**Tool: Sanitation Safety Plan**

**Sleman/Bantul (Yogyakarta)**

developed by

participants of the SSP Training

|  |  |
| --- | --- |
| **Sanitation system analysed:**  |  |

**Group participants:**

* XXX
* XXX
* XXX
* XXX
* XXX

**Date:**

**Place:**

# MODULE 1: Preparing for Sanitation Safety Planning

## **STEP 1.1. Define the SSP area and lead organization**

* **Which organization should be the leader of the SSP process? Why?**

|  |
| --- |
| *[enter you answer here]*XXXXX |

## **STEP 1.2. Assemble the SSP team**

* **Which person should be the SSP team leader?**

Remember that 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.

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| --- |
| *[enter you answer here]*XXXXX |

* **Which organizations will be part of the SSP team?**

The usual process is to: (1) conduct a stakeholder analysis and (2) select team membership to suit the SSP purpose. Limit the number of team members to keep the working group functional.

*[enter you answer in the table below]*

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| **Organization** | **Job title** | **Role in SSP team** |
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# MODULE 2 Describe the sanitation system

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## **STEP 2.1 Map the system**

* **Which system is your team responsible of analyzing?**

Indicate in the box below what is the sanitation system that you and your team are analyzing:

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| --- |
| *[enter you answer here]*XXXXX |

## **STEP 2.1: Map the system**

Based on the description provided, what you saw during the field visit and using the brown paper and markers given to you and your team, prepare a sanitation map of the sanitation system that was assigned to you.

Remember to include all steps of the sanitation system: toilet, containment-storage/ conveyance/emptying/ transport, treatment and disposal/reuse. Use the example 2.1 in page 25 of your manual.

Don’t forget to establish the path of different system flows through the sanitation system and give a System Flow Code to each flow (e.g. F1: excreta collected in pits, F2: sludge emptied from pits…).

[Take a picture of the brown paper and paste it here ]

## **STEP 2.2: Characterize system flows**

Use the following table to characterize system flows (for instance, feces, urine, excreta, wastewater, greywater, sludge collected, sludge emptied, dried feces, solid waste dumped in the pit etc.). Read guidance note 2.2 and tool 2.1 for more information. Include all the quantitative information you have and identify if the system flow might have a biological, chemical or/and physical hazards.

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| **System flow code** | **Sanitation step** | **Description of the system flow** | **Key information of the system flow** | **Expected variations** | **Type of potential hazard** |
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## **STEP 2.3: Identify exposure groups**

In your maps, identify the exposure groups, using the letters U, L, W, WC, F and C are as symbols. You might want to define sub-groups, such as U1: users of latrines, U2: users of flush toilets. Use SSP manual Tool 2.2 to characterize the exposure groups. Remember the exposure groups are:

U: Sanitation system users L: Local community W: Sanitation workers

WC: Wider community F: Farmers C: Consumers:

|  |  |  |  |  |  |  |
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| **Sanitation step** | **Exposure Group ID** | **Who are the exposure groups?** | **How many are there?** | **What are they doing there?**  | **What are they exposed to?**  | **How often are they exposed to this?**  |
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## **STEP 2.4: Gather supporting information**

Write down any information you will want to obtain to characterize the system. Indicate the source of the information. Record below:

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| --- | --- |
| **Regulatory requirements** | **Demographics and land use patterns** |
|  |  |
| **System management and performance** | **Changes related to climate and weather** |
|  |  |

# MODULE 3: IDENTIFY HAZARDOUS EVENTS, AND ASSESS EXISTING CONTROL MEASURES AND EXPOSURE RISKS

In the following tables, you will conduct a health risk assessment of the sanitation system assigned to your group under **CURRENT CLIMATE CONDITIONS**.

## **STEP 3.1: Identify hazards and hazardous events**

When **applying step 3.1**, only complete the columns **Component** and **Hazard identification**. Make sure you describe the **Hazardous event** telling the story of how the hazards cause harm, including the exposure route (ingestion after contact with excreta, ingestion of contaminated water, consumption of contaminated produce, dermal contact, vector-borne, inhalation). Revise the Newtown worked case study, the example 3.2 and guidance note 3.4 for examples).

## **STEP 3.2: Identify and assess existing control measures**

When **applying step 3.2**, only complete the columns related to **Existing Controls**. Remember that in “Validation of control(s)” you should write if the existing control is working or not.

## **STEP 3.3: Assess and prioritize the exposure risk**

When **applying step 3.3**, complete the columns related to the risk assessment. Use tools 3.5 and 3.6 of your SSP manual (page 56) for definitions and scores of likelihood, severity and risks.. Make sure you write in the comments box, the reasons that justify your choice.

