Version November 2022

SSP Training Package
Trainer's Guide

With workshop design, agenda and screenplay for:

3-day training

1-day and ½ -day workshops

For practitioners, decision makers,

local SSP teams and Steering Committees

Updated with key information from the WHO Guidelines of Sanitation and Health and climate change aspects

World Health Organization

Table of contents

1. Introduction to the SSP trainers' guide

1.1. What is this guide?

This trainers' guide is a support material for the implementation of workshops on "**Sanitation Safety Planning: a step-by-step risk management for safely managed sanitation systems**". In the following pages, aspiring SSP trainers will find key information for the carrying out of the following events:

- 3-day training in SSP for practitioners (chapter 3)
- 3-day training for members of the local SSP team (section 3.4)
- 1-day training for SSP for practitioners (chapter 4)
- ½-day workshop for general audience (chapter 5)
- ½-day workshop for the local SSP Steering Committee (section 5.4)

For each event, this guide offers instructions related to target audiences, learning objectives, proposed agenda and a training plan, which includes information about the training materials and the screenplay.

Furthermore, a simplified case study for Coppentown is presented in Annex 1 and a pre-filled risk assessment table in Annex 2. These two resources are prepared to be used as the group work material for workshops of 1 day and ½ day duration, when the time is limited for participants to come up with their own working case.

Annex 3 presents a complete screenplay for the 3-day training for practitioners. This means that this guide offers exactly what the trainer says in each slide of the PPTs.

1.2. Who is it meant for?

This guide was prepared for:

- WHO officials and consultants that are going to present Sanitation Safety Planning as a key to implement the WHO Guidelines in short workshops.
- Local and international consultants and trainers who will build capacity of practitioners to carry out SSP processes.
- Local consultants who will facilitate SSP workshops with the SSP team and Steering Committee.

This trainer's guide assumes that the trainer is a person who is very knowledgeable and experienced in SSP (preferable), and/or competent in risk-based approaches in the water/sanitation or environmental health sectors. The trainer needs not be a professional trainer, although prior experience in training is an asset.

1.3. How to use this guide?

It is recommended to read Chapter 2, which gives an overall introduction to the WHO Guidelines on Sanitation and Health, Sanitation Safety Planning and the training strategy. The trainer should then decide which type of training will she/he be delivering, depending on the audience and time available. The trainer should then refer to:

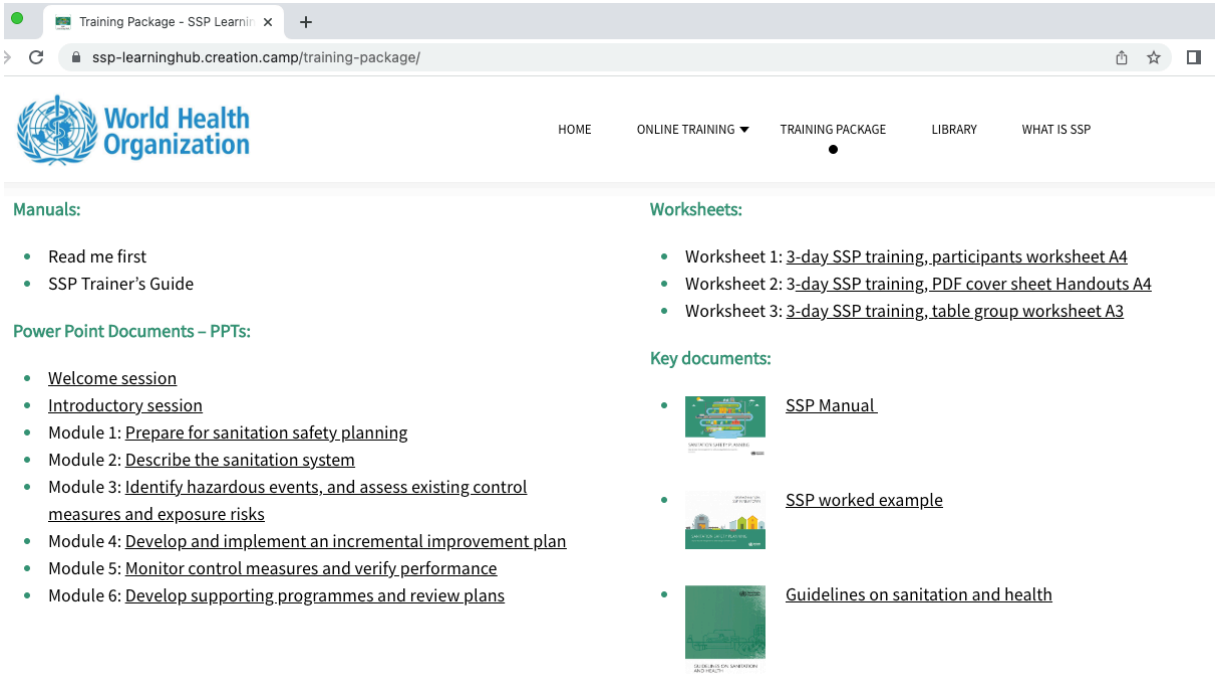
- Chapter 3 for 3-day trainings (general practitioners or local SSP team)
- Chapter 4 for 1-day trainings (general practitioners)
- Chapter 5 for ½-day workshops (general audience, incl. decision-makers, and local Steering Committee)

Notice that this document is only a guide, and the trainer should adapt the training according to the needs of the participants and the available time.

It is recommended to start with the adaptation of the learning objectives and the overall agenda of the event. Once this is clear, the trainer should decide how much time will be dedicated to presentations (PPT inputs) and how much time participants will have for working in groups. Notice that the WHO recommends planning and carrying out SSP trainings as interactive, practical and hands-on experiences, making sure that participants gain experience with the SSP process and understand the value.

For 3-day trainings, participants should work on their own sanitation systems, for which field trips need to be planned. For 1-day trainings and ½-day workshops, there will not be time to work with their cases, and therefore it is recommended to prepare a fictional case study, trying to describe typical settings and characteristics of the region where the training takes place. Annex 1 offers an example that should be adapted. Annex 2 is a pre-filled risk assessment table that should speed up the SSP process when time is short (1-day and ½-day events). The idea is to allow participants to experience the decision-making process of SSP without having to conduct thoroughly the individual modules of the SSP manual. The trainer should decide how much information should be given to participants, for instance, by eliminating some hazardous events, so participants have the time to understand the exercise.

Once the group work is clear, the trainer should explore the ready PPTs, which are available at: https://ssp-learninghub.creation.camp/training-package/



Important: Annex 3 of this document offers the screenplay for each slide of a 3-day workshop with practitioners. **Trainers should download the open source font Source Sans Pro here**: https://fonts.google.com/specimen/Source+Sans+Pro as Power points have been designed with this font.

Finally, the trainer should prepare the handouts and worksheet materials, which are also available in the Training Package platform.

Acknowledgement: this trainer's guide has been prepared by Leonellha Barreto Dillon based on the SSP training package for SSP Preparation Workshop and SSP team Workshop developed in 2016 by Darryl Jackson. To get in touch with Leonellha, contact her at: leonellha.barreto-dillon@seecon.ch

2. Introduction to Training on SSP

2.1. How SSP supports the implementation of the WHO Guidelines on Sanitation and Health

In 2018 the World Health Organization WHO launched its first comprehensive guidelines on sanitation and health to promote safe sanitation systems and practices. The guidelines aim to provide evidence-informed recommendations and offer guidance to ensure international, national and local sanitation policies and programs effectively protect public health.

According to the guidelines, sanitation is defined as "access to and use of facilities and services for the safe disposal of human urine and feces". Furthermore, a safe sanitation system is defined as "a system that separates human excreta from human contact at all steps of the sanitation service chain from toilet capture and containment through emptying, transport, treatment (in-situ or o site) and final disposal or end use" (see Fig. 1).

Fig. 1. Sanitation Service Chain

In its chapter 2, the WHO Guidelines on Water and Sanitation indicates 4 recommendations for action by national and local authorities to ensure safe sanitation systems and practices that promote health:

Recommendation 1: Ensure universal access and use of toilets that safely contain excreta.

Recommendation 2: Ensure universal access to safe systems along the entire sanitation service chain.

Recommendation 3: Sanitation should be addressed as part of locally delivered services and broader development programs and policies.

Recommendation 4: The health sector should fulfil core functions to ensure safe sanitation to protect public health.

Of key interest is recommendation 2, that "highlights the need to ensure systems and services are selected to respond to the local context and that investment and system management are based on local risk assessments along the entire sanitation chain, so users and the community are protected. In addition, it recognizes the need for protection of sanitation workers through safe working conditions".

Sanitation Safety Planning (SSP) is the WHO recommended approach for local risk assessment and management for sanitation systems. This can identify incremental improvements at each step of the sanitation service chain (Fig 1) to allow progressive implementation towards sanitation targets and allows investments to be prioritized according to the highest health risk and thereby maximize gain. Furthermore, SSP can and should take into consideration current and future risks, including those posed by climate variability and climate change.

2.2. Sanitation Safety Planning (SSP)

2.2.1. Definition

Sanitation Safety Planning (SSP) is a risk-based management tool for sanitation systems that:

- helps with systematically identifying and prioritizing health risks along the sanitation chain – that is, toilet, containment–storage/treatment, conveyance, treatment, and end use or disposal;
- guides management and investments in sanitation systems according to risk;
- identifies operational monitoring priorities and regulatory oversight mechanisms that target the highest risks; and
- provides assurance to authorities and the public on the safety of sanitation-related products and services.

The SSP process offers a platform to coordinate efforts, bringing together relevant stakeholders along the sanitation chain, such as local authorities, sanitation service providers and public health regulators to:

- Identify hazards, hazardous events and health risks in each step of the sanitation system;
- Prioritize the highest risks and use them to inform decisions about improvements;
- Agree on improvements (control measures), including technology upgrades, improved operational procedures and behavioral changes;
- Define regular monitoring and validation mechanisms.

This approach ensures that the selected control measures, in fact, target the greatest health risks, emphasizing, as well, the importance of incremental improvement over time.

2.2.2. The updated version of the Sanitation Safety Planning Manual (2022)

The Sanitation Safety Planning (SSP) risk-based management tool was first published as a Manual by the WHO in 2015. The purpose was to make the 2006 WHO Guidelines on reuse more widely adopted. These guidelines are concerned with the health implications of reusing wastewater and aim to protect the farmers, local communities and consumers, maximizing the health benefits of safe reuse.

Fig. 2. Front cover of the 2015 SSP Manual

A second edition of the SSP Manual was published in 2022. The purpose of this new edition was to:

- Simplify the process.
- Reorient the approach to support recommendations on local-level risk assessment and management in the WHO Guidelines on sanitation and health, covering all steps of the sanitation chain, with or without safe end use; and
- Include the identification of climate-related risks (such as those caused by water scarcity, sea level rise and extreme weather events), and associated management and monitoring options.

Fig. 3. Front cover of the 2022 SSP Manual

2.2.3. Who are the target audiences of SSP?

The Sanitation Safety Planning tool is primarily targeted to:

- local authorities, as a tool to coordinate, plan improvements to, and monitor, services in an administrative area;
- sanitation service providers, as a tool to manage service quality, and provide assurances to local authorities and regulators; and
- public health regulators, as an oversight tool to identify and verify effectiveness of risk-based regulatory measures applied to local authorities and service providers.

2.2.4. How does SSP work?

Figure 4 presents the modules of the SSP manual, which indicate the steps of the SSP process. While in module 1 "Prepare for SSP" stakeholders identify the SSP area, the priorities and assemble the team, during modules 2 to 5 key actors carry out a risk assessment and define a management plan. The outputs are two key documents:

- Prioritized, incremental improvement plan based on the risk assessment.
- Operational monitoring plan for regular monitoring and periodic verification.

Although these documents are needed for the implementation of improvement measures (Module 4) and monitoring (Module 5), Sanitation Safety Planning is not about writing plans. It must be understood that it is a risk-based management approach, and requires a continuous revision, evaluation, adaptation and learning, for what supporting programs and reviews (Module 6).

The success of implementing Sanitation Safety Planning lays on having a SSP leader that provides coordination of the entire process. Moreover, political will and support from high levels of the local government will secure financial resources as well as amendment of the legal framework, if needed. Finally, a Local SSP team, composed by representatives of all the steps of the sanitation service chain, as well as relevant authorities and exposure groups, is key for the success of the SSP process.

Fig. 4. Modules of Sanitation Safety Planning

2.3. Training Strategy on Sanitation Safety Planning

The overall aim of the SSP training strategy is to equip the target audiences with the needed attitude, knowledge, skills and resources to plan sanitation interventions based on a local health-risk assessment and management approach, namely Sanitation Safety Planning.

2.3.1. Target audience

The previous SSP training package (version 2016) was prepared based on the assumption that the learners (i.e., workshop participants) were already interested to initiate SSP in known localities, and therefore they were:

- Managers in the municipal, health, wastewater and/or agriculture sectors, i.e., Steering Committee. These people would be responsible for the overall coordination of SSP but are unlikely to be involved in the detailed planning and implementation of SSP. For them a "SSP Preparation Workshop" was designed.
- People who would be in the SSP team during the SSP's development and implementation. Therefore, a more technical focused training workshop, called "SSP Team Workshop" was developed.

However, during the past years, there was demand for more general trainings and information sessions to inform, raise awareness, and build capacities about SSP. Therefore, this training manual proposes the following three key target audiences:

1. **Practitioners:** these are members of the multidisciplinary team that implements the SSP (SSP team) or practitioners from WHO, local and national authorities, NGOs, consulting companies, entrepreneurs, universities, etc., who need to acquire the skills to facilitate SSP process.

   This is the audience who will be fully trained to implement the SSP methodology.

   Suggested events: 3-day and 1-day trainings with practitioners

2. **Decision makers at the national and local level:** representatives of ministries, water and sanitation authorities, regulators, national coordination agencies, as well as local authorities, from different countries who usually gather in international conferences, or attend WHO hosted events. There is the premise that WHO (HQ, regional and country offices) already have an established contact with these authorities, and they are already interested to improve their current sanitation situation.

   SSP information sessions or trainings can ignite their interest to initiate SSP processes in their localities.

   Suggested event: ½-day workshop

3. **Potential members of a Sanitation Steering Committee:** local representatives of the different ministry level agencies (Planning, Finance, Environmental Department, Health Department, Community Engagement Department, Agricultural Extension Office, among others), and representatives of the local council as well as the mayor and city level executive offices, sanitation service provider (e.g. LG department) and the private sector, who have decision-making power and have the following functions:

   i. Leadership, coordination. and oversight of the entire process.
   ii. Policy dialogue and amendment of legal framework at local level.
   iii. Advocacy to secure financial resources.

   If these representatives are gathered in an event, it means that there is political will and interest to initiate SSP process in their localities. They now need to understand the value of the process to initiate it, or, in the best case, carry out module 1 (preparation for SSP).

   Suggested event: ½-day workshop with the SSP Steering Committee

Depending on the target audience, different objectives and methodologies will need to be chosen by the trainer. The following section shortly describe the proposed formats of SSP trainings.

2.4. Formats for Sanitation Safety Planning Training

2.4.1. 3-day training with practitioners

This is perhaps the most common format of SSP trainings, in which participants acquire the skills, knowledge and resources to *actually* carry out the SSP process in a given locality. Furthermore, a first version of a Sanitation Safety Plan and a Monitoring Plan will be prepared. Participants could be:

1. A mixed audience with representatives of different organizations, without a specific case study.
2. Members of a the SSP team, who have been appointed by authorities to carry out the SPP process in their locality.
3. Representatives of different organizations (for instance, different sanitation companies, several sanitation utilities, or a number of municipalities) who will initiate their own SSP processes in their own localities, not where the training is taking place.

For the first audience, it is recommended to prepare one or two real case studies, or to organize a **field trip** so participants can familiarize themselves with the given locality. With this first-hand experience, they will be able to map the system, identify exposure groups, hazards, hazardous events, control measures, etc.

Section 3 offers a complete training guideline, with the proposed agenda, learning objectives, required materials and training plan. Additionally, in Annex 3, you can find the screenplay for all the PPTs.

If members of a **Local Sanitation Team** are participating in the training, it is recommended to plan a visit to the SSP area already identified by the Steering Committee. **Section 3.4** offers a training guideline for this type of workshop. Keep in mind that a ½-day session with the Local Steering Committee needs to be carried out before the 3-day training with the local sanitation team, as the decision-makers will decide key aspects of the SSP process (module 1).

2.4.2. 1-day workshop with practitioners

A 1-day session with practitioners allows participants to recognize the value of local health risk assessment and learn the steps involved in SSP. An entire SSP process will be conducted using a ready-made case study, which could be their own locality or a fictional case (there is one prepared in Annex 1). The facilitator needs to ensure that the case study is presented to participants and a map of the system is already prepared in a flipchart. This will save time for participants to carry out all six modules of the SSP methodology in 1 day.

At the end of the workshop, participants would have learnt about the SSP process, its outputs and outcomes, and would have gained first-hand experience, in order to identify future sites for SSP, the stakeholders that should be involved and what information they should gather, so they are best prepared to start a SSP in their localities.

Section 4 offers a complete training guideline for this type of training.

2.4.3. ½ -day information session with national or local decision-makers

This is the typical information session, in which a facilitator is invited to raise awareness about the WHO Guidelines on Sanitation and Health and Sanitation Safety Planning. Typical settings are conferences and regional or country events, in which participants are gathered to hear (probably for the first time) about SSP. The outcome expected is to spark their interest about SSP, while learning the basics of the methodology.

Section 5 offers a complete training guideline for ½-day information sessions.

When participants of the workshop are the members of the **Local Steering Committee**, time needs to be allocated for the participants to agree on the SSP area, leadership, team's composition and priorities of the SSP. This session needs to be carried out before the 3-day training with the local SSP team. **Section 5.4** offers a training guideline for this type of workshop.

3. 3-day training with practitioners

This is the most common format of a Sanitation Safety Planning training, in which participants acquire the skills, knowledge and resources to actually carry out SSP processes in the future.

Participants could be:

Type 1: A mixed audience with representatives of different organizations, without a specific case study.
Type 2: Members of a the SSP team, who have been appointed by authorities to carry out the SPP process in their locality.
Type 3: Representatives of different organizations (for instance, different sanitation companies, sanitation utilities or municipalities) who will initiate their own SSP processes in their own localities, not where the training is taking place.

Participants will develop a Sanitation Safety Plan and a Monitoring Plan for a given locality. If the participants are going to develop a SSP for the sanitation system of the region/city/town where the training is taking place (type 2), a field trip should be organized before the training. This will allow participants to get acquainted with the sanitation system.

For trainings with about 24 participants, it is recommended to divide them in 4 groups with 6 participants. The trainer should then divide the entire sanitation system into two areas, so two groups can work with the same sanitation system. These can be, for instance:

- Area 1: sewered sanitation and Area 2: non-sewered sanitation
- Area 1: city center (old-town) and Area 2: per-urban areas

What is important is to allow participants to work with the **entire sanitation service chain**.

The facilitator/trainer should point out during the field trip the components of the sanitation system, as well as potential hazards, hazardous events, exposure groups and existing control measures. It is key that the trainer facilitates the discussion with the local stakeholders, igniting the critical thinking and SSP mind-set of participants.

During the 3-day SSP training, participants will carry out the 6 modules of the SSP manual, referring continuously to the WHO Guidelines on Sanitation and Health. Participants will be working with their given case study, therefore, enough time for group works should be planned.

3.1. Learning objectives

At the end of the training, participants will have acquired the skills, knowledge, and resources to:

- Understand the value of SSP, and how it is a tool to implement the WHO Guidelines on Sanitation and Health.
- Carry out each step of the Sanitation Safety Planning methodology.
- Identify future SSP sites, those who should be involved, and know how to best prepare for SSP.
- Initiate and sustain a Sanitation Safety Planning process in a locality.

3.2. Proposed agenda

<table>
<tr><th>Time</th><th>Day 1</th><th>Day 2</th><th>Day 3</th></tr>
<tr><td>9:00 - 9:15</td><td rowspan="2">Welcome to the workshop and presentation of participants</td><td>Recap</td><td>Recap</td></tr>
<tr><td>9:15-9:30</td><td rowspan="2">Step 2.4: Gather supporting information
Step 2.5: Confirm the system description
(30 min lecture)
(15 min group work)
Step 3.1 Identify hazards and hazardous events
(45 min lecture)</td><td rowspan="2">Module 4: Develop and implement an incremental plan
(30 min lecture)
(60 min group work)</td></tr>
<tr><td>9:30- 10:45</td><td>Introductory session
(35 min lecture)
(10 min presentation of group work)
(30 min group work)</td></tr>
<tr><td>10:45 – 11:00</td><td colspan="3">Coffee Break</td></tr>
<tr><td rowspan="2">11:00 –12:30</td><td>The value of SSP
(20 min discussion)</td><td rowspan="2">Step 3.1 Identify hazards and hazardous events
(90 min group work)</td><td rowspan="2">Module 4 (cont.): Develop and implement an incremental plan
(60 min group work)
Module 5: Monitor control measures and verify performance
(30 min lecture)</td></tr>
<tr><td>Module 1: Prepare for SSP
(30 min lecture)
(40 min group work)</td></tr>
<tr><td>12:30 – 13:30</td><td colspan="3">Lunch Break</td></tr>
<tr><td>13:30 – 15:00</td><td>Step 2.1: Map the system
(25 min lecture)
Step 2.2: Characterize the system flow
(5 min lecture)
(60 min group work Step 1 and Step 2)</td><td>Step 3.2 Identify and assess existing control measures
(30 min lecture)
(30 min group work)
Step 3.3 Assess and prioritize the exposure risk
(30 min lecture)</td><td>Cont. Module 5: Monitor control measures and verify performance
(60 min group work)
Module 6: Develop supporting programs and review plan
(10 min lecture)
(20 min group work)</td></tr>
<tr><td>15:00 – 15:15</td><td colspan="3">Coffee Break</td></tr>
<tr><td>15:15 – 16:45</td><td>Step 2.3: Identify exposure groups
(15 min lecture)
(45 min group work)
Groups sharing in plenary
(30 min)</td><td>Cont. Step 3.3 Assess and prioritize the exposure risk
(60 min group work)
Groups sharing in plenary
(30 min)</td><td rowspan="2">Plenary for exploring SSP opportunities or to develop SSP roadmaps
(75 min)
Closing session
(30 min for evaluation and presentation of certificates)</td></tr>
<tr><td>16:45 – 17:00</td><td>Day 1 close</td><td>Day 2 close</td></tr>
</table>

The final session, on day 3 from 15:15 to 16:45 should be adapted to the participant's roles and expectations. In case of a mixed audience (type 1), the session can be used to explore future SSP process in their localities. Audience types 2 and 3 should define the roadmap of their own SSP process.

3.3. Training plan

Training material

- **PPTS:** You will find all the PPTs at the SSP Learning Hub:

Power Point Documents – PPTs:

- Welcome session
- Introductory session
- Module 1: Prepare for sanitation safety planning
- Module 2: Describe the sanitation system
- Module 3: Identify hazardous events, and assess existing control measures and exposure risks
- Module 4: Develop and implement an incremental improvement plan
- Module 5: Monitor control measures and verify performance
- Module 6: Develop supporting programmes and review plans

- **PPTs Handouts**: You might decide to distribute (or not) the PPTs as handouts for participants to take notes. Keep in mind that a **cover page** is already prepared. It looks like this:

- **Case study "Coppentown" Handout**: Annex 1 presents the Coppentown case study (**Annex 1**). You might need to adapt it to include details of the sanitation system that more relevant to the participants. For instance, instead of activated sludge system, it might be a pond system.

- **Worksheets:**
  - **Participants worksheets** (green cover) printed A4 for each participant (Word .docx)

  - **Table-groups worksheets** (red cover) printed A3 for each group (Word.docx)

- **References:** participants should have a hard copy of:
  - SSP manual (2022)
  - Newtown Worked Example (2022)
  - WHO Guidelines on Sanitation and Health (2018)

These three documents are available at the SSP Learning Hub:
https://ssp-learninghub.creation.camp/training-package/

Key documents:

-  SSP Manual
-  SSP worked example
-  Guidelines on sanitation and health

- **Additional material:**
    - Flipchart papers or brown papers for participants to draw the system map.
    - Markers of different colors.
    - Pencils, sharpeners, and erasers, as participants might change inputs in the A3 worksheets during the risk assessment.

Make sure you organize all the material with enough time.

Welcome session

This is the opening session, in which you will introduce yourself, the objectives and the workshop.

Available PPT: **Welcome session** (screenplay available in Annex 7.3.1)

Duration of the session: introductory presentation, with introduction of participants should be 30 min.

Introductory session

Available PPT: **Introductory session** (screenplay available in Annex 7.3.2)

Learning objectives: at the end of the session, participants will be able to:

- Describe the significance of sanitation for human health
- Summarize the recommendations for action of the WHO Guidelines
- Explain the importance of local health risk assessment
- Describe the Sanitation Safety Planning Process
- Recognize the value of Sanitation Safety Planning in prioritizing sanitation investments

Outcome of the session: working in groups on Coppentown case study, participants will have prioritized sanitation interventions based on a local risk assessment.

Duration of the session: 1 hour and 35 min

- Introductory presentation: 35 min -eliminate slides, if you think you will take longer.
- Introduction to group work: 10 min, allow time for participants to understand the case study
- Group work: 30 min
- Closing discussion: 20 min

Module 1: Prepare for SSP

Available PPT: **Module 1: Prepare for SSP** (screenplay available in Annex 7.3.3)

Learning objectives: at the end of the session, participants will be able to:

- Identify the SSP area and lead organization
- Identify key stakeholders and assemble the SSP Steering Committee, capable of leading the SSP process, as well as the SSP team, with the skills to implement the SSP process.
- Establish SSP priorities based on the recommendations given by the WHO Guidelines on Sanitation and Health.

Outcomes of the session: working in groups on given case studies, participants will have identified:

- SSP leader
- Potential members of the Steering Committee and SSP team
- SSP priorities

Duration of the session: 70 min

- Presentation: 30 min
- Group work: 40 min

Module 2: Describe the sanitation system

Available PPT: **Module 2: Describe the sanitation system** (screenplay available in Annex 7.3.4)

Learning objectives: at the end of the session, participants will be able to:

- Map a sanitation system with all its components
- Characterize system flows
- Identify exposure groups
- Gather supporting information
- Confirm the system description

Outcomes of the session: working in groups on given case studies, participants will have identified:

- Complete description of the sanitation system

Duration of the session:

- Step 2.1: Presentation should be 25 min and group work 60 min.
- Step 2.2: Presentation should be 5 min
- Step 2.3: Presentation should be 15 min and group work 45 min.
- Steps 2.4 and 2.5: Presentation should be 45 min and group work 45 min.

Module 3: Identify hazards, asses existing controls and assess exposure risk

Available PPT: **Module 3: Identify hazardous events, and assess existing control measures and exposure risks** (screenplay available in Annex 7.3.5)

Learning objectives: at the end of the session, participants will be able to:

- Identify hazards and hazardous events.
- Identify and assess existing control measures.
- Assess and prioritize the exposure risk, under current and future climate scenarios.

Outcomes of the session: working in groups on given case studies, participants will have prepared:

- A risk assessment table and a list of prioritized hazardous events.

Duration of the session:

- Step 3.1: Presentation should be 45 min and group work 90 min.
- Step 3.2: Presentation should be 30 min and group work 30 min.
- Step 3.3: Presentation should be 30 min and group work 60 min.

Module 4: Develop and implement an incremental improvement plan

Available PPT: **Module 4: Develop and implement an incremental improvement plan** (screenplay available in Annex 7.3.6)

Learning objectives: at the end of the session, participants will be able to:

- Consider options to control identified risks
- Use selected options to develop an incremental improvement plan

Outcomes of the session: working in groups on given case studies, participants will have prepared:

- An implemented plan with incremental improvements which protects all exposure groups along the sanitation chain

Duration of the session:

- Presentation should be 30 min and group work 60 min + 60 min in another session

Module 5: Monitor control measures and verify performance

Available PPT: **Module 5: Monitor control measures and verify performance** (screenplay available in Annex 7.3.7)

Learning objectives: at the end of the session, participants will be able to:

- Define and implement operational monitoring
- Define a verification monitoring system to check the performance of the sanitation system

Outcomes of the session: working in groups on given case studies, participants will have prepared:

- An operational monitoring plan
- A verification monitoring plan

Duration of the session:

- Presentation should be 30 min and group work 60 min

Module 6: Develop supporting programs and review plans

Available PPT: **Module 6: Develop supporting programs and reviews** (screenplay available in Annex 7.3.8)

Learning objectives: at the end of the session, participants will be able to:

- Identify and implement supporting programs and management procedures
- Periodically review and update the SSP outputs

Outcomes of the session: working in groups on given case studies, participants will have prepared:

- A list of supporting programs

Duration of the session:

- Presentation should be 10 min and group work 20 min

Closing session

This session might be adapted depending on the participants backgrounds and interests. The trainer can prepare a PPT with slides from all modules as a recap of the key elements of the WHO Guidelines on Sanitation and Health, as well as the SSP. The aim is to reinforce the learnings of the previous days.

Participants could also be asked to get together in groups. This could be done by country, city, type of organization, etc. After the SSP journey of the previous days, they should now reflect whether SSP is possible in their localities. Questions to ignite discussions could be:

- How could the SSP methodology be implemented in your country?
- What role could your organization play in promoting or implementing SSP in your country?
- Do you already have a plan of implementing SSP in a particular location?

Participants could have 30 minutes to discuss. The whole group could have the opportunity to present in plenary their results. The plenary discussion might take 45 min.

3.4. Alternative session: 3-day training with the Local SSP team

It could be the case, that you are invited to facilitate a 3-day training for a local SSP team. In that case, the workshop's participants will be people who will conduct the SSP's development and implementation. You will conduct the same 3-day training as with the mixed participants, but will have to make the following adjustments:

- Adapt the training objectives in the PPT. Usually the training objectives in this case are:
    - Understand the SSP process, outputs and outcomes
    - Gain confidence in applying SSP to your sanitation systems
    - Know how to complete SSP for your system

- Make sure to prepare a **field visit** to the area which has been prioritized by the Steering Committee and count with enough information to prepare a draft SSP close to reality.

- Depending on the level of preparation of the team, you might need to adapt the agenda to decrease the number of PPTs slides.

- You will need to allocate time for the SSP leader and the team to work on their own action plan after each session.

- You allocate an entire last session to finalize the action plan.

It is very important to conduct the ½ day Steering Committee Workshop (Section 6.4) before the 3-day training for the SSP local team. Furthermore, the Steering Committee must finalize the steering committee membership and its terms of reference, lead organization, SSP team membership and SSP team leader. The report they produce should be handed over to the SSP team leader, who must bring it to the workshop. If these are not done by then, the SSP team will not be able to make a good start on their SSP, and the 3-day SSP Workshop will not be effective.

4. 1-day training with practitioners

As in the case of the 3-day training, a 1-day training with practitioners allows participants to recognize the value of local health risk assessment and learn the steps involved in SSP. However, in this case, the time available is much less, as you will only count with 1 day.

