Building Resilience

Flood Risk Management, Community Adaptation and Humanitarian Action

BACKGROUND TO URBAN FLOOD

1. Floods are **common phenomena** in water cycle over the world.

2. Asia-Pacific region is under the very frequent and severe impacts of floods because of its **geographical composition.**

3. Majority of the region's **major cities are riverine or coastal,** which have concentration of population, assets, economic and industrial development, and infrastructures.

4. Flooding in urban areas can be caused by **urban water-logging, flash flood, riverine flooding, or storm surges.**

5. Additionally, **due to climate change,** as floods coming too early, too late, too large or too small, it becomes a kind of **water hazard.**

6. The increasing urban flood risk has urged all nations and international organizations to take measures to **confront the threats caused by floods and to build flood resilient cities.**









Types of urban flood

Local Floods

- Very high rainfall intensity and duration during rainy season sometimes caused by seasonal storms and depressions and exacerbated by impervious soil.
- Built environments like cities generate higher surface run-off that is in excess of local drainage capacity, thereby causing local floods.
- Local drainage capacity is primarily made up of a local stormwater drainage system composed of storm drainpipes, curb inlets, manholes, minor channels, roadside ditches and culverts.

Riverine Floods

- River floods are triggered by heavy rainfall in upstream areas, or tidal influence from the downstream.
- Ground conditions such as soil, vegetation cover, and land use have a direct bearing on the amount of runoff generated.
- River floods occur when the river run-off volume exceeds local flow capacities.
- Failure or bad operation of drainage or flood control works upstream can also sometimes lead to riverine flooding.

Coastal Floods

- High tides and storm surges caused by tropical depressions and cyclones can cause coastal floods in urban areas located at estuaries, tidal flats and low-lying land near the sea.
- Coastline configurations, offshore water depth and estuary shape can influence the intensity of coastal floods.
- High tides may impede the discharge of rivers and drainage systems, leading to local or riverine floods.
- Tsunamis, mainly triggered by powerful offshore earthquakes, can also cause coastal floods.

Flash Floods

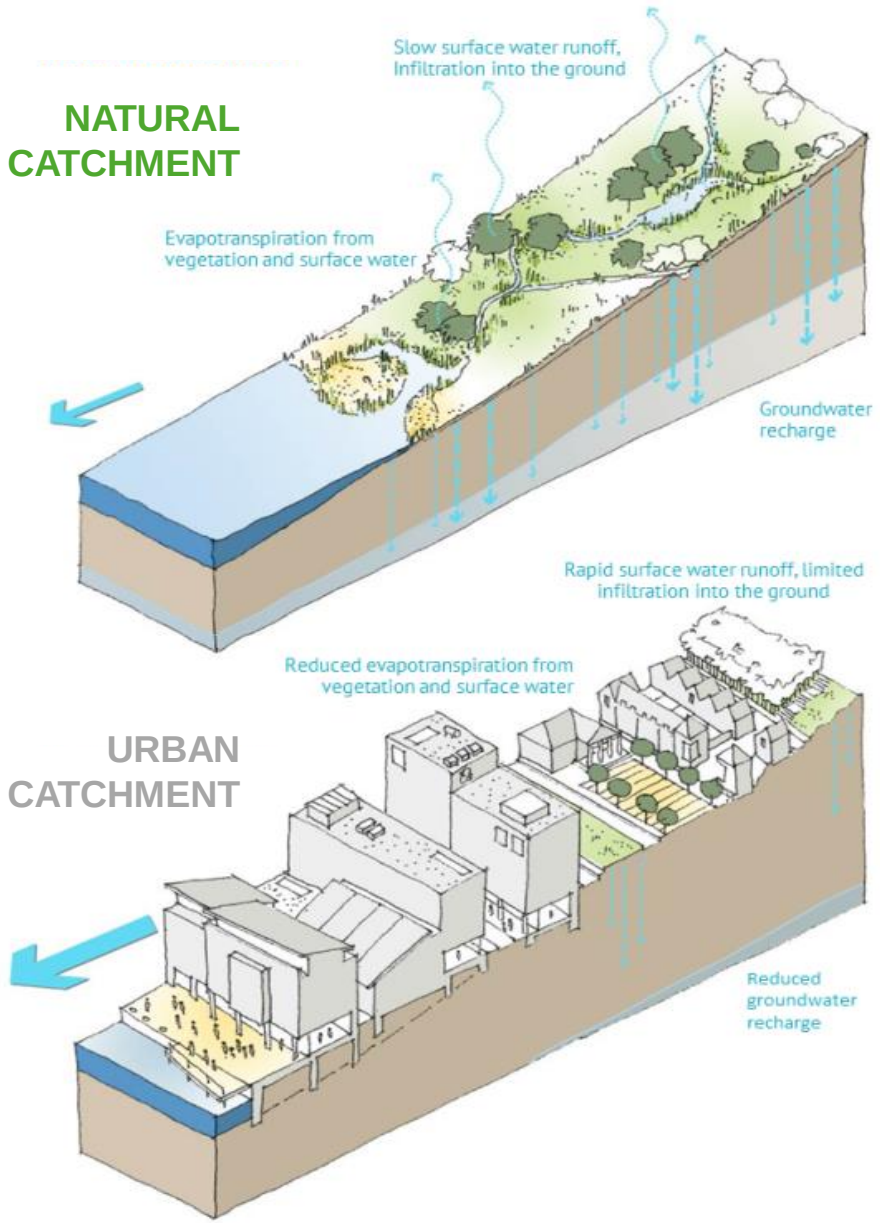
- Flash floods occur as a result of the rapid accumulation and release of runoff waters from upstream areas, which can be caused by very heavy rainfall, cloud bursts, landslides, or failure of flood control works.
- Characterized by a sharp rise followed by relatively rapid recession causing high flow velocities. Discharges quickly reach a maximum and diminish almost as rapidly.
- Small streams in urban areas can also rise quickly after heavy rain due to higher run-off generated and the smaller time of concentration.

