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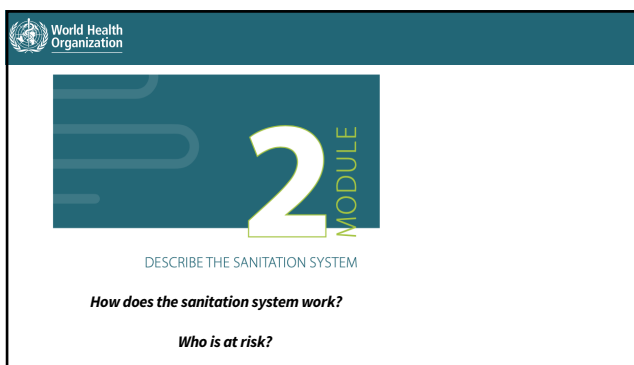
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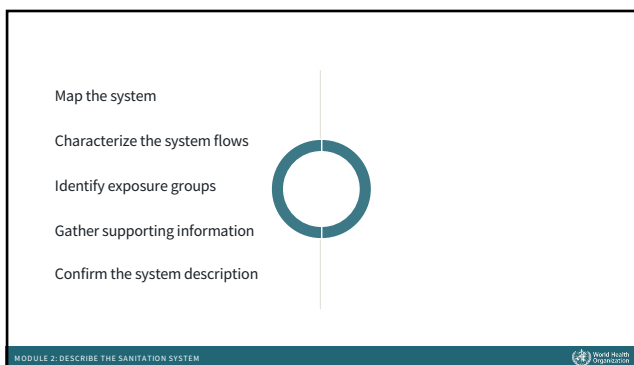
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**STEP 2.1**  
Map the system

**OBJECTIVE**

To understand the source and path of flows through the system.

WHO Guidelines Chapter 3

Sanitation systems are a combination of technologies and services that, when linked and properly managed, can form a safe chain.

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**STEP 2.1**  
Map the system

**Toilet**

WHO Guidelines Chapter 3 Page 31

- Dry Toilet
- Urine Diverting Dry Toilet
- Urinal
- Pour-Flush Toilet
- Flush Toilet
- Urine Diverting Flush Toilet

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**STEP 2.1**  
Map the system

**Containment-storage/treatment**

WHO Guidelines Chapter 3 Page 34

- Single VIP
- Dehydration Vaults
- Septic Tank
- Composting Chamber
- Urine storage tanks

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**STEP 2.1**  
Map the system

Conveyance



WHO Guidelines  
Chapter 3  
Page 39

- Conventional Gravity Sewer
- Small-Bore Sewer
- Simplified Sewers
- Human-Powered Emptying and Transport
- Motorised Emptying and Transport

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**STEP 2.1**  
Map the system

Treatment



WHO Guidelines  
Chapter 3  
Page 44

- Technologies for treatment of wastewater and faecal sludge on-site.
- Technologies for the treatment of wastewater treated off-site.
- Technologies for the treatment of sludge off-site.

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**STEP 2.1**  
Map the system

Reuse / disposal



WHO Guidelines  
Chapter 3  
Page 49

- Irrigation
- Aquaculture
- Soak pit
- Leach field
- Land application
- Surface disposal

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### STEP 2.1

Map the system

Method chosen for mapping depends on the scale and complexity of the sanitation system

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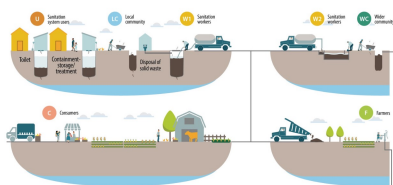
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### STEP 2.1

Map the system

Simplified drawings or free-flowing sketches



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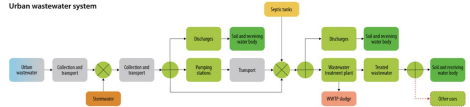
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### STEP 2.1

Map the system

System process diagram

Urban wastewater system



On-site septic system



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### STEP 2.1

Map the system

- Choose the method that your team is more comfortable with.
- You can use a combination of both methods.

