MONITORING SAFELY MANAGED ON-SITESANITATION (M-SMOSS)

MALAWI PILOT PROJECT FINDINGS

2025

NATIONAL STATISTICAL OFFICE OF MALAWI

EXECUTIVE SUMMARY

Background

The monitoring safely managed on-site sanitation (M-SMOSS) pilot in Malawi tested methods to assess sanitation across the service chain that could be integrated into ongoing national monitoring. The pilot was conducted by the National Statistics Office in collaboration with UNICEF, WHO, sector ministries and other stakeholders, and included household surveys, service provider and service authority surveys in three cities and three districts. Using a stratified multi-stage sampling design, the survey interviewed 2,160 households, 40 service providers, and 4 service authorities. Data collection employed structured questionnaires adapted from JMP-SMOSS templates, translated into Chichewa and Tumbuka, and administered via Computer-Assisted Personal Interviewing (CAPI). Rigorous training, piloting, and ethical safeguards ensured data quality and respondent protection.

The M-SMOSS pilot survey findings highlight critical gaps across the sanitation service chain—from access to basic sanitation to the safe treatment of human waste. Despite progress made in expanding access to improved sanitation, systemic challenges such as high toilet sharing, low access to emptying services, and insufficient treatment infrastructure continue to pose serious risks to public health and environmental safety in the country.

Key Findings

- **Access to Basic Sanitation**: While over 89.3% of households use improved sanitation facilities, only 50.8% have access to basic sanitation due to widespread toilet sharing—especially in urban areas, where 48% of households share toilets. Open defecation persists in rural areas (11.4%) and among the poorest households. Access to toilets is highly unequal, with 78% of the wealthiest households having their own, compared to just 18% of the poorest.
- **Waste Containment**: Over 99% of septic tanks and pit systems show safe containment, with limited structural issues and unsafe discharges observed.
- **Emptying and Transportation**: Sludge emptying is rare—only 10% of septic tank users and 3% of pit latrine users have ever emptied their systems, a total of 3.8% of all improved OSS. In rural areas, services are unavailable, leading households abandoning full pits and reconstructing new toilets or resorting to open defecation. Urban barriers to seeking pit emptying services include high costs, limited access, and a shortage of trained service providers. Public awareness is low, with only 21.2% of households aware of available pit emptying services.

- **Treatment and Disposal**: Less than half (39%) of emptied waste is safely treated, with only 48% of emptied sludge delivered to treatment and half of the treatment plants not providing adequate treatment. Rural areas lack treatment facilities entirely, while many treatment plants in urban areas are dilapidated, overstretched and not designed for fecal sludge. Weak monitoring and regulation make it difficult to track waste treatment outcomes.
- **Service Providers**: Almost all emptying is done by service providers (both formal and informal) , and over 13 percent of excreta emptied by service providers was reported by households to be disposed unsafely to the environment. The emptying and transport service provider ecosystem is underdeveloped and unevenly distributed, with limited services for many rural and poor urban populations. The sector remains largely informal and under-resourced, facing numerous operational and safety challenges that hinder effective service delivery. More than 60% of service providers have no formal training in safe emptying practices. Additionally, half of them do not use basic protective gear such as gloves or boots, leaving them exposed to health risks. Most service providers operate with minimal oversight and regulations.
- **Service Authorities**: Service authorities face systemic challenges including limited financing, inadequate staffing/limited skills, lack of tools, and weak legal mandates. Monitoring and data tracking systems for service quality and coverage remain underdeveloped.

Lessons Learned

- Sanitation progress must address the full service chain—not just toilet construction.
- Urban sanitation requires infrastructure innovations to minimize toilet sharing.
- Regular maintenance and inspections are essential to sustain safely managed sanitation.
- Equity must be central: poorer, rural, and less educated populations need targeted sanitation support.
- Urban town planning must integrate sanitation designs and regulations, especially in informal settlements.
- Strong, well-resourced service authorities are critical for oversight in SMOSS.

Strategic Recommendations

- Expand access to private and improved toilets for low-income and rural households through affordable, space-efficient technologies and targeted subsidies.
- Promote safe waste containment by undertaking routine surveillance and enforcing safety standards.
- Strengthen pit emptying services by training providers, subsidizing costs, and increasing public awareness.
- Invest in fecal sludge treatment infrastructure, especially in underserved areas of urban and rural areas.
- Build institutional capacity at local levels to regulate, monitor, and coordinate sanitation services effectively.

Monitoring of SMOSS Recommendations

1. Policy and Institutional Integration

- Develop and adopt national-level indicators for Safely Managed On-Site Sanitation (SMOSS) and integrate them into the National WASH Monitoring Framework under the leadership of the Ministry of Water and Sanitation and relevant government agencies.
- Incorporate SMOSS indicators into national WASH coordination mechanisms, including the Sanitation and Hygiene Technical Working Group (TWG), Sector Working Group (SWG), Joint Sector Reviews (JSRs), and Annual WASH Sector Performance Reports (SPR).

2. Integration into the Existing Surveys

- Develop a roadmap for integrating SMOSS indicators into national household surveys, such as the Multiple Indicator Cluster Survey (MICS), Demographic and Health Survey (DHS), and Integrated Household Surveys (IHS).
- Review and define SMOSS indicators for annual reporting at the service authority level, ensuring consistency and comparability across local authorities.

3. Service Provider Monitoring and Regulation

- Standardize and harmonize reporting indicators for service providers (e.g., emptying, transport, treatment) to be submitted periodically to local authorities as part of their service level agreements.
- Strengthen local authority oversight by enhancing systems for registration, licensing, and monitoring of service providers, including mechanisms to detect and address illegal waste dumping.

4. Capacity Building and Systems Strengthening

- Enhance local authority capacity for SMOSS monitoring through targeted training, and development of digital monitoring and data management systems to track waste along the sanitation value chain.
- Digitize record-keeping systems for service providers and treatment facilities to improve traceability and accountability in waste management.

5. Regulatory and Enforcement Mechanisms

- Review and update the regulatory framework to mandate agencies to report SMOSS indicators across the sanitation service chain, with clear enforcement mechanisms.
- Invest in laboratory infrastructure at sludge treatment facilities to enable regular monitoring of effluent quality and compliance with national environmental standards and regulations.

Conclusion

Malawi has made commendable progress in improving toilet access. However, with levels of toilet sharing and without regular emptying, and effective treatment, public health and environmental risks remain high. A holistic, equity-driven approach is essential to achieving safely managed sanitation and meeting SDG target 6.2.

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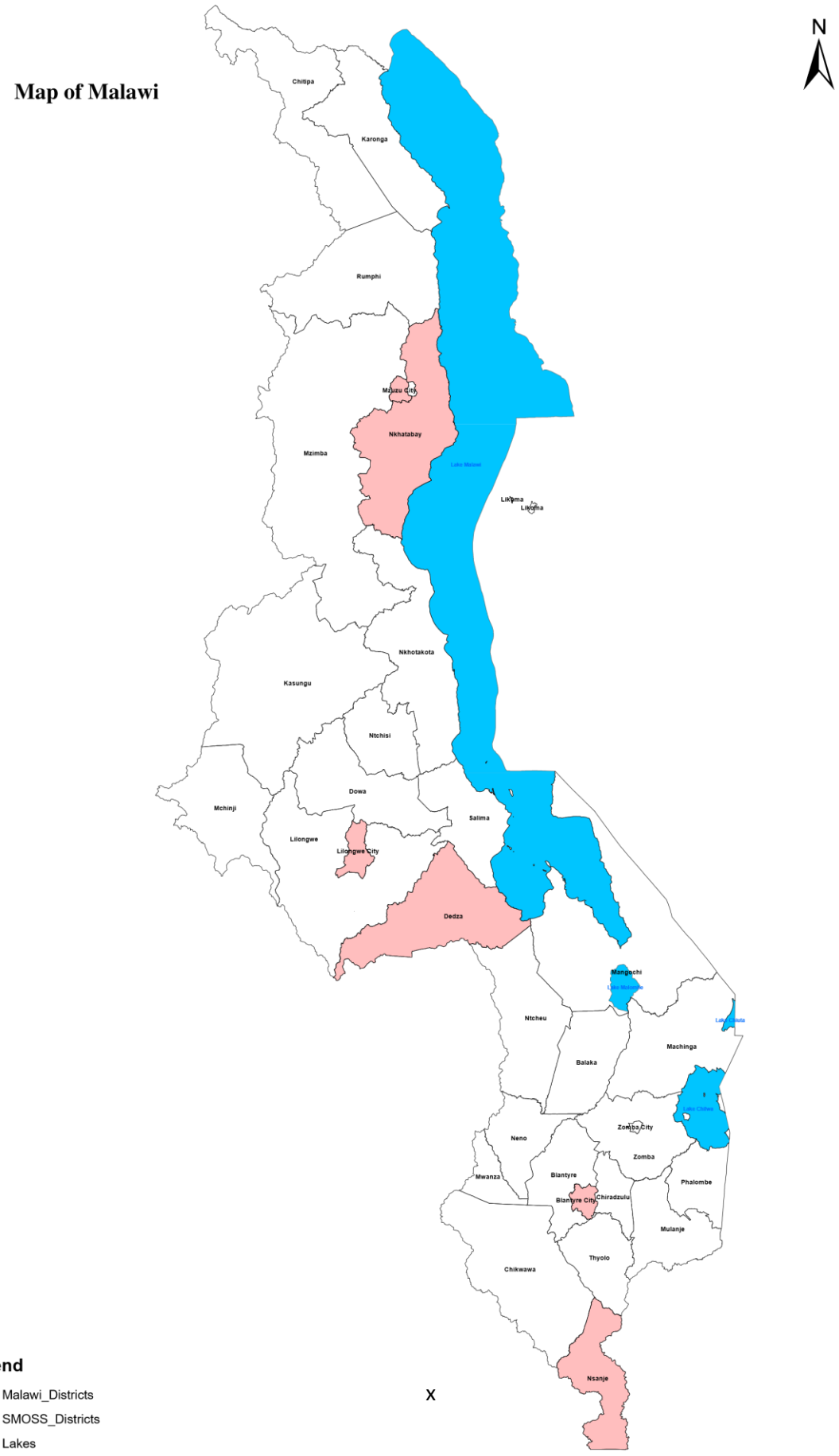
ACRONYMS

M-SMOSS	Monitoring-Safely Managed On-site Sanitation
JMP	Joint Monitoring Programme
WHO	World Health Organization
UNICEF	United Nations International Children's Emergency Fund
NSO	National Statistical Office
SDG	Sustainable Development Goals
BMGF	Bill & Melinda Gates Foundation
UN	United Nations
TWG	Technical Working Group
WASH	Water, Sanitation, and hygiene
MICS	Multiple Indicator Cluster Survey
MDU	Mobile desludging units
MPE	Manual Pit Emptier
FSTP	Faecal Sludge Treatment Plant
WWTP	Waste Water Treatment Plant
VIP	Ventilated Improved Pit Latrine
VTO	Vacuum Tanker Operator
DHIS	District Health Information System
M&E	Monitoring and Evaluation
NGO	Non-Governmental Organization
EMIS	Education Management Information System
MDA	Ministries, Departments and Agencies
CAPI	Computer-Assisted Personal Interviewing
MoH	Ministry of Health
MoWS	Ministry of Water and Sanitation
COD	Chemical Oxygen Demand

Map of Malawi



CHAPTER 1

1.1 M-SMOSS PROJECT BACKGROUND

Through the Joint Monitoring Programme (JMP) for Water Supply, Sanitation and Hygiene, WHO and UNICEF are global custodian agencies for the monitoring of Sustainable Development Goals (SDG) targets 6.1 and 6.2, which call for universal access to safe and affordable drinking water and sanitation services for all by 2030. For SDG indicator 6.2.1a on the "Proportion of population using safely managed sanitation services", there remains a large data gap on the safe management of on-site sanitation systems (pit latrines and septic tanks). This is assessed across all steps of the sanitation service chain, including faecal sludge emptying, transport, and treatment, requiring data sources in addition to household surveys to inform estimates. Since 2019 the JMP, with support from the Bill & Melinda Gates Foundation (BMGF), has been supporting 10 countries to develop or refine tools and methods for monitoring safely managed on-site sanitation (SMOSS) to develop a harmonized set of indicators, tools, and methods that other countries can use.

In each pilot country, WHO or UNICEF staff work with national stakeholders to identify approaches to strengthen national monitoring systems for tracking on-site sanitation. Once current monitoring and data gaps are identified, the pilots tested new methods and tools to improve data collection in alignment with both global definitions of safely managed sanitation and any national or local indicators or standards. The pilot aims to provide inputs to improve how national monitoring systems can regularly assess SMOSS, pre-test tools that could potentially be scaled up or integrated into existing monitoring systems and contribute findings and methods to improve monitoring of SMOSS globally.

1.2 GOVERNANCE STRUCTURES FOR M-SMOSS IMPLEMENTATION

To ensure effective implementation, oversight, and coordination of the Monitoring-Safely Managed On-site Sanitation (M-SMOSS) project, a National Steering Committee was established at the national level. The structure facilitated collaboration among stakeholders, promoted data ownership, and ensured alignment with both global standards and national priorities.

1.2.1 National Steering Committee

The Steering Committee played a central role in guiding the overall direction of the M-SMOSS initiative and provided essential technical expertise to ensure the success of the pilot project. Key responsibilities and features included:

Composition: Chaired by UNICEF, the committee comprised representatives from Ministry of Water and Sanitation, Ministry of Health, WHO and UNICEF.

- **Responsibilities:**
    - Approving survey plans and budgets to ensure alignment with project objectives.
    - Addressing ethical considerations and ensuring compliance with international standards.
    - Facilitating resource mobilization and fostering national data ownership.
    - Advising on technical aspects such as data needs, sampling methodologies, and survey design.
    - Review questionnaires to ensure they align with ethical and methodological standards.
    - Guiding fieldwork processes, including interviewer training and logistical support.

1.3 IMPLEMENTATION STRUCTURE

A framework was put in place to manage the operational aspects of the implementation of the survey:

- **Leadership:** The NSO took primary responsibility for managing the survey process and ensuring adherence to high-quality data collection standards.
- **Team Composition:**
    - Teams comprising of interviewers, supervisors, and data managers, were formed to oversee survey execution and data management.
    - Fieldwork training was conducted to equip teams with the necessary skills and knowledge.
- **Support:**
    - UNICEF provided additional technical support through a Planning and Monitoring Specialist and a WASH Officer, who assisted throughout the process, from planning to dissemination of results.

1.4 CURRENT STATUS OF ON-SITE SANITATION

BASIC SANITATION

According to the 2019-2020 Malawi Multiple Indicator Cluster Survey (MICS6), 80.1 percent of households in Malawi were using improved sanitation facilities. The disparity between urban and rural areas was notable, with 91.9 percent of urban households using improved sanitation facilities compared to 77.9 percent in rural households. Use of basic sanitation facilities, which are improved sanitation that are not shared with other households was 45.8 percent, with 34.2 percent of the population using improved facilities that are shared, labelled 'limited' sanitation. Sharing was more common in urban areas (49 percent of the population) than in rural areas (31.4 percent).

For on-site sanitation, 79.8 percent of households in Malawi were using improved on-site sanitation facilities, with only 0.3 percent using piped sewer systems. In urban areas, 91.4 percent of households utilized improved on-site sanitation facilities, while in rural areas, this figure was slightly lower at 77.6 percent. Improved on-site sanitation facilities are predominately pit latrines with slabs (74.1 percent of the population), 3.3 percent used ventilated improved pit latrines, 2.0 percent used septic tanks, and 0.3 percent used composting toilets. The previous surveys did not capture any information on the status of containment of on-site systems.

1.5 EMPTYING AND TRANSPORTATION

The MICS 2019 survey also captured data on emptying and removal of excreta from on-site sanitation, with only 1.3 percent of households with improved on-site sanitation facilities reporting to have previously emptied their onsite facility, with 97.4 percent never emptied and 1.2 percent didn't know. Regarding removal and disposal of emptied excreta, 0.5 percent of the population reported removal by a service provider, while 0.3 buried emptied excreta in a covered pit and 0.3 percent disposed off to an uncovered pit, open ground or waterbody. The emptying and transport of on-site sanitation waste in Malawi can be divided into three types of service providers: 1) vacuum tanker operators; 2) Mobile Desludging Unit; and 3) Manual Pit Emptier, with differences depending on the two main types of containment: pit latrines and septic tanks. Below is a summary of these services based on information shared by the local authorities and relevant ministries.

1.5.1 Vacuum Tank Operators / Honeysuckers

Vacuum Tanker Operators (VTOs) (or 'Honeysuckers') focus exclusively on septic tanks. VTOs mainly focus on institutional and household customers. According to available information from the Minister of Water and

Sanitation (MoWS), there are at least 17 privately operated Honeysuckers performing FS E&T services in Malawi. Tankers find it difficult to reach sanitation facilities in high density areas or to empty containments with more than 1-3% solid waste and the increased effort required to complete these services is not balanced by the prices that these customers are willing and able to pay. The honeysuckers currently operating in the country transport 3 to 8 m^3 of septage/faecal sludge per trip to the disposal site. Operators may undertake up to five emptying jobs per day depending on the distance of the customer from the final disposal site.