What causes urban flood?

Urban flooding is a consequence of **increased impermeable catchments and rapid urbanisation.**

Water tends to flow to lower grounds **without percolating at the point of incidence.**

Unplanned and haphazard growth has **changed the usual direction of water flow** causing larger empty spaces like roads and basements to be flooded.



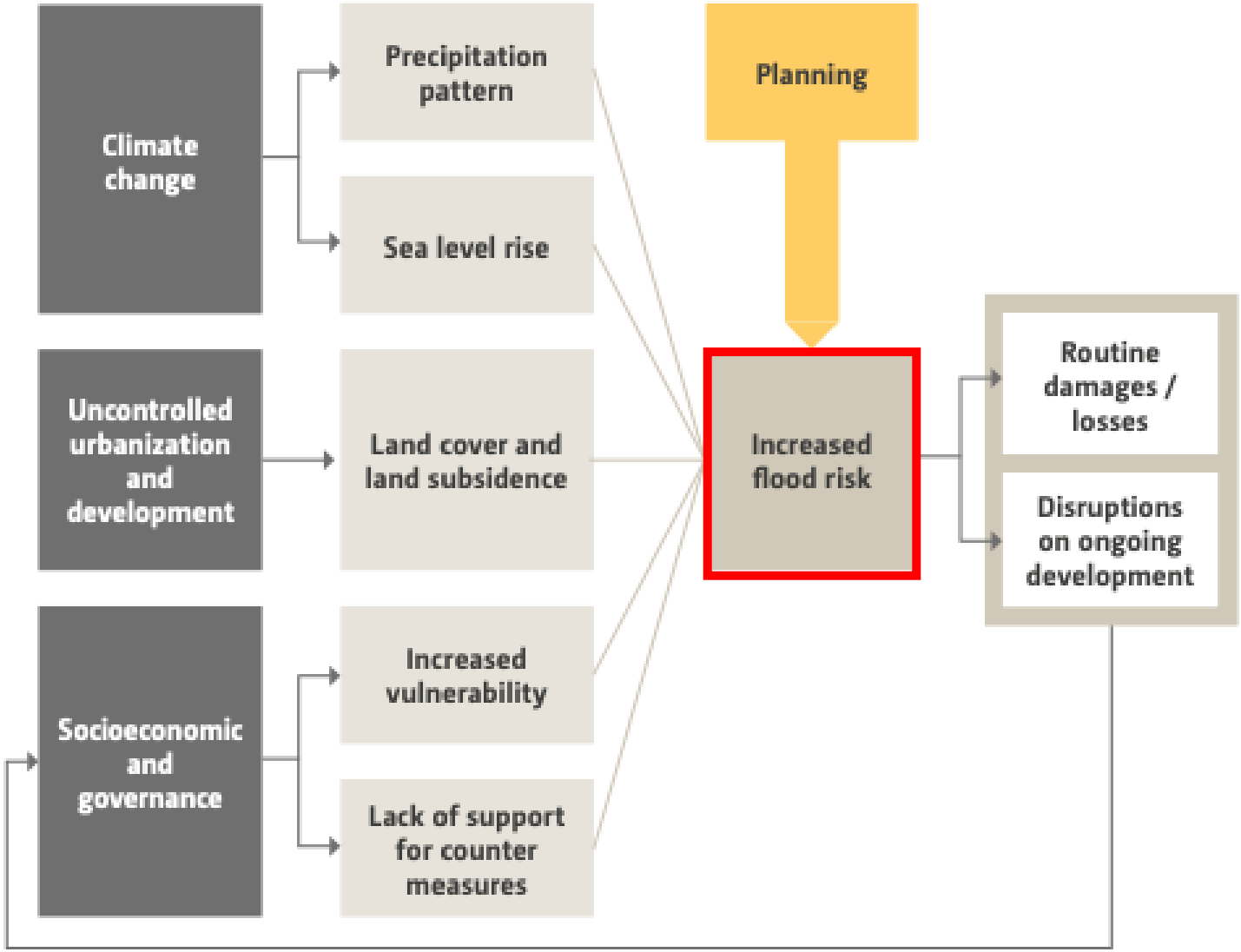
Factors contributing to flooding

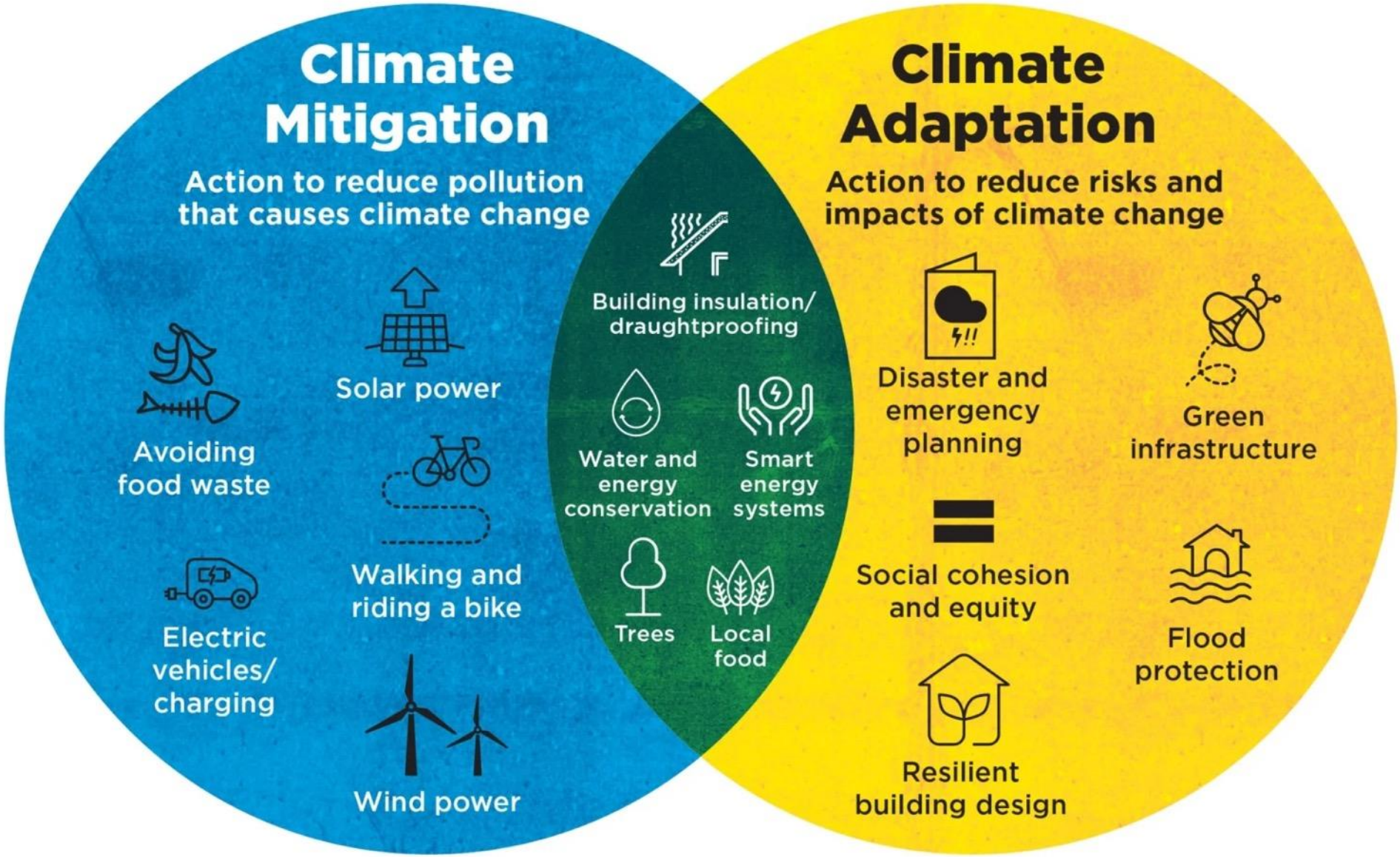
Meteorological Factors	Hydrological Factors	Human Factors Aggravating Natural Flood Hazards
• Rainfall • Cyclonic storms • Small-scale storms • Temperature • Snowfall and snowmelt	• Soil moisture level • Groundwater level prior to storm • Natural surface infiltration rate • Presence of impervious cover • Presence or absence of over bank flow • Synchronization of run-offs from various parts of watershed • High tide impeding drainage	• Land-use changes (e.g. surface sealing due to urbanization, deforestation) increase run-off and may be sedimentation • Occupation of the flood plain obstructing flows • Inefficiency or non-maintenance of infrastructure • Too efficient drainage of upstream areas increases flood peaks • Climate change affects magnitude and frequency of precipitations and floods • Urban microclimate may enforce precipitation events