**IMPORTANT!** Notice, that in the tables you can already find hazardous events identified in each sanitation system:

* Group 1: Onsite systems (cubicle and gooseneck toilet + septic tank and infiltration area + faecal trucks + FSTP)
* Group 2: Offsite communal based systems (cubicle and gooseneck toilet + household connection to sewer + community-scale WWTP)
* Group 3: Offsite institutional based systems (cubicle and gooseneck toilet + household connection to sewer + WWTP Sewon)

**These tables are NOT COMPREHENSIVE**. You and your team should identify other hazardous events and evaluate your system.

**Group 1:** Onsite systems (cubicle and gooseneck toilet + septic tank and infiltration area + faecal trucks + FSTP)

| **Sanitation step** | **Hazard Identification** | **Existing Control(s)** | **Risk Assessment** | **Comments justifying risk assessment, under current conditions or effectiveness of the control** |
| --- | --- | --- | --- | --- |
| **Under current climate conditions** |
| L=Likelihood; S=Severity; R=Risk  |
| **Component** | **Hazardous event** | **Hazard** | **Exposure Groups** | **Number of persons at risk** | **Description of existing control** | **Validation of control**Explain if this is working | **L** | **S** | **Score** | **R** |
| Toilet | Vector-borne transmission of pathogens to users, due to wrong design and/orconstruction of the toilets (e.g. lack of water seal or lid) |  |  |  |  |  |  |  |  |  |  |
| Containment–storage/treatment (septic tank) | Ingestion of contaminated groundwater due to infiltration from septic tanks + infiltration area intoshallow groundwater | Faecal pathogens |  |  |  |  |  |  |  |  |  |
| Nitrates and nitrites |  |  |  |  |  |  |  |  |  |
| Containment–storage/treatment (septic tank) | Ingestion of groundwater contaminated via leakage from cracked/damaged septictanks |  |  |  |  |  |  |  |  |  |  |
| Containment… (septic tank) | Dermal contact with pathogens due to effluent discharging directly into open drains  |  |  |  |  |  |  |  |  |  |  |
| Containment–storage/treatment | Trauma or asphyxiation caused by falling into collapsed septic tanks as a result of reducedsoil stability or structural failure of containment structure |  |  |  |  |  |  |  |  |  |  |
| Conveyance (fecal trucks) | Ingestion after contact with raw sewage during vacuum tanker operation |  | Workers |  |  |  |  |  |  |  |  |
| Conveyance (fecal trucks) | Ingestion after contact with faecal sludge caused by spillage during emptying and transport |  |  |  |  |  |  |  |  |  |  |
| Conveyance (fecal trucks) | Ingestion after contact with faecal sludge discharged without treatment to open drains |  |  |  |  |  |  |  |  |  |  |
| Conveyance (fecal trucks) | Ingestion of pathogens after contact with contaminated soil, caused by discharge of faecal sludge without treatment to open grounds |  |  |  |  |  |  |  |  |  |  |
| Treatment(Fecal Sludge Treatment Plant) | Inhalation of aerosols while manual handling of the dried faecal sludge |  |  |  |  |  |  |  |  |  |  |
| Discharge / Reuse | Ingestion of pathogens after contact with faecal sludge during application on farmland for soil improvement |  |  |  |  |  |  |  |  |  |  |
| Discharge / Reuse | Ingestion of pathogens during consumption of produce grown with non/partially treated faecal sludge |  |  |  |  |  |  |  |  |  |  |
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**Group 2:** Offsite communal based systems (cubicle and gooseneck toilet + household connection to sewer + community-scale WWTP)