1.5.2 Mobile desludging units

Mobile desludging units (MDUs), are versatile, mechanized emptying machines that are mounted on a flatbed lorry and can serve both septic tanks and lined pit latrines. According to MoWS, here are currently 5 MDUs in Malawi. MDUs can handle faecal sludge from pit latrines which has up to 15% solid waste content. MDUs can do up to eight emptying trips per day, depending on the characteristics of the waste being removed. Access to the sanitation facility can also be an issue for MDUs, since they are mounted on flatbed trucks and are unable to enter many informal, high-density settlements where roads are narrow and unpaved. Additionally, MDUs can only transport 1 m^3 of sludge at a time which means they need to do multiple trips to the disposal site to complete a single emptying job. This increases operator costs for fuel and disposal fees. These costs are ultimately passed on to customers.

1.5.3 Manual Pit Emptier with Gulpers

Over 70% of the population in Malawian cities resides in high-density, informal settlements that have either limited or no road access, these households rely on manual pit emptiers (MPE) with gulpers (i.e. manual pumps) for faecal sludge removal from onsite containment units. These MPEs primarily serve the lower-income sanitation market. MPE customers have pit latrines, and the majority live in the informal, high-density areas of the city. MPEs can also be divided into two groups, namely formal and informal groups. The formal groups are the ones known and registered with the local authorities whilst the informal ones operate on their own without any training, guidance or registration by the city authorities. The informal groups include those known as frog men who dive into the pits without any formal protective wear and usually bury sludge near the latrine As per the information from Ministry of Water and Sanitation, MPEs find it difficult to empty sludge with a high solid waste fraction, and the volume of sludge that can be removed per hour is much less than the Honeysuckers and MDUs. Formal MPEs pump sludge from latrines into 200L drums and charge clients for each drum removed. Usually, the smallest job accepted is the removal of 5 drums equivalent to 1m^3. There are Pit Emptiers Associations in Blantyre and Lilongwe districts that coordinate pit and septic tank

emptying services. Service providers prefer to empty as much sludge volume as possible per trip to maximize their margins. The formal MPEs also pay some dumping fees to the local authorities as opposed to the informal ones.

1.6 TREATMENT AND DISPOSAL SYSTEMS.

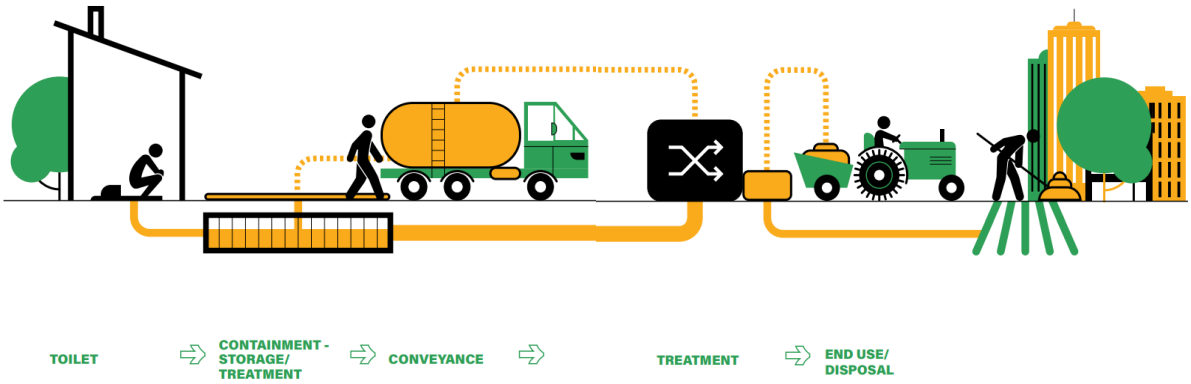
In Malawi, a few cities and towns have conventional sewerage networks. In addition to this, very few households are connected to the sewer, and the rest use on site sanitation systems. For instance, in Lilongwe, only 9% are connected to sewer whilst 71% use latrines and 20% are connected to septic tanks. Similarly, in Blantyre 16% of the households are connected to sewers while 59% and 25% of the households use pit latrines and septic tanks respectively. Due to the absence of dedicated Fecal Sludge Treatment Plants (FSTPs), sludge emptied from septic tanks and pit latrines is disposed off in some of the existing conventional wastewater treatment plants within the cities. There are six main public and private wastewater treatment plants (WWTPs) in Lilongwe city, namely, Cold Storage WWTP, Kauma WWTP, Kanengo WWTP, Kamuzu Barracks WWTP, Lumbadzi WWTP, and KIA WWTP. Kauma WWTP is the only public facility which is connected to household sewers open to the public to dump sludge from on-site sanitation (OSS). In Blantyre, there are 5 public wastewater treatment plants which include: Soche WWTP, Blantyre WWTP, Limbe WWTP, Chirimba WWTP, and Maone WWTP. In Blantyre city, Limbe, Soche and Chilimba WWTPs are sometimes open for dumping of sludge from on site sanitation systems. In Mzuzu there is 1 FSTP whilst in Nkhatabay there is one WWTP which also handles sludge from on-site sanitation. The rest of the districts including Nsanje and Dedza do not have any public wastewater or sludge treatment plans.

CHAPTER 2

2.1 EXISTING DATA AND MONITORING

Safely managed on site sanitation (SMOSS) is generally monitored through estimates from household surveys that contain information on toilet facilities, and emptying conducted by the National Statistical Office. Additional administrative data on toilets in collected through Districts Health Information System2 by the Ministry of Health, M-water platforms, and Malawi Water Access Management Information Systems (MWAMIS) by Ministry of Water and Sanitation, Education Management Information System (EMIS) by Ministry of Education and Local Authorities. The section below summarizes available data and monitoring gaps.

Figure 1: Sanitation Service Chain for On-Site Sanitation



2.2 RESPONSIBILITIES AND REGULATIONS FOR MONITORING SMOSS

The Malawi Constitution guides the government to 'provide adequate health care, commensurate with the health needs of Malawian society and international standards of health care.' These health needs include proper sanitation and hygiene facilities that promote the right to health by limiting exposure to diseases. Regarding environmental protection, the Constitution guides the government to 'provide a healthy living and working environment for the people of Malawi.' A healthy living and working environment again include the availability of good sanitation and hygiene facilities that result in clean environment. In line with the above constitutional powers, Malawi Government provides guidance on standards on the management of safely managed onsite sanitation (SMOSS) services. The government uses several Acts of Parliament and relevant policies as a means of regulating required SMOSS services.

Key policies and legislation guiding management and operations of SMOSS in Malawi include Guidelines for the Design, Operations and Maintenance of Waste Stabilization Ponds in Malawi (2012),Waterworks Act (1995) , Water Resources Act (2013), National Water Policy 2023, National Sanitation Policy (2008), Local Government, Act (1998) , Public Health Act (1948), and quality standards guided nationally by the Malawi Bureau of Standards (MBS MS539:2002 and MS691:2005). International and regional standards and guidelines such as World Health Organization (WHO) may also apply to complement the national standards. The legislation and policy mandate ministries and departments responsible for, sanitation, and public health to manage, monitor the development of water resources, utilization, and safe disposal of liquid waste among others to protect the environment. There are several players who are involved in oversight and monitoring of safely managed on-site sanitation as described below:

2.2.1 Ministry of Health

The Ministry of Health uses the Public Health Act, CAP 34:01 to regulate the management of latrines (CAP34:01 Sections 87-92). The Ministry of Health also provides enforcement on conveyance, sewerage, and drainage management as provided for in CAP 34:01 Sections 78-86 to ensure compliance with wastewater and sludge containment, transportation, treatment, and disposal standards that prohibit causation of nuisance in the environment. In line with these provisions, the ministry utilizes DHIS2 as a platform for monitoring health interventions.

DHIS2 is a free and open-source software-based highly configurable data collection, aggregation, management, and analysis tools that use a data source hierarchy to capture and report on health data from its source, up to and including well-structured, decision-supporting information. It is currently used in more than 30 countries around the world as a routine health management information system and data warehouse.

2.2.2 The Ministry of Water and Sanitation

Ministry of Water and Sanitation (MoWS) provides overall oversight on safely managed onsite sanitation services as a lead ministry in the sector. The Ministry is responsible for the provision of policy direction and coordination of sanitation to all sector programs through facilitation of the development of standards, guidelines and inspectorate for sanitation and hygiene. It is also responsible for promoting research and development on sanitation technologies and options and disseminating research through regular sanitation fora. Currently the ministry is in the process of developing mWater and MWAMIS platforms as well as consolidated M&E framework for the WASH sector in Malawi.

2.2.3 Ministry of Local Government

The Public Health Act puts an obligation on all local authorities to 'take all lawful, necessary and under its special circumstances reasonable and practicable measures for preventing the occurrence or dealing with any outbreak or prevalence of any infectious, communicable or preventable disease, to safeguard and promote the public health.' The Public Health Act states that the local authorities have an obligation to construct and maintain a public sewer on any chosen land and construct sewage disposal works on any customary land or public land or land acquired, or lawfully appropriated for purposes of sanitation and hygiene within the area of their jurisdiction. The Local Government Act (1998) also decentralized the WASH sector functions to the district councils and municipal or City councils. By powers conferred upon them under the act, they are responsible for the management of sanitation services on delegated powers at the district level on behalf of the government. They are responsible for planning and implementing sanitation interventions in addition to coordination and monitoring of WASH services. The District Monitoring and Evaluation (M&E) Office coordinates all M&E functions of the local authorities. The official collects information from different sectors to be used by the local authorities for planning and decision-making.

2.2.1 Ministry of Education

The Ministry of Education in line with the National Education Standards 2015 and National Education Policy of 2017 promotes the provision of safe drinking water and adequate sanitation in schools to ensure a conducive environment for learning. Under these provisions, they utilize the Education Management Information System (EMIS) platform that collects, analyzes, and shares school-based data to support education planning, budgeting, and management. The EMIS Report is prepared annually and shared with various government sectors and stakeholders.

2.2.2 National Statistical Office

NSO is mandated by the 2013 Statistical Act to collect, compile, analyze, abstract, publish, and disseminate official statistics of the country. This is achieved through the various surveys the institution and other MDAs conduct. The mandate allows NSO to collect information on, but not limited to, water undertakings and sanitary services, health, and the environment (Statistical Act, 2013). The table below summarizes the details

Table 2.1: Service Chain

Monitoring Mechanism	Responsible Institution	Data collection along the sanitation service chain for the onsite system					
		Toilet	Containment	Emptying	Transport	Treatment	Reuse
National Household Surveys	National Statistical Office	✓	X	✓	X	X	X
M-water platforms and MWaMIS	Ministry of Water and Sanitation	✓	X	X	X	X	X
Districts Health Information System 2	Ministry of Health	✓	X	X	X	X	X
Education Management Information system (EMIS)	Ministry of Education	✓	X	X	X	X	X
District Monitoring Database	Ministry of Local Government through Local Authorities	✓	X	X	X	X	X

2.3 GAPS AND CHALLENGES IN MONITORING SMOSS

Despite existing platforms and structures designed to generate data routinely for monitoring SMOSS, records are limited, particularly on containment, emptying, transportation, treatment and reuse.

Whilst the National Statistical Office (NSO) collects important data through surveys such as the MICS, DHS, this has often focused on toilet facilities leaving out other key components of the sanitation service chain including containment, transportation, treatment, and reuse.

Similarly, whilst DHIS2 captures data on toilets, it does not collect additional critical information related to the overall sanitation service chain, such as toilet sharing, emptying, transportation, treatment, and disposal or reuse of waste. This omission leaves substantial gaps in assessing coverage of SMOSS. The other challenge with DHIS2 is that data on toilets is not reported consistently across all districts of the country. The Ministry responsible for Local Government also collects some data on on-site sanitation, however they only collect information on latrines.

2.4 METHODOLOGY

This study employed a mixed-method approach by combining household surveys, service provider assessments, and institutional data collection. The methodology was designed to generate indicators to assess safely managed on-site sanitation.

2.4.1 Study design

The survey adopted a stratified two-stage cluster sampling approach to ensure representation across urban and rural areas in selected districts. The study domains comprised:

- Three cities: Blantyre, Lilongwe, and Mzuzu
- Three districts: Nkhata Bay, Dedza, and Nsanje

2.4.2 Sampling techniques

Household Survey Sampling

- Sampling frame: 2018 Malawi Population and Housing Census enumeration areas (EAs)
- Stratification: Urban/rural classification within each study domain
- Cluster selection: 12 EAs per domain selected with probability proportional to size (PPS)
- Household selection: 30 households systematically sampled per EA after listing Sample size: 2,160 households (360 per domain)

2.4.3 Sample coverage and characteristics of respondents

Table 3.1 shows sample implementation, including response rates. Of the 2,160 households sampled for the study, 2,146 were occupied. Of these, 2,145 were interviewed, indicating a response rate of 99.9 percent and a completion rate of 99.3 percent. Of the households interviewed, 1,195 were from urban areas and 950 were from rural areas. Overall response rates per domain were 100, 100, 100, 99.7, 100, and 100 for Blantyre City, Lilongwe City, Mzuzu City, and districts of Nkhata Bay, Dedza, and Nsanje respectively.

Table 2.2: **Coverage and characteristics of respondents**

	Total	Residence		District/City					
		Urban	Rural	Blantyre city	Lilongwe city	Mzuzu city	Nkhata Bay	Dedza	Nsanje
Sampled	2160	1200	960	360	360	360	360	360	360
Occupied	2146	1195	951	360	360	358	357	351	360

Interviewed	2145	1195	950	360	360	358	356	351	360
Household completion rate	99.3	99.6	99	100	100	99.4	98.9	97.5	100
Household response rate	99.9	100	99.9	100.0	100.0	100.0	99.7	100	100

2.4.3.1 Service Provider Sampling

Out of 92 targeted service providers, 40 were successfully interviewed. Some were reached but not available to give information, while others could not be reached since their companies ceased to operate. The following were inclusion criteria for service provider sampling:

- Population: All registered fecal sludge emptying service providers in study areas
- Inclusion: Vacuum tanker operators (VTOs), mobile desludging units (MDUs), and manual pit emptiers (MPEs)
- Census approach: Full enumeration attempted due to small population (N=92)
- Achieved sample: 40 service providers interviewed (43.5 percent coverage)

2.4.3.2 Service Authority Sampling

All 4 service authorities in the districts of Nkhata Bay, Dedza, Nsanje, and cities of Lilongwe, Mzuzu, and Blantyre were successfully interviewed.

2.4.4 Data Collection Instruments

The 2024 SMOSS survey employed the following three data collection tools:

- Household questionnaire: Covered facility type, containment, emptying practices, and user perceptions.
- Service provider survey: Assessed operational capacity, service areas, and challenges.
- Service authority interview: Examined regulatory frameworks and monitoring systems.

2.4.5 Field Implementation

- Training: 5-day intensive training for field teams, including mock interviews.
- Technology: Computer-Assisted Personal Interviewing (CAPI) using CSPro.
- Quality control: Daily data synchronization with central server; GPS verification of interview. locations; Photo documentation of sanitation facilities.
- Pilot testing: Conducted in Phalombe (households) and Zomba (service providers) districts.

2.4.6 Ethical Considerations

- Informed consent obtained from all participants.
- Anonymization of personal identifiers.
- Secure data storage protocols.

CHAPTER 3

3.1 DATA COLLECTION

The National Steering Committee agreed on key approaches to improve the data collection process. In addition to routine data collection approaches, the committee decided to conduct a study that included household, service providers, and service authority surveys in order to triangulate data collected from the sources. Also, enumerators conducted a sanitary inspection to check the condition of the facility and contamination. GPS and pictures of toilet facilities and containment were also taken as evidence of inspection.

The survey used a Computer-Assisted Personal Interviewing (CAPI) application developed in CSPro, which enabled controlled question flow, multiple translations, efficient data transmission to the central office, and GPS integration. All interviews were conducted face-to-face with household members and service providers or authority representatives.

The survey aimed to generate comparable indicators across countries on access to safe sanitation facilities, safely managed services, faecal sludge emptying from pits and septic tanks, transportation, treatment and disposal or reuse of sludge, and occupational health hazards.

Table 3.1: Data collection methods

Target	data collection methods	Tools Used	Purpose	Sample Size
Household	Household survey	Mobile-based app (CSPro)	Collect household-level data	2160 households
Service provider	Institution based Survey	Mobile-based app (CSPro)	Gather service delivery data	40 facilities
Service Authority	Institution-Based Survey	Mobile-based app (CSPro)	Gather service delivery data	4 Service Authorities

3.2 HOUSEHOLD QUESTIONNAIRES

The household survey aimed to capture data on access, use, and functionality of sanitation facilities, as well as the type of containment, emptying, and in-situ disposal/reuse practices at the household level. The survey

targeted regular households in the cities of Lilongwe, Blantyre, and Mzuzu and districts of Nkhata Bay, Dedza, and Nsanje.

The sample for the SMOSS was designed to provide estimates of indicators for the selected domains. Within each domain, 12 census enumeration areas were selected systematically with probability proportional to size. After household listing was carried out within the selected enumeration areas, a systematic sample of 30 households was drawn in each sample enumeration area. A total of 72 sample EAs and 2,160 households were selected. A more detailed description of the sample design can be found in Appendix A: Sample Design.

A team consisting of a supervisor and a maximum of 4 enumerators were deployed for data collection. A separate team of Senior officials from NSO, UNICEF, MoH, and MoWS supervised the fieldwork.

