

SANITATION SAFETY PLANNING

Step-by-step: Module 3 & 4



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MODULE 3
IDENTIFY HAZARDS,
ASSESS EXISTING
CONTROLS, AND
ASSESS EXPOSURE RISK



SSP Manual pages 39 - 55



Module 3 answers the question:
“How significant are the risks?”

Module 3



Ensures that subsequent efforts and investments in system monitoring and improvements respond to highest health risks first.

Module 3: Overview

Modules

Outputs



- 3.1 Identify hazards and hazardous events
- 3.2 Refine exposure groups and exposure routes
- 3.3 Identify and assess existing control measures
- 3.4 Assess and prioritize the exposure risk

- A risk assessment table
- A prioritized list of hazardous events
(see next slide)



SSP Manual p 40



Module 3: Outputs

Sanitation Element	Hazard Identification		Existing Control(s)		RISK ASSESSMENT allowing for the existing control L=Likelihood; Se=Severity; Sc=Score; R=Risk level					
	Hazardous Event	Hazrd type	Exposure route	Description of existing control	Validation of control	Exposure Group	L	Se	Sc	R
F1: Sewer system	Exposure to raw sewage in open drains causes illness	Diarrhoea	Inadvertent ingestion	Nil (personal protective equipment not used)	n/a	W1	5	4	20	H
		Helminth risks	Skin	Boots worn	Visual	W1	3	2	6	M
	Exposure to raw sewage during pump and pipe repair procedures	Diarrhoea	Inadvertent ingestion	Nil		W1	3	4	12	M
		Helminth risks	Skin	Boots worn	Visual and survey	W1	1	2	2	L
	Exposure to raw sewage in open drains causes illness and / or injuries	Diarrhoea	Inadvertent ingestion	Nil	n/a	LC1	4	4	16	H
		Helminth risks	Skin	Nil	n/a	LC1	3	2	6	M
	Exposure to raw sewage in open drains causes illness and / or injuries IN FLOODs	Diarrhoea	Inadvertent ingestion	Nil	n/a	LC1	5	4	20	H
		Helminth risks	Skin	Nil	n/a	LC1	5	2	10	M
	Falling into drains during maintenance in flood times	All microbial pathogens + Physical	Falling into raw wastewater	Working in pairs	Observation and worker training	W1	3	8	24	H

Hazardous events	Exposure group
Falling into open drains in flood times	L1
Exposure to raw sewage in open drains during maintenance activities	W1
Exposure to raw sewage in open drains when playing	L1
Falling into open drain resulting in injury	L1
Exposure to raw sewage due to overflowing drains in flood times	L1
Falling into drains in flood times	L1
Falling into drains during maintenance in flood times	W1
Ingestion of contaminated groundwater due to leakage from sewers and drains into shallow groundwater in floods	L1
Mosquito breeding in stagnant water enhances transmission of malaria	L1
Exposure to raw sewage in open drains during farming activities or playing	F1 F2 L1
Falling into open pit	W2

Risk assessment table Summary of:

- hazards;
- hazardous events;
- exposure groups and transmission routes;
- existing control measures; and
- and their effectiveness



A prioritized list of hazardous events



Module 3 involves:



Desktop analyses



Field investigations



Module 3 requires:

- A **technical understanding** of the various components
- An appreciation of the **pathways that lead to exposure or contamination**
- An **inquisitive mind**. Ask:
 - How could people be exposed to the hazard?
 - How has it caused an exposure in the past?
 - Is the hazard an ever-present hazard or is it only related to a specific event?
 - What has gone wrong in the past?
 - What could go wrong?



SSP Manual Guidance
Note 3.1 p 45

Module 3.1



Hazard \neq Hazardous Event (HE)



SSP manual Guidance
Note 3.2 page 46

Hazard, hazardous event, effect, risk, ...!?



Example 1: wastewater channel



Example 2: produce



Hazard, hazardous event, effect, risk, ...!?



