PILOT MONITORING OF SAFELY MANAGED ON-SITE SANITATION SERVICES (SMOSS) IN NEPAL

FINAL REPORT

OCTOBER 2025

UNICEF
NEPAL COUNTRY OFFICE

Contents

List of Figures

List of Tables

1. Introduction

As per UNICEF Nepal's approved Country Programme document 2023-2027, UNICEF has been providing technical and financial support to the federal, provincial and local governments for protection of rights of children, adolescents, women and people of deprived communities through different sectoral interventions. UNICEF signed a multi-year work plan (MYWP) with the Ministry of Water Supply for the period 2023 - 2025 under which it is mentioned to provide support to access safely managed sanitation services and hygiene facilities and behavior in targeted areas. UNICEF's support under the planned CPAP (2023-2027) and Multiyear Workplan (2023-2025), aims to ensure safely managed sanitation services.

In the above context, the consultant provided technical support to UNICEF to accomplish several activities to strengthen monitoring systems focusing on safely managed sanitation services which are onsite. Under this assignment, a set of activities guided by JMP team were carried out by UNICEF Nepal country office in partnership with the Ministry of Water Supply and selected local governments. Key activities of this pilot project included identifying and engaging stakeholders leading to an inception workshop, mapping existing monitoring systems and data, identifying gaps in Ministry of Water Supply's NWASH MIS in questionnaire in line with global monitoring of SDG 6.2, and designing of data collection methods to pilot in field to address these gaps.

2. Background

The overall purpose of this assignment is to support UNICEF in identifying data gaps in NWASH MIS for monitoring safely managed on-site sanitation (SMOSS), and to develop and refine a harmonized set of indicators, tools and methods to strengthen the WASH MIS for safely managed on-site sanitation services.

2.1.Study Area

For piloting the tools to monitor safely managed on-site sanitation systems, four municipalities viz. Baragadhi rural municipality from Madesh Province, Chandannath municipality from Karnali Province, Panchkhapan municipality from Koshi Province and Shivaraj municipality from Lumbini Province were selected with due consideration of geographical and ecological zones (Refer Figure 1 for map of study area).

2.1.1. Baragadhi Rural Municipality

Baragadhi Rural Municipality is in Bara District of Madhesh Province, Nepal. It is a rural municipality, located in the Terai, that plays a significant role in the region's socio-economic development, with a focus on improving infrastructure, education, and sanitation. The municipality encompasses a diverse landscape with a mix of agricultural and residential areas. Baragadhi has been actively working towards rural development and enhancing the quality of life for its residents through various government programmes, with a strong emphasis on improving the living conditions and providing essential services to the local communities. The municipality faces challenges related to waste management including fecal sludge, water quality, and the effective management of on-site sanitation systems.

2.1.2. Chandannath Municipality

Chandannath Municipality, situated in the Jumla District of Karnali Province, is a culturally rich and historically significant municipality. Known for its picturesque landscapes and agricultural productivity, Chandannath serves as a key administrative center for the region. The municipality is also famous for its religious and cultural heritage, with various temples and historical sites attracting both locals and tourists. However, like many mountainous regions in Nepal, Chandannath faces challenges related to access to clean water, waste management, and safely managed sanitation systems. The municipality has been striving to strengthen its infrastructure, improve sanitation services, and address water pollution through various development initiatives.

2.1.3. Panchkhapan Municipality

Panchkhapan Municipality is in the Sankhuwasabha District of Koshi Province, Nepal. The municipality is known for its agricultural economy, which is supported by fertile land and favorable climatic conditions. It is home to a significant portion of the local population, with rural areas gradually transitioning into more urbanized zones. Panchkhapan, in the hilly mountainous region, faces challenges typical of rapidly growing municipalities, such as managing waste, ensuring access to safe water, and upgrading sanitation infrastructure. With increased urbanization and population growth, there is an urgent need for effective monitoring systems and sustainable solutions for wastewater and sanitation management in

the municipality. The local government has been working to improve public health and sanitation services while maintaining sustainable development practices.

2.1.4. Shivaraj Municipality

Shivaraj Municipality is in the Kapilvastu District of Lumbini Province, Nepal. This municipality is situated in the low-lying Terai region, an area known for its agricultural significance and rapidly developing infrastructure. Shivaraj is a growing urban center that serves as an important hub for commerce, education, and healthcare in the region. However, with rapid urban expansion, the municipality is encountering challenges in managing sanitation systems, ensuring access to clean water, and preventing environmental degradation. The local government is focused on strengthening municipal services, including waste management, water quality monitoring, and the development of safe sanitation facilities to meet the needs of its growing population.

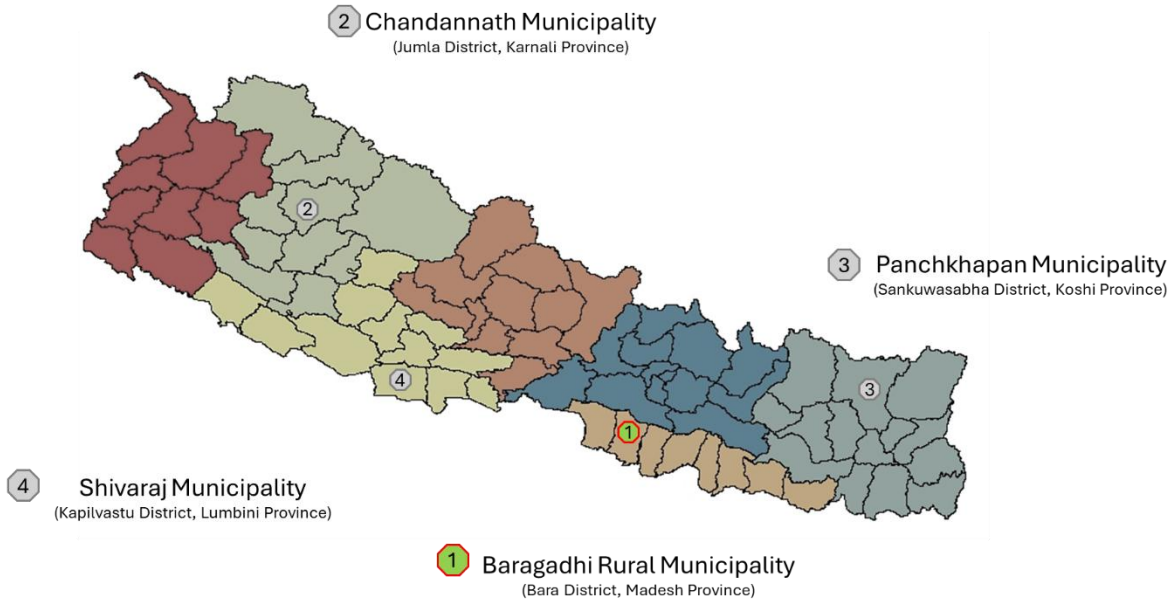


Figure 1: SMOSS pilot municipalities

3. Methodology

The overall methodology for monitoring SMOSS in the four municipalities — Baragadhi Rural Municipality, Chandannath Municipality, Panchkhapan Municipality, and Shivaraj Municipality — comprises several steps, including stakeholder engagement at both national and local levels, review of existing data and data collection tools, development

of data collection tools and data collection in these municipalities, as well as review, validation, and analysis of the collected data. These steps are detailed in the following sub-sections.

3.1.Stakeholder Engagement

The relevant stakeholders working on overall WASH and on-site sanitation were engaged through inception workshop at both national and local level. These inception workshops were held with the goal of initiating a dialogue among key stakeholders and setting the foundation for the project focused on improving on-site sanitation services across the country. The workshop brought together various stakeholders including government officials, local municipalities, non-governmental organizations (NGOs), international organizations, community leaders, and sanitation experts to discuss the current state of sanitation services in Nepal, challenges, and potential pathways forward

The major objective of these workshops is i) To provide an overview of SMOSS Initiative (Global & National Perspective), and ii) to review available M&E systems on “Onsite Sanitation” and discuss the Way Forward to strengthen Nepal’s NWASH System for tracking on-site sanitation.

3.2.Review of existing data and data collection tools

This section provides a comparison of the questions and response categories commonly used to assess sanitation facilities and practices in Nepal with those included in household questionnaires developed by JMP that align with data needed to estimate SDG 6.2.1. In context of Nepal, NWASH MIS is a national data storage and analysis tool for data collected with the N-WASH app, which used to collect

georeferenced information on water and sanitation .[1] In Nepal, as of now, 449 out of 753 local governments have initiated the process of developing municipal WASH Plans with support from the federal and provincial governments and development partners. The WASH Plan relies on WASH data inventories collected through the NWASH application, which includes a set of on-line questionnaires, most of which are believed to be aligned with JMP definitions. These questionnaires cover both on-site and sewerage systems.

This review highlights the importance of accurately assessing sanitation services, both at the national level in Nepal through the NWASH Management Information System (MIS), and globally through the Joint Monitoring Programme (JMP) questionnaire for SDG 6.2.1.

At a global scale, the JMP household questionnaire, for monitoring safely managed on-site sanitation (SMOSS) has been incorporated into the existing NWASH questionnaire to enable the collection of data required for SDG 6.2.1 estimates. This questionnaire covers a wide range of indicators related to safely managed sanitation services, addressing all steps of the service chain: containment, emptying, transport, disposal, and treatment thus providing a standardized framework for data collection and reporting.

The JMP also has questionnaires for service authorities and service providers to collect information related to existing sanitation service delivery mechanisms for emptying, transport and treatment.

To enhance the monitoring of safely managed sanitation services in Nepal and align with global standards, it may be necessary to review and update the NWASH MIS system. This could involve incorporating additional questions or modifying existing ones to ensure comprehensive coverage of indicators relevant to SDG 6.2.1. By identifying and addressing these gaps and improving data collection methods, a better and understandable status of sanitation services in Nepal can be seen and necessary targeted actions to improve access, quality, and sustainability can be made.

3.2.1. Methodology to review existing monitoring

The methodology for developing the comprehensive questions and response categories used in the pilots for monitoring safely managed on-site sanitation (SMOSS) is as below:

[1] UNICEF Nepal 2021. N-WASH Management information system (MIS) fact sheet. https://www.unicef.org/nepal/media/17766/file

A. Review of JMP SMOSS questionnaires and response categories

This step involves examining the JMP SMOSS questionnaires, which are standardized tools aligned with the approach used for global estimates of safely managed sanitation services. Core questions have been developed for household questionnaires, inspections, service provider surveys and service authority surveys. By reviewing these questionnaires and response categories, we can identify the key indicators and parameters considered essential for assessing safely managed sanitation.

B. Review of NWASH household questionnaire specific to safely managed sanitation

NWASH household questionnaire is specific to Nepal's National Water, Sanitation, and Hygiene (NWASH) Management Information System. This questionnaire contains questions related to water, sanitation, and hygiene, including some aspects of safely managed sanitation. Reviewing these questionnaires provided insight into how sanitation is currently assessed at the national level in Nepal.

C. Comparison of JMP SMOSS and NWASH questionnaire to identify gaps in NWASH MIS.

This step involves comparing the JMP SMOSS questionnaire with the NWASH household questionnaire to identify any discrepancies or gaps in the latter. By examining differences between the two questionnaires, areas where the NWASH MIS may be lacking in terms of assessing safely managed sanitation can pinpoint.

D. Adress the gaps with additional and/or inclusion of questions in NWASH household questionnaires.

Finally, based on the identified gaps, modifications, and additions to the NWASH household questionnaire have been proposed to align it more closely with the JMP SMOSS questionnaire can be proposed. This may involve incorporating new questions, modifying existing ones, or adjusting response categories to ensure comprehensive coverage of indicators related to safely managed sanitation.

3.2.2. Comparison of NWASH and JMP questions

A. Data parameters for JMP SMOSS questionnaires

The JMP SMOSS questions and its response are designed to assess various global indicators related to sanitation service delivery. The questionnaire comprises of two main components:

i. Core Questions: The household questionnaire includes eight fundamental questions covering key categories relevant to sanitation service delivery, such as toilet facility type, containment, emptying and disposal. The service provider and service authority questionnaires focus on services

beyond the households, including rates of emptying, the disposal of excreta once emptied, and the types of treatment facilities. Together, these questions form the foundation for collecting data to report on SDG 6.2.1.

ii. Expanded Questions: These questions extend beyond the core set and are tailored to capture additional or specific local indicators related to sanitation service delivery. They are drawn from existing frameworks like JMP (Joint Monitoring Programme for Water Supply, Sanitation, and Hygiene), MICS (Multiple Indicator Cluster Surveys), SFD (Shit Flow Diagram), or other relevant sources. These expanded questions provide a more comprehensive view of service delivery performance, considering both global standards and local contexts.

Both the core and expanded questions from JMP questionnaires are presented in Annex A of this report.

B. Data parameters for NWASH HH questionnaires

The NWASH HH questionnaire of water, sanitation and hygiene has 58 different questions to generate reporting WASH services. Moreover, it has specific core and optional questions related to sanitation service used to report the national benchmark and compare services across the country.

i. Core Questions: These are the fundamental questions that form the backbone of the reporting process. There are five core questions dedicated to sanitation services. These questions likely cover essential aspects of type, usage and management practices of HH level sanitation service.

ii. Expanded Questions: In addition to the core questions, there are six optional questions that provide further insights or allow for customization based on specific needs or contexts. These optional questions may address additional indicators or gather data on specific sanitation-related issues that are relevant for monitoring and evaluation purposes.

Both the core and optional questions form NWASH MIS questionnaire are presented in Annex B of this report.

C. Comparison of data parameters

Grouping the data parameters for calculating sanitation service ladder indicators from both the NWASH household survey and the JMP Household questionnaire in a comparative way is a better approach to identify gaps and discrepancies.

i. Identifying Similar Categories: The first step involves grouping the questions and response categories from both surveys into similar categories and indicators.

ii. Comparison Matrix: Using a comparison matrix, a systematic comparison of the questions and response categories between the NWASH and the JMP household questionnaire can be made. This matrix allows for side-by-

side evaluation, making it easier to spot differences and similarities. This ensures that there is alignment between definitions and clarity on how data captured via NWASH is analysed against the SDG indicators.

iii. Analysis of Gaps: By analysing the comparison matrix, identification of gaps in the NWASH household survey concerning the sanitation service ladder indicators when compared to the JMP household questionnaire can be done. These gaps may include missing questions, inadequate response options, or areas where the NWASH survey does not align with global standards or best practices. The assessment also identified gaps in data on emptying, transport and treatment data collection that are not yet captured in the NWASH surveys.

iv. Recommendations for Improvement: Based on the identified gaps, recommendations can be made to improve the NWASH HH survey. This might involve adding new questions, refining existing ones, or adjusting response categories to ensure better alignment with the JMP household questionnaire and global standards for monitoring sanitation service ladder indicators.

The comparison of data parameters from JMP and NWASH MIS household surveys are presented in Annex C of this report.

D. Conclusion

Based on the comparison and the gaps identified in the above matrices, proposed revisions to the NWASH household survey are presented in Annex A . These revisions aim to strengthen sanitation related questions and align them more closely with JMP framework.

3.3.Data Collection

The data collection for this study was carried out using a combination of the following methods to ensure a comprehensive analysis of the sanitation systems and their management in the selected municipalities:

3.3.1. Household Survey

The Household Survey was conducted to gather firsthand information from residents about their sanitation practices, access to sanitation services, and faecal sludge management. This survey focused on key aspects such as:

- Type of sanitation facilities (e.g., septic tanks, pit latrines)
- Frequency of sanitation facility maintenance
- Access to sanitation services chain and faecal sludge management
- Awareness of safe sanitation practice

The survey was administered to a representative sample of at least 400 households in each municipality to gather data on local conditions and practices. The households were selected using systematic sampling techniques as advised by National Statistics Office disaggregated by no. of wards, caste and ethnicity using the household list provided by each municipality. The following figures 2, 3, 4, 5, and 6 show the location of 4 pilot municipalities and surveyed household location within each municipality.

