

# Guidance for monitoring safely managed on-site sanitation (SMOSS)

## Annex D: Data collection - Service authority and service provider surveys

Draft – August 2022

**Background:** These annexes accompany the Guidance for monitoring SMOSS - draft prepared for phase 2 pilots. The annexes provide details on indicators, core and expanded questions and other tools for designing monitoring systems to collect data for SDG 6.2.1. The annexes are split into the following documents:

- A. Global indicators for monitoring SMOSS
- B. Data collection – Household questionnaire
- C. Data collection – household sanitation inspections
- D. Data collection - Service authority and service provider surveys
- E. Analysis to inform national estimates for SDG 6.2.1

Each document provides additional details, example questions and relevant background information to inform the design and implementation of SMOSS monitoring, recognising that not all details are relevant to all actors. These annexes are working documents that will be updated and finalised in 2023 with inputs from the phase 2 pilots and other global efforts that continue to test methods to improve monitoring of safely managed sanitation services.



Pit emptying Ecuador (UNICEF 2021)

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**Reference:** This document along with the main guidance document and other annexes are available at <https://washdata.org/monitoring/sanitation/safely-managed-on-site-sanitation>

## D. Data collection - Service authority and service provider surveys

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This annex brings together three methods of data collection to capture information about emptying, transport and treatment services, which cannot reasonably be captured with household questionnaires or inspections. There are multiple potential sources of data from service authorities and providers, numerous approaches to collect new data and typically diverse actors involved in sanitation regulation and management. This annex provides suggested questions for the following three data collection method that could be integrated into existing monitoring systems or form part of dedicated surveys:

- Service authority surveys
- Service provider surveys: i) Emptying and transport, ii) Treatment
- Spot check or inspection of treatment

The introduction section defines service authority and service provider roles in data collection as assumed for this document which can be adapted to apply to the national institutional arrangements for sanitation. Administrative data is often the term used for **routine** data collection by governments and service providers and could include regular data collection from authorities or providers. To date there are few known examples of existing administrative data relevant to SMOSS indicators. The surveys detailed in this guidance could become administrative data once implemented regularly.

This guidance proposes core questions for each method that can be used to inform national SDG estimates, possible expanded questions, examples from Phase 1 pilots or global practice, and a brief guidance on sampling considerations.

### D.1 Introduction to service authority and service provider surveys

As detailed in the accompanying guidance document, monitoring on-site sanitation services (emptying, transport, treatment) requires data from local authorities and service providers. A challenge to collecting this data is that there is not one standard approach to the regulation and management of sanitation services. Even within one country regulation and management of different part of the service chain can be fragmented across different actors or vary between urban and rural service provision. For this guidance we have suggested two main actors which can provide data on sanitation services, the service authority and service providers. Below are the general assumptions about their roles in data collection which were used to scope the data collection methods outlined in this Annex.

- **Service authority** is usually the **local government** (or municipality) responsible for overseeing provision of sanitation services by service providers. Local government may also provide services directly (in which case it is also the service provider). In both cases local government is expected to routinely collect and store data on the provision of sanitation services within their administrative jurisdiction (district, city or province). Central line ministries or regulatory authorities may require all local government units to periodically report on a small number of key sector performance indicators via a sector information management system. Ministries of local government, infrastructure, health and environment may also periodically send out questionnaires to service authorities in order to compile information on specific topics. For the core questions we assume that the service authority should be able to routinely provide updated data every 1-2 years on the main types of services provided and the populations served within their administrative jurisdiction, even if doing so could require adapting existing data collection systems.
- **Service providers** are the entities responsible for delivering sanitation services. They may be large or small, public or private, formal or informal. In some countries service provision is regulated through

the provision of licenses and permits but there may also be unlicensed service providers. Licensed service providers may be required to routinely provide information to the service authority that issues the license to operate. Local government authorities and regulators may also conduct random spot checks to assess compliance with agreed standards of service provision. For the core questions we assume the service providers should be able to routinely provide data on the quantity and quality of services they provide each year (e.g. populations served, containments emptied, sludge treated), and describe the type, function and performance of services provided.

While the survey questions have been divided into these two categories, who completes them and how may vary. Depending on the context, some authorities can complete the service provider questions from regularly collected data, otherwise they might lead the collection of this information, or require that the service providers respond directly. As noted in the guidance document, phase 1 pilot countries found that mapping stakeholders and assessing key regulations and responsibilities for each step of the sanitation service chain was an important initial activity to improve monitoring of SMOSS. This mapping could inform how data collection from service authorities and service providers could be integrated in national monitoring systems.

The suggested core questions for service authorities and service providers could either be **integrated into existing local or national data collection and reporting** or be part of a **dedicated survey**. In the phase 1 pilot in Ecuador, 15 questions related to SMOSS were added to the existing National System for Municipal Information (SNIM), a digital platform collecting information on the management of municipalities annually (see section D6.1). Where routine data collection systems do not exist, dedicated data collection could allow a one-off capture of this information as well as providing an example of how this data could be integrated into regular monitoring systems. A dedicated survey of local government units and service providers was conducted in the Phase 1 pilot in Serbia, where there was no national agency responsible for sanitation and no regular national data collection on sanitation services (see section D6.2).

## D.2 Service authority survey

### D.2.1 Service authority core questions

This section provides a set of core questions for the sanitation service authority, to report on emptying, transport and treatment data relevant to the administrative area they are responsible for. These questions could be implemented as a survey or routine MIS checklist, either as a standalone sanitation survey or integrated into existing larger data collection systems. The core questions presented in Table D 1 are those necessary to inform the global SMOSS indicators as well as questions on which population the data relates to which is necessary for analysis and interpretation of this data.

Table D 2 presents several expanded questions on broader indicators of sanitation services and performance that countries may be interested in monitoring but are not necessary for the global SDG indicator. Service authority data collection often includes questions on regulatory, finance and other institutional aspects however they are not included in the expanded question table as they are not directly relevant for the monitoring of service delivery outcomes needed for SDG indicator 6.2.1. Other tools and guidance exist for monitoring these aspects of sanitation such as the GLAASS reporting<sup>1</sup> and FSM service delivery assessments.<sup>2</sup> Phase 1 pilots found it useful to conduct stakeholder mapping and an assessment of regulations as an initial step to identify the relevant stakeholders that were responsible for service delivery who could complete the surveys and the standards to compare service outcomes against.

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<sup>1</sup> UN-Water global analysis and assessment of sanitation and drinking-water (GLAAS) includes tools for regularly capturing comprehensive data on water, sanitation and hygiene (WASH) systems, including on governance, monitoring, human resources and finance. <https://glaas.who.int/>

<sup>2</sup> Blackett, I. and Hawkins, P. 2019: [City Service Delivery Assessment \(CSDA\) for Citywide Inclusive Sanitation](#). Is an example of a tool for assessing the enabling environment of sanitation service delivery.

## Box D1. Aligning Administrative data with global indicators

### Data sources for emptying

There are a range of possible sources and units of administrative data on emptying on-site sanitation systems. The global indicator S9 requires data on the proportion of the population that has ever emptied their pit latrine or septic tank however, administrative data is often available on an annual basis, in line with common reporting periods. The data may also be in a variety of units, such as a number of trucks or volume rather than per person. The following examples show how to align the different units of administrative data with indicator S9 and what supplementary data may also need to be collected. Suggested survey questions are provided for different data sources, with number of households or containments proposed as the core question and equivalent questions based on volumes or other units are provided in the expanded questions. The choice of which question to use depends on available data.