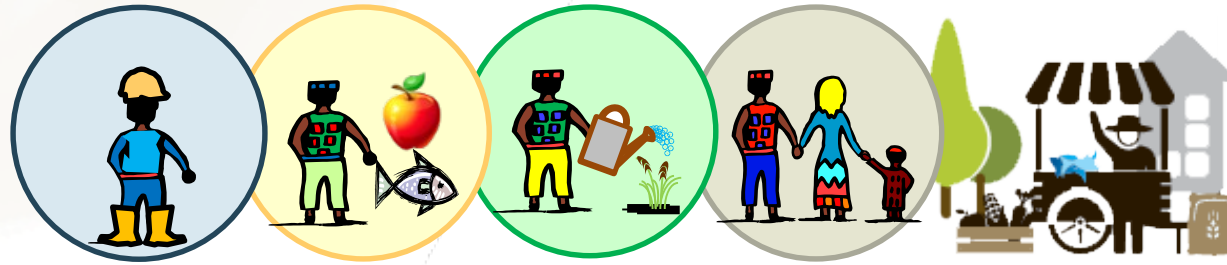
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	Falling into drains during maintenance in flood times	All microbial pathogens + Physical	Falling into raw wastewater	Working in pairs	Observation and worker training	W1	3	8	24	H

Module 3.2: Refine exposure *groups* and exposure *routes*



PURPOSE!

To identify, in detail, who may be at risk of exposure to hazards:



This will help to determine controls for hazardous events that are specific for each exposure group



SSP manual page 42,
Tool 3.1, Guidance Note 3.3.
Newtown SSP examples



6 questions to refine exposure groups



Who are they?

How many are there?

Where are they?

What are they exposed to?

What is the route of transmission?

How often are they exposed?



SSP manual Tool 3.1
(p 51) for more detail

6 exposure & transmission routes



Ingestion (unintentional)
after contact with
wastewater/excreta



Ingestion of
contaminated water



Consumption of
contaminated
produce



Dermal (skin)
contact with excreta
and wastewater



Vector-borne with
flies/mosquitoes



Inhalation of
aerosols and
particles

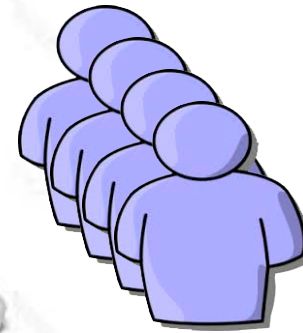
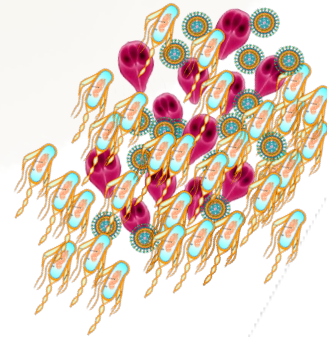