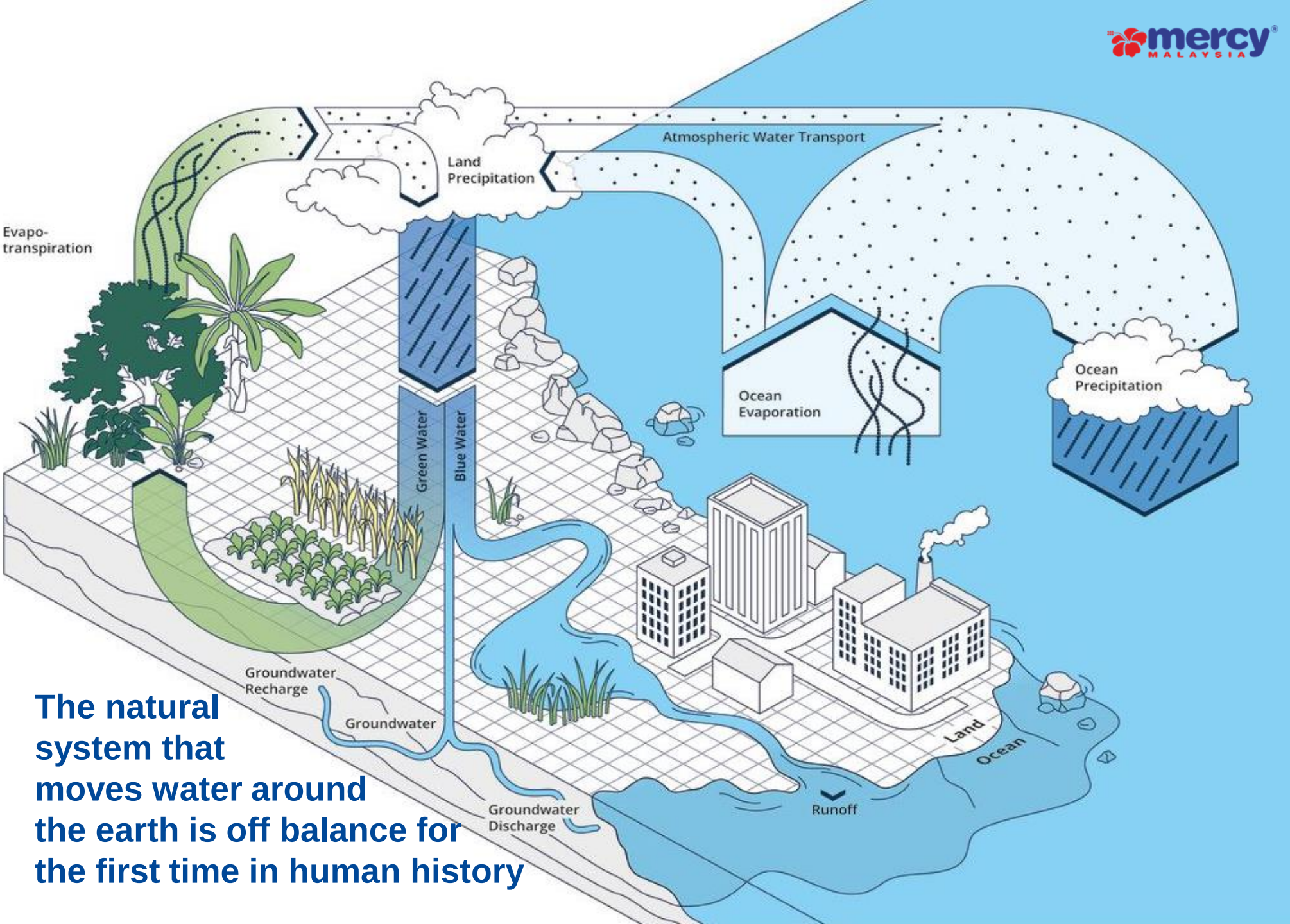
Factors contributing to flooding

Classification	Traditional Rural Type	Modern Urban Type
Causes	Mainly by natural factors	Mainly man-made, even becoming more dominant
Types	Fluvial flooding, storm surge, rainstorm, levee-breach flood, waterlogging	Increase of man-made floods, such as dam-break, accidents of burst of water supply systems
Affected area	Mainly limited in the inundated area, larger but can be more clearly identified	Inundated area may be decreased, but the affected area become uncertain, maybe much larger than the flooded areas
Probability	Floods with different return periods may form different flooded areas	Uncertain, flooding possibility in suburban areas may increased, pluvial flooding occur more frequently
Affected areas	Floodplain, farmlands, villages, towns	Upper reservoir area, newly urbanized area, underground spaces
Time	Usually during the flood season with certain periodicity	Maybe advanced or deferred artificially; the failure or interruption of critical infrastructure may occur
Duration	Related to area, duration of the rainfall and geographic features	Maybe prolonged or shortened artificially
Damage caused	Mainly in crops, farmhouses, farm tools, and casualties of life	Assets of industry and commerce, public facilities, family properties, urban infrastructures of lifeline system, indirect losses increased
Impact	Causing famine, plague, larger casualties, poverty, transport interruption, severely affected area may be recovered in several years	Higher economic loss, larger affected area compared to flood area, some losses may be unable to recuperate, but can be recovered rapidly
Flood control measures	Flood control system and regulated in lower level, flood proofing measures	Flood control and drainage system and regulated in higher level, flood proofing, storm flood storage in city area

