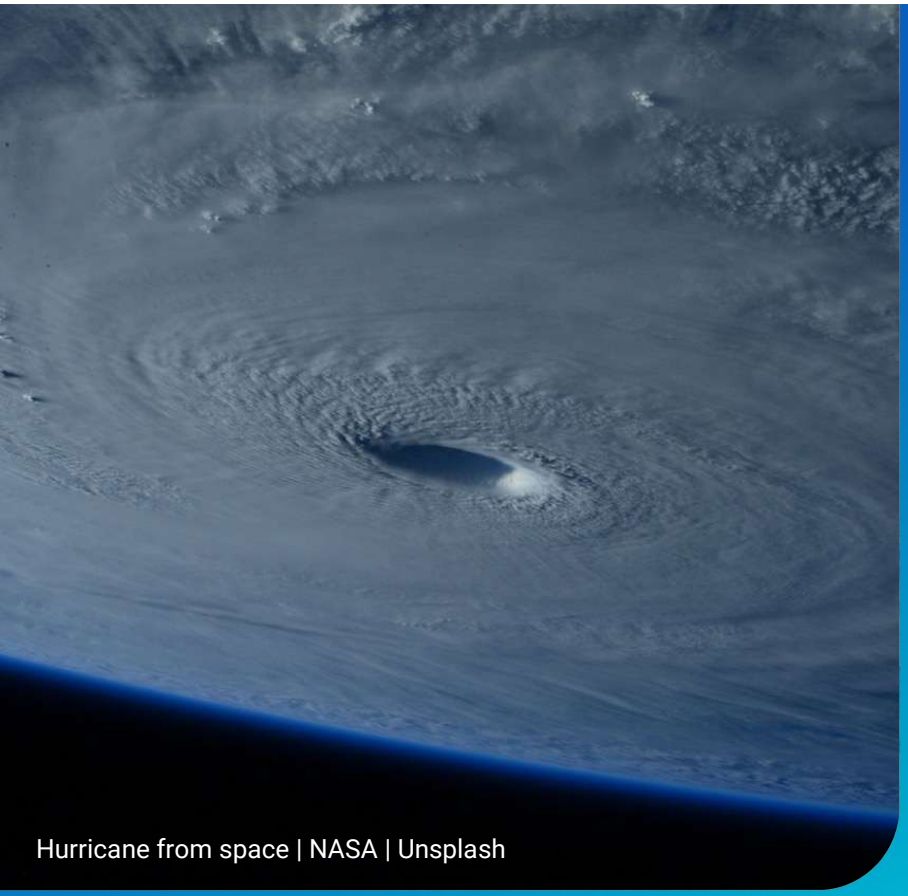


Hurricane from space | NASA | Unsplash

MODULE 3

Climate Risk Assessments

Acknowledgements

We would like to acknowledge the following partners and funders involved in designing and delivering the Climate Resilient Water Services Masterclass:

The Modules were developed with

GLOBAL CENTER ON ADAPTATION

IRC Supporting water sanitation and hygiene services for life

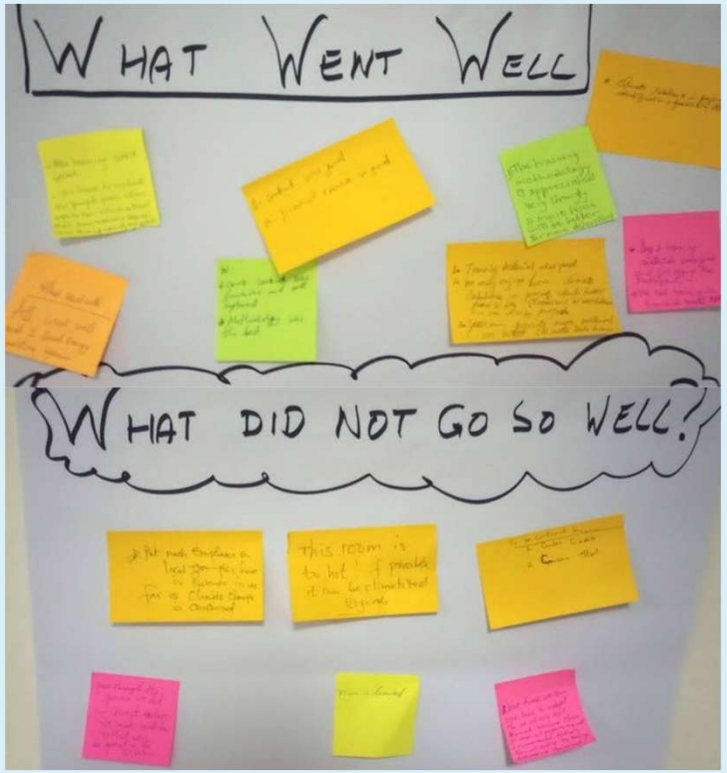
Today’s focus

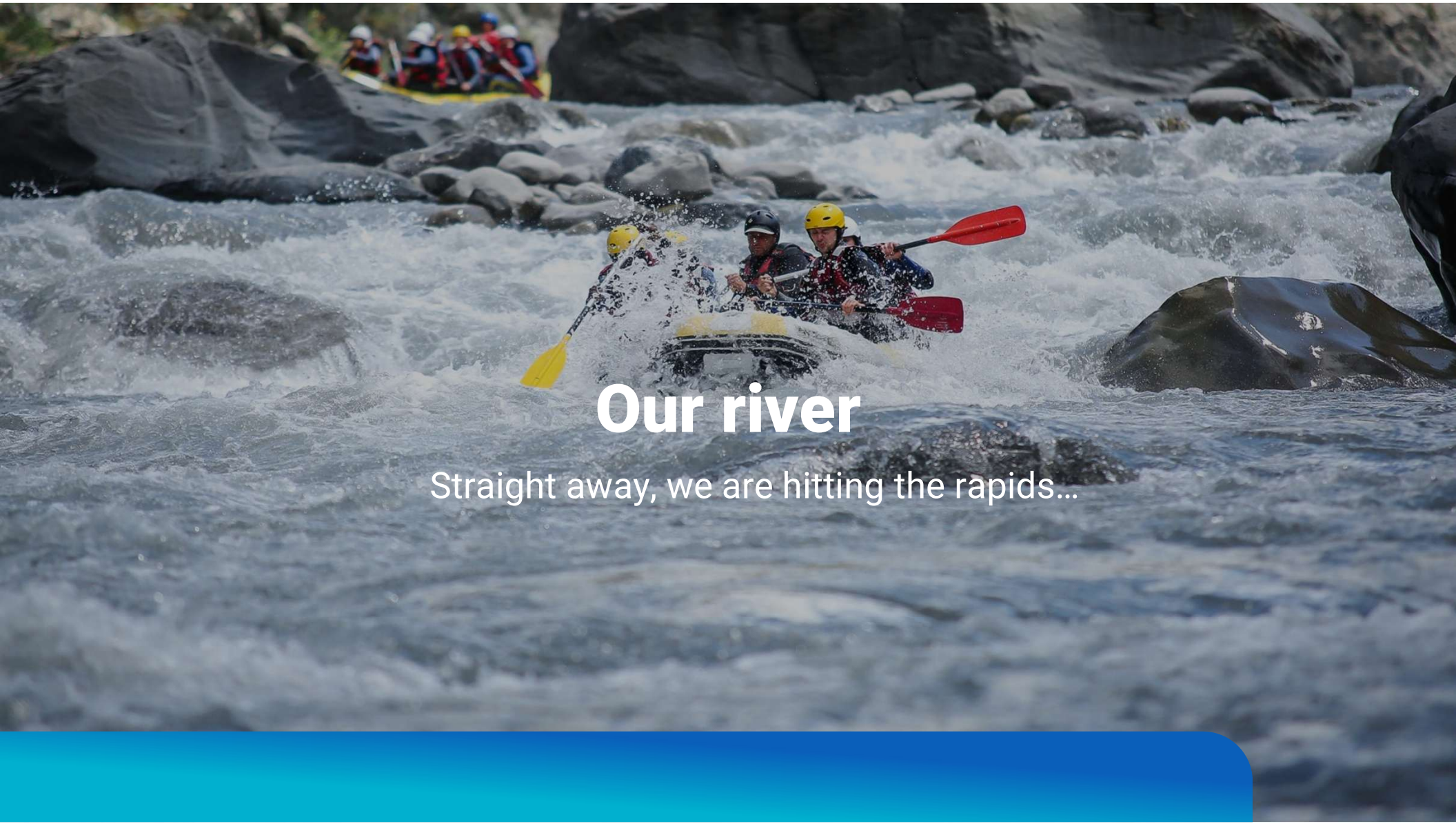
01	Overview Module 3 Including Learning objectives
02	The river: Upstream and downstream water resources
03	Recap: Climate risks
04	Climate risk assessments
	LUNCH
05	Climate risk assessments outputs
06	Climate risk assessment tools
07	Exercise: Decisions for the decade
08	A quiz & end of the day reflection

Feedback

Short feedback on follow-up of yesterday's feedback session.

Parking lot review

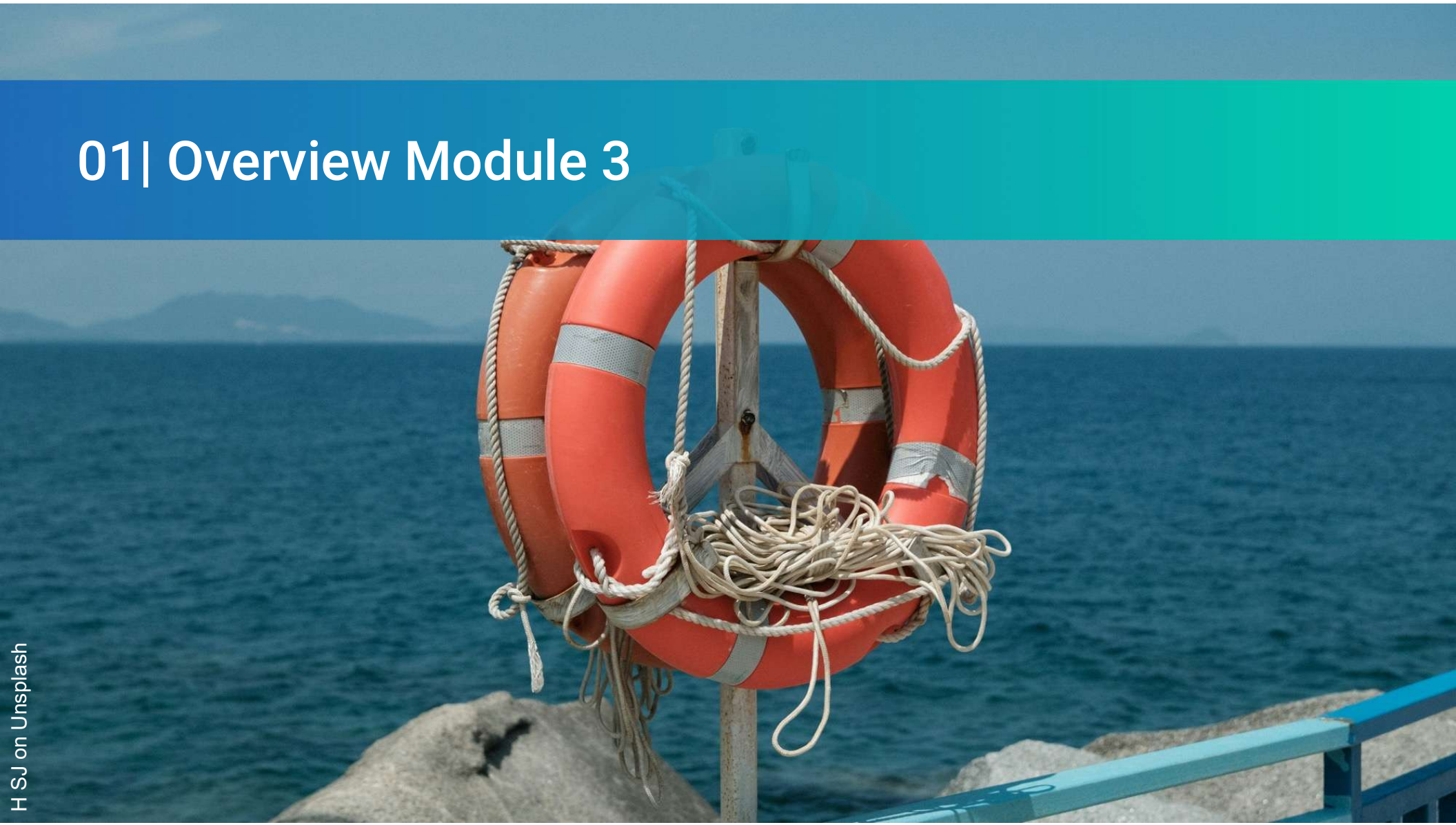




Our river

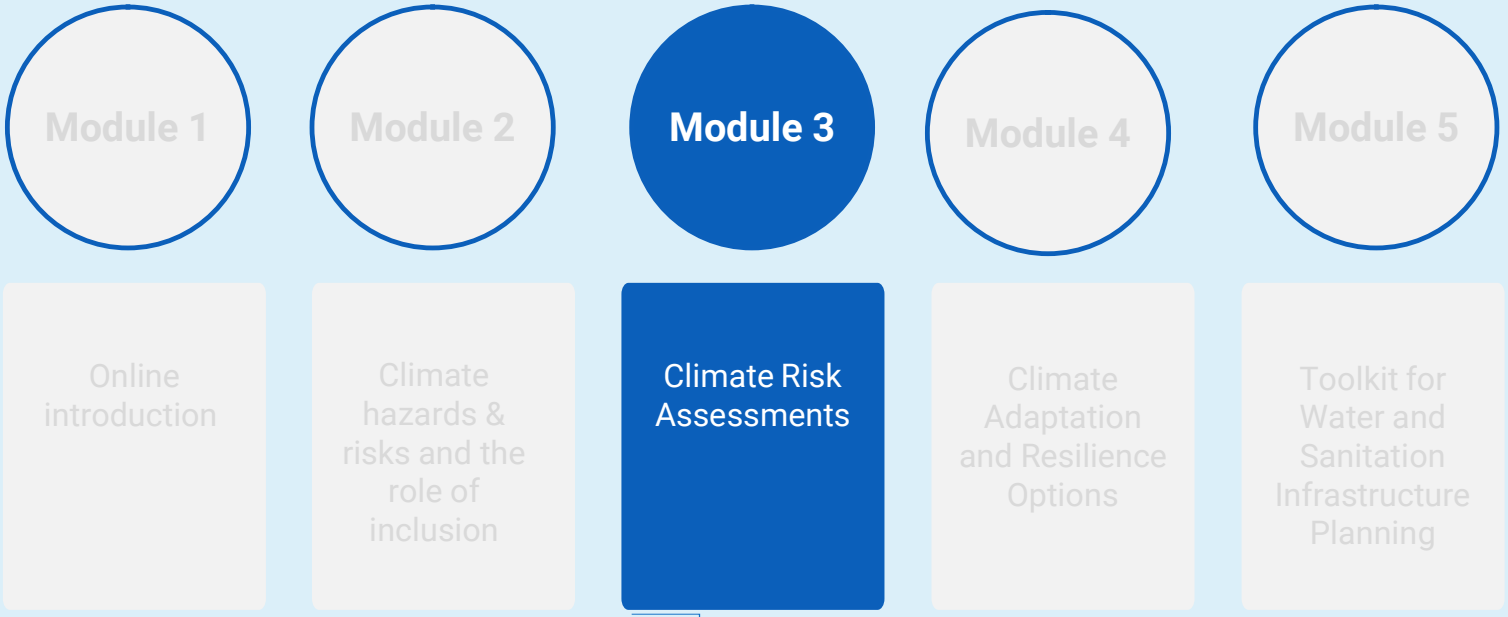
Straight away, we are hitting the rapids...