| **Sanitation step** | **Hazard Identification** | **Existing Control(s)** | **Risk Assessment** | **Comments justifying risk assessment, under current conditions or effectiveness of the control** |
| --- | --- | --- | --- | --- |
| **Under current climate conditions** |
| L=Likelihood; S=Severity; R=Risk  |
| **Component** | **Hazardous event** | **Hazard** | **Exposure Groups** | **Number of persons at risk** | **Description of existing control** | **Validation of control**Explain if this is working | **L** | **S** | **Score** | **R** |
| Toilet | 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) |  |  |  |  |  |  |  |  |  |  |
| Conveyance (sewer) | Ingestion of contaminated groundwater due to leakages of wastewater from cracked/damaged sewers intoshallow groundwater | Faecal pathogens |  |  |  |  |  |  |  |  |  |
| Nitrates and nitrites |  |  |  |  |  |  |  |  |  |
| Conveyance (sewer) | Dermal contact with pathogens due to effluent discharging directly into open drains/streams |  |  |  |  |  |  |  |  |  |  |
| Conveyance (sewer) | Ingestion of pathogens after contact with wastewater during sewer cleaning andmaintenance |  | Workers |  |  |  |  |  |  |  |  |
| Conveyance (sewer) | Ingestion of contaminated drinking water due to cross contamination with sewer leakage |  |  |  |  |  |  |  |  |  |  |
| Conveyance (sewer) | Ingestion after contact with wastewater from overflowing sewers due to blockage with solid waste |  |  |  |  |  |  |  |  |  |  |
| Treatment(Communal WWTP) | Ingestion of contaminated groundwater due to leakages from cracked holding tanks intoshallow groundwater | Faecal pathogens |  |  |  |  |  |  |  |  |  |
| Nitrates and nitrites |  |  |  |  |  |  |  |  |  |
| Treatment(Communal WWTP) | Ingestion of wastewater caused by overflows due to capacity overload, spilling untreated or partially treated wastewater into the environment |  |  |  |  |  |  |  |  |  |  |
| Treatment(Communal WWTP) | Inhalation of aerosolized microbes or contaminated vapors in biogas leaks |  |  |  |  |  |  |  |  |  |  |
| Treatment(Communal WWTP) | Ingestion of pathogens caused by the Improper disposal of backwash of filter or waste |  |  |  |  |  |  |  |  |  |  |
| Discharge / Reuse | Ingestion of pathogens in surface waters due to discharge of partially treated or untreated effluent |  |  |  |  |  |  |  |  |  |  |
| Discharge / Reuse | Ingestion of partially treated sewage during farming activities (spray irrigation) |  |  |  |  |  |  |  |  |  |  |
| Discharge / Reuse  | Consumption of contaminated produce grown with partially treated sewage  |  |  |  |  |  |  |  |  |  |  |
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**Group 3:** Offsite institutional based systems (cubicle and gooseneck toilet + household connection to sewer + WWTP Sewon)

| **Sanitation step** | **Hazard Identification** | **Existing Control(s)** | **Risk Assessment** | **Comments justifying risk assessment, under current conditions or effectiveness of the control** |
| --- | --- | --- | --- | --- |
| **Under current climate conditions** |
| L=Likelihood; S=Severity; R=Risk  |
| **Component** | **Hazardous event** | **Hazard** | **Exposure Groups** | **Number of persons at risk** | **Description of existing control** | **Validation of control**Explain if this is working | **L** | **S** | **Score** | **R** |
| Toilet | 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) |  |  |  |  |  |  |  |  |  |  |
| Conveyance (sewer) | Ingestion of contaminated groundwater due to leakages of wastewater from cracked/damaged sewers intoshallow groundwater | Faecal pathogens |  |  |  |  |  |  |  |  |  |
| Nitrates and nitrites |  |  |  |  |  |  |  |  |  |
| Conveyance (sewer) | Dermal contact with pathogens due to effluent discharging directly into open drains/streams |  |  |  |  |  |  |  |  |  |  |
| Conveyance (sewer) | Ingestion of pathogens after contact with wastewater during sewer cleaning and maintenance |  | Workers |  |  |  |  |  |  |  |  |
| Conveyance (sewer) | Ingestion of contaminated drinking water due to cross contamination with sewer leakage |  |  |  |  |  |  |  |  |  |  |
| Conveyance (sewer) | Ingestion after contact with wastewater from overflowing sewers due to blockage with solid waste |  |  |  |  |  |  |  |  |  |  |
| Sewon WWTP - screening | Inhalation of aerosols containing pathogens when removing screens or grids with accumulated debris |  | Workers |  |  |  |  |  |  |  |  |
| Sewon WWTP – inlet chamber | Ingestion after contact with leakages of raw or partially treated wastewater into the surrounding soil and groundwater, caused by breakage of inlet pipes |  |  |  |  |  |  |  |  |  |  |
| Sewon WWTP- stabilization ponds | Ingestion of contaminated drinking water caused leakages or dam failures into soil and shallow groundwater |  |  |  |  |  |  |  |  |  |  |
| Sewon WWTP - stabilization ponds | Injury to the body, possible drowning, caused byentering or falling into the ponds |  | Workers |  |  |  |  |  |  |  |  |
| Local community |
| Sewon WWTP stabilization ponds | Inhalation of aerosolized microbes or toxins created by algae blooms, that come into contact with workers during pond access |  |  |  |  |  |  |  |  |  |  |
| Discharge / Reuse | Ingestion of pathogens in incompletely treated effluent, resulting from discharge of fresh fecal sludge in wastewater treatment ponds, causing overload and failure |  |  |  |  |  |  |  |  |  |  |
| Discharge / Reuse | Ingestion of partially treated sewage during farming activities (spray irrigation) |  |  |  |  |  |  |  |  |  |  |
| Discharge / Reuse  | Consumption of contaminated produce grown with partially treated sewage  |  |  |  |  |  |  |  |  |  |  |
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After discussions with your team, write in the following table which are the hazardous events that you will prioritize UNDER CURRENT CLIMATE CONDITIONS.