3.3 SERVICE PROVIDER SURVEYS

Service provider survey aimed to gather insights into the volume, areas of operation, data management, approaches, equipment, their roles in managing faecal sludge in both urban and rural areas, and challenges encountered in the process.

All 92 service providers involved in emptying, transporting, and treating faecal sludge in the cities of Lilongwe, Blantyre, and Mzuzu were considered for interviews. This decision was necessitated by a small number of service providers in the cities of interest.

A team setup and support similar to the household survey was employed under the service provider survey.

3.4 SERVICE AUTHORITY SURVEYS

Service authority survey focused on gathering information on the type of on-site sanitation systems, volume of wastewater and faecal sludge, areas of operation, licensing of service providers, data management, wastewater and faecal sludge treatment, their roles in managing faecal sludge and challenges encountered in the process.

All 4 service authorities were selected and interviewed. A team similar to that of the household survey was employed under the service authority survey.

3.5 TRAINING AND PRE-TESTING

The tools used in this survey were provided by UNICEF Headquarters' Joint Monitoring Programme (JMP) team on WASH and were then customized to Malawian settings.

The training for Field workers (enumerators and field supervisors) was conducted for 5 days. The training included face-to-face presentations on project background, interviewing techniques, contents of questionnaires, general field best practices and potential challenges in the field. Mock interviews between trainees were used to enhance practice and familiarization of the flow of questions. Participants were first trained using paper questionnaires followed by CAPI application.

Field workers gained a thorough understanding of the survey objectives, methodologies and ethical guidelines. The training ensured that all team members were well-prepared to conduct the survey. Field Supervisors attended additional training on the duties of team supervision and responsibilities.

Pretesting was done for 5 days in some selected enumeration areas in Phalombe and service providers in Zomba district. The exercise aimed at identifying any technical, methodological and logistical issues. The feedback was used to refine the survey tools and implementation processes to enhance the effectiveness and reliability of the outcomes.

3.6 DATA ANALYSIS APPROACH

During data collection, data was synchronized to the central server daily and checked for quality. Feedback was consistently provided to the teams for possible actions.

After completing fieldwork, data was cleaned and analyzed using Stata version 17, SPSS version 25 and R version 4.3. The final tables were then exported to excel.

CHAPTER 4

4.1 ACCESS TO BASIC SANITATION

Improved sanitation facilities are defined as those that hygienically separate human waste from human contact. Improved sanitation includes flush or pour-flush to piped sewer systems, septic tank pit latrines, ventilated-improved pit latrines, or pit latrines with slab or composting toilets. Shared or public-use sanitation facilities are not considered to be improved (WHO, 2024).

In the 2024 SMOSS, 89.3 percent of the households had access to improved sanitation facilities, 5.3 percent of the households were using unimproved sanitation facilities, and 5.4 percent practiced open defecation.

The data highlights lower disparities in access to improved sanitation facilities among selected cities in Malawi. Blantyre had the highest percentage of households with access to improved sanitation facilities (98.3 percent) followed by Lilongwe (92.2 percent) and Mzuzu (88.8 percent). A comparison across districts showed that households in Nsanje had the highest access to improved facilities at 91.4 percent, followed by Dedza at 84.6 percent and Nkhata Bay at 80.3 percent.

From the sampled households using improved sanitation facilities, 73.1 percent were using single pit latrines with slabs, 5.7 percent were using twin pit latrines with slab, and 1.4 percent were using ventilated improved (VIP) pit latrine with slab. Households using flush toilets included 8.8 percent using flush-to-septic tanks, and 0.2 using flush-to-pit/cesspool sanitation facilities. Based on residence, it was noted that people in urban and rural areas use mainly improved single-pit latrines with slabs at 68.3 percent and 79.1 percent respectively. The M-SMOSS pilot survey found that whilst 89.3 percent of households in Malawi used improved sanitation facilities, only 50.2% qualified for basic sanitation—defined as improved toilets that are not shared with other households. Results show that there is widespread reliance on shared toilets (39.0%). While improved in structure, these shared facilities do not qualify as basic because of their communal nature. Thus, despite the high overall coverage of improved sanitation, lesser proportion of households in the country benefit from private, unshared sanitation options that meet the SDG 6.2.1(a) standard.

Shared sanitation is especially prevalent in urban areas, where 45% of households share toilets, compared to 31% in rural areas. In cities like Blantyre (58%) and Lilongwe (46%), shared use is common due to overcrowding, land constraints, and housing arrangements such as rented compounds or informal settlements. In contrast, rural districts like Dedza (26%) and Nkhata Bay (24%) have lower sharing rates. As a result, basic sanitation coverage is higher in rural areas (53%) than in urban areas (48%).

From a district-level perspective, Dedza (59%) and Nkhata Bay (56%) have the highest basic sanitation coverage, while Nsanje (41.7%) and Blantyre (40%) lag behind, with lower coverage as a result of higher rates of shared sanitation.

Wealth strongly influences access to sanitation. Among the wealthiest households (WQ5), 77.8% have access to private sanitation facilities, dropping to 60.5% in WQ4, 45.3% in WQ3, 29.2% in WQ2, and just 18.1% in the poorest quintile (WQ1). These figures underscore the role of income in affording construction, upgrades, and maintenance of private sanitation systems. Poorer households face both financial and logistical barriers, which often force them to depend on shared or unimproved sanitation solutions that compromise their dignity, privacy, and safety.

Alongside income, education level of the household head emerged as a key factor. Only 22.4% of households where the head had no formal education accessed basic sanitation, compared to 43.5% among those with primary education, 60.4% with secondary education, and 82.1% among households where the head had tertiary education. These findings underscore the compounding disadvantage faced by poor and less educated households, who not only have fewer financial resources but may also lack the knowledge or confidence to invest in or demand better sanitation solutions. The result is a deeply inequitable landscape where access to clean, safe, and dignified sanitation is closely tied to both economic means and educational attainment. Conversely, reliance on shared increases among the poor. Over 52.8% of WQ2 households and 41.6% of WQ1 rely on shared facilities. These disparities highlight how socioeconomic status and urban density constrain access to basic sanitation, with poorer and urban communities disproportionately affected.

Shared (limited) sanitation falls short in safety, cleanliness, and privacy, particularly for women and girls—especially at night. Often driven by necessity rather than choice, shared toilets frequently suffer from poor maintenance.

Table 4.1: Percentage of households using improved sanitation facilities.

	Improved	Unimproved	Open defecation (no facility, bush, field)	Number of households
Malawi	89.3	5.3	5.4	2145
Residence				
Urban	93.1	6.3	0.7	1195
Rural	84.6	4.0	11.4	950
NkhataBay	80.3	7.6	12.1	356
Mzuzu	88.8	10.9	0.3	358
Dedza	84.6	3.1	12.3	351
Lilongwe	92.2	7.8	0.0	360
Nsanje	91.4	1.7	6.9	360
Blantyre	98.3	0.6	1.1	360

Table 4.2 : Types of Improved Sanitation Facility

	Flush/Pour flush to:				Pit latrine with slab			Composting toilet	Number of households
	Piped sewer system	Septic tank	Pit/ cesspool	DK where	Ventilated improved (VIP)	Single	Twin		
Malawi	0	8.8	0.2	0	1.4	73.1	5.7	0.1	1916
Residence									
Urban	0	15	0.4	0.1	1.9	68.3	7.2	0.2	1112
Rural	0.1	0.9	0	0	0.7	79.1	3.8	0	804
NkhataBay	0.3	2.8	0	0	2	69.9	5.3	0	286
Mzuzu	0	26.8	0	0.3	0	53.9	7.8	0	318
Dedza	0	0.6	0	0	0.3	80.6	3.1	0	297
Lilongwe	0	11.7	1.1	0	3.6	65	10.6	0.3	332
Nsanje	0	0.3	0	0	0	87.8	3.3	0	329
Blantyre	0	10.3	0.3	0	2.5	81.1	3.9	0.3	354
Education level of head									
None/Pre-school	0	0.8	0.4	0	1.2	75.7	4	0	206
Primary education	0	1.8	0.4	0.1	1.1	78.1	5.7	0	862
Secondary education	0.1	10.6	0	0	2.1	71.4	7.4	0.3	618
University	0	58.2	0	0	0.7	38.3	1.4	0	139
Other tertiary	0	16.7	0	0	2.8	66.7	11.1	0	35
Don`t Know	0	15.8	0	0	0	82.5	0	0	56
Household ownership									
Rented	0	11.8	0.2	0	1.3	72.4	6.5	0.2	509
Owned	0	7.6	0.3	0.1	1.3	73.3	5.7	0.1	1307
Institutional house	3.1	21.9	0	0	12.5	56.3	3.1	0	31
Family/friend	0	2.5	0	0	0	80.2	1.2	0	68
Other	0	100	0	0	0	0	0	0	1
Economic status of head									
Employer	0	21.4	0	0	7.1	57.1	7.1	0	13

	Flush/Pour flush to:				Pit latrine with slab			Composting toilet	Number of households
	Piped sewer system	Septic tank	Pit/ cesspool	DK where	Ventilated improved (VIP)	Single	Twin		
Own-Account worker/self employed	0	5.1	0.2	0.1	0.9	76.9	4.7	0	1251
Employee-Public Service	0	38	0	0	3.6	46	8.8	0.7	133
Employee-Private Sector	0.3	14.9	0.7	0	1.4	69.5	7.8	0.3	280
Unpaid Family Worker	0	8.6	0	0	1.9	64.8	9.5	0	89
Other (Specify)	0	4.1	0	0	2.9	75.4	5.3	0	150

Table 4.3: Percentage of households using basic sanitation facilities

	Users of improved sanitation facilities				Number of household population using improved sanitation (shared and not shared)	Users of unimproved sanitation facilities				Open defecation (no facility, bush, field)	Total number Improved, Unimproved and Open defecation	Percentage using at least basic sanitation services	
	Shared - known households	Shared - General public	Shared Total	Not shared		Shared - known households	Shared - General public	Not shared	Shared Total			Percent	Number of households
Total	37.8	1.3	39.0	50.2	1916	2.3	0.3	2.7	2.6	5.4	2146	50,2	1078
Residence													
Urban	43.4	1.8	45.3	47.8	1112	3.4	0.3	2.6	3.7	0.7	1195	47,8	571
Rural	30.7	0.5	31.2	53.3	804	0.9	0.3	2.7	1.3	11.4	951	53,3	507
NkhataBay	23.5	0.3	23.8	56.3	286	1.1	0.8	5.6	2.0	12.0	357	56,3	201
Mzuzu	29.1	1.7	30.7	58.1	318	5.6	0.3	5.0	5.9	0.3	358	58,1	208
Dedza	25.4	0.3	25.6	59.0	297	1.4	0.0	1.7	1.4	12.3	351	59,0	207
Lilongwe	44.7	1.1	45.8	46.4	332	4.4	0.6	2.8	5.0	0.0	360	46,4	167
Nsanje	48.1	1.7	49.7	41.7	329	0.8	0.0	0.8	0.8	6.9	360	41,7	150
Blantyre	55.6	2.5	58.1	40.3	354	0.6	0.0	0.0	0.6	1.1	360	40,3	145

4.2 UNIMPROVED SANITATION

Table 5.3 presents the estimates of households using unimproved sanitation facilities. Overall, 4.9% of the households sampled rely on unimproved sanitation, primarily pit latrines without slabs or proper lining. Rural areas account for most of these cases (3.1%), with the remaining concentrated in peri-urban and rapidly urbanizing districts like Mzuzu (10.9%) and Nkhata Bay (7.6%) where steep terrain and unstable soils make it difficult to build and maintain proper latrines. Other districts exhibit lower proportions, such as Blantyre (0.6%), Dedza (3.1%), Nsanje (1.7%), and Lilongwe (7.8%). These figures show that both urban and rural areas face sanitation challenges, but local geographical and infrastructural conditions often determine the degree of access.

Households led by individuals with lower education levels are disproportionately affected. Households led by individuals with lower levels of education are significantly more likely to use unimproved sanitation. Among households headed by someone with no formal education, the prevalence of unimproved sanitation is 16.8%. This figure drops to 5.2% for those with primary education, 1.4% for secondary, and just 0.2% for tertiary-educated household heads. Education influences not only income levels but also awareness of hygiene and the importance of safe sanitation. Educated household heads are more likely to invest in proper toilet construction, seek support services, and adopt safer hygiene practices, contributing to improved household health.

Wealth is another strong determinant of sanitation access. The poorest households face the greatest challenges: 39.7% of households in the lowest wealth quintile (WQ1) rely on unimproved sanitation. This rate steadily declines across higher wealth groups—24.8% in WQ2, 10.3% in WQ3, 2.8% in WQ4, and only 0.5% in the wealthiest quintile (WQ5). These trends reveal a steep socioeconomic gradient, where financial hardship severely limits the ability to construct or maintain safe and dignified sanitation systems. Poor households often face multiple barriers, including limited land, lack of materials, and low awareness of sanitation standards, which compound their vulnerability

Gender dynamics further shape sanitation inequities. Female-headed households face a higher likelihood of using unimproved sanitation (5.9%) compared to their male-headed counterparts (4.1%).This gap is even more pronounced in rural areas, where female-headed households frequently intersect with low income and low education levels (e.g., 6.7% of rural female-headed households rely on unimproved sanitation, compared to 2.9% among rural male-headed households; 43.8% of rural female-headed households fall within the lowest two wealth quintiles (WQ1–WQ2); and 38.4% have no formal education, compared to

22.6% of rural male-headed households). Improving sanitation access for lower-income households requires not just infrastructure, but also smart support systems that make toilets affordable and accessible.

4.3 OPEN DEFECATION

The study findings show that 5.4% of the population still practice open defecation. The prevalence is much higher in rural areas (11.4%) than in urban areas (0.7%). The proportion, while seemingly small, represents over 800,000 individuals in a country of approximately 19 million people. Open defecation rates vary significantly based on education, wealth quintile, and urban-rural settings:

Households led by individuals with no formal education have the highest open defecation rates, with 12.7% practicing open defecation. This rate significantly decreases to 7.1% among those with primary education, 1.8% among those with secondary education, and 0.6% among those with tertiary education.
Only 0.3% of households in the wealthiest quintile (WQ5) practice open defecation. Whereas, 11.4% of households in the poorest wealth quintile (WQ1) engage in open defecation, highlighting the strong link between poverty and poor sanitation practices.

The highest district-level rates were reported in Nkhata Bay (12%), Dedza (12.3%), and Nsanje (6.9%), while Blantyre (1.1%) and Mzuzu (0.3%) have relatively lower rates. High water tables and sandy/unstable soils in Nkhatabay and Nsanje respectively, make latrines prone to collapse and this could be the reasons for high open defecation rates observed. Results also show that, open defecation is also closely tied to lack of land ownership.

The impact of open defecation is far reaching. Open defecation increases the risk of disease outbreaks, degrades water sources through contamination, and reduces human dignity. In Malawi's case, it signifies deep socio-cultural and economic barriers to sanitation access and requires multifaceted approaches, including infrastructure development, community engagement, and behavioral change.

Table 4.4: Percentage of households using Unimproved Sanitation Facilities and Practicing Open Defecation

	Unimproved sanitation facility			Open defecation (no facility, bush, field)	Number of households
	Flush to open drain	Pit latrine without slab/ open pit	Other		
Malawi	0	4.9	0.3	5.4	113
Residence					
Urban	0.1	6.2	0	0.7	75
Rural	0	3.4	0.6	11.4	38
NkhataBay	0	6.2	1.4	12.1	27
Mzuzu	0.3	10.6	0	0.3	39
Dedza	0	2.8	0.3	12.3	11
Lilongwe	0	7.8	0	0	28
Nsanje	0	1.7	0	6.9	6
Blantyre	0	0.6	0	1.1	2
Education level of head					
None/Pre-school	0	4.4	0.8	12.7	13
Primary education	0	5.4	0.3	7.1	56
Secondary education	0.1	6	0.1	1.8	42
University	0	1.4	0	0	2
Other tertiary	0	0	0	2.8	0
Don`t Know	0	0	0	1.8	0
Household ownership					
Rented	0	6.5	0	1.1	36
Owned	0.1	4.3	0.3	7	70
Institutional house	0	0	3.1	0	1
Family/friend	0	7.4	0	8.6	6
Other	0	0	0	0	0
Economic status of head					
Employer	0	7.1	0	0	1
Own-Account worker/self employed	0	5.1	0.1	6.9	74
Employee-Public Service	0	1.5	0.7	0.7	3
Employee-Private Sector	0	4.4	0	0.7	13
Unpaid Family Worker	0	7.6	1	6.7	9
Other (Specify)	0.6	5.3	1.8	4.7	13

4.4 WASTE CONTAINMENT

Effective containment of excreta in non-sewered sanitation systems is critical for minimizing health and environmental hazards. This relies on the use of appropriate on-site systems, such as pits, septic tanks, or mobile containers, that prevent hazardous release of excreta to the surface environment that may result in human exposure or risks of contamination. Improving containment technologies and practices can mitigate risks, safeguard water resources, and support sustainable sanitation in line with global health goals.