01| Overview Module 3

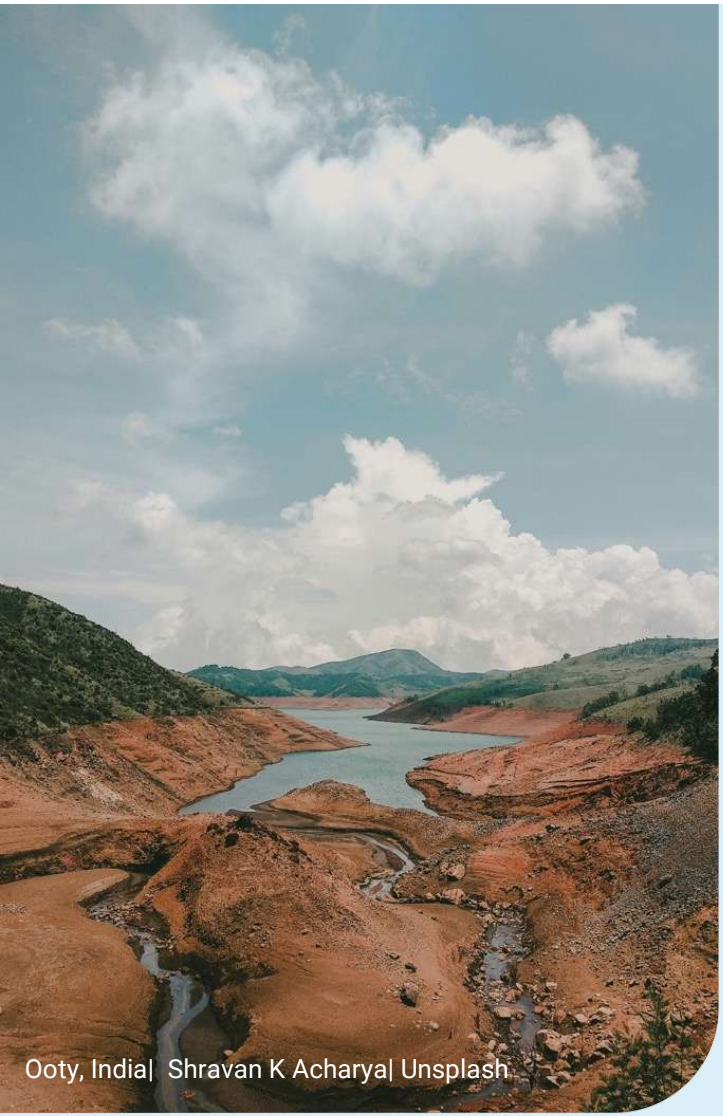


H SJ on Unsplash

Masterclass overview



Explores principles and practical steps involved in conducting, commissioning, or managing climate risk assessments.



Ooty, India| Shravan K Acharya| Unsplash

MODULE 3

Risk Assessments

In this module, participants will explore the core principles and practical steps involved in conducting, commissioning, or managing climate risk assessments tailored to local contexts and specific projects.

It builds on the broad risk categories introduced in Module 2.

Duration: 1 day

Learning objectives



MODULE 3 Learning objectives

By the end of this module, participants will be able to:

- **Explain** the fundamentals of climate risk assessment, with a focus on aligning assessments with local conditions and project-specific needs.
- **Describe** key tools and resources used to identify and evaluate climate risks.
- **Include** vulnerable groups, including women and marginalized populations, to ensure inclusive and equitable risk analysis.
- **Recognise** uses and limitations of climate models

02| Upstream and downstream water resources



Photo by Jachan DeVol on Unsplash

The water you depend on and the water you risk polluting

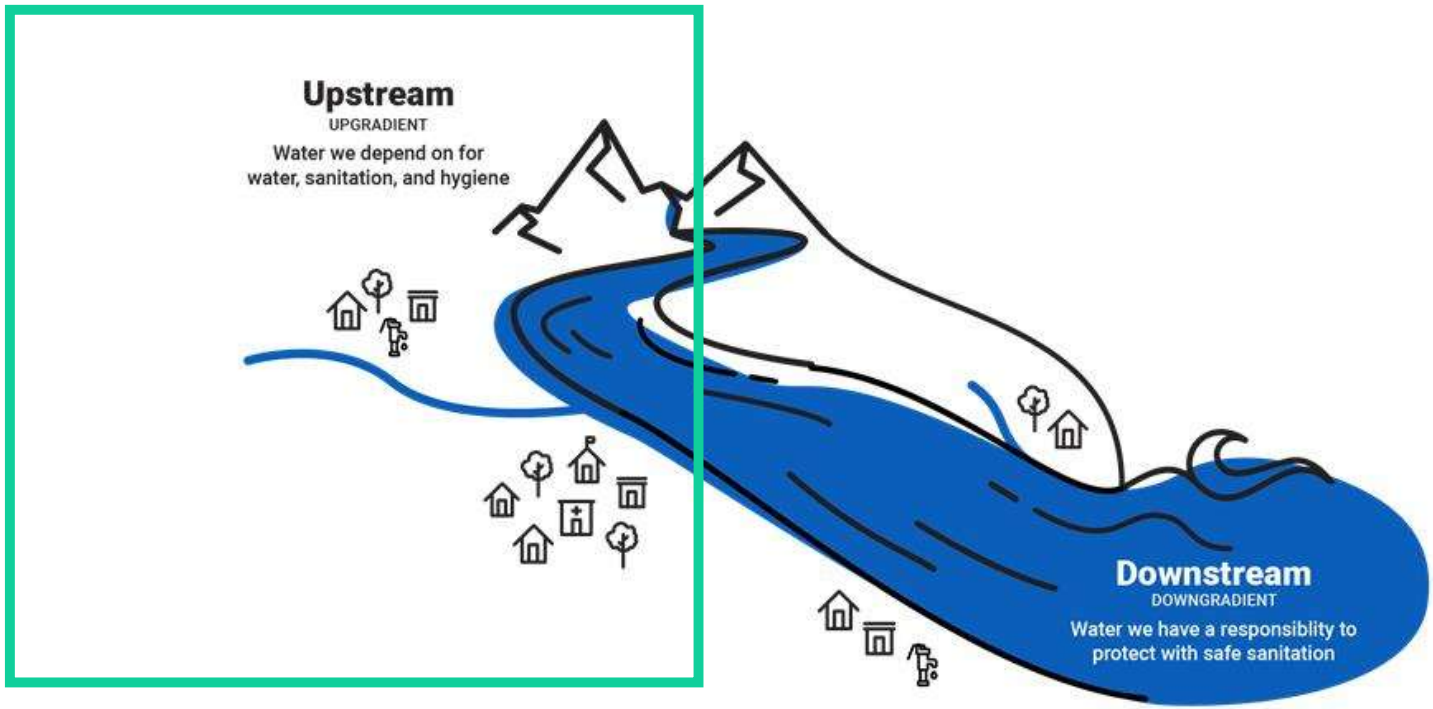


Figure: Upstream and downstream water resources

River exercise: Upstream and downstream water resources

- With your neighbour, think of three examples of water services, write them on a note and place them along the rope

- Find your place along the rope where you work most



03 | Recap: Climate risks



Tommas Tanies

Recap: What is a climate risk?

Climate risk is the chance of negative consequences for people and nature because of climate change.

Risks happen when climate hazards affect exposed and vulnerable people, communities or systems.

Climate risk is therefore closely linked with issues of equity and inclusion – since risks are made worse by vulnerable and marginalized groups.

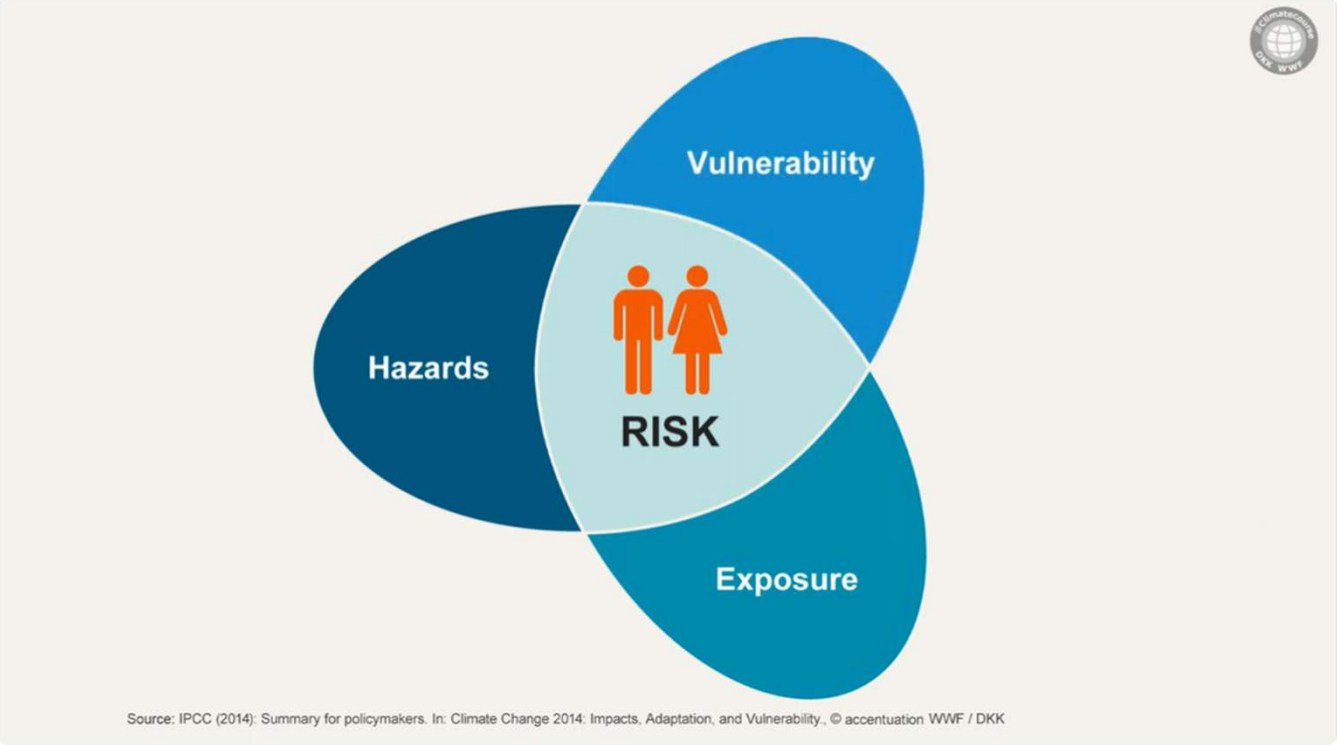
Climate risks occur as a results of three inter-linked elements:

- **Hazard:** climate event e.g., drought, flood, landslide
- **Exposure:** being in places that could be negatively affected
- **Vulnerability:** likelihood of being negatively affected. This is often made worse by inequality and social exclusion.



Risk = Hazard x Exposure x Vulnerability

Recap: What is a climate risk?



NEW TERM

Climate risk assessment

Risk = Hazard x Exposure x Vulnerability

Risk = Hazard (likelihood & probability) x Exposure x $\frac{\text{Vulnerability/Sensitivity}}{\text{Adaptive Capacity}}$

Hazards assessment

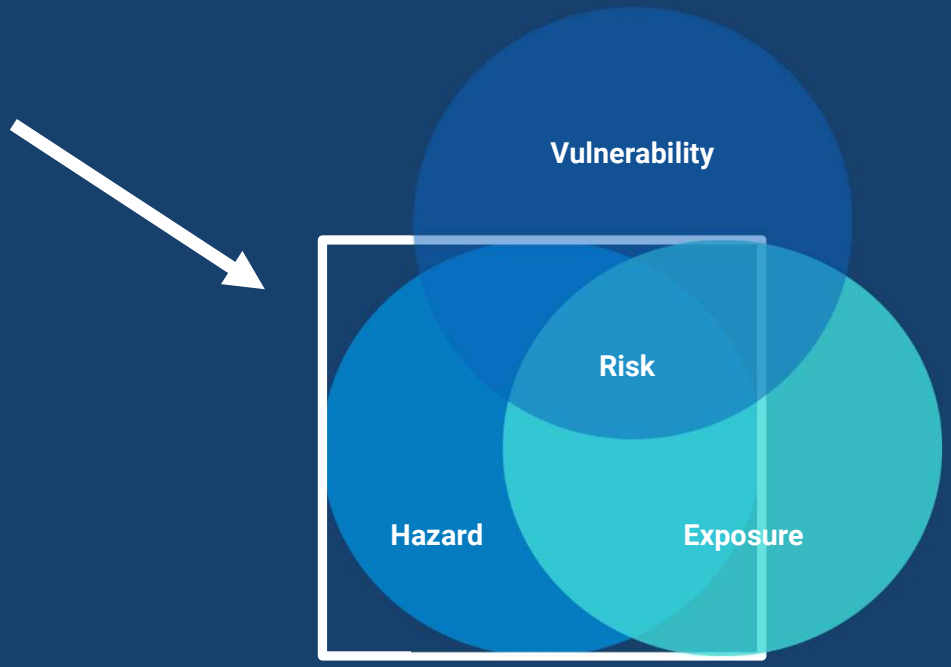


Figure: Climate risk results from the interaction of hazard, vulnerability and exposure

A hazard has two important parts:
Likelihood / probability: How likely the event is to happen
Example: a flood that happens once every 10 years
Intensity: (severity) How strong or severe the event is
Example: flood depth, drought length, temperature

Exposure assessment



Figure: Climate risk results from the interaction of hazard, vulnerability and exposure

Exposure means the people, assets, or services that are located where the hazard can occur.

Examples:

People living in a floodplain

A water intake located in a river

A pipeline crossing unstable ground

If nothing is exposed, there is no risk — even if a hazard occurs.

Vulnerability assessment

Vulnerability (susceptibility to damage)
Consists of
Adaptive Capacity (ability to anticipate, cope, respond, and recover)



Figure: Climate risk results from the interaction of hazard, vulnerability and exposure

Climate impacts on marginalised groups

Women & girls:

- A combination of social, economic, and cultural factors intersect with climate impacts making women and girls disproportionately vulnerable to climate risks.
- These factors include gender roles and responsibilities; limited resources; economic dependence; health risks, gender-based violence and limited decision-making power.

People living with disabilities

- These people face physical barriers that limit their mobility and ability to access information, services, and resources during climate-related emergencies e.g. inaccessible infrastructure and limited transportation options can hinder evacuation efforts and access to shelters.
- They are also more likely to experience poverty and economic marginalization, which can limit their ability to prepare for and recover from climate-related impacts.



Women in ASAL regions travel long distances for water; Photo by Bartosz Hadyniak

Example

Flood risk to a rural piped water scheme

Hazard

- Likelihood: Flood probability: 10% per year
- Intensity: Expected flood depth: 1 m

Exposure

- Intake, pump house, and distribution network serving 12,000 people

Vulnerability (without capacity)

80% probability of pump failure at 1 m flood depth

Capacity measures

- Raised pump platform
- Trained local operator
- Spare parts and emergency budget

Resulting vulnerability

- Failure probability reduced to 30%
- Recovery time reduced from weeks to days

Outcome: Risk is significantly reduced without changing the flood probability, purely through increased capacity.

By assessing risks, you can identify

- Likelihood of hazards that could have an impact
- Who and what is exposed to these hazards
- Vulnerabilities of those exposed and the projected damage of a hazard
- To what extent the risks can be reduced or mitigated

What changed in terms of risks?