- **Annual number of households or containments emptied:** Not all households are expected to empty their containments every year, therefore annual data needs to be converted to data relevant to the population based on the designed or expected emptying frequency. For example, septic tanks may require emptying every 3 years, therefore the proportion of the population that emptied that year is calculated as the number emptied divided by one third of the population. While the indicator S9 is calculated as the population ever emptied from household questionnaire data, it is unlikely that adequate long-term records are available to understand the proportion ever emptied, therefore the annual proportion of population that emptied would be reported for S9.
- **Volumes of sludge emptied:** Emptying data from trucks or treatment may be reported as a volume of sludge emptied or delivered. This data needs to be converted to population equivalents using supplementary data on the average volume of containment and how many people use each containment. Since faecal sludge emptied from wet containments includes both the settled sludge and liquid, it is necessary to use the volume of containment rather than sludge accumulation rates. Data on containment volume could come from household sanitation inspections or service providers surveys.

Alternative units or sources of data may also exist, such as income from emptying services available in some cities where the local authority is also the service provider. It may also be necessary to disaggregate data between residential containments and containments used by public toilets, institutions and commercial properties, as the volumes and costs of emptying differ, and estimates for SDG 6.2.1 are based on residential data. Lastly, service authorities should be encouraged to seek data from all providers, not only formal or regulated ones. During the data analysis, an assessment may be necessary to determine whether service authority data is representative of the entire administrative unit. This could be done by comparing service authority responses with data from household questionnaires or by follow up interviews with a sample of service authorities.

### Data sources transport and treatment

To date there are few examples of administrative data on faecal sludge treatment and the data that does exist often doesn't adequately inform the indicator S13 on faecal sludge delivered to treatment and both the solid and liquid phase treated.

- **Number of trucks or volume discharged at treatment** - Administrative records or logbooks may collect data on the monthly or annual number of trucks of faecal sludge received at the treatment plant or the volume discharged. If a direct comparison with the number or volume emptied is not possible due to different data sources or units, then the number or volume discharged to treatment should be converted to a population equivalent based on containment volume and emptying frequency. Service provider responses to safe delivery may need to be cross checked with log book data or spot checks.
- **Capacity of treatment** – Administrative data may exist on the capacity and treatment level of faecal sludge treatment plants. This could be the capacity of a faecal sludge treatment plant or how much faecal

sludge the wastewater treatment plant can receive. While capacity of treatment is not a core question, it may be useful to inform the portion of the administrative area that the treatment could serve, which is most relevant in areas where treatment plants are at a pilot scale and could not be expected to provide treatment to the entire population. Containment size and emptying frequency data would be needed to convert capacity to population equivalent. This data doesn't confirm the proportion that does deliver to the treatment, but indicates the upper capacity limit that can be assumed to be safely treated.

**Table D 1. Core questions for service authority**

	Overarching question	Sub-questions	Response categories
<b>Background questions</b>			
SA10	Population of the administrative unit	What is the name of this administrative unit?	
SA11		What is the population of this administrative unit?	Pp Year of data:
SA12		What is the total number of households in this administrative unit?	Households: Year of data:
SA13	What proportion of the population uses on-site sanitation?	How many households (in this administrative unit) are connected to sewerage?	Households: Year of data:
SA14		What kind of sanitation facilities are used by population without sewer connections?	Indicate the population using each of the following types of non-sewered sanitation: 12. Flush to septic tank 13. Flush to pit latrine 14. Flush to open drain 15. Flush to elsewhere 16. Flush to don't know where 21. Pit latrine with slab 22. Pit latrine without slab / open pit 23. Composting toilet 31. Bucket 32. Hanging toilet/hanging latrine 41. No facility/bush/field 96. Other (specify) <i>Optional</i> 51. Ventilated improved pit latrine with slab 52. Twin pit latrine with slab 53. Container based sanitation
<b>Core questions for indicator S9</b>			
SA20	Proportion of the population using on-site sanitation that were emptied in the last year  <i>Assume 1 containment per household</i>	Q – How many households (in this administrative unit) received emptying services in the last year? (Reported per sanitation facility type)	Number of containments emptied in last year: a. Septic tanks : b. Pit latrines (dry and wet): c. Other latrines (specify): d. Total latrines (if not disaggregate by facility type): 96. Don't know: _____
SA21		Q - What is the typical (or standard) frequency of emptying for the containments in this administrative area? (Reported by sanitation type)	Emptying frequency: a) Septic tanks: Every xxx years b) Pit latrines: Every xxx years 96. Don't know

	Overarching question	Sub-questions	Response categories
<b>Core questions for indicator S11 and S12 and S13</b>			
SA30	Transport of emptied excreta from on-site pits and tanks	<p>What proportion of emptied containments are discharged at the following sites?</p> <p><i>(Note: Consider emptying by all service providers. Proportion can be based on volume delivered, number of containments or households emptied, population served. Sum of all responses should equal 100%)</i></p>	<p>Proportion discharged at:</p> <p><u>Off-site discharge site</u></p> <p>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)</p> <p><u>Disposed safely in-situ</u></p> <p>j) Covered pit at household</p> <p><u>Delivered elsewhere</u></p> <p>k) Surface environment (includes agriculture, field, waterway, unprotected landfill)  l) Don't know</p>
<b>Core questions for indicator S11 and S12 and S13</b>			
SA40	Treatment of excreta emptied from on-site pits and tanks	<p>For faecal sludge discharged to a faecal sludge treatment (SA30=a), what level of treatment is provided?</p> <p><i>(Note: Given some administrative areas have multiple treatment plants, indicate the proportion of emptied excreta receiving the following level of treatment – sum of all treatments should equal 100%)</i></p>	<p>Proportion of emptied faecal sludge delivered to a FSTP receiving the following level of treatment:</p> <p>a) Treatment of solid and liquid fraction  b) Dewatering and/or stabilisation of solid fraction and treatment of liquid fraction  c) Solid liquid fraction separation only  d) Other  e) No treatment  f) Don't know</p>
SA41		<p>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?</p> <p><i>(Note: Given some administrative areas have multiple treatment plants, indicate the proportion of emptied excreta receiving the following level of treatment – sum of all responses should equal 100%)</i></p>	<p>Proportion of emptied faecal sludge delivered to a WWTP or sewer receiving the following level of treatment:</p> <p>a) Tertiary or higher  b) Secondary  c) Primary  d) Other (specify)  e) No treatment  f) Don't know</p>

## D.2.2 Service authority example expanded questions

As mentioned above the expanded questions presented below are examples of alternative approaches to collect data on emptying, transport and treatment service outcomes and some additional questions relating to the level of service provided that may inform local indicators. These are not a complete list and also do not include questions relating to the enabling environment that is outside the scope of monitoring for SDG indicator 6.2.1.

**Table D 2. Example expanded questions for service authority surveys**

	Overarching question	Sub-questions	Response
<b>Background questions</b>			
E-SA10	Population sharing sanitation facilities	How many people use shared sanitation facilities?	People Year of data: Source of data:
E-SA11		On average, for households that share sanitation facilities, how many people use each shared sanitation facility?	People Year of data: Source of data:
<b>Indicator S9 - Emptying</b>			
E-SA20	Proportion of the population using on-site sanitation that have ever emptied their containment by type of service provider	What proportion of households are served by each emptying provider?  (Note: for each provider indicate the % household in this administrative area that are served. This may require converting data from customer numbers or geographical areas served by each provider. Attempts should be made to understand non-formal market share.)	Proportion of population served by each: 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)
E-SA21		How many households have the following service providers emptied in the last year?  (Note: for each provider the data may be in different units (household, residential containments, all containments – need to remove non-residential). Attempts should be made to collect data from non-formal service providers).	Household emptied by each provider: 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-SA22	Volume of sludge emptied in the last year	What volume of sludge was emptied in the last year?	M3 96. Don't know
E-SA23		What is the average size/volume of household containments? (Reported per sanitation facility type)	Average volume: a) Septic tank xx m3 b) pit latrine xx m3 96. Don't know
E-SA24	Income from emptying services in the last year	What is the annual income from emptying residential containments?	(Annual) Total income
E-SA25		What is the average cost / rate charged for emptying one standard residential containment? (Alternative: cost per containment type, or m3 emptied)	Average cost/tank or pit (or indicate if alternative unit)