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| --- | --- | --- | --- | --- | --- |
| **Sanitation step** | **Hazardous event** | **Exposure Group** | **Number of persons at risk** | **Risk** | **Priority given** |
|  |  |  |  |  |  |
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# IDENTIFY HAZARDOUS EVENTS, AND ASSESS EXISTING CONTROL MEASURES AND EXPOSURE RISKS UNDER CLIMATE CHANGE SCENARIOS

In the following tables, you will conduct a health risk assessment of the sanitation system assigned to your group under different **CLIMATE CHANGE SCENARIOS**.

## **CLIMATE CHANGE SCENARIO 1: More intense or prolonged precipitation**

Discuss in a few lines, if this is a climate change scenario is relevant for your location. Decide whether the locality is vulnerable to its effects.

|  |
| --- |
| *[enter you answer here]*XXXXX |

Now, conduct the health risk assessment of hazardous events caused by “more intense or prolonged precipitation”. Keep in mind that there are already some effects and hazardous events identified. **This list is not comprehensive**. You and your team need to identify other in each step of the sanitation system assigned.

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| --- | --- | --- | --- | --- | --- |
| **Causes of hazardous events**  | **Evaluation of robustness** | **Hazard Identification** | **Existing Control(s)** | **Risk Assessment** | **Comments justifying risk assessment, under climate change scenarios or effectiveness of the control**  |
| **Under climate change scenario**L=Likelihood; S=Severity; R=Risk |
| **Sanitation step** | **Effect on the sanitation system** | **Is the sanitation step/system robust? (yes, no). Explain** | **Hazardous events** | **Hazard** | **Exposure Groups** | **Number of persons at risk** | **Description of existing control** | **Validation of control**Explain if this is working | **L** | **S** | **Score** | **R** |
| Increased flooding  | Toilet |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Conveyance (fecal trucks) | Damage to other infrastructure/systems on which sanitation systems rely (e.g., electricity networks for pumping; road networks used by FSM vehicles)  |  |  |  |  |  |  |  |  |  |  |  |  |
| Conveyance (sewers – pumping stations) |  |  |  |  |  |  |  |  |  |  |  |  |
| Treatment (units needing electricity) |  | Ingestion of surface water contaminated with raw sewage due to non-functioning wastewater treatment plant |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Containment–storage/treatment (septic tank) | Flooding of treatment units, causing spillage and contamination |  | Ingestion after contact with fecal sludge during overflowing of on-site systems |  |  |  |  |  |  |  |  |  |  |
| Treatment (holding tanks, ponds) |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Treatment |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Treatment (holding tanks, ponds) | Treatment plants receive flows that exceed their design capacities, resulting in flows bypassing the treatment processes |  | Ingestion of contaminated water with raw sewage due to bypassing wastewater treatment plant |  |  |  |  |  |  |  |  |  |  |
| Increased erosion, landslides  | Conveyance (sewers – pumping stations) | Destruction and damage to sanitation infrastructure  |  |  |  |  |  |  |  |  |  |  |  |  |
| Treatment (holding tanks, ponds) |  | Ingestion of contaminated water with raw sewage due to non-functioning wastewater treatment plant |  |  |  |  |  |  |  |  |  |  |
| Treatment |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Contamination of and damage to surface water and groundwater supplies  | Treatment (holding tanks, ponds) | Treatment plants receive flows with concentrations of pollutants that exceed their design capacities, resulting in lower treatment performance |  | Ingestion of contaminated water in partially treated sewage due to higher pollutant concentration |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Changes to groundwater recharge and groundwater levels  | Containment–storage/treatment (septic tank) | Floating of septic systems due to groundwater levels  |  | Ingestion of pathogens after contact with fecal sludge due to floating of septic tank |  |  |  |  |  |  |  |  |  |  |
| Collapse of septic tanks, via groundwater  |  | Injury to the body, possible asphyxiation, caused by falling into septic tanks due to collapsing latrine structure |  |  |  |  |  |  |  |  |  |  |
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## **CLIMATE CHANGE SCENARIO 2: Sea-level rise**

Discuss in a few lines, if this is a climate change scenario is relevant for your location. Decide whether the locality is vulnerable to its effects.

