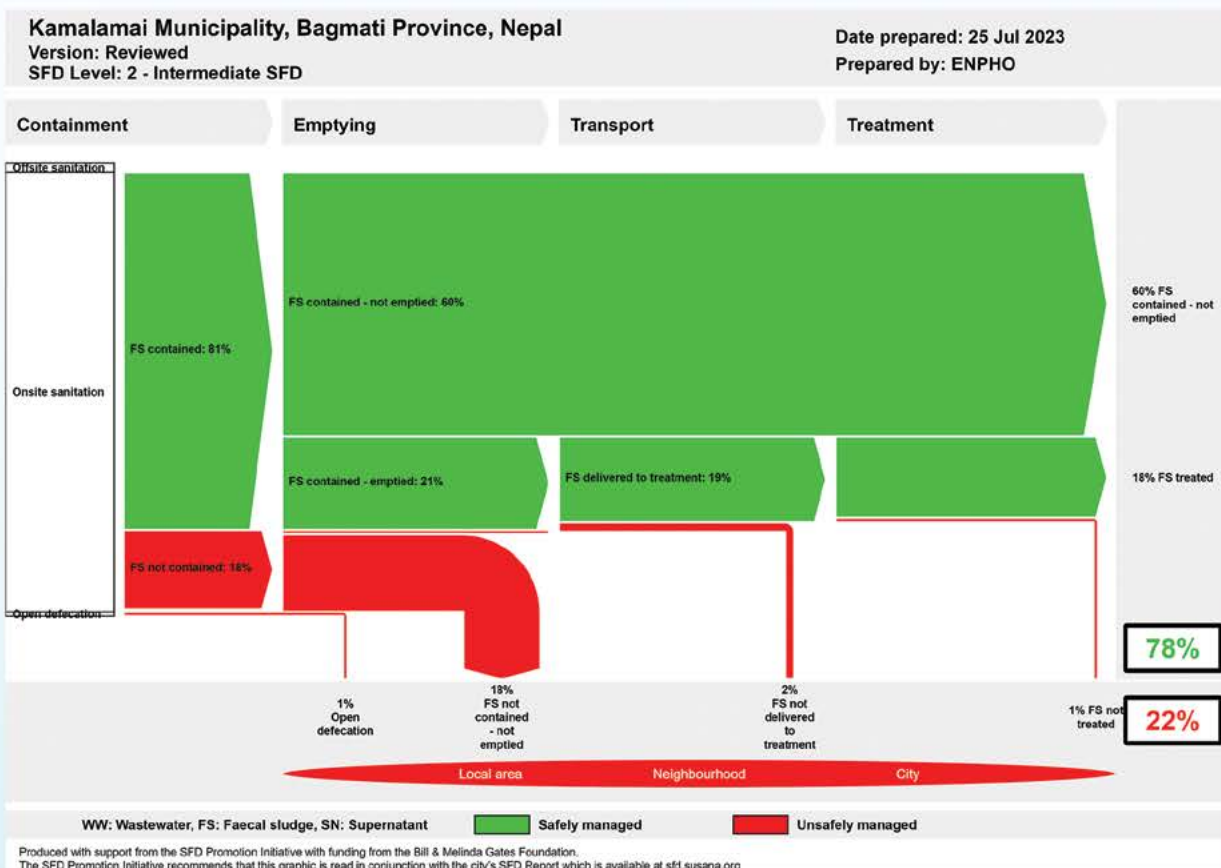
### Disposal practice after manual emptying



## SHIT FLOW DIAGRAM (SFD)

The SFD graphic for Kamalamai Municipality visually represents the status of sanitation practices across the entire sanitation value chain. In the graphic, FS and wastewater (WW) generated by 78% of Kamalamai Municipality's population is safely managed (Green). Initially 81% of FS is safely contained which drops to 60% which has not been emptied and considered as safely managed. Furthermore, 21% of FS contained is emptied, of which, 19% is delivered to treatment plant and 18% is treated which primarily comes from HHs using biogas digester.

Overall, the FS and WW generated by 22% of population is managed unsafely (Red). It includes 1% of FS not treated, 2% of FS emptied but not delivered to treatment and 18% of FS which is neither contained nor emptied. Additionally, 1% of the population still practice open defecation exacerbating the environmental risks. This highlights the significant gaps that must be addressed to mitigate environmental and public health risks associated with inadequate FS management practices.



## RECOMMENDATIONS

- Replace and retrofit the unsafe containment systems to safer techniques and technologies such as septic tanks, biogas digesters and twin pits.
- Promote mechanical desludging services in the municipality to address the current gap in sanitation value chain.
- Construct a faecal sludge treatment plant to manage FS effectively, reduce environmental pollution, and safeguard public health.
- Formulate and enforce sanitation policies and regulations to ensure the safe sanitation practices in the municipality.

# LALITPUR METROPOLITAN CITY

Municipal Sanitation Synopsis, Study Year -2024



Patan Durbar Square

## DEMOGRAPHICS



Area : 36.12 km<sup>2</sup>



Household : 77,159



POPULATION : 294,098

Male : 146,730  
Female : 147,368



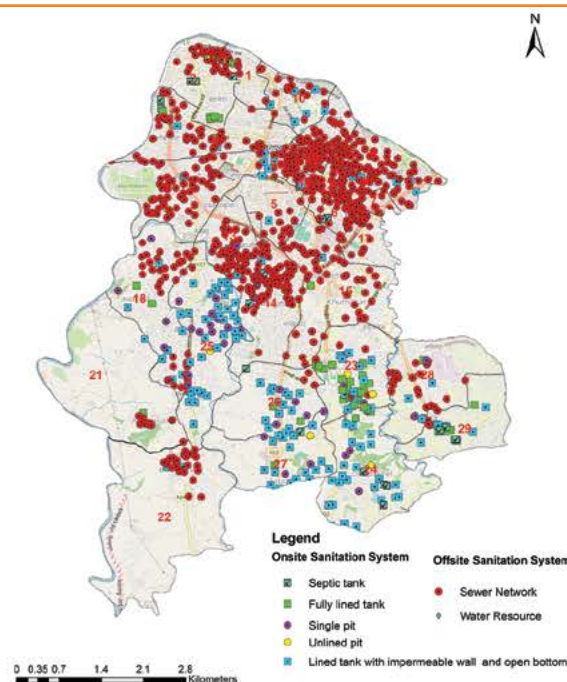
Wards : 29

Source: Census 2021

## CITY PROFILE

Lalitpur Metropolitan City is in Lalitpur District, Bagmati Province of Nepal. It is extended from 27°37'12" to 27°41'24" N latitude and 85°17'24" to 85°21'36" E longitude. The elevation of the city is approximately 1,280 metres above mean sea level.

### Types of sanitation technologies at households in Lalitpur Metropolitan City





संकलन  
(User Interface)



भण्डारण  
(Containment)



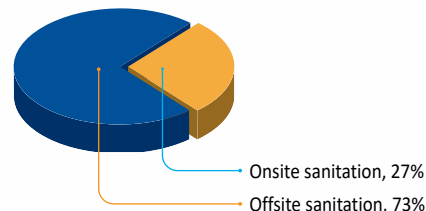
रिच्याउने र ढुवानी  
(Emptying & Transportation)

## USER INTERFACE FACILITY

All the households in the metropolitan city have access to basic sanitation facilities.

Among HHs with offsite sanitation systems, 72% are connected to sewer network while 1% are directly connected to water bodies.

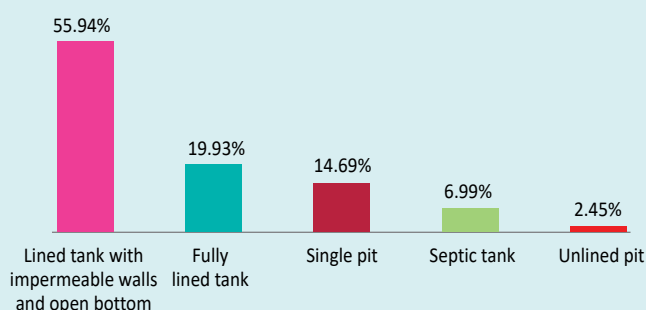
### Sanitation Facility



## CONTAINMENT

Among HHs with onsite sanitation facilities, lined tanks with impermeable walls and open bottom are the predominant type, accounting for 55.94% of HHs, possessing a risk to groundwater contamination. Moreover, few proportion of HHs have opted for safe technology such as septic tank (6.99%).

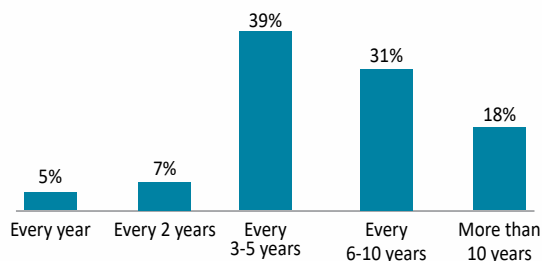
### Types of containment



## EMPTYING AND TRANSPORTATION

Approximately 30.2% of HHs with containment have emptied at least once. Usually, these containments are emptied at an interval of 3 to 10 years. The private service providers offer desludging services in city.