	Overarching question	Sub-questions	Response
<b>Transport to treatment - expanded questions</b>			
E-SA30	Service provider background	How many formal and informal emptying & transport service providers operate in this administrative area? <i>(Note: Identifying the number of providers will inform the sample size for the service provider survey)</i>	Provide the number of providers: a) Public/municipality/government: b) Private enterprise/company/NGO: c) Informal emptier (e.g. unlicensed): d) Other (specify): Or indicate: e) No emptying services (e.g. households self empty or pit latrines not emptied) f) Don't know
E-SA31		How are service providers organized or regulated, if at all? <i>(Note this informs how data could be or is being collected from these providers)</i>	a) through an association b) licenced by the municipality c) other formal arrangements d) no organization e) Don't know
E-SA32	Alternative sources of emptying and transport data by service provider	What proportion of containments are emptied by each of the following service providers? <i>(Note: please consider all emptied containments, not only those by government or formal emptying providers. Sum of all responses should equal 100%)</i>	Proportion of containments/households emptied by: 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-SA33		For <b>Public/municipality/government</b> service providers, what proportion of excreta do they discharge at the following sites? <i>(Note: Sum of all responses should equal 100%)</i>	What proportion of emptied containments are discharged at: <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> j) Covered pit at household <u>Delivered elsewhere</u> k) Surface environment (includes agriculture, field, waterway, unprotected landfill) l) Don't know
E-SA34		For <b>Private enterprise/company/NGO</b> , what proportion of excreta do they deliver to following sites? <i>(Note: Sum of all responses should equal 100%)</i>	What proportion of emptied containments are discharged at: <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

	Overarching question	Sub-questions	Response
			i) 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) l) Don't know
E-SA35		<b>For informal emptiers, what proportion of excreta do they discharge to following sites? (Note: Sum of all responses should equal 100%)</b>	Proportion of emptied containments discharged at: <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> j) Covered pit at household <u>Delivered elsewhere</u> k) Surface environment (includes agriculture, field, waterway, unprotected landfill) l) Don't know
E-SA36	Alternative sources of data on transport based on records at treatment plant	In this administrative area, how many of the following facilities exist that receive faecal sludge emptied from on-site sanitation? <i>(Note: this question can be used to reduce this list of delivery sites to only those that exist for the following questions. Identifying the number of disposal sites will also inform the sample size for the service provider and inspection surveys)</i>	Indicate how many of each type of facilities that receive excreta emptied from OSS exist: a) Faecal sludge treatment plant b) Wastewater treatment plant c) Directly into sewer d) Composting e) Landfill with treatment of FS f) Landfill without treatment of FS g) Buried in covered pit not at household h) Other disposal site (specify) Don't know
E-SA37		<b>What volume of excreta emptied from on-site containments (faecal sludge) was delivered to/received by each site (alt. in the last year)?</b>	Proportion of emptied containments discharged at: <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> j) Covered pit at household <u>Delivered elsewhere</u>

	Overarching question	Sub-questions	Response
			k) Surface environment (includes agriculture, field, waterway, unprotected landfill) l) Don't know
E-SA38		What proportion of excreta <b>delivered to the FSTPs</b> is delivered by each operator? <i>(Note: This can be answered based on volume delivered or number of containments or trucks. Sum of all responses should equal 100%)</i>	Indicate the proportion delivered by each of following to the FSTP: a) Public/municipality/government b) Private enterprise/company/NGO c) Informal emptier (e.g. unlicensed) d) Other (specify) e) Don't know
E-SA36		What proportion of excreta <b>delivered to the WWTPs or sewers</b> is delivered by each operator? <i>(Note: This can be answered based on volume delivered or number of containments or trucks. Sum of all responses should equal 100%)</i>	Indicate the proportion delivered to each of following: a) Public/municipality/government b) Private enterprise/company/NGO c) Informal emptier (e.g. unlicensed) d) Other (specify) e) Don't know
<b>Treatment- expanded questions</b>			
E-SA40	Treatment performance	What percentage of the treated faecal sludge (solid component) complies with national performance standards? <i>(Please provide annual average)</i>	% compliance 3. No tested 8. Don't know
E-SA41		What percentage of the treated liquid effluent from this treatment complied with national performance (discharge) standards? <i>(Please provide the annual average)</i>	% 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 production 3. Long ocean outfall 4. Groundwater recharge 8. Don't know
E-SA43	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?	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

### D.3 Service provider survey - Emptying and transport

Service provider surveys are separated into a survey on emptying and transport, and one on treatment, as these activities are not necessarily conducted by the same provider. These questions could be integrated into regular reporting or data collection from service providers, such as may be required for licencing arrangements or by the regulator or could be implemented as a dedicated survey. The survey was designed to be captured from the service provider directly, however regulators or service authorities may regularly collect this data and be able to complete the information. Sampling should aim to be representative of the range of service providers (e.g. government, private, informal), different areas of coverage (e.g. across each administrative unit, urban and rural) and the types of services provided (e.g. vacuum emptying, manual emptying). Other considerations for sampling to be both representative within the administrative area and representative nationally are provided in section D7.2.

These emptying and treatment questions were drawn from a set of draft questions previously developed by WHO and UNICEF in 2016. These were developed as a person-person survey or interview and suggested that the interviewer should ensure they understand the local context before conducting the interview. This includes background knowledge about what service providers exist in the area, the location and the use and management of treatment plants or other disposal sites and would also be valuable background knowledge when adapting these surveys to suit the national context.

#### D.3.1 Core questions - Service providers of faecal sludge emptying and transport

The table below includes the proposed core questions for a service provider survey covering faecal sludge emptying and transport. The scope aims to cover all types of containments, emptying and transport methods. Recognising that there are different ways data can be collected, alternative questions are provided in the expanded question table D4 and the questions most relevant to available data should be used. For example, the number of containments emptied in a year is the proposed core question however similar results could be achieved through the expanded question on the volume emptied and the average containment volume. Since service providers don't necessarily cover the entire administrative area, additional questions are included to understand what geographical areas or social groups their services relate to.

**Table D 3. Draft core questions for emptying and transport service provider surveys**

ID	Question	Response
<b>SPE-10</b>	What is your employment status?	<ol style="list-style-type: none"> <li>1. Self-employed,</li> <li>2. Company owner,</li> <li>3. Work for a private company/NGO</li> <li>4. Work for a public company/municipality/ government</li> <li>5. Other (specify)</li> <li>6. Don't know</li> </ol>
<b>SPE-11</b>	Which location(s) do you work in (describe by district, zone, village etc. of the urban or rural location)?	<ol style="list-style-type: none"> <li>1. List name(s) of service area(s)_____</li> <li>2. Don't know</li> </ol>
<b>SPE-12</b>	What type of containments do you empty?	<p>Multiple answers</p> <ol style="list-style-type: none"> <li>A. Flush to septic tank</li> <li>B. Flush to pit latrine</li> <li>C. Flush to open drain</li> <li>D. Flush to elsewhere</li> <li>E. Flush to don't know where</li> <li>F. Pit latrine with slab</li> <li>G. Pit latrine without slab / open pit</li> <li>H. Composting toilet</li> <li>I. Bucket</li> <li>J. Hanging toilet/hanging latrine</li> </ol>