An entire SSP process will be conducted using a ready-made case study, which could be their own locality or a fictional case (there is one prepared in Annex 1). The facilitator needs to ensure that the case study is presented to participants and a map of the system is already prepared in flipcharts. This will save time for participants to carry out all six modules of the SSP methodology in only 1 day.

The content to be imparted in lectures is much less compared to the 3-day training, and there not will be time for participants to work with the entire sanitation system in their group work. In this case, you might need to distribute the sanitation steps among the groups, and prepare a risk assessment table in the plenary, e.g., each being responsible of one step of the sanitation service chain and allowing for reflection and discussions of the whole system in plenary sessions.

4.1. Learning objectives

At the end of the training, participants will have:

- Understood the value of SSP, and how it is a tool to implement the WHO Guidelines on Sanitation and Health.
- Learnt about the Sanitation Safety Planning process, outputs and outcomes.
- Gained experience in the SSP process, so they can identify future SSP sites, those who should be involved, and know how to best prepare for SSP.

Notice that the learning objectives are similar to the ones for the 3-day training with practitioners. In this case, you want to offer participants the full experience of Sanitation Safety Planning, but in much less time.

4.2. Proposed agenda

9:00-9:05	**Welcome note**
9:05-9:25	Introduction to the workshop, objectives and participants of the training
9:25-9:45	Introduction to Sanitation Safety Planning, a key tool to implement the WHO Guidelines on Sanitation and Health
9:45 – 10:05	Introduction to the case study: Coppentown
10:05-10:40	Module 1: Prepare for SSP
10:40-11:00	**Coffee Break**
11:00-11:45	Module 2: Describe the sanitation system
11:45-12:45	Module 3: Identify hazardous events, assess existing control measures and exposure risks
12:45-13:30	**Lunch break**
13:30-14:40	Module 3 (cont.)
14:40-15:10	Module 4: Develop and implement an incremental improvement plan
15:10-15:30	**Coffee Break**
15:30-16:00	Module 4: Group work continuation
16:00-16:40	Module 5: Monitor control measures and verify performance
16:40-16:55	Module 6: Develop supporting programs and review plans
16:55-**17:30**	My next steps in SSP **Closing of the training**

4.3. Training plan

Training material

- **PPTS:** You need to pick and choose the slides to put together a 1-day training.

- **Handouts**: You might decide to distribute (or not) the PPTs as handouts for participants to take notes. Keep in mind that a **cover page** is already prepared.

- **Worksheets:**
    - Handout for each participant describing the Coppentown case study (**Annex 1**). You might need to adapt it to include details of the sanitation system that more relevant to the participants. For instance, instead of activated sludge system, it might be a pond system.
    - **Participants worksheets** (blue cover) printed A4 for each participant (Word .docx)
    - **Table-groups worksheets** (red cover) printed A3 for each group (Word. docx). One per group.

  You might need to adapt the worksheets, diminishing the number of tables available to work, as participants will not have the time to identify that many hazardous risks.

- **References:** participants should have a hard copy of:
    - SSP manual (2022)
    - SSP worked example
    - WHO Guidelines on Sanitation and Health (2018)

- **Additional material:**
    - You need to prepare already the **map of the sanitation system for each team**. It is recommended to draw the entire sanitation system as many times as there are groups. Each team needs to have a map to work with. Then, you assign one component of the sanitation system to each group.
    - Markers of different colors.
    - In a whiteboard or a huge piece of paper to hang in the wall, you can prepare a **consolidated risk assessment table with the inputs of all groups**. They can fill-in the consolidated table as they advance in the modules, from hazards/hazardous events until the new control measures.

Make sure you organize all the material with enough time.

Keep in mind that the learning objectives in each session are the same as for the 3-day training, but you need to reduce the content and the group work efforts. Additional tips are presented as follow:

Time	Session	Comments and time distribution
9:00-9:05 5min	Welcome note	
9:05-9:25 20min	Introduction to the workshop, objectives and participants of the training	Allow 15 minutes for participants to introduce themselves
9:25-9:45 20min	Introduction to Sanitation Safety Planning	Make sure you practice this session, as it is key to get participants interested
9:45-10:05 20min	Introduction to the case study	Formation of the group work and introduction to the group work methodology. Divide the participants in 5-6 groups, distribute each sanitation step. For instance: Group 1: toilet and on-site containment, Group 2: emptying, transport and disposal of fecal sludge Group 3: sewer system Group 4: wastewater treatment Group 5: reuse of wastewater in agriculture

		Group 6: reuse of fecal sludge. The time distribution should be as follow: 10 min Presentation of the case 7 min read the handout 3 min intro of the methodology
10:05-10:40 35min	Module 1: Prepare for SSP Introduction	Presentation (15 min) Group work (20 min)
11:00-11:45 45min	Module 2: Describe the sanitation system	Presentation (25 min) Group work (20 min) Here is the time to distribute the system maps that you have prepared before. Make sure you explain them before hand them to the groups.
11:45-12:45 60min	Module 3: Identify hazardous events, assess existing control measures and exposure risks	Introduction (5 min) 3.1: presentation (10 min) + group work (20 min) 3.2: presentation (10 min) + group work (15 min)
13:30-14:40 80min	Module 3 (cont.)	3.3: presentation (15 min) Group work (20 min) 3.4: presentation (15 min) Group work (20 min)
14:40-15:10 30min	Module 4: Develop and implement an incremental improvement plan	Introduction (30 min)
15:30-16:00 30min	Module 4 (cont.)	Group work (30 min)
16:00-16:40 35min	Module 5: Monitor control measures and verify perf.	Introduction (15 min) Group work (20 min)
16:40-16:55 15min	Module 6: Develop supporting programs	Introduction (15 min)
16:55-17:30 35min	My next steps in SSP Closure of the training	My next steps in SSP Plenary discussion (15 min) Closing remarks (5min) Closure of the training

5. Workshop ½ - day workshop for decision makers

This is the typical information session, in which a facilitator is invited to raise awareness about the WHO Guidelines on Sanitation and Health and Sanitation Safety Planning. Typical settings are conferences and regional or country events, in which participants are gathered to hear (probably for the first time) about SSP. The outcome expected is to spark their interest about SSP, while learning the basics of the methodology.

Notice that this workshop corresponds to the Introductory Session of the training sessions. In this case, participants will hear an introductory presentation about the WHO Guidelines on Sanitation and Health, which introduces the importance of Sanitation Safety Planning. Participants will then work with an already-prepared Coppentown case study and the pre-filled risk assessment table. The idea is for participants to obtain already the risk evaluation and possible improvement measures and decide what should be the immediate and short-term interventions to target the prioritized hazardous events and risks.

The exercise is designed to ignite the discussion around Recommendation 2 of the WHO Guidelines on Sanitation and Health"… ensure systems and services are selected to respond to the local context and that investment and system management are based on local risk assessments along the entire sanitation chain, so users and the community are protected."

5.1. Learning objectives

At the end of the training, participants will have:

- Understood the value of SSP, and how it is a tool to implement the WHO Guidelines on Sanitation and Health.
- Understood the importance of local health risk assessment, and how SSP works.

5.2. Proposed agenda

9:00-9:05	**Welcome note**
9:05-9:25	Introduction to the workshop, objectives and participants of the training
9:25-9:55	Introduction to Sanitation Safety Planning, a key tool to implement the WHO Guidelines on Sanitation and Health
9:55 – 10:10	Introduction to the case study: Coppentown and instructions of the group work
10:10-10:45	Group work
10:45-11:00	**Coffee Break**
11:00-11:20	Discussion in plenary about the results of the group work
11:20-11:55	My next steps in SSP
11:55-12:00	**Closure of the training**

5.3. Training plan

Training material

- **PPTS:** You may only use the PPT: Introduction to SSP.

- **Handouts:** You might decide to distribute (or not) the PPT as handouts for participants to take notes. Keep in mind that a **cover page** is already prepared.

- **Worksheets:** for each participant:
    - Handout describing the Coppentown case study (**Annex 1**). You might need to adapt it to include details of the sanitation system that more relevant to the participants. For instance, instead of activated sludge system, it might be a pond system.
    - Pre-filled risk assessment table for Coppentown case study (**Annex 2**).

- **References:** participants should have a hard copy of:
    - SSP manual (2022)
    - SSP worked example (2022)
    - WHO Guidelines on Sanitation and Health (2018)

- **Additional material:**
    - Flipcharts and markers to make notes.

Make sure you organize all the material with enough time.

In this case, participants are not going to carry out each module of the Sanitation Safety Planning methodology. You will introduce the WHO Guidelines and the SSP manual using the same content as the introductory session of the 3-day training. Then, participants will work with a pre-filled risk assessment table for a given case study in Coppentown. Finally, there will be a discussion about the applicability of SSP in their countries.

Time	Session	Comments and time distribution
9:00-9:20 20min	Introduction to the workshop, objectives and participants of the training	Allow 15 minutes for participants to introduce themselves
9:20-9:50 30min	Introduction to Sanitation Safety Planning, a key tool to implement the WHO Guidelines on Sanitation and Health	Make sure you practice this session, as it is key to get participants interested
9:50-10:10 20min	Introduction to the case study: Coppentown and instructions of the group work	Here, you will present the group work, indicating that participants will work with the groups in their tables. They will act as they were an expert consultation group. The time distribution should be as follow: 10 min Presentation of the case 7 min read the handout 3 min intro of the methodology Take the time to present the risk assessment table in slide 36. Let them know that the hazardous events have been analyzed and now it is their job to suggest 3-5 immediate/short term control measures. Indicate why.
10:10-10:45	Working in groups	Make sure participants read the handout Annex 1 with the description of the case study, as well as the risk assessment table.

35min		Go around the tables, to make sure that participants understand the task and work together.
11:00-11:20 20min	Discussion in plenary about the results of the group work	Bring the group back and ask them the given questions.
11:20-11:55 35min	My next steps in SSP	Give the participants the two questions in slide 41. 20 min to discuss in groups/pairs. They have 15 min to share
11:55-12:00 5min	Closure of the workshop	Closing remarks (5min) Closing of the training

5.4. Alternative session: 1/2-day workshop with the Local Sanitation Steering Committee

As in the 3-day training for SSP teams, you might be invited to facilitate a half day workshop for a local Sanitation Steering Committee. In that case, the workshop's participants will be managers in the municipal, health, wastewater and/or agriculture sectors. These people would be responsible for overall coordination of SSP but are unlikely to be involved in the detailed planning and implementation of SSP.

Training material

- **PPTS:** You should put together a PPT with contents of the Introduction to SSP PPT and module 1.

- **Handouts**: You might decide to distribute (or not) the PPT as handouts for participants to take notes. Keep in mind that a **cover page** is already prepared.

- **Worksheets:** for each participant:
    - Handout describing the Coppentown case study (**Annex 1**). You might need to adapt it to include details of the sanitation system that more relevant to the participants. For instance, instead of activated sludge system, it might be a pond system.
    - Pre-filled risk assessment table for Coppentown case study (**Annex 2**).

- **References:** participants should have a hard copy of:
    - SSP manual (2022)
    - SSP worked example (2022)
    - WHO Guidelines on Sanitation and Health (2018)

- **Additional material:**
    - Flipcharts and markers to make notes.

Make sure you organize all the material with enough time.

Training plan

Time	Session	Comments and time distribution
9:00-9:20 20min	Welcome note Introduction to the workshop, objectives and participants of the training	Allow time for participants to introduce themselves
9:20-9:50	Introduction to Sanitation Safety Planning, a key tool to implement the	Make sure you practice this session, as it is key to get participants interested

30 min	WHO Guidelines on Sanitation and Health	
9:50-10:10 (20 min)	Introduction to the case study: Coppentown and instructions of the group work	Here, you will present the group work, indicating that participants will work with the groups in their tables. They will act as they were an expert consultation group. The time distribution should be as follow: 10 min Presentation of the case 7 min read the handout 3 min intro of the methodology Take the time to present the risk assessment table in slide 36. Let them know that the hazardous events have been analyzed and now it is their job to suggest 3-5 immediate/short term control measures. Indicate why.
10:10-10:45 (35 min)	Working in groups	Make sure participants read the handout Annex 1 with the description of the case study, as well as the risk assessment table. Go around the tables, to make sure that participants understand the task and work together.
11:00-11:25 25 min	Plenary discussion	Discussion about the value of SSP
11:25-12:55	Module 1: Prepare for SSP	Presentation (30 min) Group work (60 min)
12:55-13:25 30 min	Next steps in SSP	Make sure participants distribute the responsibilities of the next steps
13:25-13:30 5min	Closing of the workshop	Closing remarks (5min)

6. Additional tips and tricks for trainers

A strong emphasis in the training package is on helping participants understand the SSP process and logic. This should be emphasized as you facilitate the workshops as there will be insufficient time to cover all technical aspects.

In all workshops therefore, you should, from time to time, encourage participants to look at the tools, guidance notes and examples. This applies particularly to 3-day training, as one of the objectives is for participants to know where to find more information themselves when they work on their SSP system.

A field trip is an optional (but highly recommended) activity for the 3-day training. It is not, however, included in the trainings plan. The field trip could be used before the training any time after completion of Day 1.

The significance of a facilitator cannot be overplayed. Workshop success can, to a greater or lesser extent, be a function of how it is facilitated. This Trainer's Guide provides guidance on what to deliver and makes some clear suggestions as to how this might best be done. However, participants attending the workshop will differ from each other, and their interaction will also shape the workshop and ultimately the learning experience.

There are several qualities a facilitator should try to develop in order to achieve the most from a group of participants, many of whom will not know each other. These are written below (in no order):

- **Introduction:** Facilitators should always remember to introduce themselves, not to sell themselves, but to instill confidence that they are qualified to provide the training.
- **Serve the participant:** Facilitating a workshop may be a huge achievement in a career, but it is important to remain grounded and keep the focus on the participants. The facilitator's role is to facilitate learning, not to get through the material or to tell participants what to do.
- **Respect and be respected:** Attending a workshop can be costly for participants, or their organization both in time and money. Respect their desire to learn and take care not to fabricate expertise. No question should be dismissed as irrelevant or stupid.
- **Take charge as necessary**: There may be times when a facilitator needs to take charge. For example, in response to a disruptive participant – during break time, the facilitator could have a quiet word with the person in question to request an adjustment to their behavior. Break-time could be moved earlier if the problem needs urgent attention.
- **Encourage questions:** Any form of discussion, especially those developed through questions, should be actively encouraged. Participants are more likely to ask questions if they feel physically and socially comfortable, relaxed in the company of fellow participants and the facilitator. Therefore, the facilitator should work to build a rapport with participants as soon as possible In addition to clarification and further detail, questions will help facilitators gauge the level of understanding, which in turn should influence what material will be delivered.
- **Be responsive:** Participants' opinions and questions should not be seen as an unwelcome interruption, but rather an opportunity to further explore the common perceptions and to offer any clarification as needed. Consider opening the question up to the workshop for an answer.
- **Responding to wrong answers:** During the workshop questions are asked of the participants. If they answer incorrectly, it is first important to check whether the facilitator has understood the answer by rephrasing and asking if that is what was meant. At this point, the answer can be rephrased to be more accurate but without deviating too much from the participant's answer. If their answer is still incorrect then it is important not to simply dismiss the answer but instead to try to identify the thinking behind it and then work from that point to get to the correct answer. It is essential that the participant's view is respected at all times.
- **Honoring the answer:** You can use a flipchart to record discussions or feedback from exercises. When participants make a comment, it is important not to paraphrase their comment but instead write it down as stated. This ensures that their meaning is not lost and also acts as a method of affirmation for the participant – that their opinion is worthy.
- **Deviate, but not too much:** The learning material supplied in this handbook should be a starting point only. Sharing first-hand experience and nationally relevant, practical examples to emphasize a point can solidify the subject material for some learners so interjecting the theory sessions with 'real-life stories' should be encouraged. However, care should be taken to not deviate too much and confuse the participants.

- **Alternate delivery approaches:** This handbook has made suggestions as to how to deliver the material. If the facilitator prefers to 'lecture' this does not mean that the workshop should be changed to be delivered in this manner. Each participant will have a different way of learning; some through images, some through individual thinking, some through listening, some reading, some during group work etc. The workshop needs to cover a broad range of styles so that each participant has an opportunity to learn in their preferred style.
- **Work with passion:** If the facilitator is keenly interested in the material being covered, it is likely to engage the participants more.
- **Be confident with the material:** Confidence will come as understanding and familiarization of the material is formed. Prior preparation is therefore essential.
- **Stick to time:** The timetables suggested are simply guidelines, but it is important that breaks, lunch and the end of the day deadlines do not overrun unnecessarily. Additionally, appropriate arrangements for meals and refreshments are essential. Participants' learning is enhanced through regular breaks and in order to prevent participants from becoming overtired or demoralized it is important to end the day on time.
- **Help participants appreciate time management:** Any overrun in time often comes from lengthy presentations by rapporteurs following group discussions. It should be made clear from the start that presentations are time-bound, and people must learn how to present in allotted time. Facilitators should be brutal but friendly and end presentations when allotted time is up.
- **Group work reporting:** It is not always necessary to have every group report back to the whole group. Try some alternatives:
    - A **"gallery walk"**, where flipcharts are put up around the walls and participants walk around to see what other groups have been discussing. You can have one person from the group remain with the charts to answer questions, if you wish.
    - **Pairing groups.** Group A reports to group B and group B to group A; group C reports to group D and group D to group C, etc.
    - **Take turns in reporting back**. In one session, groups A and B report back to the main group; in the next session, groups C and D report back, etc.
    - **Prioritized reporting:** each group is asked to report back only on their two or three most important points.
    - **"Pass it on".** After the discussion time, group A's chart is passed to group B, group B's to group C, etc. The receiving group has a limited time to read and can add notes or questions. The charts are then passed on to the next group, which reads and responds. The process is continued until the charts return to the original group.

    Choose a reporting back option that works for the type of discussion the groups have been involved in, and the amount of time you have.

- **Collaborate with other facilitators**: If you are using more than one facilitator, it is fundamental that the role each facilitator has at each point in the day is known so as to avoid confusion and embarrassment. It is beneficial to establish the strengths and weaknesses of each facilitator and work to the strengths during the different workshop components.
- **Prepare the material:** Many of the exercises require prior preparation such as photocopying or resource preparation. It is essential that this material is ready and organized. Other preparation that should be carried out before the participants arrive each day involves checking the working order of all electrical equipment.

Acknowledgement: This section was taken from the SSP training package prepared by Darryl Jackson in 2016. The material is based on IWA/WHO's "Water Safety Plans Training Package" available at http://www.wsportal.org/templates/ld_templates/layout_33212.aspx?ObjectId=33740&lang=eng and accessed on 15 November 2015.

6.1. Preparing participants resources

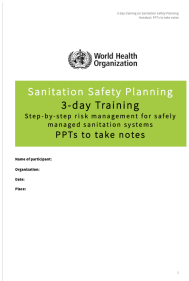
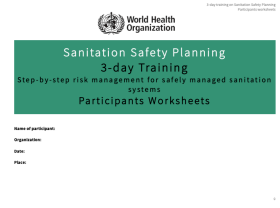
Before printing, in all cases, you need to change the details on the cover page to insert the location and dates of the training courses.

To produce the PowerPoint handouts, you can use the standard (default) slides options of Microsoft.

It is suggested to print 3 slides per page.

The color band on the front covers of the worksheets provides a convenient and rapid way to identify which booklet to use during the workshop.

The following table provides specific printing guidance.

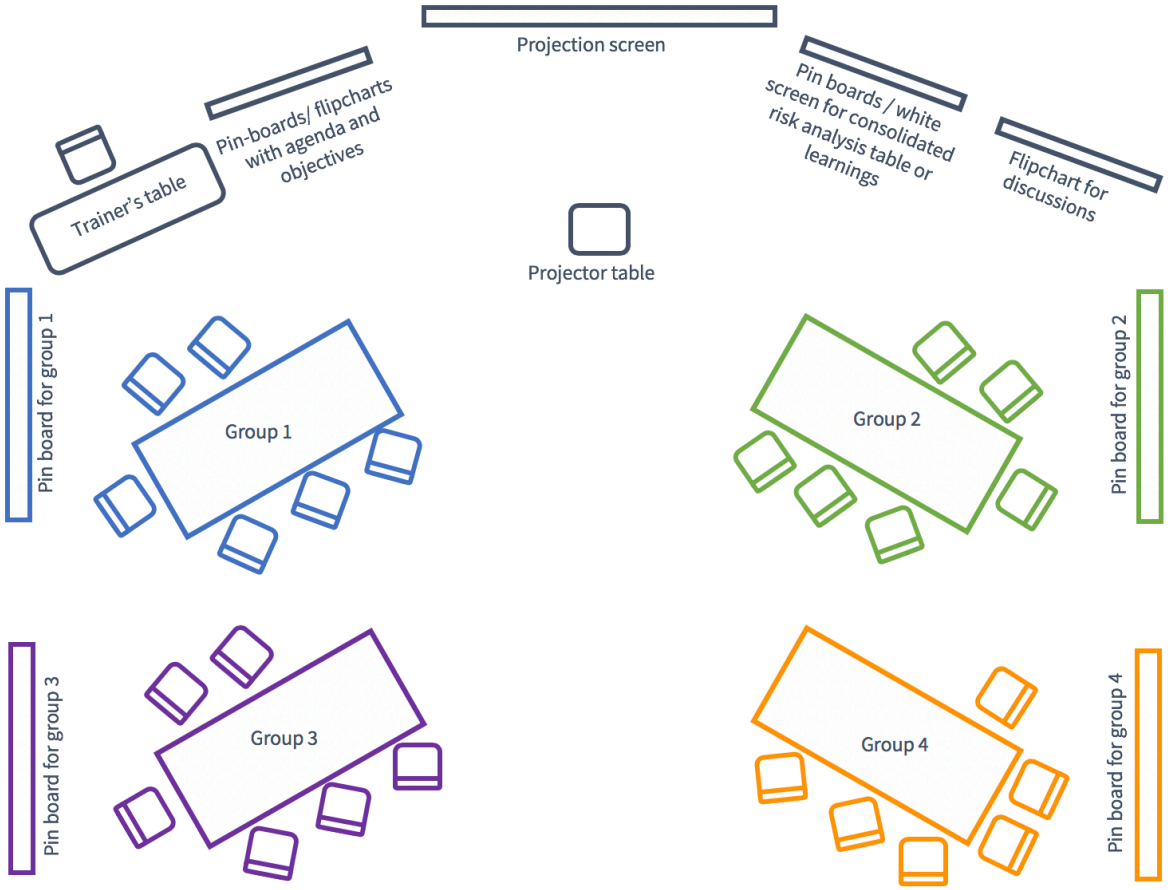
Guidance for paper printing				
Type	**General**	**Color**	**Size and orientation, gutter**	**Binding**
PowerPoint handouts	1-day and ½ trainings includes only introduction. The Steering Committee ½-day workshop includes also Module 1. 3-day trainings include Introduction, Modules 1-6 and closing session.	 Cover page in colour All other pages: black and white	A4, portrait Gutter on long side	Spiral binding
SSP manual and WHO Guidelines	As per WHO issue (professionally printed and bound) 			
Participant's Worksheets booklet	3-day and 1-day training of practitioners and SSP team: 	Cover page in color All other pages: black and white	A4, landscape Gutter on short side	Spiral binding
Table Group Worksheets booklet	3-day and 1-day training of practitioners and SSP team: 	Cover page in color All other pages: black and white	**A3** (bigger! This is double the size as A4), landscape Gutter on short side	Spiral binding recommended but stapling with book binding tape would be adequate.

Acknowledgement: This section was taken from the SSP training package prepared by Darryl Jackson in 2016.

6.2. Venue requirements

Because all the events, i.e., of 3, 1 or ½ day, require the interaction among participants, it is suggested to arrange group-work tables, independently of the number of participants. Ideally, groups of 6 persons allows for discussion, brainstorming and learning, and therefore it is recommended.

The 3-day training of practitioners has been planned for 24 participants, i.e., 4 groups of 6 persons each. The following figure shows the venue arrangements:



Notice how it is suggested to count with pin boards (black or white boards) and flipcharts for plenary discussions. Also, it is recommended to have always visible the agenda and objectives of the workshop. Furthermore, it is recommended to offer a workstation for each group, with a pinboard to hang their maps, the key findings, for instance, prioritized hazardous risks and improvement measures. Other material/resources include:

- Data projector (and all necessary cables for connection to a laptop) (Trainers would normally provide their own laptops.)
- Reliable power supply (during workshop hours)
- Sound/speaker system large enough to give good sound in the entire room. Provide all necessary cables to connect to a laptop speaker jack.
  Note: There may be a number of short videos used from the laptop, and the use of the videos must be seamless – i.e., there should be no need to turn the speaker system on and connect cables to show the videos.
- Presenters' table for laptop and presenter's notes
- Whiteboard marker pens and board eraser/wiper and chart paper (approximately 15 sheets) and marker pens.
- Large size post-it-notes (sticky notes) (2 packets).

7. Annexes

7.1. Annex 1: Description of the Coppentown case study

This is a hypothetical case of SSP in a small municipality called Coppentown in an imaginary country called the Republic of Sanitola. The Republic of Sanitola is located in the tropical climate zone and is a middle-income country. Coppentown is a town on the outskirts of a large metropolitan city with a population of approximately 50,000 people.

Water supply is from a surface water source located far upstream of the town. Seasonally heavy rains occur in the area. However, the beginning of the wet season is becoming less predictable. Further, regional climate models project average rainfall will decrease during the dry season and increase during the wet season over the next 30 years.

According to the recent studies, 20% of the population are connected to a **public sewerage system**, constructed decades ago. This is a combined system that conveys domestic wastewater with stormwater. The system is characterized by sewer breaks and sometimes chamber overflows. The mixed wastewater is transported by gravity to a **conventional wastewater treatment plant** (WWTP), with activated sludge technology. The treated wastewater is **disposed of in the river** which flows through Coppentown, which also serves as a source for **irrigation water for neighboring farmers**. Because it receives combined sewerage flows, during heavy rainfall the volume of wastewater greatly exceeds the capacity of the WWTP, and therefore, untreated wastewater together with heavy rains is discharged without any treatment, with high pathogen loads into the river. Habitants who do not live in the center of Coppentown are not connected to the central sewerage system. About 80% of the population have household **cesspools or septic tanks**, which are emptied by **local vacuum truck operators**, most of them not regulated/licensed. The fecal sludge produced is usually **discharged in the public sewerage systems or in the nearby rivers and streams**. In some cases, the **fecal sludge is taken to agricultural land**, where it is used as soil conditioner, without any treatment, by local farmers.

The Regional Public Health Office reports that about 20% of Coppentown habitants are affected by gastro-intestinal disorders, possibly due to the consumption of contaminated raw produce. Farmers often report skin diseases, so do mothers whose children play near the Coppentown river or in the fields.

Against this background, Coppentown Municipality initiated the SSP process in response to a request from national and city authorities. A Steering Committee and a local SSP team were put in place with representatives of Sanitola's Ministry of Health, Municipal Association, Ministry of Public Works, Coppentown Water and Sanitation Utility, truck drivers Association, Ministry of Agriculture, Ministry of Environment and Climate, Farmers Association and Coppentown Municipal Council. Together, they decided that the aim of Sanitation Safety Planning was to ensure that the entire sanitation service chain is safely managed, diminishing the incidence and impact of sanitation-related diseases of communities, workers, farmers and consumers.