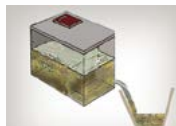
### Emptying Interval



71.95% of HHs empty mechanically (Private desludging service providers).

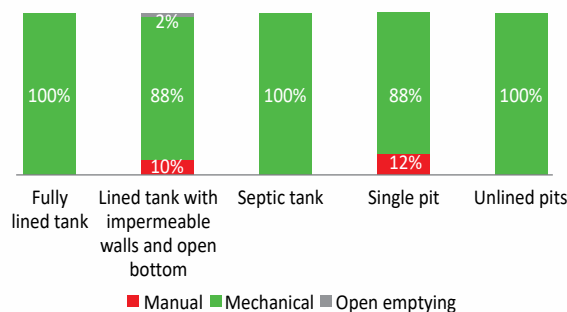


6.9% of HHs empty manually (Self-emptying or traditional sanitation workers).



1.15% of HHs practice open emptying (disposed into open drain during rainy season)

### Emptying Mechanism



### Details of desludging service providers

Service Provider	Private
No. of service providers	1
No. of vehicles	2
Capacity of vehicle (litres)	3,000
Average no. of trips per day per vehicle	2
Average service charge per trip (NPR)	3,500-5,000



FS transported to FSTP at Lubhu



प्रशोधन  
(Treatment)



पुनः प्रयोग वा सुरक्षित विसर्जन  
(Re-use or Safe Disposal)

## ESTIMATION OF FAECAL SLUDGE

Total estimated volume of FS generation in the metropolitan city: 53,999 m<sup>3</sup> per year which is 147.94 m<sup>3</sup> per day.

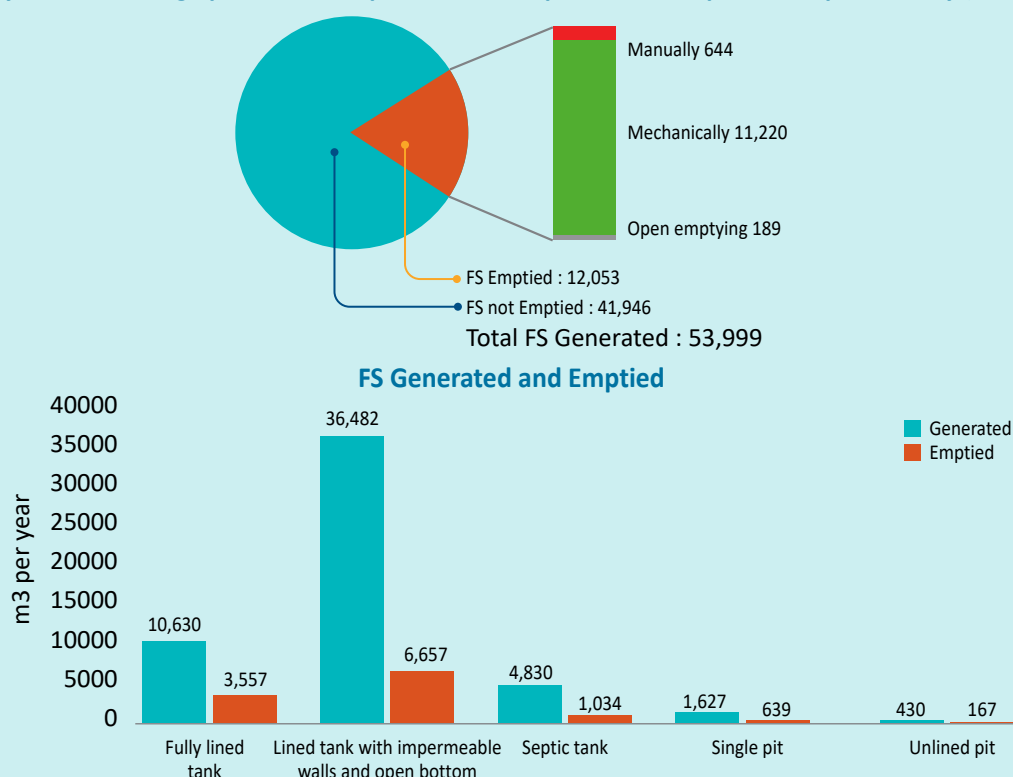
Total volume of FS emptied in the metropolitan city: 12,053m<sup>3</sup> per year which is 33.02 m<sup>3</sup> per day.

Total volume of FS emptied by mechanical desludging: 11,220 m<sup>3</sup> per year which is 30.74 m<sup>3</sup> per day.

Total volume of FS emptied by manual desludging: 644 m<sup>3</sup> per year which is 1.77 m<sup>3</sup> per day.

Total volume of FS emptied by open emptying: 189 m<sup>3</sup> per year which is 0.51 m<sup>3</sup> per day.

### Summary of faecal sludge produced, emptied and transported in Lalitpur Metropolitan City (cubic meter)



## TREATMENT

In the metropolitan city, the wastewater treatment plants (WWTPs) at Balkumari (Kodku) and Dhobighat were under rehabilitation. Moreover, FSTPs were also under construction in these sites. Also, there were three WWTPs at Harisiddhi which, however, were non-functional and one was under construction. The information on status of all the WWTPs and FSTPs are based on the time of study.

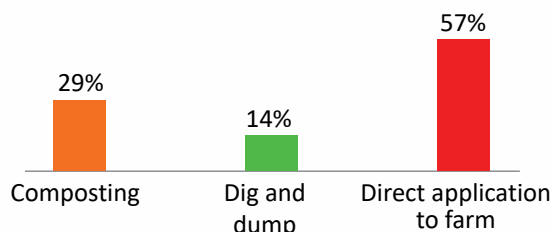


Wastewater treatment plant site at Harisiddhi

## SAFE DISPOSAL OR REUSE

Currently, the mechanically emptied faecal sludge is treated at one only FSTP at Mahalaxmi Municipality. However, other service providers are illegally disposing FS into water bodies and stormwater drain/sewer, despite strict actions taken by the metropolitan city. While manually emptied FS is directly applied on farmlands, practice composting and dig and dump. However, direct application to farms possesses a risk to the environment and public health.

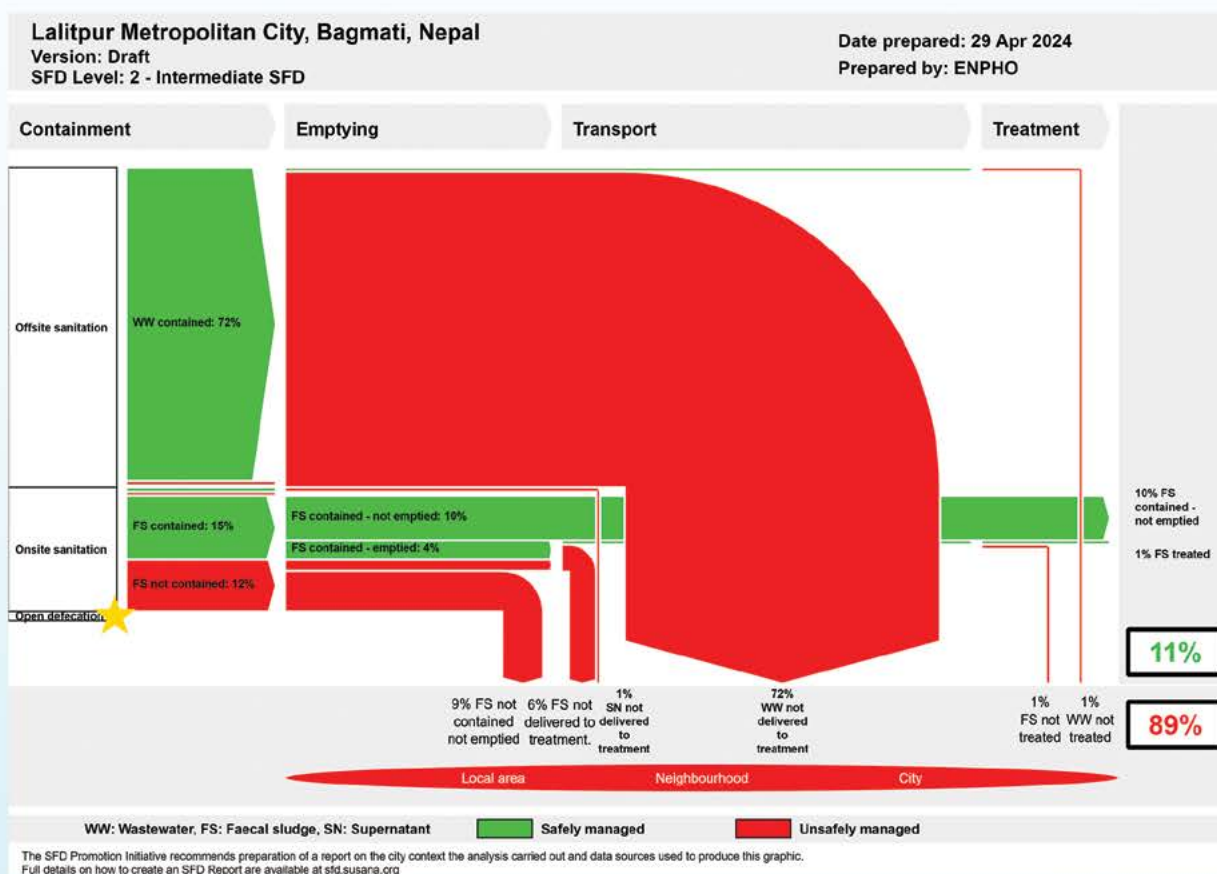
### Disposal practice after manual emptying