4.4.1 Containment of flush to septic tank status by total population, residence, and sampled districts

Unsafe containment is first assessed through the presence of an outlet discharging excreta to the surface environment. Table 5.5 displays the percentage of households with septic tanks (n=188), categorized by total population, type of residence, and sampled districts. Overall, 98.4 percent percent of households population using flush-to-septic tanks did not release excreta to the surface, including 34.6 percent with no outlet and 50.0 percent discharged to a leach field or soak pit. In urban areas, 98.9 percent of households with septic tanks did not release excreta to the surface environment via an outlet, compared to 89.9 percent in rural areas, although most septic tanks were in urban areas. The majority of septic tanks with an outlet to the environment were in Nkhata Bay. Blantyre recorded the highest percentage of households with septic tanks without outlet at 64.9 percent.

Table 4.5 : Containment of flush to septic tank status by percentage, total population, residence, and sampled districts

	Flush to septic tank								
	No outlet		Outlet, discharges to:				Number of household population using flush to septic tank	Number and percentage household population using septic tanks with liquid waste contained	
	No outlet	Unable to observe	to a leach field, soak pit	sewer/closed drain to a waterbody (not connected to WWTP	to an open drain	Don't know		Percent	Number of households
Total	34.6	13.8	50.0	0.5	0.5	0.5	188	98.4	185
Residence									
Urban	34.1	14.5	50.3	0.6	0.0	0.6	179	98.9	177
Rural	44.4	0.0	44.4	0.0	11.1	0.0	9	88.9	8
NkhataBay	40.0	0.0	40.0	10.0	10.0	0.0	10	80.0	8
Mzuzu	33.3	24.0	41.7	0.0	0.0	1.0	96	99.0	95
Dedza	100.0	0.0	0.0	0.0	0.0	0.0	2	100.0	2
Lilongwe	4.8	0.0	95.2	0.0	0.0	0.0	42	100.0	42
Nsanje	100.0	0.0	0.0	0.0	0.0	0.0	1	100.0	1
Blantyre	64.9	8.1	27.0	0.0	0.0	0.0	37	100.0	37

Full containment systems, damaged and badly constructed pits or tanks may leak, overflow, and collapse (particularly after rainfall or flooding) thereby releasing the excreta to the surface environment. Any unsafe outflows tend to be close to the home, with significant risk of faecal exposure. While some of the outflows are seasonal or occasional (thus hard to monitor), many unsafe outflows are continuous and visible (thus relatively easy to monitor). The analysis showed that overall, almost all households with septic tanks (97.3 percent) did not release excreta to surface environment from adverse events (contained), 97.2 percent in urban areas and 100 percent in rural area. Among sampled districts, Blantyre and Lilongwe were there only areas which recorded release of excreta to the surface environment (91.9 and 95.2 percent respectively). Further analysis of the containment conditions revealed various structural and functional issues. 4.8 percent of households in Lilongwe experienced overflow and 2.7 percent in Blantyre experienced the same situation.

Table 4.6 : Percentage of households using septic tanks considering release of excreta to surface environment through adverse events

	Flush to septic tank							
	Number of household population using flush to septic tank	Excreta released to surface environment due to adverse events (not contained)				Other local observations, not considered uncontained		Total contained considering both outlet and adverse events
		Excreta not released to surface environment from adverse events (Contained)	Cracks, damage	Malfunction	Overflowing from squat hole, pan, septic tank	Cover slab cracked or damaged	Poorly maintained side walls unstable	
Total	188	97.3	0.5	0.5	1.6	4.8	1.6	95.7
Residence								
Urban	179	97.2	0.6	0.6	1.7	4.5	1.7	96.1
Rural	9	100.0	0.0	0.0	0.0	11.1	0.0	88.9
NkhataBay	10	100.0	0.0	0.0	0.0	10.0	0.0	80
Mzuzu	96	100.0	0.0	0.0	0.0	4.2	0.0	99
Dedza	2	100.0	0.0	0.0	0.0	0.0	0.0	100
Lilongwe	42	95.2	0.0	0.0	4.8	2.4	0.0	100
Nsanje	1	100.0	0.0	0.0	0.0	0.0	0.0	100
Blantyre	37	91.9	2.7	2.7	2.7	8.1	8.1	91.9

4.4.2 Containment of excreta from flush toilets connected to pits/cesspools

Looking at pits and cesspools, only households using flush toilets connected to pits were assessed for an outlet, noting that this population was very small. Table 5.7 shows the number and percentage of households with containment of pits/cesspool categorized by total population, type of residence, and sampled districts. The results show that 40.0 percent households using flush to pit/cesspool had an outlet with unknown release, whereas 40 had no outlet and 20 percent using flush to pit discharges waste to leach field, soak pit.

Table 4.7 : Percentage of households using containment pit/cesspool for liquid waste

	Flush to pit/cesspool				
		Outlet, discharges to:			
	No outlet	to a leach field, soak pit	Other	Number of household population using flush-to-pit/cesspool	Number of households population using flush-to-pit/cesspool with liquid waste contained
Total	40.0	20.0	40.0	5	3
Residence					
Urban	40.0	20.0	40.0	5	3
Rural	0.0	0.0	0.0	0	0
District					
NkhataBay	0.0	0.0	0.0	0	0
Mzuzu	0.0	0.0	0.0	0	0
Dedza	0.0	0.0	0.0	0	0
Lilongwe	25.0	25.0	50.0	4	2
Nsanje	0.0	0.0	0.0	0	0
Blantyre	100	0.0	0.0	1	1

The analysis of the containment for flush systems connected to pits or cesspools, revealed that all 5 households with flush-to-pits had no instances of cracks, malfunctions, visible effluent ponds, or other forms of leakage in these systems. The containment practices are concentrated entirely in urban areas, as there were no observations of flush-to-pit systems in rural settings.

Table 4.8: Percentage of households using flush to pit/cesspool considering release of excreta to surface environment through adverse events

	Flush to Pit/Cesspool				
	Number and Percentage of household population using Flush to Pit/Cesspool		Excreta not released to surface environment from adverse events (Contained)		Total contained considering both outlet and adverse events
	Total	Percent	Total	Percent	Total
Total	5	100.0	5	100.0	60%
Residence					
Urban	5	100.0	5	100.0	60%
Rural	0	0.0	0	0.0	
NkhataBay	0	0.0	0	0.0	
Mzuzu	0	0.0	0	0.0	
Dedza	0	0.0	0	0.0	
Lilongwe	4	100.0	4	100.0	50%
Nsanje	0	0.0	0	0.0	
Blantyre	1	100.0	1	100.0	100%

4.4.3 Containment of on-site sanitation facilities considering release of excreta to surface environment through adverse events – single pit and other improved OSS

Table 5.9 presents data on the containment of excreta in Single Pit and Other Improved On-Site Sanitation (OSS) systems, categorized by residence (urban/rural) and district. Of these, 96.3 percent of the household population were using single pits or other improved OSS with no issues and therefore excreta contained. The main containment issue was 3.7 percent reported overflow and 0.1 percent with cracks or damages releasing excreta. Other issues that do not necessarily release excreta to the surface included 12.7 percent with cracked or damaged cover slabs and 10.9 percent with unstable side walls. Urban areas had a slightly lower containment rate (94.4 percent) compared to rural areas (98.6 percent), 5.6 percent of urban households experienced overflow, while only 1.4 percent from rural areas experienced the same. At district level, the highest containment rates were observed in Nsanje (99.7 percent). Among the cities, Lilongwe reported the highest containment rate 97.6 percent, followed by Mzuzu (92.3 percent) and Blantyre (91.1 percent). The highest occurrence of cracked slabs in the districts was in Nkhata Bay (29.8 percent), while in the cities, poorly maintained and unstable sidewalls were most reported in Blantyre (21.8 percent).

Table 4.9: Containment of on-site sanitation facilities considering release of excreta to surface environment through adverse events – single pit and other improved OSS

	Single pit and other improved OSS						All improved OSS	
	Number of household population using Single pit and other improved OSS	Excreta released to surface environment due to adverse events (Not contained)			Other observations of excreta release			
		Excreta not released to the surface environment from adverse events (Contained)	Cracks, damage	Overflowing from squat hole, pan, pit latrine	Cover slab cracked or damaged	Poorly maintained side walls unstable	Improved OSS	OSS does not release excreta to surface environment from adverse events (Contained)
Total	1721	96.3	0.1	3.7	12.7	10.9	1914	85.8
Residence								
Urban	927	94.4	0.1	5.6	11.2	11.0	1111	87.9
Rural	794	98.6	0.0	1.4	14.4	10.8	803	83.2
NkhataBay	275	98.5	0.0	1.5	29.8	24.4	285	78.2
Mzuzu	221	92.3	0.0	7.7	11.3	9.5	317	83.5
Dedza	295	98.0	0.0	2.0	8.5	6.1	397	82.9
Lilongwe	286	97.6	0.0	2.4	2.8	2.8	332	89.2
Nsanje	328	99.7	0.0	0.3	3.7	1.5	329	91.1
Blantyre	316	91.1	0.3	8.9	20.9	21.8	354	89.7

The M-SMOSS survey findings on excreta containment found 85.8 percent of all on-site systems could be considered contained, however there were disparities in access to safe sanitation across different wealth and education levels. These insights show how socioeconomic factors shape household sanitation practices and the ability to maintain safe containment.

Containment by Wealth Quintile

Wealthiest Households (WQ5): Households in the wealthiest quintile reported the highest levels of safe containment, with 99.2% having sanitation systems that securely contain waste. Septic tanks are the most common technology in this group, and instances of leakage or unsafe discharge are minimal.

Second Wealthiest (WQ4): Containment remains high at 91.7%, though there's a slight rise in waste being discharged into soak pits or other outlets i.e. approximately 8%. While many households still rely on flush-to-septic systems, the data points to a growing need for more sustainable, long-term containment options.

Middle-Income Households (WQ3): In this group, safe containment drops to 79.4%, with 13.6% of households reporting some form of leakage or unsafe discharge. These figures suggest a moderate but concerning level of risk, particularly in areas where sanitation infrastructure may be aging or inadequately maintained.

Second Poorest (WQ2): Containment challenges become more pronounced, with only 60.1% of households reporting adequate systems. Many in this group use flush-to-pit systems with unclear or unsafe discharge pathways, roughly 24%, raising concerns about groundwater contamination and environmental health.

Poorest Households (WQ1): The poorest quintile faces the most severe sanitation challenges. Only 48.3% of households report safe containment, while nearly 40% depend on unimproved facilities, such as pit latrines without slabs. A significant number also rely on shared toilets or resort to open defecation due to lack of resources.

Education Level and Containment Status

The educational level of the household head plays a critical role in determining the safety and quality of sanitation systems. Among households headed by individuals with primary education, containment improves significantly. A total of 72.3% report using safe systems, typically flush-to-pit or flush-to-septic toilets. For those with secondary education, safe containment rates rise sharply to 87.5%. These households tend to have greater awareness and resources, often opting for high-quality safe solutions

Impact of Wealth and Education on Safe Containment

The data reveals a clear and consistent trend, as household wealth and education levels increase, so does the likelihood of having safe and well-maintained sanitation systems.

Wealthier households, particularly those in urban areas, are more likely to have properly constructed and regularly maintained septic tanks, benefiting from better infrastructure and access to sanitation services. On the other hand, households in the poorest quintiles often face significant barriers, from lack of funds to poor infrastructure, which prevent them from maintaining safe containment.

Similarly, households led by individuals with higher levels of education are more likely to understand the importance of safe sanitation. They are also better equipped to invest in improved systems, manage maintenance, and avoid common issues such as leakage or unsafe discharge.

CHAPTER 5

EMPTYING

5.1 EMPTYING - FLUSH TO SEPTIC TANK

Table 6.1 shows the percentage of households using flush to septic tank-emptying. The results show that 10.1 percent reported having previously emptied the septic tank. By residence, 10.6 percent of households in urban areas and 0 percent in rural areas reported emptying their septic tanks. Further, 8.3 percent, 14.3 percent and 13.5 percent of households reported emptying their septic tanks in Mzuzu city, Lilongwe city and Blantyre city respectively

Table 5.1 : Percentage of households using flush to septic tank-Emptying

	households using Flush to septic tank			
	Emptying			Number of households using Flush to septic tank
	No never emptied	Don't know	Yes, previous emptied	
Total	80.3	9.6	10.1	188
Residence				
Urban	79.3	10.1	10.6	179
Rural	100.0	0.0	0.0	9
NkhataBay	100.0	0.0	0.0	10
Mzuzu	84.4	7.3	8.3	96
Dedza	100.0	0.0	0.0	2
Lilongwe	73.8	11.9	14.3	42
Nsanje	100.0	0.0	0.0	1
Blantyre	70.3	16.2	13.5	37

The results in table 6.2 indicate that out of 1,767 households with pits and other improved on-site sanitation systems, 3.1 percent previously emptied, 93.5 percent of households had never emptied their facilities, while 1.6 percent reported that their system have never been emptied and remained undisturbed when full. In rural areas, 0.3 percent of households with pits and other onsite sanitation facilities had emptied their facilities compared to 5.5 percent in urban areas.

Among the cities, Lilongwe had the highest percentage of households with pits that had never been emptied at 93.4 percent, followed by Mzuzu at 91.0 percent and Blantyre at 82.6 percent.

In terms of households that had been previously emptied, Blantyre led with 9.8 percent, followed by Mzuzu at 5.0 percent, and Lilongwe at 2.8 percent.

Table 5.2: Percentage of households using pits and other improved OSS-Emptying

	Number of households using Pits and other improved on-site sanitation					
	Emptying					
	No never emptied	Don't know	Never emptied covered and left undisturbed when full	Not emptied abandoned uncovered	Yes, previous emptied	Number of households using Pits and other improved on-site sanitation
Total	93.5	1.7	1.6	0.1	3.1	1726
Residence						
Urban	89.6	3.0	1.9	0.0	5.5	932
Rural	98.1	0.3	1.3	0.1	0.3	794
NkhataBay	94.9	0.0	4.0	0.4	0.7	275
Mzuzu	91.0	2.3	1.8	0.0	5.0	221
Dedza	99.3	0.7	0.0	0.0	0.0	295
Lilongwe	93.4	3.8	0.0	0.0	2.8	290
Nsanje	99.4	0.3	0.0	0.0	0.3	328
Blantyre	82.6	3.5	4.1	0.0	9.8	317

Households that reported having emptied their septic tanks were also asked about how they disposed of the waste. Overall, 52.6 percent of households indicated that waste was removed off-site for treatment, 15.8 percent reported burying it in a covered pit in situ, and 5.3 percent reported disposing of the waste in a covered pit or trench off-site elsewhere. By residence, 52.6 percent of the household population using flush-to-septic tanks in urban areas removed their waste off-site for treatment while rural areas had no observation.

Comparing cities, Mzuzu had 62.5 percent of households reporting waste removal off-site for treatment, Lilongwe 50.0 percent, and Blantyre 40.0 percent. However, Blantyre City had 40.0 percent of households reporting the practice of burying waste in covered pits in situ.

Table 5.3: Percentage of household using disposal - Flush to septic tank

	households using Flush to septic tank							
	Disposal				Septic tank safely disposed of in situ	Septic tank emptied and taken off-site	Septic tank emptied and disposed in situ	Number of households using Flush to septic tank
	Removed off-site to treatment	Don't know where wastes were taken	Buried in a covered pit in situ	To a covered pit/trench (off-site) elsewhere				
Total	52.6	26.3	15.8	5.3	89.9	8.0	2.1	188
Residence								
Urban	52.6	26.3	15.8	5.3	89.4	8.4	2.2	179
Rural	0.0	0.0	0.0	0.0	100.0	0.0	0.0	9
NkhataBay	0.0	0.0	0.0	0.0	100.0	0.0	0.0	10
Mzuzu	62.5	25.0	0.0	12.5	91.7	7.3	1.0	96
Dedza	0.0	0.0	0.0	0.0	100.0	0.0	0.0	2
Lilongwe	50.0	33.3	16.7	0.0	85.7	11.9	2.4	42
Nsanje	0.0	0.0	0.0	0.0	100.0	0.0	0.0	1
Blantyre	40.0	20.0	40.0	0.0	86.5	8.1	5.4	37

Households with pits and other improved OSS who reported having emptied their septic tanks were also asked about how they disposed of the waste, 20.8 percent removed off-site for treatment, 35.8 percent buried in a covered pit in-situ, 7.5 percent disposed in a covered pit/trench (off-site) elsewhere, 13.2 percent removed to water body/surface.

Comparing rural and urban areas, 50.0 percent removed waste off-site to treatment in rural areas while 19.6 percent of households removed off-site to treatment in urban. Similarly, 37.3 percent households in urban areas bury in a covered pit in-situ while no households in rural areas buried in covered pit in-situ.

Comparing cities, Lilongwe had 50.0 percent of households that removed off-site to treatment followed by Mzuzu 27.3 percent and Blantyre 9.7 percent. Blantyre had the highest number of households buried in covered pit in-situ (48.4 percent) followed by Mzuzu 36.4 percent.

Nkhata Bay had 50.0 percent of households removed off-site to treatment, 50.0 percent removed to a covered pit/trench (off-site) elsewhere. No records for emptying and disposal were recorded for Dedza and Nsanje.