7.2. Annex 2: Full version of the risk assessment table for Coppentown

Sanitation step	Hazardous event	Exposure groups	Existing control measures	Risk assessment[1] (L x S = R)	Risk	Improvement options	Likely effectiveness of options High, Medium, Low	Level of resources required High, Medium, Low	Priority given to the measure High, medium, Low
Conveyance (sewer systems)	Exposure to pathogens during O&M activities caused by increasing solid deposits and blockages. This hazardous event is intensified by reduced water flows in sewers, due to water scarcity.	W1 20 workers maintaining the sewer systems	None (only protective boots are being used)	3 x4 = 12	Medium	• Equipping staff with all personal protective equipment (PPE)			
						• Training of workers to ensure use of PPE			
						• Sanctioning workers for non-compliance			
	Exposure to raw sewage due to overflowing drains during flood periods	L1 5,000 members of a local community living adjacent to the open drains	None	4x8= 32	High	• Re-engineering to separate stormwater flows from sewage			
						• Providing additional storage for stormwater			
						• Community education on hygiene and safe behaviors during/after extreme events			
Collection/ Storage and treatment	Ingestion of contaminated groundwater due to leakage from cesspits in groundwater (located at 10m below ground level)	L2 500 individuals using groundwater during water shortages	None	2x4=8	Medium	• Upgrading of cesspools to lined and watertight septic tanks			
						• Community education on tank maintenance.			
						• Community education on Household Water Treatment and Safe Storage			
	Exposure to wastewater from overflowing toilet or on-site system due to damaged or blockage following heavy rainfall	L3 40,000 individuals using on-site systems	None	5x8=40	Very High	• Installation of sealed covers for septic tanks and non-return valves on pipes to prevent back flows			
						• Community education on tank maintenance, and on hygiene and safe behaviors during/after extreme events			
						• Monitoring system to control state of household tanks			
Conveyance (Emptying and transport of fecal sludge)	Exposure to raw fecal sludge during emptying and transport caused by spillage	L3 40,000 individuals using on-site systems	None	5x4=20	High	• Ensure that business owners train workers to conduct safe practices, including cleaning of spillages			
						• Customer service telephone line to report emptying and transport companies that do not show safe practices			
						• Manual or motorized transports are monitored and sanctioned if spillage occurs or because of lack of maintenance			
	Ingestion of fecal sludge during manual emptying and transport	W2 120 workers collecting and transferring fecal sludge	None	4x4=16	High	• Offer private operators possibilities (such as credits, manual pumps, vacuum trucks, etc.) to upgrade services.			
						• Ensure that business owners are equipping staff with personal protective equipment (PPE) and trainings.			
						• Sanction businesses that are not following safe practices			
Treatment		W3	Gloves, boots and	2x2=4	Low	• Maintain and strengthen training of workers to ensure use of PPE			

(Wastewater Treatment Plant)	Exposure to raw sewage in treatment plant O&M causes illness	20 workers operating the WWTP	equipment used			• Sanctioning workers for non-compliance			
						• Regular health checks, receive medical advice and treatment (e.g., deworming), and be adequately vaccinated against potentially relevant infections			
	Extreme rainfall events causing discharge of excess, untreated wastewater into environment. Water intake for downstream community could be unsafe for drinking.	L4 500 individuals living adjacent to treatment plant L6 10,000 individuals living in village downstream	None	3x8=24	High	• Install flood, inundation and run-off defenses (e.g., dykes) and undertake sound catchment management			
						• Invest in early warning systems and emergency response equipment (e.g., mobile pumps stored off-site, non-electricity-based treatment systems)			
						• Additional holding pond to buffer high flows and reduce overflow or bypass to river			
Reuse	Exposure to sewage during spray irrigation practices in nearby farms causes illness	F 50 farmers (+families) using the treatment plant effluent	None	4x4=16	High	• Improved spray irrigation (low throw, micro sprinklers, etc.)			
						• Increase withholding time with farm ponds			
						• Equipping farmers with personal protective equipment (PPE)			
						• Farmer improved hand washing and hygiene			
						• Improve enforcement of and/or incentives for regulations for wastewater reuse			
	Consumption of contaminated produce irrigated with WWTP effluent	C1 50,000 individuals consuming products irrigated with WWTP effluent	Post-harvest washing is not rigorous	3x4=12	High	• Crop restriction to only products eaten non-raw			
						• Improved farm practices, such as post-harvesting washing and pathogen die-off before consumption			
						• Conduct education and behavior change campaign with local community to improve food safety.			
	Ingestion of pathogens during handling of fecal sludge for soil improvement	F 50 farmers (+families) using fecal sludge	None	4x4=16	High	• Equipping farmers with personal protective equipment (PPE)			
						• Training on the risks of handling fecal sludges and on standard operating procedures.			
						• Implement a Fecal Sludge Treatment Plant (dewatering, drying and composting) to render fecal sludge safe for reuse			
Disposal	Exposure to pathogens caused by illegal dumping of fecal sludge in open drains and open fields adjacent to residential areas.	L5 20,000 individual living around the illegal dumping areas	None	5x8=40	Very high	• Designation of an off-site dumping area for fecal sludge			
						• Monitoring and controlling sludge private operators (for instance, through GPS systems).			
						• Strengthening enforcement authorities (local police)			
						• Issuing a municipal decree/by-law for fecal sludge mgmt.			
						• Implement sludge transfer stations for private operators, with intermediate transport to a Fecal Sludge Treatment Plant (dewatering, drying and composting)			

The local SSP team carried out a risk assessment using the semi-quantitative method. In this case, risk is calculated as: Likelihood (L) x Severity (S) = Risk

Using the tool 3.5 provided in the Sanitation Safety Planning Manual, the team took the following likelihood (L) and Severity (S) definitions:

	DESCRIPTOR	DESCRIPTION
Likelihood (L)		
1	Very unlikely	Has not happened in the past and it is **highly improbable** it will happen in the next 12 months (or another reasonable period).
2	Unlikely	Has not happened in the past but **may occur in exceptional circumstances** in the next 12 months (or another reasonable period).
3	Possible	May have happened in the past and/or **may occur under regular circumstances** in the next 12 months (or another reasonable period).
4	Likely	Has been observed in the past and/or is **likely** to occur in the next 12 months (or another reasonable period).
5	Almost certain	Has often been observed in the past and/or **will almost certainly occur** in most circumstances in the next 12 months (or another reasonable period).
Severity (S)		
1	Insignificant	Hazard or hazardous event resulting in **no or negligible health effects** compared with background levels.
2	Minor	Hazard or hazardous event potentially resulting in **minor health effects** (e.g. temporary symptoms of irritation, nausea, headache).
4	Moderate	Hazard or hazardous event potentially resulting in **self-limiting health effects or minor illness** (e.g. acute diarrhoea, vomiting, upper respiratory tract infection, minor trauma).
8	Major	Hazard or hazardous event potentially resulting in **illness or injury** (e.g. malaria, schistosomiasis, food-borne trematodiases, chronic diarrhoea, chronic respiratory problems, neurological disorders, bone fracture), and/or may lead to **legal complaints** and concern, and/or major **regulatory noncompliance**.
16	Catastrophic	Hazard or hazardous event potentially resulting in **serious illness or injury, or even loss of life** (e.g. severe poisoning, loss of extremities, severe burns, drowning), and/or will lead to **major investigation by regulator**, with prosecution likely.

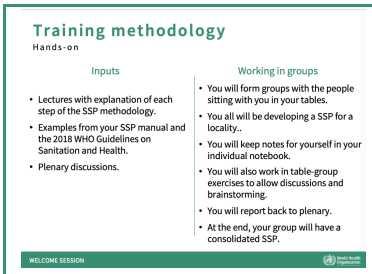
For each hazardous event, the SSP team decided on a value for L and S. The risk was calculated using tool 3.6 of the SSP manual:

			SEVERITY (S)				
			Insignificant	Minor	Moderate	Major	Catastrophic
			1	2	4	8	16
LIKELIHOOD (L)	Very unlikely	1	1	2	4	8	16
	Unlikely	2	2	4	8	16	32
	Possible	3	3	6	12	24	48
	Likely	4	4	8	16	32	64
	Almost certain	5	5	10	20	40	80
Risk score R = L × S			<6	6–12	13–32	>32	
Risk level			Low risk	Medium risk	High risk	Very high risk	

7.3. Annex 3: Full slides screenplays for 3-day training

7.3.1. Welcome session

Slide	Screenplay
1 	**Welcome** Welcome to our training on Sanitation Safety Planning, step-by-step risk management for safely managed sanitation systems. (Probably here, you as a trainer will have to thank the organizers of the training. Don't forget to include their logos in the slide if needed) (2 min)
2 	**Trainer's self-introduction** (Introduce yourself, make sure you fill in the slide in the PPT) (1 min)
3 	**Presentation of participants** Keep in mind that you have only 15 min. You also need to consider cultural preference, but in any event, aim to limit the time on this activity as much as possible. There is plenty of time later for people to get to know each other. Often, the participants may know each other already. In this case, you may not need to do any introductions. Or you could simply read out the name of the agency or organization and ask them to stand up. Try introducing people by cluster or clumping by type of people – e.g., Researcher/university, NGO, regulator, water and/or wastewater service company, health agency or other government agency. If people do stand up and introduce themselves, you need to proactively manage the time to keep it to an absolute minimum. This is best done by giving very clear instructions on what to say (e.g., Name, organization and what type of work you personally do related to sanitation). (15 min)
4 	**Training objectives** (Here, you will have to adapt the objectives, depending on the type of training) (3 min)
5	**Training methodology** (You will have to adapt the methodology and the slide, depending on the type of training. In some cases, you will visit one site for which a SSP will be prepared. You might divide the team in 4-6 groups and have them working in one step of



the sanitation chain (toilet, containment, transport, treatment, or disposal/reuse). You can also choose to assign the on-site sanitation service chain to one team, and the sewered sanitation system to another team.

You can also ask each team to work on the entire sanitation service chain, if you have enough time for them to work on all steps.)

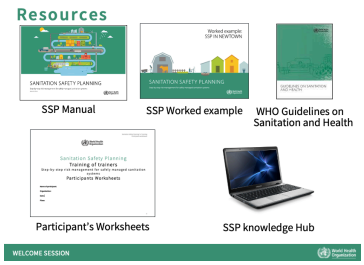
(5 min)

6

Agenda

(Make sure you adapt the timings according to the audience requirements)

7



Resources

(Here, you might need to adapt as well what resources you have available for your participants. In some cases, you will also prepare the handouts of the PPTs)

(4 min)

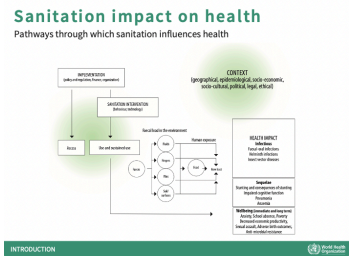
8

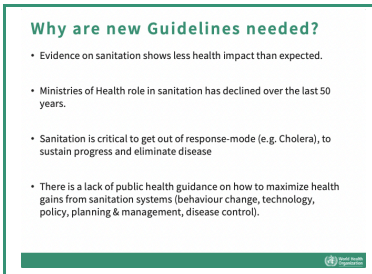
Let's start now with an introduction to SSP

7.3.2. Introductory session

This is a 45 min presentation with 38 slides, including time to present the Coppentown case study and groupwork. Cut the slides if you take longer.

Slide	Screenplay
1 	**Introduction to SSP** Let's start then understanding the basic concepts that clarify the value of the SSP to implement the WHO Guidelines.
2 	**Sanitation** According to the WHO Guidelines on Sanitation and Health, sanitation is defined as access to and use of facilities and services for the safe disposal of human urine and feces. However, when we talk about safe sanitation systems, we refer to an arrangement of technologies and practices, • designed and used to separate human excreta from human contact at all steps of the sanitation service chain from toilet capture and containment through emptying, transport, treatment (in-situ or o -site) and final disposal or end use. • That fulfils minimum requirements of design, construction and O&M to ensure safety along each step; • And that is embedded in an implementation framework for safe service delivery that ensures effective planning, delivery, maintenance, regulation and monitoring.
3 	**Significance of sanitation for human health** Inadequate sanitation systems exist in many parts of the world. Many people worldwide practice open defecation and many more do not have services that prevent fecal waste from contaminating the environment. In many low- and middle-income countries (LMICs), rural areas are underserved, cities are struggling to cope with the scale of sanitation needs caused by rapid urbanization, while sanitation system maintenance is challenging and costly worldwide. Furthermore, challenges caused by climate change require continued adaptation to ensure sanitation systems safeguard public health.
4 	**Health impact of unsafe sanitation** Safe sanitation is however essential for health, from preventing infection to improving and maintaining mental and social well-being. The lack of safe sanitation systems leads to infection and disease, including: • Diarrhea, a major public health concern and a leading cause of disease and death among children under five years in low- and middle- income countries. • Helminth infections such as soil-transmitted helminth infections, schistosomiasis and trachoma that cause a significant burden globally. • Vector-borne diseases, through poor sanitation facilitating the proliferation of mosquitos. Furthermore, besides the direct impact, unsafe sanitation has sequelae, which are conditions caused by preceding infections. For instance, unsanitary conditions have been linked with stunted growth, caused by repeated diarrhea, helminth infections, environmental enteric dysfunction. Nutrient malabsorption, gut permeability and chronic immune activation affects brain development, with further implications for cognitive functions and educational achievement.

	Lack of access to suitable sanitation facilities is also a major cause of risks and anxiety caused by embarrassment and shame associated with open defecation or shared sanitation.
5 	For all these reasons, sanitation recognized as a basic human right. According to the General Assembly, the Human Right to sanitation entitles everyone to sanitation services that provide privacy and ensure dignity, and that are physically accessible and affordable, safe, hygienic, secure, socially and culturally acceptable.
6 	**Sanitation impact on health** The primary purpose of safe sanitation services from a public health perspective is to fulfil the human right to sanitation and ensure sanitation services separate human excreta from human contact to **interrupt pathogen transmission**. To understand how effective sanitation interventions are today, the WHO commissioned studies that reviewed existing evidence. According to the study, to understand the effectiveness of sanitation, one should consider the **intervention**, which includes both technologies and behavioral change activities, as well as **implementation of the intervention**, which include policy, regulation, finance, organization, etc. Interventions and their implementation influence health via multiple intermediate outcomes: an important intermediate outcome is **access to**, as well as short- term uptake and long-term, sustained use of different sanitation interventions, be technologies or behaviors. These are assumed to influence both the **fecal load in the environment** and **human exposure to fecal contamination**. Ultimately, greater access to and use of sanitation interventions and a reduced fecal load are expected to lead to **improved health outcomes** (i.e., infectious disease and nutritional outcomes) as well as educational outcomes and mental health and social well-being.
7 	**Evidence on effectiveness** Evidence shows sanitation overall has a positive impact on infectious diseases and well-being. Overall, greater access to sanitation is associated with significant lower odds of diarrhea and other infections. -Absence of open defecation is associated with healthier populations -Evidence of a protective effect of sanitation on infectious diseases and nutrition. -Evidence of association with wider health outcomes, including nutritional status, cognitive development and general well-being, particularly for women and girls. However, the health impact is lower than we might expect.
8 	**Reasons for low health impact** There are several reasons including: 1) many interventions/programs don't reach levels of toilet access and use in the community that are high enough to remove pathogens from the environment (i.e., if I am using a toilet and my neighbor doesn't, I am still exposed to his feces). In fact, according to the studies, disease reduction will not be detected unless the coverage of sanitation use at community level is high (>70%), and 2) many sanitation systems do not effectively prevent contamination of the environment (failures in containment, transport, treatment etc.) hence have limited impact on exposure.
9	**Why are new Guidelines needed?** Evaluations of sanitation interventions have shown lower than expected health outcomes, leading to concerns on the quality of implementation of sanitation interventions and programs. Furthermore, ministries of Health role in sanitation has declined over the last 50 years



-Sanitation is critical to get out of response-mode (e.g., Cholera), to sustain progress and eliminate disease (e.g., NTDs), and to combat AMR

-There is a lack of public health guidance on how to maximize health gains from sanitation systems

Therefore, comprehensive guidelines are needed that consider the full sanitation service chain and its implications for human health, as well as the roles and responsibilities of health actors in securing sanitation-related health gains.

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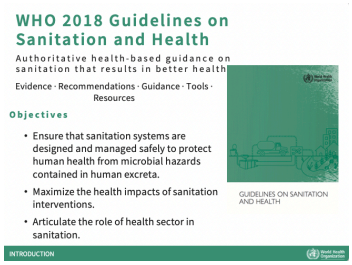

Guidelines on Sanitation and Health

The WHO Guidelines on Sanitation and Health are an authoritative health-based guidance on sanitation that results in better health. The overall purpose of these guidelines is to promote safe sanitation systems and practices to promote health. They summarize the evidence on the links between sanitation and health, provide evidence-informed recommendations, and offer guidance for encouraging international, national, and local sanitation policies and actions that protect public health. The guidelines also seek to articulate and support the role of health and other actors in sanitation policy and programming to help ensure that health risks are identified and managed effectively.

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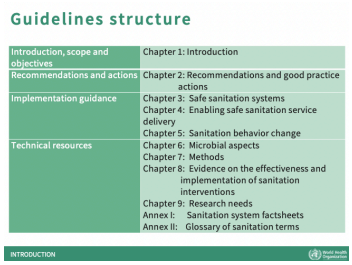

Guidelines' structure

Introduction, scope and objectives: Chapter 1: Introduction

Recommendations and actions: Chapter 2: Recommendations and good practice actions.

Implementation guidance: Chapter 3: Safe sanitation systems, Chapter 4: Enabling safe sanitation service delivery, Chapter 5: Sanitation behavior change

Technical resources: Chapter 6: Microbial aspects, Chapter 7: Methods, Chapter 8: Evidence on the effectiveness and implementation of sanitation interventions, Chapter 9: Research needs

Annex I: Sanitation system factsheets and Annex II: Glossary of sanitation terms

12

Recommendations

Based on the comprehensive evidence review, 4 main recommendations were derived for action by national and local authorities: The **first** one is **to ensure universal access and use of toilets that safely contain excreta**. This recommendation urges governments to prioritize the elimination of open defecation, and universal access to toilets, while planning for equitable progress. It also indicates that authorities need to strive to cover entire communities with safe toilets with a minimum of level service. Besides that, demand and supply approaches should be implemented concurrently to ensure toilet adoption and sustained use and enable scale. Furthermore, shared and public toilet facilities can be promoted for households as an incremental step when individual household facilities are not feasible. It must be also ensured that schools, health care facilities, workplaces and public places have access to safe toilets.

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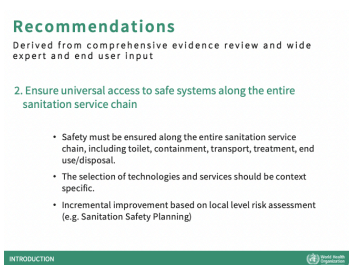

The **second** recommendation is about **Safe Sanitation Chain**. It indicates that safety must be ensured along the entire sanitation service chain, including toilet, containment, transport, treatment, end use/disposal. The selection of technologies should be context specific and respond to local physical, social and institutional conditions. Incremental improvements should be based on risk assessment and management approaches, such as Sanitation Safety Planning). Finally, the recommendation indicates sanitation workers should be protected from occupational exposure through adequate health and safety measures.

14

The **third** recommendation refers to **Sanitation being part of local services**. This indicate that to increase efficiency and health impact, sanitation should be provided and managed as part of a package of locally delivered services. Furthermore, sanitation interventions should be coordinated with water and hygiene measures, such as water supply, hygiene, animal waste, child feces.

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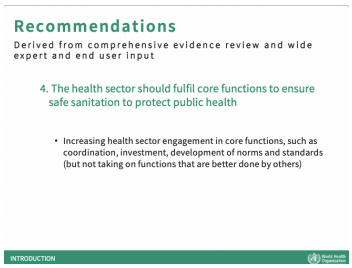

The **fourth** recommendation relates to the role of the **health sector**. It indicates that the health sector engagement should be increased, to ensure safe sanitation to protect public health.

16

Implementing recommendations

So, what all these recommendations mean for us?

What can we do as local practitioners?

We need to ensure that we maximize the health benefit of sanitation interventions. This refers to the need of ensuring that systems and services are selected to respond to the local context and that investment and system management are based on local level risk assessments along the entire sanitation chain. With this, we need to ensure that incremental improvements are based on local level risk assessment, so communities, sanitation workers, consumers and farmers are protected.

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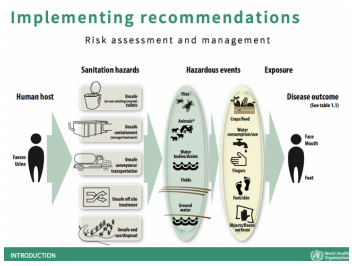

Implementing recommendations

How do we do that? We carry out a risk assessment, in which we understand the transmission pathways of excreta-related infections and propose control measures to avoid exposure.

This figure illustrates the potential pathogen transmission pathways from a human host leading to disease outcomes at each step of the sanitation service chain. For instance:

• Unsafe/ non-existing (or not used) toilets: open defecation can lead to pathogens discharged on to fields, infecting new hosts through feet or crops. Also, poorly constructed pit toilets can lead to flies and other insects breeding in excreta or spreading fecal pathogens to food, fingers, and surfaces.

• Unsafe containment (storage/ treatment): poor containment such as poorly constructed septic tanks can cause leakage into ground water and thereby into water consumed by new hosts.

•Unsafe conveyance/transportation: poor emptying practices can lead to direct exposure of sanitation workers or others involved in emptying activities to pathogens, as well as discharge of pathogens onto surfaces and therefore exposure through contaminated surfaces.

• Unsafe off-site treatment: inadequate treatment can lead to insufficient pathogen removal from fecal sludge, leading to pathogen discharge into water bodies through runoff or by purposeful discharge, contaminating water for human consumption. Poorly managed treatment processes can also allow animal contact with untreated excreta, contributing to further exposure.

• Unsafe end use/ disposal: discharge of untreated fecal sludge into the environment can lead to all hazardous events through multiple pathways.

We need to carry out this systematic assessment to protect all those who are at risk.

So, how do we do it?

18

Sanitation Safety Planning

Sanitation Safety Planning (SSP) is the WHO recommended approach for local risk assessment and management for sanitation systems.

It presents a step-by-step methodology to assist in the implementation of local level risk assessment and management for the entire sanitation service chain - from toilet, containment, conveyance, treatment and end use of disposal.

SSP can be applied to all sanitation systems, such as on-site or off-site sanitation, to ensure that the system is managed to meet the health objective.

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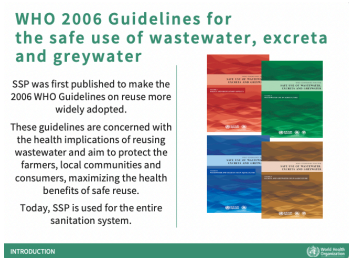

WHO 2006 Guidelines for the safe use of wastewater, excreta and grey water

Originally, the Sanitation Safety Planning manual was published in 2015 to assist with the implementation of the 2006 WHO guidelines for safe reuse.

the WHO's guidelines, first published in 1989 and revised in 2006, are concerned with the health implications of using wastewater for agriculture and aquaculture and aim to protect the health of farmers (and their families), local communities and product consumers, seeking to maximize the health benefits of safe water reuse.

The principles of SSP have been adopted more widely. Instead of focusing only on wastewater, excreta or greywater reuse, it's now used as a risk assessment method for fecal sludge management, recreational water use, irrigation of public green areas, etc.

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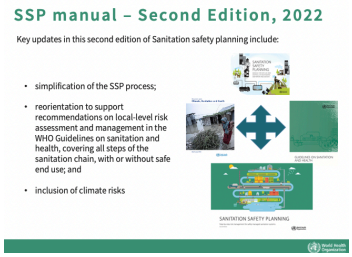

SSP manual - Second Edition 2022

This 2nd edition is an attempt to simplify the SSP process, as well as reorient to support recommendations on local-level risk assessment and management in the WHO Guidelines on sanitation and health, covering all steps of the sanitation chain, with or without safe end use.

Also, this new version provides more in-depth information to strengthen climate resilience, including identification of climate-related risks, such as those caused by water scarcity, sea level rise and extreme weather event, and associated management and monitoring.

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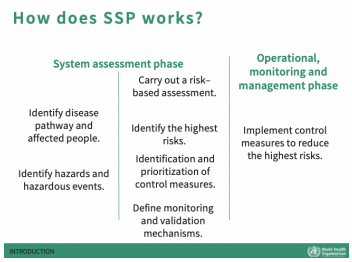


How does SSP work?

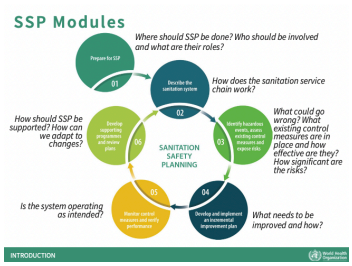
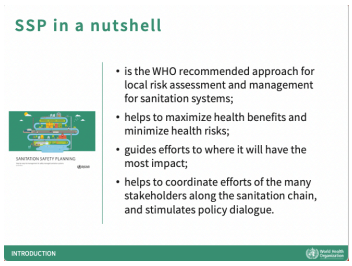
The way how SSP works is simple and straightforward. There is a first phase, in which a sanitation system is analyzed, identifying the disease pathways and affected people. Hazards and hazardous events are also identified. Following, a risk-based assessment is carried out, that defines what should be the priorities, which means which are the highest risks. The resulting information is used to take decisions about improvements, also called control measures, including technology upgrades, improved operational procedures and behavioral change campaigns. This is followed by the actual implementation of the control measures, and the continuous monitoring, learning and adaptation.

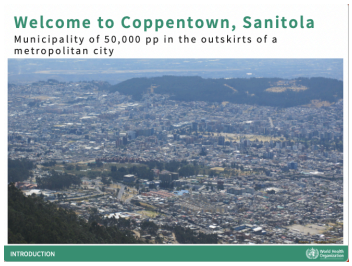
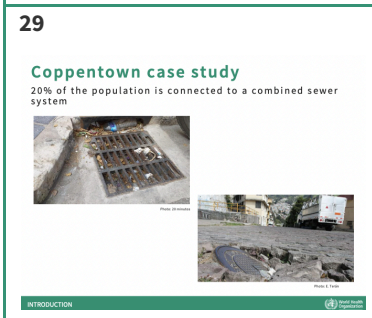
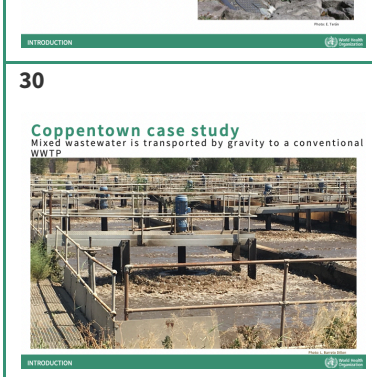
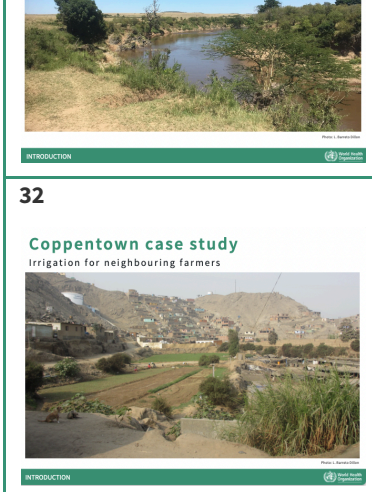
22

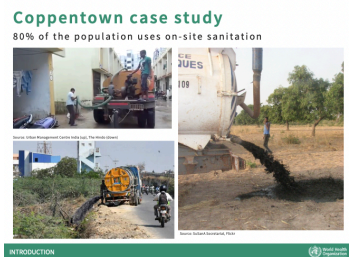
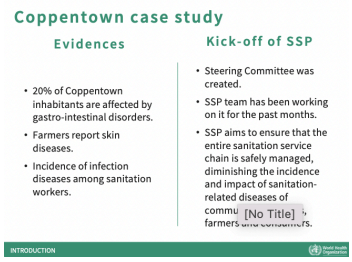
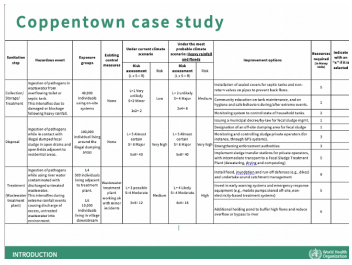
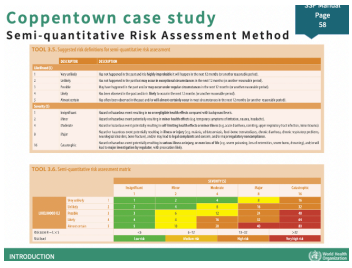
Benefits of Sanitation Safety Planning

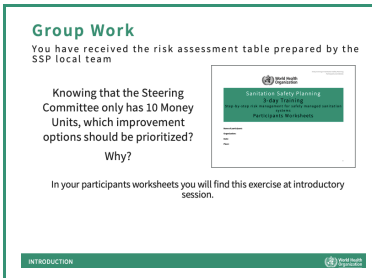
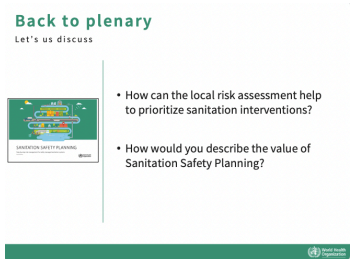
Sanitation Safety Planning:

- Helps to maximize health benefits of sanitation interventions.
- Guides operators to prioritize risk management efforts to where it will have the most impact.
- Identifies incremental improvements at each step of the sanitation service chain to allow progressive implementation towards sanitation targets.
- Allows investments to be prioritized according to the highest health risk and thereby maximize gain.
- Coordinates efforts of the many stakeholders along the sanitation chain, including the department of health, utilities, private sector, municipal authority, environmental and agricultural authorities) to maximize the health benefit of sanitation and stimulate policy dialogue and change.

23 	**SSP Modules** In total, there are 6 modules: **Module 1**: Prepare for SSP: in this module the SSP area and SSP priorities of the sanitation system are defined, together with the membership of the SSP team. **Module 2**: Describe the sanitation system: here a complete description of the sanitation system, including the waste fractions and the potential exposure groups is performed. **Module 3**: Identify hazardous events, assess existing control and measures and exposure risks: Within this module, hazards and hazardous events are identified. Also, existing control measures are assessed, and exposure risks are prioritized. **Module 4**: Develop and implement an incremental improvement plan: this module allows flexibility in selecting new control measures or other improvements that address these risks at the most effective places in the system. This process helps to ensure that funding and efforts target the highest risks with greatest urgency. In this session, participants consider options to control identified risks, use selected options to develop an incremental improvement plan. **Module 5:** Monitor control measures and verify performance: within this module, a monitoring and verification plan is prepared. **Module 6:** Develop supporting programs and review plans: in this final module, supporting programs are prepared. These develop people's skills and knowledge and enable organizations with the ability and capacity to meet SSP commitments.
24 	**Results of Sanitation Safety Planning** Carrying out the sanitation safety planning process will result in two products: • Prioritized, incremental improvement plan. • Operational monitoring plan for regular monitoring and periodic verification. Outcomes include the maximization of health impact of sanitation solutions and the progressive implementation towards sanitation targets. As the SSP process is not merely about writing a Sanitation Safety Plan, the process is an opportunity to build the capacity of local stakeholders, so they are capable of initiating and maintaining this risk-based sanitation management approach
25 	**SSP in a nutshell** In summary: • Sanitation Safety Planning (SSP) is the WHO recommended approach for local risk assessment and management for sanitation systems. • SSP helps to maximize health benefits and minimize health risks. • SSP guide while prioritizing and targeting risk management efforts to where it will have the most impact. • SSP can be used to coordinate efforts of the many stakeholders along the sanitation chain, maximizing the health benefits and stimulating policy dialogue. To understand how SSP works and how it helps, let's carry do an exercise together. (Until here you should have consumed 35 min) – Eliminate slides if you have less time
26 	**Group Work: Role Play** (explanation should be 10 min) We will divide in groups of 5 persons or organize groups according to the tables you are sitting at now. You and your group will be part of an Expert Consultation Group that should provide recommendations to the SSP Steering Committee about the implementation measures that should be prioritized in Coppentown, a small municipality in the country Sanitola.

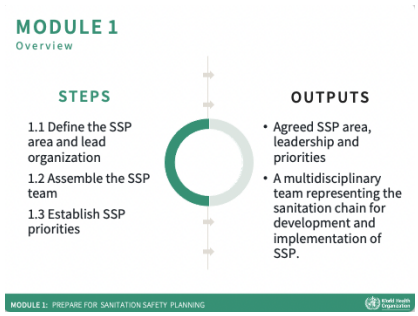
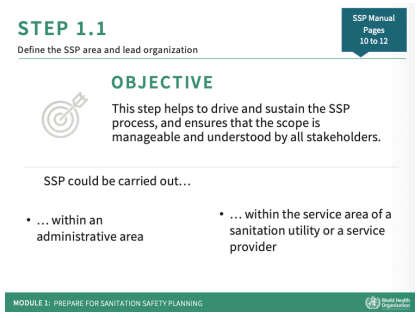
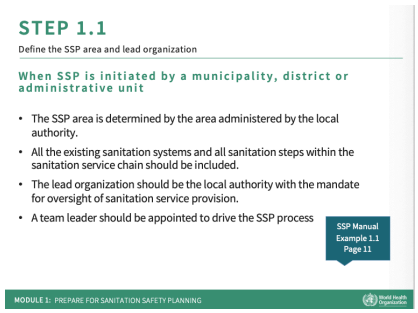
27 	The Republic of Sanitola is in the tropical climate zone and is a middle-income country. Coppentown is a town on the outskirts of a large metropolitan city with a population of approximately 50,000 people.
28 	Water supply is from a surface water source located far upstream of the town. Seasonally heavy rains occur in the area. However, the beginning of the wet season is becoming less predictable. Further, regional climate models project average rainfall will decrease during the dry season and increase during the wet season over the next 30 years.
29 	According to the recent studies, 20% of the population are connected to a public sewerage system, constructed decades ago. This is a combined system that conveys domestic wastewater with stormwater. The system is characterized by sewer breaks and sometimes chamber overflows.
30 	The mixed wastewater is transported by gravity to a conventional wastewater treatment plant (WWTP), with activated sludge technology.
31 	The treated wastewater is disposed of in the river which flows through Coppentown,
32 	which also serves as a source for irrigation water for neighboring farmers. Because it receives combined sewerage flows, during heavy rainfall the volume of wastewater greatly exceeds the capacity of the WWTP, and therefore, untreated wastewater together with heavy rains is discharged without any treatment, with high pathogen loads, into the river.