## SHIT FLOW DIAGRAM (SFD)

The SFD of Lalitpur Metropolitan City visually represents the status of sanitation practices across the entire sanitation value chain. FS generated by 11% of the metropolitan city's population is safely managed (Green). Initially, 15% of the FS is safely contained and the percentage decreases to 10% when FS generated by 4% of the population is emptied. This implies that 10% of FS are considered safely managed and remains safe until emptied. The emptied FS remains safe depending on the emptying mechanism and the available treatment options/facilities.

Furthermore, 89% of FS is unsafely managed (Red). This includes 72% of WW and 1% supernatant (SN) which is not transported to treatment plant. Additionally, 9% of FS are neither safely contained nor emptied, and 6% of FS emptied (4% FS contained and 2% FS not contained) are not transported to treatment plant. This untreated FS possesses increased environmental risks. Moreover, 1% of the WW delivered to treatment is not treated. These findings highlighted the critical gaps that must be addressed to mitigate environmental and public health risks associated with inadequate WW and FS management practices.



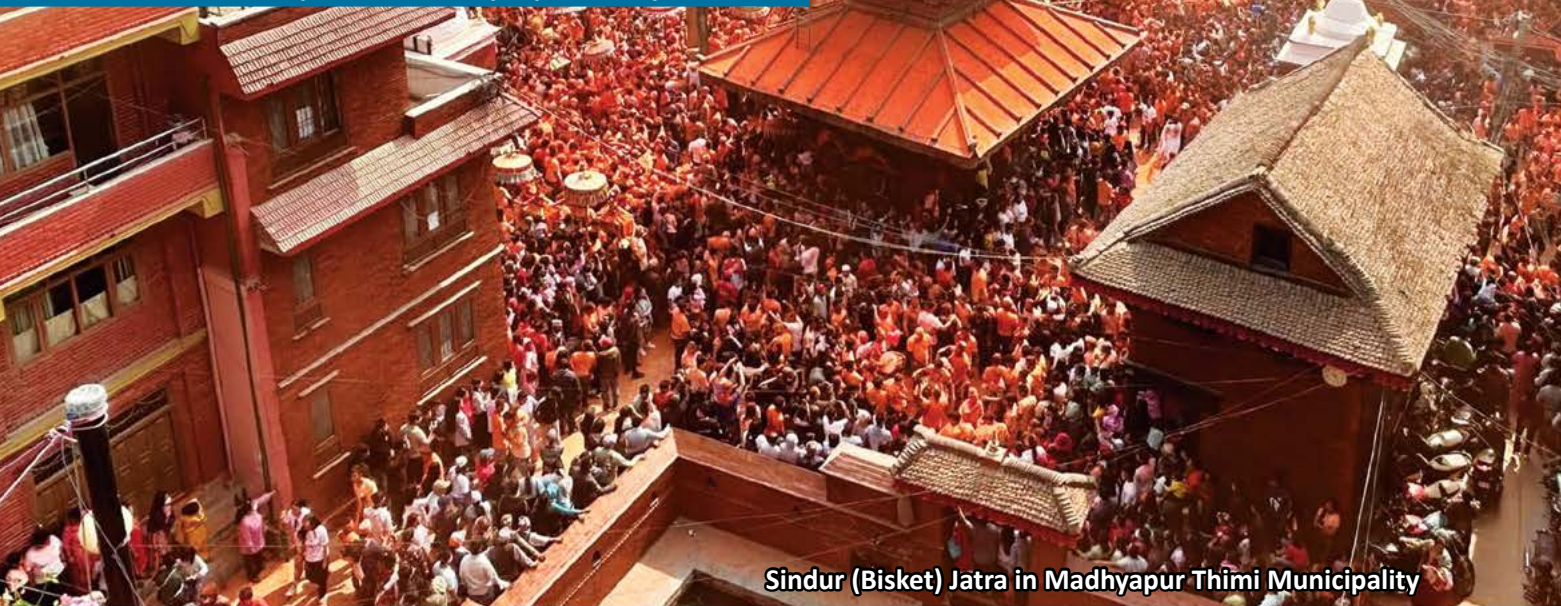
## RECOMMENDATIONS

- Accelerate the construction of WWTPs and FSTPs emphasizing the proper operation and maintenance.
- Formalize and regulate the private desludging service and mandate for the treatment at FSTPs.
- Formulate and enforce sanitation policies and regulations to ensure the safe sanitation practices



# MADHYAPUR THIMI MUNICIPALITY

Municipal Sanitation Synopsis, Study Year -2023



Sindur (Bisket) Jatra in Madhyapur Thimi Municipality

## DEMOGRAPHICS



Area : 11.47 km<sup>2</sup>



Household : 31,966



POPULATION : 119,756

Male : 60,746

Female : 59,010



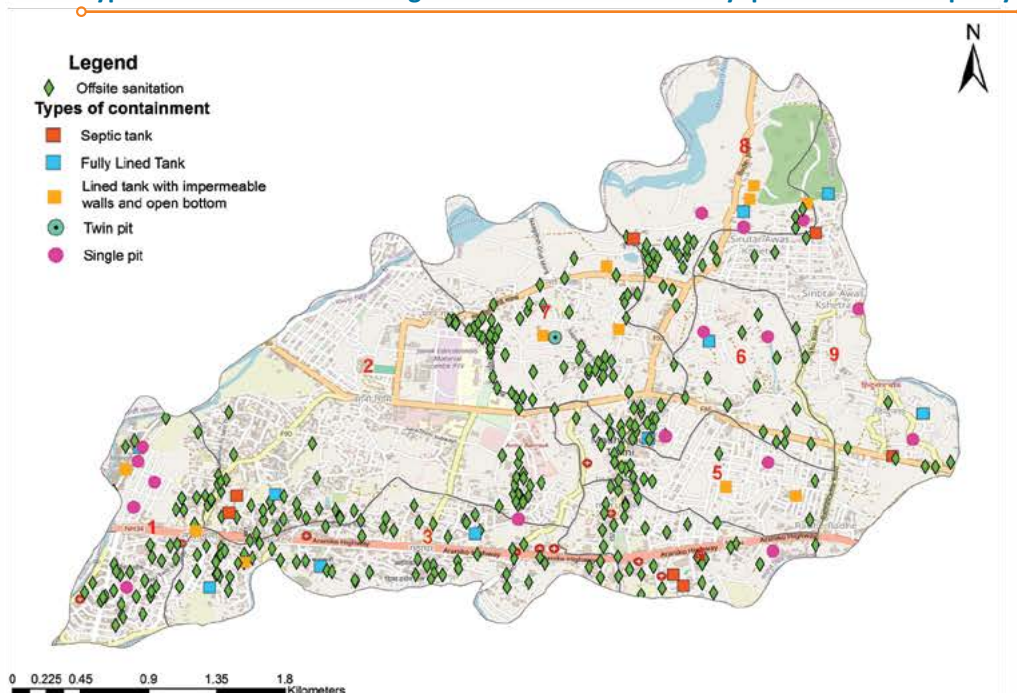
Wards : 9

Source: Census 2021

## CITY PROFILE

Madhyapur Thimi Municipality is in Bhaktapur District of Bagmati Province, Nepal. It ranges between 27°39'60" to 27°41'60" N latitude and 81°22'30" to 85°24'60" E longitude. It lies at an average altitude of 1,326 metres above mean sea level.