Underlying causes and problems

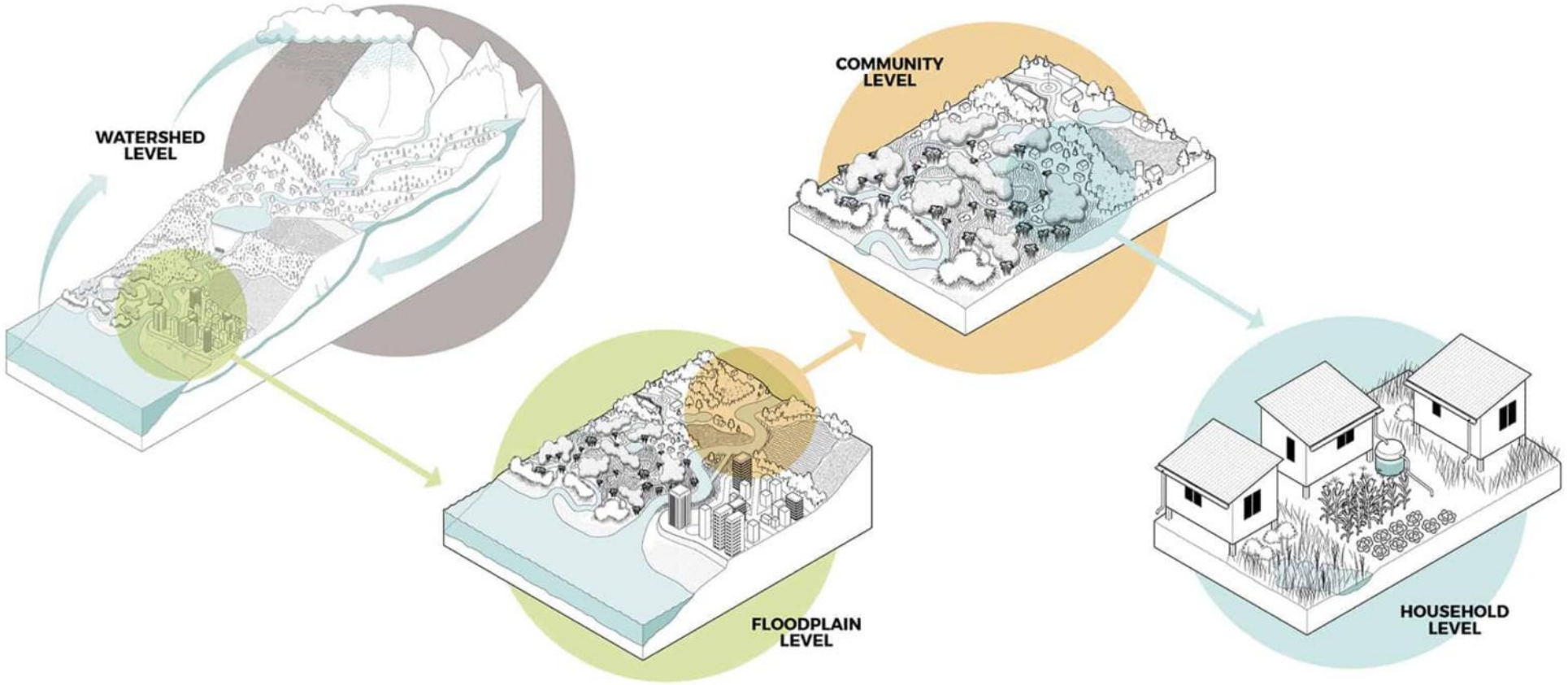



Climate Mitigation
Action to reduce pollution that causes climate change
Avoiding food waste
Solar power
Walking and riding a bike
Electric vehicles/ charging
Wind power
Building insulation/ draughtproofing
Water and energy conservation
Smart energy systems
Trees
Local food
Climate Adaptation
Action to reduce risks and impacts of climate change
Disaster and emergency planning
Green infrastructure
Social cohesion and equity
Flood protection
Resilient building design

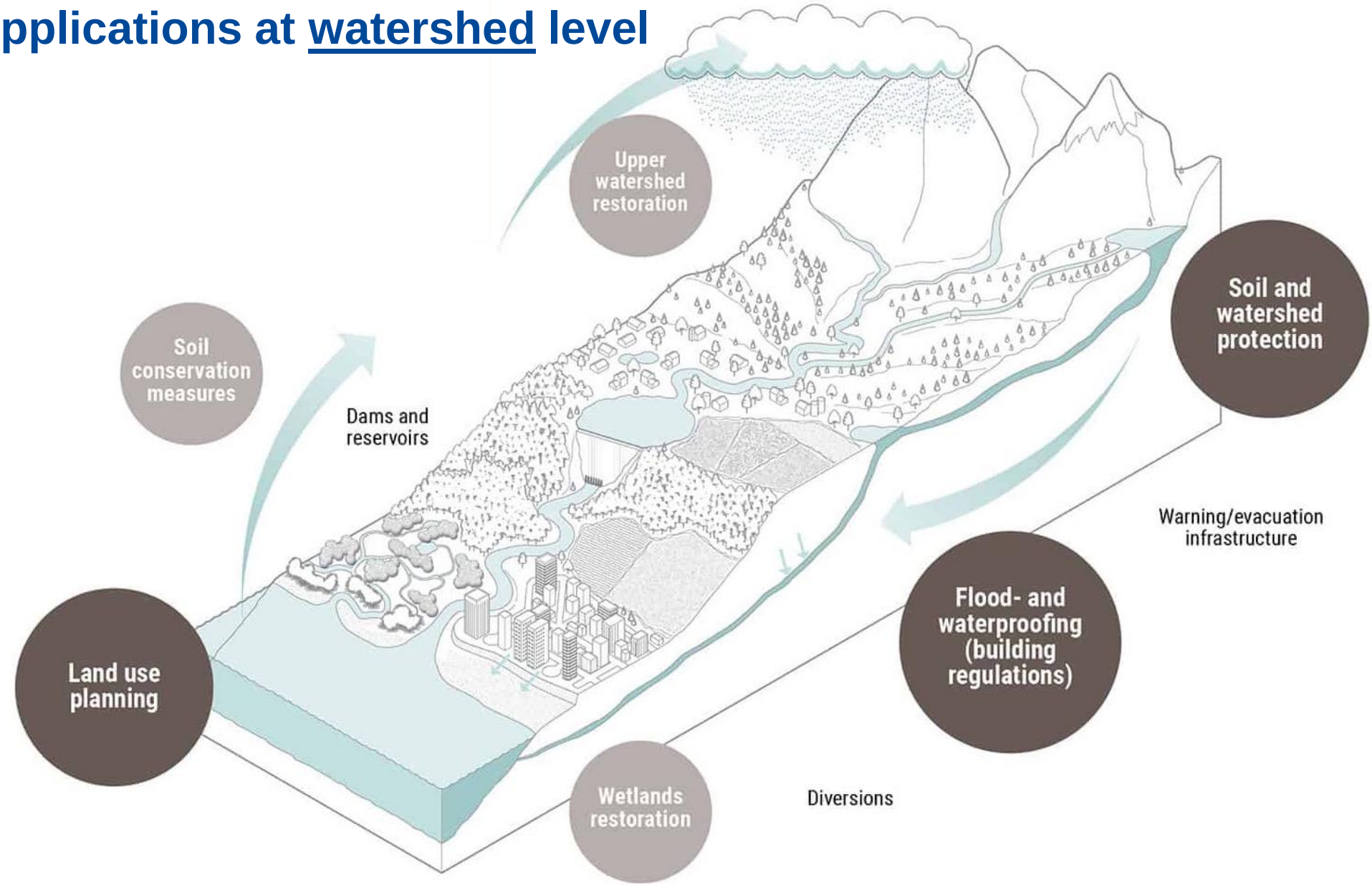


The natural system that moves water around the earth is off balance for the first time in human history