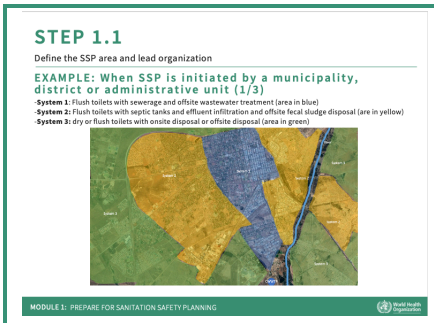
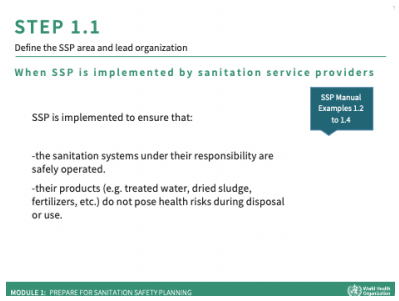
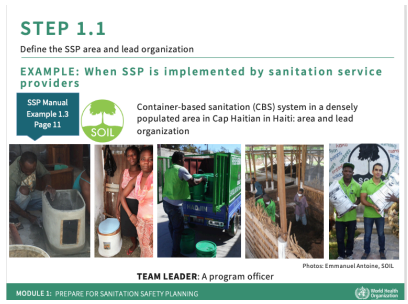
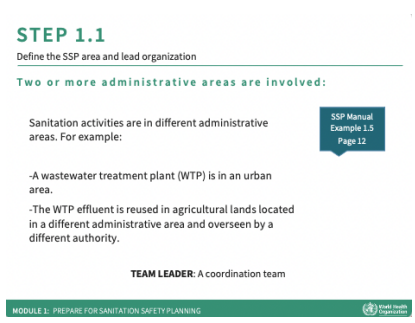
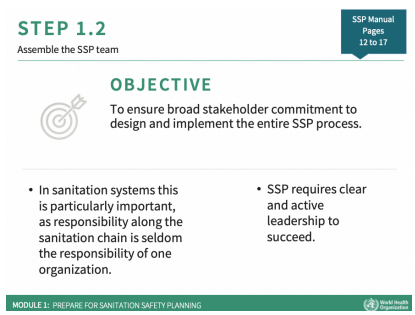
33 	Habitants who do not live in the center of Coppentown are not connected to the central sewerage system. About 80% of the population have household cesspools or septic tanks, which are emptied by local vacuum truck operators, most of them not regulated/licensed. The fecal sludge produced is usually discharged in the public sewerage systems or in the nearby rivers and streams.
34 	In some cases, the fecal sludge is taken to agricultural land, where it is used as soil conditioner, without any treatment, by local farmers.
35 	The Regional Public Health Office reports that about 20% of Coppentown's habitants are affected by gastro-intestinal disorders, possibly to due to the consumption of contaminated raw produce. Farmers often report skin diseases, so do informal workers that dislodge and transport sludge. Against this background, Coppentown's Municipality initiated the SSP process in response to a request from national and city authorities. A Steering Committee and a local SSP team was put in place with representatives of Sanitola's Ministry of Health, Municipal Association, Ministry of Public Works, Coppentown Water and Sanitation Utility, truck drivers Association, Ministry of Agriculture, Ministry of Environment and Climate, Farmers Association and Coppentown's Municipal Council. Together, they decided that the aim of Sanitation Safety Planning was to ensure that the entire sanitation service chain is safely managed, diminishing the incidence and impact of sanitation-related diseases of communities, workers, farmers and consumers.
36 	You have received the risk assessment table, prepared by the local SSP team, indicating a list of hazardous events, with the risk assessment and proposed implementation measures.
37 	Semi-quantitative Risk Assessment In this case, members of the local SSP team used a semi-quantitative risk assessment method, with given definitions of likelihood and severity. Once the team decided a Likelihood for the hazardous event (e.g., if it was very unlikely, likely, possible, certain) and a Severity (for instance, insignificant, minor, moderate, catastrophic), the tool, that you can find in your Handouts and in SSP Manual (page 52), indicates the risk using the last table.
38	You will have 30 minutes to analyze the risk assessment performed by SSP local team, and answer the following question: What are the 3-5 immediate/short terms measures that your team recommends to the Steering Committee to achieve their SSP objective? Why?

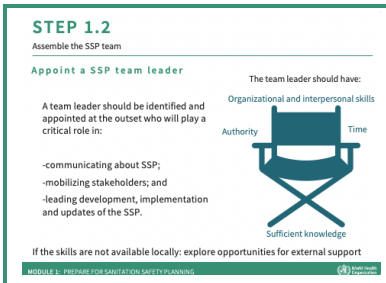
	
39 	Discussion in plenary: Guiding questions: 1) How can the local risk assessment help to prioritize sanitation interventions? 2) How would you describe the value of Sanitation Safety Planning? (Discussion should be of about 20 min)
40 	After the break, we will start the Sanitation Safety Planning Process for your locality.

7.3.3. Module 1

This is a 30 min presentation with 23 slides. Cut the slides if you take longer. You should dedicate 40 min to the group work.

Slide	Screenplay
1 	Module 1: Prepare for SSP The first module of the SSP is called “Prepare for SSP”. It is in this phase when we define the foundation elements of our initiative: • Where should SSP be done? • Who should be involved and what are their roles?
2 	**Module 1: Overview** Therefore, we will • Define the SSP area and lead organization • Assemble the SSP team • Establish SSP priorities
3 	**Step 1.1 Define the SSP area and lead organization** This step helps to drive and sustain the SSP process and ensures that the scope is manageable and understood by all stakeholders. SSP is usually carried out within an administrative area, or the service area of a sanitation utility or service provider.
4 	When SSP is initiated in a municipality, district or other administrative unit, the SSP area is determined by the area administered by the local authority. In this case, all the existing sanitation systems (e.g., sewered, on- site, decentralized systems) and all sanitation steps within the sanitation service chain (i.e. toilet, containment–storage/treatment, conveyance, treatment, and end use or disposal) should be included. The lead organization should be the local authority with the mandate for oversight of sanitation service provision, because SSP is used as a tool to coordinate sanitation, service providers, programs, and investments. A team leader should be appointed to drive the SSP process – that is, identify, engage, and coordinate key service provider representatives (e.g., toilet masons, sanitation utilities, vacuum service providers) and other stakeholders, such as other local government departments and agencies.
5	This is a typical example of SSP being initiated by a municipality. As you can see, there are three types of sanitation systems. A first system 1, flush toilets with sewerage and offsite wastewater treatment, which

	corresponds to the area in blue, which serves the old city center. The system 2, flush toilets with septic tanks and effluent infiltration and offsite fecal sludge disposal, which is marked in yellow, which serves new residential complexes and peri-urban areas, and a final system, system 3, dry or flush toilets with onsite disposal or offsite disposal, which covers the rural areas, marked in green.
6 	Another other option is when SSP is implemented by sanitation service providers such as utilities and other private operators. In this case, the objective is that the sanitation systems under their responsibility are safely operated, and their products do not pose health risks during disposal or use. The area is determined by the service provider's operations, and the team leader is identified within its organization structure.
7 	Here, we have an example of a SSP area implemented by a private service provider. In this case we can see a container-based sanitation service provider based in Haiti. In this case, we have a sanitation system composed of a toilet, transport, treatment, and reuse steps. In all these steps, the private company has identified the potential risks and the measures to control.
8 	In some cases, part of the sanitation activities might fall outside the administrative area, or the mandate of a service provider – for example, a wastewater treatment plant in an urban area, coupled with effluent reuse on agricultural lands located in a different administrative area and overseen by a different authority. In this case, a coordination team composed of the most relevant authorities should be formed to lead the SSP process. Example 1.5 shows the SSP area and the lead organizations in a complex system.
9 	Now, we will start with step 1.2. Assemble the SSP The purpose of assembling the team is to ensure broad stakeholder commitment to design and implement the SSP process. In sanitation systems this is particularly important, as responsibility along the sanitation chain is seldom the responsibility of one organization. Often the SSP process is initiated by one or several interested individuals or an organization. However, they might not have all the skills needed. Therefore, the initiators require support of all relevant organizations.
10	A team leader should be identified and appointed at the outset who will play a critical role in communicating the objectives of SSP; mobilizing stakeholders; and leading development, implementation and updates of the SSP. The team leader should have the authority, the organizational and interpersonal skills, and sufficient time and management resources



to ensure that the process can be implemented effectively. Their time should be planned as part of the official workload rather than being an additional parallel assignment.

If the required skills are not available locally, the lead organization may explore opportunities for external support from national or international partner organizations and consultants. This can help ensure that SSP is well defined and build internal capacity.

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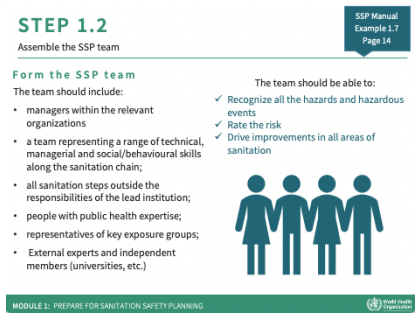
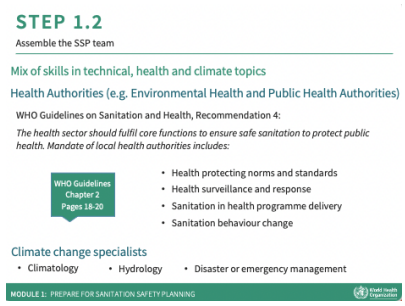


To make SSP successful, the SSP team leader will need the support of people who represent the whole system and who have skills to identify hazards, understand how the risks can be controlled and drive improvements in their respective area. These people may include:

- managers within the relevant organizations
- a team representing a range of technical, managerial and social/behavioral skills along the sanitation chain;
- all sanitation steps outside the responsibilities of the lead institution;
- people with public health expertise;
- representatives of key exposure groups;
- External experts and independent members (universities, etc.)

12



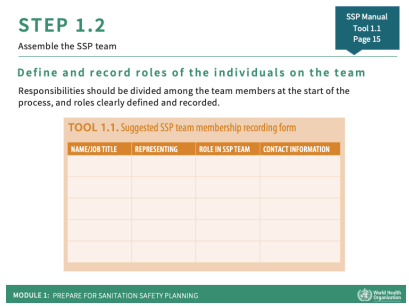
The team should have a mix of skills in technical, health and climate topics.

While implementation of sanitation programs is often delivered through infrastructure ministries, agencies and utilities, the overall responsibility to ensure these investments result in improved public health lies with health authorities.

Indeed, the WHO Guidelines in Sanitation and Health, in its recommendation 4, indicates that the health sector should fulfil core functions to ensure safe sanitation to protect public health. The principal functions of local environmental health authorities with regard to sanitation are: Health protecting norms and standards, Health surveillance and response, Sanitation in health program delivery and Sanitation behavior change.

To cover climate change impacts, the team should include specialists in climatology, hydrology and disaster or emergency management. Where it is difficult to involve climate experts (e.g. small communities or rural areas), it is possible to involve key community members or local government officials with relevant knowledge or that work in environmental resources management or disaster risk reduction (DRR). Balance should be sought in terms of technical skills, stakeholder perspectives including gender, and representation of vulnerable or socially excluded sub-groups.

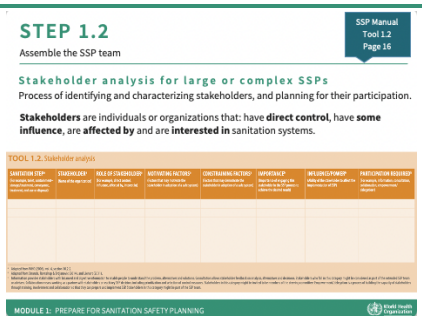
13



Responsibilities should be divided among the team members at the start of the process, and roles clearly defined and recorded. For large teams, a table can be used to outline SSP activities and responsibilities (tool 1.1).

14

Large or complex SSP areas may benefit from a stakeholder analysis to ensure that all relevant stakeholders are engaged and motivated. Stakeholder analysis is the process of identifying and characterizing stakeholders, and planning for their participation.



Stakeholder analysis

Involving the right people at the right time ensures that the needed expertise, political support and financial resources are available to implement SSP. Stakeholders are individuals or organizations that:

-have direct control over some aspects related to sanitation systems (e.g. regulatory agencies).

-have some influence over practices that affect the safety of the sanitation systems (e.g. farmers cooperatives).

-are affected by actions taken in the system to protect the safety of sanitation system (e.g. local communities).

-are interested in sanitation systems (e.g. nongovernmental organizations working with people using the sanitation system).

Depending on their characteristics, such as importance and influence, some key stakeholders should be invited to be members of the steering committee. Others, such as staff with technical and managerial expertise, are required as members of the SSP team. Tool 1.2 provides a table to conduct the stakeholder analysis and plan for stakeholder involvement.

15

SSP Steering Committee

Following stakeholder analysis, an SSP steering committee should be established (see example 1.9). This should be a representative body with combined oversight of each step of the sanitation service chain, from toilet, including on-site containment, to conveyance through sewers or vacuum trucks, to treatment and disposal or reuse.

The steering committee should include senior representation from relevant local authorities (e.g. municipality; local council and planning; housing, environmental, health and agriculture departments), as well as implementation partners (e.g. sanitation service providers, construction boards, farmers association).

The WHO Guidelines indicate, as part of the Good Practice Actions to "establish local government coordination groups with senior representation from all relevant local government departments and implementation partners to align and coordinate sanitation activities.

16

Its outputs will include:

Leadership and oversight of the entire process.

Agreed priority areas for SSP.

Engagement with, and get commitment of, senior management of the lead organization.

Secured financial and resource commitment.

Policy dialogue and amendment as needed to create an enabling environment for safe sanitation service delivery.

17

The SSP effort will require an in-kind commitment of time and some direct costs during the preparation phase (e.g., sampling and testing, data collection, field investigations). During Module 1, provisional estimates can be made by considering the likely data requirements of Module 2 and likely additional testing required from the application of Module 5. Management support will be needed for the SSP process to allocate staff time and any start-up funding needed.

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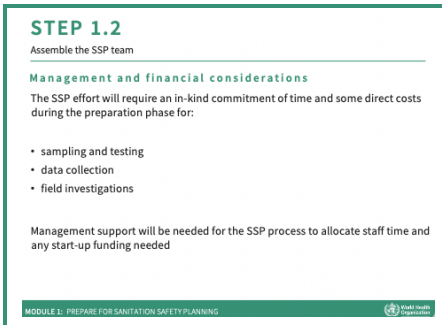
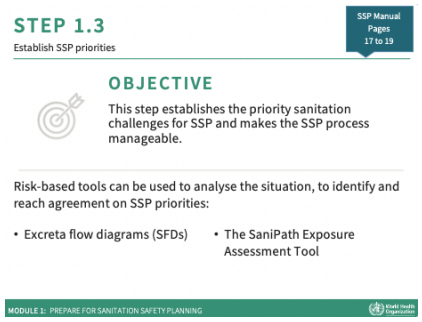
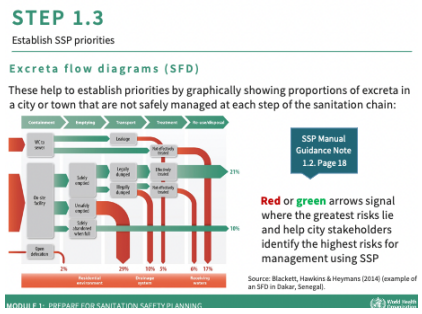
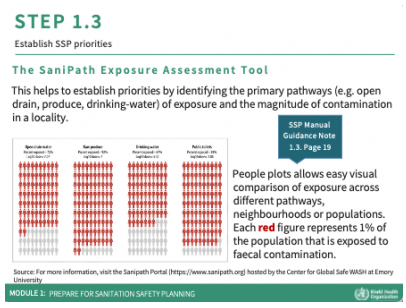
<tr><td> 
</td><td></td></tr>
<tr><td>18
 
</td><td>Teams in charge of multiple sanitation systems (e.g. sewered systems with treatment and reuse, on-site systems with septic tanks, on-site systems with pit latrines) within an administrative area or teams with constrained funding and capacities may need to establish priorities so that the SSP process is manageable.

Risk-based tools can be used to analyze the situation, to identify and reach agreement on SSP priorities. The following diagnostic tools may have already be used in the area.</td></tr>
<tr><td>19
 
</td><td>Excreta flow diagrams (SFDs) are a simple and effective way of visualizing the service types in a city and the fate of different excreta streams. Green arrows represent the proportions of excreta that are “safely managed” along the sanitation chain. Red arrows show where the excreta flows are not safely managed. The example SFD shows the thickest red arrow (29%) representing illegal emptiers discharging sludge in fields, the drainage system and open waters, followed by effective treatment at the wastewater treatment plant. By identifying the thickest red arrows, the SSP steering committee can quickly agree on risk-based priorities.</td></tr>
<tr><td>20
 
</td><td>The SaniPath Exposure Assessment Tool was developed to identify and compare risk of exposure to fecal contamination across the following 10 exposure pathways associated with inadequate sanitation in the public domain: surface waters, produce, municipal water, public latrines, floodwaters, open drains, bathing waters, soil, street food and ocean water. SaniPath provides guidance for standardized primary data collection. The data are then used to automatically produce an exposure assessment analysis, including the people plots shown below.

People plots allows easy visual comparison of exposure across different pathways, neighborhoods or populations. Each red figure represents 1% of the population that is exposed to fecal contamination through a specific pathway. The darkness of the red color represents the magnitude of the average dose of E. coli ingested per month (Raj et al., 2020). Using SaniPath results, members of the SSP steering committee can prioritize specific neighborhoods or a particular exposure pathway. In the example above, decision-makers would tend to prioritize the contamination of raw produce and hazards in open drain water.</td></tr>
<tr><td>21</td><td>While establishing the priority areas, keep in mind the recommendations given in the WHO Guidelines on Sanitation and Health.

Keep in mind Recommendation 1, that talks about universal access and use of toilets that safely contain excreta. Remember that the WHO recommends prioritizing areas with high frequency of open defecation; communities where toilets are poorly constructed, unsafe and do not</td></tr>
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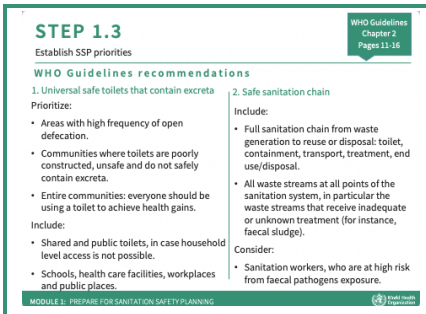
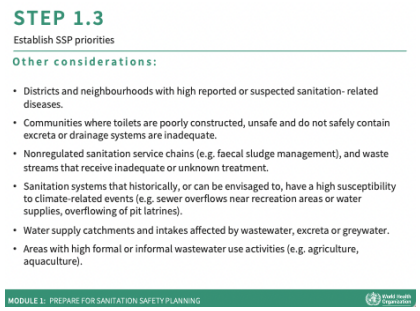


safely contain excreta; entire communities: everyone should be using a toilet to achieve health gains.

Also, you should Include shared and public toilets, in case household level access is not possible.; and schools, health care facilities, workplaces and public places.

Also, we should consider Recommendation 2 about safe sanitation chains. It emphasizes that we should include full sanitation chain from waste generation to reuse or disposal. Furthermore, we must take into account all waste streams at all points of the sanitation system, in particular the waste streams that receive inadequate or unknown treatment (for instance, fecal sludge). And we should consider sanitation workers, who are at high risk from fecal pathogens exposure.

22



The steering committee, with the support of the SSP team, might also prioritize the highest risk to health considering the following factors, keeping in mind that, in all cases, the full sanitation service chain should be covered:

Districts and neighborhoods with high reported or suspected sanitation-related diseases.

Communities where toilets are poorly constructed, unsafe and do not safely contain excreta or drainage systems are inadequate.

Nonregulated sanitation service chains (e.g. fecal sludge management), and waste streams that receive inadequate or unknown treatment.

Sanitation systems that historically, or can be envisaged to, have a high susceptibility to climate-related events (e.g. sewer overflows near recreation areas or water supplies, overflowing of pit latrines).

Water supply catchments and intakes affected by wastewater, excreta or greywater.

Areas with high formal or informal wastewater use activities (e.g. agriculture, aquaculture).

23

We will illustrate how SSP works with a worked example in Newtown. It is important to clarify that, as every SSP process is developed to suit its own circumstances, the details and conclusions for Newtown are only illustrative.

This worked example gives a hypothetical case of sanitation safety planning (SSP) in a small municipality called Newtown in an imaginary country called the Republic of Sanitola. The Republic of Sanitola is located in the tropical climate zone and is a middle-income country. Newtown is a town on the outskirts of a large metropolitan city and has a population of approximately 50 000 people. The population in Newtown has increased considerably during the past 10 years, and the rapid population growth has posed challenges for the town's infrastructure. Water supply is from a surface water source located far upstream of the town. Seasonally heavy rains occur in the area. However, the beginning of the wet season is becoming less predictable. Further, regional climate models predict that average rainfall will decrease during the dry season and increase during the wet season over the next 30 years.

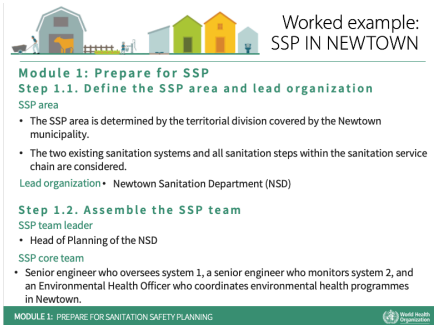
The two main types of sanitation system in Newtown are:

• sanitation system 1 – cistern flush toilet with sewerage and off-site wastewater treatment; and

• sanitation system 2 – cistern or pour flush toilets with soak pits or septic tanks and effluent infiltration, and off-site faecal sludge disposal.

According to a recent health survey, the burden of sanitation-related diseases in the town is high compared with other areas in the region. Against this background, Newtown's Municipal Council initiated the SSP process in response to a request from national and city authorities.

24



Step 1.1. Define the SSP area and lead organization

SSP area: As the SSP process is initiated by the local authority, the SSP area is determined by the territorial division covered by the Newtown municipality. In this case, the two existing sanitation systems (systems 1 and 2) and all sanitation steps within the sanitation service chain (i.e. toilet, containment–storage/treatment, conveyance, treatment, and end use or disposal) are considered.

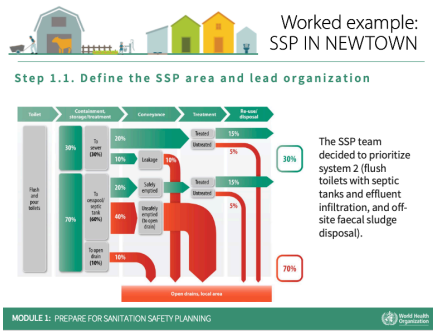
Lead organization: The Newtown Sanitation Department (NSD) is the SSP lead organization. The NSD is the local authority with responsibility for sanitation service provision.

Step 1.2. Assemble the SSP team

SSP team leader: The Head of Planning of the NSD was appointed as the SSP team leader. This person has many years of experience in developing sanitation investment projects, and has resources, knowledge and management skills to lead project implementation. The Municipal Council hired an SSP expert to support the SSP team leader and train the SSP team.

SSP core team: The team leader formed a core team within the NSD to drive the SSP process. The core team includes a senior engineer who oversees system 1, a senior engineer who monitors system 2, and an Environmental Health Officer who coordinates environmental health programs in Newtown.

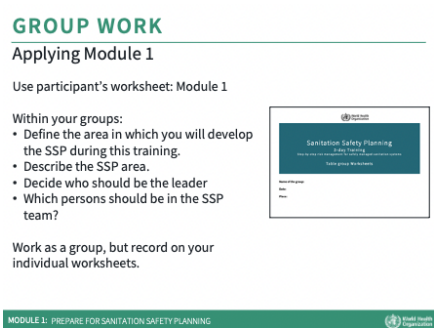
25



Step 1.3. Establish SSP priorities: It was not feasible to develop SSP for all sanitation systems in Newtown because of limited resources. The SSP expert collaborated with the Faculty of Civil Engineering of the Sanitola National University to develop an excreta flow diagram (SFD) and suggested using the results from the SFD as a starting point for the discussion.

Members of the steering committee noticed that the situation with on-site sanitation was especially critical. The team debated whether to include centralized treatment systems in the SSP. One committee member pointed out that only 30% of the population was connected to the relatively new sewer system and suggested first concentrating on the 70% of the population relying on pit toilets and septic tanks. The SSP team decided to prioritize system 2 (flush toilets with septic tanks and effluent infiltration, and off-site faecal sludge disposal).

26



Applying module 1 in your case study

In your groups, discuss and make decisions for your SSP.

Within your groups decide:

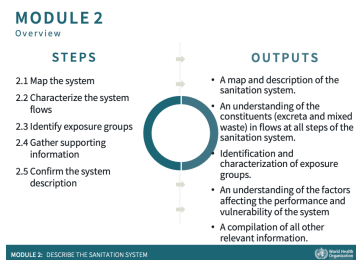
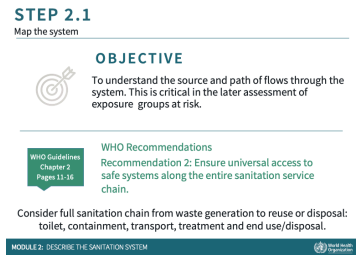
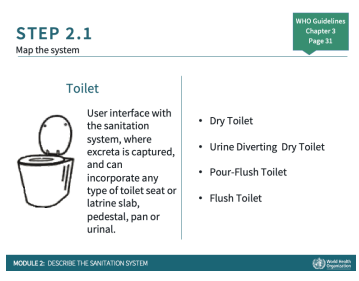
- Define the area in which you will develop the SSP during this training.
- Describe the SSP area.
- Decide who should be the leader
- Which persons should be in the SSP team?

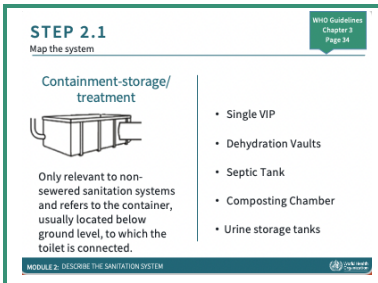
Work as a group but record on your individual worksheets.

(40 min group work)

Thank you very much!

7.3.4. Module 2

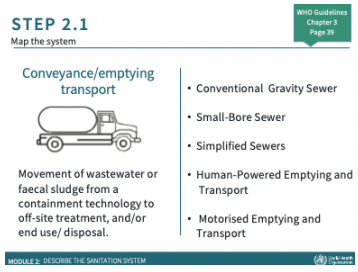
Slide	Screenplay
1 	**Module 2: Describe the sanitation system** Now it is time to talk about module 2, which answers the questions: • How does the sanitation service chain work? • Who is at risk?
2 	**Module 1: Overview** Here, we will map the system, characterize the waste fractions, identify exposure groups, gather supporting information and confirm the system description. The outputs of Module 2 should provide sufficient information to allow the SSP team to identify where the system is vulnerable to hazardous events, and to validate the effectiveness of any existing control measures. Much of the information needed may have already been gathered if the system has undergone investigations such as an SFD or SaniPath exposure assessment.
3 	**Step 2.1: Map the system** Let's start with step 2.1. The aim of this module is to understand the source and flows of the waste through the system, which is critical to identify the exposure groups. Each sanitation system is unique, and its description and map should, therefore, be specific. Keep in mind Recommendation 2 of the WHO Guidelines on Sanitation and Health, that says ensure universal access to safe systems along the entire sanitation service chain. Each element of the sanitation chain needs to be considered from toilet, containment, transport, treatment and end use/disposal.
4 	The Chapter 3 of the WHO Guidelines offers an entire description of safe sanitation systems. A safe sanitation system is defined as a system that separates human excreta from human contact at all steps of the sanitation service chain from toilet capture and containment through emptying, transport, treatment (in situ or off-site), and final disposal or end use, for both liquid and solid fractions. A combination of technologies at each step of the chain can be used; when linked and properly managed, these can form a safe chain. The type of technology needed is highly context-specific, depending on local technical, economic and social factors. The elements of a sanitation systems are:
5 	**Toilet** The term 'toilet' here refers to the user interface with the sanitation system, where excreta is captured, and can incorporate any type of toilet seat or latrine slab, pedestal, pan or urinal. There are several types of toilet, for example pour- and cistern- flush toilets, dry toilets and urine-diverting toilets.
6	**Containment-storage/treatment**



The containment step is only relevant to non-sewered sanitation systems and refers to the container, usually located below ground level, to which the toilet is connected. These include containers that are designed for either:

- containment, storage and treatment of fecal sludge and effluent (e.g. septic tanks, dry- and wet-pit latrines, composting toilets, dehydration vaults, urine storage tanks etc.); or
- containment and storage (without treatment) of fecal sludge and wastewater (e.g. fully lined tanks, container-based sanitation).

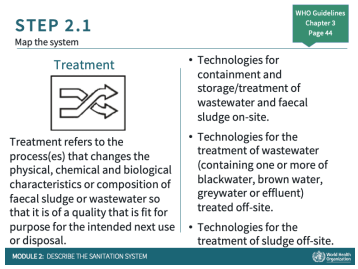
7



Conveyance (emptying/transport)

Movement of wastewater or fecal sludge from a containment technology to off-site treatment, and/or end use/ disposal. Conveyance systems can be sewer-based or based on manual or motorized emptying and transport.

8

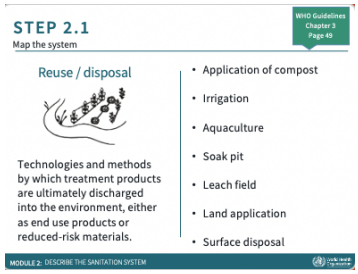


Treatment

Treatment refers to the process(es) that changes the physical, chemical and biological characteristics or composition of fecal sludge or wastewater so that it is of a quality that is t for purpose for the intended next use or disposal taking into account additional barriers in place at the end use/disposal step. Treatment can be sub-divided into three groups:

- those comprising technologies for containment and storage/treatment of wastewater and fecal sludge on-site
- those comprising technologies for the treatment of wastewater (containing one or more of blackwater, brown water, greywater or effluent) treated o -site; and
- those comprising technologies for the treatment of sludge o -site.

9



Reuse / disposal

End use/disposal refers to the different technologies and methods by which treatment products are ultimately discharged into the environment, either as end use products or reduced-risk materials.

10

For more information about sanitation systems and technologies, review the Compendium published by the Swiss research institute - eawag.