SSP manual
Guidance
Note 3.3
p 47

Module 3.3: Identify and assess existing control measures



To determine how well the existing system protects those at risk

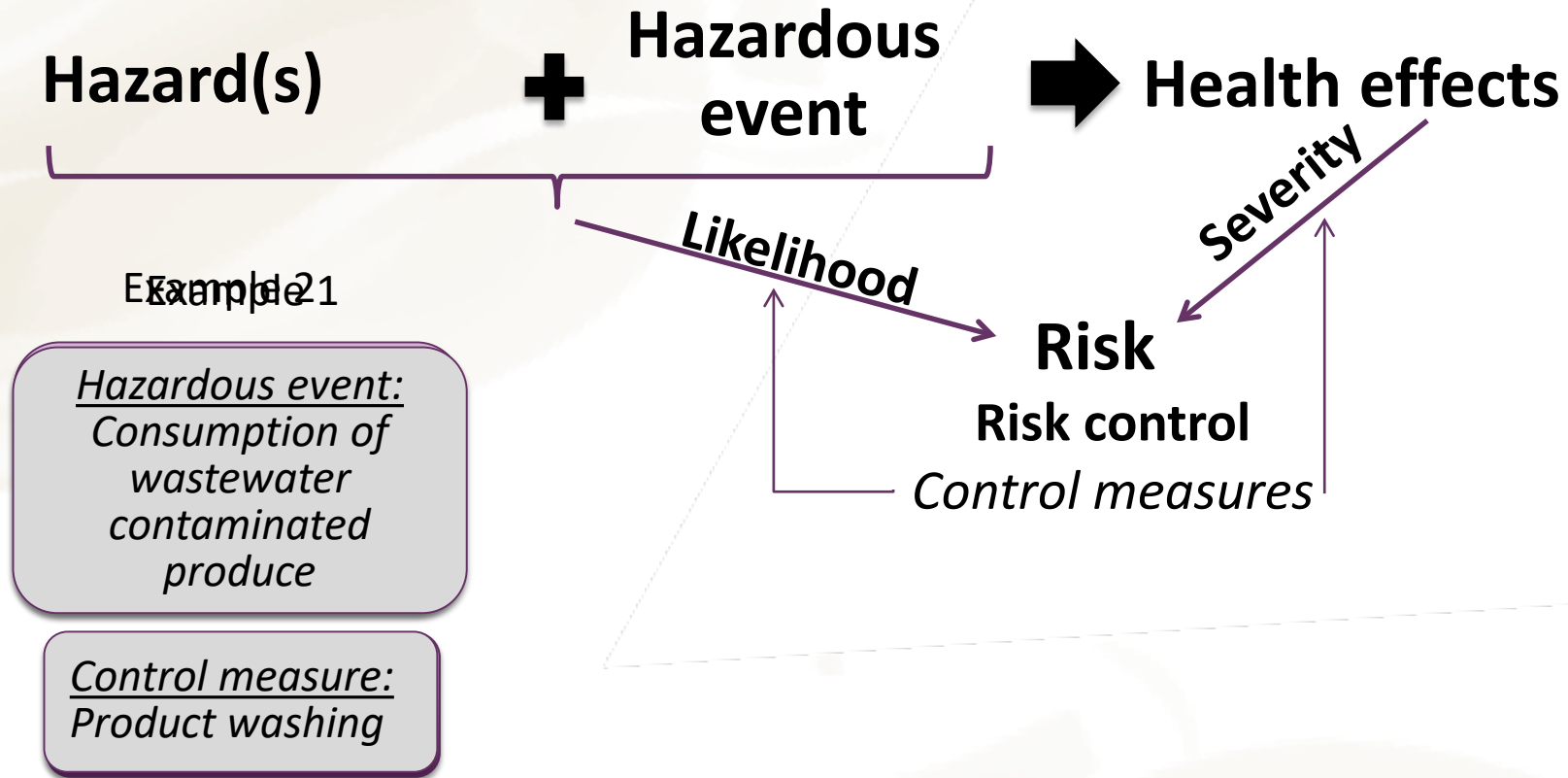


Sanitation system



SSP manual p42,
Guidance Note 3.4 p 48 and
Annex 1 p 122

Hazard, hazardous event, effect, risk, ...!?





What is a control measure?

A control measure is any action or activity (or **barrier**) that can prevent or eliminate a sanitation-related hazard, or reduce it to an acceptable level

Treatment

- Settling tanks, activated sludge, etc.

Non-treatment

- Crop selection, irrigation type, etc.

Non-technical

- Personal protective equipment, improved produce washing, vaccination, drugs, etc.



SSP manual Guidance
Note 3.4 p 48

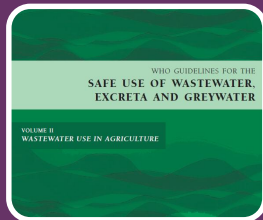


Guidance to assess CM effectiveness...