### Types of sanitation technologies at households in Madhyapur Thimi Municipality





संकलन  
(User Interface)



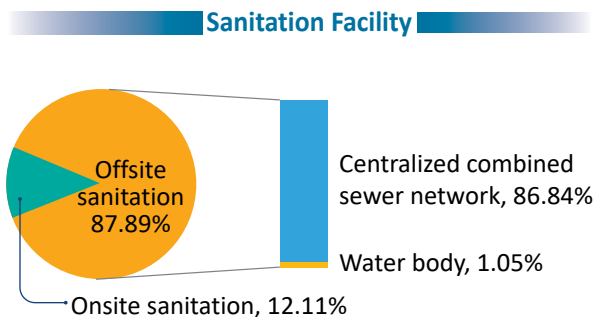
भण्डारण  
(Containment)



रिट्याउने र ढुवानी  
(Emptying & Transportation)

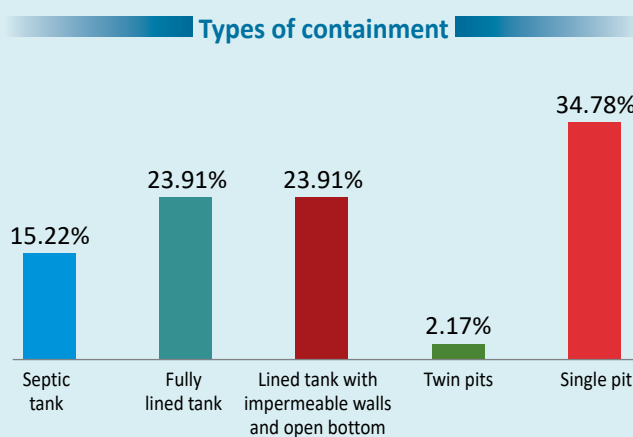
## USER INTERFACE FACILITY

Madhyapur Thimi Municipality attained Open Defecation Free (ODF) status on 6 June 2016. The survey revealed that all the households in the municipality have access to toilet. In the municipality, the majority of HHs have offsite sanitation systems connected to centralized combined sewer network while few proportion of HHs have illegal outlet to water bodies.



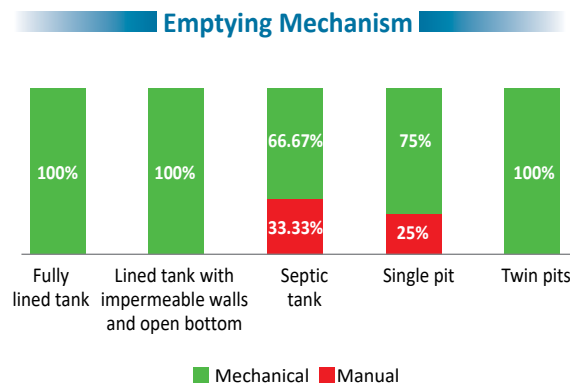
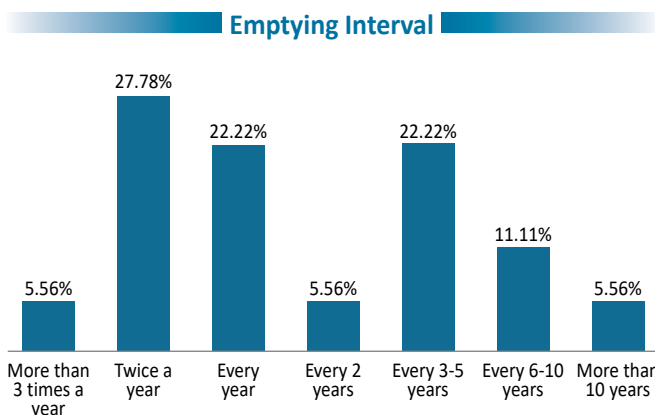
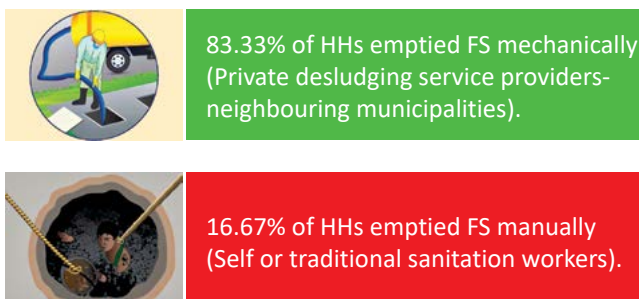
## CONTAINMENT

The survey showed that the majority of the HHs have containments with open bottom allowing leachate percolation, possessing a risk to groundwater contamination. Besides, a significant proportion of HHs use safer technologies such as septic tank and twin pits. Also, some HHs use fully lined tank which store FS safely but do not treat.



## EMPTYING AND TRANSPORTATION

Among the HHs with containment, about 40% of HHs have emptied their containment at least once after installation. Most containments are emptied twice a year. Majority of containments are emptied mechanically while manual emptying is also practiced. Only private desludging service providers serve for mechanical emptying and transport of faecal sludge in the municipality.





प्रशोधन  
(Treatment)

पुनः प्रयोग वा सुरक्षित विमर्जन  
(Re-use or Safe Disposal)

## ESTIMATION OF FAECAL SLUDGE

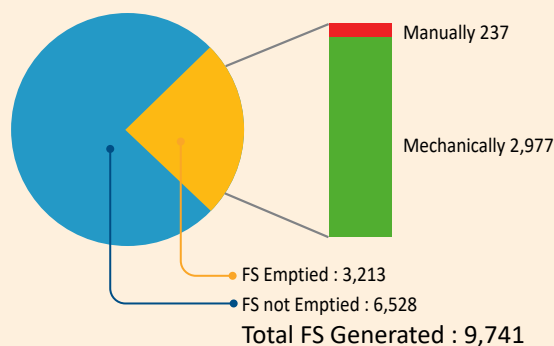
Total estimated volume of FS generation in the municipality: 9,741 m<sup>3</sup> per year which is 26.69 m<sup>3</sup> per day.

Total volume of FS emptied in the municipality: 3,213 m<sup>3</sup> per year which is 8.8 m<sup>3</sup> per day.

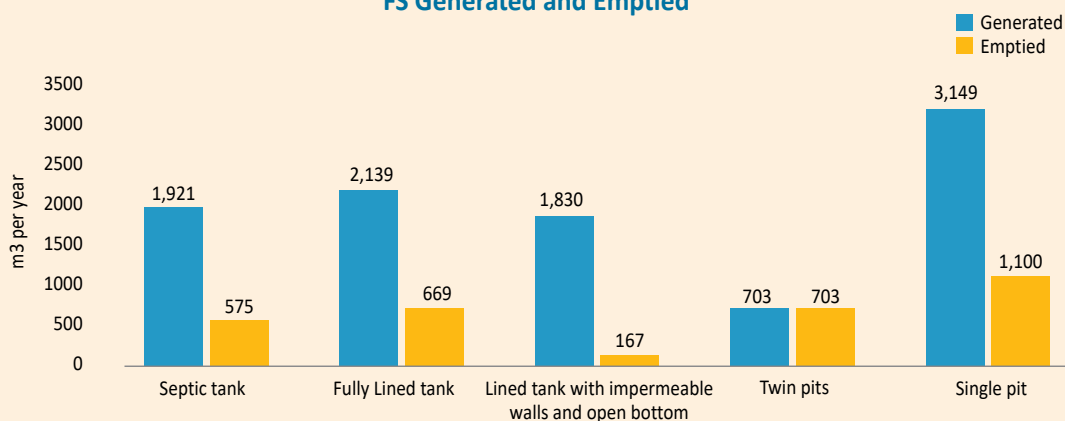
Total volume of FS emptied by mechanical desludging: 2,977 m<sup>3</sup> per year which is 8.16 m<sup>3</sup> per day.

Total volume of FS emptied by manual desludging: 237 m<sup>3</sup> per year which is 0.65 m<sup>3</sup> per day.

### Summary of faecal sludge produced, emptied and transported in Madhyapur Thimi Municipality (cubic meter)



### FS Generated and Emptied



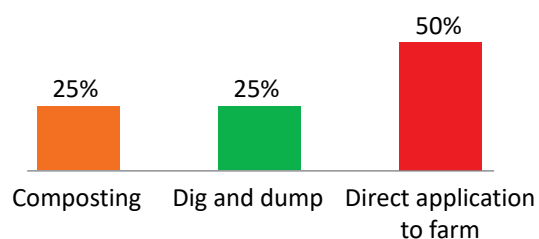
## TREATMENT

A decentralized wastewater treatment plant (WWTP) was located at sunga community of Madhyapur Thimi Municipality. It was constructed in 2005 A.D. to treat sewage from 200 households with a design capacity of 50 m<sup>3</sup>/day. However, the WWTP was non-functional at the time of study.

## SAFE DISPOSAL OR REUSE

Mechanically emptied FS are either applied to farmlands, disposed to water bodies or into sewer. While manually emptied FS is composted, directly applied to farms or dig and dump. However, direct application to farms and water bodies possesses a risk to the environment and public health.