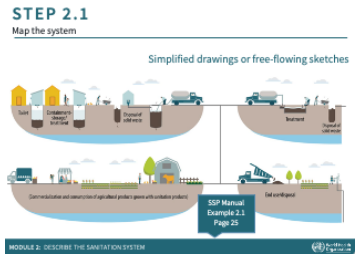
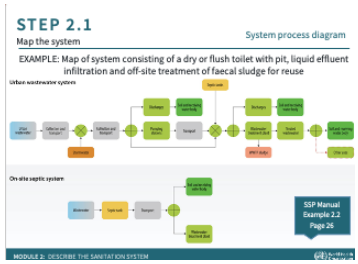
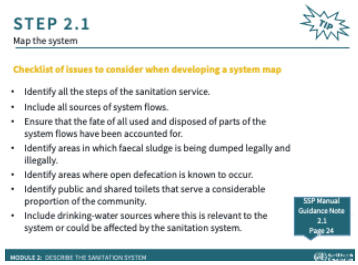
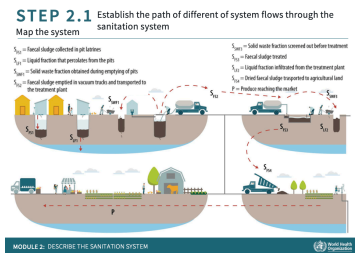
An online version is also available at www.sswm.info

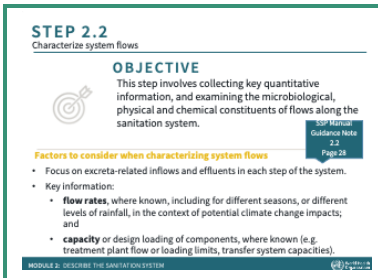
11

Map the system – System Flow Diagram

Each sanitation system is unique, and its description and maps should therefore be specific. It is important to ensure that mapping is accurate and not simply a desk-based exercise.

The method chosen for mapping will depend on the scale and complexity of the system.

	For some projects it may be useful to map using a **simplified drawings or free-flowing sketches** that illustrate the various sanitation processes. Here, for instance, we have a sanitation system of a city containing two types of system: on-site and off-site sanitation.
12 	**Map the system: System process diagram.** Another method to map the system is a **system process diagram**, which uses standard process flow systems. Here you can see an urban wastewater system and on-site septic system. In larger systems it may be more appropriate to generate a simplified schematic, referencing more detailed process flow information held in other technical drawings.
13 	**Checklist of issues to consider when developing a system map** Identify all the steps of the sanitation service. Include all sources of system flows. Ensure that the fate of all used and disposed of parts of the system flows have been accounted for. Identify areas in which fecal sludge is being dumped legally and illegally. Identify areas where open defecation is known to occur. Identify public and shared toilets that serve a considerable proportion of the community. Include drinking-water sources where this is relevant to the system or could be affected by the sanitation system.
14 	Once the system map is ready, the SSP team should indicate the path of different flows through the sanitation system, from the point of generation (i.e. toilets in various settings) to use or disposal (i.e. use in agriculture or aquaculture; or disposal to rivers, ocean and landfill). The team should map excreta-related flows, such as collected urine and feces, leakages from the pits, fecal sludge transported, wastewater in sewers and treated effluents. Other waste fractions, such as industrial effluents, pesticide runoff or specific wastes that might have an impact on the sanitation system, could also be mapped. Example 2.3 shows a simplified drawing for mapping the system flows (S). In this case, you see an example for an onsite system. All different fractions are marked in the map: F_{FS1}= Fecal sludge collected in septic tanks F_{LF}= Liquid fraction that percolates from the septic tanks F_{SWF1}= Solid waste fraction obtained during emptying of septic tanks F_{FS2}= Fecal sludge emptied in vacuum trucks F_{FS3}= Fecal sludge treated F_{SWF3}= Solid waste fraction screened out before treatment F_{Com}= Compost transported to agricultural land
15	**Step 2.2: Characterize system flows** While the mapping exercise in Step 2.1 establishes the path of different waste fractions through the sanitation system, step 2.2 characterizes the microbiological, physical and the chemical constituents from all sources, and describe factors that will affect the performance and vulnerability of the system. This information is an important preparatory step for the hazard identification.

<table>
<tr>
<td> 
</td>
<td>When characterizing system flows, the team should focus on excreta-related inflows and effluents from each step of the sanitation system – that is, what comes in and what goes out. Typical system inflows and effluents are the so-called sanitation products: faeces, urine, blackwater, compost, dried faeces, dry cleansing materials, effluents, excreta, greywater, pit humus, pre-treatment products (fat, grease, oil and solids), sludge and stored urine. Information should be collected about:
• the sanitation system in which flows are generated or pass through;
• flow rates, where known, including for different seasons, or different levels of rainfall, in the context of potential climate change impacts; and
• capacity or design loading of components, where known (e.g. treatment plant flow or loading limits, transfer system capacities).</td>
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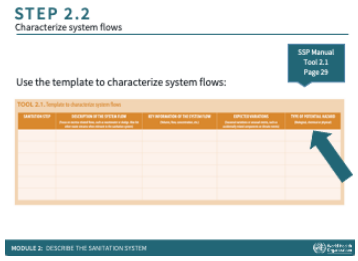
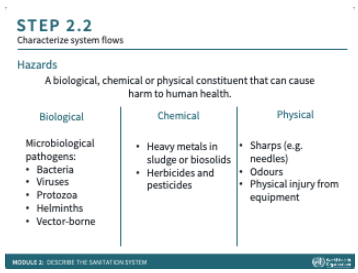
<tr>
<td>16
 
</td>
<td>Use the template available as tool 2.1 to characterize system flows.
Notice how besides description of the system flow, key information, expected variations, you should include the type of potential hazard.
But, what is a hazard?</td>
</tr>
<tr>
<td>17
 
</td>
<td>Hazards
A hazard is a biological, chemical or physical constituent that can cause harm to human health.
• Biological constituents include: Microbial pathogens such as
-Bacteria, parasitic protozoa and viruses in wastewater from fecal sources (e.g. Vibrio cholera, Giardia intestinalis, Coxsackievirus, Hepatitis E).
-Helminths (e.g. Ascaris lumbricoides, hookworm).
-Vector-borne pathogens (e.g. dengue virus, Schistosoma spp.).
Chapter 6 of the WHO Guidelines on Sanitation and Health include a description of the excreta related pathogens, including health significance.
• Chemicals: such as
-Heavy metals in sludge or biosolids from industrial sources (e.g. arsenic, cadmium, mercury).
-Herbicides and pesticides.
-In specific situations compounds relate to crop productivity (e.g. boron).
• Physical: such as
-Sharps (e.g. needles).
-Odors.
-Physical injury to workers from equipment.</td>
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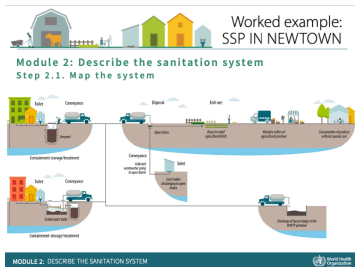
<td>18
 
</td>
<td>Newtown worked example
Now, let’s show how step 2.1, describe the sanitation system, and step 2.2 characterize system flows, happened in Newtown.
Step 2.1. Map the system: Thanks to previous work by the Faculty of Engineering on the development of Newtown’s SFD, much of the information needed had already been gathered. The SSP team leader organized a 1-day workshop with members of the extended SSP team to map and describe the system. In the invitation letter, the SSP team leader asked each member of the team to come to the meeting with information that could inform this exercise. It was decided to use a free-flowing sketch to understand the on-site system. This is shown in this figure.</td>
</tr>
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<td>19</td>
<td>Once the system was agreed on by the participants, the formal process flow diagram was prepared.</td>
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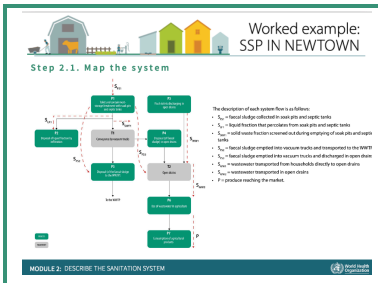
</table>



Based on the information obtained, the SSP team mapped the path of different waste flows through the sanitation system, from the point of generation (i.e. toilets) to final use or disposal (Fig. 2.3).
The description of each system flow is as follows:
- SFS1 = faecal sludge collected in soak pits and septic tanks
- SLF1 = liquid fraction that percolates from soak pits and septic tanks
- SSWF1 = solid waste fraction screened out during emptying of soak pits and septic tanks
- SFS2 = faecal sludge emptied into vacuum trucks and transported to the WWTP
- SFS3 = faecal sludge emptied into vacuum trucks and discharged in open drains
- SWW1 = wastewater transported from households directly to open drains
- SWW2 = wastewater transported in open drains
- P = produce reaching the market.

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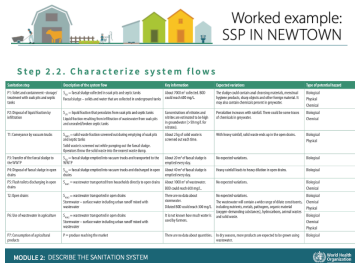

Step 2.2. Characterize system flows

Based on the information available, the team used tool 2.1 to characterize the system flows and to collect key quantitative information, and information on the microbiological, physical and chemical hazards.

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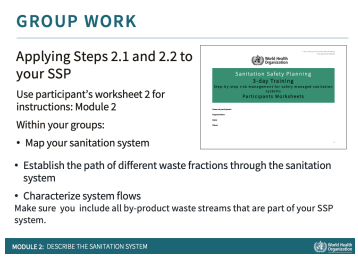
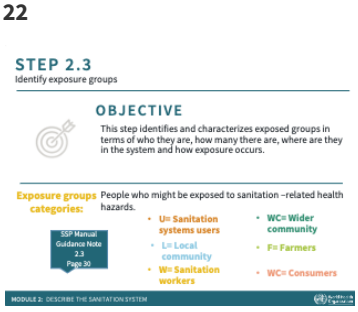


Group Work: Applying Steps 2.1 and 2.2 to your SSP
Use participant's worksheet 2 for instructions: Module 2
Within your groups:
- Map your sanitation system.
- Establish the path of different waste fractions through the sanitation system
- Characterize system flows

Make sure you include all by-product waste streams that are part of your SSP system.
(60 min group work Step 1 and Step 2)

22



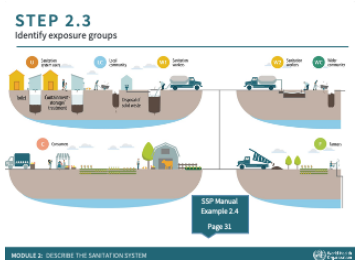
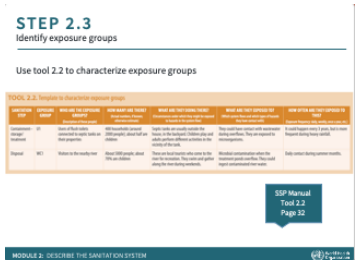
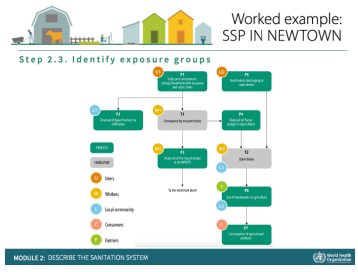
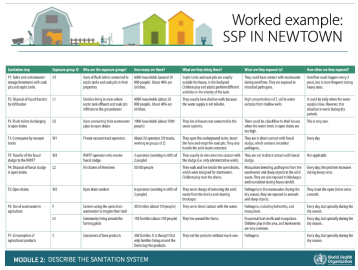
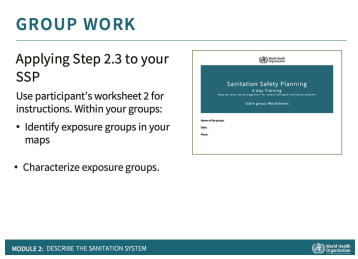
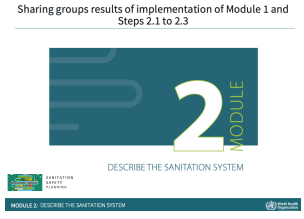
Step 2.3: Identify exposure groups

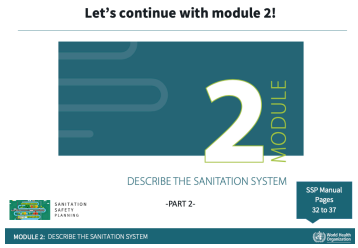
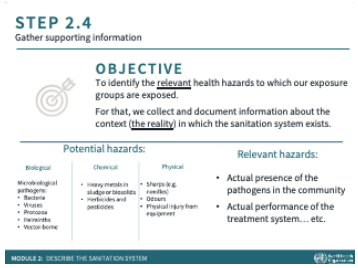
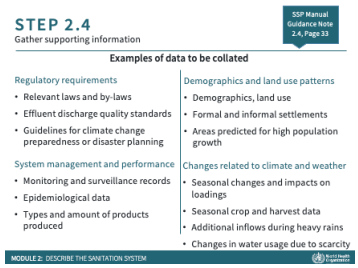
Now that we have identified the different steps in the map, the waste fractions and its characteristics, it is time to identify the people who are in each step, what are they doing there, so we can understand how they are exposed.

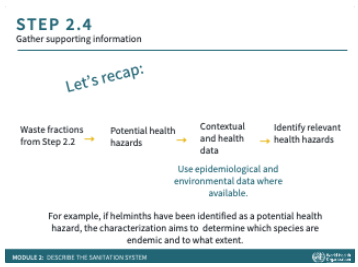
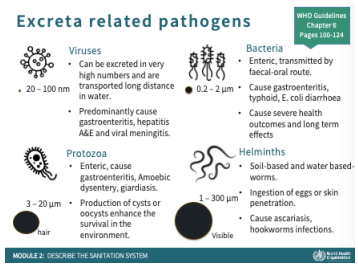
Step 2.3 has therefore the aim of ensuring an initial classification of exposed groups and identify how the exposure occurs.

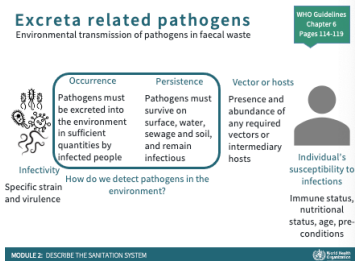
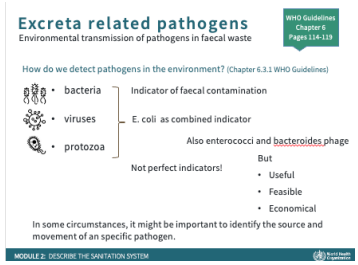
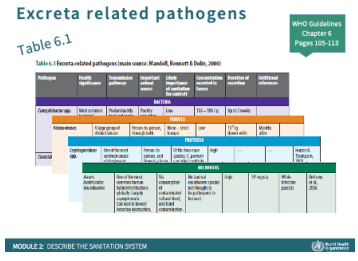
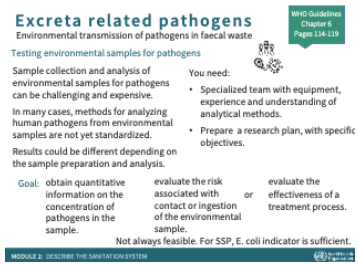
According to the SSP manual, exposure groups are people who might be exposed to sanitation related health, such as:

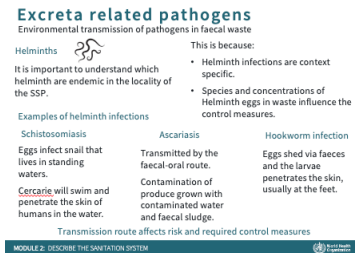
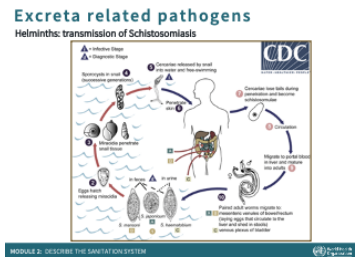
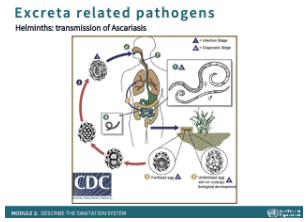
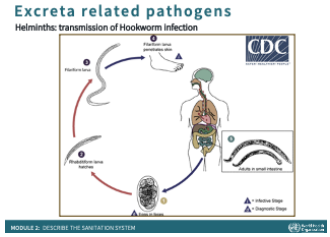
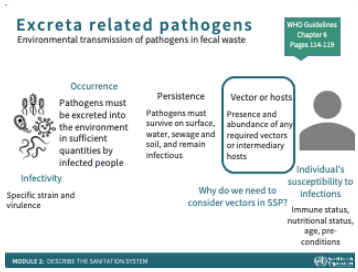
- Workers: A person who is responsible for maintaining, cleaning, operating or emptying the sanitation technology.
- Farmers: A person who is using the products (e.g. untreated, partially or fully treated wastewater, biosolids, fecal sludge).
- Local community: Anyone who is living near to, or downstream from, the sanitation technology or farm on which the material is used and may be passively affected.
- Consumers: Anyone who consumes or uses products (e.g. crops, fish or compost) that are produced using sanitation products.
- Sanitation system users: all people who use a toilet.
- Wider community: the wider population (e.g. farmers, lower lying communities) who are exposed to (e.g. through recreation or flooding) or use sanitation end use products (e.g. compost, fecal sludge, wastewater) or consume products (e.g. fish, crops) that are produced using sanitation end use products intentionally or unintentionally and may be exposed.

23 	Example 2.4 Let's take a look at this example. Here we find users, workers, farmers, local communities and consumers of produce.
24 	Use tool 2.2 to characterize exposure groups. Although some exposure groups, such as formal workers, are relatively easy to identify, others will be more difficult – for example, communities accessing nearby groundwater sources, seasonal and informal workers, and people living in informal settlements or immigrant populations. Demographics of the exposure groups, such as gender, age and potential social exclusion, should be noted. Keep in mind that climate change or climate variability may increase or decrease the frequency of exposure.
25 	**Newtown worked example** Now, let's show how step 2.3, Identify exposure groups, happened in Newtown. Here you have the map of the exposure groups: users, workers, local community, consumers and farmers….
26 	… and used tool 2.2 to identify who they are, how many are there, where they are and how exposure occurs.
27 	**Applying Step 2.3 to your SSP** Use participant's worksheet 2 for instructions: Within your groups: • Identify exposure groups in your maps • Characterize exposure groups. (Group work should be 45 min)
28 	**THIS SHOULD BE THE END OF DAY 1** **GIVE THE TIME TO PARTICIPANTS TO SHARE THE RESULTS OF THEIR WORK ON MODULE 1, STEP 2.1, STEP 2.2 AND STEP 2.3.** (Give 30 minutes for group sharing)

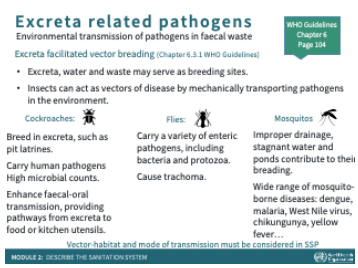
29  	**THIS IS THE BEGINNING OF DAY 2** **LET PARTICIPANTS KNOW THAT YOU ARE CONTINUING WITH MODULE 2.** (The lecture about entire steps 2.4 and 2.5 should be 30 min, and there are only 20 slides. Take your time).
30  	**Step 2.4: Gather supporting information** Now that we have identified the exposure groups, it's important to gather evidence of really what are the health risks. For this, we collect and document information about the context, means the reality, in which the sanitation system exists. We just identified and characterized the waste fractions. This tells us the ***potential*** health hazards. Now we want to look closer to reality, what helps us identifying the ***relevant*** health hazards. This has a strong impact on the development of a sanitation safety plan. The SSP team should compile and summarize information that will affect SSP development and implementation. Where no information is available, the team should note the lack of, for example, data, national standards or specifications. The steering committee should consider whether there is a need to develop monitoring or regulatory instruments where they are lacking.
31  	**Examples of data to be collated** When putting together compliance and contextual information, Guidance Note 2.4, in page 33 of our SSP manual, listS out institutional, population characteristics and environmental determinants that should be considered: • **Relevant quality standards, certification and auditing requirements**, such as • Relevant laws and by-laws • Regulations related to quality monitoring, surveillance and system auditing (not financial); • Effluent discharge or odour regulations; • Guidelines for climate change preparedness or disaster planning; • Certification requirement related to agricultural end products. • **Information related to system management and performance.** This should provide supporting documentation related to the actual follow-up and enforcement of points noted in above. Both documented and non-documented actions should be noted. Consider these points: • Data related to earlier monitoring and surveillance; • Frequency of documentation; • If faults and/or deviations were followed-up; • Epidemiological data; • Existing vulnerability, resilience or adaptation assessments of the area • Types and amount of products that are produced. • **Demographics and land use patterns:** consider these points: • Land use pattern, population and special activities that may impact the sanitation/wastewater production; • Settlements (and informal settlements); • Specific equity considerations such as: ethnicity, religion, migrant populations and disadvantaged groups. • Areas predicted for significant population growth or change. • **Known or suspected changes relating to weather or other seasonal conditions.** Consider these points: • Mean variability of the load to the treatment plant over the year;

	• Seasonal variation of use due to type of crops and harvest; • Additional inflow areas during heavy rain and implications on treatment steps (e.g. need for additional storage ponds); • Climate change projections; • Changes in usage patterns in time of water scarcity
32 	**Let's recap** In step 2.2, we have identified the waste fractions and identified potential health hazards. Then we look into contextual and health data to be able to determine what are the relevant health hazards. We need to use epidemiological and environmental data where available. For example, if helminths have been identified as a potential health hazard, the characterization aims to determine which species are endemic and to what extent.
33 	**Excreta related pathogens** This brings me back to the topic biological hazards, or excreta related pathogens. As you know, the whole aim of sanitation systems is to avoid the human contact with excreta, which contains enormous amounts of pathogens. Chapter 6 of the WHO Guidelines on Sanitation and Health outlines the characteristics of the four main groups of pathogenic hazards (bacteria, viruses, protozoa and helminths). **Bacteria**: Bacteria are small (typically 0.2-2 micrometres) single celled organisms, many of which are capable of multiplication outside a host under favorable conditions. Most bacteria considered in the Guidelines are enteric, transmitted by the fecal-oral route, and predominantly cause gastroenteritis. Some can cause severe health outcomes and may have long-term effects. While multiplication of pathogenic enteric bacteria in the environment is possible, it is rare. Bacteria have the ability to enter a viable non-culturable state that allows them to persist in the environment for long periods of time. Some of the bacteria associated diseases are Typhoid, Salmonellosis and E. Coli diarrhea. **Viruses:** are simple infectious agents, consisting only of genetic material (DNA or RNA) encased in a protein capsid. They are the smallest (typically 20-100 nanometres) organisms considered here and they are obligate intracellular organisms (i.e. they must be within a susceptible host cell to reproduce). Viruses can be excreted in very high numbers and may be transported long distances in water. Viruses cannot metabolize in the environment, so their persistence typically depends upon the extent to which the protein capsid can remain intact under adverse environmental conditions. The viruses covered in the Guidelines are enteric and predominantly lead to gastroenteritis (although some virus types can lead to other health outcomes such as hepatitis and viral meningitis). Some of the viruses associated diseases are: Rotovirus & norovirus diarrhea and Hepatitis A & E. **Protozoa:** Parasitic protozoa are complex and relatively large (typically 3-20 micrometers) single celled organisms that cannot replicate outside a suitable host. Those covered in the Guidelines are enteric and cause gastroenteritis of varying duration and severity. While excretion densities are orders of magnitude lower than viruses, the production of robust cysts or oocysts enhances survival in the environment. Cryptosporidium spp., Giardia spp. and Entamoeba histolytica are all infective upon excretion, while Cyclospora oocysts require a latency period of some days for maturation in the environment. **Helminths:** Helminths (also known as parasitic worms) include tapeworms (cestodes), flukes (trematodes) and roundworms (nematodes). They are multi-cellular, complex organisms. Some helminths, referred to as soil-transmitted helminths (STH), can be transmitted by the fecal-oral route (after a period of maturation in the environment), with infection being caused by ingestion of fertile worm eggs or through skin penetration by infective larvae. Although STH infections are often largely asymptomatic, they can lead to various mild to serious effects such as chronic abdominal pain and diarrhea, iron deficiency anemia, growth faltering, recurrent rectal prolapse, bowel/intestine obstruction, appendicitis, pancreatitis and protein energy malnutrition. Excretion of infective

	eggs can be abundant. In some species, especially Ascaris lumbricoides, eggs can survive in the environment for years where soil conditions are favorable.
34 	**Environmental transmission of pathogens in fecal waste** For any exposure to the pathogen to result in additional infections in the population, the pathogen: • must be excreted in sufficient quantities into the environment by infected people - Occurrence • persist in the environment, means it needs to survive on surfaces, water, sewage and soil - Persistence • be transported by any required vectors or intermediate hosts – Vector or host Also, it will depend on the infectivity of the individual pathogens, that is related to the specific strain and its virulence will drive the infectivity, as well as the host factors, including immune status, nutritional status, age and the presence of existing infections or diseases, will all influence an individual's susceptibility to infection. Knowing the occurrence and persistence of pathogens in a community is key to analyze the risk for infection in the next module. But how do we detect pathogens in the environment?
35 	**How do we detect pathogens in the environment?** Microbiological analyses of environmental samples collected in studies of sanitation usually focus on bacterial or phage indicators of fecal contamination – such as E. coli, enterococci, and more recently, bacteroides phage. These indicators are not perfect surrogates for the persistence, transport, and fate of some pathogens, but they are useful, feasible, and economical indicators of fecal contamination in the environment. Under some circumstances, such as disease outbreaks where it may be important to identify the source and movement of a specific pathogen in the environment, it may be useful to test environmental samples for a specific pathogen of interest. (although looking for specific pathogen in fecal waste can be challenging – see later slide)
36 	Table 6.1, from page 105 of your WHO Guidelines, outlines key excreta-related pathogens where sanitation is (or may be) important for the control of infection. Notice that the table contains information about the specific pathogens, the health effect, transmission pathways and typical concentration in excreta.
37 	**Testing environmental samples for pathogens** The WHO Guidelines on Sanitation and Health offer key information about methods to detect pathogens in environmental samples. It is key to remember that sample collection and analysis for pathogens can be challenging and expensive. In many cases, methods for analysis of many human pathogens from environmental samples (including feces, sewage, sludge and surface water) are not yet standardized and methodological approaches are rapidly evolving. Important differences may exist in data reported from different laboratories using valid but different approaches for sample preparation and analysis. **<u>However, if you require to conduct</u>** a test to detect the presence of specific pathogen in the environment, make sure that you count with a specialized team with equipment and knowledge. The investigators should carefully consider the objectives of the investigation.

	Unlike testing clinical specimens, where the **goal** is to identify the presence of an etiologic agent and thereby diagnose an infection, the objective of microbial analyses of environmental samples is to obtain quantitative information on the concentration of fecal contamination (by measuring indicator organisms) or the concentration of pathogens in the sample. This quantitative data can be used to evaluate the risk associated with contact or ingestion of the environmental sample, or to evaluate the effectiveness of a treatment process for removing or inactivating specific pathogens. In any case, keep in mind that environmental sampling is not always feasible, so it is ok to use indicators such as E. coli for the SSP process, without distinguishing between different types and species.
38  **39**  **40**  **41** 	**Helminths** In contrast to bacteria, viruses and protozoa, where we generally do not distinguish between species in SSP, it is important to understand which helminth (i.e. worm diseases) are endemic in the wider area of your SSP system. This is because the presence and frequency of different helminth infections is context specific. As the species and concentration of helminth eggs in waste influence the design of control measures, it is important to determine which helminth species are endemic in the study area. Let me illustrate this based on three examples of helminth infections: The transmission of Schistosomiasis, also known as bilharzia and snail fever, involves a snail that lives in standing waters. In fact, a person infected with schistosomiasis will shed eggs (via feces or urine), which may then end up in water body. There, the parasite will infect snails, in which they will develop into the next stage (i.e. cercariae). The cercariae will then swim in the water like tiny little fish can penetrate the skin of a human entering the water. In conclusion, for the transmission of this disease, we need the presence of a specific snail species in the waterbody of concern and humans need to enter the water. Hence, schistosomiasis may be of particular concern in aquaculture (because fishermen may enter the water for harvesting etc) and also in rice cultivation. In contrast, Ascariasis is transmitted by the fecal-oral route, i.e. soil/irrigation water being contaminated by fecal matter i.e. a contamination of produce grown on that soil or irrigated by that water is sufficient for transmission of ascariasis. Therefore, in areas where Ascaris lumbricoides is endemic, it is important that irrigation water and potentially also fecal sludge that is applied as soil conditioner are free of helminth eggs. Finally, in the case of hookworm infection, parasite eggs are shed via feces and the larval stage will then penetrate the skin (usually at the feet) of humans. Consequently, this helminth infection can be prevented by wearing shoes. (The trainer might choose to show the illustrations or not).
42 	What about vectors? Why do we need to consider vectors in SSP?

43



Vector-related diseases

Unsafe disposal of excreta including open defecation, unprotected pit latrines and poorly draining water systems, can facilitate vector breeding. Stagnant parts of drainage systems, treatment ponds or stored waste may serve as breeding sites for insect vectors.

Insects (e.g. cockroaches, flies and mosquitos) can act as vectors of disease by mechanically transporting pathogens in the environment, either on their bodies or within their intestinal tract.

There is a broad body of evidence showing that insects which breed in excreta, or feed on it, may carry human pathogens on their bodies or in their gut, like **cockroaches**. For example, cockroaches trapped from the toilets of houses with pit latrines had mean microbial counts of 12.3×10^{10} bacteria/ml and 98 parasites/ml, with the microorganisms representing a wide range of fecal-oral pathogens. They can, therefore, enhance the fecal-oral transmission of pathogens by providing additional pathways from excreta to food and/or kitchen utensils.

Flies have been shown to carry a variety of enteric pathogens including bacteria and protozoa. In addition to fecal-oral transmission of particular pathogens, flies are a key mechanism for transmission of ocular strains of Chlamydia trachomatis, the causative agent of trachoma.

The importance of **mosquito**-borne diseases for public health is widely documented. Unsafe sanitation and improper drainage leading to stagnant water or ponds can contribute to mosquito breeding, and hence the risk of mosquito-borne diseases.

Against this background, it is recommended that the SSP team determines which insect vectors are of public health concern in the study area and which vector-related diseases they may transmit.

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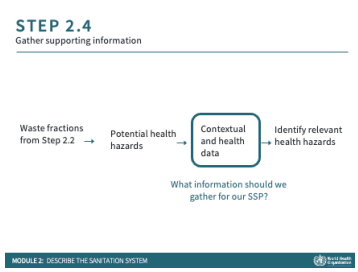

So, what information should we gather for our SSP?