SSP manual

- Annex 1 page 122 – open now



2006 WHO Guidelines

- Chapter 5 in volumes 2, 3 and 4

Module 3.4: Assess and prioritize the exposure risk measures

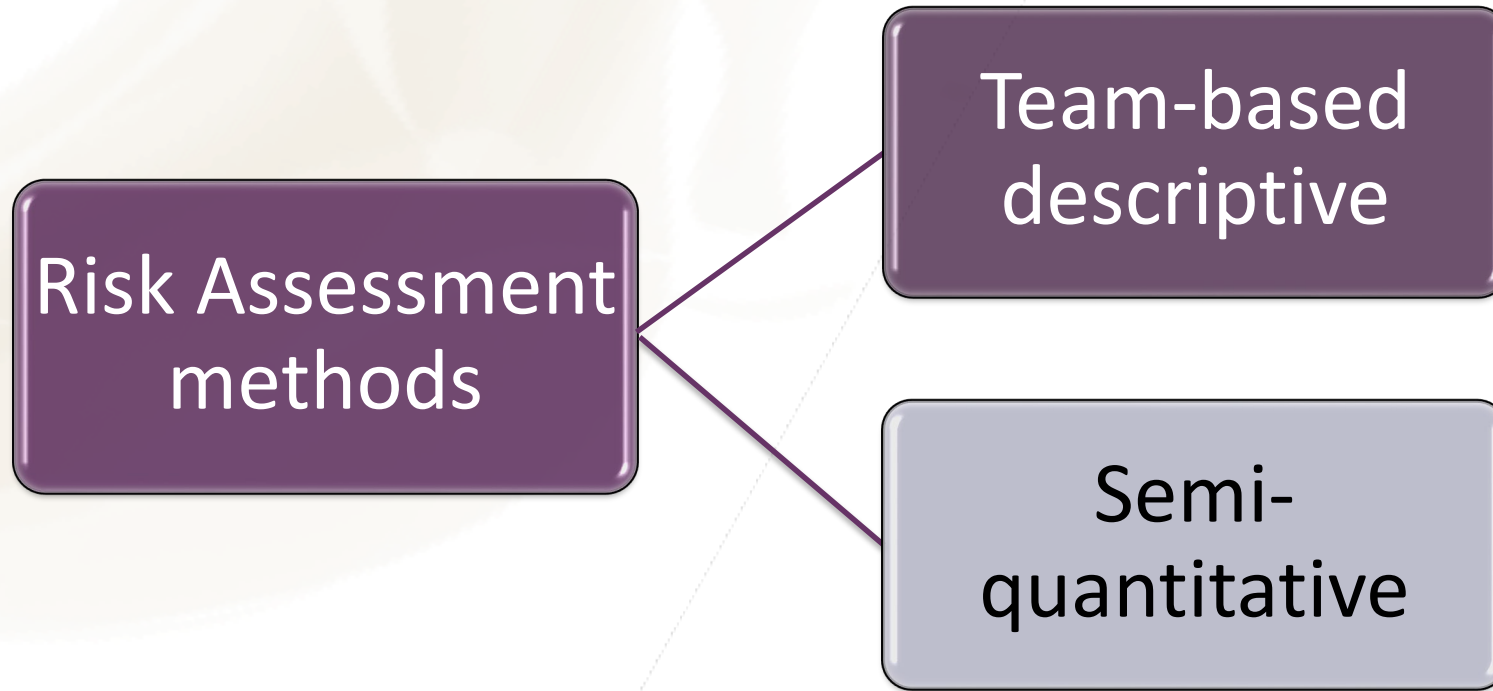


To provide a structure for prioritizing the highest risks for further attention

Helps to identify which hazardous events are serious and which are moderate or insignificant.



SSP manual page 43,
Tools 3.2, 3.3 & 3.4,
Guidance Note 3.7, and
Newtown SSP



Choose a method that the SSP team is comfortable with and that is feasible



Team-based descriptive risk assessment

Suggested tool

RISK DESCRIPTOR	NOTES
High priority	It is possible that the event results in injuries, acute and/or chronic illness or loss of life. Actions need to be taken to minimize the risk.
Medium priority	It is possible that the event results in moderate health effects (e.g. fever, headache, diarrhoea, small injuries) or unease (e.g. noise, malodours). Once the high priority risks are controlled, actions need to be taken to minimize the risk.
Low priority	No health affects anticipated. No action is needed at this time. The risk should be revisited in the future as part of the review process.
Unknown priority	Further data is needed to categorize the risk. Some action can be taken to reduce risk while more data is gathered.