### Disposal practice after manual emptying





# NEELAKANTHA MUNICIPALITY

Municipal Sanitation Synopsis, Study Year -2023



City view of Neelakantha Municipality

## DEMOGRAPHICS



Area : 199.85 km<sup>2</sup>



Household : 16,391



POPULATION : 58,828

Male : 27,365  
Female : 31,463



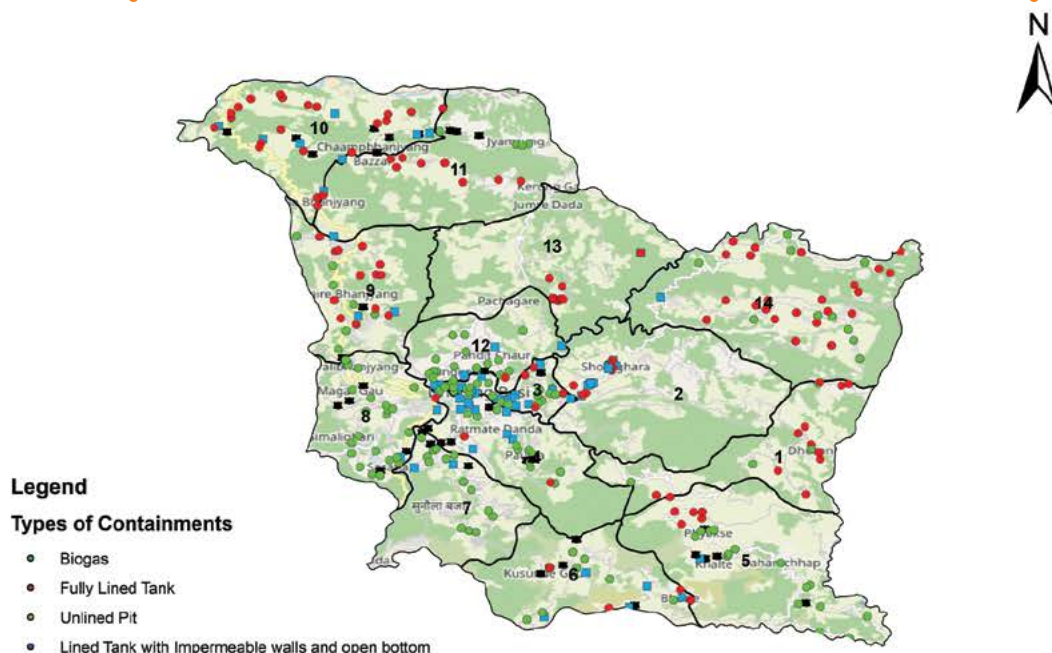
Wards : 14

Source: Census 2021

## CITY PROFILE

Neelkantha Municipality lies in Dhading District, Bagmati Province, Nepal. It is situated between 27°50'45" to 27°58'10" N latitude and 84°58'49" to 84°56'41" E longitude. It lies at an average altitude of 612 metres above mean sea level.

### Types of sanitation technologies at households in Neelakantha Municipality





संकलन  
(User Interface)



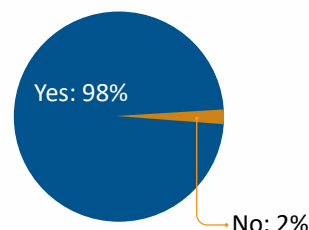
भण्डारण  
(Containment)



रिट्याउने र ढुवानी  
(Emptying & Transportation)

## USER INTERFACE FACILITY

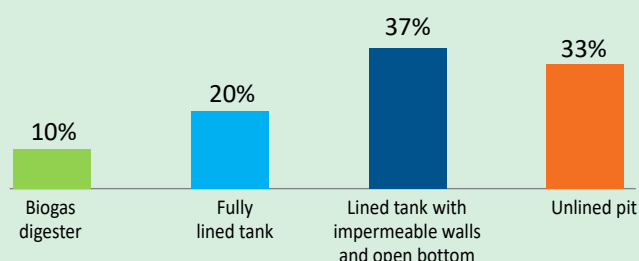
Neelakantha Municipality achieved Open Defecation Free (ODF) status in 2019 A.D. The survey shows that 98% of households in the municipality have access to basic sanitation coverage whereas still 2% of households lack toilet.



## CONTAINMENT

Most of the HHs in the municipality rely on lined tank with impermeable walls and open bottom allowing leachate percolation, possessing a risk of groundwater contamination. Moreover, a few proportion of HHs have opted for safe technologies such as biogas digesters.

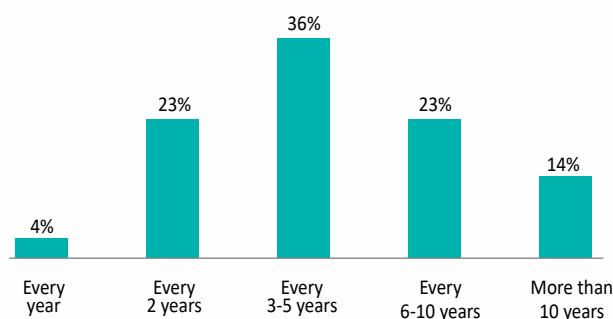
### Types of containment



## EMPTYING AND TRANSPORTATION

About 16% of the households have emptied the containment at least once since installation through both manual and mechanical emptying services, whereas 84% of the households have not emptied their containment. Most of the containments are emptied at an interval of every 3 to 5 years period.

### Emptying Interval

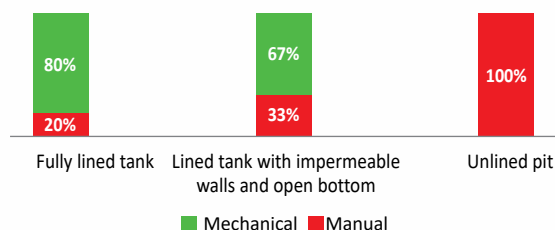


55% of HHs emptied FS mechanically (Municipal desludging service provider).



45% of HHs emptied FS manually (Self or traditional sanitation workers).

### Emptying Mechanism



### Details of desludging service providers

Service Provider	Municipality
No. of service providers	1
No. of vehicles	1
Capacity of vehicle (litres)	3,000
Average no. of trips per week per vehicle	1
Average service charge per trip (NPR)	4,000- 6,000





प्रशोधन  
(Treatment)

पुनः प्रयोग वा सुरक्षित विसर्जन  
(Re-use or Safe Disposal)

## ESTIMATION OF FAECAL SLUDGE

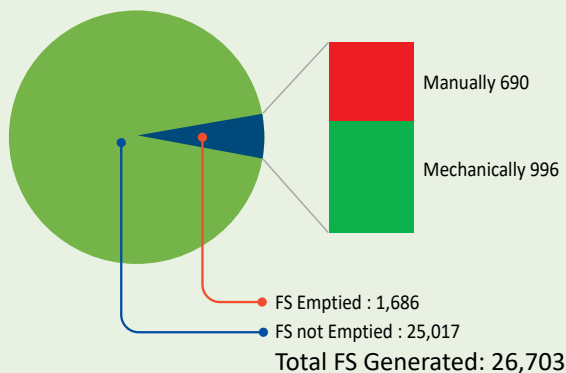
Total estimated volume of FS generation in the municipality: 26,703m<sup>3</sup> per year which is 73 m<sup>3</sup> per day.

Total volume of FS emptied in the municipality: 1,686 m<sup>3</sup> per year which is 5 m<sup>3</sup> per day.

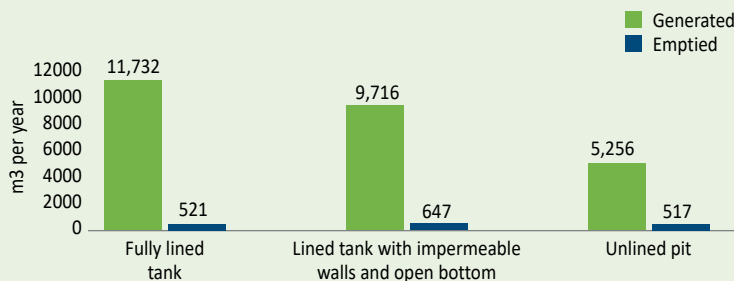
Total volume of FS emptied by mechanical desludging: 996 m<sup>3</sup> per year which is 3 m<sup>3</sup> per day.

Total volume of FS emptied by manual desludging: 690 m<sup>3</sup> per year which is 2 m<sup>3</sup> per day.

### Summary of faecal sludge produced, emptied and transported in Neelakantha Municipality (cubic meter)



### FS Generated and Emptied



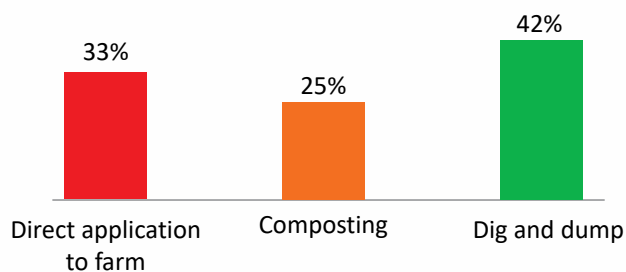
## TREATMENT

Neelkantha municipality do not have any form of treatment plant. However, the municipality has a designated site for disposal of FS consisting of a holding tank with four chambers without any components for treatment processes located at Chyado in Neelkantha-8.

## SAFE DISPOSAL OR REUSE

Municipality does not have any form of treatment plant but has a designated site for FS disposal. Thus, mechanically emptied FS is disposed in the designated site. Meanwhile, most of the manually emptied FS are managed by dig and dump method and some HHs use as compost. Additionally, few proportion of HHs directly apply in the farmlands. However, direct application to farms possesses a risk to the environment and public health.