Before - Ibisi bya Huye water supply system in Huye District – Temporary pipeline crossing on the Butamu River area after the original pipeline was washed away.	After - Ibisi bya Huye water supply system in Huye District – newly constructed reinforced pipe crossing on the Butamu river.

Source: UNICEF/World Vision Rwanda (2022), Project Reports, Rehabilitation of Damaged Water Supply Systems in Rwanda

What changed in terms of risk?





Before - Amayaga sud water supply system in Gisagara District – damaged pipeline at Kibirizi village.	After - Amayaga sud water supply system in Gisagara District – newly constructed pipe crossing with gabions.

Source: UNICEF/World Vision Rwanda (2022), Project Reports, Rehabilitation of Damaged Water Supply Systems in Rwanda

Climate risks that might occur

Degraded water & sanitation, water-borne diseases
Higher temperatures and increased rainfall, combined with a lack of adequate sanitation infrastructure can lead to higher incidence of water and vector borne diseases.



Displacement and shelter needs
Storms, cyclones and typhoons can cause destruction of housing and public infrastructure, and loss of lives.



Climate risks that might occur

Increased water stress & water scarcity
Increase in frequency of droughts can lead to acute shortage of safe and reliable water supply for drinking and industrial purposes.





Discuss

What are the climate risks in your context?

- What hazard does your context face?
- Who will they affect?
- Can you link any particular vulnerable groups?

Any questions or sharing to the room is welcome, please raise your hand.



Multi-Sectoral Team Conducts Feasibility Study and Community Engagement; Photo by Mandera County Government

04 | Climate risk assessments



Ibrahim Boran

What is a climate risk assessment?

A CRA identifies the likelihood of future climate hazards and their potential impacts for a city and its communities.

Outputs often include spatial patterns showing the impact of hazards on infrastructure, settlements and communities.

A CRA provides quantitative and qualitative estimates of climate risk.



Photo by Genevieve French, Greenpeace

Main Steps of a CRA

Step 01 | Establish the decision-making context. What are the objectives of the CRA? What decision is to be made? Set the scope.

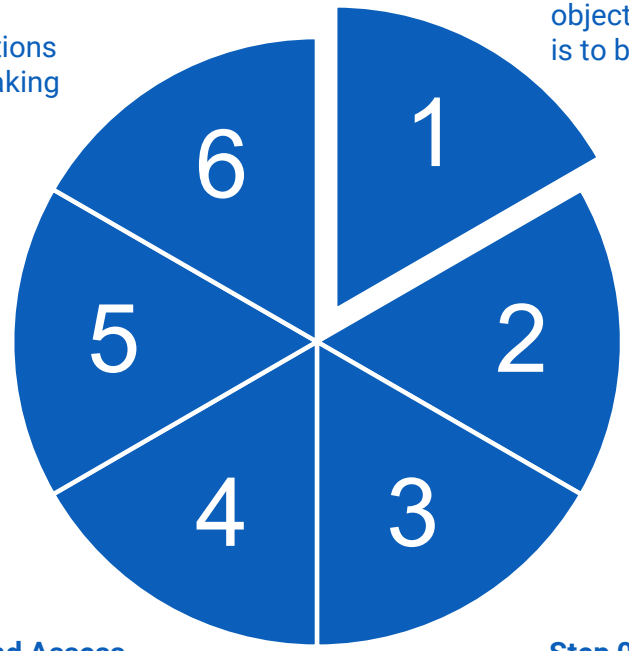
Step 02 | Assess hazards
Identify the probability, intensity and timescale of current and future climate hazards.

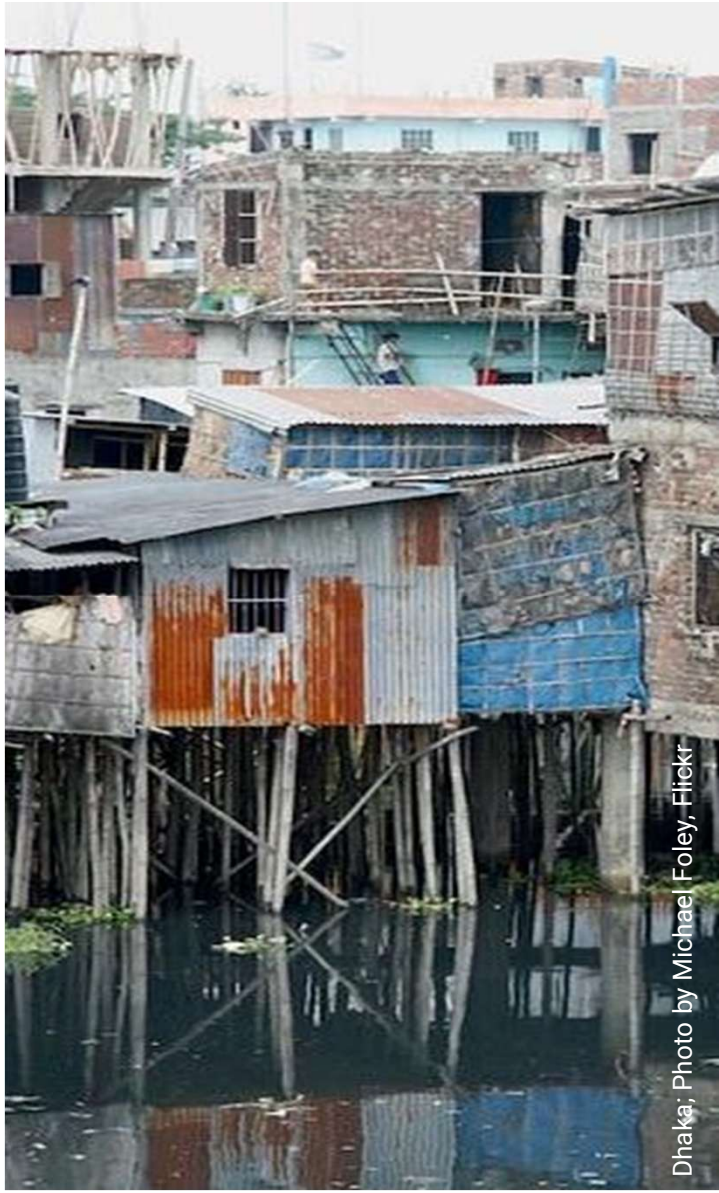
Step 03 | Assess impact
What are the potential impacts of those hazards on people, assets, services and the environment? Includes analysis of exposure, sensitivity and adaptive capacity.

Step 04 | Identify and Assess risks. Determine risks based on the likelihood of a hazard occurring and the consequence of the identified impacts.

Step 05 | Identify resilience building options
Determine a long list of adaptation options.

Step 06 | Appraise resilience building options. Assess options against decision-making criteria; prioritize resilience options.





Dhaka; Photo by Michael Foley, Flickr

Step 01 | Establish the decision-making context

What decisions need to be made?

- Investing in a new infrastructure asset? Upgrading or rehabilitating old infrastructure?
- Building resilience of a vulnerable sub-county or community?
- Developing a climate strategy? Integrating climate risk into existing policies or plans?

Questions to set the scope of the CRA:

- What is the system(s) of interest? (sector, assets, specific community)
- What resources are available?
- What are the geographic boundaries of the assessment?
- What are the relevant timescales for assessment?
- Which hazards are most relevant?



Photo by World Bank

Step 02 | Assess Hazards

2.1 | Determine relevant climate hazards

2.2 | Select relevant hazard indicators

2.3 | Analyze historical trends and events

2.4 | Analyze future projections across different scenarios

It can be helpful to categorize hazards by climate themes:

Drought:
Wildfires, Wind Erosion, Water Scarcity, Subsidence

Floods:
Flash Floods, River Flooding, Surface Flooding, Coastal Flooding, Erosion

Storms:
Tornados, Tropical Storms
Winter Storms, Thunderstorms, Coastal Flooding

Heat:
Ocean Acidification, Heat Waves, Urban Heat Islands



Khulna Dacope Koira, Bangladesh; Photo by Emdadul Islam Bitu, UNDP Bangladesh

Step 02 | Assess Hazards

2.1 | Determine relevant climate hazards

2.2 | Select relevant hazard indicators

2.3 | Analyze historical trends and events

2.4 | Analyze future projections across different scenarios

Examples of hazard indicators

Increasing temperatures:
- Annual seasonal monthly average (air) temperature

Heat waves:
- Heat wave frequency (avg. number of heat waves per year)
- Heat wave intensity (avg. temperature above local threshold)
- Heat wave duration (avg. length of individual heat waves – no. days)

Sea level rise:
- Absolute sea level change (cm)
- Relative sea level change (incl. local land movement) (cm)

River floods:
- No. of days with precipitation > 100mm
- Flooding magnitude (peak discharge)
- Flooding frequency (avg. no. of flood days per year)



Wajir; Photo by Jervis Sundays, Kenya Red Cross Society

Step 02 | Assess Hazards

2.1 | Determine relevant climate hazards

2.2 | Select relevant hazard indicators

2.3 | Analyze historical trends and events

2.4 | Analyze future projections across different scenarios

Key questions:

- What are key historical trends in the city? (looking back over 30 years is ideal)
- What major historical climate events have occurred for each relevant hazard?
- What were the impacts? (e.g. loss of lives and/or livelihoods, direct and indirect economic losses)
- What sectors and groups of people were most affected, including women, poor communities, children, the elderly, etc.?
- How have these hazards changed over time? (More/less frequent? More/less intense? Longer/shorter duration?)



Wajir; Photo by Riccardo Gangale, ILRI

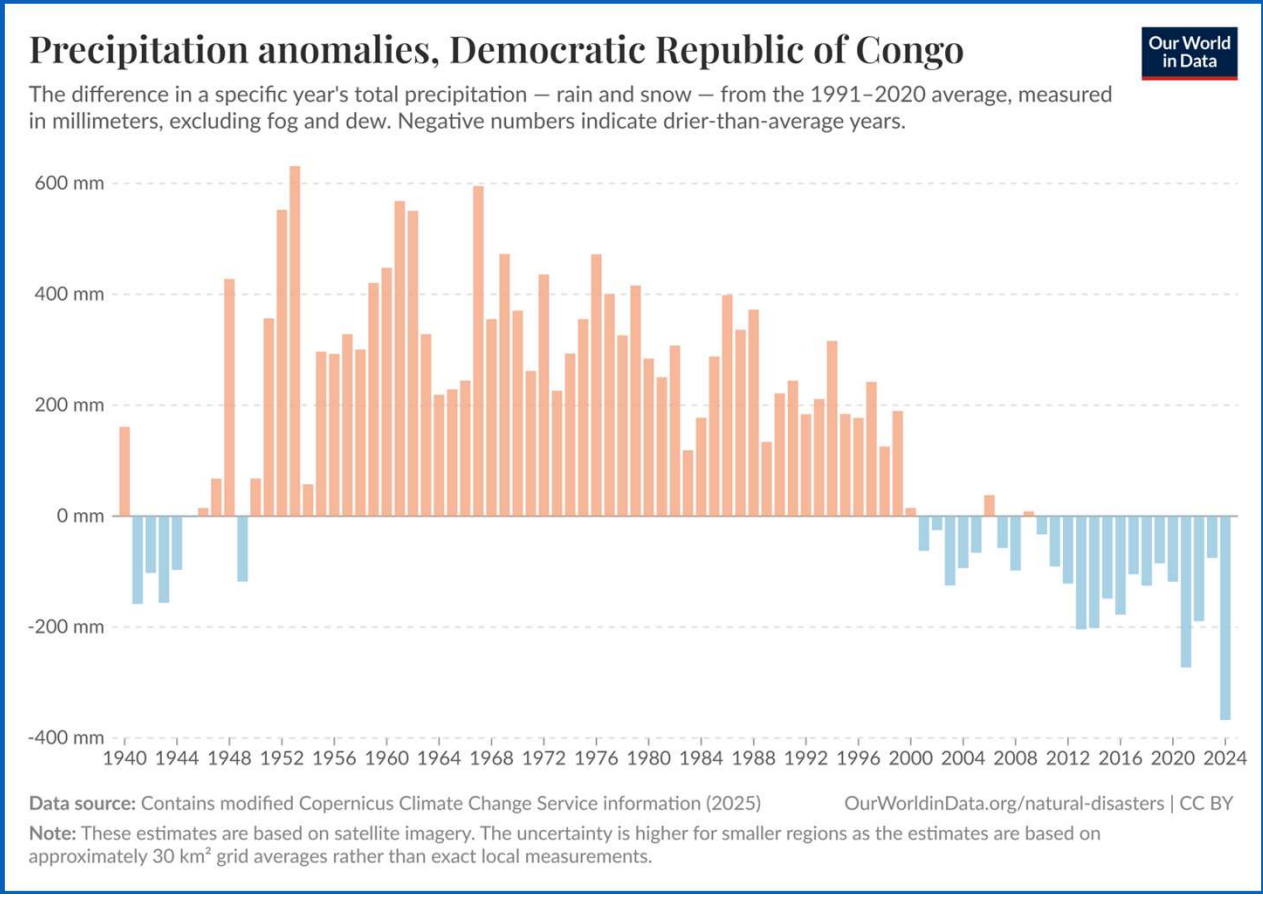
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Step 02 | Assess Hazards

2.1 | Determine relevant climate hazards

2.2 | Select relevant hazard indicators

2.3 | Analyze historical trends and events

2.4 | Analyze future projections across different scenarios

Climate Models

Tools that generate climate projections showing how the climate may change under various scenarios.

Require technical expertise to access and interpret – this should be part of team conducting the CRA.

Scenarios

A CRA should select multiple climate scenarios, usually a mid-range and a worst-case scenario.

Projections of future climate change are usually presented as a range of values (e.g. sea level rise by 3-5 cm by 2050).

Time Horizons

Typical time horizons include short-term (2030s), mid-term (2050s) and long-term (2100).

A CRA should use time horizon(s) relevant to the life and planning timescale of the community / asset of interest.

Step 03 | Assess impacts

Assessing climate impacts:

Impact is the actual consequence when a hazard occurs:

Risk → Event → Impact.

1. Risk exists– based on hazard, exposure, and vulnerability
2. A hazard event occurs– e.g. flood, drought, heatwave
3. The system is tested– exposure and vulnerability determine what fails
4. Impact is experienced– service disruption, damage, health effects

CRAs need to understand the differentiated impact of climate hazards based on **exposure**, **sensitivity** and **adaptive capacity.**

Key questions for a CRA:

People

- What are the impacts of the climate hazard on people and their livelihoods?
- What are the impacts on particularly vulnerable groups most exposed to the hazard?

Environment

- What are the impacts of the hazard on the local environment e.g. biodiversity, air quality, water quality?

Economy

- What are the impacts of the hazard on the city's economy?
- Which sectors, industries and assets will be most impacted?



Homa Bay Town; Photo by Robert Omollo, The Star

Step 03 | Assess impacts

Exposure

Exposure = people, livelihoods or assets located in proximity to potential hazards.