Figure 2: Household Survey location in four municipalities

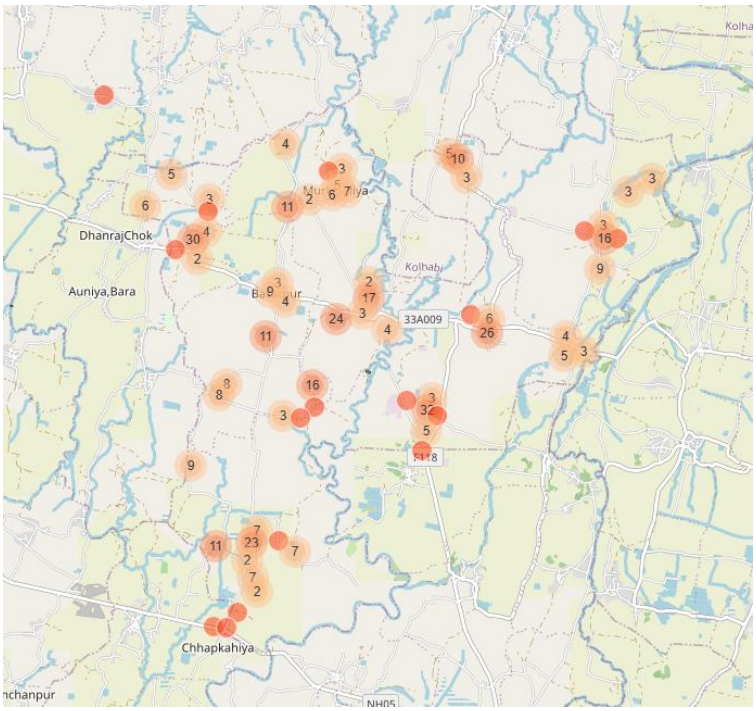


Figure 3: Household survey location in Baragadhi rural municipality

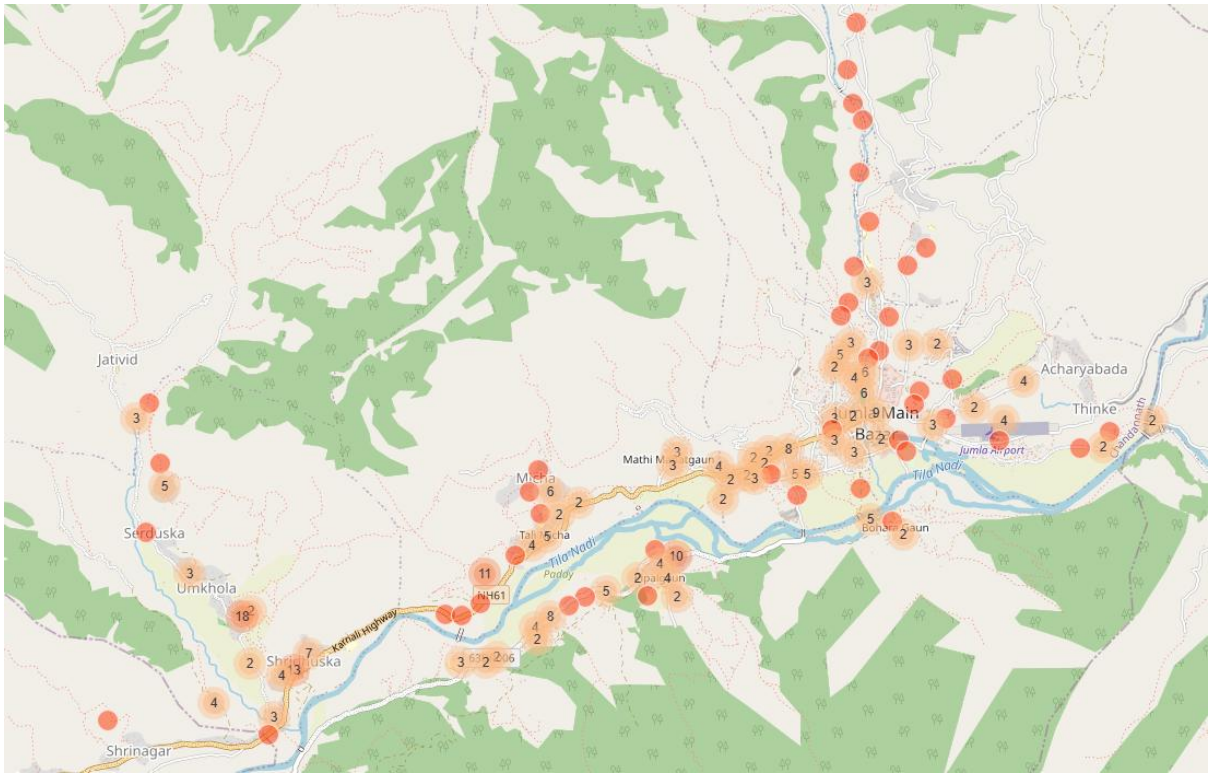


Figure 4: Household survey location in Chandannath municipality

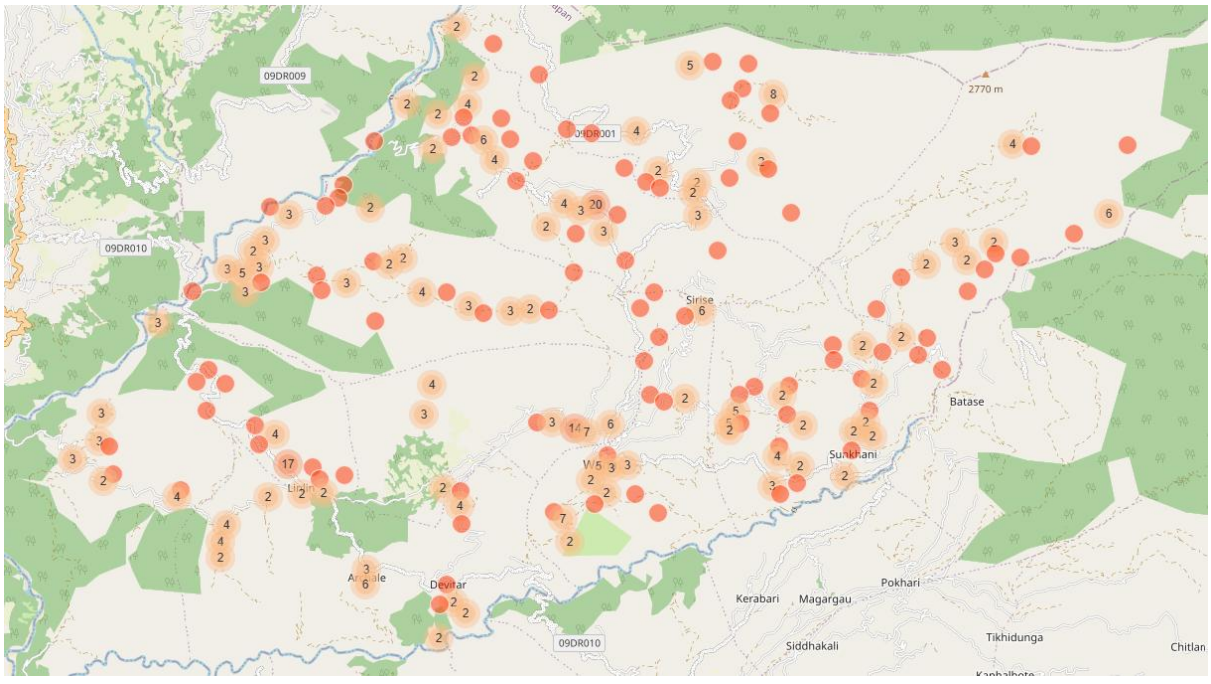


Figure 5: Household survey location in Panchkhapan municipality

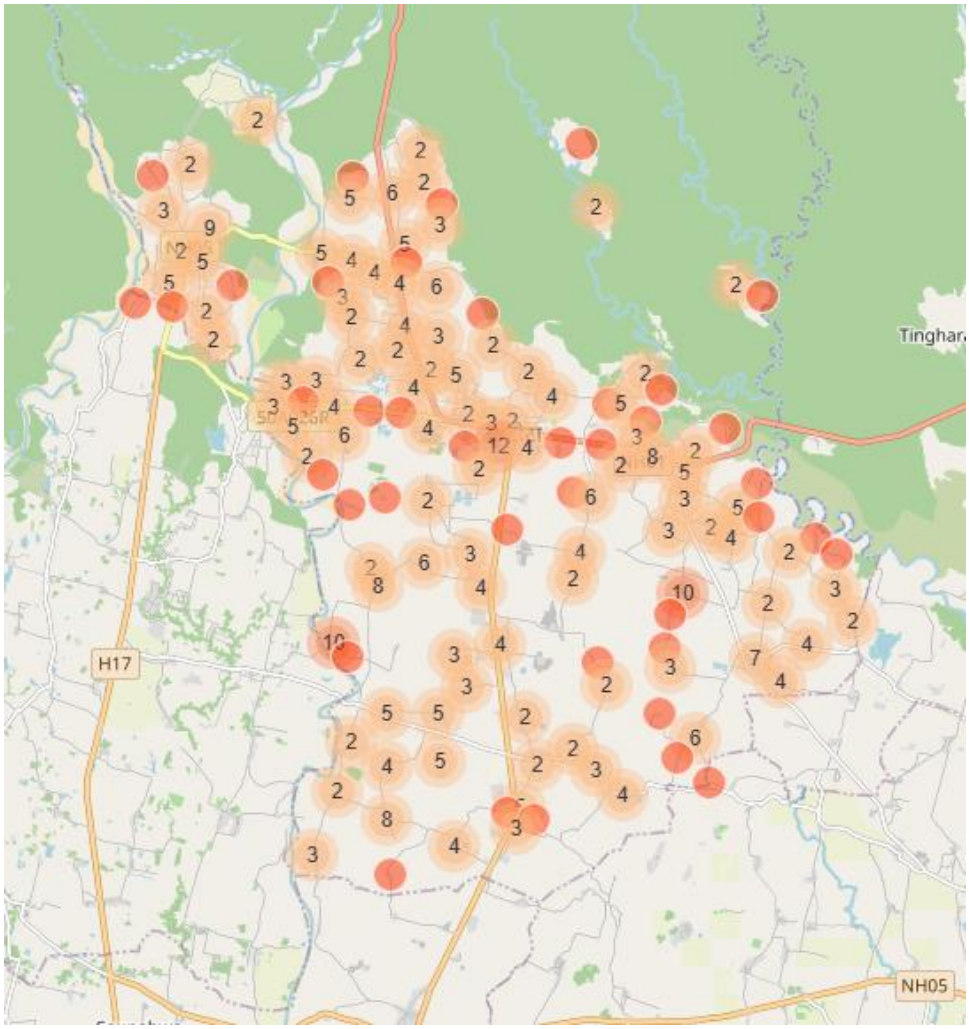


Figure 6: Household Survey location in Shivaraj municipality

3.3.2. Sanitary Inspection

A detailed sanitary inspection was carried out to assess the condition and safety of sanitation infrastructure. The enumerator observed the sanitary condition using the sanitary inspection questionnaire. The inspection focused on:

- The structural integrity of toilets and septic tanks
- Adequacy of wastewater disposal mechanisms
- Presence of contamination or leakage risks
- Potential environmental impacts, especially on groundwater resources

Inspections were conducted by enumerators trained to identify any sanitation-related risks.

3.3.3. Survey of Service Providers

This survey aimed to assess the quantity, disposal practices and safety conditions of both private and public service providers involved in emptying sanitation containment systems. Key areas of focus included (details provided in Annex G):

- Frequency and coverage of sanitation services (e.g., emptying of septic tanks or pits, transportation and disposal of faecal sludge)
- Adequacy of treatment facilities

The survey was conducted with the cooperation of municipal and private service providers to understand their operational strengths and weaknesses. Sampling was designed to include all emptying providers in each municipality, identified either by the service authority or through advertisements of their services. Since no official lists of emptying service providers existed in the municipalities, some providers based in neighboring areas were also included, as they offered services across municipal boundaries.

3.3.4. Survey of Service Authorities

A survey of local service authorities (e.g., municipal authorities or WASH unit) was conducted to assess the availability of sanitation service data collected by municipalities. With decentralization, the delivery of sanitation services is the responsibility of local governments, who also conduct data collection and input information into the NWASH MIS. While municipalities already report on household sanitation access and Open Defecation Free (ODF) status, this survey aimed to collect data across the entire service chain. Key areas assessed in the service authority survey included (details provided in Annex H):

- Household access to sanitation facilities
- Household coverage of emptying services
- Faecal sludge emptying and discharge
- Faecal sludge treatment
- Compliance with FSM regulations

Together, these data collection methods provided a holistic view of the current sanitation practices, infrastructure, service delivery, and the challenges faced by local authorities, service providers, and households. The combined datasets were instrumental in developing targeted recommendations to strengthen sanitation management systems in the municipalities.

3.4.Data Validation

The data validation process was conducted in three phases: before, during, and after data collection.

Before actual data collection, selected enumerators received training on the survey questionnaire, followed by a pretest conducted under the supervision of UNICEF staff and a consultant. The pretest ensured that enumerators correctly understood the questions and recorded consistent responses in the KOBO tool. Enumerators were

also trained on how to use the KOBO application, understanding the question flow, and accurately collect geolocation data.

During data collection, a municipal staff member was assigned as a supervisor to oversee daily activities. This included reviewing submitted data for consistency and providing immediate support in case of discrepancies, particularly in the selection of responses for similar household profiles. Since KOBO Collect updates data in real-time, supervisors could monitor both the data and locations to identify and correct errors as they occurred.

After data collection, a sharing workshop at municipal level was conducted for a thorough verification of the submitted data. Data gaps and inconsistencies were observed between the household survey and sanitation inspection responses. For example, the containment system was reported as a pit latrine in the household questionnaire and recorded as a septic tank during the sanitation inspection. Similar discrepancies were found regarding the presence of an outlet connection and where it is connected, if applicable. These discrepancies and data gaps were asked for recheck with the enumerator and municipal focal person. The data were then cleaned and analyzed, and the results were presented at the municipal level as part of the validation process.

3.5.Data Analysis

The data collected through various surveys and inspections was analyzed using both quantitative and qualitative methods to derive insights and interpretations that are relevant to the current state of sanitation management and monitoring systems in the selected municipalities. The following sections detail the analysis and interpretation process:

3.5.1. Household Survey Data Analysis

The Household Survey data was analyzed to understand the sanitation practices, access to services, and challenges faced by residents. Key steps in the analysis included:

- Descriptive Statistics:

  A basic analysis of responses was conducted to determine the prevalence of different types of sanitation facilities (e.g., septic tanks, pit latrines, and open defecation) and the frequency of maintenance practices. This was done using frequencies, percentages, and cross-tabulations to identify patterns and common trends.

- Access to Sanitation Services:

  The survey helped determine the number of households with access to safely managed sanitation systems and the frequency of their maintenance. The data were analyzed using the JMP sanitation service ladder (from open defecation to basic) and indicators of safely managed sanitation, including containment, frequency of emptying, and disposal location.

3.5.2. Sanitary Inspection Data Analysis

Sanitary inspections were carried out to visually evaluate the condition and risks of sanitation infrastructure. Data from these inspections was analyzed to:

- Condition and Safety of Sanitation Infrastructure:

  The inspection data was used to assess the condition of on-site sanitation systems such as septic tanks and pit latrines. Issues such as leaks, blockages, overflow, or damage were identified and analyzed to understand the risks they pose to public health and the environment.

- Environmental Impact:

  Data on groundwater contamination risks of drinking water tubewells with possible linkage with surrounding sanitation systems were also collected. But it cannot be concluded the poorly managed sanitation systems or other environmental conditions resulted in groundwater contamination as the data did not find any significant relationship.

- Maintenance and Usage:

  The frequency and adequacy of sanitation system maintenance were evaluated. Data was used to identify areas where sanitation systems were either underutilized or improperly maintained, leading to contamination risks.

3.5.3. Service Providers Survey Data Analysis

The Survey of Service Providers collected data on the effectiveness and efficiency of sanitation service delivery. This data was analyzed in the following ways:

- Service Coverage and Frequency:

  Data was examined to understand the extent of sanitation services in the municipalities, including how often services such as waste collection, treatment, and septic tank emptying were provided. This analysis helped to identify gaps in service delivery, particularly in rural or remote areas.

- Service Provider Challenges:

  Key challenges faced by service providers such as insufficient resources, administrative and logistical constraints, and lack of infrastructure were

identified through the survey as well as follow-up interviews and discussions. Analysis of these challenges helped pinpoint areas of improvements, including investment in infrastructure, capacity building and training, and enhanced regulatory support.

3.5.4. Service Authorities Survey Data Analysis

Data from the Survey of Service Authorities was analyzed to evaluate the governance and policy framework surrounding sanitation management. Key points included:

- Regulatory and Policy Framework:

  The policies and regulations governing sanitation systems were reviewed to assess their adequacy in managing safely managed sanitation services. This included an analysis of local regulations for septic tank construction, waste disposal, and fecal sludge management.

- Monitoring and Reporting Mechanisms:

  The effectiveness of monitoring systems used by local authorities to track sanitation services and environmental impacts was analyzed. This helped to identify gaps in monitoring and reporting, which are crucial for ensuring compliance with national and international standards.

- Coordination and Institutional Challenges:

  Data was analyzed to understand the level of coordination between local government bodies, service providers, and other stakeholders. Issues such as overlapping responsibilities, lack of communication, and insufficient funding were identified as key barriers to effective service delivery.

3.5.5. Comparative Analysis

After analyzing the data collected from all sources, a comparative analysis was conducted across the four municipalities to identify common patterns, differences, and best practices. One key finding was:

- The identification of municipalities performed better in terms of service coverage and sanitation system maintenance. This comparison highlighted areas where improvements could be made in underperforming municipalities.

3.5.6. Interpretation and Conclusions

The findings from the data analysis were interpreted to draw conclusions about the overall status of safely managed sanitation systems in the municipalities. The conclusions highlighted areas of success as well as critical challenges that need to be addressed. The analysis also provided a foundation for the

recommendations for strengthening sanitation services, improving infrastructure, and ensuring better monitoring and management systems.

All this comparative analysis and interpretation were carried out in an excel based template.

4. Findings and Results

4.1.Questionnaire

The findings from the surveys such as household, sanitary inspection and service providers/authorities have been extracted from the KOBO tools per municipality and presented below in Table 1. The general observation on the survey tool forms have been provided under the comment column of Table 1.

Table 1: Summary of tools implemented to monitor SMOSS including sample size and comments

Municipalities	Baragadhi	Shivaraj	Panchkhapan	Chandannath	Comments on method
Household survey (HH Survey)	407	417	408	406	From the data analysis, the household surveys appeared to be the most effective method for detailed assessment of access, containment, emptying and in-situ disposal. There were fewer response gaps than other methods and due to limited or absent emptying and treatment services in most municipalities, household surveys appear to adequately assess the services that exist. Some updates to the questionnaire are suggested below in Table 3 and Annex A.
Sanitation inspection (SI)	128	273	148	0	A sanitary inspection was not conducted in Chandannath because the SI conducted in other pilot sites did not reveal significant differences across municipalities. The sampling approach for SI typically ranged from one-third to two-thirds of households to capture variations, and the assessment of containment in the pilot sites showed

					much lower scores of uncontained systems compared with the household survey.
Service provider survey (SPS)	4	2	0	1	A service provider survey was not conducted in Panchkhapan because there were no service providers in the municipality. In other municipalities, most service providers were able to answer questions about emptying, although the responses in the survey form didn't always differentiate the estimates vs. responses based on data, as was intended. Most providers didn't have data on emptying so they relied on estimates. Future surveys could be improved to understand the proportion of emptying in different municipalities as providers often cover multiple municipalities.
Service authority survey (SAS)	1	1	1	1	Data on access to toilets and types of sanitation facilities differed from household surveys. Baragadhi and Chandannath service authorities had data on emptying and only Chandannath had data on treatment.

4.2.Field Finding

4.2.1. Household Survey

As noted above, the household survey appears to be the most effective approach to collect data on safely managed on-site sanitation, however some modifications on the questionnaire are advised to enable analysis harmonized with global indicators.

The findings on access to sanitation facility and details of sanitation service chain are described in following sections.

Access to sanitation

The questions tested in the survey had limitations particularly with the assessment of shared sanitation facilities as the type of shared facility was not asked. Therefore, for the analysis of the SMOSS surveys, it was assumed that the proportion of shared latrines that were improved was the same as the proportion of improved private toilets. We recommend for the simple and consistent analysis going forward, the questions and response categories could be improved by aligning with the JMP core questions shown in table 3 below (also refer Annex A). This approach focuses on the infrastructure assessment as the primary question, on the assumption that the respondents can reply to what type of toilet they use

even if the toilet is a public or neighbours' facility (i.e. dry pit, flush pit, flush to don't know).

A subsequent question can then ask about sharing of that facility. The JMP core questions do not typically differentiate between the type of shared facility, as both neighbours and public toilets are considered shared. For Nepal, this may be important for local targets or analysis, therefore additional response categories can be included, as shown in Table 3 (also refer Annex A). It was noted that maybe some respondents have different interpretations of "household", therefore a note could be added for the enumerator to clarify what is considered as a household in Nepal for the purpose of access to a private toilet.

The findings from household surveys on different types of toilets from four SMOSS pilot municipalities are provided below in Table 2.

Table 2: Summary of Sanitation Facility

	Baragadhi	Shivaraj	Panchkhapan	Chandannath
Open defecation	**12%**	**16%**	**0%**	**2%**
Unimproved	**0%**	**0%**	**3%**	**2%**
Improved - Public toilet	2%	0.5%	3%	2%
Improved - Sewer	0%	0%	0%	0%
Improved - OSS (not shared)	**86%**	**83%**	**93%**	**94%**
- Improved - Septic tank (incl. Biogas)	15%	39%	8%	30%
- Improved - Pit latrine/other	70%	44%	85%	64%
Improved (all)	**88%**	**84%**	**97%**	**96%**
Limited sanitation services (shared)	**4%**	**8%**	**6%**	**6%**
Basic sanitation (improved, not shared)	**84%**	**75%**	**91%**	**90%**

The rate of open defecation was higher in Terai municipalities (Baragadhi and Shivaraj) compared with hill and mountain municipalities (Panchkhapan and Chandannath), while the rate of unimproved sanitation was more prevalent in the hill and mountain municipalities. Overall, the rate of improved on-site sanitation rate was higher in hill and mountain municipalities (93 %) than in the Terai municipalities.