		<p>K. No facility/bush/field</p> <p>X. Other (specify)</p> <p><i>Optional</i></p> <p>L. <i>Ventilated improved pit latrine (with slab)</i></p> <p>M. <i>Twin pit latrine with slab</i></p> <p>N. <i>Container based sanitation</i></p>
<b>SPE-13</b>	On average, how many containments (septic tanks, pit latrines and other systems) do you empty per day/week/month/year?	<p>Total number of containments:</p> <p>Unit of data:</p> <ol style="list-style-type: none"> <li>1. Day</li> <li>2. Week</li> <li>3. Month</li> <li>4. Year</li> </ol>
<b>SPE-14</b>	In the last month, what proportion of the faecal sludge you collect do you discharge at the following sites? <i>(Note: If all delivered to one site mark 100%, otherwise distribute based on number of containments/trucks/volume depending on data available).</i>	<p>Proportion of emptied containments discharged at:</p> <p><u>Off-site discharge site</u></p> <ol style="list-style-type: none"> <li>a) Faecal sludge treatment plant</li> <li>b) Wastewater treatment plant</li> <li>c) Sewer line</li> <li>d) Composting plant</li> <li>e) Landfill with treatment of FS</li> <li>f) Landfill without treatment of FS</li> <li>g) Covered pit/trench</li> <li>h) Designated waste pond</li> <li>i) Other designated disposal site (specify)</li> </ol> <p><u>Disposed safely in-situ</u></p> <ol style="list-style-type: none"> <li>j) Covered pit at household</li> </ol> <p><u>Delivered elsewhere</u></p> <ol style="list-style-type: none"> <li>k) Surface environment (includes agriculture, field, waterway, unprotected landfill)</li> <li>l) Don't know</li> </ol>

### D.3.2 Expanded questions - Service providers of emptying and transport services

**Table D 4. Service providers emptying and transport survey – expanded questions**

ID	Question	Response
E-SPE10	Cluster no./service area no.	
E-SPE11	Service provider number	
E-SPE12	Interviewer's name	
E-SPE13	Day / Month / Year of interview	
E-SPE14	Location	
E-SPE15	Area	<ol style="list-style-type: none"> <li>1. Urban</li> <li>2. Rural</li> </ol>
E-SPE16	Name	
E-SPE17	Organisation name (if any)	<ol style="list-style-type: none"> <li>1. Name____</li> <li>2. Don't know</li> </ol>
E-SPE18	Title or position held in organisation (if any)?	
E-SPE19	License number (if any)?	
E-SPE20	Are you a member of, or affiliated to, an association of 'emptiers'?	<ol style="list-style-type: none"> <li>1. Yes</li> <li>2. No</li> <li>3. Other (specify)</li> <li>4. Don't know</li> </ol>

ID	Question	Response
E-SPE21	Are there other E&T service providers working in the same areas?	1. Yes 2. No 3. Don't know
E-SPE22	How many other E&T service providers working in the same areas?	Other responses to be added
E-SPE23	What percentage of the overall district/city population do you serve? (Note: They may either have specific population numbers or estimate, 100%, 90%, 50%, 10%)	% of city/district population
E-SPE24	Do you serve particular groups of the population?	Multiple answers A. Household/domestic B. Institutions C. Commercial D. Residential – specifically low-income / informal/slum areas E. Emergency camps X. Other
E-SPE25	What type of equipment do you use for emptying?	Multiple answers A. Pump attached to vacuum truck B. Submersible pump C. Manual pump D. Bucket E. Shovel X. Other (specify)
E-SPE26	Does emptying require you (or your colleagues or employees) to enter the containment to empty?	1. Yes 2. No 3. Don't know
E-SPE27	What type of equipment do you use for transport?	1. Vacuum truck 2. Truck with tank 3. Truck with open storage 4. Cart 5. Other (specify) 6. No transport, direct disposal
E-SPE28	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 3. Don't know
E-SPE29	What special clothes or equipment is worn?	Select all that apply A. Gloves; B. Boots; C. Masks; D. Overalls; E. Others (specify); F. Don't know.
E-SPE30	If, available please report the average number of containments emptied per type (septic tank, pit latrine) per day/week/month/year?	a) Septic tanks emptied: b) Pit latrines emptied: Unit of data: 1. Day 2. Week 3. Month 4. Year
E-SPE31	On average, what is the total volume of excreta did you empty from on-site sanitation facilities per day/week/month/year?	Quantity (m <sup>3</sup> ): Unit of data: 1. Day 2. Week 3. Month

ID	Question	Response
		4. Year
E-SPE32	What is the average size/volume of household containments? (Reported per sanitation facility type)	Average volume: a) Septic tank xx m3 b) pit latrine xx m3 96. Don't know
E-SPE33	Are you permitted to deliver to all treatment sites that exist in this area? If not, why?	
E-SPE34	During the year are there periods when it is not possible to deliver to the treatment sites? If so, why?	
E-SPE36	Do you keep a record of all household emptying and transport activities?	
E-SPE37	Do you have records of your annual income from emptying?	
E-SPE38	What is average the cost / rate charged for emptying one containment?	

#### D.4 Service provider survey – faecal sludge treatment

Similar to the emptying and transport service provider survey, these questions can be implemented into an existing monitoring system, such as conducted by a technical ministry or conducted by regulators. These systems more commonly focus on compliance with environmental effluent standards or capacity of the systems but do not always include questions relevant to inform SMOSS estimates. In particular often the details of treatment steps are not provided and may need to be added or how solids are treated in a wastewater treatment plant.

A dedicated survey can also be conducted collect once-off data on the type and status of treatment facilities for faecal sludge, depending on the progress and function of systems this type of survey may not need annual updating.

Identification of who will complete the survey will be important in the survey design, and the respondent should have some technical knowledge to be able to identify the type of treatment and whether it is designed and functioning as intended. The below Figure D1 provides examples of what treatment facilities can be considered as adequate treatment and highlights that both solid and liquid phases must be treated wastewater and faecal sludge waste streams.

Figure D1. Types of treatment for solid and liquid fractions

	Faecal sludge <sup>a</sup>	Wastewater and liquid fraction from faecal sludge
<b>Treated: Advanced treatment (possible for reuse)</b>	<p><b>Further drying/ pathogen reduction</b></p> <ul style="list-style-type: none"> <li>• Extended storage</li> <li>• Thermophilic anaerobic digestion</li> <li>• Sludge incineration</li> <li>• Mechanical/thermal drying (e.g. Pelletiser)</li> <li>• Lime or ammonia stabilization</li> <li>• Co-composting, black soldier fly, vermi-composting</li> </ul> <p style="text-align: center;"><b>Liquid fraction &gt;</b> As per wastewater treatment</p>	<p><b>Advanced and Tertiary treatment <sup>a</sup></b></p> <ul style="list-style-type: none"> <li>• Advanced oxidation</li> <li>• Membrane filtration</li> <li>• Carbon absorption</li> <li>• Ion exchange</li> <li>• Chemical oxidation</li> <li>• Advanced N, P removal</li> <li>• Disinfection</li> </ul> <p style="text-align: center;"><b>&lt; Sludge/solid fraction</b> As per faecal sludge treatment</p>
<b>Treated: Adequate treatment</b>	<p><b>Dewatering and/or stabilization of solid fraction</b></p> <p><u>Combined solid/liquid phase or septage</u></p> <ul style="list-style-type: none"> <li>• Anaerobic pond, reactors or digestion</li> <li>• Mechanical dewatering (screw press, belt press)</li> <li>• Safe burial/storage (deep row entrenchment)</li> </ul> <p><u>Solid fraction only</u></p> <ul style="list-style-type: none"> <li>• Drying beds (planted or unplanted)</li> </ul> <p style="text-align: center;"><b>Liquid fraction &gt;</b> • As per wastewater treatment</p>	<p><b>Secondary treatment <sup>b</sup></b></p> <ul style="list-style-type: none"> <li>• Aerobic suspended or attached growth (e.g. AS or trickling filters)</li> <li>• Anaerobic suspended or attached growth (e.g. UASB)</li> <li>• Waste stabilisation ponds</li> <li>• Wetlands</li> </ul> <p style="text-align: center;"><b>&lt; Sludge/solid fraction</b> • As per faecal sludge treatment</p>
<b>The levels above are the threshold for 6.2 and 6.3</b>		
<b>Not adequately treated</b>	<p><b>Solid liquid separation only</b></p> <ul style="list-style-type: none"> <li>• Sedimentation (settling-thickening tanks or pond)</li> <li>• Storage / partial treatment (septic tanks)</li> </ul>	<p><b>Primary treatment <sup>c</sup></b></p> <p>Screening and grit removal with</p> <ul style="list-style-type: none"> <li>• Sedimentation</li> <li>• Chemical precipitation</li> <li>• Filtration</li> <li>• High rate clarification</li> </ul> <p>Flotation</p>
<b>Not treated</b>		