Indicators may include:

- Population (including marginalized groups) exposed
- Value of economic services exposed
- Assets (e.g. housing) exposed
- % of livelihoods dependent on natural resources exposed

Sensitivity

Vulnerability is composed of **sensitivity** + adaptive capacity

Sensitivity = degree to which people and assets/systems are affected by their exposure to climate impacts

Indicators may include:

- Population of dependent demographic groups
- Livelihood dependence of affected sectors
- Condition of housing

Adaptive Capacity

Vulnerability is composed of sensitivity + **adaptive capacity**

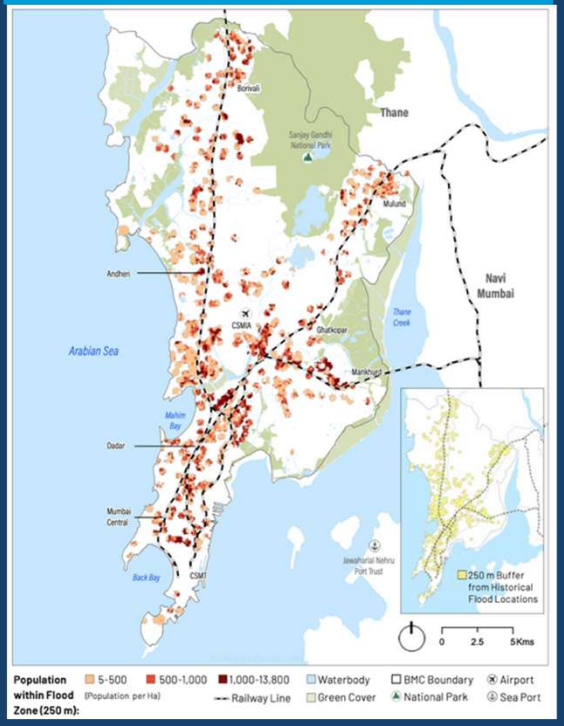
Adaptive capacity = potential of people and systems to adjust to the impacts of climate change or take advantage of opportunities that may arise from them.

Indicators may include:

- Access to basic services (water, sanitation)
- Access to healthcare
- Meaningful participation of diverse groups in local adaptation decisions
- Ability of individual to make and act on livelihood or resource-use decisions during climate shocks

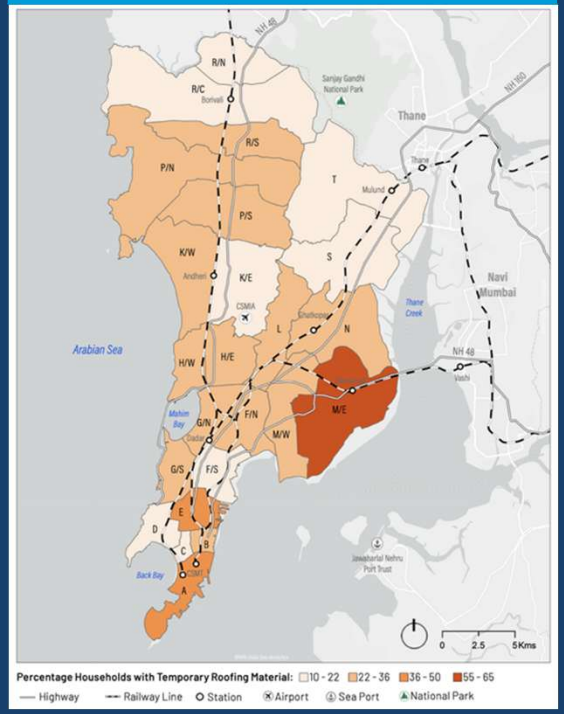
Step 03 | Assess impacts

Exposure



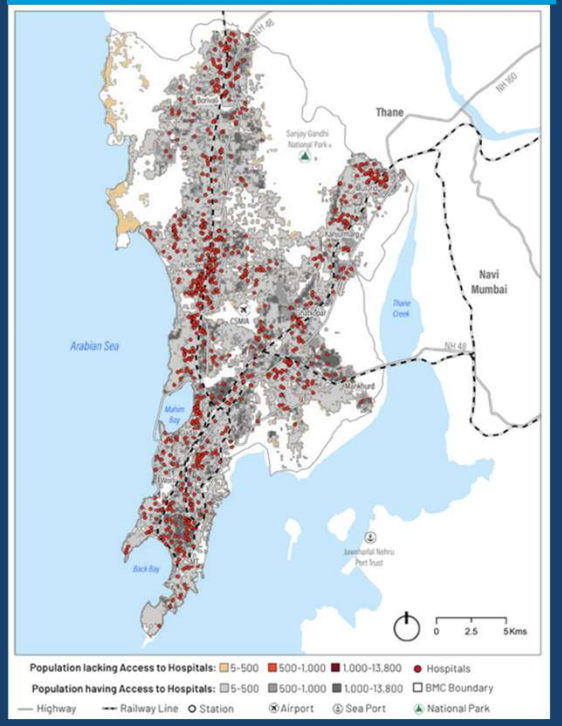
Population within flood zones (250m)
Mumbai's Climate and Air Pollution Risks and Vulnerability Assessment, 2022

Sensitivity



% households with temporary roofing material
Mumbai's Climate and Air Pollution Risks and Vulnerability Assessment, 2022

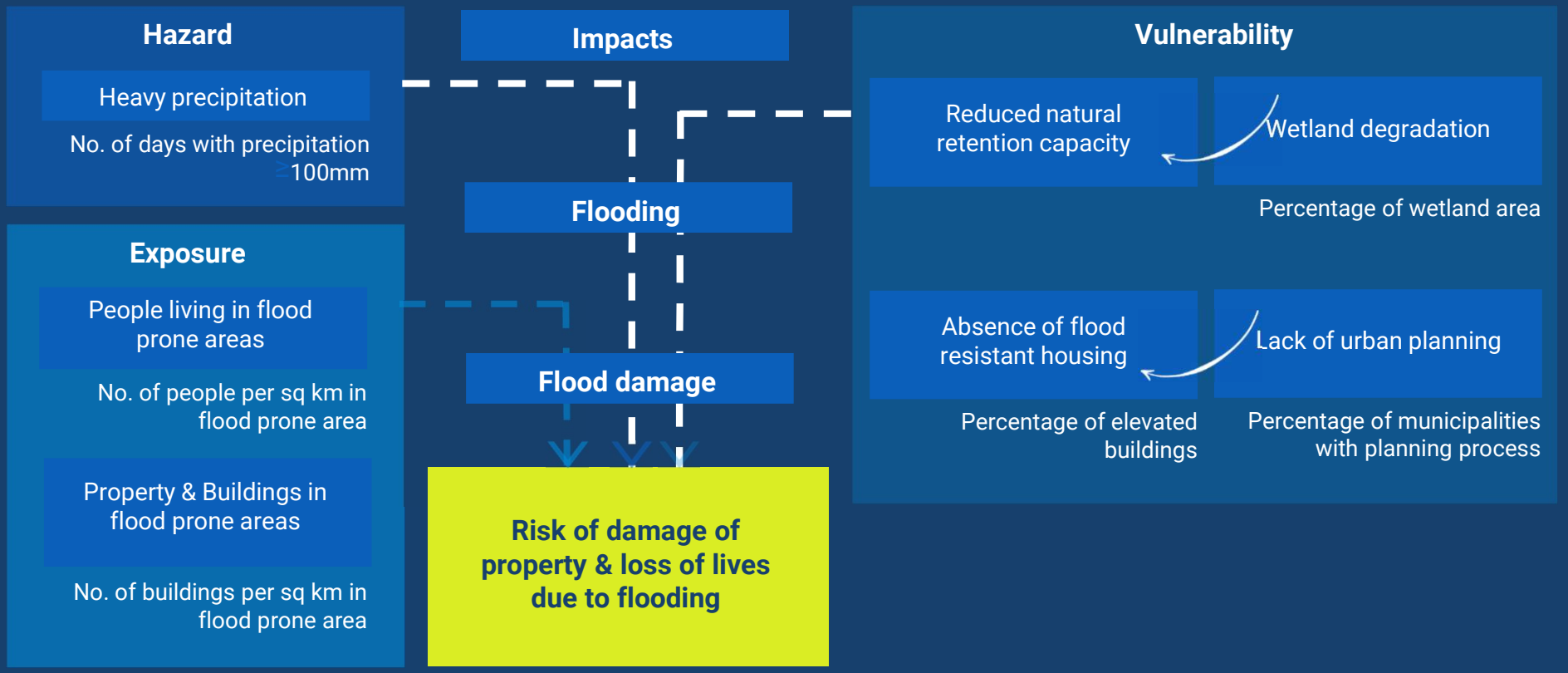
Adaptive capacity



Population with / without access to hospitals
Mumbai's Climate and Air Pollution Risks and Vulnerability Assessment, 2022

Step 03 | Assess impacts

Example | Flood Risk Chain



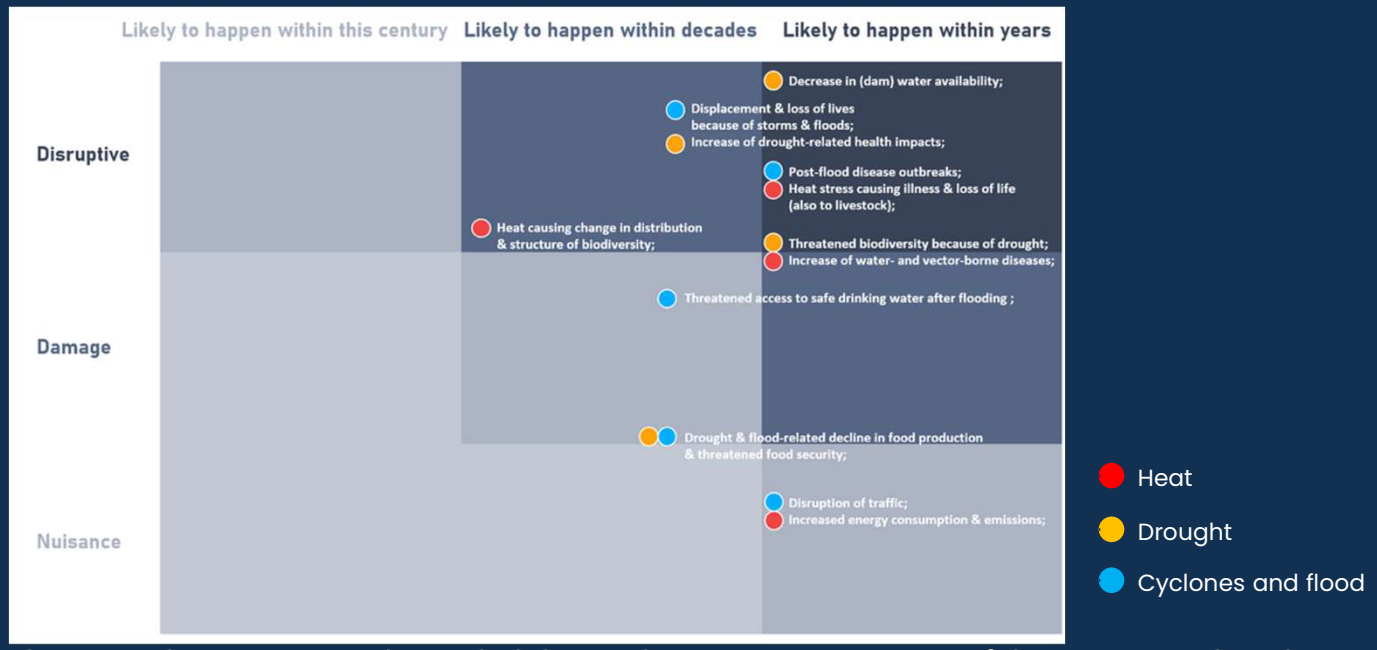
Step 04 | Identify & assess risks

Identify the key risks in your city by assigning a probability and consequence score to each identified risk.

Probability: how likely is the risk to occur?

Consequence: how serious would the consequences be if the risk did occur?

Case Study | Air Temperature 1973-2020 | Mumbai, India



Plotting risks on a matrix by probability and consequence is a useful way to visualize the most likely and most damaging impacts, to prioritize action

Step 04 | Identify & assess risks

Identify the key risks in your city by assigning a probability and consequence score to each identified risk.

Probability: how likely is the risk to occur?

Consequence: how serious would the consequences be if the risk did occur?

Case Study | Rwanda climate risk assesment

Likelihood					
Almost certain 5	5	10	15	20	25
Likely 4	4	8	12	16	20
Moderate 3	3	6	9	12	15
Unlikely 2	2	4	6	8	10
Rare 1	1	2	3	4	5
	Insignificant or no impact 1	Mild or minor 2	Moderate 3	Major 4	Catastrophic 5
	Severity				
Risk score	<6	6-9	10-12	15-25	
Risk rating	Low	Medium	High	Very high	

Plotting risks on a matrix by likelihood and intensity/severity is a useful way to visualize the most likely and most damaging impacts, to prioritize action

Step 04 | Identify & assess risks

Example | Risk Matrix

Likelihood Rating		
Almost Certain	5	Recurrent events - expect this event almost annually. Single event - highly likely (>90% probability)
Probable	4	Recurrent events - expect this event several times in your career. Single event - more likely than not (50-90% probability)
Possible	3	Expect this event to occur once in your career, at any time. Single event - less likely than not, but still appreciable chance of occurring (10-50% probability)
Unlikely	2	Event hasn't occurred during your career yet, but could occur at some time. Single event - unlikely but not negligible (1-10% probability)
Rare	1	Event has occurred elsewhere, but in exceptional circumstances. Single event - not expected to occur, but possible (<1% probability)

Consequence Rating

Likelihood \ Consequence	1	2	3	4	5
5	Medium	High	Very High	Very High	Very High
4	Medium	Medium	High	Very High	Very High
3	Low	Medium	Medium	High	Very High
2	Low	Low	Medium	Medium	High
1	Low	Low	Low	Medium	Medium

Very High	Very high risks are unacceptable. When possible, identify options to avoid or transfer risk. Where not possible, discuss immediately with Senior Management.
High	Discuss options with Senior Management.
Medium	Medium risk is tolerated if analysis show that risk can be rendered as acceptable reducing residual risk.
Low	Low risks are acceptable.

Step 05 | Identify options

- Many CRAs identify a list of options that can be taken to build resilience to climate risks.
- This should include a list of the main climate risks faced by a city, ranked in order of severity or priority for policymakers to address.
- It could also include an explanation of the main locations or groups of people that are vulnerable to climate hazards so that actions can be undertaken to ensure climate resilient priorities address equity & inclusion.
- It should then include a list of priority adaptation and resilience building measures to be taken - for example a list of priority sectors that need to be made resilience, or a list of priority actions to be undertaken to build resilience.



Photo by Poco_bw, Canva

Step 06 | Appraise options

- Selecting adaptation options involves trade-offs between economic, environmental and social implications
- Adaptation often involves both financial and non-financial costs and benefits
- Involve affected stakeholders to agree criteria and their weightings, in order to capture different values in selection of options

There are many approaches to appraise adaptation options:

- Cost-benefit analysis
- Multi criteria analysis
- Cost-effectiveness analysis
- Expert judgment
- Stakeholder consultation



Githurai area of Nairobi; Photo by Patrick Ngugi, AP

Equity & inclusion

A CRA should integrate considerations of equity and inclusion to understand differentiated impacts on vulnerable groups

CRA design should involve different stakeholder groups across gender, race, religion, age, ability, income etc.

Wide consultations with different population groups helps capture local knowledge and capacities to adapt.

Include indicators that reflect impacts on a wide range of groups, including the most vulnerable (e.g. women-headed households, female participation in the workforce, age-dependency ratio etc.).

Identify adaptation options that promote equity and inclusion/ build resilience of vulnerable groups.