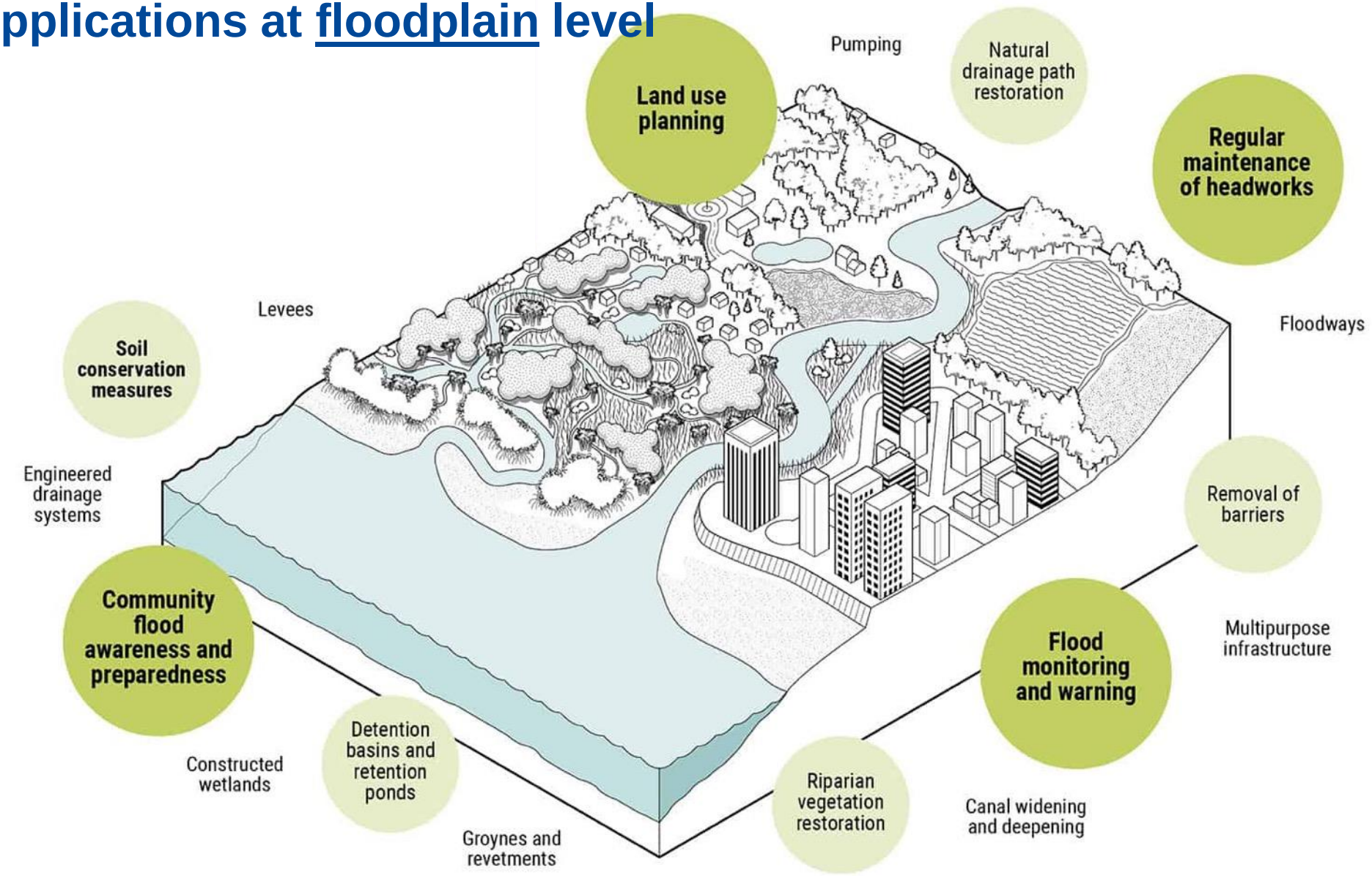
Water and flood risk management – scales of application