Notes:

a. Table adapted from the WHO and UN-Habitat 2018 description of treatment types to also include the faecal sludge treatment technologies referenced in Tayler 2018 and Strande et al 2014.<sup>3</sup>

b. **Tertiary treatment** is a process that follows secondary treatment and removes nitrogen, phosphorous or any other pollutant, such as microbiological pollution or colour, that affects the quality or a specific use of water.

c. **Secondary treatment** is a process that follows primary treatment of water and generally involves biological or other treatment with a secondary settlement or other process that results in a BOD removal of at least 70 per cent and a chemical oxygen demand (COD) removal of at least 75 per cent.

d. **Primary treatment** can be described as a mechanical, physical or chemical process involving settlement of suspended solids or any other process in which the biochemical oxygen demand (BOD) of the incoming water is reduced by at least 20 per cent before discharge, and the total suspended solids of the incoming water are reduced by at least 50 per cent. Where effluent from primary treatment plants is discharged to water bodies at very low risk of exposure to humans (for example, long ocean outfalls) these wastes are also classified as safely managed.<sup>4</sup>

<sup>3</sup> WHO and UN-Habitat, 2018. Piloting the monitoring methodology and initial findings for SDG indicator 6.3.1. Geneva: World Health Organization and UNHABITAT.

Tayler, K., 2018. Faecal Sludge and Septage Treatment: A guide for low-and middle-income countries. Warwickshire: Practical Action publishing.

Strande, L. & Brdjanovic, D. (Eds.), 2014. Faecal sludge management: Systems approach for implementation and operation. IWA publishing.

<sup>4</sup> WHO and UNICEF, 2017. Progress on Drinking Water, Sanitation and Hygiene Update and SDG Baselines 2017. Geneva: World Health Organization and UNICEF

#### D.4.1 Core questions - Service providers of faecal sludge treatment

**Table D 5. Core questions for treatment service providers**

ID	Question	Response
<b>SPT-10</b>	What types of materials are received for treatment at this facility?	<ol style="list-style-type: none"> <li>1. Wastewater only</li> <li>2. Faecal sludge only</li> <li>3. Wastewater and faecal sludge</li> <li>4. Solid/organic waste and faecal sludge</li> <li>6. Other</li> <li>7. None</li> <li>8. Don't know</li> </ol>
<b>SPT-11</b>	<p>What is the volume of faecal sludge currently delivered to this treatment?</p> <p>(Do you have records that could verify these flows? How do you calculate/monitor it?)</p>	<p>Xxx inflow</p> <p>Units (m3 per year, m3/month, trucks per week)</p>
<b>SPT-12</b>	<p>How is wastewater (sewage) treated at this WWTP facility?</p> <p>(Respond if SPT-1 is 1 or 3)</p>	<ol style="list-style-type: none"> <li>1. Tertiary or higher treatment</li> <li>2. Secondary treatment</li> <li>3. Primary treatment</li> <li>4. Other (specify)</li> <li>5. No treatment</li> <li>6. Don't know</li> </ol>
<b>SPT-13</b>	<p>How is faecal sludge treated at this facility?</p> <p>(Respond if SPT-1 is 2)</p>	<ol style="list-style-type: none"> <li>1. Advanced treatment of solid and liquid fraction (including further drying / pathogen reduction)</li> <li>2. Adequate treatment - Dewatering and/or stabilisation of solid fraction and treatment of liquid fraction</li> <li>3. Solid liquid fraction separation only</li> <li>4. Other</li> <li>5. No treatment</li> <li>6. Don't know</li> </ol>
<b>SPT-14</b>	<p>Which treatment processes are used for the solid fraction of faecal sludge?</p> <p>(Respond if SPT-1 is 2)</p>	<p>(Select multiple)</p> <p><u>Typically combined fractions</u></p> <ol style="list-style-type: none"> <li>A. Disposal uncovered on land or uncovered burial</li> <li>B. Safe burial/storage (deep row entrenchment)</li> <li>C. Sedimentation (settling-thickening tanks or pond)</li> <li>D. Mechanical dewatering (screw press, belt press)</li> <li>E. Drying beds (planted or unplanted)</li> <li>F. Anaerobic pond, reactors or digestion</li> </ol> <p><u>Solids fraction only</u></p> <ol style="list-style-type: none"> <li>G. Thermophilic anaerobic digestion</li> <li>H. Sludge incineration</li> <li>I. Mechanical/thermal drying (e.g. Pelletiser)</li> <li>J. Extended storage (unplanted drying bed)</li> <li>K. Lime or ammonia stabilization</li> <li>L. Co-composting, black soldier fly, vermi-composting</li> <li>M. Other</li> <li>X. Don't know</li> </ol>
<b>SPT-15</b>	<p>Which treatment processes are used for the liquid fraction resulting from faecal sludge treatment?</p>	<p><u>Tertiary</u></p> <ol style="list-style-type: none"> <li>A. Advanced oxidation</li> <li>B. Membrane Filtration</li> <li>C. Carbon absorption</li> <li>D. Ion exchange</li> <li>E. Chemical oxidation Advanced N,P removal</li> </ol>

		<p>F. Disinfection (chlorination, UV, etc.)</p> <p><u>Secondary</u></p> <p>G. Aerobic suspended or attached growth (e.g. trickling filter, activated sludge)</p> <p>H. Anaerobic suspended or attached growth (e.g. UASB)</p> <p>I. Waste stabilization ponds</p> <p>J. Constructed wetlands</p> <p><u>Primary treatment</u></p> <p>K. Screening and grit removal with</p> <p>L. Sedimentation</p> <p>M. Chemical precipitation</p> <p>N. Filtration</p> <p>O. High rate clarification</p> <p>P. Flootation.</p> <p>Q. Other</p> <p>X. Don't know</p>
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#### D.4.2 Expanded questions - Service providers of faecal sludge treatment

**Table D 6. Example expanded questions for treatment service provider survey**

	Background	
E-SPT10	Cluster no./service area no.	
E-SPT11	Service provider number	
E-SPT12	Interviewer's name	
E-SPT13	Day / Month / Year of interview	
E-SPT14	Location	
E-SPT15	Area	1. Urban 2. Rural
E-SPT16	Name	
E-SPT17	Organisation name (if any)	
E-SPT18	Title or position held in organisation (if any)?	
	Inflows to treatment plant	
E-SPT19	What size population does the treatment plant serves? (do you have records to verify this figure?)	1. Population 8. Don't know
E-SPT20	What percentage of the overall district/city population do you serve? (Note: They may either have specific population numbers or estimate, 100%, 90%, 50%, 10%)	% of city/district population 8. Don't know
E-SPT21	Which location(s) does this treatment plant serve (describe by district, zone, village etc. of the urban or rural location)?	List name(s) of service area(s) _____ 2. All city/district 3. Don't know
E-SPT22	What is the treatment plant design capacity for wastewater and faecal sludge?	a. Xxxx Capacity m3/d for faecal sludge b. Xxxx Capacity m3/d for wastewater
E-SPT23	Where does the faecal sludge come from and in what proportions? (Do you have records to verify these figures?)	1. Household/domestic 2. Institutions 3. Commercial 4. Residential – specifically low-income / informal/slum areas 6. Other 8. Don't know