Photo by Riccardo Lennart Niels [illegible], Getty Images (licensed via Canva)

EXAMPLE: Vulnerability assessments in Rwanda

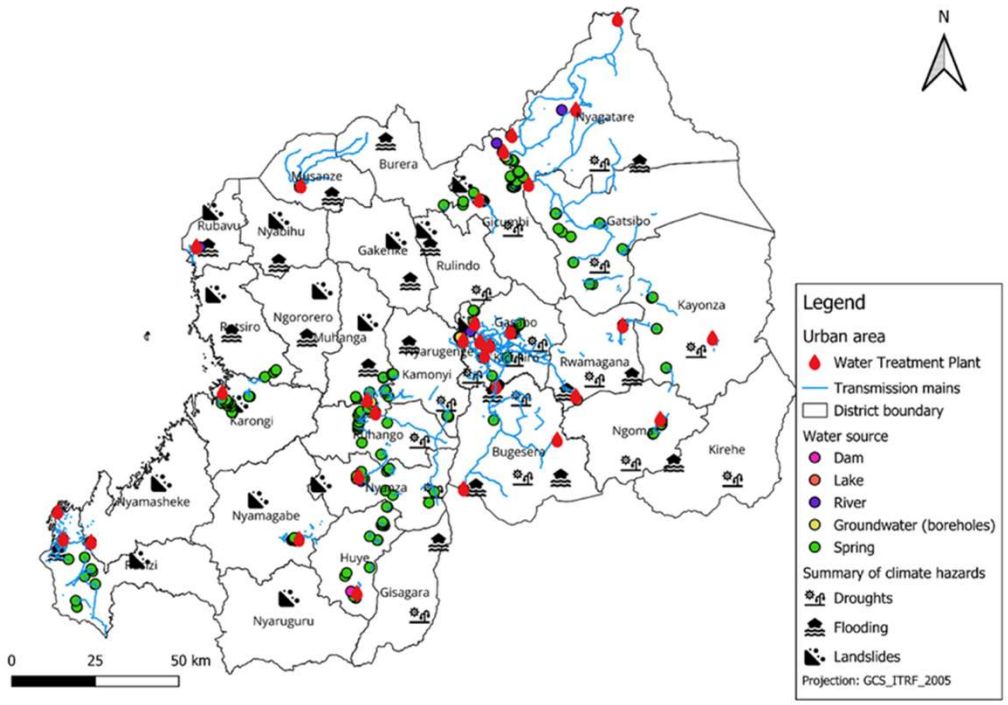


Figure: Map of Rwanda showing the locations of the main assets overlain by the climate hazards



Photo credit: Theophile Harushyamagara, Water For People

EXAMPLE: Vulnerability assessments in Rwanda

Assets	Physiograhic regions	Lake Kivu Region						Highlands of the Congo-Nile						Central Plateau						East Rwanda Plains					
	Hazards	Droughts		Floods		Landslides		Droughts		Floods		Landslides		Droughts		Floods		Landslides		Droughts		Floods		Landslides	
	Current vs climate change conditions	2023	CC	2023	CC	2023	CC	2023	CC	2023	CC	2023	CC	2023	CC	2023	CC	2023	CC	2023	CC	2023	CC	2023	CC
Sources	Springs	6	6	6	8	6	8	6	6	6	8	6	8	9	12	6	8	6	8	9	12	6	8	4	4
	Boreholes	6	6	9	12	6	8	6	6	9	12	6	8	9	12	9	12	6	8	9	12	9	12	4	4
	Riverbank infiltration boreholes	6	6	9	12	6	8	6	6	9	12	6	8	9	12	9	12	6	8	9	12	9	12	4	4
	Lakes and wetlands	8	8	12	16	15	20	8	8	12	16	15	20	12	16	12	16	15	20	12	16	12	16	8	8
	Dams	8	8	12	16	20	20	8	8	12	16	15	20	12	16	12	16	15	20	12	16	12	16	15	10
	Streams and rivers	8	8	12	16	15	20	8	8	12	16	15	20	12	16	12	16	15	20	12	16	9	12	8	8
WTPs including intake infrastructure	Nzove	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	16	12	16	12	20
	Kimisagara	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	12	9	12	12	20
	Karenge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	12	16	16	9	9
	Gihira	6	6	12	16	16	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other WTPs, intake from springs	6	6	6	8	9	12	6	6	6	8	9	12	9	12	6	8	12	16	9	12	6	8	6	6
	Other WTPs, intake from surface water	6	6	12	16	12	16	6	6	12	16	12	16	9	12	12	16	12	16	9	12	12	16	8	8
	Other WTPs, intake from boreholes	6	6	12	16	9	12	6	6	12	16	9	12	9	12	12	16	9	12	9	12	12	16	6	6
Conveyance	Pumping stations	2	2	9	12	9	12	2	2	9	12	9	12	3	4	9	12	12	16	3	4	9	12	6	6
	Reservoirs	2	2	9	12	6	8	2	2	9	12	6	8	3	4	12	16	12	16	3	4	9	12	4	4
	Transmission mains	2	2	12	16	12	16	2	2	12	16	12	16	3	4	12	16	12	16	3	4	12	16	8	8
	Distribution network	2	2	9	12	9	12	2	2	9	12	9	12	3	4	9	12	9	12	3	4	9	12	6	6
	Connection pipes	2	2	6	8	6	8	2	2	6	8	6	8	3	4	6	8	6	8	3	4	6	8	4	4
Service points	private service connections	2	2	3	4	3	4	2	2	3	4	3	4	3	4	3	4	3	4	3	4	3	4	2	2
	communal taps and standpipes	4	4	6	8	6	8	4	4	6	8	6	8	6	8	6	8	6	8	6	8	6	8	4	4
Rural infra	sources, WTPs, pipelines and taps	6	6	9	12	9	12	6	6	9	12	9	12	9	12	9	12	9	12	9	12	9	12	6	6
Sanitation	Sewer collection systems, and pit latrines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	12	9	12	6	6
	Wastewater treatment plants, and landfills	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	12	12	16	8	8

Figure: Risk categorisations for the various asset types and regions in Rwanda. "CC" stands for incorporating climate change hazards and note that those columns have a higher overall risk.

Very High

Very high risks are unacceptable. When possible, identify options to avoid or transfer risk. Where not possible, discuss immediately with Senior Management.

High

Discuss options with Senior Management.

Medium

Medium risk is tolerated if analysis show that risk can be rendered as acceptable reducing residual risk.

Low

Low risks are acceptable.

Recap exercise

Buzz groups

- In groups of two – three discuss the previous session
- Discuss any questions you have
- Up to 5 minutes. We want to hear a nice Buzz around the room!

If you want to share an experience with the room, please raise your hand.



Group photo



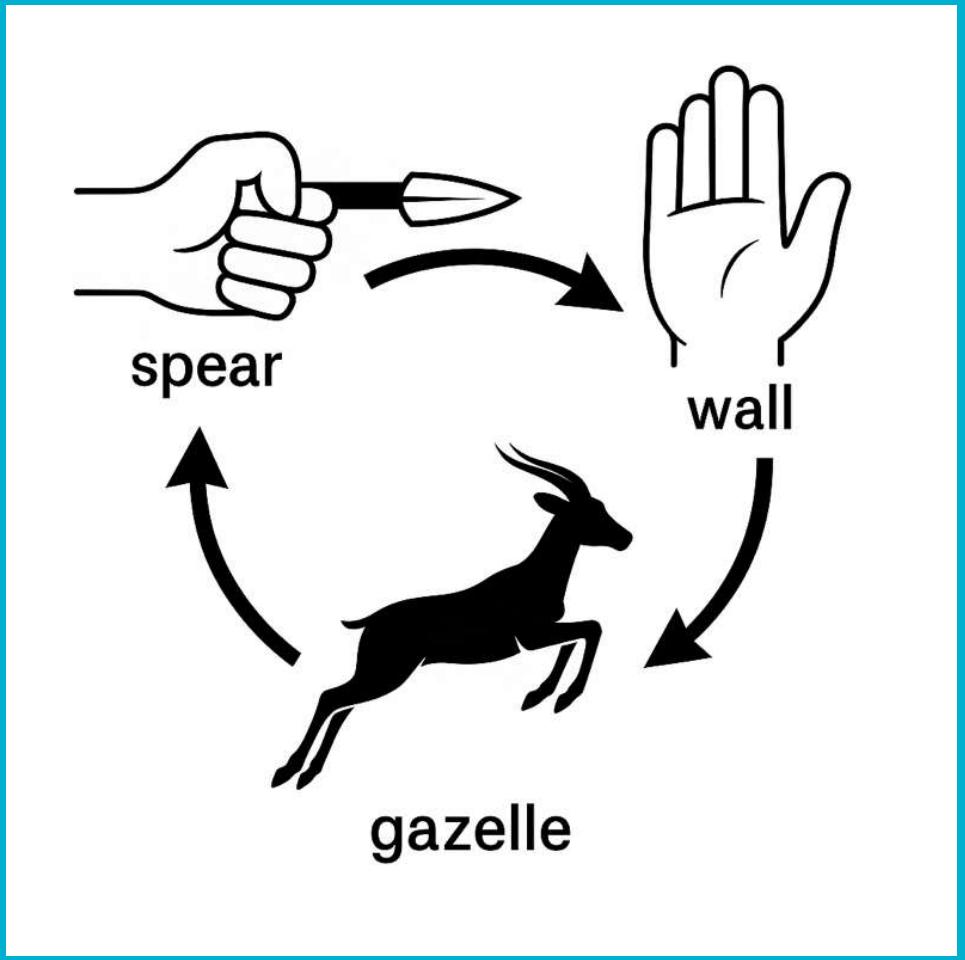
LUNCH



Energiser

Spear, wall, gazelle

- A spear (put one hand outstretched forward and one backward),
- a wall (both hands out sideways)
- gazelle (both hands pointing upwards and forwards).



05 | Bottom-up approaches



Ibrahim Boran

Bottom-up approaches

Bottom-up climate approaches reduce risk by starting from local impacts and system weaknesses, using participatory risk assessment to identify risks, understand impacts, and agree on actions that work across many possible future climates, based on local knowledge and experience.

- Start with what people experience on the ground
- Focus on real impacts, not abstract projections
- Value local knowledge alongside technical data

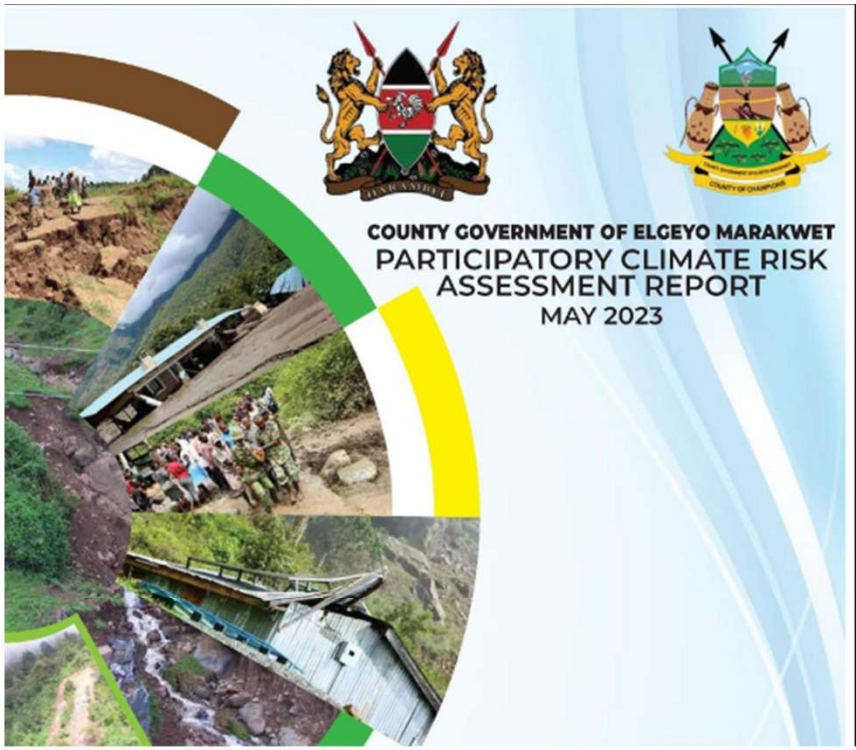
Example - Participatory Climate Risk Assessment (PCRA)

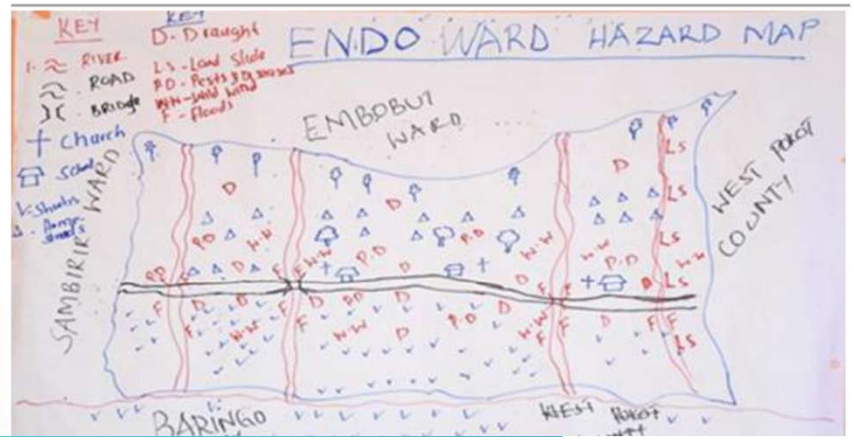
Financing Locally-Led Climate Action (**FLLoCA**) consisted of three main steps;

(a) Conducting of community/ward-level sensitization and participatory climate risk assessments informed by climate scenarios at the ward level;

(b) Development of prioritized ward-level climate action plans; and

(c) Proposition of County Climate Resilience Investment (CCRI) plans.





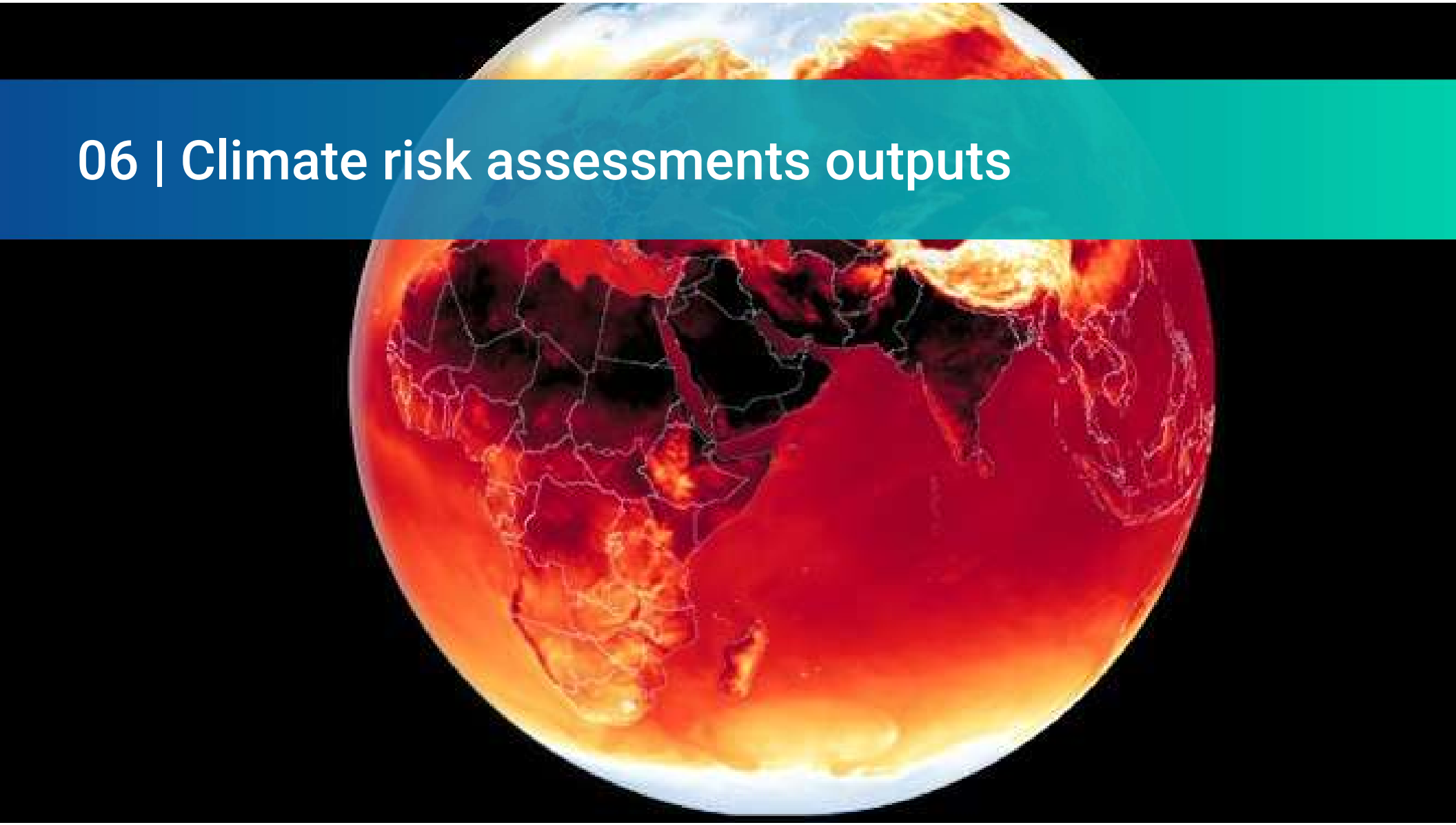
Example - Rapid Climate Risk Assessment (RCRA)

Flooding is the main cause of climate change risks in the Mukuru informal settlement, Kenya. These risks include:

- Loss of lives and livelihoods
- Displacement of families
- Disease burden due to waterborne and vector-borne diseases, as well as heat stress complications
- Infrastructure destruction
- Food and water scarcity.