Twin pits and biogas toilets were included as response categories in the sanitary inspection survey, with some responses recorded. If this additional disaggregation of containment type is considered useful for local indicators in Nepal, the additional response categories could be added. For example, flush to twin pits (15) and flush to biogas (16). These categories would also need to be

incorporated into the subsequent questions on containment and emptying, similar to how cesspools and septic tanks are addressed. The questions on disabled access were not used in global analysis but might be used for local targets. The table 3 below provides comparison of current NWASH questions and recommended JMP questions (Also refer Annex A).

Table 3: Comparison of current NWASH questions and recommended JMP questions

Current questions (NWASH)	**Suggested core questions (JMP)**	**Responses**
23. Is there toilet in the house? 24 If No, please specify? 27. What is the type of toilet? 28. Is the toilet shared by other households / neighbours?	**S1**. What kind of toilet facility do members of your household usually use? *(Note this is focused on the technology, so if the household usually uses a neighbour's latrine or public toilet, please respond the type of toilet this is, to the best of their knowledge)*	**Flush / pour flush** flush to piped sewer system.....11 flush to septic tank.....12 flush to pit/cesspool.....13 flush to open drain.....14 flush to twin pits .....15 flush to biogas / anaerobic digester .....16 flush to dk where.....18 Pit latrine ventilated improved pit latrine (with slab) .....21 single pit latrine with slab.....22 twin pit latrine with slab.....24 pit latrine without slab / open pit.....23 Composting toilet.....31 Container based sanitation.....32 Bucket.....41 Hanging toilet / hanging latrine.....51 No facility / bush / field.....95 **Other** (*specify*) 96
	S2. Do you share this facility with others who are not members of your household? *(Enumerator to explain the local definition of household as it applies to sharing latrines)*	Yes..... 1 >S2B No ..... 2 >S3

	S2b. Do you share this facility only with members of other households that you know, or is the facility open to the use of the general public?	Shared with known households (not public) .....1 Shared with general public .....2 *(Add any alternative response categories as required for local monitoring or an additional question on where the facility is located to determine if own dwelling/plot/elsewhere)*

Alternatively, if the N-WASH questions need to be kept predominately as they are, the following modifications could be made as provided in Table 4. However there remains some ambiguity in the response and analysis compared with the core questions above.

Table 4: Review of current NWASH questions

Current NWASH question	Current response	Suggested changes
23. Is there a toilet in the house?	• Yes • No	This question is somewhat confusing since it isn't clear whether the toilet is in use and doesn't inform the type of containment as the JMP core question above does.
24 If No, please specify?	• Bush / field • Community toilet • Public toilet • Neighbours' toilet	If this question is included, to capture data about toilet type, all the respondents that use a community toilet/public toilet/neighbours' toilet should also answer question 27 about type of toilet. Even if the toilet cannot be observed by the enumerator the respondent should be able to report what type of containment it is. Only Bush/field should skip to end.
41. Is the toilet in use? Please observe	• Yes • No	This question is useful to validate that the toilet in the house is in use. However previous monitoring by SNV indicates that fewer than 1% report not using the toilet. If it is included, then it should probably come after Q23. And if the answer is NO then go back to 23 and ask differently about what toilet is used.
25. is the toilet private?	• Yes • No	Remove this as it duplicates the sharing question below which is more precise.
26. Is the toilet disable friendly?	• Yes • No	Optional, not needed for global monitoring. If included, there needs to be criteria provided to enumerators to support the assessment of what makes a toilet disabled friendly.
26. Toilet type?	A1. Flush to piped sewer system	The response categories included in the pilot questionnaire are an improvement on the

	connected to treatment plant A2. Flush to piped sewer system not connected to treatment plant A3. Flush to piped sewer system and do not know about treatment b. Flush to anaerobic / biogas digestor c. Flush to septic tank d. Flush to pit latrine e. Flush to open drain f. Flush to elsewhere g. Flush to don't know where h. Pit latrine with slab i. Pit latrine without slab / open pit j. Composting toilet k. Ventilated improved pit latrine (with slab) l. Twin pit latrine with slab m. Others	original responses in NWASH (i.e. Flush, Pour Flush, Composting, Pit Latrine with Slab). Note that the data from some service authorities indicate that the classification of toilets may not well understood. For example, there seemed to be misclassification of flush to pit vs dry pit, flush to drain vs sewer, and maybe open defecation vs unimproved pit.
42. Is your toilet shared by other households/ neighbours?	Yes No	Discussions indicated some guidance may be needed to support enumerators explain what a household in the terms of an unshared sanitation facility is.

Containment

For the analysis, the two aspects of containment must be assessed: outlets from onsite sanitation systems (OSS) or events such as flooding, overflow, or damage.

Outlets: The presence of an outlet should be asked to all on-site systems except dry sanitation, therefore includes all tanks, wet pits and biogas as these all may have outlets.

Note that the previous NWASH question # 27 (Where is the toilet faecal sludge waste connected to?) is a very confusing question that mixes outlet and emptying and needs to be replaced by the separate questions for outlet (is there an outlet and where to), containment events and if ever emptied, such as those presented below in table 7.

The outlet pipes in septic tanks are found more in Terai (Baragadhi and Shivaraj municipalities), while none were reported in the hills and mountain areas. Only few outlets were from pit latrines in Chandannath. The details are provided below in Table 5.

Flooding and overflow are relevant to all on-site systems, and the question wording should be clear that it relates to events that cause the release of excreta to the surface environment – such as heavy rainfall or flooding, clogging or blockage of the system, or damages. It does not refer to emptying or flushing out contents to empty which should be classified as emptying to drain/surface, or pipe to allow to drain which is included under outlets.

Issues with containment of excreta from on-site systems were much higher from flooding, overflow and other events compared with the presence of outlet. Events releasing excreta to the surface were reported for more than half of the on-site systems in Panchkhapan and between 8-11% of systems in the other municipalities (Table 5). The high values for Panchkhapan were reported as overflow and are much higher than the sanitation inspection containment issues, where only 7% were observed to have damage and no overflow observed. There was potential misinterpretation of the question and the sanitation inspection data is used in the overall analysis.

Summing up outlets and events such as flooding/overflow, etc could lead to an overestimation of unsafe containment. If analysis of each household response is not possible (i.e. assessing whether a household responds to any of the containment issues), then the maximum of either outlet or any reported issues should be used given it is feasible one household may report multiple containment issues. This is shown in the overall assessment of containment in the last row in Table 5.

Table 5: Containment of improved Onsite Sanitation Service

	Baragadhi	Shivaraj	Panchkhapan	Chandannath
Outlets:				
Septic tank with outlet to environment	4%	9%	0%	0%
Flush pit latrine with outlet to environment	0%	0%	0%	3%
Overflow, flooding or other events:				
Septic tanks	2%	11%	32%	14%
Flush pits	10%	11%	54%	5%
Improved dry pits	20%	5%	-	-
Total Uncontained (of improved OSS)	9%	11%	52%*	8%

* The sanitation inspection data for Panchkhapan indicated 7% of OSS were uncontained, which was used for the overall service chain analysis.

From the table 6 below it is not evident that any containment issues are greater or more important to include than others, therefore it is recommended the four proposed core indicators as overflow, flooded, collapsed, other. Alternatively, the overflow question could be further explained by the description used in the SI ("Is there any evidence of leakage or overflow to the surrounding area from the toilet or the containment?).

Table 6 below indicates that pit latrines show a higher incidence of excreta being released to the surface and surrounding environment, primarily due to events such as overflows, flooding, and structural collapse. This is observed more frequently compared to other toilet types like septic tanks, biogas systems, or other improved on-site sanitation (OSS) systems. This clearly highlights the increased environmental and health risks associated with pit latrines, especially in areas prone to waterlogging or lacking proper containment infrastructure.

The issues related to containment are not very prevalent, particularly when compared with the findings from SFDs, which were done in more urban settings than the municipalities included in this study. Further testing of containment related questions in denser, more populated urban areas may be useful to confirm whether the questions remain relevant in contexts where containment is likely to be poor.

Table 6: Assessment of containment questions, average across four4 municipalities

Household questionnaire 47C. In the last year, have excreta from your toilet, pit or tank been released to the surface and surroundings due to any of the following events?			
% of improved OSS, averaged across municipalities	SEPTIC TANKS AND BIOGAS	FLUSH TO PIT LATRINE	OTHER IMPROVED OSS (dry single, twin, composting, etc.)
[A] Overflowed? Yes	14%	19%	7%
[B] Flooded? Yes	2%	2%	0%
[C] Containment collapsed? Yes	0%	2%	3%
[D] Other event releasing excreta to the surface and surroundings? Yes	1%	0%	0%

Other questions on impermeable/lined walls and base are not used for global monitoring but may be of interest for local indicators, however, enumerators noted these questions were difficult to assess.

Table 7: List of questions to assess containment for Onsite Sanitation Service

Below questions only asked for flush on-site sanitation as dry OSS don't have effluent. S1 = 12,13 (+ 15 flush to twin pit, 16 biogas or other tanks if they are response options to S1)					
S3. Does your (*answer from WS11*) have an outlet pipe for liquid waste? *If there is infiltration underground from the base or sides of the tank or pit, select "No"* *If the tank or pit containing wastes has a pipe which discharges liquid wastes, select "Yes"*	Yes.....1 No.....2 Don't know 8				2>S4 8>*S4*
S3b. Where does this pipe go?	To a leach field, soak pit.....11 To a sewer / closed drain that leads to A wastewater treatment plant (WWTP) .....21 A waterbody (not connected to WWTP) .....22 Don't know where.....23 To an open drain.....31 To a waterbody/surface.....32 Other (*specify*) .....96 Don't know.....98				
Below questions asked for all on-site sanitation S1 = 12,13,15,16,21,22,23,24,31,32					
S4. In the last year, have excreta from your (***answer from WS11***) been released to the surface and surroundings due to any of the following events?					
		Yes	No	DK	
[A] Overflowed?	Overflowed	1	2	8	
[B] Flooded?	Flooded	1	2	8	
[C] Containment collapsed?	Containment collapsed	1	2	8	
[D] Other event releasing excreta to the surface and surroundings?	Other event	1	2	8	
[D1] *Specify the other event mentioned*	(*specify*)				

Emptying and Disposal

The question tested in the survey was not fully clear for the objective of assessing whether a containment has ever been emptied. Therefore, it is recommended that the JMP core question be used instead (see S5 below in Table 8).

The questions on frequency of emptying (S5b/d) and who emptied (S5c) are useful for the analysis of service provider data that requires converting containments emptied per month to a proportion of the population served annually by emptying.

Other questions on how the containment was emptied (i.e. manual vs mechanical) are not used for global monitoring but may be of interest for local indicators.

The NWASH questionnaire currently does not capture where excreta are disposed of after emptying. This is important to include to identify whether excreta are buried in-situ, which, if contained, can be considered safely stored or whether they are disposed of into the environment or taken off-site. While households may not be able to accurately report where excreta are disposed of when taken off-site, it is still useful to capture their knowledge regarding in-situ disposal or disposal in the local environment, and this also reflects the disposal of self-emptied systems.

Table 8: List of questions on containment emptying

S5. Has your pit/tank ever been emptied?	Yes, emptied.....1 No, never emptied.....4 No, not emptied but covered and left undisturbed when full.....5 Don't know 8	1>S5c 4>*S5b* 5>*S5b* 8>*S5b*
S5b. How many years ago was the OSS built?	Less than 1 year ago.....1 1-2 years ago.....2 3-5 years ago.....3 5-10 years ago.....4 >10 years ago.....5 Don't know 8	ALL TO END
S5c. How many years was the OSS in use before it was last emptied?	Less than 1 year ago.....1 1-2 years ago.....2 3-5 years ago.....3 5-10 years ago.....4 >10 years ago.....5 Don't know.....8	All > S5d
S5d. The last time it was emptied, who emptied the OSS?	**Service provider** public/municipality/government.....11 private company/NGO.....12 informal emptier (e.g., unlicensed) .....13 **Not service provider** Self-emptied.....21 neighbour, family member, friend.....22 Other (*specify*) .....96 Don't know.....98	All > S6

S6. The last time it was emptied, where were the contents emptied to?	Removed off-site (to treatment / unknown) .....1 Removed to a waterbody, open ground, field or elsewhere.....2 Buried in a covered pit at or near household (in-situ) .....3 Buried in a covered pit/trench elsewhere (off-site) .....4 Emptied into an uncovered pit.....5 Other (*specify*) .....6 Don't know.....8	

The toilet emptying is done mostly in Terai municipalities (Baragadhi and Shivaraj) than in hills and mountain areas. This may be due to less porous soil composition, higher population size and a high-water table. Though some municipalities have provided pit emptying services, mainly the informal or private sector are providing those services. Similarly, more emptying is done mechanically where there is good access (especially in Terai municipalities). Due to unavailability or limited availability of service providers and authorities, emptying is mostly done manually. In some cases, very few households engage service providers (e.g., in Chandannath), but the high cost involved (around 80 USD per trip) limits this option. The key findings from the survey are provided below in Table 9.

Table 9: Emptying and disposal of Fecal Sludge

Emptying	Baragadhi	Shivaraj	Panchkhapan	Chandannath
% Emptied - Household data	26%	35%	3%	13%
% Emptied - Service provider data	18%	9%	No service provider	2%
Who emptied				
Public / municipality / government	25%	0%	0%	2%
Private company / NGO	37%	61%	0%	0%
Informal emptier	37%	6%	0%	0%
Self emptied	1%	27%	100%	94%
Neighbour, family member, friend	0%	6%	0%	4%
Don't know	0%	0%	0%	0%
How emptied				
Manual emptying	2%	39%	100%	90%
Mechanized emptying (pump and truck)	76%	61%	0%	2%
Mechanized emptying (cess pool vehicle or vacuum truck)	21%	0%	0%	0%
Don't know	0%	1%	0%	8%
Where disposed				
Removed off-site (to treatment / unknown)	0%	0%	0%	2%

Removed to a waterbody, open ground, field or elsewhere	37%	98%	54%	44%
Buried in a covered pit at or near household (in-situ)	0%	0%	0%	24%
Buried in a covered pit/trench elsewhere (off-site)	0%	1%	15%	28%
Buried in an uncovered pit	0%	0%	31%	2%
Other (specify)	0%	2%	0%	0%
Don't know	63%	0%	0%	0%

Note: No service provided in Panchkhapan.

4.2.2. Sanitation Inspections

The sanitation inspections were conducted by both observation (one-third) and asking (two-thirds), although typically is intended to just be observed with the household questionnaire covering the self-reported aspects. The inspection aims to be a more detailed assessed by a trained enumerator to enable a more thorough assessment of risks. However, responses were often "don't know" and generally identified fewer issues than those reported by the households. So far, the reasons for this include the observer's inability to access some questions related to the material of the pit, while other issues were not visible at the time of the survey (i.e. flooding and overflow) but may have occurred in the past.

Regarding the current survey form, updates should include skip functions so that questions about OSS containment are not asked to households not using OSS.

There are possibly too many similarities between 3a/3b/3c in Table 10, and these should be reviewed and possible updated to align with the household survey questions on containment. "47C. In the last year, have excreta from your toilet, pit or tank been released to the surface and surroundings due to containment collapse?"

Based on the sanitation inspection data, pit latrines were found to be more prone to structural damage and environmental leakage compared to septic tanks, biogas systems, and other improved on-site sanitation (OSS) technologies. Observations revealed that 8% of pit latrines had cracked or damaged slabs, 5% had damaged or collapsed side walls, and 5% showed visible damage to the containment or outlet pipes. Additionally, 4% of pit latrines exhibited evidence of leakage or overflow to the surrounding environment. In contrast, septic tanks and biogas systems showed minimal structural issues and no observed cases of overflow or leakage, indicating better containment performance.

Other improved OSS technologies, such as composting and twin pits, showed moderate levels of structural wear (6% observed damage to slabs and side walls) but no visible leakage or overflow. Notably, discrepancies were observed between user-reported data and inspection findings, with higher percentages of issues reported by users than those physically observed. This suggests either limited

user understanding of the system's condition or overreporting due to perceived risks. Overall, the findings highlight the greater environmental and public health risks associated with pit latrines, particularly in areas susceptible to flooding or lacking proper infrastructure.

Table 10: Average of containment issues across the three municipalities

	SEPTIC TANKS AND BIOGAS		FLUSH TO PIT LATRINE		OTHER IMPROVED OSS (dry single, twin, composting, etc.)	
Sanitation inspection questions	Observed	Asked	Observed	Asked	Observed	Asked
3a. Is the cover of the pit or the slab cracked or damaged?	2%	3%	8%	10%	6%	11%
3b. Are the side walls of the pit damaged or collapsed?	0%	2%	5%	7%	6%	11%
3c. Is there visible damage to the septic tank, pit or outlet pipes, e.g. cracks, corrosion, deformation or leakage?	0%	2%	5%	8%	0%	7%
4a. Is there any evidence of leakage or overflow to the surrounding area form the toilet or the containment?	0%	7%	4%	6%	0%	0%

Note: SI was not conducted for Chandannath

4.2.3. Service Provider Surveys

The service provider surveys were successful in capturing emptying data from known private and municipal providers, however converting this to a representative value for the municipalities requires some assumptions.

For the survey, the intention was to separate the emptying rates that were estimates and the ones based on recorded data, (i.e. ES03 is intended for estimates and ES04-ES09 in JMP questionnaire on sanitation service providers were intended for values based on recorded data). However, this was not clear, and responses for estimates were entered directly into the data boxes. Improved clarity on the form is needed if estimated and recorded data are to be separated.

While different units for emptying rates were tested in the form, moving forward the form could be simplified to collect data only on "containments emptied per month", rather than volume, truck, or weekly data. However, given only two respondents had data records, further pre-testing with service providers who maintain records may be needed to confirm whether this is the typical unit of data.

Assumptions were required to convert the containments emptied per month to the proportion of the population served. We assumed one containment per

household and an emptying frequency of 4 years for Baragadhi and Shivaraj municipalities based on reported emptying frequencies, and 12 years for septic tanks and 5 years for pit latrines for Chandannath. These assumptions could be improved with additional emptying frequency/age question in the household survey.

3 out of 4 municipalities included service providers that serve beyond the boundary of that municipality, therefore in the analysis it was necessary to assume what portion of the reported monthly rate was relevant to this municipality. For example, in Baraghadi it was assumed that for providers located outside the study area, only 5% of their reported annual emptying occurred in the study area. Future updates to the questionnaire could ask the provider to self-report the proportion of services provided to different municipalities.

Given that it wasn't clear whether all service providers were assessed and that most of them didn't keep records of emptying, for the analysis of the service chain the proportion of OSS emptied was based on the household survey response. This decision may vary between municipalities depending on the quality of the service provider data.

4.2.4. Service Authority Surveys

Little information was obtained from the service authority surveys and none used in the analysis. This was due to most of the questions on emptying, transport and disposal not being answered or reported as zero. Also, it is important to note that the available sanitation related data for this analysis is limited. The WASH plan and census survey data presented were provided in a very limited manner with no data disaggregation, and there was fewer common data point between the two datasets. For example, in Baragadhi, much higher open defecation rates (41%) were reported by the service authority compared with the 12% open defecation rate from the household questionnaire survey. There is no clear reason for this discrepancy, but it was assumed the service authority collected this data aftermath of wind cyclone in the municipality which destroyed many houses and its toilets.

Related to the service authority survey, for Chadannath the trenching site was classified as no FS treatment, unsafe disposal. Moving forward it will be necessary to identify whether trenching could be classified as a safe treatment solution if it meets certain safety requirements, for example ensuring the sludge is always covered.