Table 5.4: Percentage of households using disposal-Pits and other improved on-site sanitation

	households using Pits and other improved on-site sanitation											
	Disposal											
	Removed off-site to treatment	Don't know where wastes were taken	Buried in a covered pit in situ	To a covered pit/trench (off-site) elsewhere	Removed to water body/ surface	Other	Number of households Previously emptied	Pit and other OSS safely disposed of in-situ	Pit and other OSS emptied and taken off-site	Pit and other OSS emptied and disposed in situ	Pit and other OSS unsafe emptying or disposal	Number of households using Pits and other improved on-site sanitation
Total	20.8	15.1	35.8	7.5	13.2	7.5	53	96.9	1.1	1.3	0.7	1726
Residence												
Urban	19.6	15.7	37.3	7.8	11.8	7.8	51	94.5	1.9	2.5	1.1	932
Rural	50.0	0.0	0.0	0.0	50.0	0.0	2	99.6	0.1	0.0	0.3	794
Nkhata Bay	50.0	0.0	0.0	50.0	0.0	0.0	2	98.9	0.4	0.4	0.4	275
Mzuzu	27.3	0.0	36.4	18.2	0.0	18.2	11	95.0	1.4	2.7	0.9	221
Dedza	0.0	0.0	0.0	0.0	0.0	0.0	0	100.0	0.0	0.0	0.0	295
Lilongwe	50.0	50.0	0.0	0.0	0.0	0.0	8	97.2	2.8	0.0	0.0	290
Nsanje	0.0	0.0	0.0	0.0	100.0	0.0	1	99.7	0.0	0.0	0.3	328
Blantyre	9.7	12.9	48.4	3.2	19.4	6.5	31	90.2	2.2	5.0	2.5	317

5.2 SERVICE PROVIDER - EMPTYING AND TRANSPORTATION

The survey on emptying service providers in three sampled city councils (Blantyre, Lilongwe, and Mzuzu) and Nkhata Bay district provides insights into the state of safely managed on-site sanitation in Malawi. The results highlight trends and gaps that are essential for aligning local practices with global sanitation goals, particularly Sustainable Development Goal 6.2 and the Joint Monitoring Programme (JMP) framework for safely managed sanitation services. Figure 2 provides a summary of sample of service providers in the city councils who participated in the survey.

Figure 2: Number of surveys of emptying providers by district/city council

5.3 URBAN AND RURAL COVERAGE OF CONTAINMENT-EMPTYING SERVICE PROVIDERS

The majority of the 40 surveyed service providers operate in urban areas (33), with minimal coverage in rural (4) and peri-urban areas (3). This urban bias reflects a gap in service provision for rural areas, where sanitation access is often limited. Safely managed sanitation requires impartial service coverage, including the containment, emptying, and treatment of faecal waste in both urban and rural areas. Expanding service coverage to rural populations is critical for reducing health and environmental risks associated with inadequate sanitation.

Table 5.5: Number of service providers by residence

	Number of service providers
Urban	33
Rural	4
Per-urban	3
Total	**40**

5.3.1 Residences and Populations Served by Emptying Service Providers

Emptying service providers predominantly serve urban residences (34 providers), with fewer extending their services to Peri-urban residences (18), institutions or commercial entities (26), and rural residences (19). It is worthwhile to note that more than one emptying service provider works in the same area. Emergency camps are the least served, with only three service providers catering to this category.

Table 5.6: Number and type of residences that are served by the service providers in the 3 city councils and Nkhata Bay district council

District	Urban residence	Peri-urban residence	Institutions/Commercial	Rural residence	Emergency camps
Blantyre City	18	9	13	12	1
Lilongwe City	14	6	8	5	2
Mzuzu City	2	2	4	2	
Nkhata Bay		1	1	-	-
Total	**34**	**18**	**26**	**19**	**3**

5.3.2 Containment Types that are emptied by service providers

The data indicate that service providers handle various types of faecal containment systems, with single pit latrines (26), septic tanks (32), and ventilated improved pit latrines (28) being the most commonly emptied.

Table 5.7: Type of Containment emptied by service providers in the 3 city councils and Nkhata Bay district council

District	Flush to septic tank	Flush to pit latrine/cesspool	Single pit latrine with slab	Ventilated improved pit latrine (with slab)	Twin pit latrine with slab	Composting toilet
Blantyre City	15	9	19	17	16	-
Lilongwe City	13	4	7	11	2	1
Mzuzu City	3	1	-	-	-	-
Nkhata Bay	1	-	-	-	-	-
Total	**32**	**14**	**26**	**28**	**18**	**1**

CHAPTER 6

EMPTYING PROVIDER

The survey collected information on emptying providers, the majority of whom were informal emptiers (43.1 percent), followed by private companies/NGOs (34.7 percent), and these emptying providers were based in urban areas.

At the district level, Blantyre recorded the highest number of emptying service providers, with a total of 36 service providers, of which 58.3 percent were informal emptiers, followed by Mzuzu with 19 emptying service providers (26.3 percent informal emptiers), and Lilongwe with 14 emptying service providers (35.7 percent informal emptying providers). A total of 93.1 percent of households had their waste emptied by service providers, with disposal methods distributed as follows: 13.9 percent disposed of waste unsafely, 34.7 percent disposed of waste in situ, and 44.4 percent disposed of waste offsite.

Table 6.1: Emptying provider

	Number of household population using improved on-site sanitation	Emptying Provider													
		Method of emptying													
		Of those emptied, who provided emptying service													
		Public/ Municipality/ Government	Private Company/ NGO	Informal Emptier (e.g. unlicensed)	Neighbor, family, friends	Don't know if emptied	Total emptied by a service provider	Households emptied by a service provider		Emptied by a service provider and disposed of unsafely		Emptied by a service provider and disposed of in situ		Emptied by a service provider and disposed of offsite	
								Total	Percent	Total	Percent	Total	Percent	Total	Percent
Total	1914	15.3	34.7	43.1	5.6	1.4	72	67	93.1	10	13.9	25	34.7	32	44.4
Residence															
Urban	1111	14.3	34.3	44.3	5.7	1.4	70	65	92.9	9	12.9	25	35.7	31	44.3
Rural	803	50.0	50.0	0.0	0.0	0.0	2	2	100.0	1	50.0	0	0.0	1	50.0
District															
NkhataBay	285	100.0	0.0	0.0	0.0	0.0	2	2	100.0	0	0.0	1	50.0	1	50.0
Mzuzu	317	31.6	36.8	26.3	5.3	0.0	19	18	94.7	2	10.5	7	36.8	9	47.4
Dedza	297	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0	0.0	0	0.0	0	0.0
Lilongwe	332	7.1	50.0	35.7	7.1	0.0	14	13	92.9	0	0.0	1	7.1	12	85.7
Nsanje	329	0.0	100.0	0.0	0.0	0.0	1	1	100.0	1	100.0	0	0.0	0	0.0
Blantyre	354	5.6	27.8	58.3	5.6	2.8	36	33	91.7	7	19.4	16	44.4	10	27.8

6.1 DATA MANAGEMENT PRACTICES BY EMPTYING SERVICE PROVIDERS

Table 7.2 indicates that 25 service providers maintain records of the containment they empty, while 14 rely on estimates, and 1 lacks clarity (did not know). The recorded data on the rates of emptying is mostly in the form of hand/paper records. Accurate data is essential for monitoring and planning sanitation services. The lack of consistent data collection and reporting hinders the ability to assess and optimize the performance of sanitation service chains, which is crucial for meeting JMP indicators.

Table 6.2: Availability of data on Containments

District	Have data on containments	Do not have data (use estimates)	Don't know
Blantyre City	18	3	0
Lilongwe City	5	8	1
Mzuzu City	2	2	0
Nkhata Bay	0	1	0
Total	25	14	1

6.2 AVERAGE VOLUMES OF CONTAINMENT EMPTIED BY SERVICE PROVIDERS AND FREQUENCIES OF EMPTYING

Monthly emptying volumes vary across cities, with Blantyre leading at 27.2 cubic meters, followed by Lilongwe (22.7 cubic meters) and Mzuzu (4.0 cubic meters). Annual volumes follow a similar trend, with Blantyre City accounting for the highest yearly emptied volume of 326.3 cubic meters. This is explained by the largest number of service providers (21 out of 40) operating in the city. These figures indicate a disparity in service intensity, suggesting that some cities may face overburdened systems or insufficient coverage. The average volume emptied from one household septic tank and household pit latrine is 40.8 m^3 and 36.0 m^3 respectively.

Table 6.3: Average volume of excreta emptied by service providers in the 3 city councils

	Average Volume emptied monthly	Average Volume emptied Yearly	Average volume emptied from one household septic tank	Average volume emptied from one household pit latrine
Blantyre City	27.2	326.3	46.6	38.3
Lilongwe City	22.7	271.9	16	3
Mzuzu City	4	48.1	51	98
Total	**24.4**	**293.2**	**40.8**	**36**

6.3 TYPES OF EQUIPMENT USED FOR TRANSPORTING FAECAL WASTES BY EMPTYING SERVICE PROVIDERS

The equipment used for transporting faecal waste highlights significant reliance on traditional and semi-mechanized methods. Trucks with open storage are the most commonly used, employed by 23 service providers. Vacuum trucks, used by 14 service providers. 10 service providers used trucks equipped with tanks or drums.

Table 6.4: Type of transport used by emptying service providers

Type of equipment for transport	Number of emptying service providers
Vacuum truck	14
Truck with tank /drums	10
Truck with open storage	23
Cart	1
Total	**48**

Only 21.2% of households knew of a nearby service provider, and this awareness was twice as high in urban areas. Households with higher education and wealth had greater access to and use of these services. For instance, 36% of the highest wealth quintile households had used or interacted with a service provider, compared to only 7.8% in the lowest quintile.

There are serious gaps in occupational health and safety. More than 60% of service providers reported receiving no formal training in safe emptying practices. Additionally, half of them do not use basic protective gear such as gloves or boots, leaving them exposed to hazardous waste and health risks (i.e. harmful pathogens and toxic gases). In turn, these unsafe conditions contribute to the negative public

perception of sanitation jobs, making it even harder to attract skilled and professional workers into the sector.

In urban areas, 53.4% of households report having access to a pit emptying service provider. In contrast, access drops sharply in rural areas, with only 12% of households reporting access to such services. The growing gap in sanitation services between urban and rural areas risks worsening health outcomes and accelerating environmental degradation in rural communities.

Households in the wealthiest quintile (WQ5) are more than twice as likely to have access to pit emptying services compared to the poorest quintile (WQ1) (48.5% vs. 15.4%, respectively). Financial barriers remain a major obstacle for low-income households, limiting their ability to access safe and reliable sanitation services.

The implication is that without equitable access to service providers, safe sanitation is a privilege rather than a right. Informal providers remain essential but require training, effective tools, regulations and oversight to provide quality services and operate safely.

The sanitation service provider ecosystem is underdeveloped, unevenly distributed, and largely inaccessible to rural and poor urban populations. The sanitation service provider sector remains largely informal and under-resourced, facing numerous operational and safety challenges that hinder effective service delivery. Most providers operate without adequate tools, systems, severely limiting their efficiency and capacity to serve households effectively.

CHAPTER 7

TREATMENT AND DISPOSAL

Overall, only 48.1% of households that emptied their systems reported using a treatment facility. Others buried the sludge, dumped it informally, or didn't know where it went. In rural areas, not a single household accessed a formal treatment plant. In Lilongwe and Blantyre, which have wastewater treatment plants, the facilities weren't designed for faecal sludge. Most of these are overwhelmed, dilapidated, and functioning with less efficiency. Other districts like Nsanje, Dedza, and Nkhata Bay don't have treatment facilities at all.

Blantyre City Council is mandated to manage wastewater treatment plants as per the current regulations which are under review. With regards to general sanitation service provision in Blantyre City, the sewerage infrastructure serves only 16% of the households in the City while 59% and 25% of the households use pit latrines and septic tanks respectively. The sewerage infrastructure, the city has five designated sites (Soche, Blantyre, Limbe, Chirimba and Maone) for treating wastewater. Figure below shows the locations of the five WWTPs.

Design values for Soche, Blantyre, Chirimba, Maone and Limbe WWTPs are 4,100m3 /day, 14,325 m3 /day, 534 m3 /day, 60 m3 /day and 4,875 m3 /day respectively. However, the 1995 assessment indicates that Soche, Blantyre and Limbe WWTPs were receiving 6,240 m3 /day, 7,950 m3 /day and 2,850 m3 /day respectively which is well above their design loads. It could be expected that the current wastewater flows for these WWTPs should be higher due to increased population and water consumption. Unfortunately, due to persistent sewer line blockage and vandalism, the current wastewater flows for Soche, Blantyre and Limbe WWTPs are observed to be 5,465 m3 /day, 5,740 m3 /day, and 1,350 m3 /day respectively.

Despite the current flows being lower than the previously recorded data, it is worth noting that the WWTPs that are currently receiving wastewater are producing effluent not meeting the Malawi Standards (MS) effluent discharge limits mainly due to aged and broken-down components and equipment that require urgent rehabilitation and expansion. For instance, recorded BOD5 20 effluent values for Soche, Blantyre and Limbe indicate discharge values of 130 mg/L, 382 mg/L and 86 mg/L, respectively against MS discharge value of 20 mg/L.

The provision of emptying services to onsite sanitation systems by mainly private pit emptiers, has resulted in huge volumes (500 m3 /month) of faecal sludge being disposed of at the current wastewater treatment plants whose designs were not meant to handle pit latrine septage and septic tank sludge. In some facilities like Limbe and Chirimba, unplanted drying beds have been constructed adjacent to the plants.

The Blantyre Wastewater Treatment plant is the biggest, it was originally built in the 1960s but was expanded twice to increase the design flow. The plant does not have any facility to handle faecal sludge, and thus only wastewater is treated partially in use. The treatment works are not fully operational because of defective and/or missing equipment, most electrical and mechanical devices are either broken or lacking, preventing efficient treatment. “Currently, raw sewage virtually bypasses the crucial treatment units’ processes and operations, fed directly into lagoons before discharge into Mudi Stream.

Soche (Zingwangwa) WWTP is second in terms of design treatment capacity, but it also needs repair and/or replacement of mechanical and electrical equipment. The plant can receive some fecal sludge for treatment.

The Limbe plant is located south of the city and was built in the 1970s to treat domestic sewage with a further extension in the 80s. It consists of a set of 16 stabilization ponds forming 4 parallel treatment systems that discharge their effluent into the Limbe stream. The plant was originally designed to accept only wastewater from sewers. However, drying beds have been constructed at the plant to treat FS from septic tanks or pit latrines.

The Chirimba plant is located near the airport, northwest of the city. This plant is relatively new but is in a poor state due to a lack of maintenance and vandalism. The plant would be an opportunity for nearby industries and households, although it needs to be refurbished to decent working conditions. Recently some drying beds were constructed at the facility to treat faecal sludge.

Maone WWTP is a small facility that was built in the 60s in the eastern part of Blantyre. The plant was built by a private company to serve the Maone residential area. The site is abandoned and is not receiving any fecal waste.

The responsibility of providing sewerage services was under the Lilongwe City Council and has recently been moved to the Lilongwe Water Board. The majority (71%) of the residents of Lilongwe City use traditional or improved pit latrines, with or without a superstructure of either logs or a concrete slab over the pit. About 19.8% use septic tanks and about 9% of the city’s population is served by a sewerage

system. Sludge from filled-up septic tanks and pit latrines is emptied and disposed of in the existing conventional wastewater treatment plant in the city.

The Kauma Sewage Treatment Plant, located in Area 44, commissioned in 1997, is a large wastewater treatment facility that utilizes a stabilization pond system with varying functions and detention times, to treat wastewater from residences, institutions, commercial buildings, industries, and even groundwater and stormwater. It's known as the largest sewage treatment plant in Malawi and the third largest in Southern Africa. The plant was originally designed to handle 61,000 cubic meters of wastewater per day but currently operates under low capacity. Recently through the World Bank Supported Lilongwe Water and Sanitation Project (LWSP), the government upgraded Kauma WWTP to increase its sewerage capacity from 6300 m3 a day to handle a minimum of 8,700m3/day; and construction of Faecal Sludge Treatment Plant (FSTP) which now receives an inflow of 1200 cubic meters of faecal sludge per day (although the design is over 8000m3 of fecal sludge per day)

The wastewater is biodegradable with a low COD/BOD ratio of 1.99 and low strength with a COD concentration of <2000. According to Lilongwe City Council, the quality of the effluent meets the acceptable threshold for BOD and COD in Malawi tolerance limits and World Bank guidelines; and slightly above for TSS and TDS. Physical and biological treatments take place at the stabilization ponds. Preliminary treatments are performed with screening bars, grit tanks, and equalization tanks. Primary sedimentation takes place in rectangular tanks, where the influent is treated anaerobically. Maturation ponds are the secondary and final stages of the treatment process. Sub-tropical climate provides favorable conditions for this type of secondary treatment, due to its simplicity in construction, flexibility concerning degree of treatment, low maintenance requirements, low energy consumption, and ease of operation. Treated wastewater is finally discharged into the Lilongwe River.

Mzuzu City Council runs the Nkhorongo Faecal Sludge Treatment Plant, which receives an approximate inflow of 30 cubic meters of faecal Sludge weekly. It employs unplanted drying beds, and extended storage.

Nkhatabay District Council runs the Nkhatabay sewage Treatment Plant, which receives an approximate inflow of 6 cubic meters of faecal Sludge months. The plant utilizes ponds which are connected to sewer network linked to the district hospital premises. It only offers primary treatment as there are no separate processes or drying beds to treat the fecal sludge.