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| --- |
| *[enter you answer here]*XXXXX |

Now, conduct the health risk assessment of hazardous events caused by “sea-level rise”. Keep in mind that there are already some effects and hazardous events identified. **This list is not comprehensive**. You and your team need to identify other in each step of the sanitation system assigned..

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| **Causes of hazardous events**  | **Evaluation of robustness** | **Hazard Identification** | **Existing Control(s)** | **Risk Assessment** | **Comments justifying risk assessment, under climate change scenarios or effectiveness of the control**  |
| **Under climate change scenario**L=Likelihood; S=Severity; R=Risk |
| **Sanitation step** | **Effect on the sanitation system** | **Is the sanitation step/system robust? (yes, no). Explain** | **Hazardous events** | **Hazard** | **Exposure Groups** | **Number of persons at risk** | **Description of existing control** | **Validation of control**Explain if this is working | **L** | **S** | **Score** | **R** |
| Saline intrusion in coastal/low-lying zones | Toilet |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Treatment (holding tanks, ponds) | Damage to wastewater treatment works (which are often low-lying/coastal) from exposure to saltwater |  | Ingestion of microbial pathogens in surface water contaminated with partially or non-treated sewage |  |  |  |  |  |  |  |  |  |  |
| Reduced effectiveness of biological treatment processes due to saltwater exposure from saline intrusion into wastewater influent |  | Ingestion of microbial pathogens in surface water contaminated partially treated sewage due to higher pollutant concentration |  |  |  |  |  |  |  |  |  |  |
| Containment–storage/treatment (septic tank) | Damage to underground infrastructure from rising groundwater levels  |  | Ingestion of groundwater contaminated with fecal pathogens |  |  |  |  |  |  |  |  |  |  |
| Discharge / reuse /consumption of products |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Rising groundwater levels in coastal/low-lying zones | Containment–storage/treatment (septic tank) | Damage to underground infrastructure from rising groundwater levels |  | Ingestion of groundwater contaminated with fecal pathogens |  |  |  |  |  |  |  |  |  |  |
| Treatment |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Higher risk of inundation, especially from extreme weather events (potentially contributing to flooding, erosion, landslides) | Conveyance (fecal trucks) | Damage to other infrastructure/systems on which sanitation systems rely (e.g., electricity networks for pumping; road networks used by FSM vehicles)  |  |  |  |  |  |  |  |  |  |  |  |  |
| Conveyance (sewers – pumping stations) |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| Treatment (units needing electricity) |  | Ingestion of surface water contaminated with raw sewage due to non-functioning wastewater treatment plant |  |  |  |  |  |  |  |  |  |  |
| Containment–storage/treatment (septic tank) | Flooding of treatment systems causing spillage and contamination |  | Ingestion after contact with fecal sludge during overflowing of on-site systems |  |  |  |  |  |  |  |  |  |  |
| Treatment (holding tanks, ponds) |  | Dermal contact with fecal sludge due to overflowing of on-site systems |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Treatment (holding tanks, ponds) | Treatment plants receive flows that exceed their design capacities, resulting in flows bypassing the treatment processes |  | Ingestion of contaminated water with raw sewage due to bypassing wastewater treatment plant |  |  |  |  |  |  |  |  |  |  |
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## **CLIMATE CHANGE SCENARIO 3: More variable or increasing temperatures**

## Discuss in a few lines, if this is a climate change scenario is relevant for your location. Decide whether the locality is vulnerable to its effects.

|  |
| --- |
| *[enter you answer here]*XXXXX |

Now, conduct the health risk assessment of hazardous events caused by “More variable or increasing temperatures”. Keep in mind that there are already some effects and hazardous events identified. **This list is not comprehensive**. You and your team need to identify other in each step of the sanitation system assigned.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Causes of hazardous events**  | **Evaluation of robustness** | **Hazard Identification** | **Existing Control(s)** | **Risk Assessment** | **Comments justifying risk assessment, under climate change scenarios or effectiveness of the control**  |
| **Under climate change scenario**L=Likelihood; S=Severity; R=Risk |
| **Sanitation step** | **Effect on the sanitation system** | **Is the sanitation step/system robust? (yes, no). Explain** | **Hazardous events** | **Hazard** | **Exposure Groups** | **Number of persons at risk** | **Description of existing control** | **Validation of control**Explain if this is working | **L** | **S** | **Score** | **R** |
| Higher freshwater temperatures  | Treatment | Proliferation of algal blooms or microbes carried by vectors in water |  | Ingestion of contaminated surface water during bathing |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Hot and cold temperature extremes | Treatment (holding tanks, ponds) | Reduced efficiency of biological wastewater treatments (if temperature exceeds or falls below operational limits)  |  | Ingestion of water contaminated with partially treated sewage due to higher pollutant concentration |  |  |  |  |  |  |  |  |  |  |
| Conveyance (sewers – pumping stations) | Increased corrosion of sewers  |  | Ingestion of groundwater contaminated with fecal pathogens leaking from broken sewers |  |  |  |  |  |  |  |  |  |  |
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## **CLIMATE CHANGE SCENARIO 4: More frequent or intense storms or cyclones**