The data provided by the service authorities was often based on previous data collection efforts supported by different programs. These also highlight discrepancies in results and the need for more consistent data collection methods and systematic data records at service authorities.

Comparison with previous data collection

All municipalities included in the pilot survey have prepared a WASH plan. Two municipalities, Shivaraj and Chandannath, were also supported by external organizations. Environment and Public Health Organisation (ENPHO) conducted a Shit Flow Diagram (SFD) in Shivraj, and SNV implemented the Urban Sanitation and Hygine for Health and Development survey in Chandannath (2023). However, the survey information from these municipalities is not available from the municipal authorities. Information obtained from Chandannath was partially disaggregated to and made available through a former SNV staff member who is local to the area, allowing for a more thorough comparison and analysis across different variables. In contrast, although an SFD was conducted in Shivaraj, it did not provide much detailed information from that municipality.

Below (Table 11) is some data on the sanitation service chain from different surveys conducted around the same time. Findings on open defecation vary widely, ranging from 30 per cent in Chandannath to over 100 per cent in other parameters. Due to such large discrepancies across data sources, it is very challenging to draw strong and comprehensive conclusions or to fully understand the factors influencing the sanitation chain in all four municipalities.

Table 11: Data available from different sources from four municipalities

	Shivaraj Municipality		**Chandannath Municipality**		**Baragadhi Municipality**	**Panchkhapan Municipality**
Sanitation category	WASH plan (2022)	SFD (2024)	WASH Plan (20222)	USHHD (2023)	WASH Plan (2021)	WASH Plan (2023)
SMS	22.88	51.00	26.22		27.36	46.07
Basic	41.29		65.87		65.36	47.21
Limited	0		0.33	0.10	0.43	0.67
Un-improved	24.87		0		0.25	0
OD	10.94, 15.2*	6.00	7.58, 1.84*	1.40	6.61, 3.38*	6.05, 1.65*

Note: SFD: Shit Flow Diagram, USHHD: Urban Sanitation and Hygiene for Health Development, SMS: Safely Managed Sanitation, OD: open Defecation, figure with * indicates census data (2021)

4.2.5. Analysis of multiple data sources

When analyzing sanitation data from multiple sources, it is essential to make informed decisions about which dataset to prioritize. In this case, data from service providers and municipal authorities were often found to be incomplete or inconsistent, limiting their reliability for detailed analysis. As a result, greater emphasis was placed on household survey data and sanitation inspection findings, which were more comprehensive and consistent across sampled areas. These sources provided valuable insights into the actual condition and performance of sanitation facilities at the household level, enabling a more accurate assessment of risks and service delivery gaps. Given that service providers and service authorities' surveys are most important for emptying /

transport / treatment, if there isn't any emptying or if all emptying results in unsafe disposal, it may be inefficient to conduct service provider and authority surveys if the outcome will always be 0% transported or treated. However there remains value in collecting this data to highlight that gaps in services remain for these steps of the service chain.

4.3.Service chain assessment

The overall service ladder for the four municipalities is presented below in figure 7 and shows that the proportion of safely managed sanitation varied from 44% to 81%, basic sanitation from 10% to 32%, limited sanitation from 4% to 8%, unimproved sanitation from 0 to 3% and notably there remained high rates of open defecation (0 - 16%).

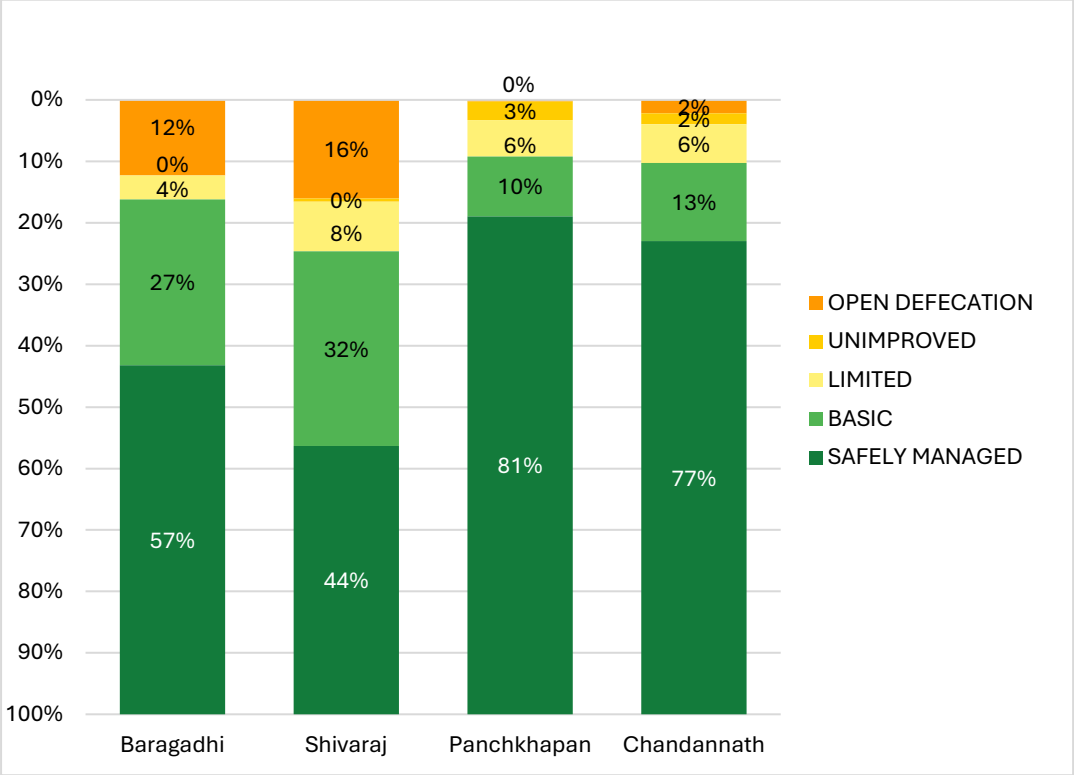


Figure 7: Sanitation ladder SMOSS pilot municipalities

As shown in the service chain graph in figure 8 and Table 12, safely managed sanitation is achieved through improved, not shared onsite sanitation (OSS) that are contained, never emptied and safely stored in-situ. Emptied sludge was considered safely managed only if it was emptied and buried in a covered in-situ pit, as can be seen in Chandranath (this includes households reporting burial in a covered in-situ pit, as well as household reporting removal off-site by a service provider to a designated off-site trenching location). Almost all other emptied sludge was disposed of untreated into the environment.

Table 12: Disaggregated data on onsite sanitation service chain

	Baragadhi	Shivaraj	Panchkhapan	Chandannath
Improved OSS	88%	83%	97%	96%
Limited sanitation services (shared)	4%	8%	6%	6%
Basic on-site sanitation services	27%	32%	10%	13%
At least basic on-site sanitation services (includes both basic and safely managed)	84%	75%	91%	89%
Improved OSS not shared, contained, excreta treated and disposed in-situ	57%	44%	81%	71%
Improved OSS not shared, contained, excreta emptied and disposed in-situ	0%	0%	0%	6%
Improved OSS not shared, contained, excreta emptied and treated off-site	0%	0%	0%	0%
Total - Safely managed on-site sanitation	57%	44%	81%	77%

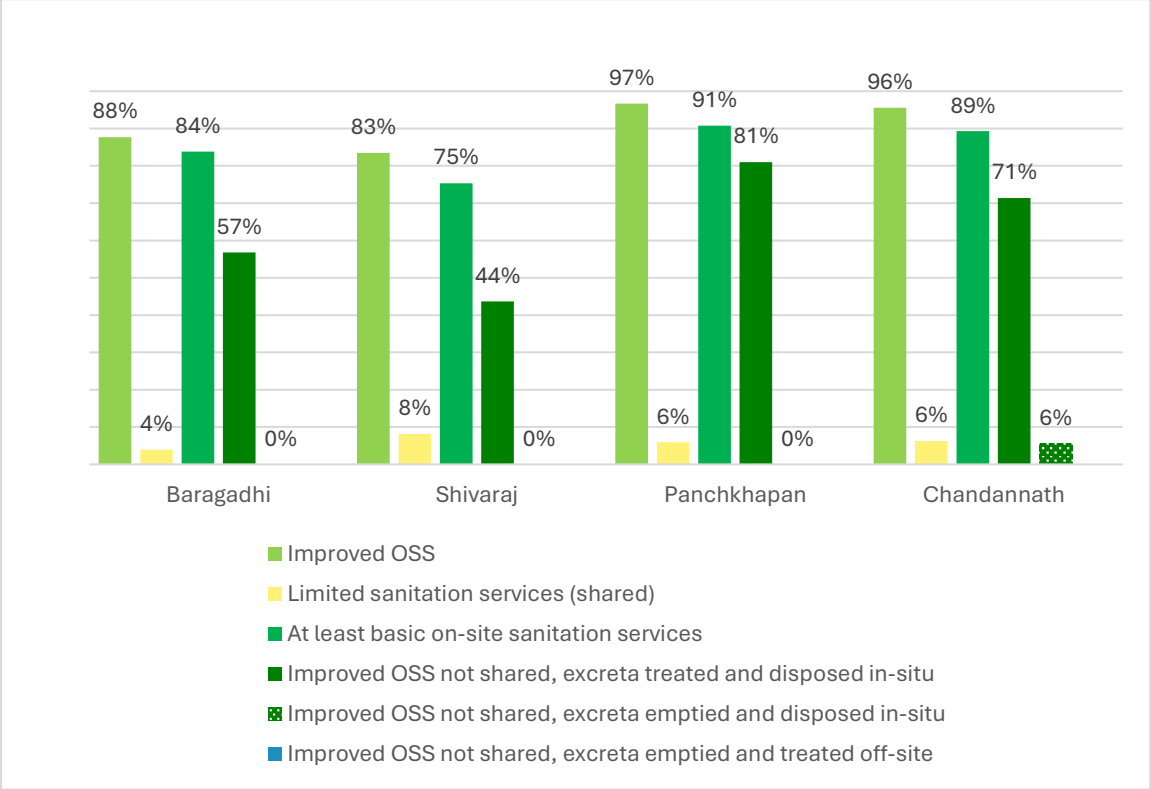


Figure 8: Onsite Sanitation Service chain in pilot municipalities.

This figure shows the surveyed population using improved, limited, at least basic services and safely managed services, divided by the category of safely managed.

The below ratios were calculated from the various data sources, although predominately the household questionnaire was used given it had fewer data gaps than other sources. On average 91% of onsite sanitation (OSS) were contained, with the main issues being impact of events such as flooding or overflow and, in these municipalities, presence of an outlet pipe to the surface environment was uncommon. Emptying of OSS ranged from 3-35%, with the low rate of emptying in Panchkhapan associated with the high overall proportion of safely managed sanitation, given most emptied sludge is unsafely disposed as can be seen by 0% safely delivered in Ratio 5 which is shown in figure 9 below.

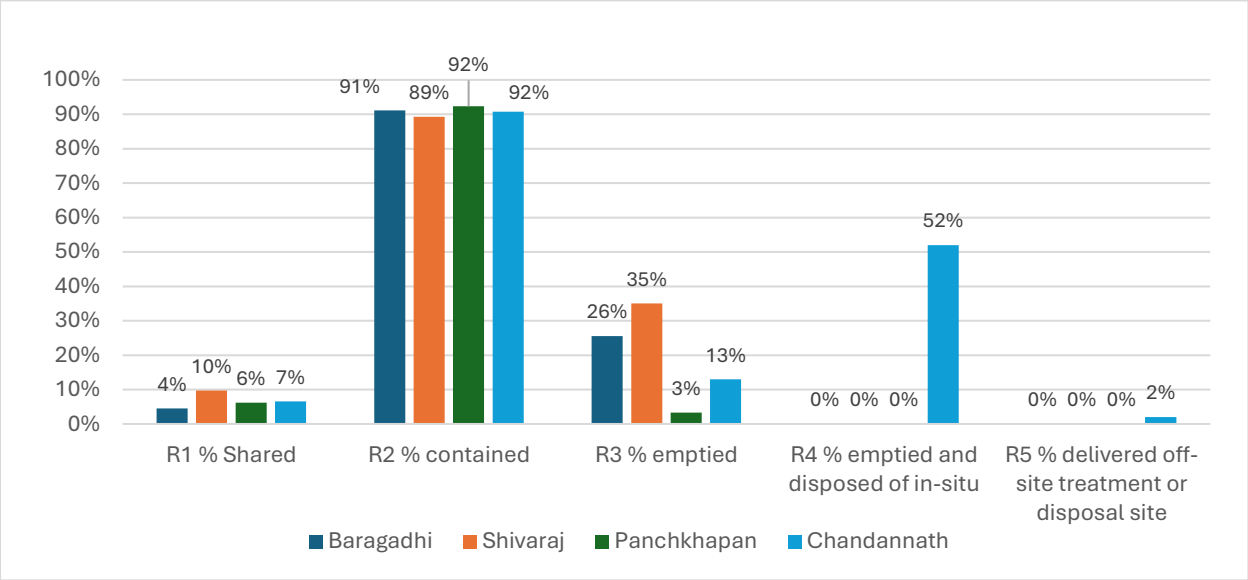


Figure 9: Ratios of sanitation chain

The excreta flow diagrams prepared for each four municipalities are presented in Annex – G of this report.

5. Recommendation

5.1.Monitoring of SMOSS

The recommendations for monitoring SMOSS are proposed as both general and specific, as outlined below:

A. General recommendations

After piloting SMOSS monitoring in selected local governments, UNICEF would like to recommend the following general actions to create an enabling environment.

1. Policy and Regulatory Framework
    - Municipal FSM Policy: Develop municipal policies that will address the entire FSM service chain in accordance with national standards (e.g., the FSM Institutional and Regulatory Framework, 2017) and ensure alignment with SDG 6.2.
    - Sanitation Standards: Develop guidelines on standard on-site sanitation systems to ensure that they are environmentally safe and have no risk to health and safety.
    - Regulatory guideline: Prepare a regulatory guideline on sustainable financing, incorporating a private sector engaged business model to support the FSM services, infrastructure development and expansion, and implementation of municipal FSM policies and sanitation standards.
    - Operation Guideline: Develop a comprehensive operation guideline that clearly outlines the roles and responsibilities of stakeholders involved in the FSM chain, especially regarding emptying, operation of treatment systems/plants.
    - Monitoring Guideline: Develop monitoring guidelines that clearly define who collect data and who tracks service status. Monitoring data will be gathered by service providers using a mobile-based application, stored in the municipal database, and utilized by the service authority (i.e., the municipality) to support planning and enable comparison with historical records.
    - Emergency FSM plans: Formulate emergency FSM plans for disasters or public health emergencies, including the design of mobile treatment facilities, emptying mechanisms, and transportation systems for emergency situations.

2. Institutional Roles and Responsibilities
    - FSM Unit: Establish a municipal FSM unit under WASH unit / department to oversee FSM planning and monitoring.
    - Private Sector Engagement: Establish partnerships with private desludging operators through clear agreements and contracts.

3. Community Engagement:
   After ODF declarations, sustaining sanitation requires regular monitoring of on-site systems. Community groups such as water and sanitation user committees that already track ODF status and other services should be mobilized to monitor containment structures, raise awareness, and report issues, supported by capacity-building. Data from these efforts should be shared with private sector actors for timely repairs and with municipal FSM units for planning and oversight, ensuring proactive and sustained sanitation management.

4. Capacity Building and Training
    - Train municipal staff and service providers on the theory and practice of FSM, including safety protocols and regulatory compliance.

- Conduct awareness raising activities on safe FSM practices within communities.
- Develop capacity building modules (guidelines, standards, SOPs) for municipal personnel, the private sector, emptying and transportation organizations, and communities on planning, monitoring and reporting mechanisms for SMOSS.

5. Licensing and Regulation
   - Establish a licensing and regulatory mechanism for desludging operators and monitor their performance through performance-based contracts between municipalities and private operators.
   - Introduce a system of rewards and penalties/fines to ensure compliance with FSM regulations and performance-based contracts
   - Plan direct, safe transport routes and ensure the use of sealed vehicles compliant with traffic regulations

6. Financing
   - Design affordable tariffs for desludging services and subsidies for low-income households. Demand-based desludging should be converted into scheduled desludging every 3 to 5 years, with costs either integrated into water bills or paid in installments through community savings and credit groups.
   - Seek funding for infrastructure development and capacity-building initiatives.
   - Develop innovative financing mechanisms by exploration linkages between SMOSS and climate funds, as well as blended financing, to bridge funding gaps.

7. Infrastructure Development
   - Develop a detailed project report, including design, cost estimates and a business plan for safe and appropriate FSM.
   - Implement faecal sludge treatment plants (FSTPs) and safe disposal sites.
   - Develop design guidelines for the use, design and sizing of faecal sludge treatment or safe disposal sites (e.g. trenching), considering both short- and long-term solutions.
   - Promote innovative technologies, such as decentralized treatment units and biogas digesters, where appropriate.

8. Public Awareness and Advocacy
   - Run campaigns highlighting FSM's importance in public health and environmental protection, collaborating with community leaders and organizations for greater outreach.

9. Emergency FSM Preparedness
   - Conduct vulnerability assessments of the municipal areas considering earthquake, flood, inundation, landslide with identification of possible

temporary settlements with FSM interventions which should include not only treatment plants but the necessary tools and equipment for installation of containment units as well as emptying and transportation systems.
- Develop FSM plans for disasters or public health emergencies and design mobile treatment facilities for emergency situations

10. Stakeholder Coordination
    Align municipal efforts with provincial and national governments for technical and financial support.

B. Specific Recommendations for monitoring SMOSS

1. Data Collection and Inventory:
    - Employ stratified sampling to create a representative database of sanitation facilities, involving around 400 households per municipality, considering caste and ethnicity, and assess their conditions.
    - Conduct household surveys every 2-3 years to help track SDG 6.2, while surveys of service providers and treatment facilities should be conducted on annual basis. All data should be updated in the NWASH MIS.
    - Municipalities wishing to conduct such surveys and update the NWASH MIS should be capacitated by the government and incentivized if they implement the sanitation programme as planned. Document details such as type, size, condition, age, and volume of systems, including septic tanks, pit latrines, and other containment structures.
    - Ensure standard containment types (e.g., septic tank, biogas, ring, stone/brick masonry pits - single or double) are included in the inventory for easy identification during inspections.
    - Use mobile applications (such as KOBO, mWater etc.) to collect data and store it in cloud-based systems linking with municipal data servers.
    - Develop mechanisms for regular collection of data on emptying rates from service providers and disposal rates at treatment facilities to track safe delivery to treatment and assess capacity for current demand and future growth.

2. Plan for Interim Disposal Sites:
    - Collaborate with local authorities to designate and map temporary disposal sites, ensuring compliance with safety guidelines regarding distance from water sources, residential areas, and farms, and avoiding flood prone locations.

3. Planning for New FSTPs:
    - Evaluate the need for new FSTPs or disposal sites based on sludge volume, population density, and accessibility, and conduct a detailed feasibility study

considering environmental, technical, social and economic factors, including a strategic environmental assessment.