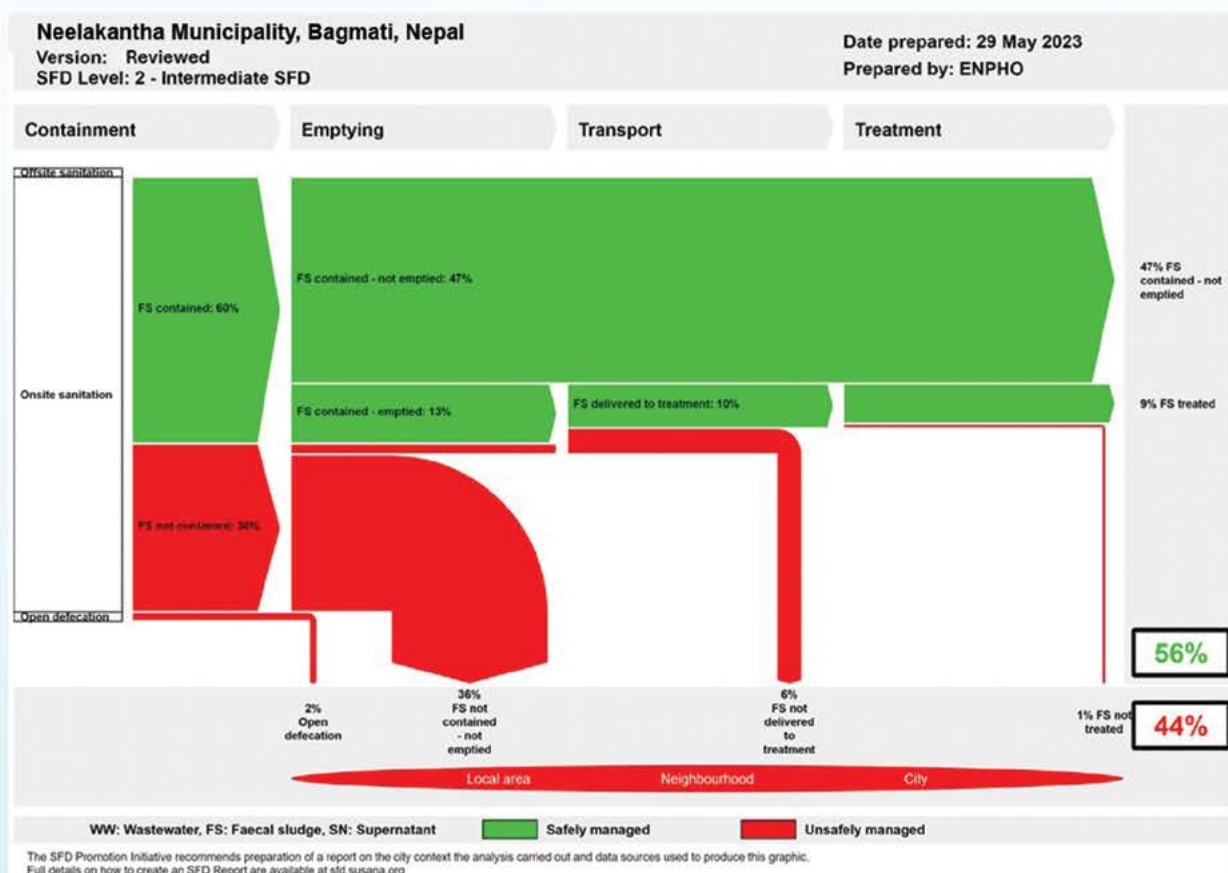
### Disposal practice after manual emptying



## SHIT FLOW DIAGRAM (SFD)

The SFD of Neelakantha Municipality visually represents the status of sanitation practices across the entire sanitation value chain. It shows that FS generated by 56% of the population is safely managed (Green). Initially, FS generated by 60% of the population is safely contained. However, this proportion drops to 47% which can be considered safe until emptied. The emptied FS remains safe depending upon the nature of the emptying mechanism and available treatment facilities. Out of the 13% safely contained FS which has been emptied, 9% of FS is treated, and this comes from a biogas digester. This highlights the necessity of safe emptying and treatment.

Overall, FS generated by 44% of the population is unsafely managed (Red). It includes 1% of FS not treated, 6% FS not delivered to treatment plant (3% FS contained and 3% FS not contained) and 36% FS which is neither contained nor emptied. Additionally, 2% of the population practice open defecation that exacerbates the environmental risks. This highlights the significant gaps that must be addressed to mitigate environmental and public health risks associated with inadequate FS management practices.



## RECOMMENDATIONS

- Replace and retrofit the unsafe containment systems to safer techniques and technologies such as septic tanks, biogas digesters and twin pits.
- Construct a faecal sludge treatment plant to manage FS effectively, reduce environmental pollution, and safeguard public health.
- Formulate and enforce sanitation policies and regulations to ensure the safe sanitation practices in the municipality.



# RATNANAGAR MUNICIPALITY

Municipal Sanitation Synopsis, Study Year -2023



Rapti River, Sauraha

## DEMOGRAPHICS



Area : 68.68 km<sup>2</sup>



Household : 22,403



POPULATION : 89,905

Male : 43,531  
Female : 46,374



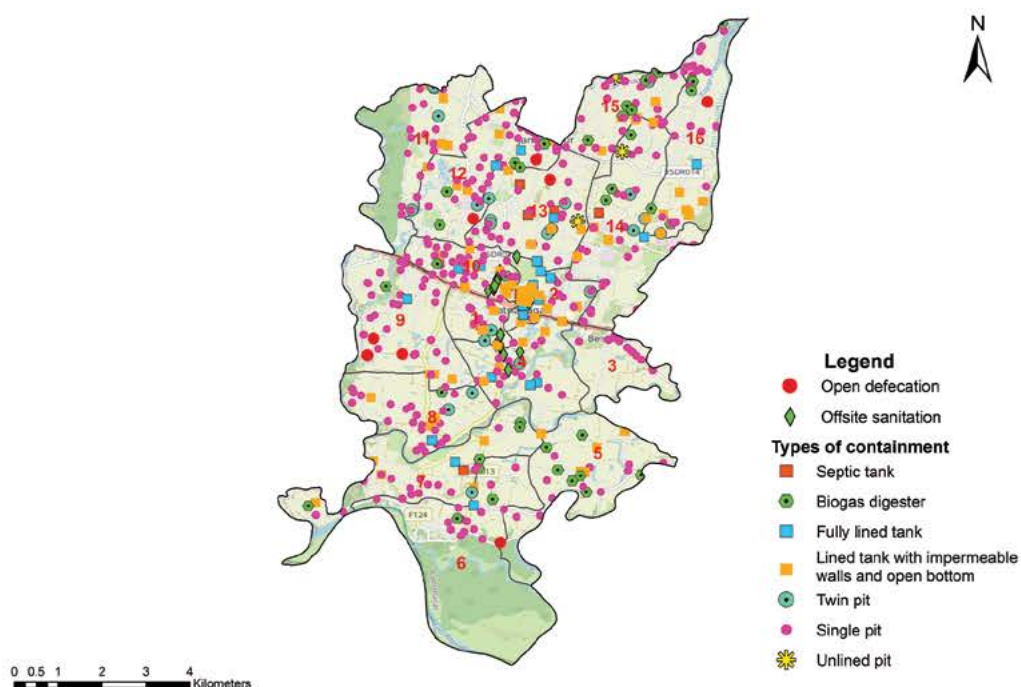
Wards : 16

Source: Census 2021

## CITY PROFILE

Ratnanagar Municipality is located in Chitwan District of Bagmati Province, Nepal. It lies at 27°36'36" N latitude and 84°30'42" E longitude. It ranges at an altitude from 185 metres to 213 metres above mean sea level.

### Types of sanitation technologies at households in Ratnanagar Municipality





संकलन  
(User Interface)



भण्डारण  
(Containment)

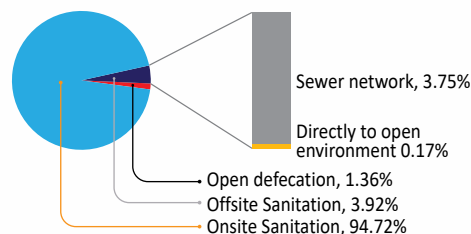


रिक्त्याउने र ढुवानी  
(Emptying & Transportation)

## USER INTERFACE FACILITY

Ratnanagar Municipality attained Open Defecation Free (ODF) status on 23 September 2011. The survey revealed that the majority of HHs have onsite sanitation systems while 3.92% have offsite sanitation systems mostly connected to sewer network. Also, 1.36% of HHs do not have access to toilet.