SSP manual Tools 3.2 p 52

Semi-quantitative risk assessment method



Likelihood (L) x Severity (S) = Risk

Uses definitions of L and S and a risk matrix



SSP manual Tools
3.3 & 3.4 pp 52 & 53



Definitions

Risk matrix

TOOL 3.3

Suggested risk definitions for semi-quantitative risk assessment

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 background levels.
2 Minor	Hazard or hazardous event symptoms like irritation, nausea, etc.
4 Moderate	Hazard or hazardous event illness (e.g. acute diarrhoea).
8 Major	Hazard or hazardous event schistosomiasis, food-borne problems, neurological disorders and/or may lead to legal action and/or major regulatory non-compliance.
16 Catastrophic	Hazard or hazardous event of life (e.g. severe poisoning) lead to major investigation.

TOOL 3.4

Semi-quantitative risk assessment matrix

		SEVERITY (S)					
		Insignificant	Minor	Moderate	Major	Catastrophic	
LIKELIHOOD (L)	Very unlikely	1	2	4	8	16	
	Unlikely	2	4	8	16	32	
	Possible	3	6	12	24	48	
	Likely	4	8	16	32	64	
	Almost Certain	5	10	20	40	80	
Risk Score R = (L) x (S)		7-12				13-32	>32
Risk level		Low Risk		Medium Risk		High Risk	Very High Risk



SSP manual Tools 3.3 & 3.4 pp 52 & 53, Guidance Note 3.7 (p 50)