- Engage stakeholders to identify suitable locations and secure budgets for FSTP construction in underserved areas.
- Develop a detailed implementation plan for FSM

4. Regular Inspection and Maintenance Schedules:
    - Implement annual inspections to detect leaks, overflows, and contamination risks as part of monitoring of SMOSS monitoring by community groups or Water and Sanitation Users Committee (WSUCs) as a part of post-ODF activities. Proper capacity building should be provided, and a mobile app-based system should be used for data collection. For household level monitoring, systematic sampling (e.g, inspecting every 10th household or at least 10 % from a ward wise list) may be applied. This differs from the earlier stratified sampling used to create a representative database across caste and ethnicity groups. WSUCs have applied similar approaches during ODF monitoring, which can be adapted for SMOSS monitoring.

    - Promote desludging every 3–5 years in line with municipal FSM by-law or regulations, transitioning from demand-based to scheduled desludging services.

    - Conduct regular inspections of treatment plants or disposal facilities to ensure safe management of waste, including sampling effluent or treated sludge in accordance with national discharge standards.

5. FS Emptying and Transportation:
    - Deploy trained personnel equipped with manual sludge collection tools, such as gulpers, in densely populated areas with limited or no road access. Safely store the collected sludge in drums for proper disposal at designated pits or treatment facilities. Ensure leak proof operations with mechanized machinery to minimize spillage and odors.
    - Use vacuum trucks for emptying pits or septic tanks, ensuring safety measures are followed.
    - Monitor the emptying practices to ensure personnel use appropriate PPE and receive proper training on occupational health and safety (OHS).
    - Develop and implement an emptying and disposal data collection and monitoring system (e.g. mobile app) to track services, including household details, volume emptied, and disposal locations.
    - Provide training in Sanitation Safety Planning, emphasizing safety practices before, during, and after the emptying process.

6. Disposal Monitoring and FS Treatment:

- Ensure the safe disposal and reuse of treated waste.
- Identify safe disposal sites when reuse is not possible and designate safe locations for reuse of treated sludge.
- Monitor inflows or truck discharges to the treatment process.
- Conduct regular assessment and reporting of treatment inflows, capacity, and performance to confirm safe treatment of excreta and inform planning.
- Monitor treatment processes to ensure compliance with domestic effluent standards (2022).

7. Water Quality Testing:
   - Conduct water quality testing for contamination (e.g., E. coli, nitrates) where people use hand pump or dug well within 15m distance as per National Drinking Water Quality Standard.
   - Focus on vulnerable areas like flood-prone or densely populated region.

8. Community Engagement:
   - Raise awareness about regular maintenance, emptying, safe sanitation practices.

9. Community Health Surveillance:
   - Utilize community health surveillance to identify and address high-risk sanitation areas, and to determine whether these risks are linked to on-site sanitation systems, enabling targeted interventions and improved public health outcomes.

10. Performance Monitoring:
    - Develop KPIs for emptying service providers, focusing on service coverage, regulatory compliance, leak-free operations, adherence to desludging schedules and safe delivery of sludge treatment plants or formal disposal sites.
    - Develop KPIs for treatment operators to ensure that treatment facilities are accessible to all emptying trucks, properly record inflows, operate effectively, regularly sample effluent, comply with discharge standards, and safely manage by-products.
    - Track progress towards SDG 6.2.1 on safely managed sanitation, with the municipality responsible for monitoring supported by the NWASH MIS system to ensure accurate, timely, and comprehensive reporting.

11. Financial Sustainability:
    - Monitor the financial sustainability of sanitation services, including annual O&M costs.

- Provide subsidies or incentives to support low-income households in upgrading sanitation systems. Review current tariffs for emptying services and dumping fees, assessing whether they adequately contribute to O&M costs and overall financial sustainability of emptying and treatment services.

12. Regulatory Compliance:
    - Ensure adherence to local and national standards for sanitation management.
    - Collaborate with higher authorities to update policies based on compliance trends.
    - Conduct regular inspections to prevent illegal sludge dumping in rivers, fields, or other unauthorized locations.
    - Work with community leaders to report and enforce penalties for unsafe disposal practices.

13. Documentation and Reporting:
    - Establish a SMOSS dashboard within NWASH MIS for tracking sanitation status.
    - Digitize records of inspections, treatment plant performance, and corrective actions.
    - Develop and publish findings to guide infrastructure and policy decisions.

14. Capacity Building for Local Authorities:
    - Train municipal staff and service providers in information management and monitoring.
    - Facilitate knowledge-sharing and exposure visits to spread best practices.
    - Develop dedicated sanitation cadres for regular inspections and monitoring activities of onsite sanitation systems as well as treatment systems.

Annexure

Annex A : Comparison between JMP vs NWASH Household Questionnaires and proposed changes

	Proposed questions from JMP core questions		**NWASH questions**		**Reason for change in NWASH questions**
	Question	**Response (Green are not core but optional)**	**Question**	**Response**	
H1	What kind of toilet facility do members of your household usually use? If 'flush' or 'pour flush', probe: Where does it flush to? If not possible to determine, ask permission to observe the facility.	11. Flush to piped sewer system 12. Flush to septic tank 13. Flush to pit latrine 14. Flush to twin pits 15. Flush to biogas 16. Flush to open drain 17. Flush to elsewhere 18. Flush to don't know where 21. (Single) Pit latrine with slab 22. Twin pit latrine with slab 23. Ventilated improved pit latrine with slab 24. Composting toilet 25. Pit latrine without slab / open pit 41. No facility / bush / field 96. Other (specify)	23. Is there toilet in the house?	1. Yes 2. No	**Revise** This doesn't align with use and also means that the assessment of shared facilities is not possible. The approach used in the core question covers all toilets, which households can respond the type even if the enumerator can't visually inspect it.
			If "2. No" selected in 23, need further responses:	A. No facility / bush / field B. Community toilet C. Public Toilet D. Neighbours toilet	
			26. Toilet type?	1. Flush 2. Pour flush 3. Composting 4. Pit latrine with slab 5. No	**Revise** These don't all define the containment type. Important to use JMP categories to enable harmonized assessment of unimproved and type of OSS.
H1b	Is the toilet disable friendly? *(Note: Guidance may be needed to inform the enumerator how to*	1. Yes 2. No	25. Is the toilet disable friendly?	1. Yes 2. No	Keep it if required for Nepal This is not a core question but it was indicated that it might be a local indicator for Nepal. To discuss if keeping and if any standards/guidance are

	Proposed questions from JMP core questions		NWASH questions		Reason for change in NWASH questions
	Question	**Response (Green are not core but optional)**	**Question**	**Response**	
	assess disabled friendly)				used to inform the assessment.
H2	Do you share this facility with others who are not members of your household? (Asked to all households with sanitation – improved and unimproved)	1. Yes 2. No	42. Is the toilet shared by other households/neighbours?	Yes No	**OK**. Aligned.
			24. Is the toilet private?	1. Yes 2. No	**Delete** as this duplicated the above question on sharing.
H2b	If answered yes to H2, Do you share this facility only with members of other households that you know, or is the facility open to the use of the general public?	1. Shared with known households (not public) 2. Shared with general public *(Add any alternative response categories as required for local monitoring or an additional question on where the facility is located to determine if own dwelling/plot/elsewhere)*			Keep it if required for Nepal Can be included if the differentiation between type of shared toilets is needed as a local indicator. The responses could be as shown in green or the three categories above (Community, Public, Neighbours) or number shared with (i.e. more or less than 5 households)
First containment questions only asked to flush to OSS (i.e. septic tank, cesspool/pit latrine, twin pit, biogas)					
H3	Does your septic tank or pit latrine have an outlet pipe for liquid effluent?	1. Yes 2. No (include those infiltrating underground from the base of	27. Where is the toilet faecal sludge waste connected to?	1. Pit never filled up 2. Disposed off to	**Revise.** Options are applicable for sewerage and onsite. Some options are

	Proposed questions from JMP core questions		NWASH questions		Reason for change in NWASH questions
	Question	**Response (Green are not core but optional)**	**Question**	**Response**	
	(Only asked to wet containments - those replying H1(12,13,14,15))	sides of the tank or pit) 8. Don't know		open space 3. Disposed of to treatment plant 4. Pit connected to open drain 5. Pit connected to sewer with WWTP 6. Double pit 7. Don't know	inline with JMP Q8. This question confuses the concepts of outlet pipe to surface and emptying. This question should be replaced by the core questions on containment and emptying.
H4	If it has an outlet pipe for liquid effluent (yes to H3), where does this pipe discharge?	11. To a leach field, soak pit To a sewer / closed drain that leads - 21. to a wastewater treatment plant (WWTP) - 22. to a waterbody (not connected to WWTP) - 23. to don't know where 31. To an open drain 32. To a waterbody / surface 96. Other (specify) 98. Don't know			
Second containment questions asked to all improved OSS (all septic tank, biogas, pit latrines, VIPs, composting. But not to unimproved pit, sewer, discharge to drain or OD)					
H5	In the last year, have excreta from your (pit latrine or septic tank) been released to the surface environment due to any of the following events? (Asked to all OSS H1(12,13,14,15,21,22,23,24))		47. Is the toilet pit free of seepage/leakage on the ground?	1. Yes 2. No	**Revise** Proposed core question more clearly assesses the different options of release of excreta to the surface.
H5a	Overflowed	1. Yes, 2. No, 8. Don't know			

	Proposed questions from JMP core questions		NWASH questions		Reason for change in NWASH questions
	Question	**Response (Green are not core but optional)**	**Question**	**Response**	
H5b	Flooded	1. Yes, 2. No, 8. Don't know			Alternatively, if the explanation of 47 aligns with H5a, then question 47 could remain and add H5b, c, d.
H5c	Containment collapsed	1. Yes, 2. No, 8. Don't know			
H5d	Other event releasing excreta to the surface environment (specify)	1. Yes, 2. No, 8. Don't know			
Emptying question asked to all respondents with improved OSS (all septic tank, biogas, pit latrines, VIPs, composting. But not to unimproved pit, sewer, discharge to drain or OD)					
H6	Has your (pit latrine or septic tank) ever been emptied?	1. Yes emptied 2. Never emptied 3. Not emptied but covered and left undisturbed when full 8. Don't know	56. Has the toilet pit been filled yet?	1. Yes 2. No	**Revise**- filled to emptied Preference is to focus on emptying as per the core question. Filling doesn't necessarily equate to emptying.
H6b	How many years ago was your pit latrine/septic tank built?	1. Less than 1 year ago 2. 1-2 years ago 3. 3-5 years ago 4. 5-10 years ago			Keep it if is required for Nepal Optional questions but may inform analysis of service provider emptying rates or be

	Proposed questions from JMP core questions		NWASH questions		Reason for change in NWASH questions
	Question	**Response (Green are not core but optional)**	**Question**	**Response**	
		5. >10 years ago 8. DK			useful to designing service provision or treatment size.
H6c	How many years ago was your pit latrine/septic tank last emptied? (If H6=1)	1. Less than 1 year ago 2. 1-2 years ago 3. 3-5 years ago 4. 5-10 years ago 5. >10 years ago 8. DK	57. After how many years of construction, the toilet pit was filled?	1. In 2 years 2. In 2 - 4 years 3. In 4 - 6 years 4. After 6 years	**Revise**- filled to emptied The proposed question is on emptying rather than filling aligns with standard questions on emptying.
H7	The last time it was emptied, who emptied the OSS? (If H6=1)	**Service provider** 11. Public/municipality/ government 12. Private company/NGO 13. Informal emptier (e.g. unlicensed) **Not service provider** 21. Self-emptied 22. Neighbour, family member, friend 98. Don't know	58. Who cleaned the toilet pit?	1. Self 2. Contract 3. Others	**Revise**, as question H7 allows for alignment with the service provider or service authority surveys
			59. How was the toilet pit cleaned?	1. Manual emptying 2. By contractor 3. Using pump 4. Not emptied till now 5. Others	
Disposal only asked if responded yes to Ever emptied					

	Proposed questions from JMP core questions		NWASH questions		Reason for change in NWASH questions
	Question	**Response (Green are not core but optional)**	**Question**	**Response**	
H8	The last time it was emptied, where were the contents emptied to? (If H6=1)	1. Removed off-site (to treatment / unknown) 2. Removed to a waterbody, open ground, field or elsewhere 3. Buried in a covered pit at or near household (in-situ) 4. Buried in a covered pit/trench elsewhere (off-site) 5. Buried in an uncovered pit 96. Other (specify) 98. Don't know			**Add** Required to assess disposal

Annex B : JMP Core Questions – Household questionnaire

ID	Core question	Responses
H1	What kind of toilet facility do members of your household usually use? If 'flush' or 'pour flush', probe: Where does it flush to? If not possible to determine, ask permission to observe the facility.	11. Flush to piped sewer system 12. Flush to septic tank 13. Flush to pit latrine 14. Flush to open drain 15. Flush to elsewhere 16. Flush to don't know where 21. Pit latrine with slab 22. Pit latrine without slab / open pit 23. Composting toilet 31. Bucket 32. Hanging toilet / hanging latrine 41. No facility / bush / field 96. Other (specify) *Optional* *51. Ventilated improved pit latrine (with slab)* *52. Twin pit latrine with slab* *53. Container based sanitation*
H2	Do you share this facility with others who are not members of your household? (Asked to all households with sanitation – improved and unimproved)	1. Yes 2. No
H3	Does your septic tank or pit latrine have an outlet pipe for liquid effluent? (Only asked to wet containments - those replying H1(12,13,52,96))	1. Yes 2. No (include those infiltrating underground from the base of sides of the tank or pit) 8. Don't know
H4	If it has an outlet pipe for liquid effluent (yes to H3), where does this pipe discharge?	11. To a leach field, soak pit To a sewer / closed drain that leads 21. - to a wastewater treatment plant (WWTP) 22. - to a waterbody (not connected to WWTP) 23. - to don't know where 31. To an open drain 32. To a waterbody / surface 96. Other (specify) 98. Don't know
H5	In the last year, have excreta from your (pit latrine or septic tank) been released to the surface environment due to any of the following events? (Select all that apply) (Only asked to those replying H1(12,13,21,23,51,52,53))	(Select all that apply) A. Overflowed B. Flooded C. Containment collapsed D. Other event releasing excreta to the surface environment (specify) E. None of the above X. Don't know

H6	Has your (pit latrine or septic tank) ever been emptied? (Only asked to those replying H1(12,13,21,23,21,51,52,53))	1. Yes emptied 2. Never emptied 3. Not emptied but covered and left undisturbed when full 8. Don't know
H7	Who emptied the containment?	**Service provider** 11. Public/municipality/government 12. Private company/NGO 13. Informal emptier (e.g. unlicensed) **Not service provider** 21. Self emptied 22. Neighbor, family member, friend 98. Don't know
H8	The last time it was emptied, where were the contents emptied to?	1. Removed off-site (to treatment / unknown) 2. Removed to a waterbody, open ground, field or elsewhere 3. Buried in a covered pit at or near household (in-situ) 4. Buried in a covered pit/trench elsewhere (off-site) 5. Buried in an uncovered pit 96. Other (specify) 98. Don’t know

Possible expanded questions for household questionnaires from JMP question guide and SFD indicators

JMP XS7. Does the design of your toilet prevent other people seeing and hearing what you are doing when you use it?
JMP XS1/MICS WS17. How many households in total use this toilet facility, including your own household? MICS WS16. Do you share this facility only with members of other households that you know, or is the facility open to the use of the general public?
SFD. Does the containment have impermeable/lined walls? Does the containment have an open/not sealed base?
JMP XS11. How many years ago was your pit latrine/septic tank built?
JMP XS13. The last time your pit latrine/septic tank was emptied, who emptied it?
JMP SX12. How many years ago was your pit latrine/septic tank last emptied?
SFD. What is the depth of the water table (during the wettest period of the year)?
SFD. Is the sanitation facility located less than 10m from a groundwater well?

Annex C: Comparison between Core, Expanded and NWASH Questionnaires

	SMOSS	Responses		Expanded Questions		NWASH	Responses	Comment
H1	What kind of toilet facility do members of your household usually use? If 'flush' or 'pour flush', probe: Where does it flush to? If not possible to determine, ask permission to observe the facility.	11. Flush to piped sewer system 12. Flush to septic tank 13. Flush to pit latrine 14. Flush to open drain 15. Flush to elsewhere 16. Flush to don't know where 21. Pit latrine with slab 22. Pit latrine without slab / open pit 23. Composting toilet 31. Bucket 32. Hanging toilet / hanging latrine 41. No facility / bush / field 96. Other (specify) *Optional* *51. Ventilated improved pit latrine (with slab)* *52. Twin pit latrine with slab* *53. Container based sanitation*		JMP XS7. Does the design of your toilet prevent other people seeing and hearing what you are doing when you use it?		23. Is there toilet in the house?	1. Yes 2. No	If "2. No" selected need further responses: 41. No facility / bush / field 96. Other (specify) [this might include CT / PT]
						24. Is the toilet private?	1. Yes 2. No	
						25. Is the toilet disable friendly?	1. Yes 2. No	

						26. Toilet type?	1. Flush 2. Pour flush 3. Composting 4. Pit latrine with slab 5. No	These responses need to further elaborate leading to flush to where?
H2	Do you share this facility with others who are not members of your household? (Asked to all households with sanitation – improved and unimproved)	1. Yes 2. No		JMP XS1/MICS WS17. How many households in total use this toilet facility, including your own household? MICS WS16. Do you share this facility only with members of other households that you know, or is the facility open to the use of the general public?		42. Is the toilet shared by other households/neighbors?		
H3	Does your septic tank or pit latrine have an outlet pipe for liquid effluent? (Only asked to wet containments - those replying H1(12,13,52,96))	1. Yes 2. No (include those infiltrating underground from the base of sides of the tank or pit) 8. Don't know						No question on this.

H4	If it has an outlet pipe for liquid effluent (yes to H3), where does this pipe discharge?	11. To a leach field, soak pit To a sewer / closed drain that leads 21. - to a wastewater treatment plant (WWTP) 22. - to a waterbody (not connected to WWTP) 23. - to don't know where 31. To an open drain 32. To a waterbody / surface 96. Other (specify) 98. Don't know				27. Where is the toilet faecal sludge waste connected to?	1. Pit never filled up 2. Disposed off to open space 3. Disposed of to treatment plant 4. Pit connected to open drain 5. Pit connected to sewer with WWTP 6. Double pit 7. Don't know	Need to revise the answer options
H5	In the last year, have excreta from your (pit latrine or septic tank) been released to the surface environment due to any of the following events? (Select all that apply) (Only asked to those replying H1(12,13,21,23,51,52,53))	(Select all that apply) A. Overflowed B. Flooded C. Containment collapsed D. Other event releasing excreta to the surface environment (specify) E. None of the above X. Don't know		SFD. Does the containment have impermeable/lined walls? Does the containment have an open/not sealed base?		47. Is the toilet pit free of seepage/leakage on the ground?	1. Yes 2. No	Need to revise the question to include i) containment have lining or not, and ii) free of seepage/leakage

H6	Has your (pit latrine or septic tank) ever been emptied? (Only asked to those replying H1(12,13,21,23,21,51,52,53))	1. Yes emptied 2. Never emptied 3. Not emptied but covered and left undisturbed when full 8. Don't know		JMP XS11. How many years ago was your pit latrine/septic tank built?		56. Has the toilet pit been filled yet?	1. Yes 2. No	
						57. After how many years of construction, was the toilet pit filled?	1. In 2 years 2. In 2 - 4 years 3. In 4 - 6 years 4. After 6 years	Need to add responses where the emptied FS disposed of to?
H7	Who emptied the containment?	**Service provider** 11. Public/municipality/government 12. Private company/NGO 13. Informal emptier (e.g. unlicensed) **Not service provider** 21. Self-emptied 22. Neighbor, family member, friend 98. Don't know		JMP XS13. The last time your pit latrine/septic tank was emptied, who emptied it?		58. Who cleaned the toilet pit?	1. Self 2. Contract 3. Others	
						59. How was the toilet pit cleaned?	1. Manual emptying 2. By contractor 3. Using pump 4. Not	

							emptied till now 5. Others	
H8	The last time it was emptied, where were the contents emptied to?	1. Removed off-site (to treatment / unknown) 2. Removed to a waterbody, open ground, field or elsewhere 3. Buried in a covered pit at or near household (in-situ) 4. Buried in a covered pit/trench elsewhere (off-site) 5. Buried in an uncovered pit 96. Other (specify) 98. Don't know		JMP SX12. How many years ago was your pit latrine/septic tank last emptied?				
				SFD. What is the depth of the water table (during the wettest period of the year)?				
				SFD. Is the sanitation facility located less than 10m from a groundwater well?				