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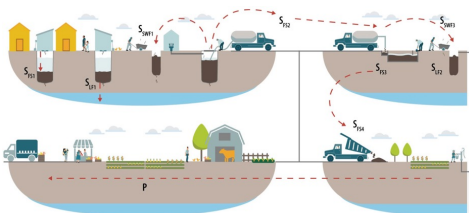
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### Establish the path of the different flows through the sanitation system



- $S_{101}$  = Faecal sludge collected to pit latrines
- $S_{102}$  = Liquid fraction that percolates from the pits
- $S_{103}$  = Solid waste fraction obtained during emptying of pits
- $S_{104}$  = Faecal sludge emptied in vacuum trucks and transported to the treatment plant
- $S_{105}$  = Solid waste fraction screened out before treatment
- $S_{106}$  = Faecal sludge treated
- $S_{107}$  = Liquid fraction infiltrated from the treatment plant
- $S_{108}$  = Dried faecal sludge transported to agricultural land
- $P$  = Produce reaching the market

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### STEP 2.2

Characterize the system flows

#### OBJECTIVE



To characterize the microbiological, physical and chemical constituents of all sources

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### STEP 2.2

Characterize the system flows

#### Hazard

A biological, chemical or physical constituent that can cause harm to human health.

#### Biological

- Microbiological pathogens:
- Bacteria
  - Viruses
  - Protozoa
  - Helminths
  - Vector-borne

#### Chemical

- Heavy metals in sludge or biosolids
- Herbicides and pesticides

#### Physical

- Sharps (e.g. needles)
- Odours
- Physical injury from equipment

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Sanitation step	Description of the system flow	Key information	Expected variations	Type of potential hazard
P1: Solid and wastewater: storage treatment with soak pits and septic tanks	S <sub>1</sub> = faecal sludge collected in soak pits and septic tanks Faecal sludge – solids and water that are collected in underground tanks	About 1700 m <sup>3</sup> collected. BOD could reach 600 mg/L.	The sludge could contain anal/ cleaning materials, menstrual hygiene products, sharp objects and other foreign material. It may also contain chemicals present in prewaste.	Biological Physical Chemical
P2: Disposal of liquid fraction by infiltration	S <sub>2</sub> = liquid fraction that percolates from soak pits and septic tanks Liquid fraction resulting from infiltration of wastewater from soak pits and unsealed/leaking septic tanks	Concentrations of nitrate and nitrite are estimated to be high in groundwater (> 50 mg/L for nitrite).	Percolation increases with rainfall. There could be some traces of chemicals in groundwater.	Biological Chemical
T1: Conveyance by vacuum trucks	S <sub>3</sub> = solid waste fraction screened out during emptying of soak pits and septic tanks Solid waste is screened out while pumping out the faecal sludge. Operators throw the solid waste into the nearest waste dump.	About 2 kg of solid waste is screened out each time.	With heavy rainfall, solid waste ends up in the open drains.	Biological Physical
P3: Transfer of the faecal sludge to the RWTF	S <sub>4</sub> = faecal sludge emptied into vacuum trucks and transported to the RWTF	About 20 m <sup>3</sup> of faecal sludge is emptied every day.	No expected variations.	Biological
P4: Disposal of faecal sludge in open drains	S <sub>5</sub> = faecal sludge emptied into vacuum trucks and discharged in open drains	About 40 m <sup>3</sup> of faecal sludge is emptied every day.	Heavy rainfall leads to heavy dilution in open drains.	Biological
P5: Flush-toilet discharging in open drains	S <sub>6</sub> = wastewater transported from households directly to open drains	About 1000 m <sup>3</sup> of wastewater. BOD could reach 600 mg/L.	No expected variations.	Biological Chemical
T2: Open drains	S <sub>7</sub> = wastewater transported in open drains Stormwater – surface water including urban runoff mixed with wastewater	There are no data about stormwater. About 600 could reach 300 mg/L.	No expected variations. The wastewater will contain a wide range of dilute constituents, including nutrients, metals, pathogens, organic material (oxygen-demanding substances), hydrocarbons, animal wastes and solid waste.	Biological Chemical Physical
P6: Use of wastewater in agriculture	S <sub>8</sub> = wastewater transported in open drains Stormwater – surface water including urban runoff mixed with wastewater	It is not known how much water is used by farmers.		Biological Chemical Physical
P7: Consumption of agricultural products	P = produce reaching the market	There are no data about quantities.	In dry seasons, more products are expected to be grown using wastewater.	Biological

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### STEP 2.3

Identify exposure groups



#### OBJECTIVE

To identify and characterize the people who may be exposed to a particular hazard at each step of the chain.