End of Module 3



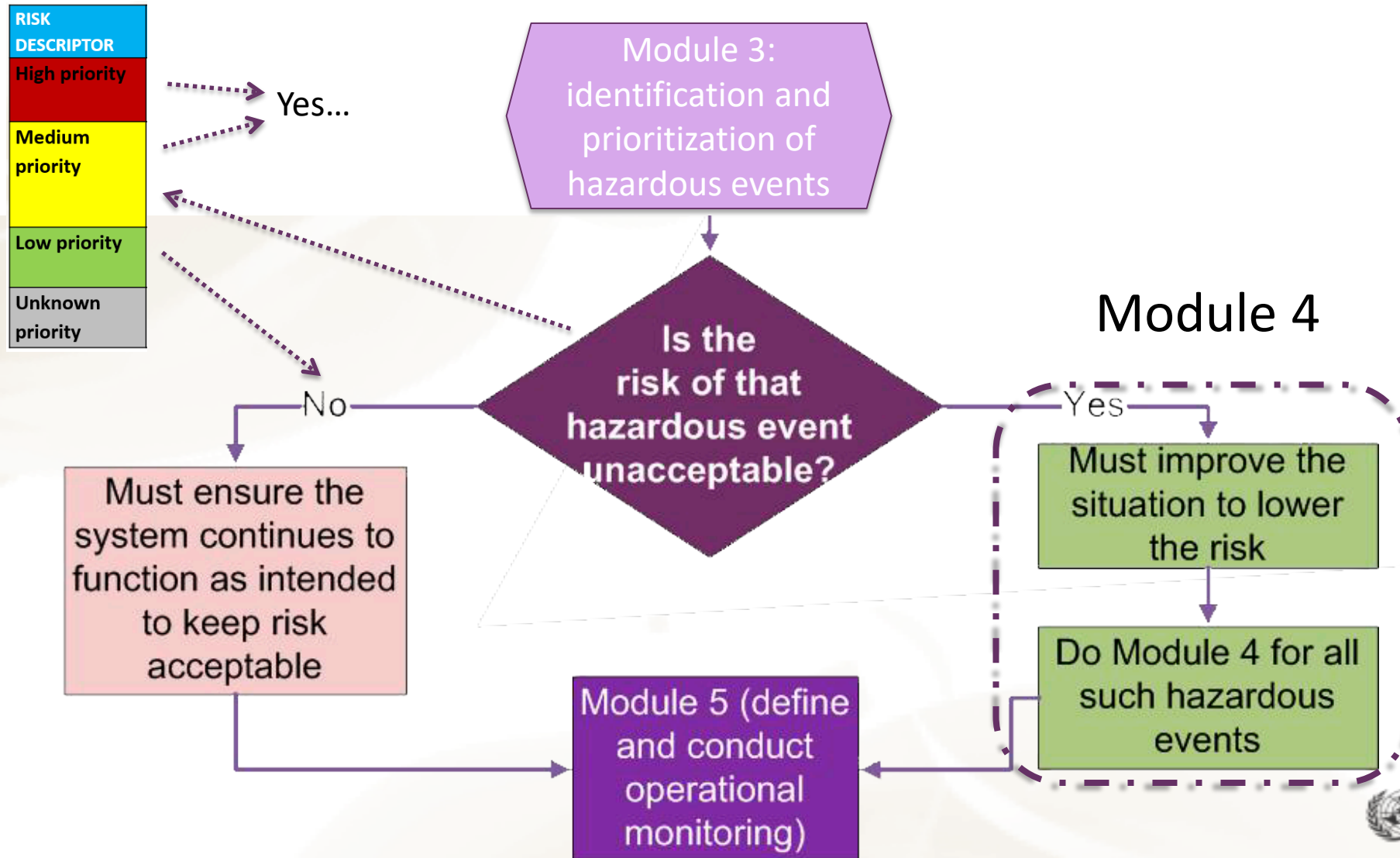
MODULE 4
DEVELOP AND
IMPLEMENT AN
INCREMENTAL
IMPROVEMENT PLAN



SSP Manual pages 57-67

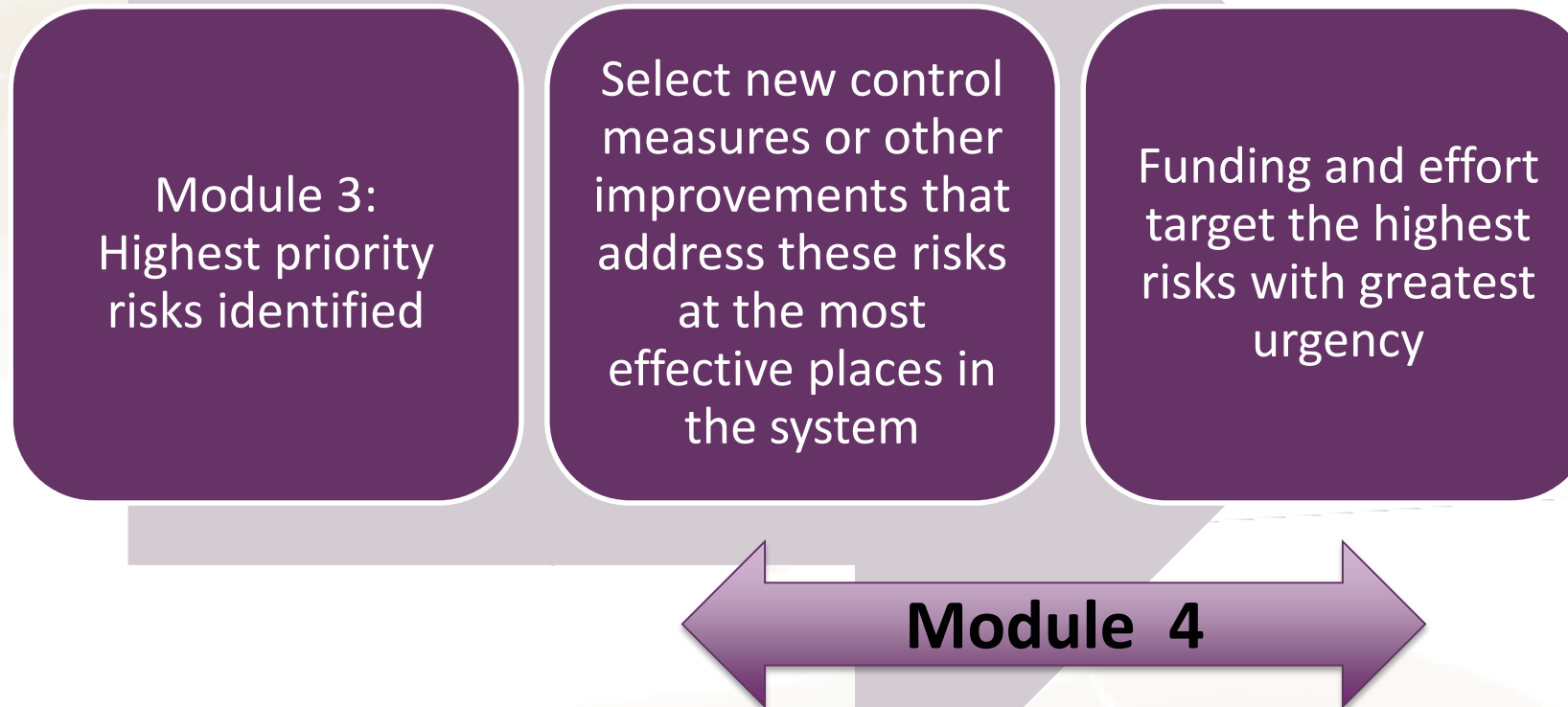


Modules 3, 4 and 5 flow





Module 4: Flow



Module 4: Overview



- 4.1 Consider options to control identified risks
- 4.2 Use selected options to develop an incremental improvement plan
- 4.3 Implement the improvement plan

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

Modules

Outputs



Module 4.1: Consider options to control identified risks



To help SSP teams choose the most appropriate way to control risks by considering a variety of options

These options may include:

- short and long term plans, treatment, non-treatment and behaviour options, and