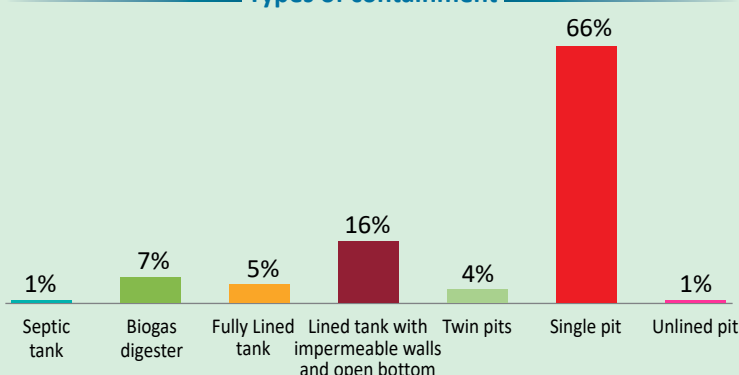
## Sanitation Facility



## CONTAINMENT

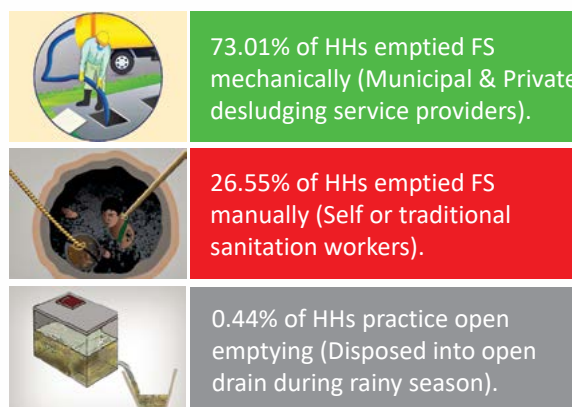
The survey showed that the majority of the HHs use single pit followed by lined tank with impermeable walls and open bottom and few HHs use unlined pit. These types of containment have open bottom, allowing leachate percolation and possessing a risk to groundwater contamination. Thus, are considered as unsafe containments. Besides, only limited HHs use safer technologies such as biogas digester, septic tank and twin pits. Also, some HHs use fully lined tank.

## Types of containment



## EMPTYING AND TRANSPORTATION

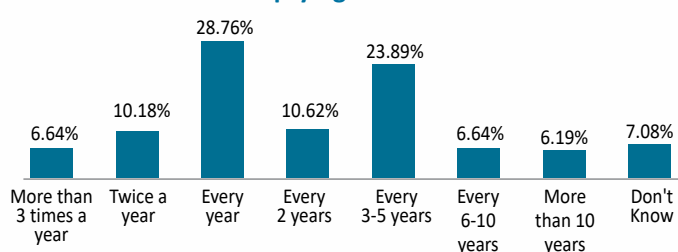
Based on the survey, about 44% of HHs have emptied their containment at least once after installation. Most containments are emptied every year and at an interval of 3 to 5 years. Majority of containments are emptied mechanically while manual emptying is also practiced. Additionally, few HHs also practice both manual and mechanical emptying and some practice open emptying. The municipal desludging vehicle and private desludging service providers serves for mechanical emptying and transport of faecal sludge in the municipality.



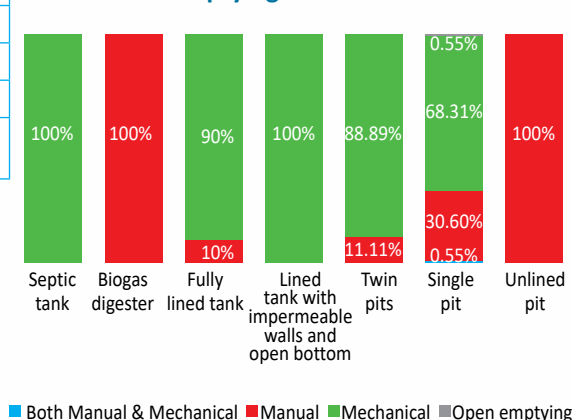
## Details of desludging service providers

Service Provider	Municipality	Private
No. of service providers	1	40
No. of vehicles	1	50
Capacity of vehicle (litres)	3,500	3,000-6,000
Average no. of trips per day per vehicle	1	37
Average service charge per trip (NPR)	3,500	2,000-5,000 for rectangular 500-1,500 for ring

## Emptying Interval



## Emptying Mechanism





प्रशोधन  
(Treatment)

पुनः प्रयोग वा सुरक्षित विसर्जन  
(Re-use or Safe Disposal)

## ESTIMATION OF FAECAL SLUDGE

Total estimated volume of FS generation in the municipality: 43,125 m<sup>3</sup> per year which is 118.15 m<sup>3</sup> per day.

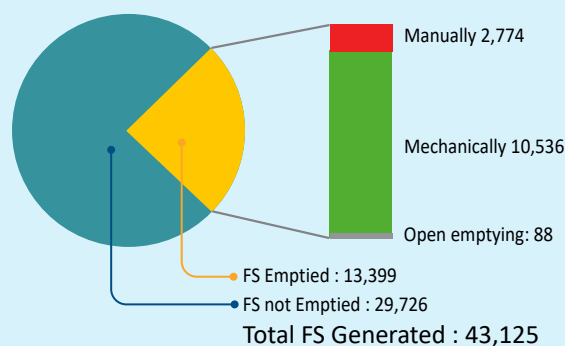
Total volume of FS emptied in the municipality: 13,399 m<sup>3</sup> per year which is 36.71 m<sup>3</sup> per day.

Total volume of FS emptied by mechanical desludging: 10,536 m<sup>3</sup> per year which is 28.87 m<sup>3</sup> per day.

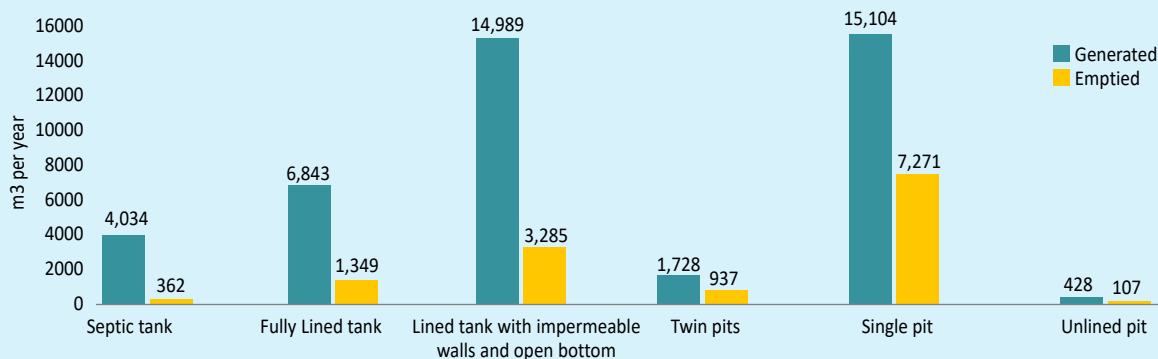
Total volume of FS emptied by manual desludging: 2,774 m<sup>3</sup> per year which is 7.6 m<sup>3</sup> per day.

Total volume of FS emptied by open emptying: 88 m<sup>3</sup> per year which is 0.24 m<sup>3</sup> per day.

### Summary of faecal sludge produced, emptied and transported in Ratnanagar Municipality (cubic meter)



### FS Generated and Emptied



## TREATMENT

The municipality has 2 decentralized wastewater treatment plants (WWTPs) on the bank of Budhikhola. The wastewater from wards 1,2,4 and 10 is conveyed in these WWTPs and are estimated to treat approximately 1,424 m<sup>3</sup> of wastewater daily. Moreover, both WWTPs are only partially functional due to physical damage in the WWTPs. Additionally, municipal desludging services dispose the FS in this treatment plant.