Annex D: Sanitary Inspection Questions – Tubewell with hand pump

सरसफाई निरीक्षण प्रश्नावली - हाते पम्प सहित को ट्यूबवेल

1. Do you have water source in or near the house?	१. के तपाईको घर मा वा घर नजिक पानी को श्रोत छ? (सोध्नु होला)
a. Yes	क. छ
b. No	ख. छैन
2. If yes, please specify? []	२. यदि छ भने, कुन श्रोत लेख्नु होला? (सोध्नु होला) .....
3. What is the depth of tubewell (and unit of depth)? [Number, unit]	३. ट्यूबवेल को गहिराई कति छ? (इकाई) (सोध्नु होला)
4. How many households are service by the tubewell? (Approximately)	४. यो ट्यूबवेल बाट कति घरधुरी लाभान्भित छन? (अन्दाजी) (सोध्नु होला)
a. 1 – 10	क. १ - १०
b. 11 – 50	ख. ११ - ५०
c. 51 – 100	ग. ५१ - १००
d. More than 100	घ. १०० भन्दा बढ़ी
5. Is there a platform surrounding the tubewell?	५. के ट्यूबवेल वरीपरी प्लेटफर्म छ? (अबलोकन गर्नु होला)
a. Yes	क. छ
b. No	ख. छैन
6. If yes, is the platform tight enough to prevent seepage of water into the ground?	६. यदि छ भने, सो प्लेटफर्म ले वरीपरी को पानी जमीन मुनी रसाउन बाट रोक्न सक्छ? (अबलोकन गर्नु होला)
a. Yes	क. सक्छ
b. No	ख. सक्दैन
7. Is the tubewell located in low lying area?	७. के ट्यूबवेल होचो ठाऊँ मा छ? (अबलोकन गर्नु होला)
a. Yes	क. छ
b. No	ख. छैन
8. If yes, is the tubewell located in flooding area?	८. यदि छ भने, ट्यूबवेल बाढ़ी आउन सक्ने ठाऊँ मा छ? (सोध्नु होला)
a. Yes	क. छ
b. No	ख. छैन
9. If yes, has the tubewell been submerged to the highest level of the hand pump?	९. यदि छ भने, ट्यूबवेल हाते पम्प भन्दा माथि सम्म डुबेको थियो? (सोध्नु होला)

a. Yes	क. छ
b. No	ख. छैन
10. If yes, what is the frequency (no. of times in a year), duration of submergence (no. of days)?	१०. यदि छ भने, ट्यूबवेल एक बर्ष मा कति पटक डुबेको थियो र कति दिन सम्म डुबेको थियो? (सोध्नु होला)
11. Is water currently available form the tubewell?	११. के अहिले ट्यूबवेल बाट पानी उपलब्ध हुन्छ? (सोध्नु होला)
a. Yes	क. हुन्छ
b. No	ख. हुदैन
12. Is the drainage inadequate creating stagnant water in the surrounding area of tubewell?	१२. के ट्यूबवेल वरीपरी पानी को निकास को कमी ले गर्दा पानी जम्ने अवस्था हुन्छ? (अबलोकन गर्नु होला)
a. Yes	क. हुन्छ
b. No	ख. हुदैन
13. Have you ever carried out water quality testing of water source?	१३. के पानी को श्रोत को गुणस्तर जाँच गर्नु भएको छ? (सोध्नु होला)
a. Yes	क. छ
b. No	ख. छैन
14. If yes, when did you carried out water quality testing?	१४. यदि छ भने, पानी को गुणस्तर कहिले जाँच गर्नु भएको थियो? (सोध्नु होला)
a. Within a month	क. एक महिना भित्र
b. More than 3 months ago	ख. तीन महिना अगाड़ी
15. If yes, did you find E. coli. in your tubewell water?	१५. यदि छ भने, ट्यूबवेल को पानी मा E.coli. भेटिएको थियो? (सोध्नु होला)
a. Yes	क. थियो
b. No	ख. थिएन
16. If yes, what preventive measures did you take?	१६. यदि थियो भने, सुरक्षित पानी को लागी के बिधि प्रयोग गर्नु भयो? (सोध्नु होला)
a. Use of chlorination	क. क्लोरीनेशन प्रबिधि
b. Drilled new tubewell	ख. नया ट्यूबवेल को जडान
c. Using neighbours tubewell	ग. छिमेकिको ट्यूबवेल को प्रयोग
17. Is there sanitation infrastructure within 15 m of the tubewell? (e.g. latrine pit, septic tank, soak pit, sewer pipe etc.)	१७. के ट्यूबवेल बाट १५ मि. को परिधि मा सरसफाई का प्रबिधि हरु छन? (जस्तै: खाल्ड़े चर्पी, सेप्टिक टैंक, सोकपिट, ढल आदि) (अबलोकन गर्नु होला)
a. Yes	क. छ
b. No	ख. छैन

c. N/A	ग. थाहा छैन
18. Is there sanitation infrastructure on higher ground or upstream area within 30 m of the tubewell?	१८. के ट्यूबवेल बाट ३० मि. को दुरी भित्र सो क्षेत्र भन्दा उचाई मा वा माथिल्लो क्षेत्र मा सरसफाई का प्रबिधि हरु छन? (अबलोकन गर्नु होला)
a. Yes	क. छ
b. No	ख. छैन
c. N/A	ग. थाहा छैन
19. Are there any other possible sources of pollution within 15 m of the tubewell? (e.g. open defecation, animals, livestock water point, debris/rubbish/waste, commercial activity?	१९. के ट्यूबवेल को १५ मि. परिधि भित्र अन्य कुनै प्रदुषण हुन सक्ने सम्भाबित श्रोत हरु छन? (जस्तै: खुला दिशा पिसाब, जनावर, पशु पंछी को पानी खाने ठाऊँ, फोहोर फाल्ने ठाऊँ, आर्थिक क्रियाकलाप हुने ठाऊँ आदि) (अबलोकन गर्नु होला)
a. Yes	क. छ
b. No	ख. छैन
c. N/A	ग. थाहा छैन

Annex E: Sanitary Inspection Questions – Pits or Septic Tank

सरसफाई निरीक्षण प्रश्नावली - खाल्डो अथवा सेप्टिक टैंक

(Optional questions in green)

1. *Observe the type of sanitation facility – if "Flush" or "Pour Flush", ask: Where does it flush to*	*१. सरसफाई को प्रबिधि अबलोकन गरे पछि - यदि "फ्लश प्रणाली" छ भने, कुन चर्पी को प्रकार हो सोध्नु होला*
a. Flush to piped sewer system	क. फ्लश प्रणाली, ढल मा जोडिएको
b. Flush to septic tank	ख. फ्लश प्रणाली, सेप्टिक टैंक मा जोडिएको
c. Flush to biogas reactor	ग. फ्लश प्रणाली, बायोग्यांस मा जोडिएको
d. Flush to pit latrine	घ. फ्लश प्रणाली, खाल्ड़े चर्पीमा जोडिएको
e. Flush to twin pits	ङ. फ्लश प्रणाली, दुई खाल्ड़े चर्पीमा जोडिएको
f. Flush to open drain	च. फ्लश प्रणाली, खुल्ला सतही ढलमा जोडिएको
g. Flush to don't know where	छ. फ्लश प्रणाली, कहाँ जोडिएको थाहा नभएको
h. Pit latrine with slab	ज. ढक्कन सहित को खाल्ड़े चर्पी
i. Pit latrine without slab / open pit	झ. ढक्कन रहित / खुला खाल्ड़े चर्पी
j. Twin pit latrine with slab	ञ. ढक्कन सहित को दुई खाल्ड़े चर्पी
k. Ventilated improved pit latrine	ट. सुधारिएको खाल्ड़े चर्पी (ढक्कन सहित)
l. Composting toilet	ठ. कम्पोस्टटिंग चर्पी
m. No facility	ड. केही नभएको
n. Other (specify)	ढ. अन्य
o. Observation not possible	ण. अवलोकन गर्न सम्भव नभएको
If there is no facility or observation not possible, then inspection cannot be completed, end the survey in this HH and move to next HH.	*यदि अवलोकन गर्न सम्भव नभएको छ भने, हाल को निरीक्षण समाप्त गरी, अर्को घर मा निरीक्षण गर्नु होला*
2. Toilet cleanliness	२. चर्पी को सरसफाई को अवस्था
a. Is the toilet dirty with visible excreta on surfaces?	क. के चर्पी को सतह मा खुला रूपमा दिशा देखिन्छ
i. Yes	अ. देखिन्छ
ii. No	आ. देखिन्दैन
iii. Don't know	इ. थाहा छैन
3. Damages	३. क्षति

a. Is the cover of the pit or the slab cracked or damaged?	क. के खाल्डो को ढक्कन अथवा ढलान चर्किएको वा क्षतिग्रस्त छ?
i. Yes	अ. देखिन्छ
ii. No	आ. देखिन्दैन
iii. Don't know	इ. थाहा छैन
b. Are the side walls of the pit damaged or collapsed?	ख. के खाल्डो को पर्खाल क्षतिग्रस्त वा भत्किएको छ?
i. Yes	अ. छ
ii. No	आ. छैन
iii. Don't know	इ. थाहा छैन
c. Is there visible damage to the septic tank, pit or outlet pipes, e.g. cracks, corrosion, deformation or leakage?	ग. के सेप्टिक टैंक, खाल्डो, वा निकाश पाइप हरु मा देखिने गरी क्षति हरु छन? (जस्तै: चिरा, खिया लागेको, बांगिएको, चुहिएको आदि)
i. Yes	अ. छ
ii. No	आ. छैन
iii. Don't know	इ. थाहा छैन
4. Surface water and ground contamination	४. सतही र जमीन मूनी पानी को प्रदुषण
a. Is there any evidence of leakage or overflow to the surrounding area form the toilet or the containment?	क. के चर्पी वा सेप्टिक टैंक बाट आसपास को क्षेत्र मा फोहोर पानी चुहिएको वा जमीन मा बगेको देखिन्छ?
i. Yes	अ. देखिन्छ
ii. No	आ. देखिंदैन
iii. Don't know	इ. थाहा छैन
b. Does the tank or pit have an outlet pipe for liquid effluent?	ख. के सेप्टिक टैंक वा खाल्डो मा फोहोर पानी बग्न को लागी निकाश पाइप छ?
i. Yes	अ. छ
ii. No	आ. छैन
iii. Don't know	इ. थाहा छैन
c. If yes, where does the outlet pipe discharge to?	ग. यदि छ भने, सो निकाश पाइप के मा जोडिएको छ?
i. Leach field or soak pit	अ. शोक पिट अथवा लीच फील्ड
ii. Sewer or closed drain that leads to a wastewater treatment plant	आ. जमीन मुनी को ढल वा बंद सतही ढल बाट प्रशोधन केंद्र मा जोडिएको

iii. Sewer or closed drain that leads to a water body (canal, river, pond, etc.)	इ. जमीन मुनी को ढल वा बंद सतही ढल बाट सतही पानी (बिना प्रशोधन)
iv. Sewer or closed drain that leads to unknown place (don't know where)	ई. जमीन मुनी को ढल वा बंद सतही ढल बाट कता जान्छ थाहा छैन
v. Open drain	उ. खुल्ला सतही ढलमा
vi. Water body or ground surface	ऊ. सतही पानी वा जमिनमा
vii. Land or gardens used to grow food crops.	ए. अन्न उब्जाउन खेत वा करेसा बारी मा
viii. Other (specify)	ऐ. अन्य
ix. Don't know	ओ. थाहा छैन

Annex F: Tubewell Survey Data Analysis Result Sheet

TW Survey Data			
Location	Shivaraj Municipality		
Number of surveys		138	

Sanitary Inspection Questions			
Question	**Response Categories**	**Values**	**Percent**
1. Do you have water sources in or near the house?	a. Yes	138	100%
	b. No	0	0%
	(Missing responses)		0
2. If yes, please specify?	a. Own tubewell	122	88%
	b. Public tubewell	12	9%
	c. Pipe supply	3	2%
	d. Dug well	0	0%
	e. Others	1	1%
	(Missing responses)		0
3. What is the depth of tubewell (and unit of depth)? [Number, unit]	No. of tubewell	134	
	(Missing responses)		0
	Depth of tubewell (average)	86.43	
	Unit of depth	Feet	

4. How many households are serviced by the tubewell? (Approximately)	a. 1 – 10	131	98%
	b. 11 – 50	3	2%
	c. 51 – 100	0	0%
	d. More than 100	0	0%
	(Missing responses)		0

5. Is there a platform surrounding the tubewell?	a. Yes	118	88%
	b. No	16	12%
	(Missing responses)		0

6. If yes, is the platform tight enough to prevent seepage of water into the ground?	a. Yes	77	65%
	b. No	41	35%
	(Missing responses)		0

7. Is the tubewell located in low lying area?	a. Yes	3	2%
	b. No	131	98%
	(Missing responses)		0

8. If yes, is the tubewell located in a flooding area?	a. Yes	1	33%
	b. No	2	67%
	(Missing responses)		0

9. If yes, has the tubewell been submerged to the highest level of the hand pump?	a. Yes	1	100%
	b. No	0	0%
	(Missing responses)		0

10. If yes, what is the frequency (no. of times in a year), duration of submergence (no. of days)?	Frequency		
	(Missing responses)		0
	Duration		
	(Missing responses)		0

11. Is water currently available from the tubewell?	a. Yes	129	96%
	b. No	5	4%
	(Missing responses)		0

12. Is the drainage inadequate to create stagnant water in the surrounding area of tubewell?	a. Yes	38	28%
	b. No	96	72%
	(Missing responses)		0

13. Have you ever carried out water quality testing of water source?	a. Yes	21	16%
	b. No	113	84%
	(Missing responses)		0

14. If yes, when did you carry out water quality testing?	a. Within a month	1	5%
	b. More than 3 months ago	20	95%
	(Missing responses)		0

15. If yes, did you find E. coli. in your tubewell water?	a. Yes	3	14%
	b. No	12	57%
	c. Don't know	6	29%
	(Missing responses)		0

16. If yes, what preventive measures did you take?	a. Use of chlorination	1	33%
	b. Drilled new tubewell	1	33%
	c. Using neighbors tubewell	1	33%
	(Missing responses)		0

17. Is there sanitation infrastructure within 15 m of the tubewell? (e.g. latrine pit, septic tank, soak pit, sewer pipe etc.)	a. Yes	56	42%
	b. No	78	58%
	c. N/A	0	0%
	(Missing responses)		0

18. Is there sanitation infrastructure on higher ground or upstream area within 30 m of the tubewell?	a. Yes	2	3%
	b. No	76	97%
	c. N/A	0	0%
	(Missing responses)		0

19. Are there any other possible sources of pollution within 15 m of the tubewell? (e.g. open defecation, animals, livestock water point, debris/rubbish/waste, commercial activity?	a. Yes	20	15%
	b. No	114	33%
	c. N/A	0	33%
	(Missing responses)		0

Annex G: Emptying Service Provider Survey

Shortened updated questions for review for integration to NWASH

Green questions are optional questions that don't feed into global monitoring but to be agreed on whether these are of interest for local targets

ID	Question	Response	Skip logic
E01	Province, District, city, municipality (That this survey relates to)		
E02	Did the respondent provide informed consent for the survey?	1. Yes 2. No	2>End
E03	Service provider name		
E03b	Municipality/location of service provider headquarters		
E03c Optional	Licence/business number		
E04	What is your employment status within this sanitation service provider?	1. Self-employed 2. Company owner 3. Work for a private company/NGO 4. Work for a public company/municipality/ government 6. Other (specify)	
E05	In this city/district, do your services cover the entire area?	1. Yes serve the whole city/district 2. Yes serve the whole city/district and also beyond this city/district 3. No, serve only certain areas 4. Other (specify)	1>E05d 2,3>E05c 4>E05b
E05b	Other coverage of services	[Text]	>E05c
E05c	If multiple districts/municipalities served, what percentage of your trips are done in each district/municipality	1. District 1 a) Name: b) % of trips in this district: 2. District 2 a) Name: b) % of trips in this district: 3. District 3 a) Name: b) % of trips in this district:	>E05d
E05d	How many other emptying service providers work in this district?	0. None other ___Number of other providers 98. Don't know	
E06	On average, how many truck/cart trips do you make per month	__ Truck/cart tips per month 98 Don't know	#> E06b 98 > E07

E06b	For each trip, on average how many containments (i.e. pits or tanks) are in each trip?	1. Containment per trip 2. Containments are large, two trips needed per containment 3. Containments are large, three or more trips needed per containment 4. Containments are small, two containments are emptied per trip 5. Containments are small, three or more containments can be emptied per trip 8. Don't know	>E06c
E06c	Were these data based on recorded data on the rates of emptying or was it estimated?	1. Digital/computer records 2. Hand/paper records 3. Some/incomplete records 4. No records 6. Other (specify)	6 > E06d Others>E07
E06d	Specify other way of recording emptying	[TEXT]	
E07	What type of equipment do you use for emptying?	**Multiple answers** A. Pump attached to vacuum truck B. Submersible pump C. Manual pump (e.g. Gulper) D. Bucket E. Shovel X. Other (specify)	X>E07b Others>E08
E07b	Specify other equipment	[TEXT]	
E08	Does emptying require you (or your colleagues or employees) to enter the containment to empty?	1. Yes 2. No 98. Don't know	
E09	When emptying and/or transporting the faecal sludge, do you (or your colleagues or employees) wear any special clothes or equipment?	1. Yes 2. No 8. Don't know	1,8>E09b 2>E10
E09b	What special clothes or equipment is worn?	Select all that apply A. Gloves B. Boots C. Masks D. Overalls X. Others Z. Don't know.	
E10	What type of equipment do you use for transport?	**Multiple answers** A. Vacuum truck B. Truck with tank /drums C. Truck with open storage D. Cart	X>E10b Others>E11

		X. Other (specify)		
E10b	Specify other equipment	[TEXT]		
E11	Does any excreta spill to the ground during emptying or transport?	1. Yes often 2. Yes sometimes 3. Yes rarely 4. No never 8. Don't know		
E12	In the last month, what proportion of the faecal sludge collected, do you discharge at the following sites? *(Note: If all delivered to one site mark 100%, otherwise distribute based on number of containments/trucks/volume depending on data available).*	Proportion of emptied sludge discharged at:	%	
		Off-site discharge site a) Faecal sludge treatment plant		
		b) Wastewater treatment plant		
		c) Sewer line		
		d) Composting plant		
		e) Landfill with treatment of FS		
		f) Landfill without treatment of FS		
		g) Covered pit/trench		
		h) Uncovered pit/trench (unsafe trenching)		
		i) Designated waste pond		
		x) Other designated disposal site		
		<u>Disposed safely in-situ</u> j) Covered pit at household		
		<u>Delivered elsewhere</u> k) Surface environment (including agriculture, field, unprotected landfill)		
		l) Waterway (river, lake, pond, drain, canal)		
		Z) Don't know		
E13	Are you permitted to/able to deliver to all treatment sites that exist in this city/district?	1. Yes 2. No 8. Don't know		1,8>E13b 2>E14
E13b	If not, why?	[TEXT]		
E14	During the year are there periods when it is not possible to deliver to the treatment sites?	1. Yes 2. No 8. Don't know		1>E14b 2,8>E15
E14b	If yes, why?	[TEXT]		
E15	Other notes about emptying service provision	[TEXT]		

Annex H: Service Authority Transport and Treatment Indicators

Brief list of indicators for monitoring transport and treatment from OSS and sewers via service authority annual surveys

Indicators for excreta emptied from OSS

- Number of households' OSS that were emptied in the last year. (Note this data may require collecting monthly emptying rates from service providers).
- Proportion of the sludge emptied and taken off-site that is discharged to treatment or official disposal sites (i.e. not disposed to the environment)
- Alternative to above - Proportion of emptied sludge that is a) disposed of in-situ, b) taken off-site to treatment or official disposal site, or c) taken off-site and disposed to the environment
- Optional - Volume of sludge discharged to treatment or official disposal site
- Does the treatment or disposal site treat both the liquid and solid phase (i.e. leachate from drying beds or wetlands requires further secondary treatment before discharge) ?
- Optional - Proportion of sludge discharged to the treatment that receives treatment (not bypassed, overflow, stored adjacent, or not treated for other reasons).
- Optional - If disposed of in-situ/trenching, is the excreta regularly covered and/or meets national requirements for safe trenching?
- Is the liquid phase tested before disposal and meets national discharge standards?
- Is the sludge tested before disposal and meets national discharge standards (if they exist)?