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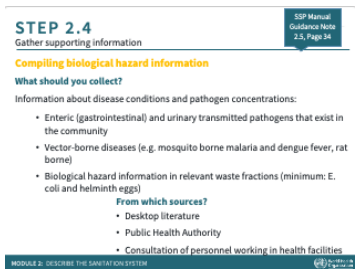

Compiling biological hazard information

What information you should collect? You should collect information about disease conditions and pathogen concentrations:

- Enteric (gastrointestinal) and urinary transmitted pathogens that exist in the community
- Vector-borne diseases (e.g. mosquito borne malaria and dengue fever, rat borne)
- Biological hazard information in relevant waste fractions (minimum: E. coli and helminth eggs)

From which sources?

To obtain information on the presence or absence of a specific disease or pathogen, a desktop literature review may give additional information. Information can also be obtained from public health authorities (e.g. Ministry of Health), which have access to the routine health information system, but this information often underestimates disease prevalence and is dependent on the existing medical surveillance system. Consultation of personnel working in health facilities within, or in proximity to, the study area is also a useful way to obtain the information required. Ideally, different data sources are consulted for obtaining reliable information.

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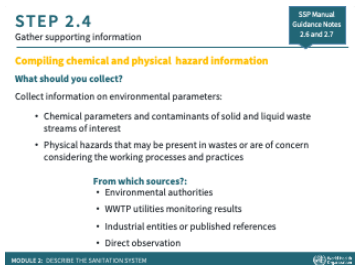

Compiling chemical and physical hazard information

Chemical contaminants in waste are a critical issue since they often pose considerable health risks and are difficult to control/eliminate. Toxic chemicals such as insecticides, pesticides, pharmaceuticals and heavy metals persist and may accumulate in water bodies, soils and animals. Where toxic chemicals or heavy metals have been identified as a potential health hazard under the waste characterization (Module 2.2), information on the type of chemical pollutants and, if possible, concentrations need to be determined.

Physical hazards such as sharp objects (e.g. broken glass, razor blades, syringes), contamination with inorganic material and malodors are often general characteristics of the given waste or linked to a mixture of different waste streams (e.g. razor blades and plastic bags being mixed in fecal sludge). Since the presence or absence of physical hazards has important implications for health risk mitigation, it is important to build up a thorough understanding of the composition and characteristics of the waste as part of the waste characterization.

Potential data sources:

In the first instance, environmental authorities should be contacted for information on potential data sources (e.g. existing environmental monitoring programs) on chemical concentrations in different media (e.g. wastewater, river water).

In addition, existing WWTP may have ongoing monitoring activities that can provide valuable data on chemical hazards. Industrial entities or published references may also be consulted where industrial waste is of concern.

In case of poor data availability, the collection and analysis of environmental samples that are obtained from specific waste fractions or environmental media may be warranted.

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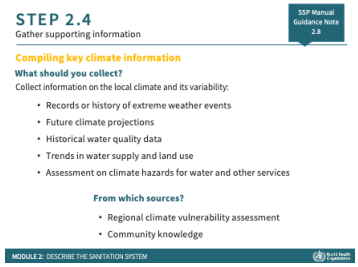

Compiling climate related hazard information

Information on the local climate and its variability needs to be collected to understand climate related hazards and hazardous events. At a local level this can include records or history of extreme weather events (e.g. floods and droughts), future climate projections, historical water quality data, trends in water supply and land use (particularly relating to new sources, population growth or agriculture), assessments on climate hazards for water and other services.

As this information is not always easy to synthesis and interpret at a local level, the it is important to carry out regional climate vulnerability assessments to inform the system description. Due to uncertainty of predicted climate changes, variations in possible scenarios and at times limited data available at a local level, it is advisable to focus on the data that is available or has higher certainty at this stage and incorporate new or updated data when available. In addition to collected data, community knowledge and experience of past events and their impacts could be included to inform climate hazards and risks (e.g. through community consultation workshops or community elders).

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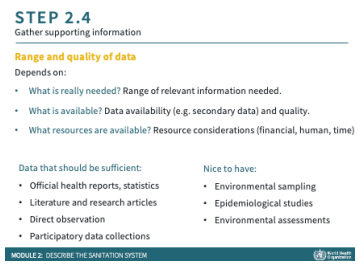


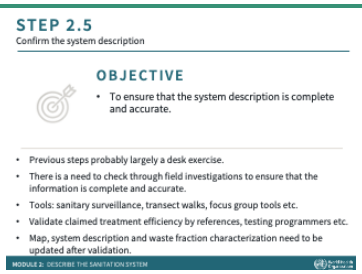
Range and quality of data

You will find that in some cases, information is not available. So, the Steering Committee should consider if primary information needs to be gathered. In all cases, the information that the SSP team will have will depend on:

- What is really needed? Range of relevant information needed.
- What is available? Data availability (e.g. secondary data) and quality.
- What resources are available? Resource considerations (financial, human capacity, time).
- What is the actual objective of SSP? Objectives of SSP.

49

Step 2.5: Confirm the system description



While carrying out modules 2.1 to 2.4, we need to validate if the system description is complete and accurate. This should provide evidence of the stated system characteristics and system performance.

This is needed because modules 2.1 to 2.4 are probably mainly a desk exercise. So, only through field investigation we can know if, for instance the "claimed treatment efficiency" is true.

There are a number of methods to conduct the field investigation such as sanitary inspections and surveillance, focus group discussions, key informant interviews and collection of samples for laboratory testing. Evidence of claimed treatment efficiency could be obtained from a combination of testing programs, technical references or initial process validation data. The system map, system description and waste characterization and factors affecting performance and vulnerability of the system should be updated following validation.

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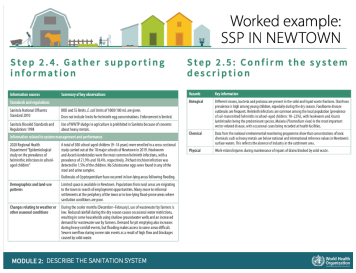

Newtown worked example

Now, let's show how step 2.4 and 2.5 happened in Newtown.

Guidance note 2.4 was used to collate supporting information. Important sources of data included the information compiled for the SFD, municipal town planning data and future growth projections, health reports and records, historical weather records and flooding history, national and regional climate change projections, and mapping. The SSP team extracted relevant information from each of these documents and summarized the major issues in Table 2.3.

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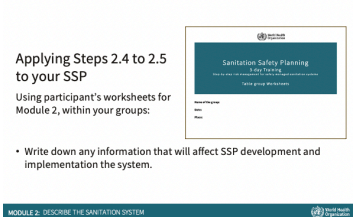
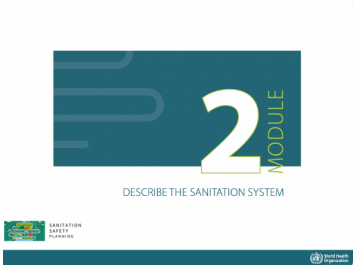


Applying steps 2.4 and 2.5 in your case study

In your groups, think of key information that you need to gather for your SSP. What would be the sources of information?

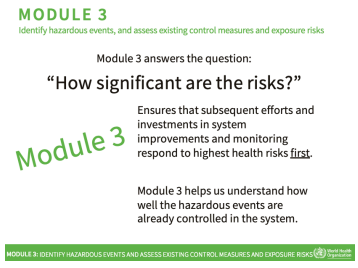
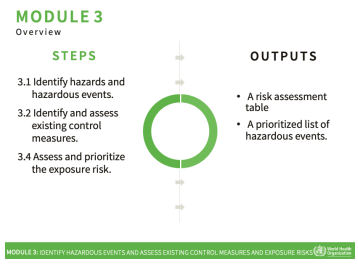
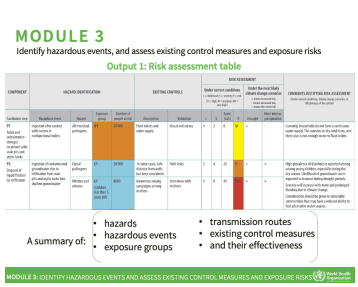
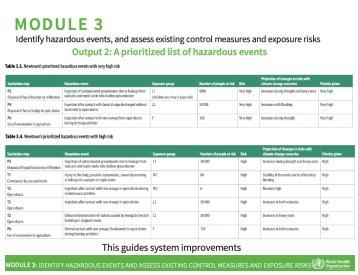
(The group work should be 15 min)

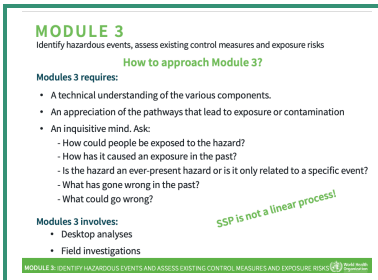
52



Thank you very much!

7.3.5. Module 3

Slide	Screenplay
1 	**Identify hazardous events, assess existing control measures and exposure risks** Now let's start with module 3 "Identify hazardous events, assess existing control measures and exposure risks". (The presentation of step 3.1 should be 45 min. Eliminate slides or content, for instance, giving less examples of hazardous events, in case you take longer.)
2 	**Module 3** It answers the question "how significant are the risks?" Because the underlying purpose of all sanitation systems is to protect public health, module 3 ensures that subsequent efforts and investments respond to the highest health risks first. Also, module 3 helps us understand how well the hazardous events are already controlled in the system.
3 	**Module 3: Overview** We will start with the steps 3.1 identifying hazards and hazardous events. Step 3.2 determines how well the existing system protects those at risk. Step 3.3 allows identifying and prioritizing the highest risks for additional attention. Once we finish module 3, the team would have identified the hazardous events with the highest risks. The key outputs of module 3 are: a risk assessment table and a prioritized list of hazardous events.
4 	**Output 1: Risk assessment table** This contains a summary of hazards, hazardous events, exposure groups, transmission routes, existing control measures and their effectiveness. This also contains the risk assessment.
5 	**Output 2: A prioritized list of hazardous events** Here we will have a prioritized list of hazardous events. This is because there are no existing control measures, or because the existing control measures are not effective.
6	**How to approach module 3?** As Module 3 is conducted, SSP team members need:

<table>
<tr>
<td> 
</td>
<td>• A technical understanding of the various components of the system – how they work, both in theory and in practice.
• An appreciation of the transmission routes that may lead to infection or incidence of disease.
• An inquisitive mind: consider:

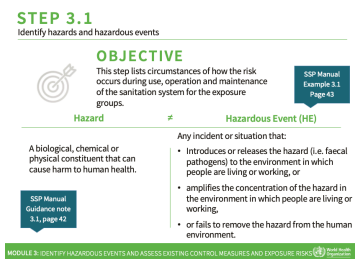
-How could the hazard lead to an incidence of a disease or other health impact?

-How has it done this in the past?

-Is the hazard ever-present or is it only related to a specific event?

-What has gone wrong in the past in the system?

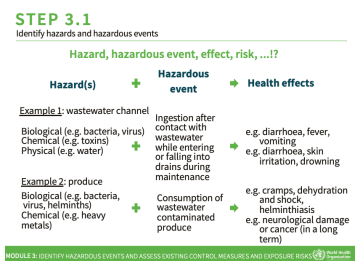
-What could go wrong?

Although steps 3.1 to 3.3 are identified as separate steps, in practice, there is considerable overlap between these actions. It is not a simple linear process, and it may be an iterative process (e.g., after the initial assessment of hazards and hazardous events, it may be appropriate to adjust the initial assessment once more thought has been given to the types of exposure groups, exposure, or transmission routes, and where they are in the system).</td>
</tr>
<tr>
<td>7
 
</td>
<td>Step 3.1: Identify hazards and hazardous events

Step 3.1 lists circumstances of how the risk occurs during use, operation and maintenance of the sanitation system for the exposure groups.

Before starting with this step, it is important to understand the difference between hazards and hazardous events:

<u>Hazard</u>: a biological, chemical or physical constituent that can cause harm to human health.

<u>Hazardous events:</u> Any incident or situation that introduces or releases the hazard (i.e. fecal pathogens) to the environment in which people are living or working, or amplifies the concentration of the hazard in the environment in which people are living or working, or fails to remove the hazard from the human environment.</td>
</tr>
<tr>
<td>8
 
</td>
<td>Hazards, hazardous event, effect, risk, ...!?

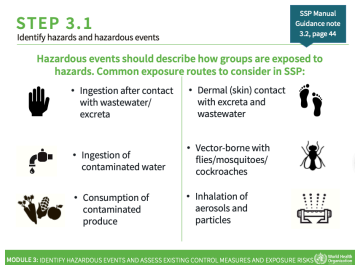
Let's see these examples. Hazards in sanitation systems are biological, chemical or physical. For instance, in a wastewater channel, you will find pathogens, such as bacteria and viruses from fecal sources. The hazardous event is Ingestion after contact with wastewater while entering or falling into drains during maintenance. Another example is the case of agricultural produce irrigated with wastewater. Wastewater contains biological hazards and chemicals, such as heavy metals. The hazardous event is the consumption of wastewater contaminated produce. The health effects could be cramps, dehydration, etc. Also, the chemical hazards can cause neurological damage or cancer.</td>
</tr>
<tr>
<td>9
 
</td>
<td>Keep in mind that a hazard is different from a hazardous event

A good hazardous event tells a short story.

The villain is the hazard and the hazardous event (the story) says what happens - how the villain causes harm.

For example: Workers are exposed to pathogens in raw sewage in open drains during maintenance activities. But now, the question is how exposed?</td>
</tr>
<tr>
<td>10</td>
<td>Exposure routes

Hazardous events should describe how groups are exposed to hazards. This requires understanding of the exposure route. The exposure route for excreta-related pathogens may be:</td>
</tr>
</table>



- **Ingestion after contact with wastewater /excreta**: Transfer of excreta (urine and/or feces) through direct contact to the mouth from the hands or items in contact with the mouth including ingestion of contaminated soil via contact with hands (e.g., farmers or children).
- **Ingestion of contaminated groundwater/ surface water:** Ingestion of water, drawn from a ground or a surface source, which is contaminated from wastewater or excreta/sludge including unintentional ingestion of recreational waters by swimmers/bathers.
- **Consumption of contaminated produce (vegetables):** Consumption of plants (e.g., lettuce) that have been grown on land irrigated or fertilized with a sanitation product.
- **Dermal contact with excreta and wastewater:** Infection where a pathogen (e.g., hookworms) enters through the skin via the feet or other exposed body part following contact with wastewater, excreta, open defecation, contents of leaking sanitation technologies or during operation (e.g., pit emptying).
- **Vector-borne with flies/mosquitoes:** Transmission routes include the mechanical transfer of excreta by flies to a person or food items, and bites from a mosquito or other biting insects which could be carrying a disease.
- **Inhalation of aerosols and particles:** The inhalation of micro-droplets of water and particles (which may not be noticeable) emanating or resulting from a sanitation technology, which may carry a pathogen dose.

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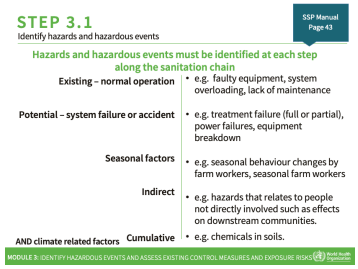
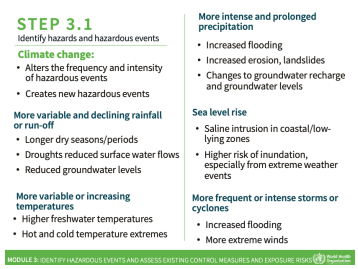


Hazards and hazardous events must be identified at each step along the sanitation chain

The team should identify hazards and their associated hazardous events at each step along the sanitation chain. When doing this, consider:

- Hazardous events associated with normal operation of the system (e.g., faulty infrastructure, system overloading, lack of maintenance, unsafe behaviors);
- Hazardous events due to a system failure or accident (e.g., partial or full treatment failure, power failures, equipment breakdown, operator error);
- Hazardous events related to seasonal factors, such as seasonal behavior changes by farm workers, seasonal farm workers.
- Indirect hazards and or hazardous events (e.g., hazards that potentially affect people not directly involved in the sanitation chain, such as through vermin, vectors or the effects on downstream communities);
- Cumulative hazards (e.g., chemicals in soils)
  AND climate related factors.

12



Climate change

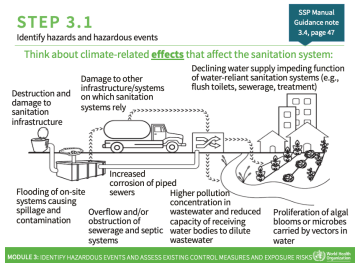
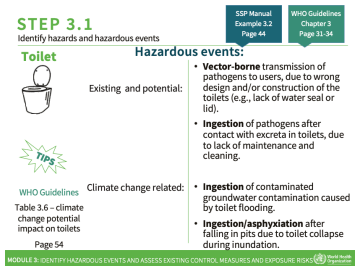
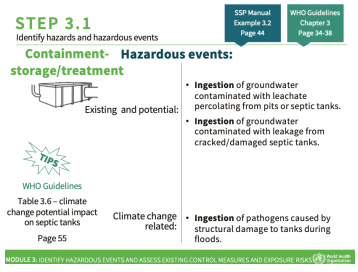
Climate change exacerbates the risks that the current climate, including variability, poses for sanitation. It alters the frequency and intensity of hazardous events and creates new hazardous events.

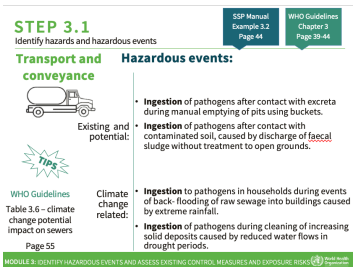
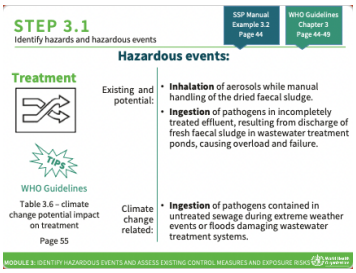
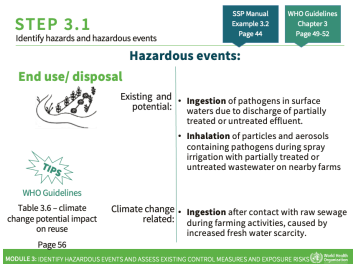
Many risks for sanitation come through extreme events and gradual changes to the hydrological cycle with corresponding changes to water resources. These include:

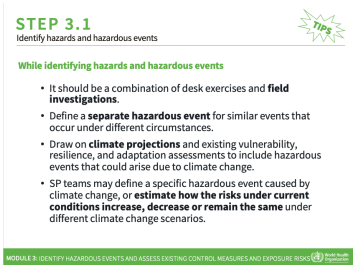
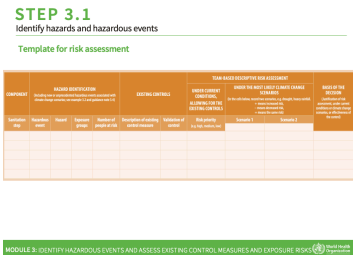
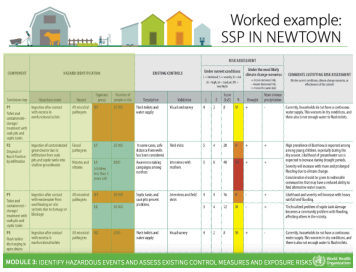
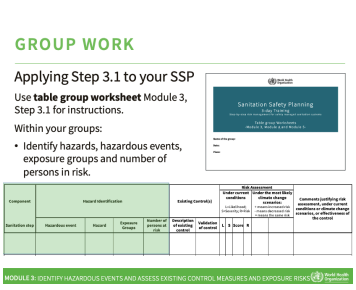
- More intense or prolonged precipitation
- More variable or declining rainfall or run-off
- Sea-level rise
- More variable and increasing temperatures
- More frequent or more intense storms or cyclones

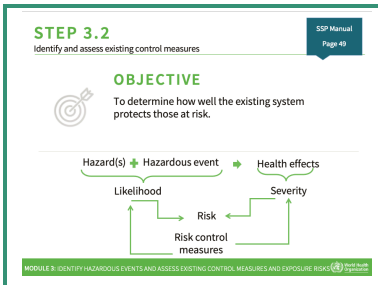
These changes in the local hydrological cycle creates **effects** that, in turn exacerbates existing and potential hazardous events or creates new. These effects can be:

- More intense or prolonged precipitation
  - Increased flooding
  - Increased erosion, landslides
  - Changes to groundwater recharge and groundwater levels
- More variable or declining rainfall or run-off
  - Longer dry seasons/periods

	• Droughts (both seasonal and longer-term) • Reduced surface water flows • Reduced groundwater levels/resources • Sea-level rise • Saline intrusion in coastal/low-lying zones • Higher risk of inundation, especially from extreme weather events (potentially contributing to flooding, erosion, landslides) • More variable or increasing temperatures • Higher freshwater temperatures • Hot and cold temperature extremes • More frequent or intense storms or cyclones • Increased flooding • More extreme winds
13 	**Think about climate-related causes of new hazardous events?** Let's think about climate-related causes of new hazardous events: • Destruction and damage to sanitation infrastructure • Damage to other infrastructure/systems on which sanitation systems rely (e.g. electricity networks for pumping; road networks used by FSM vehicles) • Flooding of on-site systems causing spillage and contamination • Overflow and/or obstruction of sewerage and septic systems • Increased reliance on wastewater for irrigation which, if not adequately managed, can increase health risks • Increased corrosion of piped sewers • Higher pollution concentration in wastewater and reduced capacity of receiving water bodies to dilute wastewater • Proliferation of algal blooms or microbes carried by vectors in water And many other. Remember that the identification of hazards and hazardous events should be done in each step along the sanitation service chain. Let's give some examples.
14 	**Toilet** The WHO Guidelines on Sanitation and Health present a comprehensive analysis of hazards, hazardous events and the potential risks for each step of the sanitation system and its related technologies. You will find it for **toilets** from page 31 to 34. Some of the existing and potential hazardous events include: • Vector-borne transmission of pathogens to users, due to wrong design and/or construction of the toilets (e.g., lack of water seal or lid). • Ingestion of pathogens after contact with excreta in toilets, due to lack of maintenance and cleaning. On page 54 of the Guidelines, you will find Table 3.6 with climate change potential impact on toilets, including: • Reduced soil stability leading to lower pit stability. • Environmental and groundwater contamination from toilet flooding. • Toilet collapse due to inundation or erosion • Declining water supply impedes the use of flush toilets. These, can also cause other hazardous events such as: • Ingestion of contaminated groundwater contamination caused by toilet flooding. • Ingestion/asphyxiation after falling in pits due to toilet collapse during inundation.
15 	**Containment-storage/treatment** Like for toilets, the Guidelines, from page 34 to 38, shows a comprehensive analysis of the safety of the containment/storage and treatment step. Some of the existing and potential hazardous events include: • Ingestion of groundwater contaminated with leachate percolating from pits or septic tanks. • Ingestion of groundwater contaminated with leakage from cracked/damaged septic tanks.

	On page 55 of the Guidelines, you will find Table 3.6 with climate change potential impact on septic tanks, including: • Increased water scarcity reducing water supplies and impeding tank function • Rising groundwater levels, extreme events and/or floods, causing structural damage to tanks, flooding drain fields and households, tank flotation, environmental contamination. These, can also cause other hazardous events such as: • Ingestion of pathogens caused by structural damage to tanks during floods.
16 	**Transport and conveyance** You will find the same analysis for transport and conveyance in your WHO Guidelines from page 39 to 44. Some of the existing and potential hazardous events include: • Ingestion of pathogens after contact with excreta during manual emptying of pits using buckets. • Ingestion of pathogens after contact with contaminated soil, caused by discharge of fecal sludge without treatment to open grounds. On page 55 of the Guidelines, you will find Table 3.6 with climate change potential impact on sewers, including: • Extreme rainfall events causing back flooding of raw sewage into buildings • Extreme events damaging sewers and causing leakage, resulting in environmental contamination • Increased water scarcity reducing water flows in sewers, increasing solid deposits and blockages These, can also cause other hazardous events such as: • Ingestion to pathogens in households during events of back- flooding of raw sewage into buildings caused by extreme rainfall. • Ingestion of pathogens during cleaning of increasing solid deposits caused by reduced water flows in drought periods.
17 	**Treatment** You will find the same analysis for treatment in your WHO Guidelines from page 44 to 49. Some of the existing and potential hazardous events include: • Inhalation of aerosols while manual handling of the dried fecal sludge. • Ingestion of pathogens in incompletely treated effluent, resulting from discharge of fresh fecal sludge in wastewater treatment ponds, causing overload and failure. On page 55 of the Guidelines, you will find Table 3.6 with climate change potential impact on treatment, including: • Extreme weather events or floods destroying/damaging wastewater treatment systems, causing discharge of untreated sewage and sewerage overflow and environmental contamination • Extreme rainfall damaging waste stabilization ponds • Increased water scarcity causing obstruction, reducing capacity in rivers or ponds that receive wastewater These, can also cause other hazardous events such as: • Ingestion of pathogens contained in untreated sewage during extreme weather events or floods damaging wastewater treatment systems.
18 	**End use / disposal** You will find the same analysis for treatment in your WHO Guidelines from page 49 to 52. Some of the existing and potential hazardous events include: • Ingestion of pathogens in surface waters due to discharge of partially treated or untreated effluent. • Inhalation of particles and aerosols containing pathogens during spray irrigation with partially treated or untreated wastewater on nearby farms On page 55 of the Guidelines, you will find Table 3.6 with climate change potential impact on reuse, including:

	• Increased water scarcity leading to increased reliance on wastewater for irrigation purposes • Without adequate wastewater treatment, increased reuse can expose populations (farmers, their communities and consumers) to health hazards including pathogens, chemicals, and anti-microbial resistance. These, can also cause other hazardous events such as: • Ingestion after contact with raw sewage during farming activities, caused by increased freshwater scarcity.
19 	**While identifying hazards and hazardous events** It is suggested that SSP teams define a separate hazardous event for similar events that occur under different circumstances e.g., normal operating conditions and flood conditions. This is because the risk profile may be different for each hazardous event. Climate change may create new or unprecedented hazardous events in the future. The SSP team should draw on climate projections and existing vulnerability, resilience, and adaptation assessments to include hazardous events that could arise due to climate change. Hazardous event identification may include consideration of the regulatory and policy shortcomings. For example, release of untreated industrial wastes into the drainage or sewer system may be due (wholly or in part) to lack of enforcement of discharge regulations. While identifying hazards and hazardous events we will apply several tools, including desk reviews with field investigations, interviews, and samples. (The presentation of step 3.1 should be 45 min. Eliminate slides or content, for instance, giving less examples of hazardous events, in case you take longer.)
20 	**Tool 3.4 Template for team-based descriptive risk assessment** In tool 3.4, you will find the template for risk assessment.
21 	**Newtown worked example** Now, let's show how step 3.1 was implanted in Newtown. Notice that only the first 5 columns were filled…. (continue describing the table)…
22 	**Group Work: Step 3.1** Use the **table group worksheet** 3, step 3.1 to identify for <u>each sanitation step</u>: • Hazardous events • Hazards • Exposure groups • Number of persons at risk (The group work should be 90 minutes)
23	**Step 3.2: Identify and assess existing control measures**

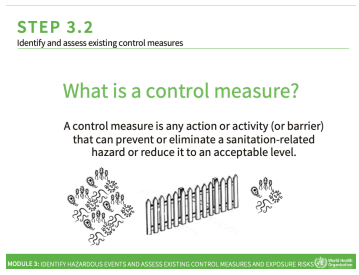


Step 3.2 is about identifying and assessing existing control measures.

For each hazardous event identified in step 3.1, we need to identify what control measures are already in place to mitigate the risks of that hazardous event. This helps us to determine how well the system protects those at risk.

So, we know that a hazard plus a hazardous event creates health effects. The likelihood of this happening with the severity of the health effects makes a risk. Therefore, there are what we call control measures.

24



What is a control measure?

Control measures are any action and activity (or barrier) that can be used to reduce, prevent or eliminate a sanitation-related hazard, or reduce it to an acceptable level.

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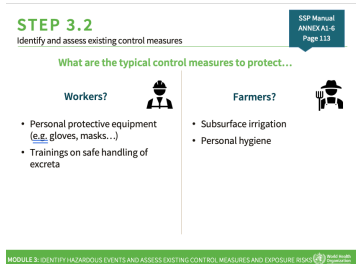


What are the typical control measures to protect…

(You can ask the participants)

Guidance note 3.4 gives us some examples of the typical control measures to protect workers and farmers and their families…

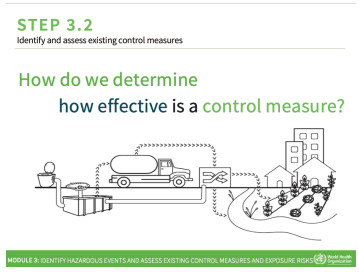
26

What are the typical control measures to protect…

(You can ask the participants)

Guidance note 3.4 gives us some examples of the typical control measures to protect consumers and local communities…

27



How do we determine how effective is a control measure?

We need to determine how effective the existing control measure is at reducing the risk of that hazardous event.

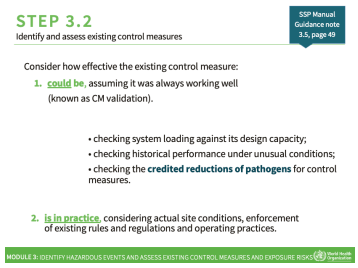
28

Consider how effective the existing control measures:

1. *could be* assuming it was working well at all times. This is referred to as control measure validation (see Guidance Note 3.6).

Control measure validation proves the control measure is capable of meeting the specified targets (e.g., microbial reduction targets). For sanitation systems, control measure validation may mean:

- checking system loading against its design capacity;



- checking literature for performance capability of individual treatment process units;
- checking historical performance under unusual conditions;
- checking the 2006 WHO Guidelines for credited reductions of pathogens for control measures

2. How effective the existing control measure is ***in practice*** (e.g., bearing in mind the actual site conditions, actual enforcement of existing rules and regulations and actual operating practices).

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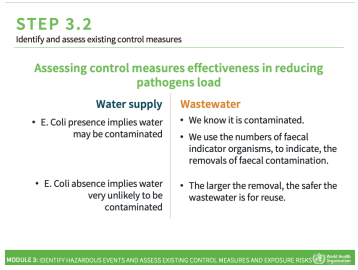


Assessing CM effectiveness

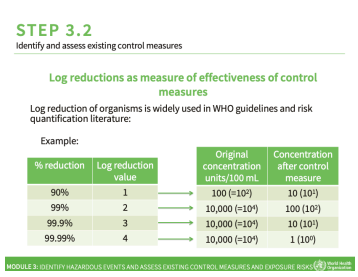
How do we determine how effective a control measure is in reducing pathogen load? We will make use of the hazard reduction concepts in the 2006 WHO guidelines.

In water supply, the concept of fecal indicator was developed in the late 19th century to address the efficiency of water treatment. The presence of bacteria of fecal origin (E. coli) indicates that the water has been polluted with feces. the absence of fecal indicator bacteria indicates that the water is unlikely to contain any pathogenic micro-organisms.