Location	Description of treatment plant	Assumed % flows treated	Treatment level adequate
Blantyre City Council	5 treatment plants, only three receive faecal sludge - 500m3 monthly (125m3 weekly) sludge	50%	Yes, secondary or higher with limited compliance to treatment standards
Lilongwe City Council	One treatment received 1200m3 sludge weekly	90%	Yes, secondary or higher and higher level of compliance to treatment standards
Mzuzu City Council	One treatment facility receives 30m3 sludge weekly	25%	Yes, secondary (unplanted drying beds) with low compliance to treatment standards
Nkhata Bay DC	One treatment facility receives 6m3 monthly from vacuum tanker (1.5m3 weekly)	100%	No, primary treatment only (no separate drying beds for fecal sludge)

7.1 OVERALL ASSESSMENT OF SAFELY MANAGED ON-SITE SANITATION

The findings on the containment of on-site sanitation systems—including flush-to-septic tanks, flush-to-pits or cesspools, and single-pit latrines—demonstrate notable progress toward achieving safely managed sanitation in Malawi. Across these technologies, the majority of households exhibited effective containment, with over 98 percent showing no visible excreta release due to adverse events.

Despite these gains, challenges remain. Limited desludging services continue to compromise containment reliability in several cities and districts, especially in Blantyre, Mzuzu and Nkhata Bay. These challenges reflect broader disparities in infrastructure quality, maintenance capacity, and financing.

To ensure universal access to safely managed on-site sanitation, there is a need for targeted interventions that address these gaps. This includes improving infrastructure, enhancing maintenance services, and increasing community awareness and engagement. Advancing these efforts will not only accelerate progress toward Sustainable Development Goals 6.2 and 6.3 but also contribute to long-term public health improvements and environmental protection.

CHAPTER 8

CONCLUSIONS AND RECOMMENDATION

8.1 CONCLUSIONS

Access to Basic Sanitation

While many households report using improved sanitation facilities, only 50.8% have access to basic sanitation, primarily due to widespread toilet sharing. Open defecation remains a concern, with approximately 5% of households still practicing it.

The study highlights significant inequities in access to basic sanitation. Disparities are especially pronounced between urban and rural areas, and between wealthier and poorer households. In urban informal settlements, limited infrastructure and overcrowding make private toilets inaccessible, forcing many to rely on shared or poorly maintained facilities. These conditions contribute to poor public health outcomes, and increased safety risks—particularly for women and children.

Containment of Waste

The majority of containment systems—such as septic tanks and pit latrines—are considered safe (98.4%). However, the study identified instances of overflow, leakage, and structural failures (e.g., cracked slabs, unstable walls), which pose serious public health risks.

Key implications include:

- Without regular inspections and upgrades, the risk of groundwater contamination and environmental pollution will increase.
- As urban areas grow denser, there is a need for compact, sustainable containment solutions that are durable and space-efficient.
- Stronger regulations and construction standards should be integrated into building codes and permitting processes to ensure safe containment.

Emptying and Transportation

A large proportion of households—80.3% with septic tanks and 93.5% with pit latrines—have never emptied their systems. This raises concerns about sustainability, as full pits often overflow, threatening public health and the environment.

In rural areas, the absence of pit emptying services forces households to abandon full pits and resort to unsafe disposal methods. In urban areas, although services are available, many households cannot afford them due to high costs. These costs are driven up by long travel distances to treatment sites, which are inadequate and poorly located.

Access to Safely Managed Sanitation

Although many households have improved toilets, the study reveals a critical gap in what happens after waste is deposited. There is minimal regulation and oversight of the collection, transportation, and treatment of waste. Without a complete sanitation chain, waste often re-enters the environment through illegal dumping or overloaded treatment plants, undermining public health. This calls for a paradigm shift—from focusing solely on toilet construction to building end-to-end sanitation systems.

Treatment and Disposal

Waste treatment remains one of the weakest links in Malawi's sanitation system. Even in major cities like Blantyre and Lilongwe, few treatment plants are equipped to handle fecal sludge. In rural areas, treatment infrastructure is virtually nonexistent, leading to unsafe disposal practices.

This gap undermines progress toward SDG 6 and improved national sanitation outcomes.

Urgent actions include:

- Expanding treatment capacity and building dedicated Fecal Sludge Treatment Plants (FSTPs).
- Establishing strong regulatory frameworks and monitoring systems to ensure compliance with safety standards.

Service Authorities

Local governments are central to delivering safe sanitation, but the study reveals major capacity gaps—including shortages in human resources, training, financing, tools, and data systems. Notably, most authorities lack electronic data management systems, limiting their ability to monitor and regulate sanitation services effectively. To strengthen oversight, Malawi must:

- Invest in staffing, training, equipment, and financing for local authorities.
- Develop supportive policies that empower regulatory bodies.
- Improve data systems for better planning, monitoring, and accountability.

8.2 RECOMMENDATIONS:

Access to Basic Sanitation

Improving access to basic sanitation, especially for vulnerable groups in rural areas and low-income urban communities, calls for targeted, practical solutions:

- Invest in affordable, space-efficient toilets and off-grid technologies suitable for densely populated areas.
- Expand access to revolving funds, micro-loans, and targeted subsidies for latrine construction, supported by effective sanitation marketing.
- Strengthen Community-Led Total Sanitation (CLTS) programs to promote behavior change and encourage household investment in safe sanitation.
- Enforce urban building standards that require every household to have adequate and safe toilet facilities.

Containment

Good sanitation doesn't stop at access, it also means containing waste safely. To prevent leakage and protect the environment, the following actions are vital:

- Develop national WASH standards and design guidelines to ensure containment systems are durable, sealed, and structurally sound.
- Introduce routine sanitary inspections by public health authorities to detect and address structural issues early.
- Promote shared or centralized containment systems (e.g., linked septic tanks or neighborhood waste hubs) in space-constrained urban areas.
- Scale up climate-resilient sanitation options to prevent latrine collapse and waste spillage during extreme weather events.

Emptying and Transportation

Without safe and reliable ways to empty and transport waste, the sanitation chain remains fragile. The following can be done to strengthen this critical link:

- Expand the number of pit emptying service providers in underserved urban areas through equipment subsidies and entry incentives.
- Train pit emptiers in safe practices, equipment maintenance, and health and safety protocols, including the use of protective gear.
- Launch public awareness campaigns to promote regular and safe pit emptying for health and environmental protection.
- Introduce mobile desludging technologies and low-cost manual emptying services for hard-to-reach areas.

Access to Safely Managed Sanitation

Achieving 'safely managed sanitation' means more than just having a toilet, but making sure every step, from use to treatment, is safe and sustainable. Therefore, the following are some of the proposed recommendations.

- Ensure sanitation upgrades address the entire service chain—from toilet use to waste removal, treatment, and safe disposal—with adequate funding and technical support.
- Invest in fecal sludge treatment plants (FSTPs) in underserved areas to ensure proper waste treatment.
- Integrate wastewater and fecal sludge systems in large urban areas to optimize space and improve treatment efficiency.
- Establish small-scale, decentralized treatment plants in low-density districts like Nsanje and Dedza for cost-effective waste management.

Treatment and Disposal

It is important that treatment effluent doesn't become a health hazard or a threat to the environment. The following actions are key:

- Upgrade existing wastewater treatment plants in cities like Lilongwe and Blantyre to handle both sewage and fecal sludge.
- Implement decentralized treatment systems in smaller cities and rural areas tailored to local needs.
- Enforce clear guidelines for composting and safe burial of sludge in areas lacking treatment facilities to prevent environmental contamination.

Service Authority

Stronger institutions are essential for delivering and maintaining quality sanitation services. The recommendations below can help the authorities lead the way:

- Build local government capacity by providing training, tools, and resources to monitor services, enforce standards, and track progress toward SDG 6.
- Professionalize the sanitation sector by regulating service providers and offering incentives to meet safety and quality standards.
- Improve systems for tracking sanitation access, service quality, and treatment capacity to support better planning and resource allocation.
- Conduct routine inspections, engage communities, and enforce penalties for non-compliance to protect public health and build trust.

CHAPTER 9

RECOMMENDATIONS FOR MONITORING SMOSS

A. Policy and Institutional Integration

- Develop and adopt national-level indicators for Safely Managed On-Site Sanitation (SMOSS) and integrate them into the National WASH Monitoring Framework under the leadership of the Ministry of Water and Sanitation and relevant agencies.
- Incorporate SMOSS indicators into national WASH coordination mechanisms, including the Sanitation and Hygiene Technical Working Group (TWG), Sector Working Group (SWG), Joint Sector Reviews (JSRs), and WASH Sector Annual Performance Reports.

B. Data Collection and Survey Integration

- Develop a roadmap for integrating SMOSS indicators into national household surveys, such as the Multiple Indicator Cluster Survey (MICS), Demographic and Health Survey (DHS), and Integrated Household Surveys (IHS).
- Review and define SMOSS indicators for annual reporting at the service authority level, ensuring consistency and comparability across local authorities.

C. Service Provider Monitoring and Regulation

- Standardize and harmonize reporting indicators for service providers (e.g., emptying, transport, treatment) to be submitted periodically to local authorities as part of their service level agreements.
- Strengthen local authority oversight by enhancing systems for registration, licensing, and monitoring of service providers, including mechanisms to detect and address illegal dumping.

D. Capacity Building and Systems Strengthening

- Enhance local authority capacity for SMOSS monitoring through targeted training, provision of monitoring equipment, and development of digital data management systems to track waste along the sanitation value chain.
- Digitize record-keeping systems for service providers and treatment facilities to improve traceability and accountability in waste management.

E. Regulatory and Enforcement Mechanisms

- Review and update the regulatory framework to mandate reporting of SMOSS indicators across the sanitation service chain, with clear enforcement mechanisms.

- Invest in laboratory infrastructure at treatment facilities to enable regular monitoring of effluent quality and compliance with environmental standards.

CHAPTER 10

FINDINGS ABOUT THE DATA COLLECTION PROCESSES

A. Implementation Structure

Clear roles and strong coordination were critical to the success of the study. Key takeaways include:

- Establishing a dedicated national steering committee—comprising the National Statistical Office (NSO) and key government ministries—ensured alignment with national priorities and fostered shared ownership.
- Government involvement was active and meaningful, not just symbolic. Their participation throughout planning and implementation secured political backing and mobilized essential human resources.
- Collaboration among key partners, including UNICEF, WHO, the Ministry of Water and Sanitation (MoWS), and the Ministry of Health (MoH), significantly enhanced the quality and credibility of the study.

B. Data Collection Tools

- While tools were customized for the Malawian context, maintaining standardization across household surveys and inspection checklists ensured consistency and comparability across countries.
- The use of digital tools (e.g., tablets) improved data accuracy, accelerated the collection process, and minimized errors associated with paper-based methods.

C. Survey Design and Methodology

- Keeping survey questions concise and easy to understand helped maintain respondent engagement and reduced the risk of incomplete or inaccurate responses.
- Stratified random sampling enabled the study to capture a representative picture across diverse population groups—urban and rural, affluent and low-income.
- In hard-to-reach areas, cluster sampling proved cost-effective and practical, without compromising data representativeness.

D. Data Collection Methods

A mixed-methods approach provided a more complete understanding of sanitation realities:

- Household surveys offered quantitative insights, while sanitary inspections of latrines and septic tanks provided critical physical verification.
- Key informant interviews enriched the data with qualitative perspectives, shedding light on user experiences and perceptions.
- Built-in quality assurance measures—such as field supervision—helped identify and resolve issues early, ensuring data reliability.

E. Data Analysis and Reporting

- The use of **Stata syntaxes (command scripts)** streamlined the analysis process, enabling reproducibility and transparency. This approach allowed supervisors, peers, and external reviewers to audit the analysis steps and better understand how conclusions were drawn.

CHAPTER 11

STUDY LIMITATIONS

Despite employing a rigorous and comprehensive methodology, the study faced several limitations that may have influenced the findings. These should be considered when interpreting the results:

A. Limited Scope of Household Sanitary Inspections

While household inspections were conducted, they could not detect subsurface cracks or contamination leaching into the soil, which may pose risks to groundwater. Additionally, households may lack the technical knowledge to identify or report structural issues, leading to under-reporting. The absence of chemical and biological analyses further limited the ability to confirm the presence or absence of contaminants.

B. Reliance on Self-Reported Data

Key information regarding sanitation practices—such as pit emptying, waste transportation, and disposal—was based on self-reports. This introduces potential recall bias and social desirability bias, where respondents may misremember events or provide answers they perceive as acceptable. For instance, some

may assume that waste handled by service providers was safely treated, even without direct knowledge of its final destination.

C. Incomplete Information from Tenants

Sanitation facilities are often constructed by landlords, making it difficult for current tenants to provide accurate details about design features such as pit depth or sealing. This gap in knowledge may lead to errors or incomplete data.

D. Sensitivity of Pit Emptying Data

Pit emptiers were asked about waste disposal practices, including potentially illegal dumping. Due to the sensitive nature of this topic, some respondents may have withheld information or provided inaccurate responses out of fear of legal repercussions, despite assurances of anonymity.

E. Low Response Rate from Service Providers

Only about half of the listed service providers were interviewed. Some were unreachable, while others had ceased operations. This limited participation may introduce selection bias, affecting the representativeness of the findings.

F. Exclusion of Informal Service Providers

Informal pit emptying providers were not included in the survey due to their lack of formal registration and contact information. As a result, the study reflects only the practices of recognized providers, potentially overlooking significant informal sector contributions.

G. Limited Sample Sizes in Certain Areas

In some districts—particularly remote rural or densely populated urban settlements—the sample size may have been insufficient to capture the full diversity of sanitation conditions. Although cluster sampling was used to optimize fieldwork, it may have constrained the depth of analysis in these areas.

H. Inadequate Records from Service Providers

Many service providers operate informally and lack proper documentation of their activities. This made it difficult to verify the scope and quality of their services. Additionally, information about equipment and training was self-reported and may not accurately reflect actual practices.

I. Variability in Data Collection

Despite thorough training of enumerators, differences in interpretation of survey questions and occasional data entry errors are possible in large-scale fieldwork. While supervision and quality checks were in place, such inconsistencies may have affected the reliability of some responses.

ANNEX

SURVEY TOOLS

The estimation of sample size for this quantitative study was based on the sample size determination formula that employs known or preferred parameters, for instance, the power of the study, effect size, and response rate.

$$n * (1 + adj) = \frac{(Z^2 * S^2 * deff)}{((ME)^2 RR * pb * Avg\ HH\ size)}$$

Where:

n is the required sample size;

Z, Z-score = 1.96 for the confidence level of 95 percent;

Variance: s^2 = r * (1-r);

r = 0.933, proportion of households with a toilet (MIC 2019-20);

deff, Design effect = 3,

ME: Absolute margin of error =0.05 = r * RME,

RR, Response rate = 0.983 (MICS 2019-20)

adj is the oversampling adjuster = 0.02 (2 percent);

Considering that this study location included cities where survey completion is often characterized by challenges, a 2 percent contingency was necessitated (oversampling adjuster). Therefore, the final calculated sample was 360 households per domain.

Sample allocation

To achieve the highlighted sample size of 360 households, a sample of 30 households per enumeration area was employed. This arrangement translates to 12 clusters/EAs per domain.

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HOUSEHOLD SANITATION INSPECTION

HOUSEHOLD INFORMATION PANEL			
ID	**Question text**	**Response**	**Logic**
Cluster	**Cluster Number**		
HH1	Household number	Number	
HH2	Interviewer's Number	Number	
HH3	Date of interview	DD/MM/YY	
HH4	Area	1. Urban 2. Peri-Urban 3. Rural	
HH7	District	1. Mzuzu 2. NkhataBay 3. Lilongwe 4. Dedza 5. Blantyre 6. Nsanje	
HH10	Location (area/village)	[Enter text]	

INFORMED CONSENT: Hello, my name is (***your name***). We are from ***National Statistical Office***. We are conducting a survey about toilets and sanitation. I WOULD LIKE TO TALK TO YOU ABOUT THESE SUBJECTS. THE INTERVIEW WILL TAKE ABOUT 40 TO 50 MINUTES. ALL THE INFORMATION WE OBTAIN WILL REMAIN STRICTLY CONFIDENTIAL AND ANONYMOUS.

HH11 MAY I START NOW?.