Indicators for sewer and wastewater

- Volume of wastewater collected
    - And/or: Population connected to sewers
- Optional - Population connected to wastewater treatment plant (i.e. some sewers may not discharge to wastewater treatment)
- Volume of wastewater received at treatment plant
    - And/or: Proportion of wastewater that is lost during conveyance due to leakage or overflow
- Volume that receives a) primary, b) secondary or c) tertiary treatment
    - And/or: Does the treatment plant provide at least secondary treatment (i.e. secondary or tertiary treatment but not only primary treatment only)?
- Optional - Proportion of wastewater discharged to the treatment plant that receives treatment (i.e. not bypassed, diverted, not receiving treatment due to other issues).
- Optional - Capacity of wastewater treatment plants
- Is the effluent tested before disposal and meets national discharge standards?
- Optional - Is the sludge tested before disposal and meets national discharge standards (if they exist)?

Notes:

Definitions of levels of wastewater treatment from UNSD environmental monitoring https://unstats.un.org/unsd/envstats/fdes/MS3.2_Wastewater.pdf :

- Primary wastewater treatment: Treatment of wastewater by a physical and/or chemical process involving settlement of suspended solids, or other process in which the biochemical oxygen demand (BOD5) of the incoming wastewater is reduced by at least 20% before discharge and the total suspended solids of the incoming wastewater are reduced by at least 50%. To avoid double counting, water subjected to more than one type of treatment should be reported under the highest level of treatment only.20
- Secondary wastewater treatment: Post-primary treatment of wastewater by a process generally involving biological or other treatment with a secondary settlement or other process, resulting in a biochemical oxygen demand (BOD5) removal of at least 70% and a chemical oxygen demand (COD) removal of at least 75%. To avoid double counting, water subjected to more than one type of treatment should be reported under the highest level of treatment only.21
- Tertiary wastewater treatment: Treatment (additional to secondary treatment) of nitrogen and/or phosphorous and/or any other pollutant affecting the quality or a specific use of water: microbiological pollution, colour etc. The different possible treatment efficiencies ('organic pollution removal' of at least 95% for BOD5, 85% for COD, 'nitrogen removal' of at least 70%, 'phosphorous removal' of at least 80% and 'microbiological removal') cannot be added and are exclusive. To avoid double counting, water subjected to more than one type of treatment should be reported under the highest level of treatment only. 22

Annex I: Potential Sewer Service Provider Questions for Nepal

(Black related to SDG indicators, Green are optional)

This survey combined the disposal to treatment and type of treatment, therefore is designed to be completed per treatment plant. This survey could also be used for decentralized treatment systems.

1. Province
2. District or city
3. Muncipality
4. Service provider name
5. Name of wastewater treatment plant:
6. In this municipality, what neighborhoods are covered by this treatment plant?

COVERAGE AND DELIVERY TO TREATMENT

7. How many households are connected to sewers that discharge to the treatment plant?
8. What proportion of the sewer network discharges to the treatment plant (i.e. some sewer pipes may discharge directly to rivers/drains and not be connected to the treatment)?
9. What proportion of wastewater flows in sewers is lost to leakage or overflow?
10. Are there separate sewers for wastewater and for drainage (rainfall) or is there one combined sewer?

TREATMENT

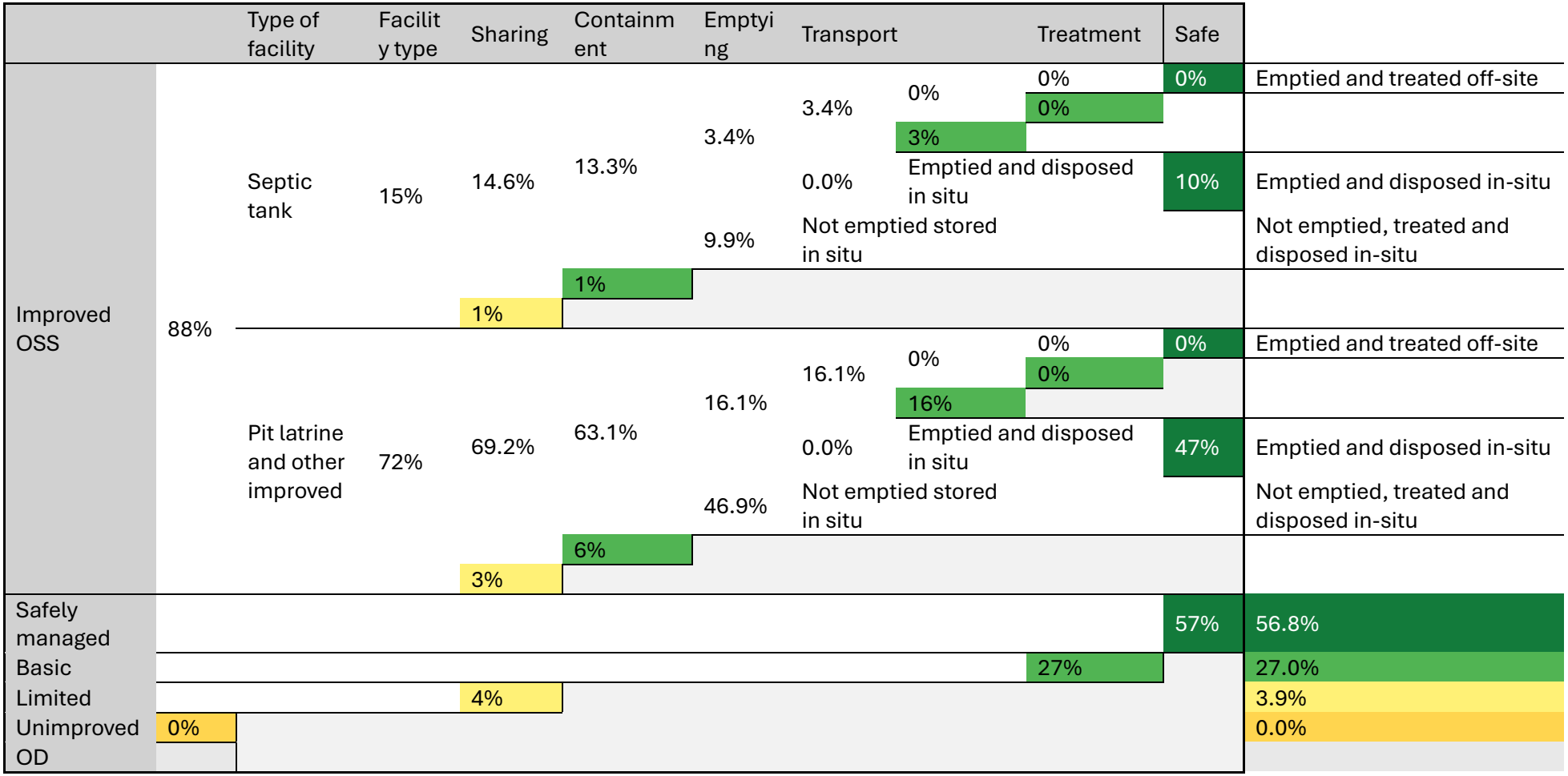
11. What is the level of treatment? (Primary, secondary, tertiary)
12. Please describe the treatment train:
13. What is the average daily inflow to the treatment plant?
14. Does the treatment plant also receive discharge from sludge trucks, if so, how many on average per month?
15. What is the design capacity of the treatment plant?
16. Do any inflows bypass the treatment? If so, what proportion of flows, or how often.
17. Are all steps of the treatment plant functional? If not, what proportion is functional out of 100%?

DISPOSAL

18. Did the effluent meet national effluent standards? (SDG 6.3)
19. Does the solids/sludge meet national standards for disposal? (SDG 6.3)
20. Where is the effluent discharged?
21. What happens to the solids/sludge from the treatment?
22. Is there any reuse of treated effluent? If so, for what purpose.
23. Is there any reuse of treated sludge? If so, for what purpose.

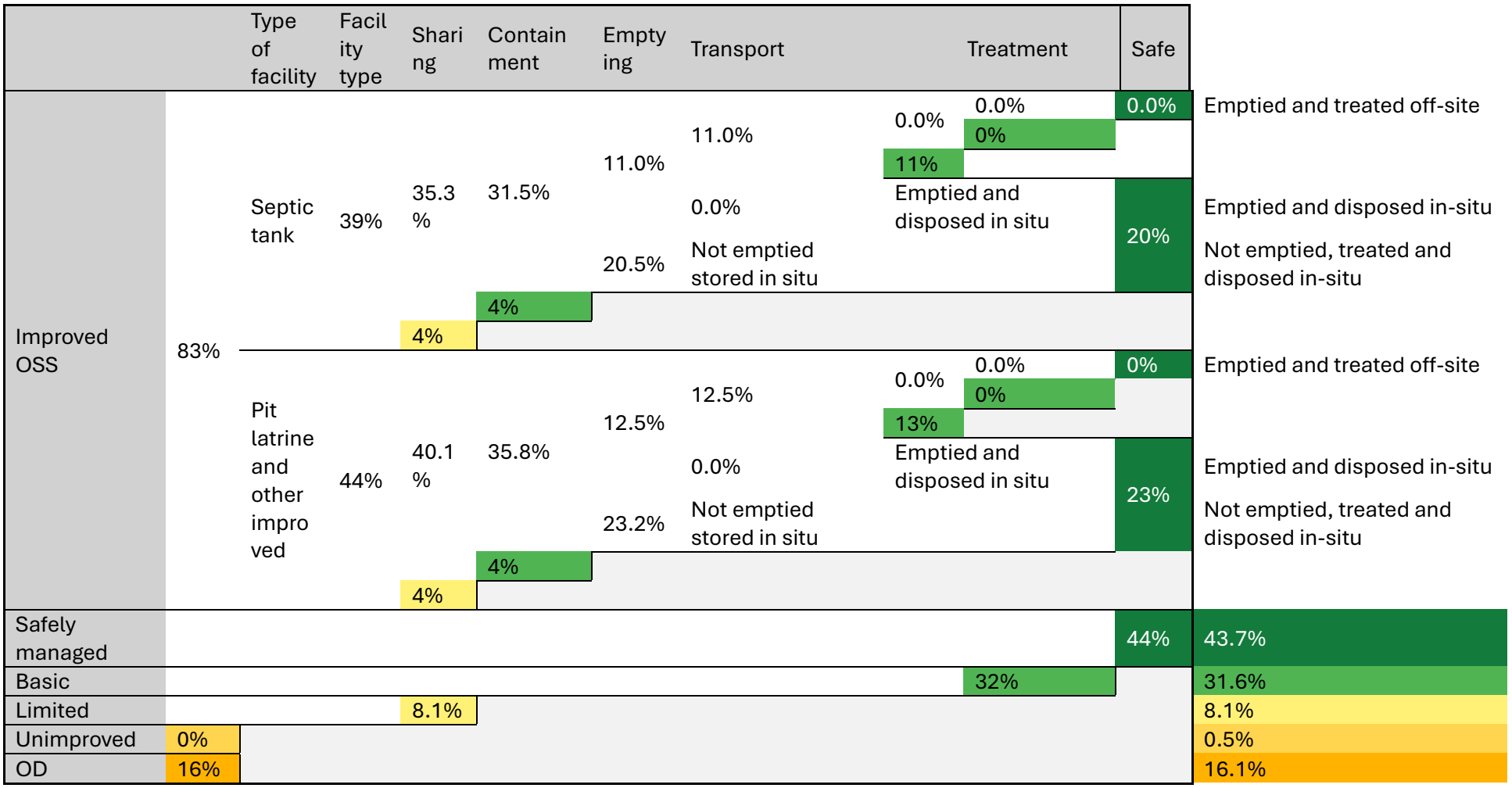
Annex J: Excreta Flow Diagram

A. Baragadhi

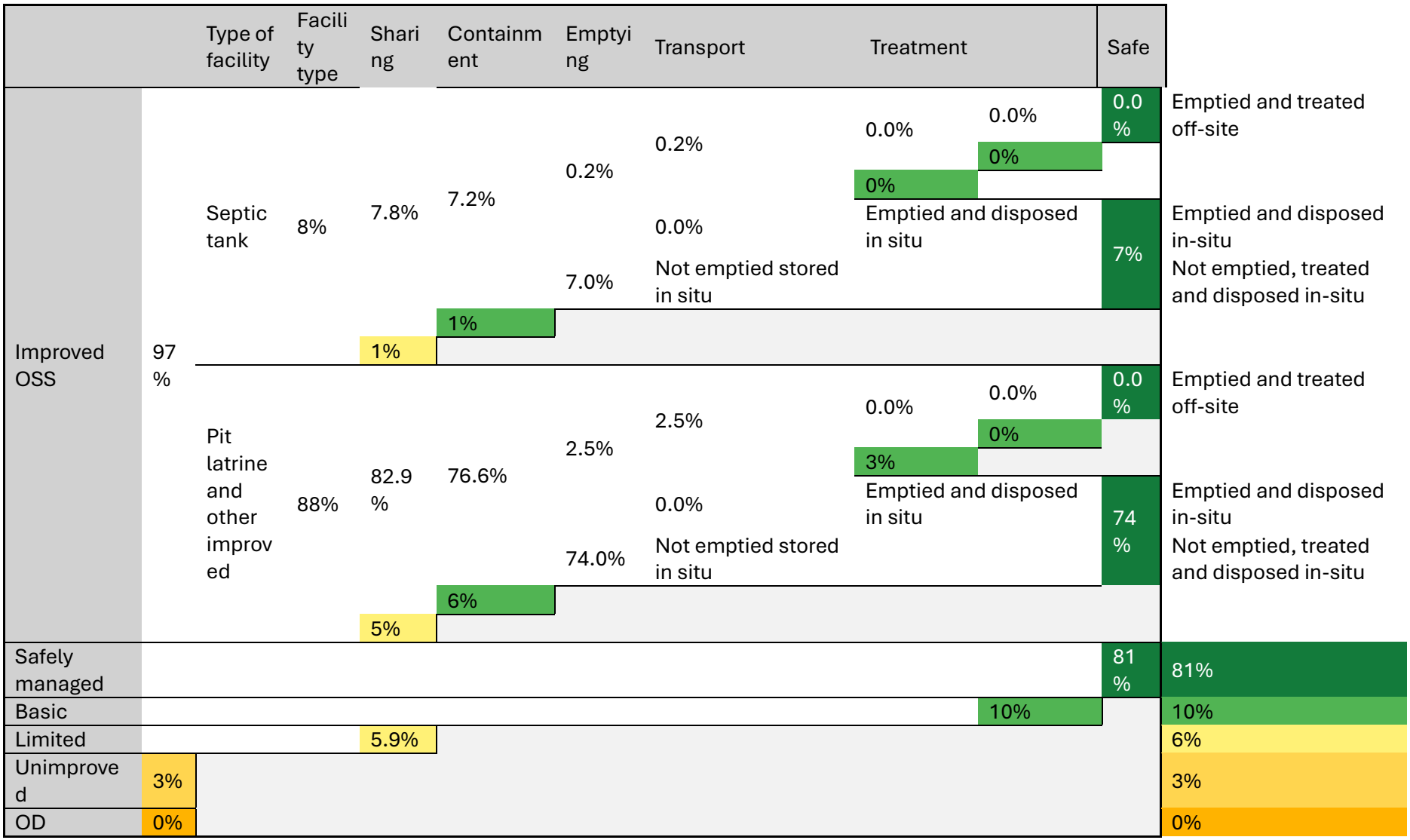


Of the households assessed in Baragadhi, 57% used safely managed sanitation. Open defecation remained high at 12% reported by the household questionnaire. Sharing occurred for 4% of the respondents, which was either using a neighbour's latrine or sharing a private latrine. There were some issues with containment, predominately overflow of pit latrines, with the results similar between household survey (9% uncontained) and inspection (8% uncontained). The proportion of OSS emptied was 28% from household surveys or 18% from service provider information, of which 4 were surveyed that serve this municipalities with only 1% of households reporting self-emptying. These providers emptied between 13-20 containments per month, with one serving only this municipalities and three from other municipalities, which we assumed 5% of their service was from this municipalities. All emptied sludge was discharged directly to waterways or fields.