For wastewater, we know it's contaminated, so we use the numbers of fecal indicator to indicate the removal of fecal contamination through treatment or other processes. The larger the removal, the safer the wastewater is for reuse.

This helps us to quantify the risk reduction for the exposure or use of wastewater.

30



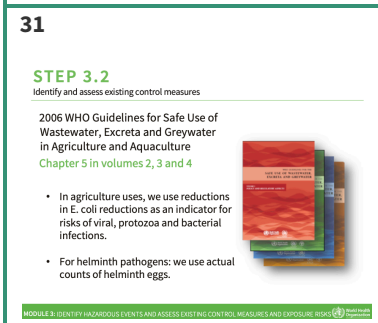
Log reductions as measure of effectiveness of CMs

Log reduction of organisms are used to refer to the reduction achieved by a control measure.

Log reduction means how many zeros we can cross out.

Let's take one example: let's imagine that a control measure has an effectiveness measured in log reduction of 3 logs. It means that we can cross out 3 zeros, then if the original concentration was 10'000 which is equal to 10 to the power of 4, after the control measure, the concentration will be 10, which is 10 to the power of 1.

31



2006 WHO Guidelines for Safe Use of Wastewater, Excreta and Greywater in Agriculture and Aquaculture

The 2006 guidelines offer pathogen reduction targets, which are based on viral reductions, this means that they provide enough protection against bacterial and protozoal infections.

For helminth, however, the WHO Guidelines have specific suggestions using counts of helminth eggs for different exposure conditions.

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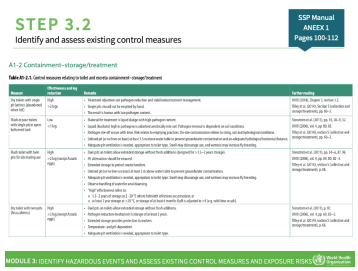


Annex 1: Example control measures for biological hazards

Here you will find tables of control measures with the effectiveness measured between very low and high. You will find control measures related to:

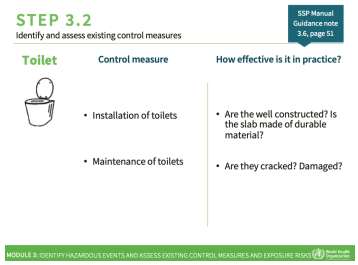
- Wastewater treatment
- Wastewater in agriculture
- Wastewater in aquaculture
- Excreta containment or onsite sanitation
- Excreta conveyance
- Excreta, urine and greywater treatments and use in agriculture/ aquaculture.

33

Control measure validation at each step of the sanitation system

So, now we know that for all existing control measures, we should check the control measure validation (how it should be if all was working well) and also how it is in practice. Let's analyze for each step of the sanitation system:

34

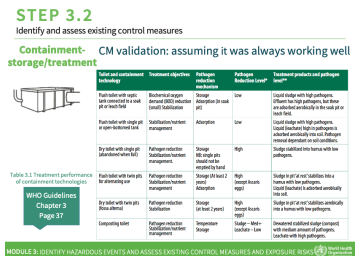


Toilets

According to the WHO Guidelines on Sanitation and Health, the key principle for safe toilet management is that the design, construction, management and use is arranged so that users are safely separated from excreta, avoiding both active contact (e.g. from soiled surfaces) and passive contact (e.g. via flies or other vectors).

So, control measures include Installation of toilets, maintenance of toilets and cleaning of toilets. In all cases, we should check how effective is the control measure in practice. Field observations, will be enough to identify if the toilets are well constructed, if the slab is made of durable material? If the slab can be cleaned? If the toilets are cracked, etc.

35

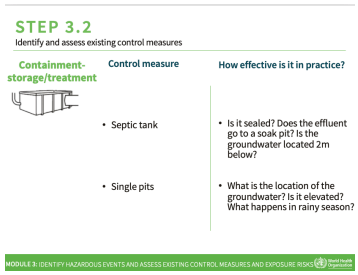


Containment-storage/treatment

The WHO Guidelines on Sanitation and Health in page 37, offers pathogens reduction levels of containment technologies, such as septic tanks, single pits, twin pits, etc. Notice how technologies which aims is to dehydrate the excreta, letting the material rest, without being taken out when "wet" have a high pathogen reduction level.

This is of course the "theoretic" effectiveness… then we need to check how is it in practice:

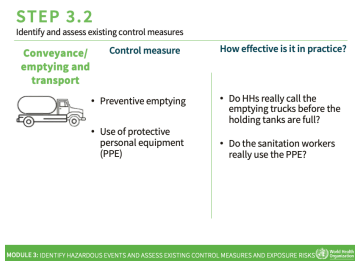
36



Containment-storage/treatment

For each of the control measures, we should revise how effective is it in practice. For instance, for septic tank we should ask is it sealed? Does the effluent go to a soak pit? Is the groundwater located 2m below? For single pits: What is the location of the groundwater? Is it elevated? What happens in rainy season?

37



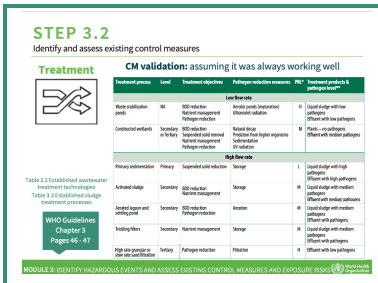
Transport and conveyance

Some control measures that might be already in place include preventive emptying and use of protective personal equipment (PPE). We should then ask if they are working as planned. …

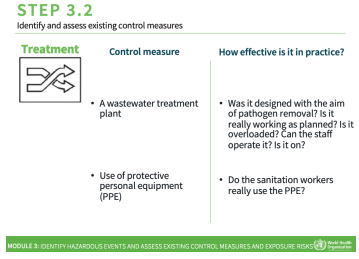
38

Treatment

The WHO Guidelines on Sanitation and Health in page 46 and 47, offers pathogens reduction levels of established wastewater technologies and sludge treatment process. This is of course the "theoretic" effectiveness… then we need to check how is it in practice.



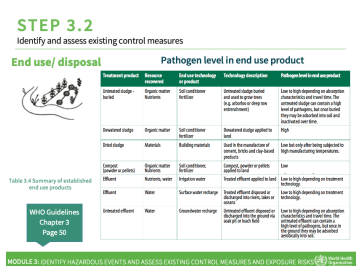
39



Treatment

Some control measures that might be already in place include a WWTP, effluent quality control, use of protective personal equipment (PPE). We should then ask if they are actually working as planned. …

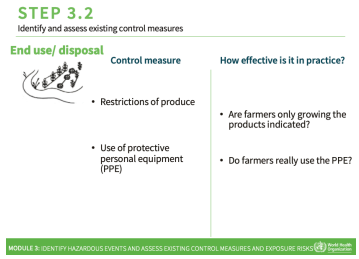
40



End use / disposal

The WHO Guidelines on Sanitation and Health in page 50 offers a description of the end use products, the resource recovered and the likely pathogen level of each end use product.

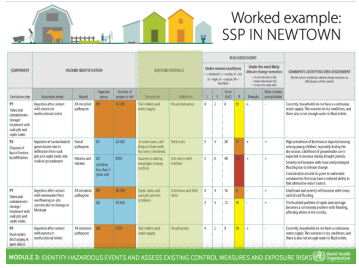
41



End use / disposal

Some control measures that might be already in place include restriction of produce, the use of protective personal equipment (PPE). We should then ask if they are actually working as planned.

42

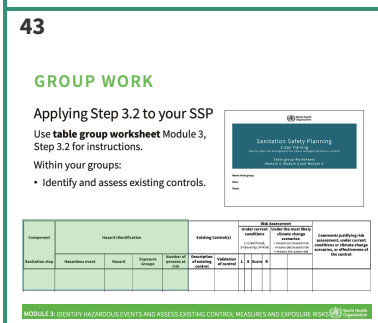


Newtown worked example

Now, let's show how step 3.2 was implanted in Newtown.

The Newtown SSP team gave a very brief description in a few words of the existing controls. Note that in step 3.3, you are assessing existing controls (you are not, at this stage, thinking of new controls that you may add later). In this column the team noted the method by which it assessed the existing control. These notes should be kept very simple.

43



Applying Step 3.2 to your SSP

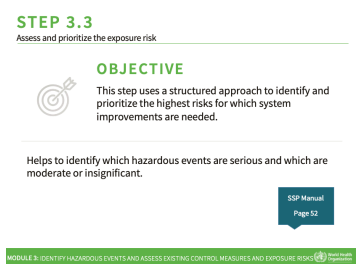
Use table groups Worksheet:

Within your groups, for the hazardous events that you identified, indicate:

- Existing control measures existing
- Indicate how can you validate the control measure

The total time for the exercise should be 30 min.

44

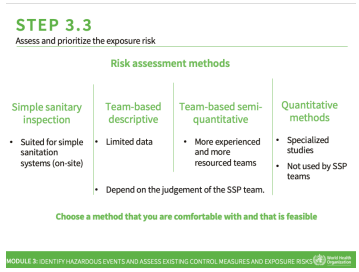


Step 3.3: Assess and prioritize the exposure risk

In Step 3.1 we identified a large number of hazards and hazardous events, some of which will be serious while others will be moderate or insignificant.

Now, in step 3.3 we will establish the risk associated in each event giving the needed structure to prioritize the highest risk for further attention. This will help us to prioritize interventions.

45



Risk assessment methods

In SSP, there are different approaches to risk assessment, these are:

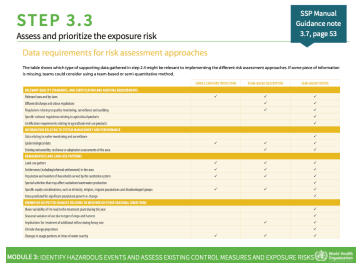
• Simple sanitary inspection – suited to simple sanitation systems, primarily on-site systems, focusing on the toilet and containment steps.

• Team-based descriptive risk assessment – suited to more complex systems with limited data and teams that are relatively new to conducting risk assessments.

• Semi-quantitative risk assessment – uses a matrix of likelihood and severity; suited to more complex systems and more experienced or well-resourced teams.

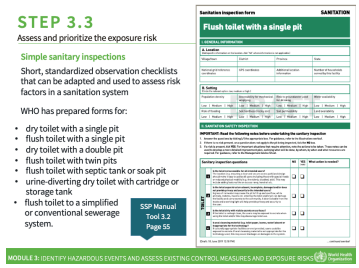
• Quantitative methods (e.g. quantitative microbial risk assessment) – specialized assessments that can complement SSP; generally not used by SSP teams.

46



Guidance note 3.7. show the requirements for risk assessment approaches, which means which type of supporting data gathered in step 2.4 might be relevant to implementing the different risk assessment approaches. If some piece of information is missing, teams could consider using a team-based or semi-quantitative method.

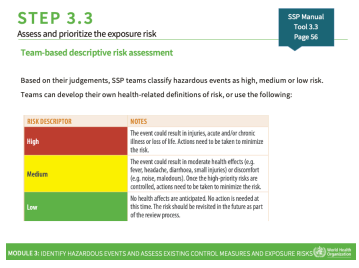
47



Simple sanitary inspections

These are short, standardized observation checklists that can be adapted and used to assess risk factors in a sanitation system. These forms are used during field investigations to identify the presence of a predefined risk. As a first step, an SSP team member should note general information about the locality, including the number of facilities. They then judge predefined risks, such as the risk of flooding.

48



Team-based descriptive risk assessment

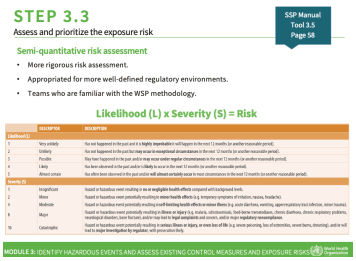
The team-based descriptive risk assessment method involves using the SSP team's judgement to assess the risk of each hazardous event by classifying them according to high, medium, low or uncertain/unknown risk. These definitions can be defined by the SSP team or those given in Tool 3.2 can be used. However, the principle of safeguarding public health should never be compromised in any definitions.

49

Semi-quantitative risk assessment

A more rigorous approach is the semi-quantitative risk assessment. This method requires the SSP team to assign a likelihood and severity to each identified hazardous event using a risk matrix to arrive at a risk category or score.

The risk will be given by multiplying the likelihood times the severity.



Definitions of Likelihood (L)

In page 52 Tool 3.3 we find definitions of what is very unlikely, unlikely, possible, likely and almost certain.

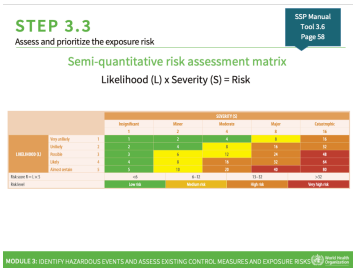
Definition of Severity (S)

The same tool, tool 3.3 offers definitions of severity: insignificant, minor, moderate, major, catastrophic.

When assessing the severity, consider the contents and concentration of the waste (determined in Module 2) as well as the magnitude of associated health outcomes.

The SSP team may choose to develop its own definitions for likelihood and severity, based on the system and local context. The definitions could include aspects relating to potential health impacts, regulatory impacts, and impacts on community or customer perceptions. However, the principle of safeguarding public health should never be compromised in any definitions.

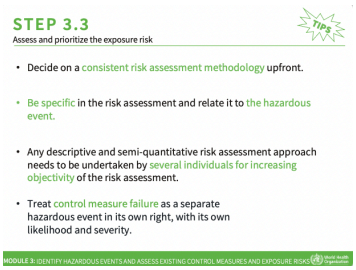
50



Semi-quantitative risk assessment

By multiplying likelihood times severity, we find the risk. Tool 3.4 in page 53 provides a table with the risk scores.

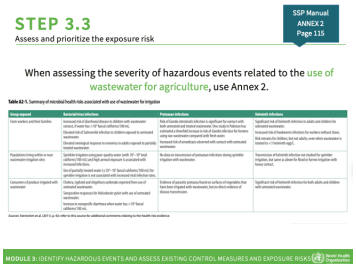
51



Keep in mind the following tips:

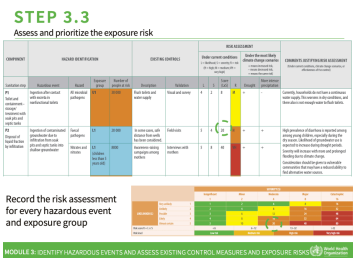
- Decide on a consistent risk assessment methodology upfront.
- Be specific in the risk assessment and relate it to the hazardous event.
- Any descriptive and semi-quantitative risk assessment approach needs to be undertaken by several individuals for increasing objectivity of the risk assessment.
- Treat control measure failure as a separate hazardous event in its own right, with its own likelihood and severity.

52

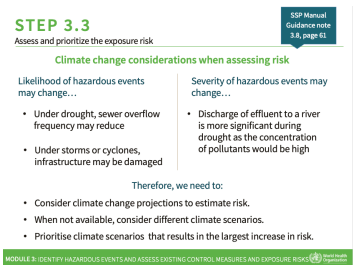
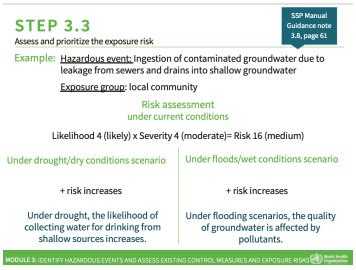
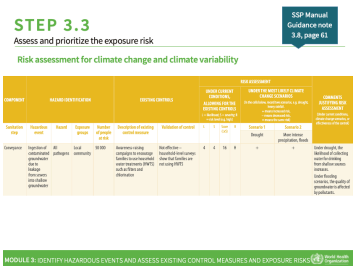
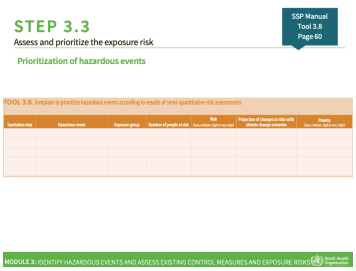


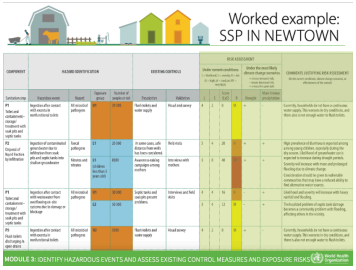
When assessing the severity of hazardous events related to the use of wastewater for agriculture, use Annex 2.

53



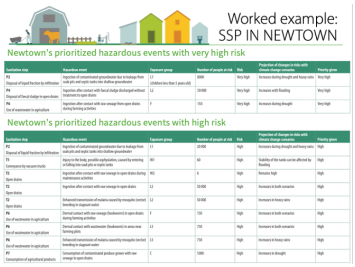
Record the risk assessment for every hazardous event and exposure group/route.

54 	Climate change considerations when assessing risks Climate change and variability can change both the **likelihood** and **severity** of existing and new hazards or hazardous events. The **likelihood** that particular hazards of hazardous events occur may increase or decrease due to climate change, for example under drought conditions, sewer overflow frequency may reduce but use of untreated wastewater may increase. Although it can be difficult to place firm values on the likelihood for future scenarios, it is necessary that the future likelihoods are considered in the risk assessment. Similarly, **the consequences may become both more or less severe.** For example, the discharge of effluent to a river is more significant in drought conditions when receiving water levels are low, compared with high rainfall events when there is greater dilution. Consider also that the geographical range of hazardous events can increase with extreme events. Therefore, we need to draw on **climate change projections** to consider the potential for climate change to influence risk. Where climate projections are not available, consider how different climate scenarios (e.g. drier conditions, wetter conditions, conditions with more severe storms) would affect the severity or likelihood score. The climate scenarios that result in the largest increase in risk should be prioritized.
55 	This is an example on how the likelihood and the severity of a hazardous event can change because of climate change. As an example of hazardous event, we are taking: Ingestion of contaminated groundwater due to leakage from sewers and drains into shallow groundwater. Here the exposure group is local community and exposure route is ingestion. The risk assessment under current conditions is: Likelihood 3 (possible) x Severity 4 (moderate)= Risk 8 (medium) However, under drought/dry conditions scenario, the risk increases, as the likelihood of using groundwater during dry periods increases. Likewise, under floods/wet conditions scenario, the severity of contamination of groundwater increases, because under flooding scenarios, the quality of groundwater is affected by pollutants.
56 	In guidance note 3.8, we find an example for risk assessment for climate change and climate variability. (Read the table)
57 	Tool 3.8 allows the team to summarize the highest risks. It is essential to consider the number of people who are at risk while prioritizing the hazardous events. These will be addressed in the improvement actions selected in Module 4.
58	**Newtown worked example** Now, let's see the risk assessment in Newtown.



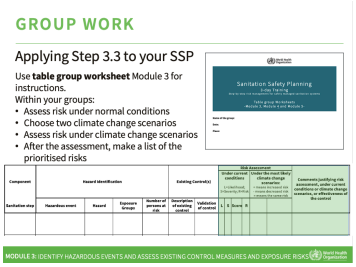
(read the table)

59



Once the extended SSP team had conducted the health risk analysis, the SSP team leader invited the steering committee to a high-level meeting to decide which hazardous events to prioritize. Based on the evidence, the hazardous events in Table 3.3 were prioritized by members of the steering committee.

60



Applying Step 3.3 to your SSP

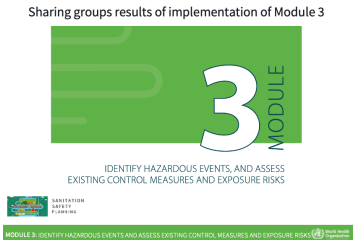
Use table group worksheet Module 3 for instructions.

Within your groups, for the hazardous events that you identified, considering existing control measures, carry out:

- Risk assessment under current condition.
- Risk assessment under a given climate change scenario.

(The group work should be 60 min.)

61

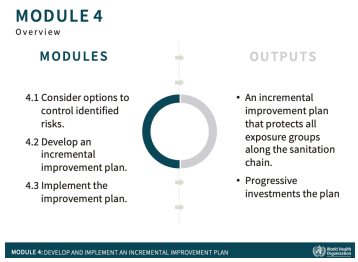
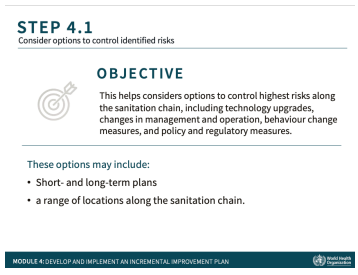
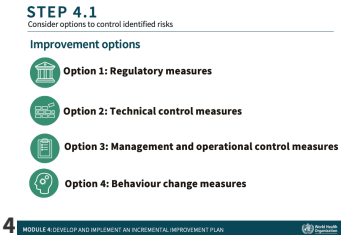
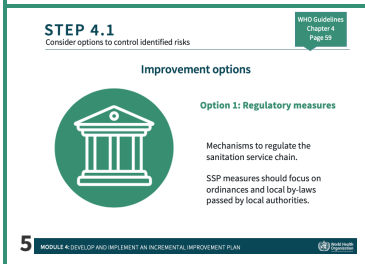
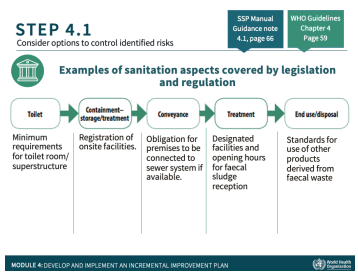


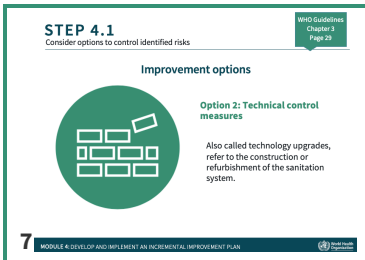
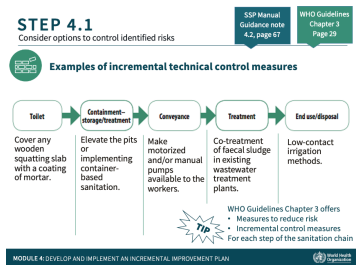
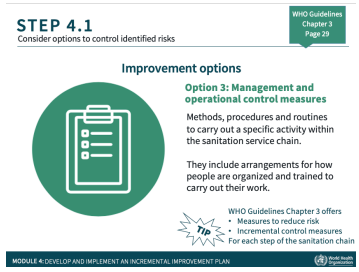
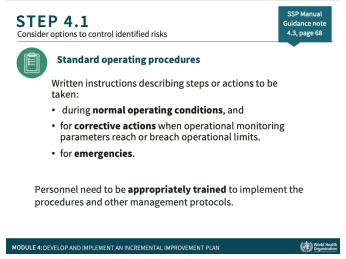
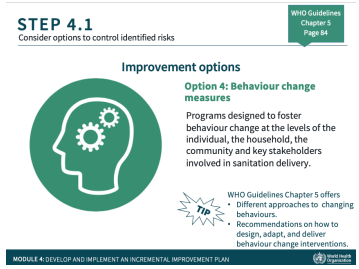
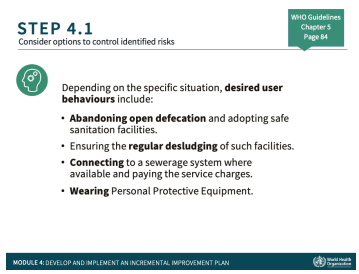
THIS SHOULD BE THE END OF DAY 2

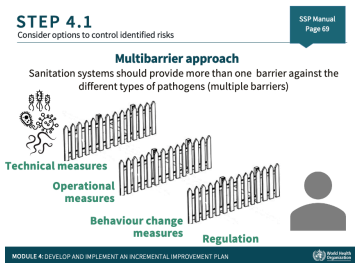
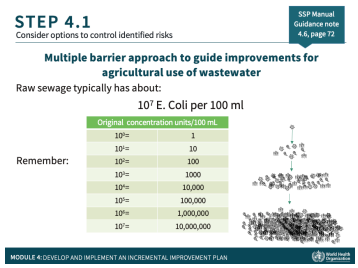
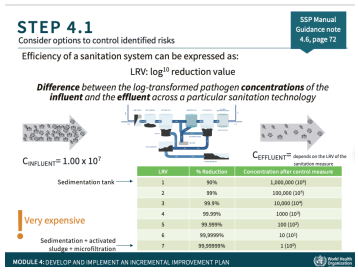
GIVE THE TIME TO PARTICIPANTS TO SHARE THE RESULTS OF THEIR WORK ON MODULE 3.

(Give 30 minutes for group sharing)

7.3.6. Module 4

Slide	Screenplay
1 	**Module 4: Develop and implement an incremental improvement plan** In module 3, the SSP team identified the highest priority risks. Now it's time to select new control measures or other improvements that address these risks at the most effective places in the system. Module 4 consists on developing and implementing an incremental improvement plan. It responds to the question: what needs to be improved.
2 	**Module 4: Overview** Module 4 is composed of three elements: • Consider options to control identified risks. • Develop an incremental improvement plan. • Implement the improvement plan. Our main output is an implementation plan that should ensure the protection of exposure groups most at risk along the sanitation chain.
3 	**Module 4.1: Consider options to control identified risks** From module 3, the SSP team will have a comprehensive list of hazards and hazardous events ranked according to their risks. Module 4.1 encourages the SSP team to consider a variety of ways to control risks, reducing risk levels. These options may include: Short- and long-term plans, and a range of locations along the sanitation chain.
 4 	Improvement options include the following: Option 1: Regulatory measures Option 2: Technical control measures Option 3: Managerial and operational control measures Option 4: Behavior change measures Let me explain each of them.
 5 	**Regulatory measures** are mechanisms to regulate the sanitation service chain. Because sanitation cuts across many sectors, relevant legislation and regulation may be found under building and planning codes and standards, local government legislation, public utility regulations, licensing agreements, and so on. SSP measures should focus on ordinances and local by-laws passed by local authorities. In some cases, local authorities could advocate for changes in the national regulation.
6 	In your WHO Guidelines, you can find an entire chapter called "Enabling safe sanitation service delivery". It presents an implementation framework for sanitation interventions, including planning, delivery, maintenance, regulation and monitoring. Section 4.4 presents examples of sanitation areas that may require legislation and regulation. For instance, for toilet, there could be a by-law with minimum requirements for toilet room/superstructure. Also, for containment there could be a decree to register onsite facilities….

	**Technical control measures**, also called technology upgrades, refer to the construction or refurbishment of the sanitation system.
8 	Examples include constructing or repairing toilets in households or other settings, upgrading or repairing containment technologies (e.g. pits, septic tanks), providing or upgrading faecal sludge emptying and transport equipment, repairing sewers, constructing faecal sludge transfer stations and sewer discharge stations, and providing additional or new treatment plant or process elements. Chapter 3 (“Safe sanitation systems”) of WHO (2018) shows key technical and managerial features to ensure that people’s risk, as a result of exposure to excreta, is minimized at each step of the sanitation service chain. Guidance note 4.2 highlights some recommendations to reduce risk and examples of incremental control measures for each step of the sanitation service chain.
9 	**Managerial and operational control measures**: refers to methods, procedures and routines to carry out a specific activity within the sanitation service chain. It includes the establishment of support systems for information management and control. Management procedures also describe how people must be organized and trained to carry out their work. Your WHO Guidelines on Sanitation and Health, in its chapter 3 page 29, offers key technical and management features to ensure that users’ well-being is improved and that all people’s risk as a result of exposure to excreta is minimized for each step of the sanitation service chain, from the toilet, through containment – storage treatment onsite, conveyance, treatment and end use/disposal
10 	Examples include the development and adherence to Standard Operation Procedures (SOP), training of key actors in service delivery, establishment of information management systems, vector-control programs, as well as operational measures specific for reuse such as crop restrictions and withholding times.
11 	Another important improvement option is behavior change measures. The WHO guidelines on Sanitation and Health offers an entire chapter on this topic. Behavior change is now seen as an essential component of sanitation programs, whether to improve the uptake of sanitation solutions, hygienic practices in households or, indeed, in the institutions responsible for sanitation programming. Behavior change among a range of stakeholders is necessary for sanitation interventions to improve public health. Chapter 3 focuses on fostering behavior change at the individual, household and community-level, through behavior change interventions designed to increase the adoption of household toilets and their consistent use, management and maintenance
12 	Depending on the specific situation, desired user behaviors may include: • Abandoning open defecation and adopting safe sanitation facilities. • Building and using permanent onsite facilities with access for emptying and accessibly situated for emptying equipment. • Ensuring the regular desludging of such facilities. • Connecting to a sewerage system where available and paying the service charges. • Safe practices in handling wastewater and fecal sludge in food production and sale. • Wearing Personal Protective Equipment

13 	**Multibarrier approach** Sanitation systems should provide a series of barriers against different types of or hazards. That is, a multi-barrier approach is recommended. Put another way, good sanitation systems provide several controls along the entire pathway to reduce the risks to human health. As you can see, developing improvement plans is about using a combination of measures to achieve the health targets. We are now going to understand how the multibarrier approach works by taking a look to log reduction.
14 	**Understanding log reductions and the multibarrier approach** Let's remember that raw sewage typically has about 10 to the power of 7 e. coli per 100 ml.
15 	The efficiency of a particular sanitation system can be expressed as the log10 reduction value (LRV), which is defined as the difference between the log-transformed pathogen concentrations of the influent and effluent across a particular sanitation technology or across the whole system. For instance, if the influent concentration is 1.00 × 107 Escherichia coli/100 mL and the effluent concentration is 1.00 × 105 E. coli/100 mL, the LRV of that sanitation technology is 7 – 5 = 2. In centralized sanitation systems, such as advanced wastewater treatment plants found in high-income settlements, the desired concentration is achieved by placing treatment steps in series. The overall efficiency of the treatment system results from the additions of the individual treatment steps: LRV overall = LRVUNIT A + LRVUNIT B + LRVUNIT C. For instance, a complete wastewater treatment system could comprise three sanitation technologies (sedimentation, activated sludge and microfiltration) placed in series, with the following reduction efficiencies: Unit A = 90% (LRV = 1), Unit B = 99.9% (LRV = 3) and Unit C = 99.9% (LRV = 3). In this situation, the overall pathogen reduction efficiency will be: LRVoverall = LRVUNIT A + LRVUNIT B + LRVUNIT C = 1 + 3 + 3 = 7. These treatment systems are usually very expensive and might not be feasible in areas with scarce resources.

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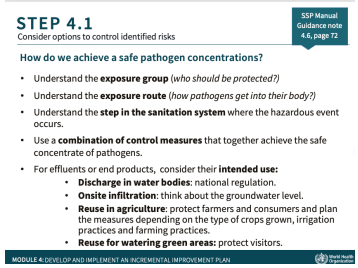
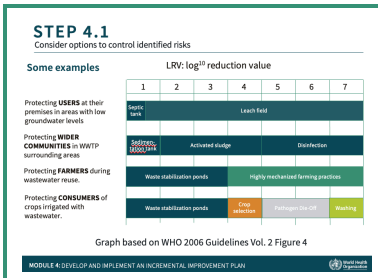
 
	How do we achieve a safe pathogen concentrations?
	