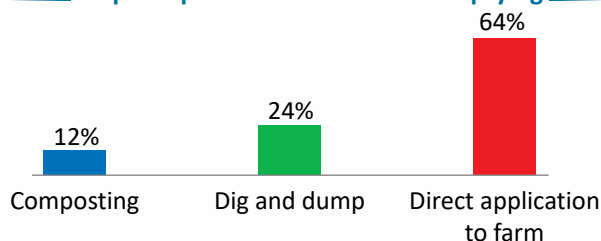


Wastewater treatment plant at Budhikhola

### Disposal practice after manual emptying

## SAFE DISPOSAL OR REUSE

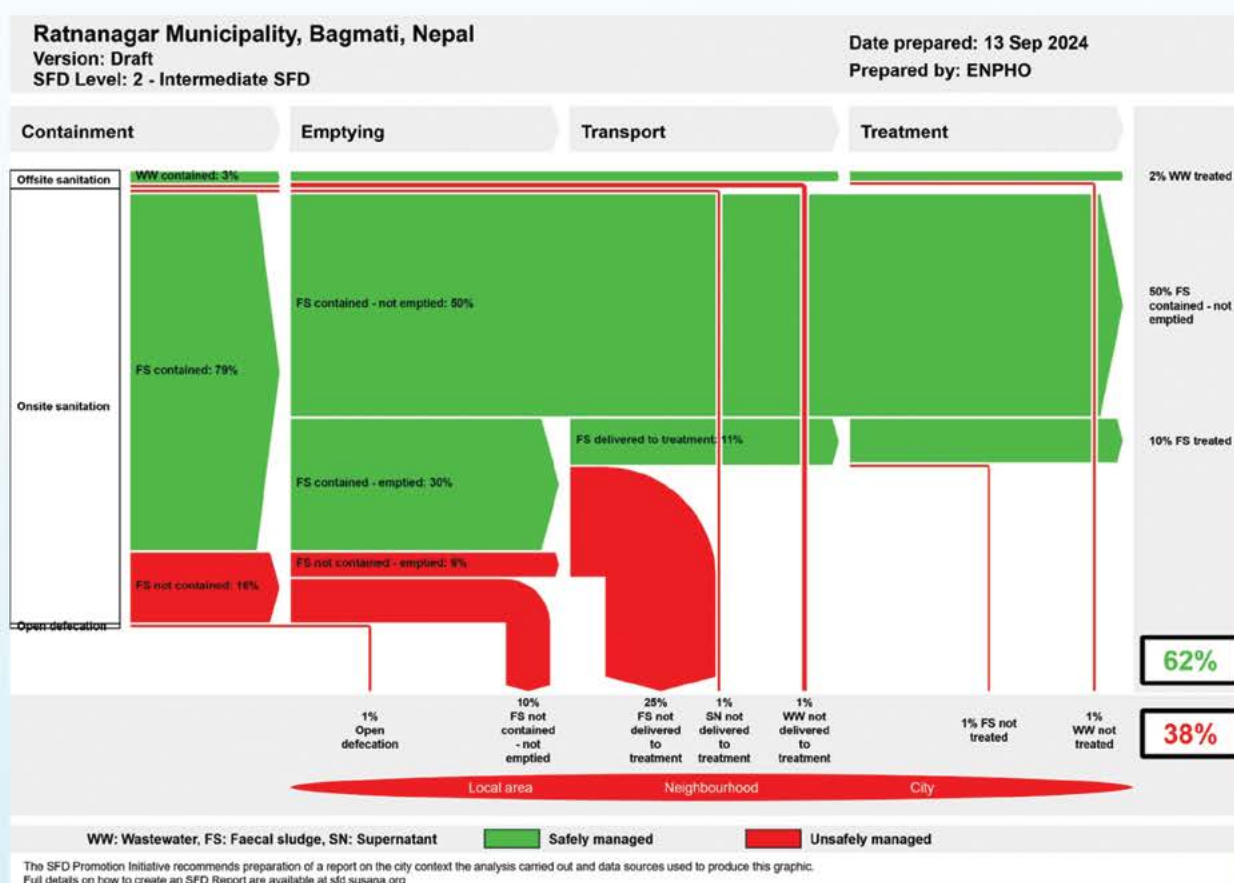
Mechanically emptied FS are either taken to treatment plants or applied to farmlands. While manually emptied FS is composted, directly applied to farms or dig and dump. However, direct application to farms possesses a risk to the environment and public health.



## SHIT FLOW DIAGRAM (SFD)

The SFD of Ratnanagar Municipality visually represents the status of sanitation practices across the entire sanitation value chain. It shows that FS generated by 62% of the population is safely managed (Green). Initially, FS generated by 79% of the population is safely contained. However, this proportion drops to 50% which can be considered safe until emptied. The emptied FS remains safe depending upon the nature of the emptying mechanism and available treatment facilities. Out of the 30% safely contained FS which has been emptied, only 11% is delivered to treatment plant and 10% is treated, and this comes from a biogas digester and FS treated at WWTP. In addition, of 3% of WW, which is delivered to treatment plant 2% is treated. This highlights the necessity of safe emptying, transportation and treatment of FS and WW.

Overall, FS generated by 38% of the population is unsafely managed (Red). It includes 10% FS which is neither contained nor emptied, 25% of FS (19% FS contained and 6% FS not contained) not delivered to treatment plant, 1% supernatant not delivered to treatment plant, 1% wastewater (WW) not delivered to treatment plant, 1% WW not treated and 1% of FS not treated. This highlights the significant gaps that must be addressed to mitigate environmental and public health risks associated with inadequate FS management practices.



## RECOMMENDATIONS

- Replace and retrofit the unsafe containment systems to safer techniques and technologies such as septic tanks, biogas digesters and twin pits.
- Manage faecal sludge properly in non-sewered areas.
- Promote and regulate mechanical desludging services in the municipality to address the current gap in sanitation value chain.
- Regulate the proper functionality of WWTPs and construct FSTP as required to manage WW and FS effectively.
- Formulate and enforce sanitation policies and regulations to ensure safe sanitation practices in the municipality.

## ABOUT THE PROJECT:

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

- Funded By** : Bill & Melinda Gates Foundation (BMGF)
- Executing Agency** : United Cities and Local Governments Asia-Pacific (UCLG ASPAC)
- Implementing Agency** : Municipal Association of Nepal (MuAN)
- Technical Partner** : Environment and Public Health Organization (ENPHO)
- Program Duration** : November 2021 – December 2024

In 2017, phase I of “MuNASS program” was implemented to support the roll-out of the Institutional and Regulatory Framework (IRF) for Faecal Sludge Management in Nepal. After implementation of Phase I of the MuNASS program, a need to scale up the program was recognized. In this prospective Phase II of MuNASS program was launched to support meet SDG target 6.2. The project was initiated with the objectives to determine the sanitation status of 65 municipalities and to generate national and provincial level SFD, to enhance knowledge and skill of municipal staffs on installation and operation of FSTP and to enhance capacity of elected representatives and municipal officials regarding the need for FSM/CWIS.

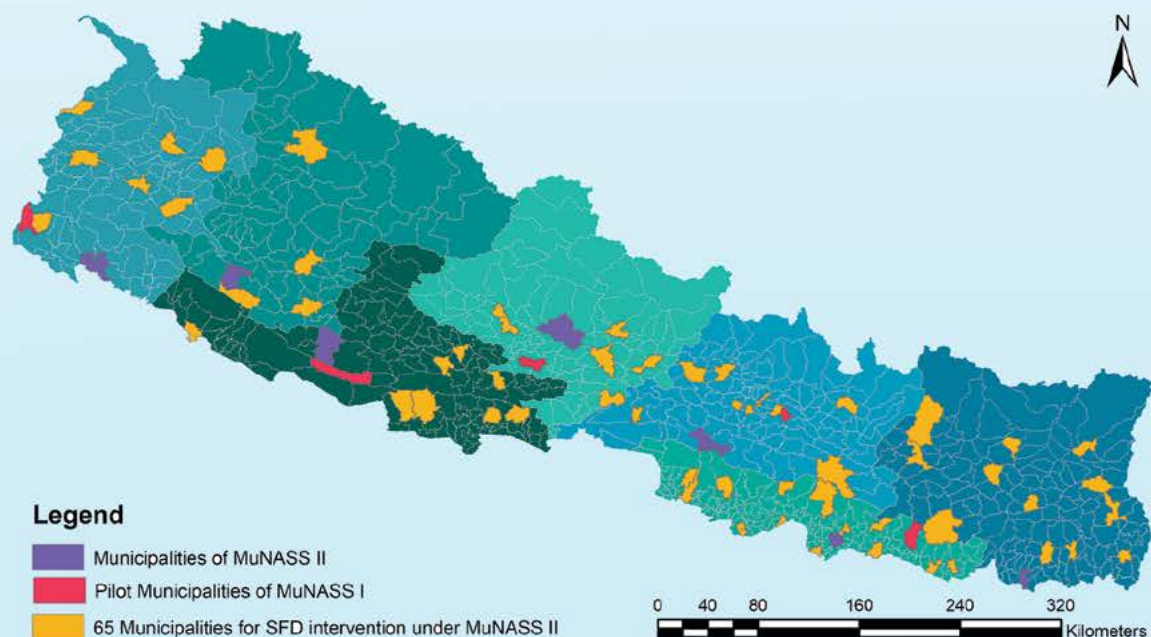
## GOAL

The goal of MuNASS Phase II is to develop and demonstrate innovation on safely managed sanitation to achieve SDG 6.2 and mainstream into regional agenda, paying special attention to the needs of women and girls and those in vulnerable situations.

## OUTCOMES/OBJECTIVES:

- Demonstrate innovation on SDG 6.2 measurement by mobilizing cities in South Asia
- Documentation of the Municipal-led investment for CWIS and FSM in South Asia is available
- SDG 6.2 are mainstreamed into the regional agenda through advocacy, knowledge exchange and joint activities among municipalities in the Asia-Pacific region.

### Program Locations of MuNASS I and MuNASS II in Nepal





## FOR FURTHER INFORMATION

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Website: [www.muannepal.org.np](http://www.muannepal.org.np)

### **Environment and Public Health Organization (ENPHO)**

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