- a range of locations along the sanitation chain.



SSP manual p 59,
Guidance Note 4.1 (p 61) &
Examples 4.1, 4.2 (p 64)



Improvement examples

Capital works	Operational measures	Behavioural measures	A combination of these
<ul style="list-style-type: none">• Additional treatment plant or specific process elements	<ul style="list-style-type: none">• New work procedures,• Vector-control	<ul style="list-style-type: none">• Improved personal protective equipment,• Health education,• Regular medical check-ups	<ul style="list-style-type: none">• Capital and operational



SSP manual Annex 1 (p 122-134) for examples

Module 4.1



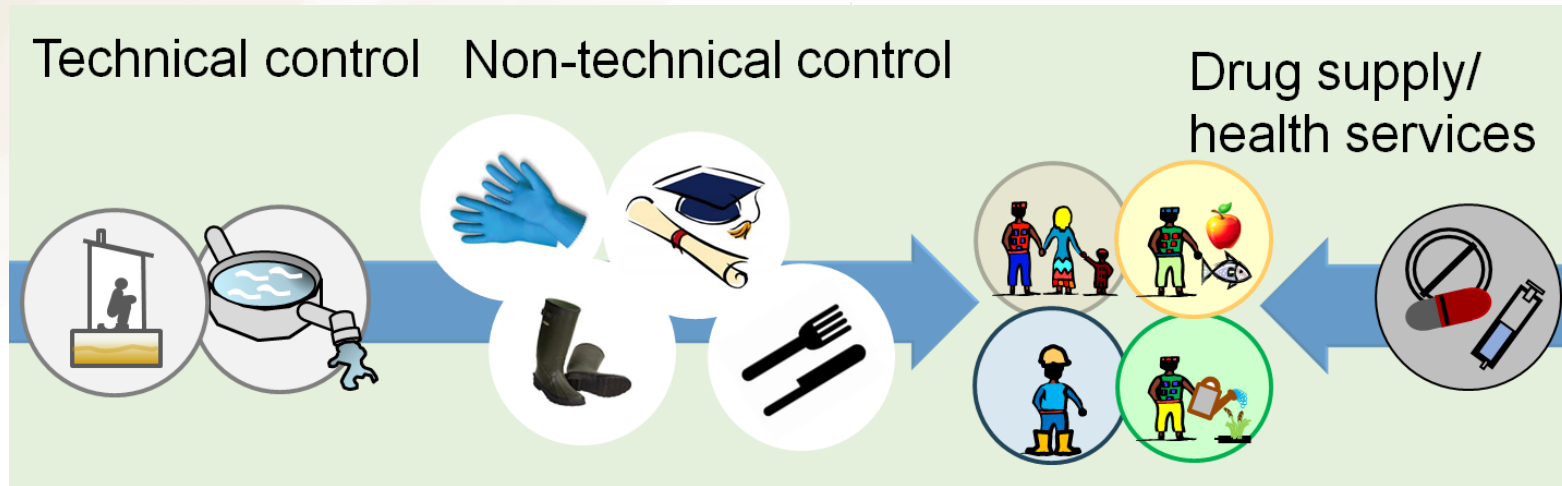
Targets may not be immediately met
→ Use a step-wise approach to get **incremental** improvements.



