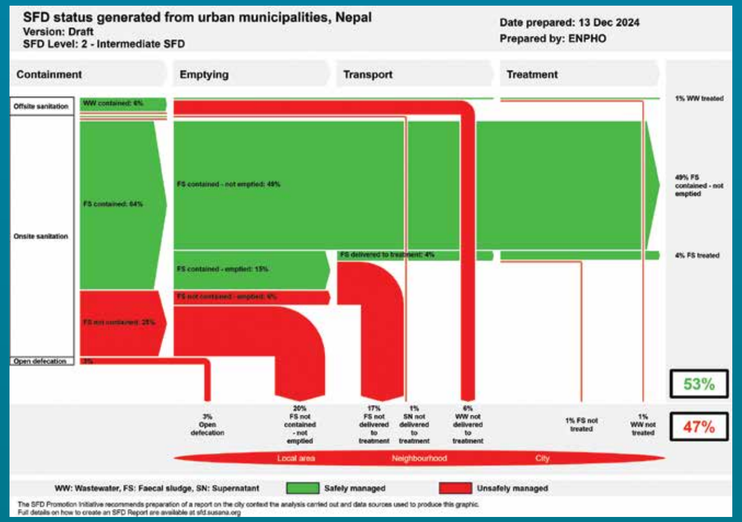
SHIT FLOW DIAGRAM (SFD)

The shit flow diagram (SFD) of urban municipalities represents the sanitation status of the municipalities across the sanitation value chain. FS generated by 53% of the population is safely managed (Green). Initially, 64% of the FS is safely contained but the percentage decreases to 49% when FS generated by 15% of the population is emptied. This implies that 49% of FS are considered safely managed and remains safe until emptied. Furthermore, 1% of Wastewater (WW) is considered treated in Wastewater Treatment Plant (WWTP) and 4% of FS are considered treated primarily from biogas digesters and Faecal Sludge Treatment Plant (FSTP). The emptied FS remains safe depending on the emptying mechanism and the available treatment options/facilities.

Overall, FS generated by 47% of the population is managed unsafely (Red). This includes 1% WW not treated, 1% Supernatant (SN) not delivered to treatment plant, 6% WW not delivered to treatment plant, and 1% FS not treated. Additionally, 17% of emptied FS (11%-FS contained, 6%-FS not contained) is not delivered to treatment plant. Likewise, 20% of FS is neither safely contained nor emptied which increases the environmental risks. Furthermore, 3% 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

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 in the municipality where the services are not available, along with its formal registration and proper regulation.

Construction of treatment facilities:

- Construction of treatment facilities to ensure the safe and effective management of faecal sludge, addressing critical gaps in treatment and disposal.

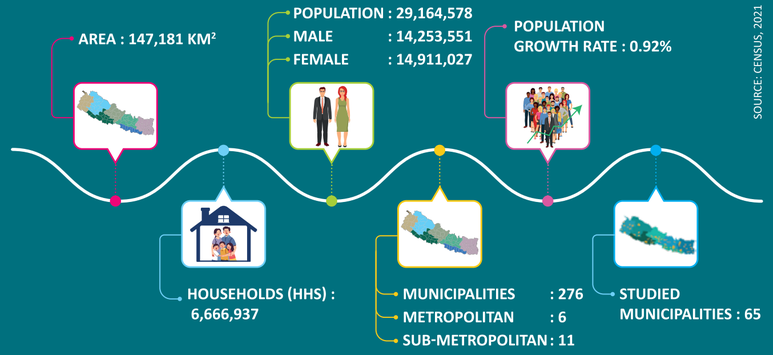
Regulate Sanitation Service:

- Promote regular emptying of containments, ideally at least once every 3 to 5 years, to prevent over flow 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 ensuring proper operation and maintenance of the treatment facilities.

SANITATION SYNOPSIS OF URBAN NEPAL 2024


Mt. Everest (Sagarmatha)

DEMOGRAPHICS



BILL & MELINDA GATES foundation

UCLG ASPAC United Cities and Local Governments Asia Pacific

Municipal Association of Nepal 2050

ENPHO Creating Eco Societies

ABOUT

A study on Faecal Sludge Management (FSM) was conducted in 65 municipalities of Nepal as part of the Municipalities Network Advocacy on Sanitation in South Asia II (MuNASS II) program. MuNASS II was implemented in Nepal, with the financial support from the Bill & Melinda Gates Foundation (BMGF), executed by United Cities and Local Governments Asia Pacific (UCLG ASPAC) and implemented by the Municipal Association of Nepal (MuAN), with Environment and Public Health Organization (ENPHO) as a technical partner. This sanitation study was carried out in selected municipalities of 7 provinces covering 3 geographical regions of Nepal.