## Discuss in a few lines, if this is a climate change scenario is relevant for your location. Decide whether the locality is vulnerable to its effects.

|  |
| --- |
| *[enter you answer here]*XXXXX |

Now, conduct the health risk assessment of hazardous events caused by “More frequent or intense storms or cyclones”. Keep in mind that there are already some effects and hazardous events identified. **This list is not comprehensive**. You and your team need to identify other in each step of the sanitation system assigned.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Causes of hazardous events**  | **Evaluation of robustness** | **Hazard Identification** | **Existing Control(s)** | **Risk Assessment** | **Comments justifying risk assessment, under climate change scenarios or effectiveness of the control**  |
| **Under climate change scenario**L=Likelihood; S=Severity; R=Risk |
| **Sanitation step** | **Effect on the sanitation system** | **Is the sanitation step/system robust? (yes, no). Explain** | **Hazardous events** | **Hazard** | **Exposure Groups** | **Number of persons at risk** | **Description of existing control** | **Validation of control**Explain if this is working | **L** | **S** | **Score** | **R** |
| Increased flooding | Treatment (units needing electricity) | Damage to other infrastructure/systems on which sanitation systems rely (e.g., electricity networks for pumping; road networks used by FSM vehicles)  |  | Ingestion of surface water contaminated with raw sewage due to non-functioning wastewater treatment plant |  |  |  |  |  |  |  |  |  |  |
| Containment–storage/treatment (septic tank) | Flooding of on-site systems causing spillage and contamination |  | Ingestion after contact with fecal sludge during overflowing of on-site systems |  |  |  |  |  |  |  |  |  |  |
| Treatment (holding tanks, ponds) | Flooding of on-site systems causing spillage and contamination |  | Dermal contact with fecal sludge due to overflowing of on-site systems |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| More extreme winds |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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## **CLIMATE CHANGE SCENARIO 5: More variable and declining rainfall or run-off**

## Discuss in a few lines, if this is a climate change scenario is relevant for your location. Decide whether the locality is vulnerable to its effects.

|  |
| --- |
| *[enter you answer here]*XXXXX |

Now, conduct the health risk assessment of hazardous events caused by “More variable and declining rainfall or run-off”. Keep in mind that there are already some effects and hazardous events identified. **This list is not comprehensive**. You and your team need to identify other in each step of the sanitation system assigned.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Causes of hazardous events**  | **Evaluation of robustness** | **Hazard Identification** | **Existing Control(s)** | **Risk Assessment** | **Comments justifying risk assessment, under climate change scenarios or effectiveness of the control**  |
| **Under climate change scenario**L=Likelihood; S=Severity; R=Risk |
| **Sanitation step** | **Effect on the sanitation system** | **Is the sanitation step/system robust? (yes, no). Explain** | **Hazardous events** | **Hazard** | **Exposure Groups** | **Number of persons at risk** | **Description of existing control** | **Validation of control**Explain if this is working | **L** | **S** | **Score** | **R** |
| Water shortages | Toilet | Decreased water availability impairs the operation of flushing toilets |  | Ingestion after contact with non-functional toilets |  |  |  |  |  |  |  |  |  |  |
| Water-dependent treatment units | Decreased water availability impairs the operation of water-dependent sanitation processes, leading to reduced functionality of treatment systems |  | Ingestion after contact with wastewater that has not been treated sufficiently  |  |  |  |  |  |  |  |  |  |  |
| Containment–storage/treatment (septic tank) | Increased reliance on alternative water sources for drinking |  | Ingestion of contaminated drinking water |  |  |  |  |  |  |  |  |  |  |
| Reuse | Increased reliance on alternative water sources for irrigation |  | Ingestion after contact with polluted irrigation water |  |  |  |  |  |  |  |  |  |  |
| Discharge | Potential contamination due to insufficient dilution |  | Ingestion after contact with polluted river water |  |  |  |  |  |  |  |  |  |  |
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| Longer dry seasons/periods |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Reduced groundwater levels |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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After discussions with your team, write in the following table which are the most relevant the hazardous events that you will prioritize UNDER DIFFERENT CLIMATE CHANGE SCENARIOS.