YES, permission is given; to record time and begin interview
NO, permission not given; discuss with supervisor

Result of respondent

Completed	01
Not Available	02
Refused	03
Partially Completed	04
Incapacitated	05
Other (specify)	06

HH11	May I start the interview?	1. YES 2. NO	1 > HH12 2 > END
HH12	GPS		

Note: *Check that the respondent is a knowledgeable member of the household and at least 18 years old before proceeding. You may only interview a child age 15-17 if there is no adult member of the household or all adult members are incapacitated. You may not interview a child under age 15.)*

RESPONDENT INFORMATION PANEL			
Item	**Question text**	**Response**	**Logic**
R1	Participant Gender	1. Male 2. Female	
R2	Participant Age	1. 15-17 (see note above) 2. 18 - 25 3. 26 - 60 4. More than 60	1 > R3 2,3,4 > R4
Note: *Check that the respondent is a knowledgeable member of the household and at least 18 years old before proceeding. You may only interview a child age 15-17 if there is no adult member of the household or all adult members are incapacitated. You may not interview a child under age 15.)*			
R3	Suitable to continue the interview / adult respondent found (update age if so)	1. Yes 2. No	1 >R4 2 > End
R4	Participant's name:	[Text]	
R4B	House Hold Name		
R5	Are you the head of the household? [Household head is the primary decision maker on matters concerning the home]	1. Yes 2. No	
R6	Have you ever attended School?	1. Yes	2>R&

		2. No.	
R6a	What is the highest level of school (NAME) has attended? *completed by the head of the household?*	1. No formal education 2. Primary education 3. Secondary education 4. Tertiary education 5. Don't know	
R6b	What is the highest grade/Class / Year (NAME) has completed at that level?		
R7	How many people live in the household?	[Number L=2]	
R8	Is the Head of Household own or rent this house?	1. Rent this house 2. Own this house 3. Institution 4. Family/Friend 5. Other	
R9	What is the Head of Household economic Status/occupation	1, Employer 3. Own-Account worker/self employed 4. Employee - Public Service 5. Employee - Private Sector 6. Un Paid Family Worker 96. Other (specify)	

HOUSEHOLD SANITATION INSPECTION PANEL			
Item	**Question text**	**Response**	**Logic**
IH1	What type of sanitation facility do the members of the household usually use	**FLUSH /POUR FLUSH TOILETS:** 11. Flush to piped sewer system 12. Flush to septic tank 13. Flush to pit latrine/cesspool 14. Flush to open drain 18. Flush to don't know where **PIT LATRINES:** 21. Ventilated improved pit latrine (with slab) 22. Single pit latrine with slab 23. Twin pit latrine with slab 24. Pit latrine without slab / open pit 31. Composting toilet 32. Container based sanitation 41. Bucket 51. Hanging toilet/hanging latrine	If IH1 in 11-51 then skip to IH1c If IH1 in 95 skip to End If IH1 in 96 skip to IH1b

		95. No facility/bush/field 96. Other	
IH1b	Please specify other	Text	Then skip to IH20 (assumes not an OSS)
IH1c	Would it be possible to observe the sanitation facility?	1. Yes 2. No, No permission to observe sanitation facility 3. No, unable to access sanitation facility 4. No, unable to assess/view containment 4. No, Other	If IH1c =1 to IH1d If IH1c in 2-4 skip to IH1f
IH1d	Was the observed sanitation facility the same as reported by the household?	1. Yes same 2. No different (specify reasons and observed facility) 3. Other (specify)	If IH1d = 1, skip to IH1f If IH1d=2,3 to IH1e
IH1e	Explain reason for difference/other from previous question	[Add text]	IH1f
IH1f	For pit latrines only (IH1a=21, 22, 23, 24), please clarify whether the slab is completely covered (only one small drop hole)	1. Fully covered (only one small hole) 2. Partially covered (large hole, small cracks) 3. Not well covered (cracks, gaps) 4. Other (specify_____)	For IH1a=21, 22, 23, 24 go to IH1g All others skip to IH2
IH1g	For pit latrines only (IH1a=21, 22, 23, 24), please clarify whether the slab is washable around the drop hole	1. Cleanable 2. Partially washable 3. Not washable	All to IH2
IH12	Where is this toilet facility located?	1. In own dwelling 2. In own yard / plot 3. Elsewhere	
IH13a	Do you share this facility with others who are not members of your household?	1. Yes 2. No	1 >IH13b 2 > End
IH13b	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	1>IH13c 2 > End
IH13c	(Optional) How many households in total use this toilet facility, including your own household?	Number (Length x2) __ Number (if less than 10) 10 If ten or more households 98 if don't know	

IH2	**Does the containment (tank or pit) have an outlet pipe for liquid effluent?** (Only asked to wet containments - those replying IH1(12,13) *Prompt: outlet is an external pipe through which liquid effluent from the containment is discharged*	1. Yes 2. No (includes those infiltrating from base of tank/pit to ground) 7. Unable to observe	If IH2 in 1 then skip to IH3 If IH2 in 2 then skip to IH4 If IH2 in 7 then skip toIH2c
IH3	**If the containment has an outlet pipe for liquid effluent (yes to IH2), where does this pipe discharge?**	11. To a leach field, soak pit 21. Sewer/closed drain to a wastewater treatment plant (WWTP) 22. Sewer/closed drain to a waterbody (not connected to WWTP) 23. Sewer/closed drain to don't know where 31. To an open drain 32. To a waterbody/surface 96. Other 98. Don't know	96 > IH3b
IH3b	**Specify other location outlet discharges to**	[Text]	Ask if IH3 = 96
IH4a	**Observe if there are other visible problems with the facility causing excreta to not be contained?**	*Observations (select all that apply)* A. There are large cracks, corrosion, deformations or other visible damage to the containment B. Major malfunction of the installation (e.g. incomplete system, broken pipes) C. Ponds of effluent are visible on the ground/surface outside the containment D. Other visible leaking or overflow to the surface environment	
IH4b	Are there excreta overflowing from the squat hole, pan or pedestal or septic tank?	1. Yes 2. No 8. DK	
IH4c	Is the pit poorly maintained such that the cover slab is cracked or damaged?	1. Yes 2. No 8. DK	
IH4d	Is the pit poorly maintained such that the side walls of the toilet/septic tank are not stable?	1. Yes 2. No 8. DK	

IH5	**Observe/Ask the type of sanitation facility (latrine/septic tanks)** What is the material used for containment wall?	1. Cement 2. Cement blocks 3. Bricks 4. Plastic 5. Clay 6. Other	
IH6	Can ground water get in or out of the pit/septic tank? (so the pit/septic tank is not "water tight or sealed")	1. Yes 2. No 3. Don't know	
IH7	What is the dimension of the containment?	1. Rectangular 2. Circle 3. Other 8. Don't know	
IH8	What is the capacity of the containment facility?	Width _____M Length _____M Height _____M 99. Impossible to measure	
IH9	Has the pit/tank ever been emptied?	1. Yes, emptied 2. No, never emptied 3. No, not emptied but covered and left undisturbed when full 4. No, not emptied, abandoned uncovered 8. Don't know	1 >IH11 Others > IH12
IH10	The last time it was emptied, who emptied the pit/tank? (Note it may be useful to remind the household that the responses are confidential/anonymous and for the purpose of improving services, all responses are acceptable)	**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 96 Other (*specify*) 98 Don't know	11, 12, 13 > IH10c Others > IH11 96 > IH10b
IH10b	Who emptied (other specify)?	[Text]	For IH10=96
IH10c	What method was used to empty the pit/tank?	1. Manual emptying - bucket and/or barrel 2. Manual emptying – manual pump (gulper) 3. Emptied using a mechanical pump / vacuum truck 4. Emptied both manually and using a pump 6. Other 8. Don't know	
IH11	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	1, 2, 4 > IH11c

		3. Buried in a covered pit at or near household (in-situ) 4. Buried in a covered pit/trench elsewhere (off site) 5. Emptied into an uncovered pit 6. Other (*specify*) 8. Don't know	6. >IH112b
IH11b	If other, please specify	[Text]	For IH11=6
IH11c.	How was the sludge transported?	1. Manual cart with drums/ containers 2. Open body vehicle with drums/containers 3. Motorized tanker truck 4. Other	
END	Other comments	[Text]	

Service Provider Questionnaire EMPTYING AND TRANSPORT

ID	Question	Response
Q1	Interviewer's Name	
Q2	Date of Interview	Day / Month / Year of interview
Q3	District	1. Mzuzu 2. NkhataBay 3. Lilongwe City 4. Dedza 5. Blantyre City 6. Nsanje
INFORMED CONSENT: Hello, my name is (***your name***). We are from ***National Statistical Office***. We are conducting a survey about toilets and sanitation. I would like to talk to you about these subjects. The interview will take about [**NUMBER]** to [**NUMBER]** minutes. All the information we obtain will remain strictly confidential.		
Q4	a. Service Provider Name	
	b. License Number/Registration number(from the city council)	**LN: _____** **NA: _____** **DH: Don't have** **DK : Don't know**
Q5	Location	GPS Coordinates
Q6	Area	1. Urban 2. Per-Urban 3. Rural
Q8	Name of Respondent	
Q9	Sex	1. Male 2. Female
Q10	Title or position held in organization	
Q11	Contact	Telephone: Cell: Email:

D.3 Service provider survey - Emptying and transport

D.3.1 Core questions – For Emptying and Transport Service Providers

ID	Question	Response	Skip logic
GENERAL INFORMATION SERVICE PROVISION			
SPE-10	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)	
SPE-11	Are you or your organization a member of, or affiliated to, an association of 'emptiers'?	1. Yes 2. No 6. Other (specify) 8. Don't know	
SPE-11b	Association Name	[Text]	
SPE-12	Which location(s) do you work in (describe by district,T/A, village etc. of the urban or rural location)?	List name(s) of service area(s)_____ 1. Location a. Districts (insert drop down list) b. Villages (list) 2. Category of Areas *(multiple response possible*) a. Rural b. Urban **3. Don't know**	
SPE-13	Are there other E&T service providers working in the same areas?	1. Yes 2. No 8. Don't know	1>SPE-14B Others > SPE-15
SPE-14B	How many other E&T service providers working in the same areas?		Only if SPE-13= 1
SPE-15	What population of the overall district population do you serve? *(Note: They may either have specific population numbers or estimate)*	Number:	
SPE-16	Do you serve particular groups of the population?	**Multiple answers (select all)** A. Residential Urban B. Residential Per Urban C. Residential Rural D. Institutions / Commercial E. Emergency camps X. Other (specify)	
EMPTYING			

SPE-17	What type of containments do you empty?	*Multiple answers* A. Flush to septic tank B. Flush to pit latrine / cesspool Ventilated improved pit latrine (with slab) C. Single pit latrine with slab D. Twin pit latrine with slab E. Pit latrine without slab / open pit F. Composting toilet G. Container based sanitation H. Bucket X. Other (specify) Optional	
SPE-17b	If other types of containments, please specify	[TEXT]	Answer only if SPE-17 = X
SPE-18a	Do you have data on the number of containments your organization/company empties?	1. Yes 2. No 8. Don't know	1 > SPE19a 2 and 3 > SPE-18b 8 > SPE-20
SPE-18b	If no data, could you estimate number of containments (septic tanks, pit latrines and other systems) you emptied last month or last year? *Number of containments (Enter 999 if don't know)*	Total number of containments: [NUMBER]	Answer if SPE-18b = 2 or 3 All answers> SPE-20
SPE-19a	What unit do you count the rates of emptying? For example, number of containments, or volume (m3)?	1. Containments 2. Volume 3. Truck/Cart 6 Other (specify)	1 > SPE-19b 2>SPE-19c
SPE-19b	How many containments (septic tanks, pit latrines and other systems) do you empty per month? (for each containments)	Total number of containments: Unit of data: 1. Month 2. Year	Answer if SPE-19a = 1 All response to SPE-20
SPE-19c	On average, what is the total volume (*m3 preferred*) of excreta that you emptied from on-site sanitation facilities per month or per year? *(Where possible, convert volume to m3, otherwise litres and tonnes are also allowed)*	Quantity_____ 1. Cubic meter 2. Litre 3. Tonne **Unit of data:** 1. Month 2. Year	Answer if SPE-19a = 2 All response to SPE-19d
SPE-19d	What is the average size/volume of household containments?	Average volume: a) Septic tank xx M^3	All response to SPE-20

	(Reported per sanitation facility type)	b) pit latrine xx M^3 z) Don't know	
SPE-19g	Is there 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	6 > SPE-13y
SPE-19h	Specify other way of recording emptying	[TEXT]	
SPE-19i	Additional notes regarding the emptying number	[TEXT]	Allow no answer if no notes
SPE-20	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)	
SPE-21	Does emptying require you (or your colleagues or employees) to enter the containment to empty?	1. Yes 2. No 98. Don't know	
SPE-22	What type of equipment do you use for transport?	a. Vacuum truck b. Truck with tank /drums c. Truck with open storage d. Cart 6. Other (specify)	
SPE-23A	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	
SPE-23b	What special clothes or equipment is worn?	Select all that apply A. Gloves B. Boots C. Masks D. Overalls E. Others (specify) Z. Don't know.	Ask if SPE=1
DISPOAL AND TREATMENT			
SPE-24	In the last month, what proportion of the faecal sludge you collect do you discharge at the following sites? *(Note: If all delivered to one site mark 100%, otherwise distribute based on*	Proportion of emptied containments discharged at: **Off-site discharge site** a) Faecal sludge treatment plant b) Wastewater treatment plant	

	number of containments/trucks/volume depending on data available).	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 i) Designated waste pond x) Other designated disposal site (specify) **<u>Disposed safely in-situ</u>** j) Covered pit at household **<u>Delivered elsewhere</u>** k) Surface environment (includes agriculture, field, waterway, unprotected landfill) Z) Don't know	
SPE-25	Are you permitted to deliver to all treatment sites that exist in this area? If not, why?	1. Yes 2. No. Why?_____	
SPE-26	During the year are there periods when it is not possible to deliver to the treatment sites? If so, why?	1. Yes MK_____ No.	

D.4.1 Core questions - Service providers of Treatment Area

ID	Question	Response
Q1	Interviewer's Name	
Q2	Date of Interview	Day / Month / Year of interview
Q3	District	1. Mzuzu 2. NkhataBay 3. Lilongwe 4. Dedza 5. Blantyre 6. Nsanje

INFORMED CONSENT: Hello, my name is (*your name*). We are from *National Statistical Office*. We are conducting a survey about toilets and sanitation.

This interview usually takes about *number* minutes.
Participation in this survey is voluntary. No payment or incentive will be given to you or your family members for answering these questions. However, the information gathered will be very helpful for the government and the general public to better understand the situation and needs of the population.

Please know that all the information you share during the interview will remain strictly confidential and anonymous. No information about you or your organization will be made publicly available. We will only produce information about the general population.

Should you feel uncomfortable about any questions and not wish to answer, just let me know and we can skip the question. Also, if you wish to stop the interview at any point just let me know.

If at any time you have any complaints or concerns about this survey, please use the information on this card to contact the Commissioner of the National Statistical Office.

Q4	a. Treatment name / location	
	b. Which organization/department owns the treatment plant?	
	c. Which organization/department operates the treatment plant?	
Q5	Location	GPS Coordinates
Q6	Area	1.Urban 2. Per urban 3. Rural
Q8	Name of Respondent	
Q9	Sex	3. Male 4. Female
Q10	Title or position held in organization	
Q11	Contact	Telephone: Cell:

		Email:

ID	Question	Response	Logic
TREATMENT INFLOWS			
SPT-10	What types of materials are received for treatment at this facility?	a. Wastewater b. Faecal sludge c. Wastewater and faecal sludge d. Solid/organic waste and faecal sludge e. Wastewater /Solid/organic waste and faecal sludge x. Other (specify) f. None / no inflows z.Don't know	a,b,c,d,z > SPT-11 6 > SPT-10b 7 > SPT-10c
SPT-10b	If other materials received at treatment please specify	[TEXT]	>SPT-11
SPT-10c	Why is the treatment not receiving any inflows?	[TEXT}	>SPT-10d
SPT-10d	How long has the treatment received no inflows?	1. Less than 1 week 2. 1 week to 1 month 3. 1-6 months 4. More than 6 months 5. Never received inflows	1-4>SPT10e 5> END
SPT-10e	Previously, what inflows did it receive?	a. Wastewater only b. Faecal sludge only c. Wastewater and faecal sludge d. Solid/organic waste and faecal sludge x. Other (specify) z. Don't know	All to END
SPT-11a	What is the volume of faecal sludge currently delivered to this treatment per month/year? (specifically for pit latrines and septic tanks)	Volume [Number]	
SPT-11b		Volume Units: 1. M^3 per year, 2. M^3/month, 6. Other (specify) 8. Don't know	

SPT- 11c	Do you have records that could verify these flows? (verify the records if available)	1. Yes, complete records available 2. Yes, Some/ incomplete records available 3. No records available 8. Don't know	
SPT-11d	How do you calculate it? (Probe for who takes records, whether these are digital or manual)	1.Manual 2.Electronic 6. Other 8.Dont know	
E-SPT19	What is the number of households the treatment plants serve?	[NUMBER, L=9]	
E-SPT19b	Do you have records to verify this figure?	1. Yes, complete records available 2. Yes, Some/ incomplete records available 3. No records available 98. Don't know	
E-SPT21	Which location(s) does this treatment plant serve? *(describe by district, village etc. of the urban or rural location)?*	A. Districts: [TEXT] B. Wards [TEXT] C. Specific Locations: [TEXT]	
E-SPT22a	What is the treatment plant design capacity for wastewater?	Xxxx Capacity m^3/d for wastewater 98. Don't know	
E-SPT22b	What is the treatment plant design capacity for faecal sludge?	Xxxx Capacity m^3/d for faecal sludge 98. Don't know	
E-SPT23	Where does the faecal sludge come from	Proportion of sludge come from: A.Residential urban B. Residential Per Urban C. Residential Rural C. Institutions / Commercial D. Residential –Rural X. Other	
	what proportions?	(make sure it adds to 100%)	