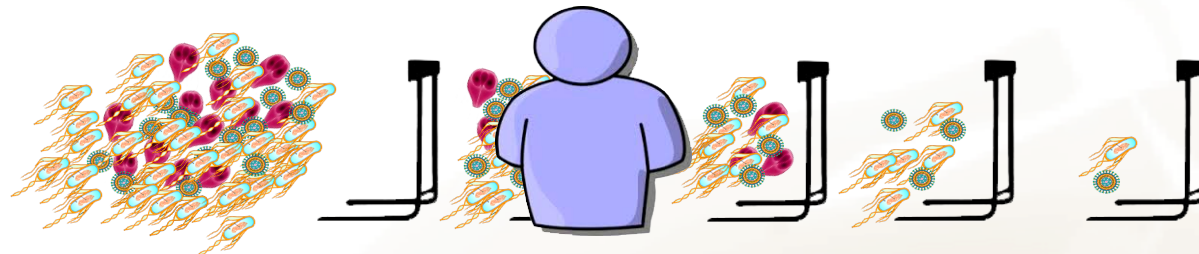
SSP manual Example 4.2
page 64

Multiple barrier approach

Sanitation systems should provide more than one barrier against the different types of pathogens (**multiple barriers**)



SSP manual
Guidance
note 4.1
page 61-62



Examples of control measures for wastewater/sludge in agriculture



- **Additional treatment** of wastewater to $<1000 E. coli/100$ ml and < 1 helminth egg / litre
- Protect wastewater treatment and storage facilities from **animal and insect vectors**
- **Crop selection** according to wastewater quality
- Farm **worker's protection**
- **Post harvest controls**



See SSP Manual Annex 1 Table A1-4, p 128, and WHO 2006 Guidelines Vol 2, Chapter 5

Examples of control measures in composting



- **Transport and storage** – faecal sludge removal (manual *versus* suction tanker), worker protection, etc.
- **Treatment** – includes combinations of storage, and temperatures
- **Application** – crop restriction, worker protection/practices, pathogen die off period
- **Post harvest** (consumer protection) – e.g. produce washing etc



See SSP Manual Annex 1, parts of
Table A1-4 pp128-131



Types of control measures for CBS systems

Substitute the hazardous equipment

- Modify toilet to remove dead spaces
- Change hazardous process step

Improve treatment controls

- Heat or chemical inactivation
- pH shocks

Improve non-treatment controls

- Change collection timings
- Fly/vector control

Use SOPs

- Standard operating or working procedures



SSP manual page 59



Module 4.2: Use selected options to develop incremental improvement plan



To consolidate the options into a clear plan of action

- **Prioritise** plan, based on hazardous events with highest risks
- Identify **who** (institution and individual) takes action
- You may choose more **affordable interim control measures**



SSP manual page 60,
Examples 4.2 – 4.7,
Newtown SSP



Module 4.3: Implement the improvement plan



To achieve the expected benefits

The SSP team should monitor and report on the implementation status of the improvement plan.



End of Module 4