Identify the priority of each individual hazardous event as: 1 (highest), 2, 3, 4, 5….

|  |  |  |  |
| --- | --- | --- | --- |
| **Climate change scenario** | **In general, is this sanitation system robust in the case of the climate change scenario?** | According to the health risk assessment, write the **highest health risks for the relevant climate change scenarios** | **Priority given** |
| **Sanitation step** | **Hazardous event** | **Cause of hazardous event** | **Exposure Group** | **Number of persons at risk** | **Risk** |
| More intense or prolonged precipitation |  |  |  |  |  |  |  |  |
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| Sea-level rise |  |  |  |  |  |  |  |  |
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| More variable or increasing temperatures |  |  |  |  |  |  |  |  |
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| More frequent or intense storms or cyclones |  |  |  |  |  |  |  |  |
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| More variable and declining rainfall or run-off |  |  |  |  |  |  |  |  |
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# MODULE 4: DEVELOP AND IMPLEMENT AN INCREMENTAL IMPROVEMENT PLAN

## **STEP 4.1: Consider options to control identified risks**

## **MEASURES FOR HAZARDOUS EVENTS UNDER CURRENT CLIMATE CONDITIONS**

For each hazardous event prioritized UNDER CURRENT CLIMATE CONDITIONS (maximum 3), analyze the possible control measures using the following tables:

| **Step of the sanitation service chain:** **Description of the hazardous event:** **Exposure group:** **Improvement options** |
| --- |
| **Option of new or modified control measures for this hazardous event** | **What is the likely effectiveness of this control measure option?** (High, medium, low) | **What is the level of resources required?**(Including financial, human resources, political support: high, medium, low)  | **To what extent will this control measure be effective under the different climate change scenarios?** (Effective, ineffective, detrimental) | **Comments/****discussion** | **Priority for improvement plan**(Immediate, short term, medium term, long term) |
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| **Step of the sanitation service chain:** **Description of the hazardous event:** **Exposure group:** **Improvement options** |
| --- |
| **Option of new or modified control measures for this hazardous event** | **What is the likely effectiveness of this control measure option?** (High, medium, low) | **What is the level of resources required?**(Including financial, human resources, political support: high, medium, low)  | **To what extent will this control measure be effective under the different climate change scenarios?** (Effective, ineffective, detrimental) | **Comments/****discussion** | **Priority for improvement plan**(Immediate, short term, medium term, long term) |
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| **Step of the sanitation service chain:** **Description of the hazardous event:** **Exposure group:** **Improvement options** |
| --- |
| **Option of new or modified control measures for this hazardous event** | **What is the likely effectiveness of this control measure option?** (High, medium, low) | **What is the level of resources required?**(Including financial, human resources, political support: high, medium, low)  | **To what extent will this control measure be effective under the different climate change scenarios?** (Effective, ineffective, detrimental) | **Comments/****discussion** | **Priority for improvement plan**(Immediate, short term, medium term, long term) |
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## **MEASURES FOR HAZARDOUS EVENTS UNDER THE MOST PROBABLE CLIMATE CHANGE SCENARIOS**

Now, for the hazardous event prioritized UNDER THE MOST PROBABLE CLIMATE CHANGE SCENARIOS (maximum 3), analyze the possible control measures using the following tables:

| **Climate change scenario:** **Step of the sanitation service chain:** **Description of the hazardous event:** **Cause of hazardous event:** **Exposure group:** **Improvement options** |
| --- |
| **Option of new or modified control measures for this hazardous event** | **What is the likely effectiveness of this control measure option?** (High, medium, low) | **What is the level of resources required?**(Including financial, human resources, political support: high, medium, low)  | **To what extent will this control measure be effective under the other climate change scenarios?** (Effective, ineffective, detrimental) | **Comments/****discussion** | **Priority for improvement plan**(Immediate, short term, medium term, long term) |
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| **Climate change scenario:** **Step of the sanitation service chain:** **Description of the hazardous event:** **Cause of hazardous event:** **Exposure group:** **Improvement options** |
| --- |
| **Option of new or modified control measures for this hazardous event** | **What is the likely effectiveness of this control measure option?** (High, medium, low) | **What is the level of resources required?**(Including financial, human resources, political support: high, medium, low)  | **To what extent will this control measure be effective under the other climate change scenarios?** (Effective, ineffective, detrimental) | **Comments/****discussion** | **Priority for improvement plan**(Immediate, short term, medium term, long term) |
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| **Climate change scenario:** **Step of the sanitation service chain:** **Description of the hazardous event:** **Cause of hazardous event:** **Exposure group:** **Improvement options** |
| --- |
| **Option of new or modified control measures for this hazardous event** | **What is the likely effectiveness of this control measure option?** (High, medium, low) | **What is the level of resources required?**(Including financial, human resources, political support: high, medium, low)  | **To what extent will this control measure be effective under the other climate change scenarios?** (Effective, ineffective, detrimental) | **Comments/****discussion** | **Priority for improvement plan**(Immediate, short term, medium term, long term) |
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## **STEP 4.2: Develop an incremental improvement plan**