Exposure groups: People who might be exposed to sanitation-related health hazards.

- U= Sanitation systems users
- W= Workers
- L= Local community
- F= Farmers
- C= Consumers
- WC= Wider community

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### STEP 2.3

Identify exposure groups

TOOL 2.2. Template to characterize exposure groups

SANITATION STEP	EXPOSURE GROUP	WHO ARE THE EXPOSURE GROUPS? (Description of these people)	HOW MANY ARE THERE? (Local numbers, if known; otherwise estimate)	WHAT ARE THEY DOING THERE? (Circumstances under which they might be exposed to hazards in the system flow)	WHAT ARE THEY EXPOSED TO? (Which system flows and which types of hazards they have contact with)	HOW OFTEN ARE THEY EXPOSED TO THIS? (Exposure frequency: daily, weekly, once a year, etc.)
Containment-storage-treatment	U1	Owners of flush toilets connected to septic tanks on their properties	400 households (around 2000 people); about half are children	Septic tanks are usually outside the house, in the backyard. Children play and adults perform different activities in the vicinity of the tank.	They could have contact with wastewater during overflows. They are exposed to microorganisms.	It could happen every 3 years, but is more frequent during heavy rainfall.
Disposal	WC1	Visitors to the nearby river	About 5000 people; about 70% are children	There are local tourists who come to the river for recreation. They swim and gather along the river during weekends.	Microbial contamination when the treatment ponds overflow. They could ingest contaminated river water.	Daily contact during summer months.

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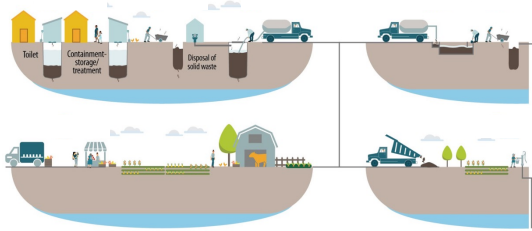
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### STEP 2.3

Identify exposure groups



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### STEP 2.4

Gather supporting information



#### OBJECTIVE

To gather evidence of what the real health hazards are.

SSP Manual  
Guidance Note  
2.4

Examples of the data to be collated.

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**STEP 2.4**  
Gather supporting information

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**Examples of data to be collated**

Regulatory requirements

- Relevant laws and by-laws.
- Effluent discharge regulations.
- Guidelines for climate change preparedness or disaster planning.

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**STEP 2.4**  
Gather supporting information

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**Examples of data to be collated**

System management and performance

- Earlier monitoring and surveillance.
- Epidemiological data.
- Types and amount of products produced.

From which sources?:

- Desktop literature
- Public Health Authority
- Consultation of personnel working in health facilities

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**STEP 2.4**  
Gather supporting information

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**Examples of data to be collated**

Demographics and land use patterns

- Land use pattern, population and special activities that may impact the sanitation system.
- Formal and informal settlements.
- Specific considerations such as ethnicity, religion, migrant populations and disadvantaged groups.

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**STEP 2.4**  
Gather supporting information

**Examples of data to be collated**

Changes related to climate and seasons

- Seasonal variation of use due to type of crops and harvest.
- Seasonal crop and harvest data.
- Additional inflows during heavy rains.
- Climate changes projections.

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**STEP 2.4**  
Gather supporting information

In some cases, this information is not available.

Steering Committee needs to decide whether they need to collect new data, based on:

- **What is really needed?** Range of relevant information needed.
- **What is available?** Data availability
- **What resources are available?** Resource considerations (financial, human, time).

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**STEP 2.5**  
Confirm the system description



**OBJECTIVE**  
To conduct field visits to confirm that the system description is complete and accurate.

**METHODS:**

- Sanitary inspections
- Transect walks
- Focus group discussions
- Key informant interviews
- Collection of samples for laboratory testing

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Map the system


Characterize the system flows

Identify exposure groups

Gather supporting information

Confirm the system description



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WHO Guidelines Chapter 6

GUIDELINES ON SANITATION AND HEALTH

SANITATION SAFETY PLANNING

SSP Manual Module 2

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SANITATION SAFETY PLANNING

Step-by-step risk management for safely managed sanitation systems

Second Edition 

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