OBJECTIVE OF THE STUDY

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

METHODOLOGY OF THE STUDY

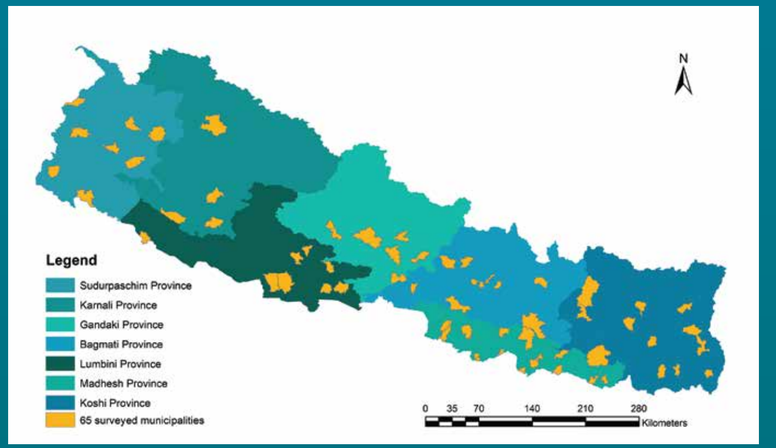
A total of 65 municipalities were selected out of 293 municipalities based on a selection criteria developed jointly by the partners considering Province municipality ratio and geographical distribution. In each selected municipalities simple size were determined using statistical formula considering Confidence Level of 95% and error of margin at 5%. Sample was distributed through each ward (stratum) of municipalities proportionally based on number of households. Systematic random sampling was then employed for the selection of sample in each stratum.

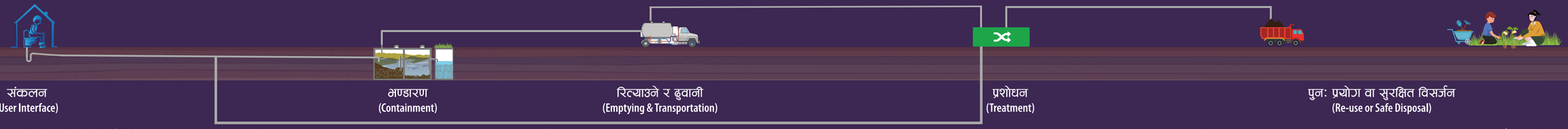
Local enumerators, selected by the respective municipalities, were capacitated and mobilized and supervised throughout the survey by technical team of ENPHO in coordination with respective municipalities. The data was collected using the KOBO collect mobile application. Additionally, the Key Informant Interviews (KIIs) and direct observations of the sanitation system were conducted with concerned stakeholders of the municipalities.

NEPAL PROFILE

Nepal is a landlocked country in South Asia, nestled in the foothills of the Himalayas. It is bordered by China in North and India in the East, South, and West. It lies between approximate coordinates of 26°22' to 30°27' N latitude and 80°4' to 88°12' E longitude. Nepal occupies 0.03 percent of the Earth's total land area and 0.3 percent of Asia's total land area. Topographically, it is divided into 3 regions: Hill, Himalayan, and Terai, and administratively divided into 7 provinces, 77 districts and, 753 local governments including 6 metropolitans, 11 sub-metropolitans, 276 municipalities and 460 rural municipalities. Nepal has a diverse geography, including fertile plains, forested hills, and eight of the worlds ten tallest mountains, including Mount Everest.

MAP OF NEPAL WITH STUDIED MUNICIPALITIES





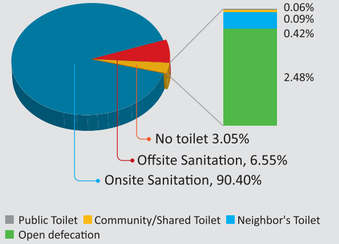
The Sanitation Service Chain (SSC) is a comprehensive service framework delineating the sequential stages of faecal sludge management from excreta generation to safe disposal. It encompasses five key phases: collection, containment, emptying and transportation, treatment, and reuse/safe disposal.

USER INTERFACE FACILITY

The sanitation facility, commonly referred to as toilet, serves as collection points for human waste and directs it to either offsite or onsite sanitation system. The findings show that 3.05% of the households (HHs) do not have access to basic sanitation facilities.

Among 6.55% of offsite sanitation, 5.63% are connected to sewer network, and 0.92% are illegally connected to open drains and water bodies, while about 90.40% of the HHs toilets are connected to onsite sanitation systems. Meanwhile, those containments which are connected to sewered network and open drain (4.70%) are also taken as onsite sanitation in this study.