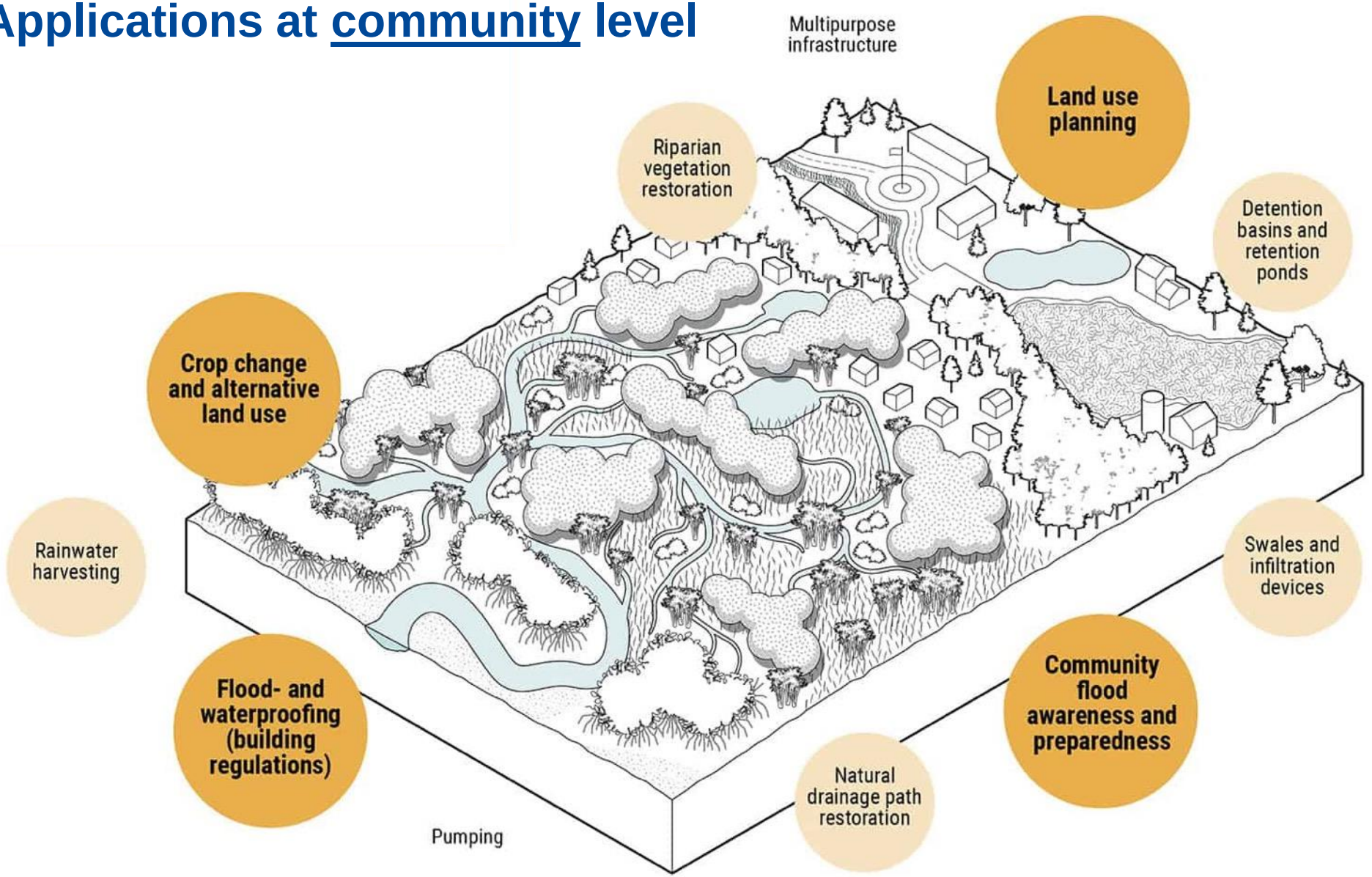
Applications at watershed level



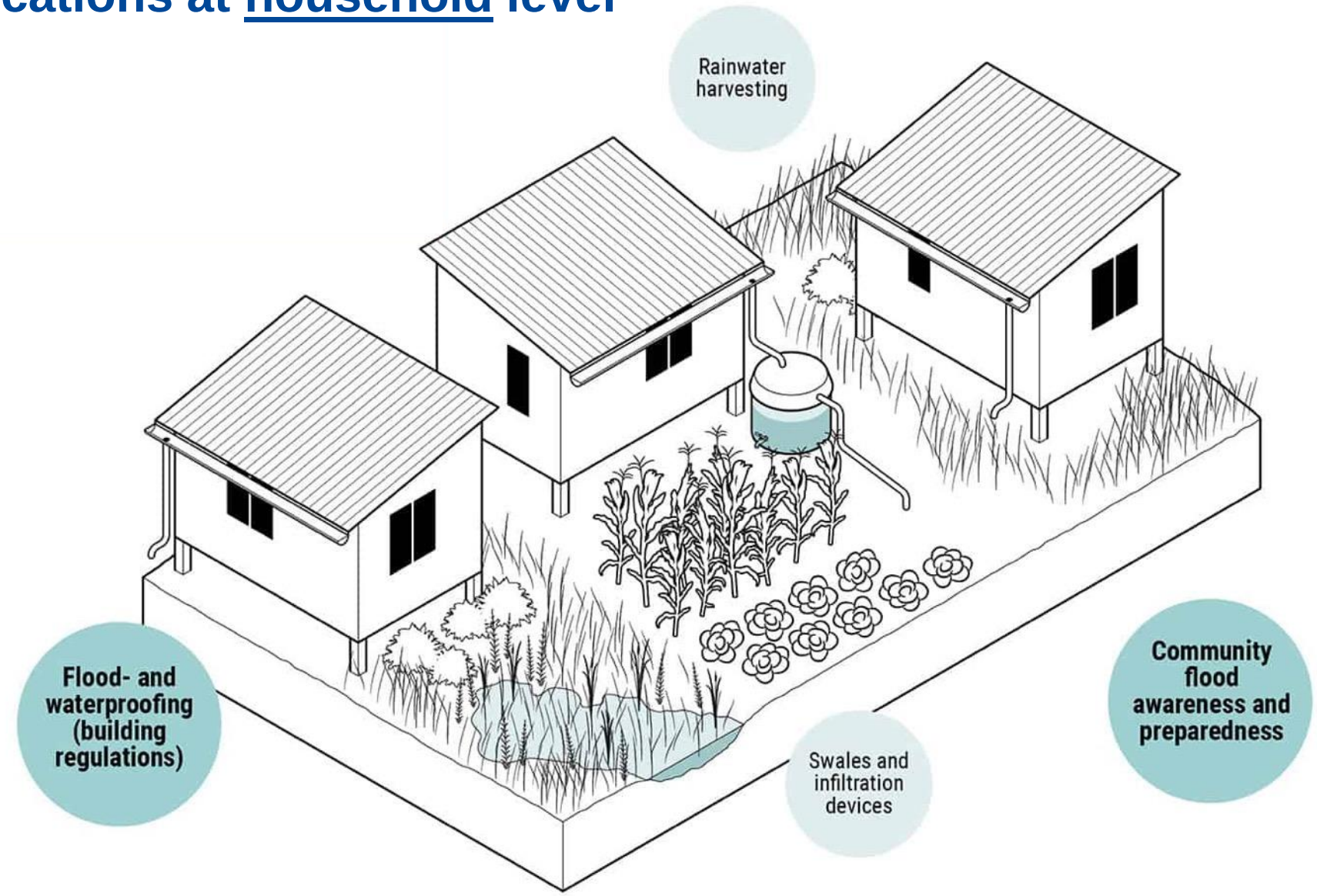
Applications at floodplain level



Applications at community level



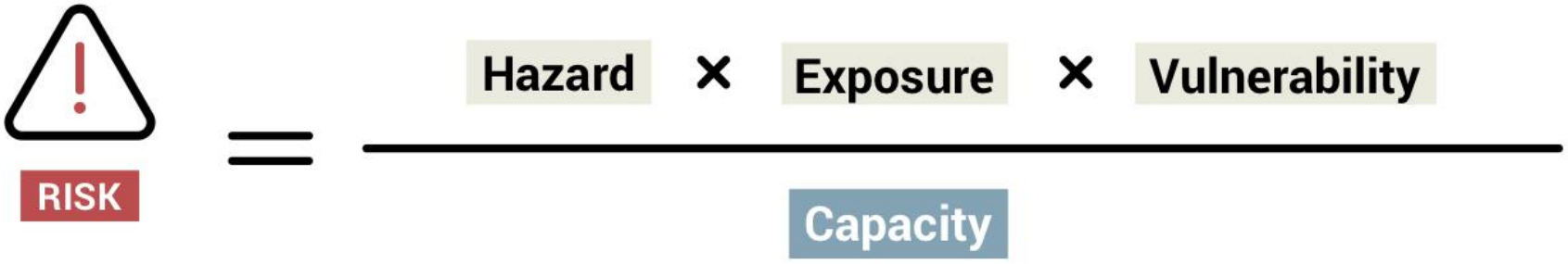
Applications at household level



FLOOD RISK MANAGEMENT

Disaster risk is defined as **"the potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time".**