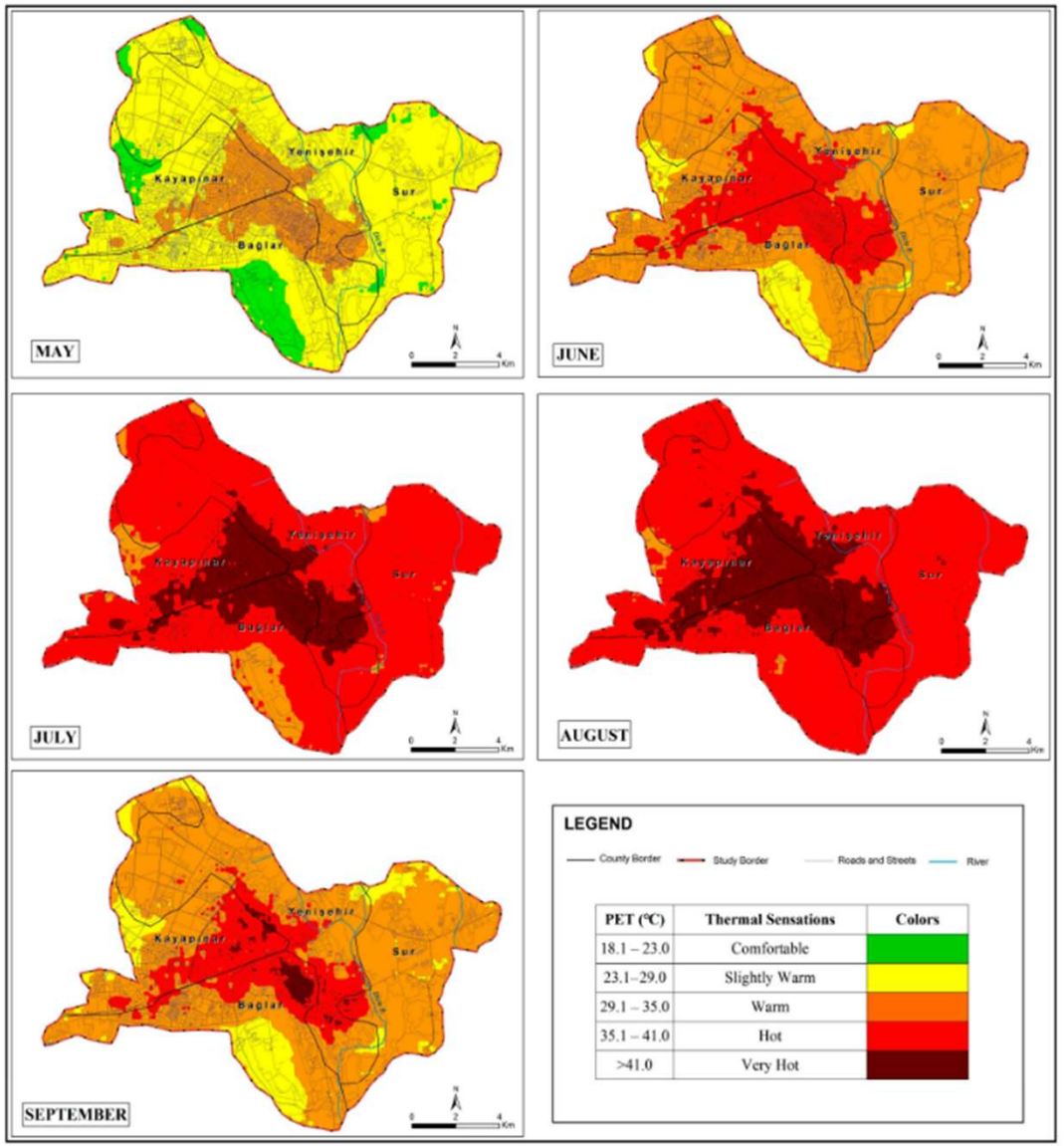


06 | Climate risk assessments outputs

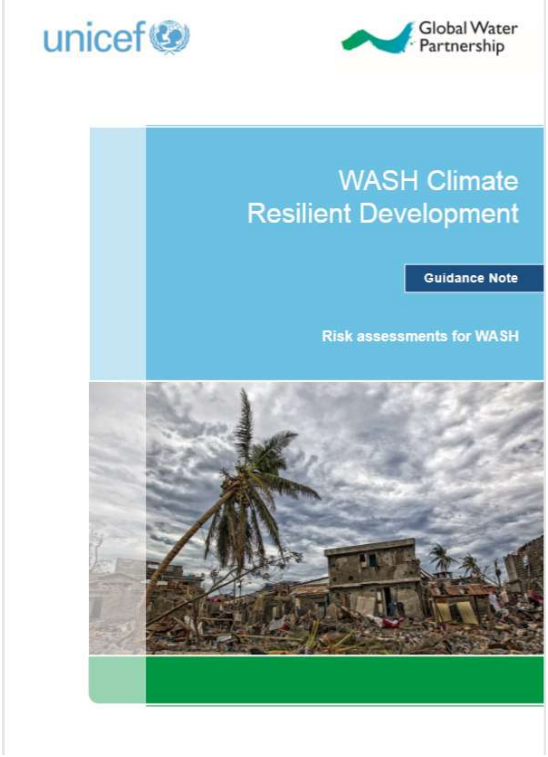


Types of CRA outputs

- Risk matrices
- Hazard, risk and vulnerability maps
- Infographics
- Interactive online platforms



Methodology for risk analysis



Key notion: Risk results from the interaction of hazard, exposure, and vulnerability.

Risk = Hazard x Exposure x Vulnerability

Hazard	Exposure	Vulnerability	Risk
High	High	High	HIGH
Medium	Medium	Medium	MEDIUM
Low	Low	Low	LOW

Uganda National Risk Assessment WASH

Step 1:
Identification, characterization, and scoring of hazards, including identification of high-risk areas

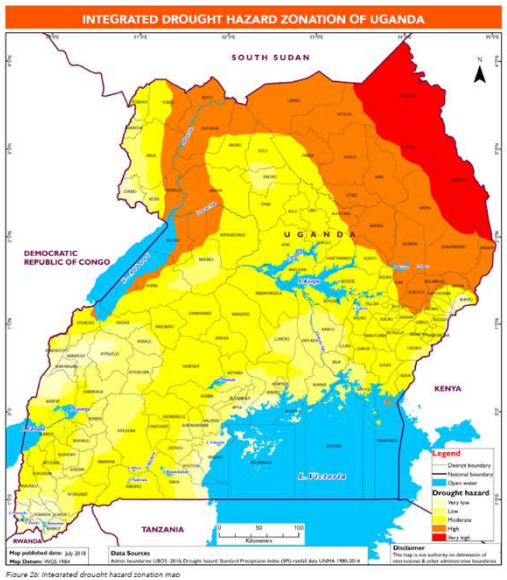
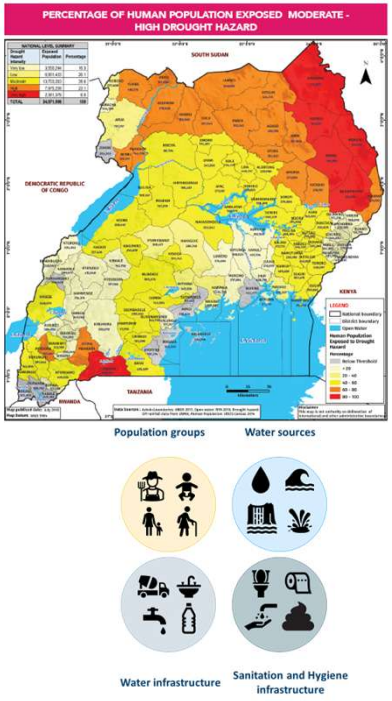
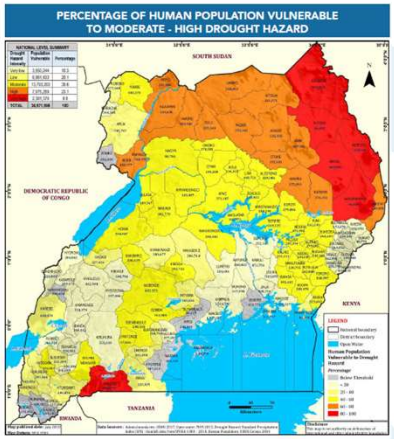


Figure 2a: Integrated drought hazard zonation map

Step 2:
Identification and scoring of exposure



Step 3:
Identification and scoring of vulnerabilities



Social	Financial	Physical
Environmental	Human	Political (and institutional)

Step 4:
Assessment and prioritization of climate risks

HAZARDS	EXPOSURE
DROUGHT	Women and children, in charge of searching for alternative sources and for fetching water, are exposed to work and school absenteeism, respectively, and to all kinds of risks (attacks, violence, etc.) when water access is not on premises Farmers who rely on rain-fed crops for subsistence might incur in income losses, severely impacting their livelihoods Water supply systems, particularly distribution lines and pumping stations, might be damaged due to fluctuating water levels Protected springs and shallow wells, serving around 22% and 24% of the population, respectively Exposure is more pronounced in the arid and semi-arid areas of Northeastern Uganda
FLOODING	People living near water bodies and in flood prone areas is expected to increase due to more concentrated rainfalls in the future. In urban areas, inhabitants are particularly affected by flash flooding Children are exposed if WASH facilities at schools are not climate resilient, which might lead to school absenteeism and health issues Water distribution systems, particularly pumping systems, and distribution by gravity Pit latrines (improved and unimproved), particularly in rural and periurban areas (80% of population use this sanitation solution) Protected springs and shallow wells, serving around 22% and 24% of the population, respectively Exposure is more pronounced in Central and Eastern Uganda
LANDSLIDE	People living near hills and mountainous areas, especially in Mt. Elgon and Rwenzori regions Children are affected (school absenteeism and health issues) if WASH facilities at schools are not climate resilient. This situation is expected to worsen in the future

VULNERABILITY		
HUMAN	**SOCIAL**	**FINANCIAL**
Most vulnerable groups include women, children, farmers, people that live near mountains and water bodies and in informal settlements Population age (54% are below 18 years) and growth (around 3% per year) are relevant demographic features that increase vulnerability Limited knowledge of climate hazards and impacts, particularly by vulnerable population and in rural areas	Population affected by climate related hazards is diverted to lower service levels or to unimproved facilities. 5% of population in Uganda defecates in the open, most of them in rural areas Limited waste management, mainly at household level, increases health impacts during flood events, particularly in urban areas Conflicts have been reported in relation to access to water	Income losses by farmers provoked by hazards affect their livelihoods and their access to WASH Insufficient cost recovery due to poor revenue collection and increased operation costs (e.g., treatment costs) during and after hazards hamper financial sustainability of service providers
ENVIRONMENTAL		**PHYSICAL**
High vulnerability of shallow wells and moderate vulnerability of protected springs. Deep boreholes seem more resilient to shocks and extreme events Erosion, caused by poor land management, impacts water availability and quality Poor water quality increases the incidence of waterborne diseases and leads to higher treatment costs Inadequate waste disposal and poorly managed landfills (those located close to larger cities) lead to water pollution in those areas		Pit latrines' high vulnerability to hazards such as flooding raises serious health and environmental concerns Pumping systems and supply by gravity, which are the most common infrastructure in Uganda, are vulnerable to several hazards

CRA outputs | risk matrix

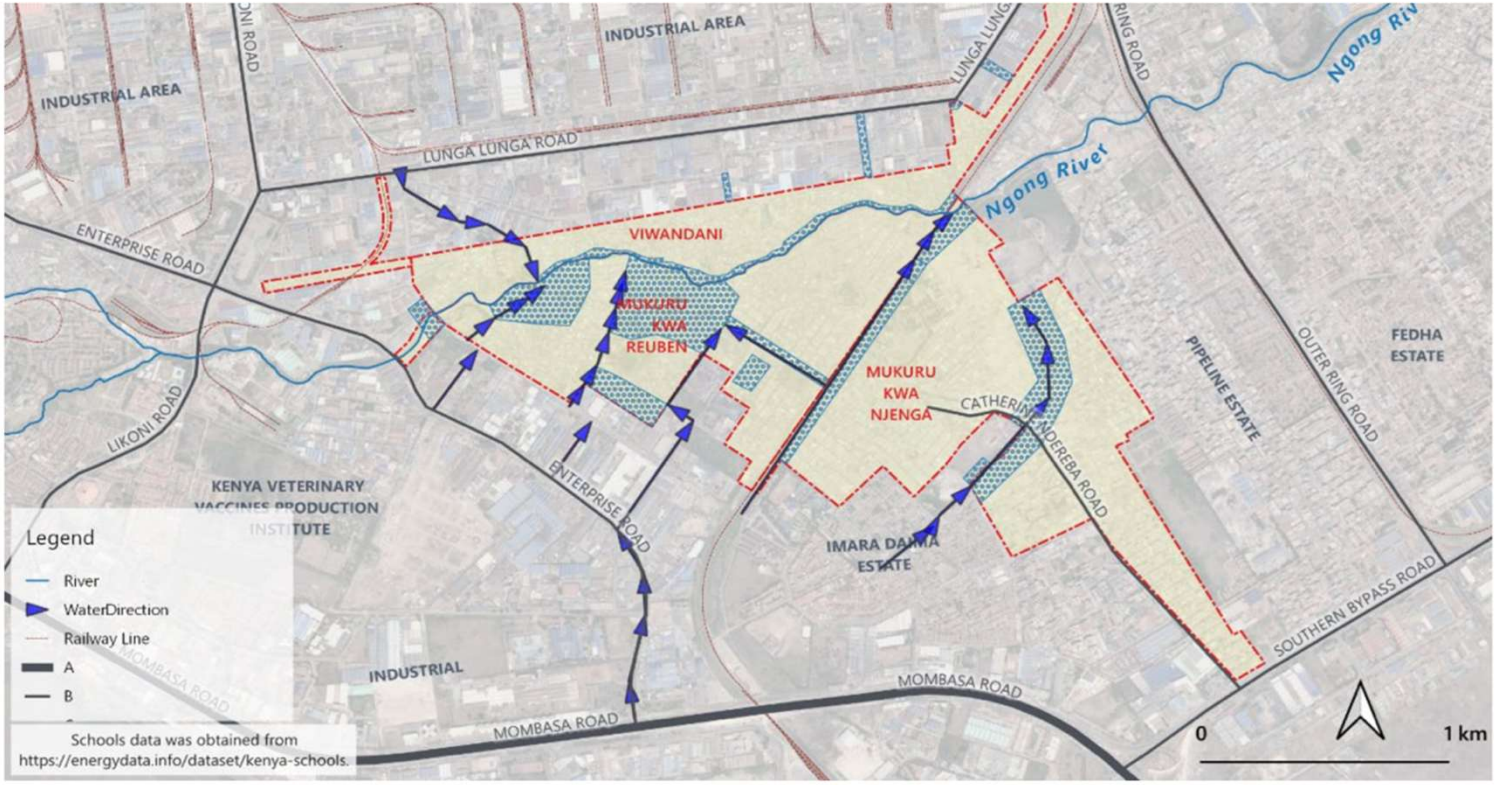
Case Study | Risk Matrix | Nagpur, India