Sanitation Facilities



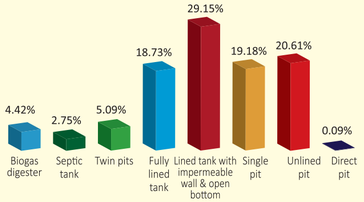
Toilet structure at household

CONTAINMENT

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

The HH having onsite sanitation system have installed different types of containments, substantial proportion of the HH have built unsafe containments as lined tank with impermeable walls and open bottom, followed by unlined pit and single pit. Additionally, direct pit is installed by a negligible proportion of HH. These containments are considered unsafe as it holds high risk of groundwater contamination due to leachate percolation through their permeable bases. Fully lined tank is installed by significant proportion of the HH. Only a small proportion of HHs have installed safe containment, such as septic tanks, biogas, and twin pits.

Types of Containments

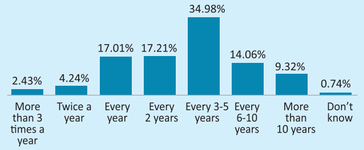


Twin pits

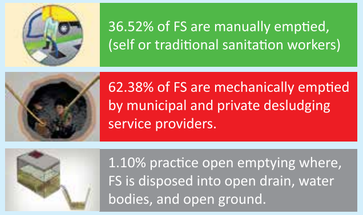
EMPTYING AND TRANSPORTATION

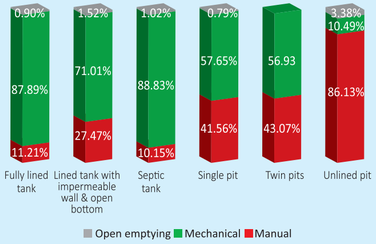
Regular emptying is essential for maintaining the functionality of these containments. The survey reveals that only 23.41% of HHs have emptied their containments at least once since installation. The containments are emptied in different time intervals, where 34.98% are emptied in an interval of 3 to 5 years. The emptying mechanism varies as per the containment types which is shown in the graph.

Emptying Interval



Emptying Mechanism

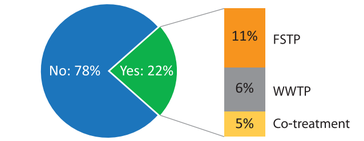




TREATMENT

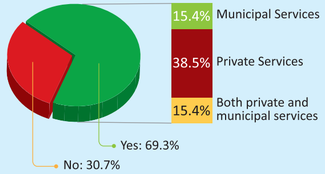
Biogas digesters, if functioning properly, are regarded as safe and considered capable of treating faecal sludge. However, FS stored in other types of containments requires treatment. The findings show that only about 22% of the sampled municipalities have treatment options available, 11% of them are faecal sludge treatment plant (FSTP), and 6% wastewater treatment plant (WWTP), and 5% have co-treatment facilities.

Availability of treatment facilities



Charali FSTP, Mechinagar Municipality

Availability of Mechanical Desludging Service Providers



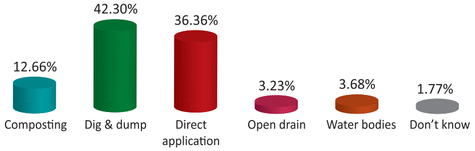
Details of desludging services in surveyed municipalities

Service Provider	Municipality	Private
No. of service providers	19	120
No. of vehicles	19	170
Capacity of vehicles (litres)	2500-5000	2500-9,000
Average number of trips per day per vehicle	5	7
Service charge per trip (NPR)	1500-7,000	1500-18,000

SAFE DISPOSAL OR REUSE

The mechanically collected FS are usually taken to treatment plant, if available. In places where treatment plants are not available or not functional, the disposal practices of mechanically emptied FS vary. As per the KII findings, some desludgers directly applied it to farms, water bodies, and forests without any treatment. Meanwhile, the majority of HH who practice manual emptying dig and dumped the FS, followed by direct application to farm, and composting. Small proportion of HHs illegally disposed the FS into water bodies, and nearby open or stormwater drains. This practice of direct application in farmland, disposal in water bodies, and open drain increases risks to the environment and public health.

Disposal practice after manual emptying



FS disposed in farmland

ESTIMATION OF FAECAL SLUDGE

The estimation of faecal sludge production 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 urban municipalities of Nepal: 5,483,632 m^3 per year which is 15,024 m^3 per day.

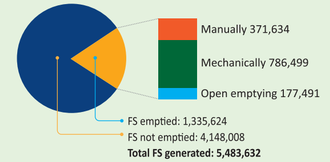
Total estimated volume of FS emptied: 1,335,624 m^3 per year which is 3,659 m^3 per day.

Total estimated volume of mechanically emptied FS: 786,499 m^3 per year which is 2,155 m^3 per day.

Total estimated volume of manually emptied FS: 371,634 m^3 per year which is 1,018 m^3 per day.

Total estimated volume of FS emptied by open emptying: 177,491 m^3 per year which is 486 m^3 per day.

Summary on faecal sludge produced, emptied, and transported in Urban Municipalities (cubic metre)



FS Generated and Emptied