E-SPT24	What proportion of containments/ volume of faecal sludge discharged to this treatment plant comes from each of the following emptying service providers? (Do you keep a record of all deliveries to the treatment plant? If so, please can i see it?)	Either mark which group and/or provider details (names) a) Public/municipality/government b) Private enterprise/company/NGO c) Informal emptier (e.g. unlicensed) d) Other (specify) e) Don't know
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 excreta to this treatment plant?	(Select all that apply) A. Vacuum truck B. Truck with tank (pump not integrated) C. Truck with open storage D. Cart E. Other (specify) F. None – sewer only X. Don't know
<b>Level of treatment</b>		
E-SPT28	Which treatment processes are used at the wastewater treatment plant (for the liquid fraction)? (Respond if SPT-10 is 1,3)	<u>Tertiary</u> A. Advanced oxidation B. Membrane Filtration C. Carbon absorption D. Ion exchange E. Chemical oxidation Advanced N,P removal F. Disinfection (chlorination, UV, etc.) <u>Secondary</u> G. Aerobic suspended or attached growth (e.g. trickling filter, activated sludge) H. Anaerobic suspended or attached growth (e.g. UASB) I. Waste stabilization ponds J. Constructed wetlands <u>Primary treatment</u> K. Screening and grit removal with L. Sedimentation M. Chemical precipitation N. Filtration O. High rate clarification P. Flootation. Q. Other X. Don't know
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) 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

		<ul style="list-style-type: none"> <li>I. Mechanical/thermal drying (e.g. Pelletiser)</li> <li>J. Extended storage (unplanted drying bed)</li> <li>K. Lime or ammonia stabilization</li> <li>L. Co-composting, black soldier fly, vermi-composting</li> <li>M. Other</li> <li>X. Don't know</li> </ul>
E-SPT30	What is done with the solids remaining after treatment?	<ul style="list-style-type: none"> <li>1. Land for food production</li> <li>2. Land not for food production</li> <li>3. Protected landfill or safe burial</li> <li>4. Open land, unsafe burial</li> <li>6. Other</li> <li>8. Don't know</li> </ul>
E-SPT31	Where is the treated liquid fraction remaining after treatment?	<ul style="list-style-type: none"> <li>1. Land or water for food production</li> <li>2. Land or water bodies – NOT for food production</li> <li>3. Long ocean outfall</li> <li>4. Groundwater recharge</li> <li>6. Other</li> <li>8. Don't know</li> </ul>
E-SPT32	What percentage of the treated faecal sludge complies with national performance (discharge) standards? (Please provide annual average)	<ul style="list-style-type: none"> <li>% compliance</li> <li>3. No tested</li> <li>8. Don't know</li> </ul>
E-SPT33	What percentage of the treated liquid effluent from this treatment complied with national performance (discharge) standards? (Please provide the annual average)	<ul style="list-style-type: none"> <li>% compliance</li> <li>3. No tested</li> <li>8. Don't know</li> </ul>

## D.5 Spot check / inspection - treatment plant

### D.5.1 Proposed spot check core questions

The below questions have not been widely tested however are the suggested minimum questions to be included in inspections or spot checks of treatment plants to inform global indicators. While spot checks or inspections can also occur for emptying and transport services, data on emptying and transport to inform the core indicators are more likely to come from other sources to achieve an adequate sample size (household questionnaire, local government or service provider sources). Inspections of emptying and transport are likely more useful for triangulation and verification of data collected through other sources.

**Table D 7. Draft Core questions for treatment inspection / spot checks**

ID	Core inspection question	Responses
SI-10	What types of materials are received for treatment at this facility?	<ul style="list-style-type: none"> <li>1. Wastewater only</li> <li>2. Faecal sludge only</li> <li>3. Wastewater and faecal sludge</li> <li>4. Solid/organic waste and faecal sludge</li> <li>6. Other</li> <li>7. None</li> <li>8. Don't know</li> </ul>
SI-11	How is faecal sludge treated at this facility? (Respond if SI-10 is 2, 3 or 4)	<ul style="list-style-type: none"> <li>1. Advanced treatment of solid and liquid fraction (including further drying / pathogen reduction)</li> <li>2. Adequate treatment - Dewatering and/or stabilisation of solid fraction and treatment of liquid fraction</li> <li>3. Solid liquid fraction separation only</li> </ul>

ID	Core inspection question	Responses
		4. Other 5. No treatment 6. Don't know
SI-12	Which treatment processes are used for the solid fraction of faecal sludge?	(Select multiple) Typically combined fractions 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 Solids fraction only 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 M. Other X. Don't know
SI-13	How is wastewater (sewage) treated at this WWTP facility? (Respond if SI-10 is 1 or 3)	1. Tertiary or higher treatment 2. Secondary treatment 3. Primary treatment 4. Other (specify) 5. No treatment 6. Don't know
SI-14	Which treatment processes are used for the liquid fraction resulting from faecal sludge treatment?	<u>Tertiary</u> A. Advanced oxidation B. Membrane Filtration C. Carbon absorption D. Ion exchange E. Chemical oxidation Advanced N,P removal F. Disinfection (chlorination, UV, etc.) <u>Secondary</u> G. Aerobic suspended or attached growth (e.g. trickling filter, activated sludge) H. Anaerobic suspended or attached growth (e.g. UASB) I. Waste stabilization ponds J. Constructed wetlands <u>Primary treatment</u> K. Screening and grit removal with L. Sedimentation M. Chemical precipitation N. Filtration O. High rate clarification P. Floatation. Q. Other 1. Don't know
SI-15	What is the volume of faecal sludge currently delivered to this treatment?  (Do you have records that could verify these flows? How do you calculate/monitor it?)	Xxx inflow 2. Units (m3 per year, m3/month, trucks per week)

## D.5.2 Proposed spot check expanded questions

**Table D 8. Example expanded questions for treatment inspections/sport**

ID	Core inspection question	Responses
E-SI1	Cluster no./service area no.	
E-SI2	Service provider number	
E-SI3	Interviewer's name	
E-SI4	Day / Month / Year of interview	
E-SI5	Location	
E-SI6	Area	1. Urban 2. Rural
E-SI7	Name	
E-SI8	Organisation name (if any)	
E-SI9	Title or position held in organisation (if any)?	
<b>Treatment questions</b>		
E-SI0	What types of materials are received for treatment at this facility?	1. Wastewater only 2. Faecal sludge only 3. Wastewater and faecal sludge 4. Solid/organic waste and faecal sludge 6. Other 7. None 8. Don't know
E-SI1	If the treatment is not a FSTP, is it designed (or designated/intended) to receive excreta from on-site sanitation?	1. Yes records of design and intended for FS 2. Yes designated by authority to receive FS 3. Yes think it is designed or designated for FS but no evidence 4. Other 5. No not designed or intended to receive FS 8. Don't know
<b>Capacity and inflow</b>		
E-SI4	What is the design capacity of the wastewater treatment plant? And if available, what is the allowable inflow of faecal sludge per day? ( <i>this is usually a fraction of the total capacity as faecal sludge is more concentrated</i> ) (if E-SI0=1)	Xxxx Capacity m3/d for wastewater Xxx capacity m3/d for faecal sludge input
E-SI5	What is the faecal sludge treatment plant design capacity? (if E-SI0=2)	Xxxx Capacity m3/d for faecal sludge
E-SI6	What is population that the treatment plant serves?	xxx Population 8. Don't know
E-SI7	If population numbers not available, what proportion of the district/city does this treatment serve?	1. <10% 2. 10-50% 3. 50-75% 4. >75% Specific % 8. Don't know
E-SI8	Which location(s) does this treatment plant serve (describe by district, zone, village etc. of the urban or rural location)?	List name(s) of service area(s) _____ B. All city/district X. Don't know