B. Shivaraj

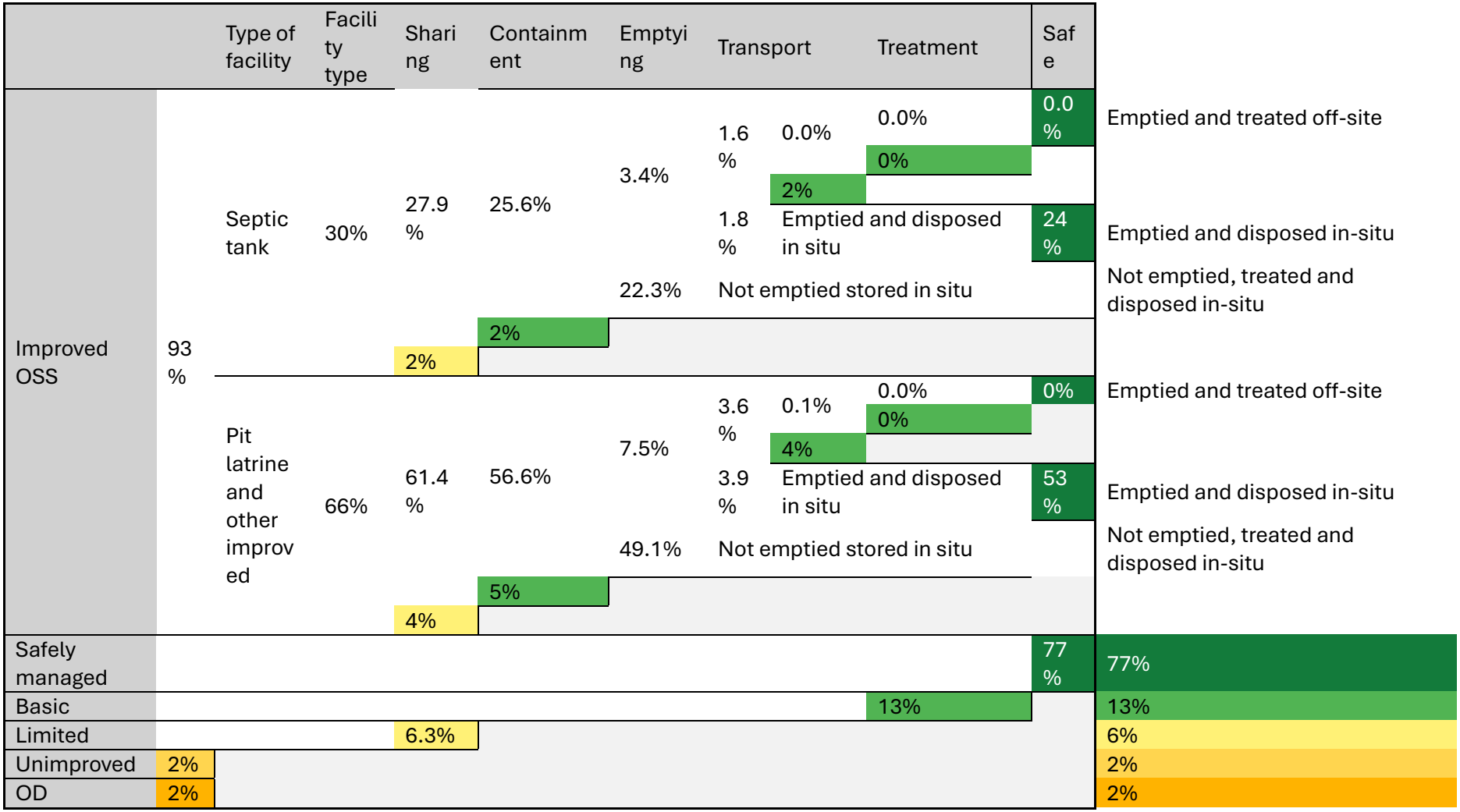

Type of facility
Facility type
Sharing
Containment
Emptying
Transport
Treatment
Safe
Improved OSS
83%
Septic tank
39%
35.3%
31.5%
11.0%
11.0%
0.0%
0.0%
0%
11%
Emptied and disposed in situ
20.5%
Not emptied stored in situ
20%
4%
4%
Pit latrine and other improved
44%
40.1%
35.8%
12.5%
12.5%
0.0%
0.0%
0%
13%
Emptied and disposed in situ
23.2%
Not emptied stored in situ
23%
4%
4%
Safely managed
44%
Basic
32%
Limited
8.1%
Unimproved
0%
OD
16%
0.0%
Emptied and treated off-site
Emptied and disposed in-situ
Not emptied, treated and disposed in-situ
Emptied and treated off-site
Emptied and disposed in-situ
Not emptied, treated and disposed in-situ
43.7%
31.6%
8.1%
0.5%
16.1%

C. Panchkhapan



Note that the household surveys reported 54% of pits and 34% of septic tanks overflow, but then didn't answer the other questions on flooding, collapse or other issues. This rate is much higher than other locations. The SI reported 0% evidence of leakage or overflow, and the value of uncontained of 8% from the SI contained aligned with other municipalities therefore was used in the analysis. The explanation provided for the high proportion of overflow was that the municipal official mentioned there is very less containment emptied, and they do not recall having regular desludging as well, this might lead to overflow of pits as found in HH survey. It may be necessary to clarify that overflow doesn't mean intentional emptying by flooding out the pit, which should go under emptying to drain/surface.

D. Chandannath



Note that no SI was conducted in Chandannath. An emptying provider exists by most household reported self-emptying. The emptying provider reported all sludge is discharged to an uncovered pit and the service authority also classified this as no treatment, only uncovered trench. Therefore, going forward, it will be important for Nepal to review the approach to trenching and decide whether it can be considered a safe treatment option and under what conditions this treatment could be classified as safe (i.e. buried in covered pit is the typically the criteria used by the JMP to assess burying sludge in-situ or off-site).

Annex K: Water Quality Monitoring

Groundwater monitoring in Shivaraj municipality was carried out in two phases using the sanitary inspection checklist provided in Annex D and E for tubewell and septic tank/pits respectively. The first phase was conducted before the monsoon season (May – June 2024) and the second phase was carried out after the monsoon season (Sep – Oct 2024). Along with the groundwater monitoring, sanitary inspection was also carried out using a sanitary inspection questionnaire as a tool provided by WHO to assess the condition and risks to groundwater sources. It focuses on identifying potential contamination risks, infrastructure deficiencies, and practices affecting groundwater quality.

Water Quality Test Results

A total of 820 water quality samples were collected from the tubewell for E. coli testing, with 410 samples taken before the monsoon and 410 samples after the monsoon. Before the monsoon, 43 out of the 410 samples tested positive for E. coli, while after the monsoon, only 5 out of the 410 samples showed the presence of E. coli. (Refer table 13 below).

Table 13: Water quality samples and results

SN	Phase	Total No. of Samples	No. of samples with e. coli. present
1	First Phase (before monsoon)	410	43 (*10.5%*)
2	Second Phase (after monsoon)	410	5 (*1.2%*)

The figure below presents the location of the tubewell of which water quality tests were conducted in Shivaraj municipality. And chart below shows the comparison of water quality test results before and after the rainy season.

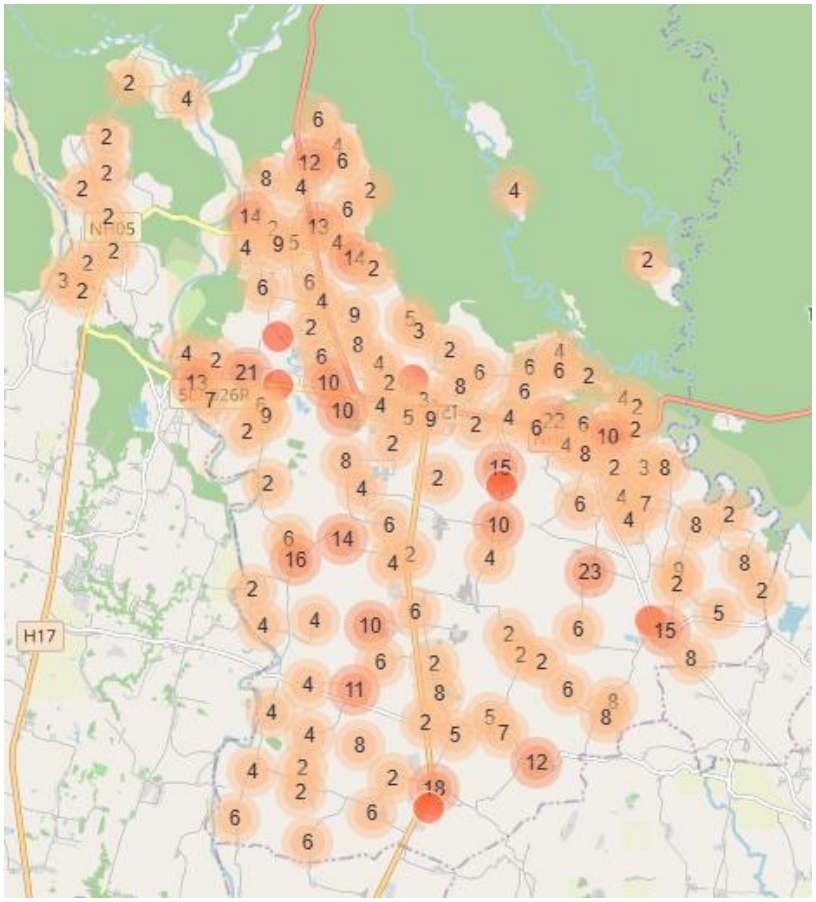


Figure 10: Location of water quality sampling points

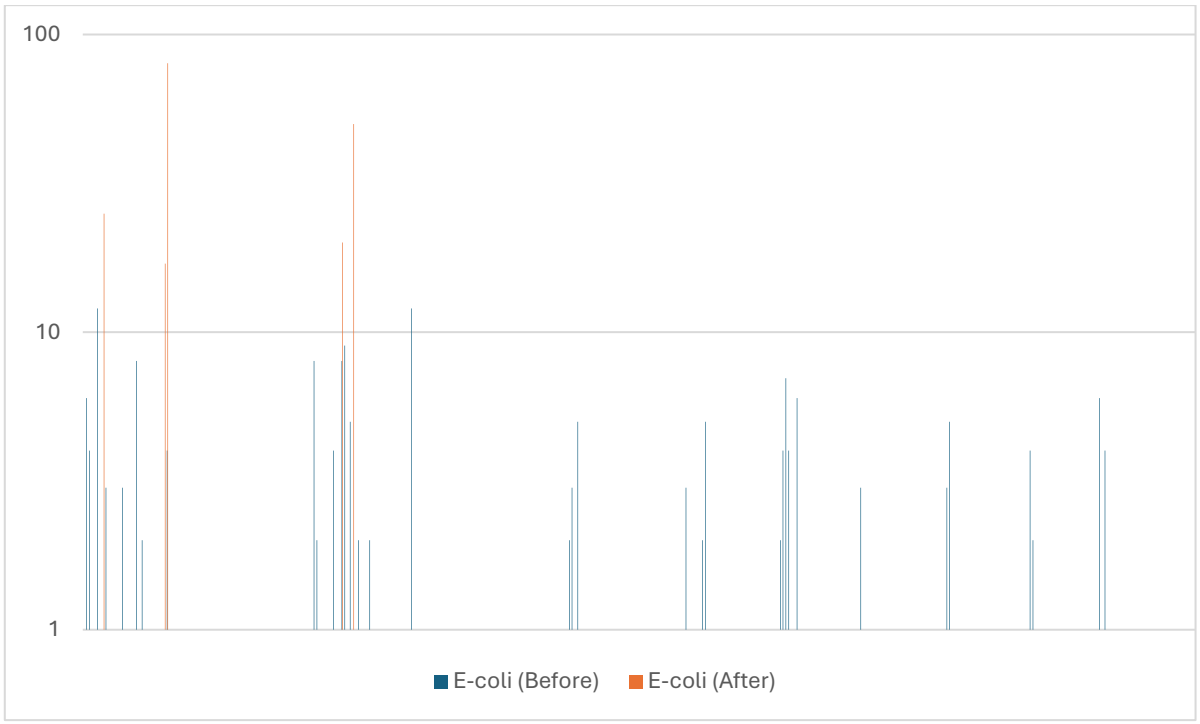


Figure 11: E.coli test results

Sanitary Inspections

- The sanitary inspection survey data of tube wells from Shivaraj Municipality provides an overview of groundwater usage, tubewell conditions, and potential contamination risks. The result of sanitary survey data is presented in Annex – F of this report. The sanitary inspection questions for tubewell with hand pump is presented in Annex – D of this report. Similarly, the sanitary inspection questions for pits or septic tank is presented in Annex – E of this report. The key summary and analysis based on the data provided:

Summary of Key Findings

1. Water Source Availability and Use
    - All respondents (100%) reported having water sources in or near their houses.
    - The majority (88%) rely on own tubewells, while 9% use public tubewells.
2. Tubewell Characteristics
    - The average depth of tubewells is 86.43 feet with 13 feet and 230 feet as minimum and maximum depth.
    - Most tubewells service 1–10 households (98%) remaining 2% provide service to 11-50 households.
3. Tubewell Structural Conditions
    - 88% have platforms around their tubewells; however, only 65% of these platforms are tight enough to prevent seepage.
    - A small percentage (2%) of tubewells are in low-lying areas, with one in a flooding area.

    Poorly sealed or missing platforms around tubewells or being located in floodplains could potentially increase the risk of the presence of E. coli in tubewells. Improving platform quality and ensuring proper site or protection of tubewells can significantly reduce contamination risks.
4. Drainage and Stagnation Risks
    - 28% of respondents report inadequate drainage, causing stagnant water around the tubewells.
5. Water Quality Test Monitoring
    - Only 16% of respondents have carried out water quality testing, out which 95% have done water quality testing before one month and remaining 5% carried out water quality testing within one month.

- 71% of respondents who tested, 14% detected E. coli. in their water and used various preventive measures (e.g., chlorination, drilling new tubewells, or using neighbors' sources) presented in figure 13 below.

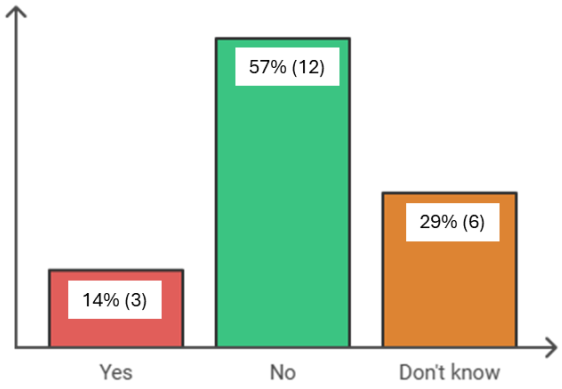


Figure 12: Water quality test and E.coli. presence

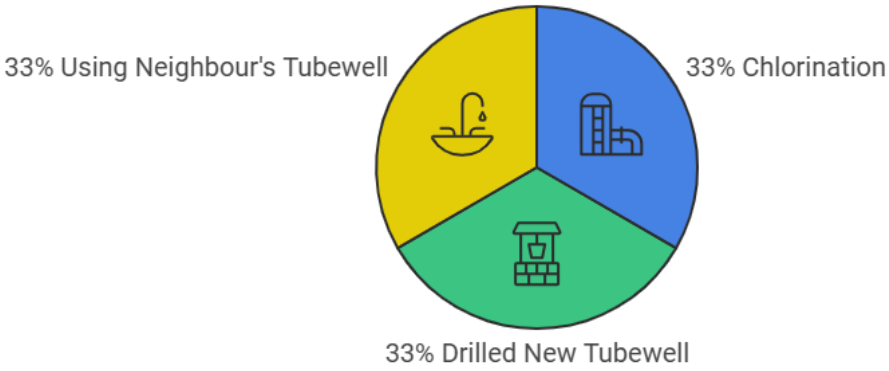


Figure 13: Methods adopted for safe water, in the case of E.coli. presence

6. Potential Pollution Sources

- 42% of tubewells have sanitation infrastructure (e.g., latrines, septic tanks) within 15 meters.
- 15% report other pollution risks within the same distance, such as open defecation or livestock activity.

Technical Recommendation

Based on the findings, water quality test results and sanitary inspection carried out, the following priority areas and actions steps are recommended to improve the safety, accessibility, and quality of groundwater by addressing structural, sanitation, and monitoring challenges identified through the survey

1. Priority Areas

i. Sanitation Risks

- Tubewells with sanitation infrastructure within 15 meters (42%).

- Tubewells near other pollution sources like livestock, open defecation, or debris (15%).

ii. Structural Concerns

- Tubewells lacking tight platforms to prevent seepage (35%).
- Areas with stagnant water due to inadequate drainage (28%).

iii. Water Quality

- Low water testing frequency (16% tested).
- E. coli contamination detected in some samples tested (14%).

2. Action Steps

A. Immediate Interventions (up to 3 months)

A1. Enter data into NWASH MIS

- When water quality data (E. coli results) is entered into NWASH MIS, it will provide a real time overview of groundwater safety across wards and municipality.
- This real time overview will help engineers, public health and planners in the municipality identify i) sources which are safe or unsafe, ii) contamination hotspots area located, iii) urgent mitigation measures such as chlorination or switching sources are required.

A2. Address Sanitation Risks

- Mapping and Relocation:
  - Map all tubewells with sanitation infrastructure within 15 meters.
  - Relocate or enhance infrastructure to meet safe buffer zone standards.
- Community Engagement:
  - Educate residents on maintaining sanitation around water sources from possible activities such as open defecation, cattle stalling, drainage etc.
  - Promote sanitation practices like proper latrine maintenance.
  - Information to users on the use of water from E. coli free tubewell.
  - Promote point of use of household drinking water treatment system, for e.g. boiling, safe storage where E. coli free water is not available.

A3. Improve Structural Integrity

- Platform Upgrades:
  - Provide financial or technical assistance for constructing tight, impermeable platforms.

- Drainage Systems:
    - Install or repair drainage channels around tubewells prone to stagnation.

B. Medium-Term Actions (4 – 12 Months)

B1. Water Quality Testing Campaign

- Testing Campaign:
    - Organize biannual water quality testing campaigns targeting E. coli, nitrates, and heavy metals.
- Awareness and Support:
    - Train community members on simple water testing kits.

B2. Policy Development

- Sanitation Buffer Regulations:
    - Develop guidelines for safe distances of sanitation infrastructure from water sources (30 meters).
- Flood-Prone Areas:
    - Identify tubewells in low-lying or flood-prone areas for potential elevation or replacement.

C. Long-Term Goals (1 – 2 Years)

C1. Groundwater Monitoring System

- Establish a database to record and monitor water quality, tubewell conditions, and compliance with standards.

C2. Infrastructure Investment

- Secure funding for comprehensive sanitation and groundwater safety programmes through partnerships with government and NGOs.

C3. Advocacy and Scaling Up

- Advocate for stricter enforcement of groundwater safety standards in regional and national policies.

4. Timeline

Activity	**Timeline**	**Responsible**
Community awareness campaigns	Immediate (0–3 months)	Municipality & NGOs
Data entry into NWASH MIS	Immediate (0–3 months)	Municipality

Platform and drainage improvements	3–6 months	Municipality & local community
Biannual water testing campaign	Start after 3 months	Municipality, Water quality testing lab
Policy development and enforcement	After 12 months	Municipality & regulatory bodies
Groundwater monitoring database	After 12 months	Municipality IT/Water Dept.

5. Stakeholders and Resources

5.1 Stakeholders

- Municipality staff.
- Local communities.
- NGOs focused on water and sanitation.
- Health departments for water quality testing.

5.2 Resources Needed

- Testing kits and training.
- Funds for infrastructure upgrades.
- Technical expertise for monitoring and database management.

6. Monitoring and Evaluation

1. Indicators for Success
    - Reduction in the number of tubewells near sanitation or pollution sources.
    - Increase in the percentage of tested and treated tubewells.
    - Reduction in reported contamination cases (e.g., E. coli presence).
2. Evaluation Schedule
    - Quarterly reviews of progress.
    - Annual reporting on groundwater quality trends.