	• Understand the exposure group (who should be protected?)
	• Understand the exposure route (how pathogens get into their body?)
	• Understand the step in the sanitation system where the hazardous event occurs.
	• Use a combination of control measures that together achieve the safe concentrate of pathogens.
	• For effluents or end products, consider their intended use:
	  • Discharge in water bodies: national regulation.
	  • Onsite infiltration: think about the groundwater level.
	  • Reuse in agriculture: protect farmers and consumers and plan the measures depending on the type of crops grown, irrigation practices and farming practices.
	  • Reuse for watering green areas: protect visitors.

17	Examples of control combinations This graph is based on WHO 2006 Guidelines Vol 2 Figure 4. **Option A: Protecting USERS at their premises in areas with low groundwater levels.** This illustrates a typical single-household or institutional situation: minimal treatment in a septic tank (0.5 log) followed by sub-surface irrigation



(SSI) via the soil absorption method for the septic tank effluent credits 6.5 log reductions.

Option B: Protecting WIDER COMMUNITIES in WWTP surrounding areas. This relies solely on wastewater treatment (6 or 7 log) to achieve the required log reduction. This option is of course very relatively expensive. This is what is done in in California.

Option C: Protecting FARMERS during wastewater reuse. This uses highly mechanized farming practices which provide some protection to farmers hence only 3 log reduction in treatment is required.

Option D for Protecting CONSUMERS of crops irrigated with wastewater. This is for leaf crops, that has a lower required pathogen reduction. Leaf crops have less exposure to pathogens compared with root crops. But the crop may be eaten uncooked (i.e. it is unrestricted irrigation). In this case a total of 6 log reduction is required. This has been achieved with the following control measures: 3 logs from wastewater treatment and two post-treatment health protection measures, like 2 log due to pathogen die-off between the last irrigation and consumption and 1 log due to washing the salad crops prior to consumption.

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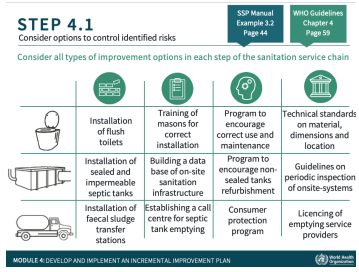

Consider all types of improvement options in each step of the sanitation service chain

Every time, when considering improvement options, we need to think about all types of measures in each step of the sanitation system. For instance, at the toilet step, we might propose the installation of flush toilets. However, this must be accompanied by other non-technical measures, for instance, the training of masons for correct installation (inc. water seal), a program to encourage correct use and maintenance of the toilet, and technical standards on material, dimensions and location.

At the containment – storage/treatment step, we might think about installing sealed and impermeable septic tanks, also we should be able to monitor, so building a data base of on-site sanitation infrastructure will support the technical measure. Furthermore, a program to encourage the refurbishment of non-sealed containment tanks among households and well as guidelines on periodic inspection of onsite systems by authorities.

While considering improvement options at the conveyance step, we could think about installing fecal sludge transfer stations, establishing a call center for septic tank emptying, developing a consumer protection program to inform users of fecal sludge emptying services about their rights and responsibilities, and licensing of emptying service providers.

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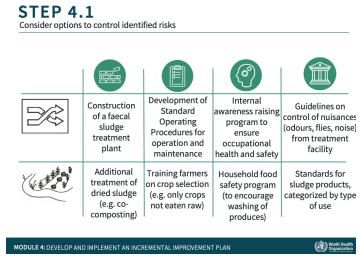

Likewise, while developing improvement options for treatment, we might consider the construction of a fecal sludge treatment plant, with standard operating procedures for operation and maintenance. To keep workers safe, an internal awareness raising program could be implemented, as well as the publishing of guidelines on control of nuisances (odors, flies, noise) from treatment facility.

For reuse, we might construct additional treatment of dried sludge (e.g. co-composting), we could train farmers on crop selection for instance, only crops not eaten raw. To protect the health of consumers, we could start a household food safety program (to encourage washing of produces), and from the regulatory perspective standards for sludge products could be published.

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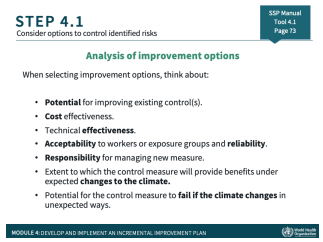
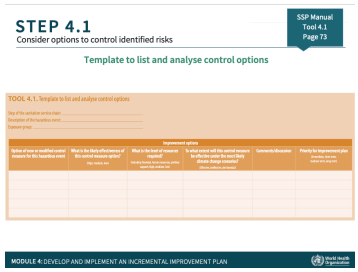
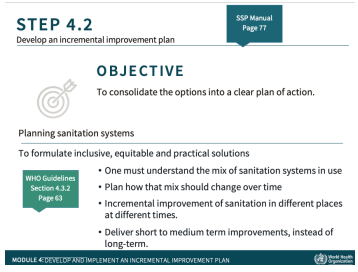
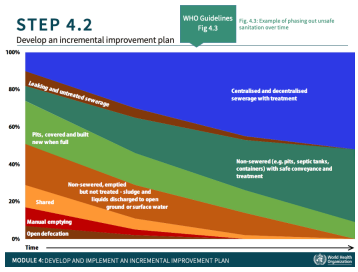
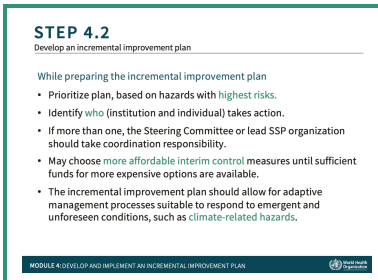


When selecting control options take into account the:

- Potential for improving existing control(s);
- Cost of the control option relative to its likely effectiveness;
- Most appropriate location in the sanitation chain to control the risk (e.g. at the hazard source, or another point downstream);
- Technical effectiveness of proposed new control options;
- Acceptability and reliability of the control in relation to local cultural and behavioral habits;

	• Responsibility for implementing, managing and monitoring the proposed new controls; • The extent to which the control measure will provide benefits under expected changes to the climate • Potential for the control measure to fail if the climate changes in unexpected ways. Where possible, the root cause of a problem should be addressed in the improvement plan. An important risk-based principle is that of preventing the hazardous event or locating the control measure or improvement as close as possible to the source of the risk. This is not always possible. Often a combination of hazardous events may be most effectively managed through a single control in another part of the system.
21 	This is tool 4.1 is a template to list and analyze control options. For each hazardous event consider: • What is the likely effectiveness of this control measure option? • What is the level of resources required? • To what extent will this control measure be effective under the most likely climate change scenarios? Then, decide the priority for improvement plan, which could be Immediate, short term, medium term or long term.
22 	Step 4.2: Use selected options to develop an incremental improvement plan Once the most appropriate control measures for each risk have been identified the SSP team can record the planned new and improved controls in an improvement plan. The aim of step 4.2 is therefore to consolidate the options into a clear plan of action. Section 4.3.2 in page 63 of the WHO Guidelines on Sanitation and Health offers an interesting piece of information about **planning sanitation systems**. It indicates that to formulate inclusive, equitable and practical solutions, it is essential to understand the existing mix of sanitation systems in use, and to plan how that mix should change over time as progress is made. A consequence of this approach is the incremental improvement of sanitation in different places and at different times. Interventions can be targeted and sequenced to maximize their positive impacts on public health and well-being. This can deliver much greater improvements in the short to medium term than the master planning approach that sets long- term targets but tends to miss intermediate steps. The forms used in Worked example: SSP in Newtown can be used as a template for the improvement plan.
23 	Example of phasing out unsafe sanitation over time Figure 4.3 is an example of how technology targets can be visualised, showing phasing out of unsafe sanitation systems to achieve universal access to safe systems over time. The time frame to achieve sanitation targets typically falls well beyond the normal time horizons of electoral cycles or externally funded projects (i.e. 3–5 years). Sanitation planning, therefore, should be institutionalised and integrated into government planning, budgeting and financing systems. Establishing specific budget lines, funding windows and expenditure codes for sanitation at central and local government levels can help achieve this.
24	While preparing the incremental improvement plan • Prioritize plan based on hazards with the highest risks. • In order for improvement plans to be implemented and managed, it is necessary to identify the person or agency responsible for the proposed action, and the



proposed timeframes. The different roles and responsibilities related to improvement plant implementation, as well as funding and timelines, are ideally defined under the improvement plan.

- Some risks may need actions from more than one organization represented in the SSP team or other stakeholder. In cases where multiple stakeholders are identified for the implementation of the improvement plan, the Steering Committee (Module 1.1) or SSP lead organization (Module 1.3) should take responsibility for agreeing the outcome of the risk assessments and identifying what actions are required. Some of the control measures, such as flood or land use management, will fall outside the responsibility of the local sanitation agency and will be the primary responsibility of other stakeholders, therefore coordinated development of planning is needed.
- The SSP team may also choose to select and implement more affordable interim control measures until sufficient funds for more expensive options are available.
- The incremental improvement plan should allow for adaptive management processes suitable to respond to emergent and unforeseen conditions. For instance, this may include incorporating an emergency management plan for specific climate-related hazards.

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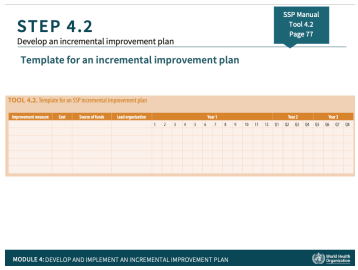

Template for an incremental improvement plan

The forms used in Worked example: SSP in Newtown can be used as a template for the improvement plan.

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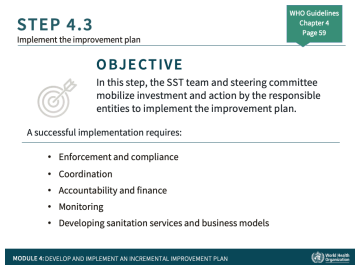

Step 4.3: Implement the improvement plan

To be able to implement, we need to have a clear plan of who is involved, time frame, costs and how the project management is going to be carried out.

Because of the complexity of sanitation, the success of the implementation depends on the local oversight and coordination, to ensure that all the complementary components of the service chain function effectively together.

Chapter 4 of the Guidelines on Sanitation and health offers a great reference of the enabling environment elements for the delivery of safe sanitation, including:

- Enforcement and compliance
- Coordination
- Accountability and finance
- Monitoring
- Developing sanitation services and business models.
- Fostering the sanitation services market.

The SSP team should monitor and report on the implementation status of the improvement plan to ensure that action is taken.

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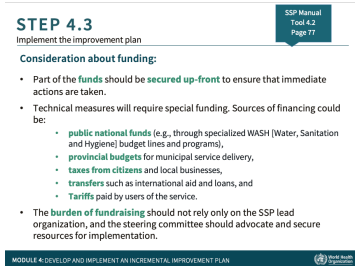
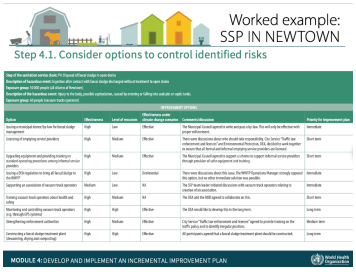
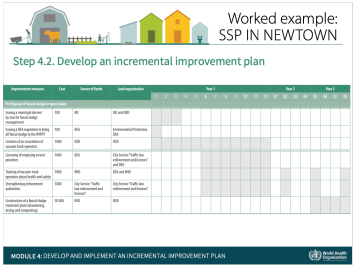
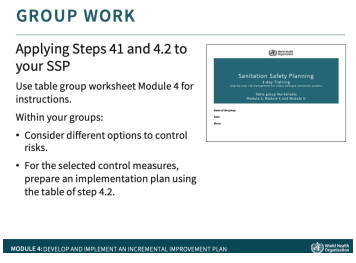


Consideration about funding:

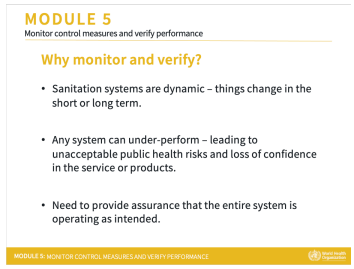
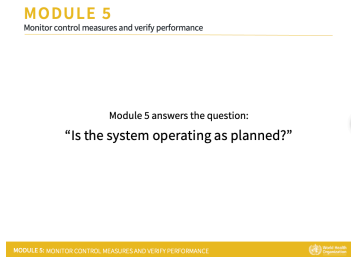
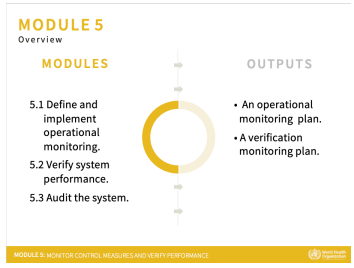
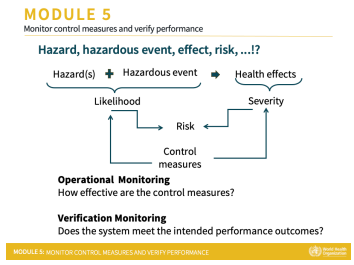
Part of the funds should be secured up-front to ensure that immediate actions are taken.

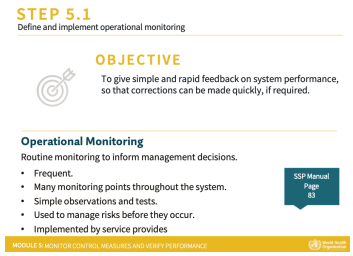
Technical measures will require special funding. Sources of financing could be:

- public national funds (e.g., through specialized WASH [Water, Sanitation and Hygiene] budget lines and programs),
- provincial budgets for municipal service delivery,
- taxes from citizens and local businesses,
- transfers such as international aid and loans, and
- Tariffs paid by users of the service.

	The burden of fundraising should not rely only on the SSP lead organization, and the steering committee should advocate and secure resources for implementation.
28 	**Newtown worked example** Now, let's see one example of the options to control identified risks. (Read the example…)
29 	Look how the SSP team prepared a Gantt Chart of their implementation plan.
30 	Applying Module 4 to your SSP Use participant's Worksheet: Within your groups, for the hazardous events with the highest risk, identify and evaluate: • Improvement options • Prepare an incremental improvement plan. You have today 90 min.
31 	Thank you very much!

7.3.7. Module 5

Slide	Screenplay
1 	Module 5: Monitor control measures and verify performance Now, it is time to start module 5 which deals with monitoring control measures and verification of performance. (Presentation should be 30 minutes).
2 	Why monitor and verify? There are internal and external dynamics to any sanitation system. Event sanitation systems in highly industrialized countries occasionally fail, resulting in unacceptable public health risk and loss of confidence in the service or products. Therefore, we need to provide assurance that the entire system is operating as intended.
3 	Module 5 answers the question: is the system operating as planned? It consists on regular checks that the system is operating as intended, and action to correct problems. Module 5 generates specific evidence to show that existing operations are OK. If not, improvements are needed.
4 	Overview Module 5 is composed of 3 key elements: ● Operational monitoring ● Verification monitoring ● Audits, which are independent assessments.
5 	You remember this diagram, of how risk is derived from the severity of the health effects and the likelihood of hazardous events and hazards happening. In order to reduce the risk, we have a control measure. Operation monitoring refers to how that control measure is working. Overall, there is an impact related to changes in health, society and environment, what is what we call verification monitoring within this module.
6	Module 5.1: Define and implement operational monitoring In modules 3 and 4 we identified a number of existing and new control measures. The purpose of module 5.1 is to select monitoring points and parameters to give a simple and rapid feedback on system performance.



This will show if control is being effective, and if not, then we can make corrections quickly.

Operation monitoring is….

Operational monitoring is the routine monitoring of parameters that can be measured rapidly (through tests that can be performed quickly or through visual inspection) to inform management decisions to prevent hazardous conditions from arising.

Operational monitoring plans can be implemented by collating the plans into field-friendly monitoring tables or log books.

7

Operational monitoring collects and uses

•Simple observations and measures (e.g. flow rate to check on detention times, temperature of composting, observations of on-farm practices);

•Sampling and testing (e.g. chemical oxygen demand, biochemical oxygen demand and suspended solids).

Practical considerations dictate that only a limited number of indicators can be monitored. However, we need to ensure that they do monitor the entire sanitation service chain.

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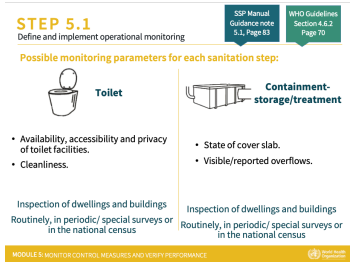

Possible parameters for each sanitation step

At the **toilet step**, monitoring parameters could be:

- Quality of the construction of the superstructure
- Cleanliness/availability of public facilities

Data on sanitation and handwashing facilities should be collected through the inspection of dwellings and buildings (this may be done routinely, in periodic/ special surveys or in the national census).

At the **containment-storage / treatment,**

- State of the cover slab (cracked/damaged)
- Visible/reported overflow

Also, data is collected through the inspection of dwellings and buildings (this may be done routinely, in periodic/ special surveys or in the national census).

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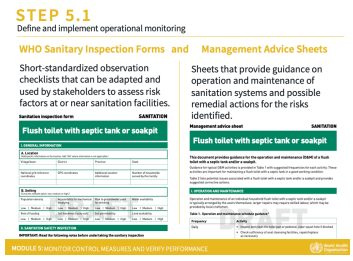

WHO Sanitary Inspection Forms for sanitation systems and Management Advice Sheets

WHO developed new sanitary inspection forms for sanitation systems. These are short-standardized observation checklists that can be adapted and used by stakeholders to assess risk factors at or near sanitation facilities and identify appropriate actions to safeguard public health.

Sanitary inspections support the implementation of the WHO Guidelines on sanitation and health and are linked to Chapter 3 on Safe sanitation systems and the Sanitation system fact sheets. Sanitary inspections may be used by community representatives, government officers such as environmental health inspectors, or field officers from national and international organizations.

Sanitation inspections are complemented by a set of management advise sheets which provide guidance on operation and maintenance of sanitation systems and possible remedial actions for the risks identified.

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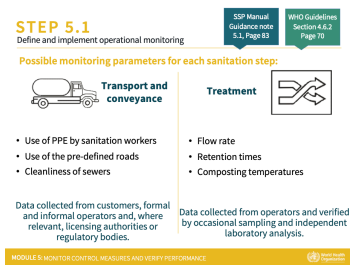
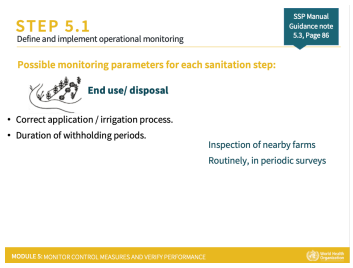
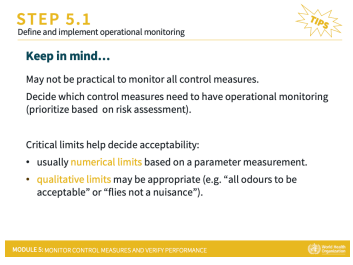
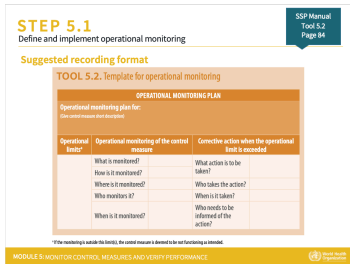
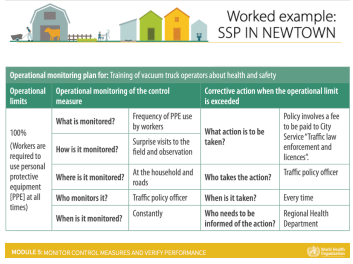


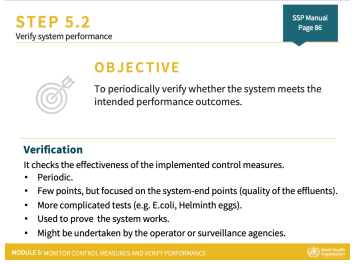
Key considerations for each sanitation step

Transport and conveyance:

- Use of PPE by sanitation workers
- Use of the pre-defined roads
- Cleanliness of sewers

Data on the emptying and transport component for onsite facilities and on leakage or overflow of untreated sewage should be collected from customers, formal and informal operators and, where relevant, licensing authorities or regulatory bodies. When information is collected by operators, it should be backed by periodic observation or

	audit to ensure that information provided is correct. This component should intentionally capture data on management of full pits, including informal and manual emptying practices. At the **treatment** step, typical monitoring parameters are: • Flow rate • Retention times • Composting temperatures Data on the effectiveness of sludge and sewage treatment should be collected from operators and verified by occasional sampling and independent laboratory analysis. A good basic principle to apply in service provider regulation) is for them to report specified monitoring information, subject to challenge inspection by environmental health authorities. The frequency of such inspections depends on the level of trust by environmental health staff in the service providers and the potential hazards arising from non-compliance.
11 	Key considerations for each sanitation step **End use/disposal** • Visual inspection of the application / irrigation process. • Actual versus planned duration of withholding periods We would have to carry out inspections of nearby farms, with routinely or periodic surveys. You will find in Guidance Note 5.2 in page 74 typical parameters, frequency and limits for operation monitoring, which are available in the 2006 WHO Guidelines. This is for wastewater use in agriculture (in volume 2), wastewater and excreta use in aquaculture (volume 3) and excreta and greywater use in agriculture (volume 4).
12 	Keep in mind Monitoring of all control measures may not be practical. The most critical monitoring points, based on the control of the highest risks, should be selected. Critical limits are usually numerical limits based on a parameter measurement. In some cases, qualitative limits are appropriate (e.g. "all odours to be acceptable" or "flies not a nuisance").
13 	Suggested recording format The following aspects should be identified for each of the monitoring points: • parameter (may be measured or observational); • method of monitoring; • frequency of monitoring; • who will monitor; • a critical limit; • an action to be undertaken when the critical limit is exceeded SSP teams may use the formats shown in Tools 5.1 and 5.2 to record the operational monitoring plan (see also Example 5.1).
14 	**Newtown worked example** Here, we have an example of the operational monitoring for Newtown SSP.
15	Step 5.2: Verify system performance

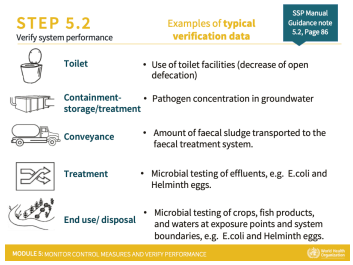


Verification monitoring is performed to periodically verify whether the system meets the intended performance outcomes, such as the use of the sanitation facilities, the reduction of fecal load in the environment, quality of effluents or products.

Verification monitoring can be done by the SSP team or an external authority as part of the surveillance function. Verification has the following characteristics:

- Periodic.
- Few points, but focused on the system-end points (quality of the effluents).
- More complicated tests (e.g. E.coli, Helminth eggs).
- Used to prove the system works.
- Might be undertaken by the operator or surveillance agencies.

16



Some typical verification data

- For toilets: Use of toilet facilities (decrease of open defecation)
- Containment-storage/treatment: Pathogen concentration in groundwater
- Transport and conveyance: Amount of fecal sludge transported to the treatment site
- Treatment: Microbial testing of effluents, e.g. E. coli and Helminth eggs.
- End use/disposal: Microbial testing of crops, fish products, and waters at exposure points and system boundaries, e.g. E. coli and Helminth eggs.

Operators should receive information from meteorological early warning systems (e.g. drought and cyclone warnings) and consider their likely impact on the parameters being monitored. Likely impacts can be judged based on past experiences with climate-related hazardous events. Where enough data exist, the likely impact may be able to be quantified (e.g. how much flow rates will be reduced by a certain number of days without rain).

17

Step 5.3: Audit the system

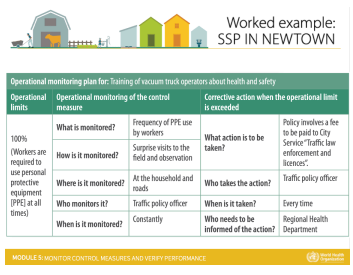
Step 5.3 provides additional independent evidence of the system performance and quality of the SSP.

A system audit may not be viable in the initial stages of all SSP implementations, especially in the absence of regulatory requirements for risk assessment management approaches.

However, audits ensure that SSP continues to contribute to positive health outcomes by checking the quality and effectiveness of SSP implementation. Auditing can be done by internal, regulatory or independent auditors. It should demonstrate that the sanitation safety plan has been properly designed, is being implemented correctly and is effective. Guidance Note 5.7 gives suggestions for key questions to consider in audits. Audits can assist implementation by identifying opportunities for improvement such as the accuracy, completeness and quality of implementation of the SSP outputs, the better use of limited resources and identifying training and motivational support needs.

(Presentation should be 30 minutes).

18



Newtown worked example

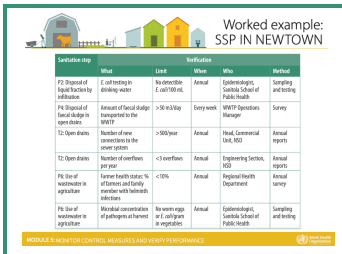
Here we have the example of the one monitoring plan in Newtown.

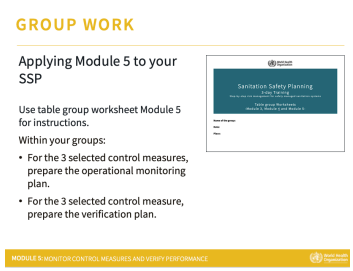
19

Newtown worked example

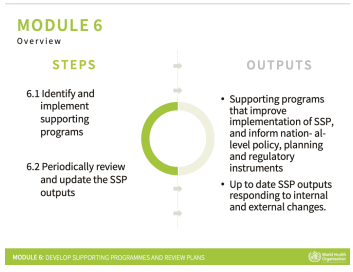
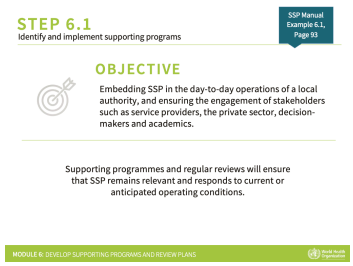
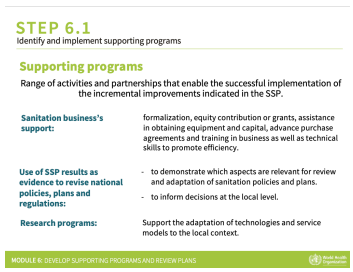
Here we have the example of the verification plan in Newtown.

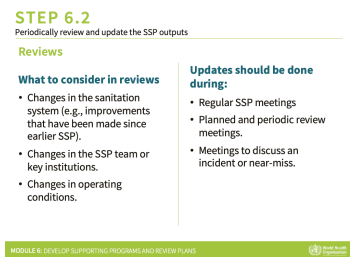
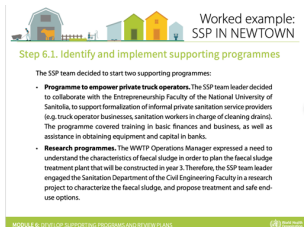
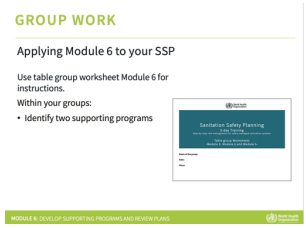
(Read the table)



20 	Applying Module 5 to your SSP Use participant's Worksheet: Within your groups, select at least two control measures. Develop operational monitoring plan for each control measure. Select at least two verification monitoring programs for your SSP system that might be useful to verify the overall system performance. Prepare a verification plan. (Time for work 60 min. The total time of Module 5 session is 90 min).
21 	Thank you very much!

7.3.8. Module 6

Slide	**Screenplay**
1 	Module 6: Develop supporting programs and review plans Let's start with the last module of SSP: develop supporting programs and review plans.
2 	Overview This module consists of 6.1 Identify and implement supporting programs and 6.2 periodically review and update the SSP outputs. Supporting programs and regular reviews will ensure SSP is always relevant and responds to the current or anticipated operating conditions.
3 	Step 6.1: Identify and implement supporting programs The objective of Step 6.1 is to embed SSP in the day-to-day operations of a local authority, and ensuring the engagement of stakeholders such as service providers, the private sector, decision-makers and academics. Supporting programs and regular reviews will ensure that SSP remains relevant and responds to current or anticipated operating conditions.
4 	Supporting programs Supporting programs cover a range of activities and partnerships that enable the successful implementation of the incremental improvements indicated in the SSP. Supporting programs include activities that help anchor SSP in a locality, engaging all stakeholders in the achievement of a safer sanitation system for all. They differ from control measures as they do not directly control hazardous events. Supporting programs can be: -Sanitation businesses' support. Sanitation actors that directly provide products and services to users, such as hardware supply, toilet construction or pit/septic tank emptying, can often function well as private businesses. In many localities, private operators, such as traditional service providers and innovating sanitation entrepreneurs, are key actors in the sanitation service chain, and local authorities should seek to work closely with them. Supporting programs for sanitation businesses should ensure that SSP control measures and monitoring are incorporated within their business operations and may extend to additional mechanisms such as formalization, equity contribution or grants, assistance in obtaining equipment and capital, advance purchase agreements and training in business as well as technical skills to promote efficiency. -Use of SSP results as evidence to revise national policies, plans and regulations. SSP implementation may identify gaps or inconsistency in national policy, planning and regulation that impedes local level risk management. Also, it may identify improved implementation approaches that are relevant for adoption at national level and scaling in other localities. SSP results should be presented to policy makers at the national level to demonstrate which aspects are relevant for review and adaptation of sanitation

	policies and plans. SSP results serve as local level context specific evidence to inform change. -Research programs. Partnership with academic institutions can support both initial development and ongoing adaptation of services. Research and innovation programs with local universities support the adaptation of technologies and service models to the local context. Additionally, research programs can fill knowledge gaps, such as current and future impacts of climate change in the local area.
5 	Step 6.2: Periodically review and update the SSP outputs Step 6.2 refers to the periodical reviews and updates. The SSP should be systematically reviewed and revised on periodical basis. This should inform us about new or emerging hazards and hazardous events. Remember: Sanitation Safety Planning is not linear! It's a continuous process!
6 	Reviews The review will take into account: • improvements that have been made • changes in operating conditions • any new evidence on health risks related to the sanitary systems or further resources on climate aspects as they become available. In addition, to scheduled periodic review the SSP should also be reviewed in the following situations: • after an incident, extreme weather event, emergency or near miss; • after major improvements or changes to the system; • after an audit or evaluation to incorporate findings and recommendations.
7 	**Newtown worked example** Here we have the example of supporting programs implemented in Newtown.
8 	**Applying Module 6 to your SSP** Use participant's Worksheet 6 for instructions. Within your groups, brainstorm about the supporting programs that are needed to sustain the Sanitation Safety Planning in the given locality. In your incremental improvement plan (Gantt Chart) identify when you should review your SSP. (Time for work 20 min. The total time of Module 6 session is 30 min).
9 	Thank you very much!