S. No.	Urban systems	Climate fragility statement	Likelihood	Consequence	Risk score	Risk status
1	Water supply	High intensity & short duration rainfalls, rainfall irregularity and change in pattern will affect city's water supply.	4	3	12	Medium-High
		Increase in temperature will increase evapo-transpiration rate reducing available water quantity with degradation of quality and increasing water demand putting stress on ground water.	4	4	16	High
2	Sewage treatment	Mixing and overflows of sewage and storm water due to high intensity rainfall causes inefficient sewage treatment thereby polluting river streams, eventually affecting dependent farms.	4	2	8	Medium
		Increase in temperature causes septic conditions in open nullahs and drains thereby causing foul odour, toxic gas emissions eventually affecting wastewater treatment.	4	2	8	Medium
3	Storm water management	Dilapidated insufficient storm water drains get flooded due to high intensity rainfall causing water logging and backflow of contaminated water due to sewage mixing into residential/ commercial properties creates significant health risks and environmental pollution.	4	2	8	Medium

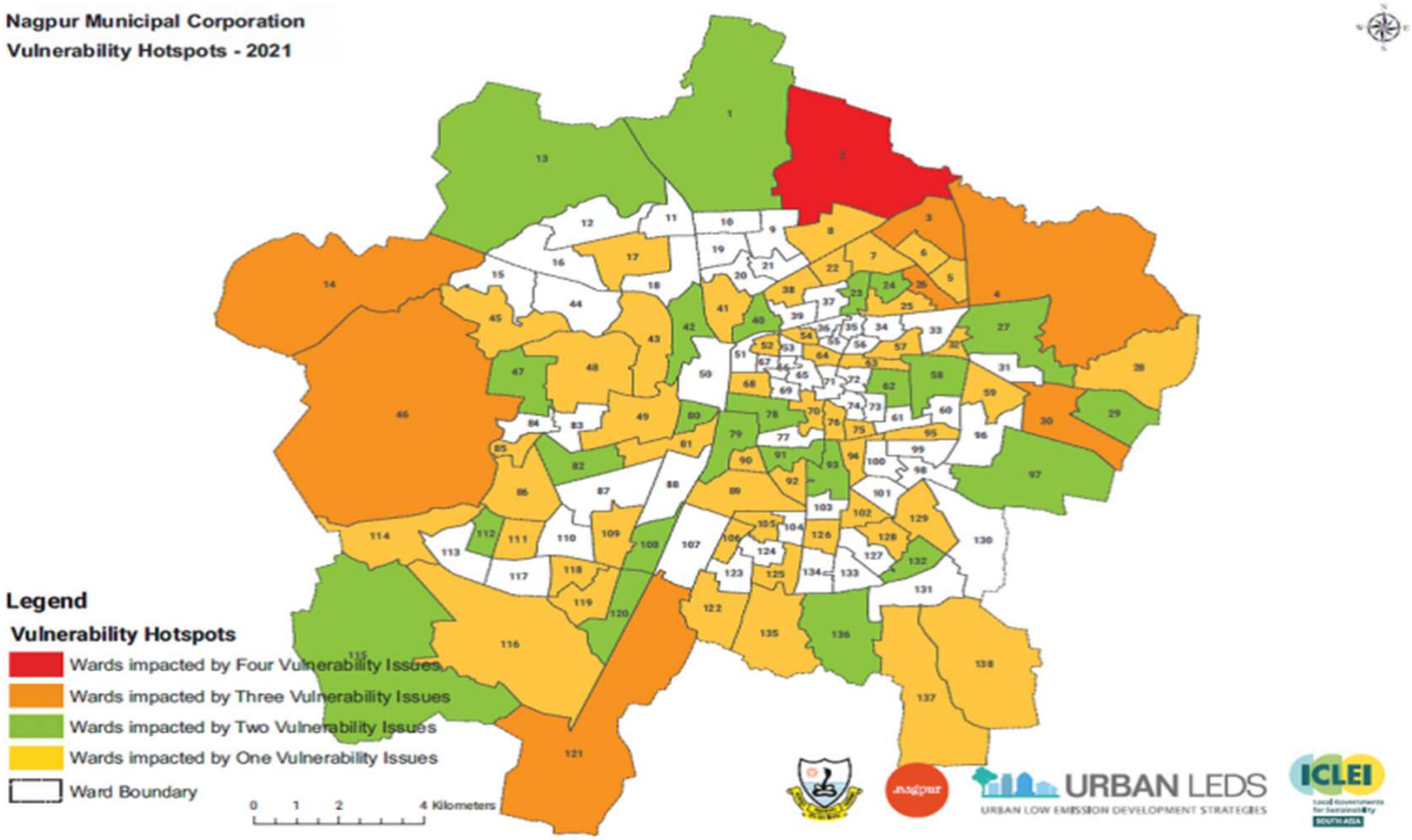
CRA outputs | Hazard & risk maps

Case Study | Mukuru Flood Risk Map | Nairobi, Kenya



CRA outputs | Vulnerability maps

Case Study | Vulnerability Hotspot Map | Nagpur, India



Vulnerability hotspots, Nagpur (India)

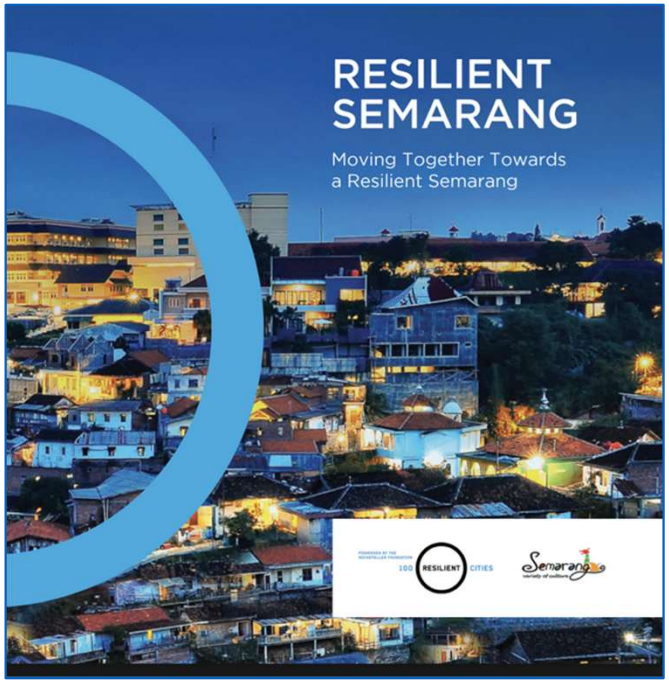
CRA outputs | Ranked Risk Matrix, Malawi

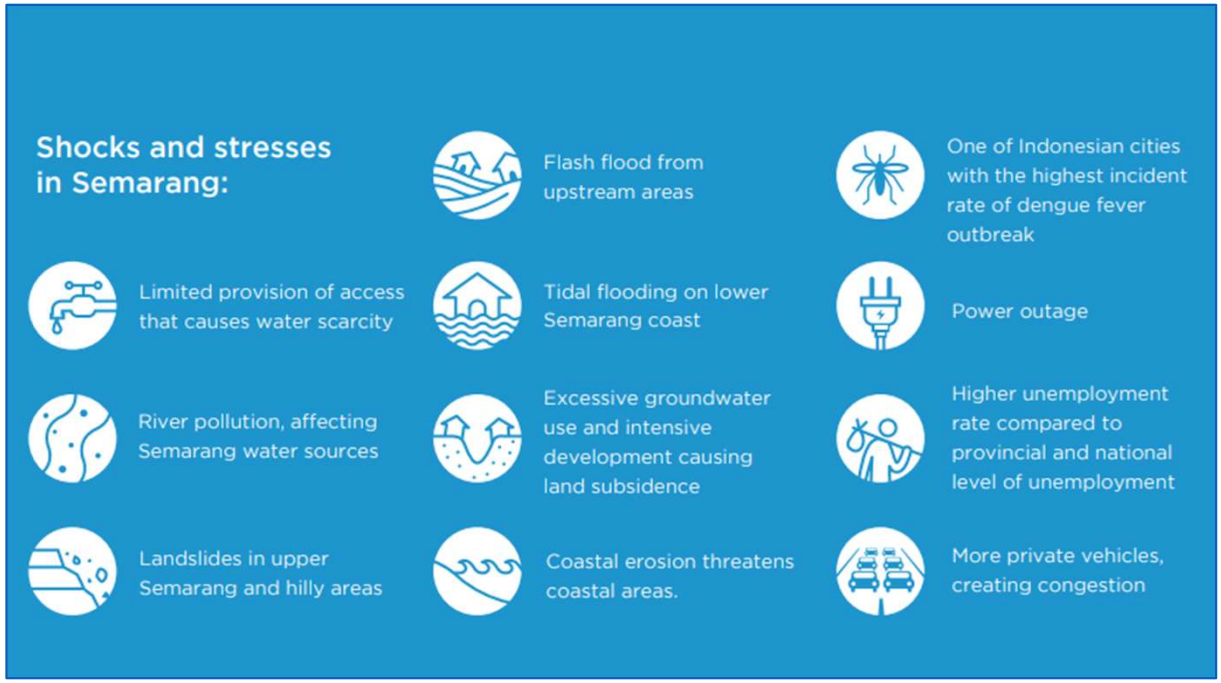
Case Study | Malawi national climate resilient WASH Strategy

Hazard		Exposure		Vulnerability		Risk	
Hazard	Score	Exposure	Score	Factor	Score	Score	Rank
Tropical Cyclone	3	Finance	3	Ability to draw on emergency funds	3	27	1
Diseases	3	Finance	2	Ability to draw on emergency funds	3	18	2
Drought	3	Point source	3	Resilience of WASH infrastructure	2	18	2
Drought	3	Hygiene behavior	3	Community-wide knowledge and understanding of risks and WASH benefits	2	18	2
Drought	3	Finance	2	Ability to draw on emergency funds	3	18	2
Flooding	3	Toilet/latrine	3	Resilience of WASH infrastructure	2	18	2
Flooding	3	Finance	2	Ability to draw on emergency funds	3	18	2
Tropical Cyclone	3	Toilet/latrine	3	Resilience of WASH infrastructure	2	18	2
Diseases	3	Point source	2	Resilience of WASH infrastructure	2	12	9
Diseases	3	Bulk Water supply	2	Environmental degradation	2	12	9
Diseases	3	HW facility	2	Resilience of WASH infrastructure	2	12	9
Diseases	3	Hygiene behavior	2	Norms/practice	2	12	9
Drought	3	Bulk Water supply	2	Environmental degradation	2	12	9
Drought	3	Toilet/latrine	2	Resilience of WASH infrastructure	2	12	9
Drought	3	HW facility	2	Resilience of WASH infrastructure	2	12	9
Flooding	3	Point source	2	Resilience of WASH infrastructure	2	12	9
Flooding	3	Bulk Water supply	2	Environmental degradation	2	12	9
Flooding	3	Treatment and reuse	2	Resilience of WASH infrastructure	2	12	9
Flooding	3	HW facility	2	Resilience of WASH infrastructure	2	12	9
Flooding	3	Hygiene behavior	2	Community-wide knowledge and understanding of risks and WASH benefits	2	12	9
Soil Erosion	3	Point source	2	Resilience of WASH infrastructure	2	12	9
Soil Erosion	3	Treatment and distribution	2	Resilience of WASH infrastructure	2	12	9
Soil Erosion	3	Toilet/latrine	2	Resilience of WASH infrastructure	2	12	9
Tropical Cyclone	3	Point source	2	Resilience of WASH infrastructure	2	12	9
Tropical Cyclone	3	Bulk Water supply	2	Environmental degradation	2	12	9
Tropical Cyclone	3	Treatment and reuse	2	Resilience of WASH infrastructure	2	12	9
Tropical Cyclone	3	Hygiene behavior	2	Community-wide knowledge and understanding of risks and WASH benefits	2	12	9