Use the following Gantt Chart to plan the implementation of your improvement measures. *During the training, we will conduct this exercise, if we have time.*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Improvement measure** | **Cost** | **Source of funds** | **Lead organization** | **Year 1** | **Year 2** | **Year 3** |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 |
| *Improvement measures to control prioritized hazardous event 1* |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| *Improvement measures to control prioritized hazardous event 2* |
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| *Improvement measures to control prioritized hazardous event 3* |
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| *Improvement measures to control prioritized hazardous event 4 (under climate change scenario)* |
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| *Improvement measures to control prioritized hazardous event 5 (under climate change scenario)* |
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| *Improvement measures to control prioritized hazardous event 5 (under climate change scenario)* |
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# MODULE 5: Monitor control measures and verify performance

## **STEP 5.1: Define and implement operational monitoring**

For 3 of the prioritized hazardous events (including those arising from climate change) and their improvement measures, choose 1 improvement measure that should have an operational monitoring plan.

|  |  |  |
| --- | --- | --- |
| **Prioritized hazardous event** | **Sanitation step** | **Choose one control measure that will have a detailed operational monitoring plan** |
|  |  |  |
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Using the following tables, prepare the operational monitoring plan for the chosen control measures:

|  |
| --- |
| **Operational monitoring plan** |
| **Operational monitoring plan for:** |  |
| **Operational limits** | **Operational monitoring of the control measure:Control measure:**  | **Corrective action when the operational limit is exceeded** |
|  | **What is monitored?** |  | **What action is to be taken?** |  |
| **How is it monitored?** |  |
| **Where is it monitored?** |  | **Who takes the action?** |  |
| **Who monitors it?** |  | **When is it taken?** |  |
| **When is it monitored?** |  | **Who needs to be informed of the action?** |  |

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| **Operational monitoring plan** |
| **Operational monitoring plan for:** |  |
| **Operational limits** | **Operational monitoring of the control measure:Control measure:**  | **Corrective action when the operational limit is exceeded** |
|  | **What is monitored?** |  | **What action is to be taken?** |  |
| **How is it monitored?** |  |
| **Where is it monitored?** |  | **Who takes the action?** |  |
| **Who monitors it?** |  | **When is it taken?** |  |
| **When is it monitored?** |  | **Who needs to be informed of the action?** |  |

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| **Operational monitoring plan** |
| **Operational monitoring plan for:** |  |
| **Operational limits** | **Operational monitoring of the control measure:Control measure:**  | **Corrective action when the operational limit is exceeded** |
|  | **What is monitored?** |  | **What action is to be taken?** |  |
| **How is it monitored?** |  |
| **Where is it monitored?** |  | **Who takes the action?** |  |
| **Who monitors it?** |  | **When is it taken?** |  |
| **When is it monitored?** |  | **Who needs to be informed of the action?** |  |

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**STEP 5.2: Verify system performance**

For each prioritized hazardous event and their improvement, identify the verification plan.

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| --- | --- | --- | --- |
| **What is the control measure?** | **What is the objective of implementing this control measure?** | **How would you measure it?** | **Verification** |
| **What indicator will you use?** | **What is the maximum value you will accept?** | **When are you going to measure it?** | **Who will measure it?** | **How will it be measured?** |
|  |  |  |  |  |  |  |  |
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# MODULE 6: DEVELOP SUPPORTING PROGRAMMES AND REVIEW PLANS

## **STEP 6.1: Identify and implement supporting programs**

Write in the box below two supporting programs that should be implemented in the framework of Sanitation Safety planning.

|  |  |  |
| --- | --- | --- |
|  | **Supporting program 1** | **Supporting program 2** |
| **Title of the program**  |  |  |
| **Objective of the program**  |  |  |
| **Description of the program** |  |  |
| **Key partners to implement the program** |  |  |

# FINAL NOTES