E-SPT23a	Do you have records to verify these proportions? (Verify the figures if records available)	1. Yes, complete records available 2. Yes, Some/ incomplete records available 3. No records available 8. Don't know	
E-SPT24	What volume of faecal sludge discharged to this treatment plant comes from each of the following emptying service providers?	Either mark which group and/or provider details. If zero note 0, if don't know note 988% a) Xx% Public/municipality/government b) Xx% Private enterprise/company/NGO c) Xx% Informal emptier (e.g. unlicensed) d) Xx% Other (specify) e) Specify other [TEXT]	
E-SPT24a	(Do you keep a record of all deliveries to the treatment plant? If so, please can I see it?)	1. Yes, complete records available 2. Yes, Some/ incomplete records available 3. No records available 98. Don't know	*If 3/ 98 skip to ESPT25*
E-SPT24b	Would you please show me the records	1. Records seen 2. Not seen (verify with the previous figures)	
E-SPT25	Are all service providers permitted to discharge faecal sludge to this treatment plant?	1. Yes 2. No 8. Don't know	
E-SPT26	What type of equipment is used to deliver faecal sludge to this treatment plant?	(Select all that apply) A. Vacuum truck B. Truck with tank /drums (pump not integrated) C. Truck with open storage F. None – sewer only X. Other (specify) Z. Don't know	
TREATMENT TYPE			

SPT-12	How is wastewater (sewage) treated at this WWTP facility?	(Read out) 1. Tertiary or higher treatment 2. Secondary treatment 3. Primary treatment 4. No treatment 6. Other (specify) 8. Don't know	*Respond if SPT-10 = 1, 3, 6, 8*
SPT-12b	Specify other treatment method for wastewater	[TEXT]	
SPT-12c	Does faecal sludge receive the same treatment as wastewater	1. Yes 2. No 7. Don't know	*Respond if SPT-10 = 3, 6, 8*
SPT-12ci1	specify the treatment difference	[Text]	
E-SPT28	Which treatment processes are used at the wastewater treatment plant (for the liquid fraction)? (Read out responses)	<u>Tertiary</u> A. Disinfection (chlorination, UV, etc.) <u>Secondary</u> B. Aerobic suspended or attached growth (e.g. trickling filter, activated sludge) C. Anaerobic suspended or attached growth (e.g. UASB) D. Waste stabilization ponds E. Constructed wetlands Primary treatment <u>Primary</u> F. Screening and grit removal with G. Sedimentation M. Chemical precipitation H. Filtration O. High rate clarification I. Floatation. X. Other Z. Don't know	*Respond if SPT-10 = 1,3,6,8*
E-SPT29	Which treatment processes are used for the solid fraction or sludge produced at the wastewater treatment plant? (Respond if SPT-10 is 1,3)	(Select multiple) <u>Typically combined fractions</u> A. Disposal uncovered on land or uncovered burial B. Safe burial/storage (deep row entrenchment) C. Sedimentation (settling-thickening tanks or pond)	*Respond if SPT-13 = 2*

		D. Mechanical dewatering (screw press, belt press) E. Drying beds (planted or unplanted) F. Anaerobic pond, reactors or digestion <u>Solids fraction only</u> G. Thermophilic anaerobic digestion H. Sludge incineration I. Mechanical/thermal drying (e.g. Pelletiser) J. Extended storage (unplanted drying bed) K. Lime or ammonia stabilization L. Co-composting, black soldier fly, vermin-composting X. Other Z. Don't know	
SPT-13	How is faecal sludge treated at this facility?	1. Advanced treatment of solid and liquid fraction (including further drying / pathogen reduction) 2. Adequate treatment - Dewatering and/or stabilization of solid fraction and treatment of liquid fraction 3. Solid liquid fraction separation only 6. Other 7. No treatment 8. Don't know	*Respond if SPT-10 = 2,4* *1,2,3,6 > SPT-14* 4>SPT-13b 5>END
SPT-13b	Specify other treatment method for wastewater	[TEXT]	*Respond if SPT-13=4* *All > SPT-14*
SPT-14	Which treatment processes are used for the solid fraction of faecal sludge? (Respond if SPT-1 is 2)	(Select multiple) <u>Typically combined fractions</u> A. Disposal uncovered on land or uncovered burial B. Safe burial/storage (deep row entrenchment) C. Sedimentation (settling-thickening tanks or pond) D. Mechanical dewatering (screw press, belt press) E. Drying beds (planted or unplanted) F. Anaerobic Pond, reactors or digestion	*Respond if SPT-13 = 1,2,3,4* *All > SPT-15*

		<u>Solids fraction only</u> G. Thermophilic anaerobic digestion H. Sludge incineration I. Mechanical/thermal drying (e.g. Pelletiser) J. Extended storage (unplanted drying bed) K. Lime or ammonia stabilization L. Co-composting, black soldier fly, vermi-composting X. Other Z. Don't know	
SPT-15	Which treatment processes are used for the liquid fraction resulting from faecal sludge treatment?	<u>Tertiary</u> A. Disinfection (chlorination, UV, etc.) <u>Secondary</u> B. Aerobic suspended or attached growth (e.g. trickling filter, activated sludge) C. Anaerobic suspended or attached growth (e.g. UASB) D. Waste stabilization ponds E. Constructed wetlands <u>Primary treatment</u> F. Screening and grit removal with G. Sedimentation H. Chemical precipitation I. Filtration J. High rate clarification K. Floatation. X. Other Z. Don't know	*Respond if SPT-13 = 1,2,3,4*
E-SPT30	What is done with the solids remaining after treatment?	A. Land for food production B. Land not for food production C. Protected landfill or safe burial D. Open land, unsafe burial X. Other Z. Don't know	
E-SPT31	Where is the treated liquid fraction	A. Land or water for food production	

	remaining after treatment?	B. Land or water bodies – NOT for food production C. Groundwater recharge X. Other Z. Don't know	
E-SPT32	What percentage of the treated faecal sludge complies with national performance (discharge) standards? (Please provide annual average)	% compliance 999. No tested 998. Don't know (write instructions in CAPI that if not tested write 999 and 998 for don't know)	
E-SPT33	What percentage of the treated liquid effluent from this treatment complies with national performance (discharge) standards? (Please provide the annual average)	% Compliance 999. No tested 998. Don't know (Write instructions in CAPI that if not tested write 999 and 998 for don't know)	

Service Authority

Question Number	Overarching question	Sub-questions	Response categories
Background question			
SA10	Population of the administrative unit	What is the name of this administrative unit?	
SA11		What is the population of this administrative unit?	Population:
SA12		What is the total number of households in this administrative unit?	Households:
SA13	What proportion of the population uses sewer vs. on-site sanitation?	How many households (in this administrative unit) are connected to **sewerage?**	Households:
SA14		What kind of sanitation facilities are used by population? (*Indicate the population (or % population) using each of the following types of sanitation):*	**TYPE SANITATION**
			10. No data available
			FLUSH /POUR FLUSH TOILETS: 11. Flush to sewer
			12. Flush to septic tank
			13. Flush to pit latrine/cesspool
			14. Flush to open drain
			18. Flush to don't know where
			PIT LATRINES: 21. Ventilated improved pit latrine (with slab)
			22. Single pit latrine with slab
			23. Twin pit latrine with slab
			24. Pit latrine without slab / open pit
			31. Composting toilet
			32. Container based sanitation
			41. Bucket
			51. Hanging toilet/hanging latrine
			95. No facility/bush/field
			96. Other (Specify:_____)
SA15	Population sharing sanitation facilities	How many people use shared sanitation facilities? *(indicate % population if number people unknown)*	People (or % population): 96. Don't know
			Year of data:
			Source of data:
SA16		On average, for households that share sanitation facilities, how many people use each shared sanitation facility?	a) Average number people sharing each toilet: 96. Don't know
			b) Year of data:
			c) Source of data:
SA17	Comments containment	Other comments or additional information about containments?	

Question Number	Overarching question	Sub-questions	Response categories
Core questions for indicator S9 – Emptying			
SA20	Data availability	Is data available on the emptying of sanitation systems (i.e. septic tanks/pit latrines)? If so, what are the units of data (number of containments, volume of emptied sludge, revenue, trucks, etc.)	Multiple response A. Data available: Number emptied containmer B. Data available: Volume (m3) emptied C. Data available: Other unit (Please specify, e. D. No data but can make estimate E. No data, cannot make estimate
SA21	For SA20 = A Containments emptied in the last year	How many containments (in this administrative unit) were emptied in the last 12 months?	a). Number of containments emptied in the last 12 months: 96. Don't know:
			b) Year of data:
			c) Source of data:
SA22	For SA20 = B Volume of sludge emptied in the last year	What volume of sludge from on-site sanitation systems was emptied in the last 12 months?	a) Volume emptied per year (m^3): 96. Don't know
			b) Year of data:
			c) Source of data:
		What is the average size/volume of household containments? *(Reported per sanitation facility type)*	a) Septic tank Volume (m3): 96. Don't know
			b) Pit latrine Volume (m3) : 96. Don't know
			c) Other common containment Volume (m3)
			d) Specify type of other containment
SA26	For SA20 = D Estimate of annual emptying	How many containments are estimated to have been emptied last 12 months? *(Explain basis of estimate)*	a) Number:
			b) Explanation of estimate:
E-SA20 (Optional)	(Optional) Service provider background	How many formal and informal emptying & transport service providers operate in this administrative area? *(Note: Identifying the number of providers will inform the sample size for the service provider survey)*	Service provider types
			a) Public/municipality/government:
			b) Private enterprise/company/NGO:
			c) Informal emptier (e.g. unlicensed):
			d) Other (specify:_____):
			e) No emptying services (e.g. households self-empty or pit latrines not emptied)
			f). Don't know
E-SA21 (Optional)		How are service providers organized or regulated, if at all?	MULTIPLE ANSWER A) through an association B) licensed by the municipality C) Other formal arrangements (Specify) D) no organization

Question Number	Overarching question	Sub-questions	Response categories
		(Note this informs how data could be or is being collected from these providers)	E) Don't know
SA27	Proportion of emptying by service provider	What proportion of emptying (or number of emptied household containments) were served by each emptying provider last year? *(Note: This may require converting data from customer numbers or geographical areas served by each provider and removing non-household emptying (i.e. commercial, institutional). Attempts should be made to include non-formal market share.)*	Division of emptying across service providers last year: a) Public /municipality/ government b) Private enterprise/ company/ NGO c) Informal emptier (e.g. unlicensed) d) Other provider (specify:_____) e) No emptying services (e.g. households self-empty or pit latrines not emptied) x) No data or Don't know
SA28	Emptying frequency *(required to calculate proportion emptied from annual data)*	Q - What is the typical (or standard) frequency of emptying for the containments in this administrative area? *(Reported by sanitation type. Indicate actual rather than design emptying frequency)*	**Containment type:** a) Septic tanks: 96. Don't know b) Pit latrines: 96. Don't know c) Other common containment type (specify_____)
SA29	Comments emptying	Other comments or additional information about emptying	
Core questions for indicator S11 and S12 and S13 – Transport and Treatment			
SA 30	Transport of emptied excreta from on-site pits and tanks	Where are excreta from emptied containments (septic tanks and pit latrines) discharged? Indicate the proportion discharged at the following sites? *(Note: Consider emptying by all service providers. Proportion can be based on number of containments or households emptied, population served, volume delivered. If treatment/disposal type doesn't exist in this city/district, indicate*	**Type of treatment or disposal site** **<u>Off-site discharge site</u>** 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) Designated waste pond i) Other designated disposal site (specify: _____) **<u>Disposed safely in-situ</u>**

Question Number	Overarching question	Sub-questions	Response categories		
		0%. Sum of all responses should equal 100%.	j) Covered pit at household		
			Delivered elsewhere k) Surface environment (includes agriculture, field, waterway, unprotected landfill)		
			l) Don't know		
SA31		What is the source of above data?	Multiple response A) Records/data from treatment plant B) Records/data from service providers C) Other (Specify:_____) D) Estimate		
SA32	Disposal location per service provider	Which disposal sites are used by each type of service provider? (For each group of service providers indicate Yes/No whether they dispose excreta at each site)	Service provider:	a) Public /municipality/ government	
			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) Designated waste pond		
			i) Other designated disposal site (specify: _____)		
			Disposed safely in-situ j) Covered pit at household		
			Delivered elsewhere k) Surface environment (includes agriculture, field, waterway, unprotected landfill)		
SA33	Quantity received at each disposal site	Of the formal disposal sites, what volume of excreta from emptied on-site sanitation (septic tanks and pit latrines) do they receive per year? Alternatively indicate number of trucks disposed at each site annually.	Disposal site	Annual disp volume (m3	
			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		

Question Number	Overarching question	Sub-questions	Response categories			
		(Note do not include wastewater flows from sewers)	f) Landfill without treatment of FS			
			g) Covered pit/trench			
			h) Designated waste pond			
			i) Other designated disposal site (specify:)			
			Don't know/ Data not available			
SA40	Details of faecal sludge treatment plants (not wastewater / combined treatment)	How many faecal sludge treatment plants, composting plants, landfill with FS treatment, covered pits/trench exist in this administrative area and what are the names/locations:	0. No faecal sludge treatment plants, (FSTP) 1. Faecal sludge treatment 1, Name/location:__ 2. Faecal sludge treatment 2, Name/location:__ 3. Faecal sludge treatment 3, Name/location:__ 4. Faecal sludge treatment 4, Name/location:__ 5. Faecal sludge treatment 5, Name/location:__ 6. Faecal sludge treatment 6, Name/location:__			
SA41		What flows do the FSTPs receive weekly/monthly/quarterly?	FS treatment number (above)	1	2	3
			inflows (m3/weekly/monthly/quarterly)			
			OR - inflows (trucks/weekly/monthly/quarterly)			
SA42	Treatment of excreta emptied from on-site pits and tanks	What level of treatment is provided in each faecal sludge treatment plant?	What level of treatment is provided at each faec			
			FS treatment number (above)	**1**	**2**	3
			Solid liquid fraction separation a) settling-thickening tanks			
			b) Mechanical dewatering of solid fraction			
			c) Planted drying beds			
			d) Unplanted drying beds			
			Stabilization of solid fraction e) Co-composting			
			f) Anaerobic digestion / ponds			
			g) Incineration			
			h) Mechanical or thermal drying			
			Treatment of liquid fraction i) primary treatment (sedimentation ponds, filtration, etc.)			

Question Number	Overarching question	Sub-questions	Response categories			
			j) secondary or higher treatment (includes wetlands, waste stabilization ponds, etc.)			
			Other k) Lime or Ammonia treatment			
			l) Deep row entrenchment (sludge buried and covered)			
			m) Extended storage			
			n) Other (Specify:_____)			
			o) No treatment			
			x) Don't know			
SA43	Treatment of all inflows at FS treatment	Do all of the inflows to these faecal sludge treatment plants receive the full treatment? *(I.e. Flows not bypassed/ overflow/ treatment not functioning)*	FS treatment number (above)	**1**	**2**	
			flows that receive full treatment 1. no flows treated, 2. partially functioning, 3. all flows treated)			
SA44	Details of wastewater treatment plants that also receive excreta emptied from on-site sanitation	How many wastewater treatment plants receive excreta emptied from on-site sanitation (septic tanks and pit latrines) in this administrative area and what are the names/locations:	0. No wastewater treatment plants, (WWTP) 1. WWTP 1, Name/location:_____ 2. WWTP 2, Name/location:_____ 3. WWTP 3, Name/location:_____ 4. WWTP 4, Name/location:_____ 5. WWTP 5, Name/location:_____ 6. WWTP 6, Name/location:_____			
SA45		What flows from emptied on-site sanitation systems only do the WWTPs receive weekly/monthly/quarterly? (Note, *do not include* wastewater or sewer flows)	WWTP number (above)	1	2	
			inflows from on-site sanitation only (m3/ monthly/yearly)			
			OR - inflows (trucks/ monthly/yearly)			
SA46	Level of wastewater treatment provided	For faecal sludge delivered wastewater treatment plant or into a sewer line connected to WWTP (SA30 b+c), what level of treatment does the WWTP provide?	WWTP number (above)	1	2	
			1) Tertiary or higher			
			2) Secondary			
			3) Primary			
			4) Other (specify)			
			5) No treatment			
			8) Don't know			
SA47	Treatment of all inflows at WWTP	Do all of the inflows to these wastewater treatment plants receive the full treatment? *(I.e.*	WWTP number (above)	1	2	
			flows that receive full treatment 1. no flows treated,			

Question Number	Overarching question	Sub-questions	Response categories
		Flows not bypassed/ overflow/ treatment not functioning)	2. partially functioning, 3. all flows treated)
E-SA40	(Optional) Treatment performance	What percentage of the treated faecal sludge (solid component) complies with national performance standards? *(Please provide annual average)*	% compliance: 3. No tested 8. Don't know
E-SA41		What percentage of the treated liquid effluent from complied with national performance (discharge) standards? *(Please provide the annual average)*	% compliance: 3. No tested 8. Don't know
E-SA42		Where is the final treated effluent (treated wastewater) discharged (or given/sold) to?	1. Land or water for food production 2. Land or water bodies – NOT for food produc 3. Long Ocean outfall 4. Groundwater recharge 8. Don't know
E-SA43	(Optional) Reuse	Are the solids from the treatment process used in agriculture or other purposes?	1. Yes 2. No 3. Maybe / Occasionally 8. Don't know
E-SA44		What types of activities is the liquid effluent used for?	(MULTIPLE RESPONSE) A. Food production B. Agriculture non-food production C. Aquaculture/fishing D. Energy production E. Building/construction X. Other
E-SA45		Does any further treatment or storage of solids occur prior to reuse?	1. Yes 2. No 8. Don't know
E-SA46		Are the areas where treated wastewater or sludge are reused accessible to the public	1. Yes 2. No 3. Maybe / Occasionally 8. Don't know