CRA outputs | infographics

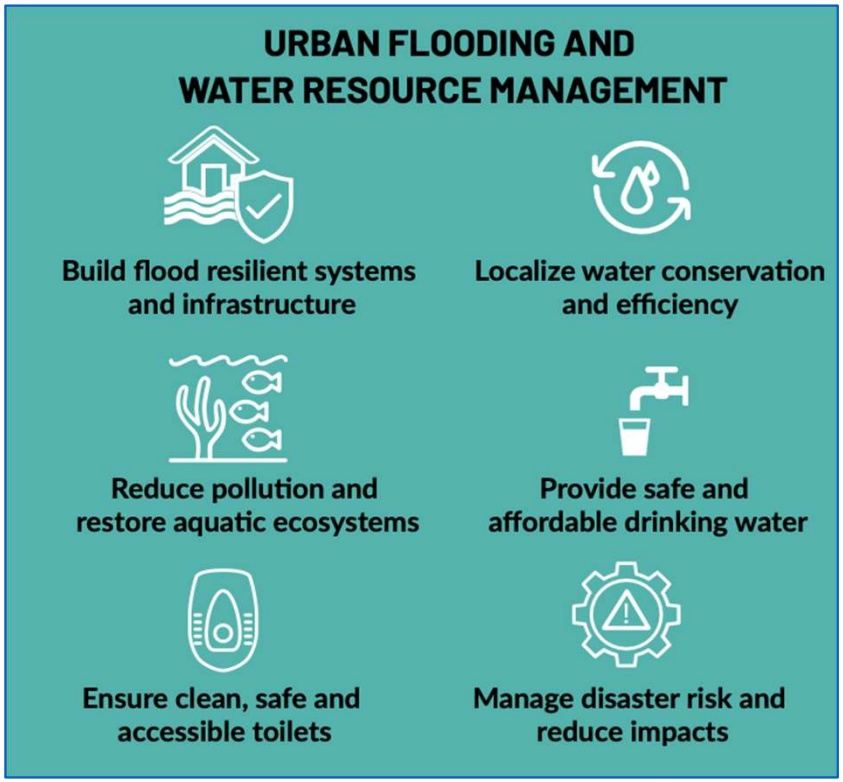
Case Study | Semarang, Indonesia

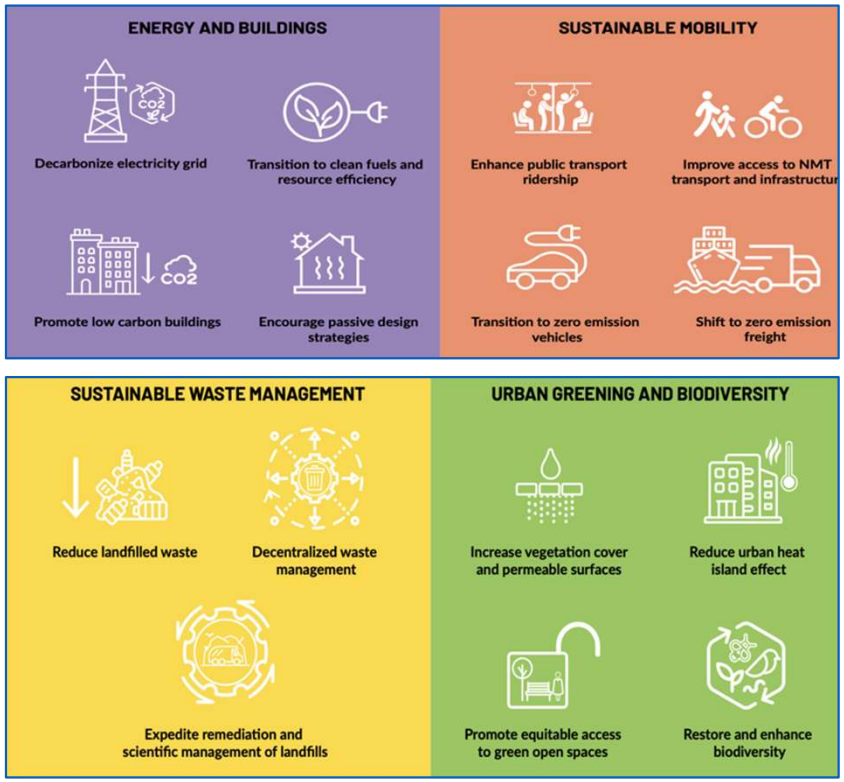




CRA outputs | Prioritised adaptation solutions

Case Study | Mumbai, India

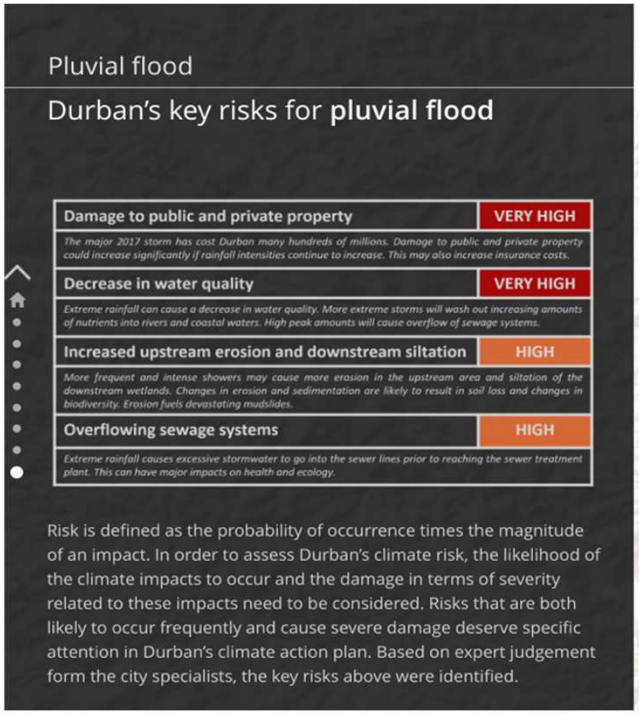


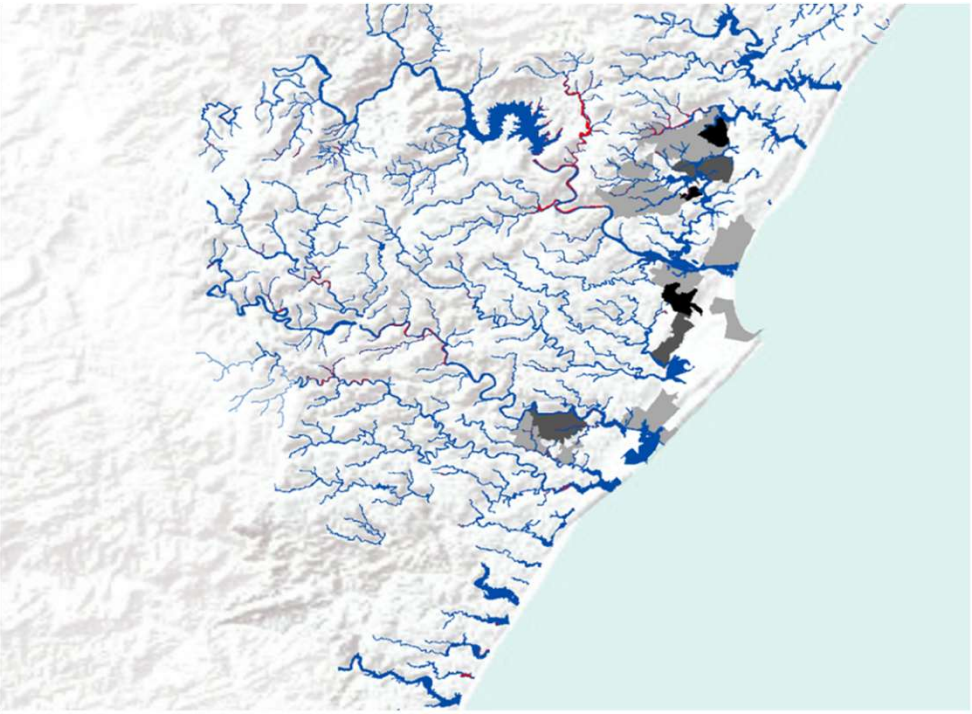


Priority adaptation actions for Mumbai (India)

CRA outputs | Interactive online platforms

Case Study | eThekwini Municipality (Durban), South Africa

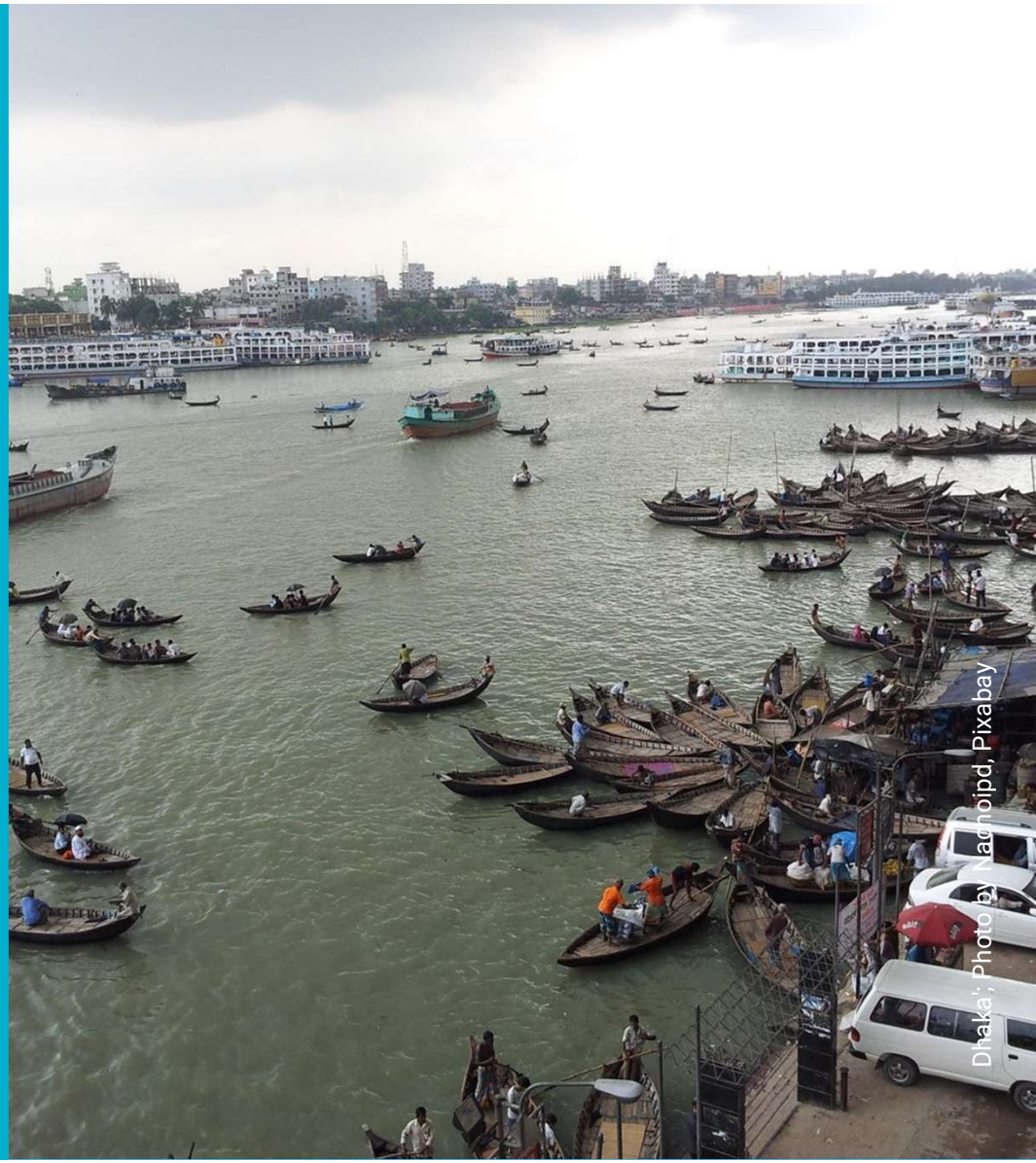




Questions

Do you have any questions?

- Consider ‘how to conduct a climate risk assessment’.
- Is there anything introduced in this section that you are unfamiliar with and that you would like to discuss in further detail?



Dhaka; Photo by Nachoipd, Pixabay

Experience & share

Your experiences with CRA outputs and / or decision making

→ Have you had any experience working with CRA outputs?

→ Have you ever used a CRA in decision making?

If you want to share an experience with the room, please raise your hand.



Nairobi, Photo by Millerpd, Getty Images (licensed via Canva)

07 | Climate risk assessment tools



Speaker Case studies / experiences of climate change and water and sanitation

How to work in data scarce environments?

- Use what is available: administrative records, hydrology data, health stats.
- Draw on local knowledge: participatory mapping, operator insights, community memory.
- Apply proxy indicators: tanker prices, latrine flooding, satellite imagery.
- Leverage open-access sources: rainfall estimates, soil moisture, global flood models.
- Document assumptions & limitations transparently to build credibility.
- Aim for decision-relevant outputs – even a 'good enough' CRA adds value.



Image: Wolfgang Hasselmann

07 | Exercise: Decisions for the decade



Decisions for the decade

- Investing in infrastructure for the future is full of uncertainty
- Let’s play a game to discuss the level of uncertainty in which we must operate.
- Are you ready?



Source: Red Cross/Red Crescent

Decisions for the Decade



Decisions for the Decade



Umbrella Flood Protection



Thumbs Up Development



Bucket Drought Protection

Practice run



Umbrella Flood Protection



Thumbs Up Development



Bucket Drought Protection

Decisions for the Decade

Strategy: Where should we invest?



Umbrella Flood Protection



Thumbs Up Development



Bucket Drought Protection

Decisions for the Decade

Strategy: Where should we invest?

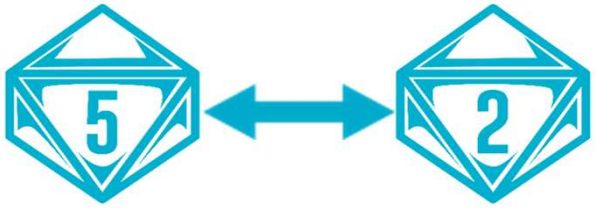
	Decade 1		Decade 2		Decade 3		TOTAL
	Start	End	Start	End	Start	End	End all three
 Umbrella Flood Protection							
 Thumbs Up Development							
 Bucket Drought Protection							

Decade 1





Too much flood disaster



Just right
It's okay for development



Too little drought disaster



Umbrella Flood Protection



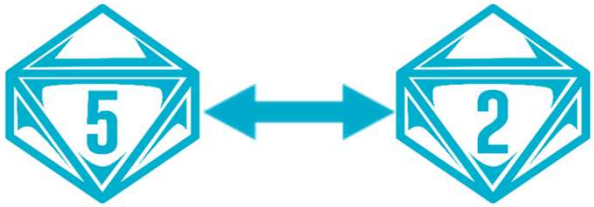
Bucket Drought Protection

Decade 2





Too much flood disaster



Just right
It’s okay for development



Too little drought disaster

Decade 3



CONE OF UNCERTAINTY



Too much
flood disaster



Just right
It’s okay for development



Too little
drought disaster

Discussion







Did your team make good decisions?

What is a good decision?

How did the decision making change over time as the risk levels changed?

Were you too cautious or too ambitious?

What other strategy could you have deployed?

08| A quiz & end of the day reflection



1. True or False.

Climate Risk Assessments (CRAs) are a structured approach to identifying hazards, vulnerabilities, and risks.

2. Why is a CRA important? Which answer is not correct.

A. A CRA provides an evidence base for climate action and investment.

B. CRAs provide data on the locations, the types of infrastructure and the groups of people that will be negatively impacted by climate change.

C. The interpretation and use of a CRA in decision-making is important to how you address climate risk.

D. It helps to secure climate finance.

3. What can you do with a CRA?

A. Identify priority climate resilient infrastructure and services that need to be built.

B. Integrate resilience into long-term planning (e.g. master plans).

C. Develop policies and strategies such as city-level Climate Action Plans or catchment plans.

D. Secure finance for investment in priority adaptation and resilience options.

4. True or False

If there is limited data, you don’t need to do a CRA

5. Which of the following statements BEST describes bottom-up approaches using Decision-Making under Deep Uncertainty (DMDU) in water and sanitation?

A. They rely on predicting the most likely future climate scenario and designing fixed infrastructure solutions accordingly.

B. They prioritise stakeholder-driven goal setting, explore multiple plausible futures, and use adaptive pathways to adjust decisions over time.

C. They transfer decision-making authority primarily to national experts to ensure technical optimisation under climate uncertainty.

D. They aim to eliminate uncertainty by improving climate models before making any planning decisions.

End of the day reflection

Key points Module 3 Using a climate risk assessment

Why is a CRA important?

- A CRA provides an **evidence base** for climate action and investment.
- CRAs provide data on the locations, the types of infrastructure and the groups of people that will be negatively impacted by climate change.
- The interpretation and use of a CRA in decision-making is important to how you address climate risk.

What can you do with a CRA?

- Identify priority climate resilient infrastructure and services that need to be built.
- Integrate resilience into long-term planning (e.g. master plans).
- Develop policies and strategies such as city-level Climate Action Plans or catchment plans.
- Secure finance for investment in priority adaptation and resilience options.



Photo by AP

Extra resources Module 3

Physical Climate Risk Assessment: Practical Lessons for the Development of Climate Scenarios NGFS & World Bank (2022)

Technical Guidance on Comprehensive Risk Assessment and Planning in the Context of Climate Change UNDRR

Programme guidance for climate resilient WASH WaterAid

WASH Climate Resilient Development Guidance Note UNICEF

How Tough is WASH? Bristol University

Climate, Environment and Disaster Risk Reduction Guidance (CEDRIG) Swiss Agency for Development Cooperation

Integrating climate resilience with WASH systems strengthening WaterAid

Climate Risk Informed Decision Analysis CRIDA

End of day reflection

- **Yellow post-it**
  what went well today
- **Pink post-it**
  what could be improved of today
- Post them on the evaluation sheet when leaving the room