ID	Core inspection question	Responses
E-SI9	Where does the faecal sludge come from and in what proportions? (Do you have records to verify these figures?)	A. Xx% from Household/domestic B. Xx% from Institutions C. xx% from commercial D. Other (specify) X. Don't know
E-SI10	Is the average annual inflow above or below the design capacity of the plant?	1. Above capacity / too much 2. At capacity 3. Below capacity / less flow Xxx Actual % inflow / capacity 8. Don't know
E-SI11	Has the plant overflowed or spilled past 2 years?	1. Yes 2. No 8. Don't know
<b>To assess function and performance</b>		
E-SI12	Are all systems in place and functioning at the time of the visit?	1. Yes 2. No 6. Other (specify)
E-SI13	In the past year, how many days did the treatment plant not function as intended?	Xx days 8. Don't know
E-SI14	Is there any visible damage to the tanks/basins causing excreta/wastewater to discharge or overflow to the surface environment or waterways?	1. Yes 2. No 6. Other (specify)
E-SI15	Are any parts of the system not being used or being bypassed? (Does this significantly affect performance?)	1. Yes significantly affects performance 2. Yes but not significant impact on performance 3. No not bypassed 6. Other (specify) 8. Don't know
E-SI16	Are contaminated by-products safely disposed and not left in open (e.g. grit/sludge/solid waste removed from treatment processes)?	1. Yes 2. No 6. Other (specify)
E-SI17	Is the sludge drying area protected from flooding or wash out?	1. Yes 2. No 6. Other (specify)
<b>Disposal of treated waste</b>		
E-SI18	What is done with the solids remaining after treatment?	1. Land for food production 2. Land not for food production 3. Protected landfill or safe burial 4. Open land, unsafe burial 6. Other 8. Don't know
E-SI19	Where is the treated liquid fraction remaining after treatment?	1. Land or water for food production 2. Land or water bodies – NOT for food production 3. Long ocean outfall 4. Groundwater recharge 6. Other 8. Don't know
E-SI20	Does the community access the waterways where liquid fraction is discharged? (e.g. for washing, recreation, other)	1. Yes 2. No 3. Maybe 8. Don't know

ID	Core inspection question	Responses
E-SI21	What percentage of the treated faecal sludge complies with national performance (discharge) standards? (Please provide annual average)	% compliance 3. No tested 8. Don't know
E-SI22	What percentage of the treated liquid effluent from this treatment complied with national performance (discharge) standards? (Please provide the annual average)	% compliance 3. No tested 8. Don't know

## D.6 Example service provider questionnaires

### D.6.1 Example service authority questionnaire from Ecuador pilot

During the Phase 1 pilots, Ecuador included additional parameters related to on-site sanitation, which were included in the 2020 National System for Municipal Information (SNIM) reporting. The National System for Municipal Information (SNIM) is a digital platform collecting annual information on the management of municipalities at the national level. It is administered by the Association of Municipalities of Ecuador (AME), in coordination with Agency for Water Regulation and Control (ARCA) and the National Institute of Statistics and Censuses (INEC). The survey was distributed to all municipalities (221) by the AME. While submission was mandatory, there were a high percentage of non-responses for different SMOSS questions.

**Table D 9. Ecuador onsite sanitation survey questions in National System for Municipal Information (SNIM) survey 2019 (translated)**

National System for Municipal Information – New questions	Responses
Does the municipality offer services of emptying waste (solid or liquid) generated in homes that have individual sanitation facilities such as septic tanks, cesspits, latrines, Basic Sanitary Units (UBS), among others?	Yes / No
What way is management carried out? (Selection)	Direct Outsourced other (specify)
Select the type of emptying:	Mechanic Manual Manual and Mechanical
Does the municipality have a suction vehicle for waste (solid or liquid) generated in the homes that have individual sanitation facilities?	Yes / No
Do you have records of their waste emptying service (solid or liquid)?	Yes / No
How many disposal sites do you have?	
Type of waste discharge site (solid or liquid) Select:	-Residual water treatment plant -Dump / landfill -River -Broken -Floor -Other (specify)
Disposal site name	Name:

National System for Municipal Information – New questions	Responses
Do the staff of the municipality that offers the service of emptying waste (solid or liquid) have personal protective equipment such as respiratory protection equipment, hooded coveralls, gloves, boots, helmet, goggles, among others?	Yes / No
In the canton, are there private companies that empty the waste (solid or liquid) generated in the homes that have individual sanitation facilities such as septic tanks, blind wells, latrines, Basic Health Units (UBS), among others .	Yes / No
Are they authorized by the municipality?	Yes / No
Do you know where their final disposal of waste (solid or liquid) is made?	Yes / No
What type of waste discharge site (solid or liquid) do the private companies dispose waste? Select:	-Residual water treatment plant -Dump / landfill -River -Broken -Floor -Other (specify)
Do you have records of private companies that empty individual sanitation facilities and / or final disposal of sludge?	Yes / No
Does the municipality have regulations / ordinance that regulates the private sector that empties individual sanitation facilities and / or final disposal of sludge?	Yes / No
Does the Wastewater Treatment Plant (WWTP) has the capacity to receive the waste (solid or liquid) generated in the individual sanitation facilities?	Yes / No
Does the wastewater treatment plant has a full-time operator who is responsible for its operation?	Yes / No
Number of dwellings with the following individual services in <b>urban areas</b> : <ul style="list-style-type: none"> <li>- septic tanks,</li> <li>- cesspits</li> <li>- latrines,</li> <li>- Basic Sanitary Units (UBS)</li> </ul>	Number for each:
Number of dwellings with the following individual services in <b>rural areas</b> : <ul style="list-style-type: none"> <li>- septic tanks,</li> <li>- cesspits</li> <li>- latrines,</li> <li>- Basic Sanitary Units (UBS)</li> </ul>	Number for each:
Number of inspection boxes connected to homes (with effective connection)	

#### D.6.2 Example service authority questionnaire from Serbia pilot

The Serbia phase 1 pilot implemented a structured checklist of indicators to assess toilets, containment, emptying, transport, treatment and disposal from households' and institutional on-site systems in line with JMP indicators. It was distributed to all 150 public utility companies responsible for emptying of septic tanks and transport of faecal sludge to further treatment. The survey was implemented through an online survey (using Google forms) shared by the Standing Conference of Towns and Municipalities, which has got organised network for supporting the work of local self-government and units (LGUs). The response rate was 50% of LGUs which represented 80% of the population. This assessment was

complemented with the key-informant interviews in 4 districts, selected one per each statistical region (Vojvodina region, City Belgrade region, Western Serbia and South-East Serbia).

The survey of local self-governments consisted of the following sections:

1. Basic data on the local self-government unit
2. Management of emptying, transport and treatment of faecal sludge from pit latrines, septic and holding tanks and small-scale sewage systems (up to 2000 PE) at the local self-government unit
  - o Assembly Decisions governing the performance of utility services
  - o Scope and management of utility services
3. Inspection surveillance over management of containment, emptying, transport and treatment of faecal sludge on-site
4. Planning in the field of sanitation at the level of the local self-government unit
5. Human resources for performing tasks involving emptying, transport and treatment of faecal sludge from septic and holding tanks and small-scale sewage systems
6. Financing services and investments in the local self-government unit
7. Coordination

[Link](#) to the full survey of local authorities

**Table D 10. Summary of topics included in Serbia national survey**

SERBIA LOCAL GOVERNMENT SURVEY CATEGORIES	SERBIA SERVICE PROVIDER SURVEY CATEGORIES
<ul style="list-style-type: none"> <li>• Basic data on the local self-government unit</li> <li>• Management of emptying, transport and treatment of faecal sludge from pit latrines, septic and holding tanks and small-scale sewage systems (up to 2000 PE) at the local self-government unit</li> <li>• Assembly Decisions governing the performance of utility services</li> <li>• Scope and management of utility services</li> <li>• Inspection surveillance over management of containment, emptying, transport and treatment of faecal sludge on-site</li> <li>• Planning in the field of sanitation at the level of the local self-government unit</li> <li>• Human resources for performing tasks involving emptying, transport and treatment of faecal sludge from septic and holding tanks and small-scale sewage systems</li> <li>• Financing services and investments in the local self-government unit</li> <li>• Coordination</li> </ul>	<ul style="list-style-type: none"> <li>• General data about service provider</li> <li>• Regulations, standards and guiding documents for emptying, transport and treatment provided by public utility companies</li> <li>• Monitoring/ records of emptying, transport and treatment of faecal sludge from pit latrines, septic and holding tanks and small-scale sewage systems (up to 2000 PE)</li> <li>• Emptying, transport, treatment and disposal</li> <li>• Human resources</li> <li>• Financing</li> </ul>

## D.7 Sampling for service authority and service provider surveys

### D.7.1 Service authority surveys

Sampling depends on the method of implementation and sample unit. Typically, administrative data applies to all administrative units nationally, however there may be cases where a smaller representative sample is acceptable. A representative sample could follow the approaches proposed in the service provider surveys, such as UN-Habitat's guidance on nationally representative sampling from cities<sup>5</sup> or focusing on larger towns as proposed in the Eurostat data collection on water and wastewater<sup>6</sup>, as these populations will have more impact on the national estimate. In some cases, samples may need to include different sample populations depending on the institutional arrangements, for example when the responsibility for sanitation differs between rural and urban areas two different sample populations are needed (for example the health department may be responsible for sanitation in rural areas and the infrastructure department in urban areas).

The response rate is an important consideration for service authority surveys and national requirements or practices for acceptable response rates should guide this, given they are considered reasonable for a representative estimate. Response rate could be based on the number of responses, or the population represented, which was the approach used in Serbia where 50% of local governments responded yet as this represented 80% of the population it was deemed nationally representative. As noted by FAO 2019<sup>7</sup>, it cannot be assumed that the characteristics of nonrespondents are equivalent to the respondents, and further investigation of the sanitation status of these non-respondents or adjustment of estimates may be necessary to ensure there is not bias in data from respondents only.

#### **Box 2. Example of service authority sampling from France (Eurostat, 2021).**

France undertook an extensive survey of water and wastewater in local authority areas in 1998, 2001, 2004 and 2008 (approximately every three years). In 2008, a sample of 5 215 local authority areas (out of a total of 36 686) was taken from across the whole country, including overseas territories. The samples were stratified according to the size of the regional and local authority areas. The survey rate ranged from full coverage, for local authority areas with more than 10 000 inhabitants, to 5%, for areas with under 400 inhabitants. This selection is statistically valid sample, and the data can therefore be grossed up to reflect the country as a whole, and the results used for reporting.

### D.7.2 Service provider surveys

The sampling approach for service provider surveys is also more complex as the population they serve is not fixed, may overlap with other providers or may cross administrative boundaries. Compared with an off-site network where it is clear which households are served by a sewer network and which treatment plant this connects to, the populations served by on-site sanitation emptying, transport and treatment providers may not be fixed and needs to be identified in the surveys.

The sample size and approach may require some understanding of the possible data variability between service providers (e.g. government, enterprises or informal emptying services), which could be informed by previous studies or secondary data. Understanding of the regulations may also be important as these may influence the chosen sample. For example, in Serbia private emptying providers are not permitted to

<sup>5</sup> UN-Habitat, 2016. National Sample of Cities: A model approach to monitoring and reporting performance of cities at national level. Nairobi: UN-Habitat. Available at: [https://unhabitat.org/sites/default/files/2020/06/national\\_sample\\_of\\_cities\\_english.pdf](https://unhabitat.org/sites/default/files/2020/06/national_sample_of_cities_english.pdf)

<sup>6</sup> EUROSTAT, 2021. Data Collection Manual for the OECD/Eurostat Joint Questionnaire on Inland Waters and Eurostat Regional Water Questionnaire. Luxembourg: Eurostat. Available at: <https://ec.europa.eu/eurostat/documents/1798247/6664269/Data+Collection+Manual+for+the+OECD+Eurostat+Joint+Questionnaire+on+Inland+Waters+%28version+3.0%2C+2014%29.pdf/f5f60d49-e88c-4e3c-bc23-c1ec26a01b2a>

<sup>7</sup> FAO, 2019. Guidelines on improving and using administrative data in agricultural statistics. Rome: Food and Agriculture Organization of the United Nations. Available at: <http://www.fao.org/3/ca6413en/ca6413en.pdf>

deliver sludge to the treatment plant, therefore only government providers were sampled as private providers will always be considered unsafe. However for local indicators or planning, it may be useful to collect data from these operators to understand where they dispose of excreta, even if illegal. Effort should be given to ensure a representative sample is achieved, which may require different approaches to engage with and sample formal and informal providers. Similarly assumptions about the existence of services in certain areas (e.g. emptying providers in informal settlements or rural areas) should be validated by data, such as cross checking with the household responses.

Sampling will need to be representative for within the district (e.g. between formal and informal providers) and also representative for national estimates. This may depend on the scale and homogeneity of the management of on-site sanitation across the country. While some countries may have a treatment plant and emptying service in every administrative unit and therefore a representative sample may be suitable, other countries may only have a handful of treatment plants in the entire country, therefore requiring a different approach to sampling and analysis. An understanding of how the data will be analysed will inform the sampling approach and is discussed in the following chapter. The UN-Habitat guidance on nationally representative sampling from cities summarised below could be relevant to service provider surveys.<sup>8</sup>

### Box 3. Guidance on nationally representative sampling from cities

The national sample of cities (NSC) is a carefully constructed representative sample of cities that takes into account sub-regional and city specific characteristics and variances to monitor the dominant pattern in the country's cities in an aggregated manner in any given country.

A brief summary of some of the steps proposed for the national sampling of cities approach that are relevant to service provider survey sampling include:

1. Compiling the national sampling frame of cities: Identify and compile a complete listing of all the cities (or relevant sampling unit) in a given country. This identification of all cities requires a definition of what constitutes a city.
2. Defining and localizing the selection criteria: representative of a given country's territory, geography, size, history, and systems of cities. In general, the national sample of cities will be drawn using sound scientific methods based, but not limited to the following recommended criteria: city population size, city area sizes, geographical location, city functionality, economic and political importance, etc.
3. Selection of the Sample of Cities including a) Defining city clusters/combinations or b) Random sampling within clusters
4. Weights calculation and representativeness of the sample. It is important to ensure that measures obtained using the final sample are accurate and can be extrapolated to the universe of cities.



<sup>8</sup> UN-Habitat, 2016. Ibid

### D.7.3 Spot check

Depends on the objective of the spot check and the results of supplementary data that is to be validated. Also influenced by budget as labour intensive to physically visit plants, unless a remote approach to monitoring is applied through local actors conducting it, provided they have sufficient technical knowledge or training.

As per service provider surveys, consideration should be given to identify the range of service services that exist and how sampling and implementation of inspections includes a representative sample, not avoiding the harder to reach respondents, such as manual emptiers or private service providers. The frequency of such inspections depends on whether it serves as a primary data source, in which a representative sample is needed, or for validating other data, in which a smaller sample may be adequate. It also depends on the level of trust by environmental health staff in the service providers and the potential hazards arising from non-compliance.<sup>9</sup>

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<sup>9</sup> WHO and UNICEF, 2018. Core questions on drinking water, sanitation and hygiene for household surveys: 2018 update. New York: United Nations Children's Fund and World Health Organization