In simple terms, disaster risk is determined as an equation of **hazard, exposure, and vulnerability** as shown below:



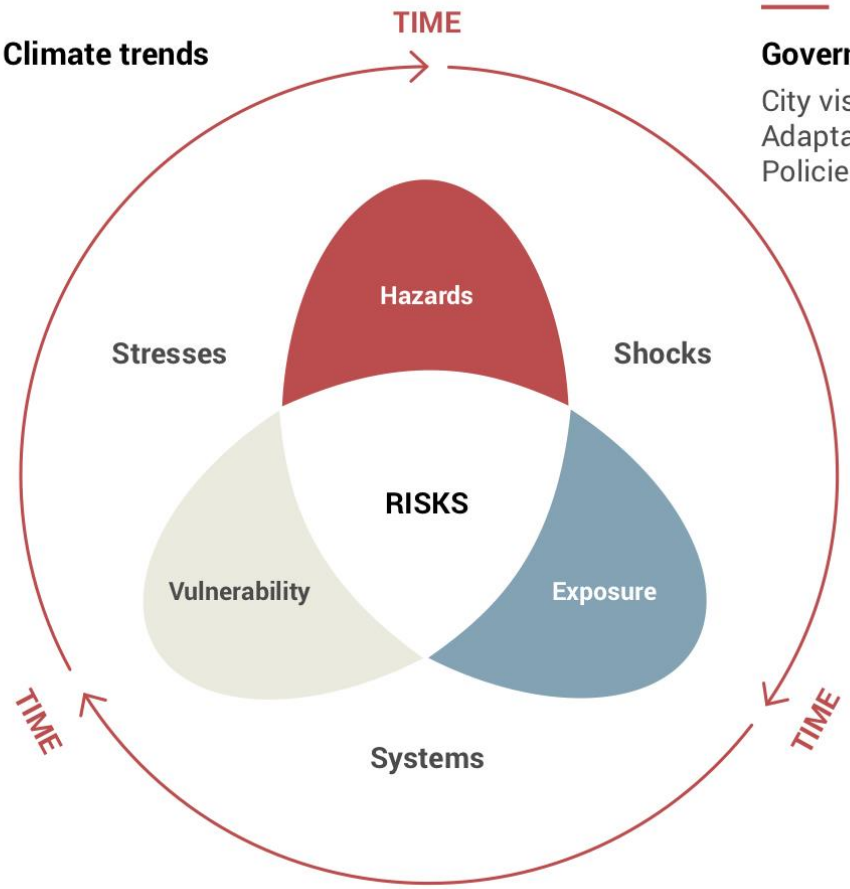
FLOOD RISK MANAGEMENT

Environmental & Climate trends

Climate change
Natural trends

Governance & Decision making

City vision
Adaptation & mitigation
Policies & incentives

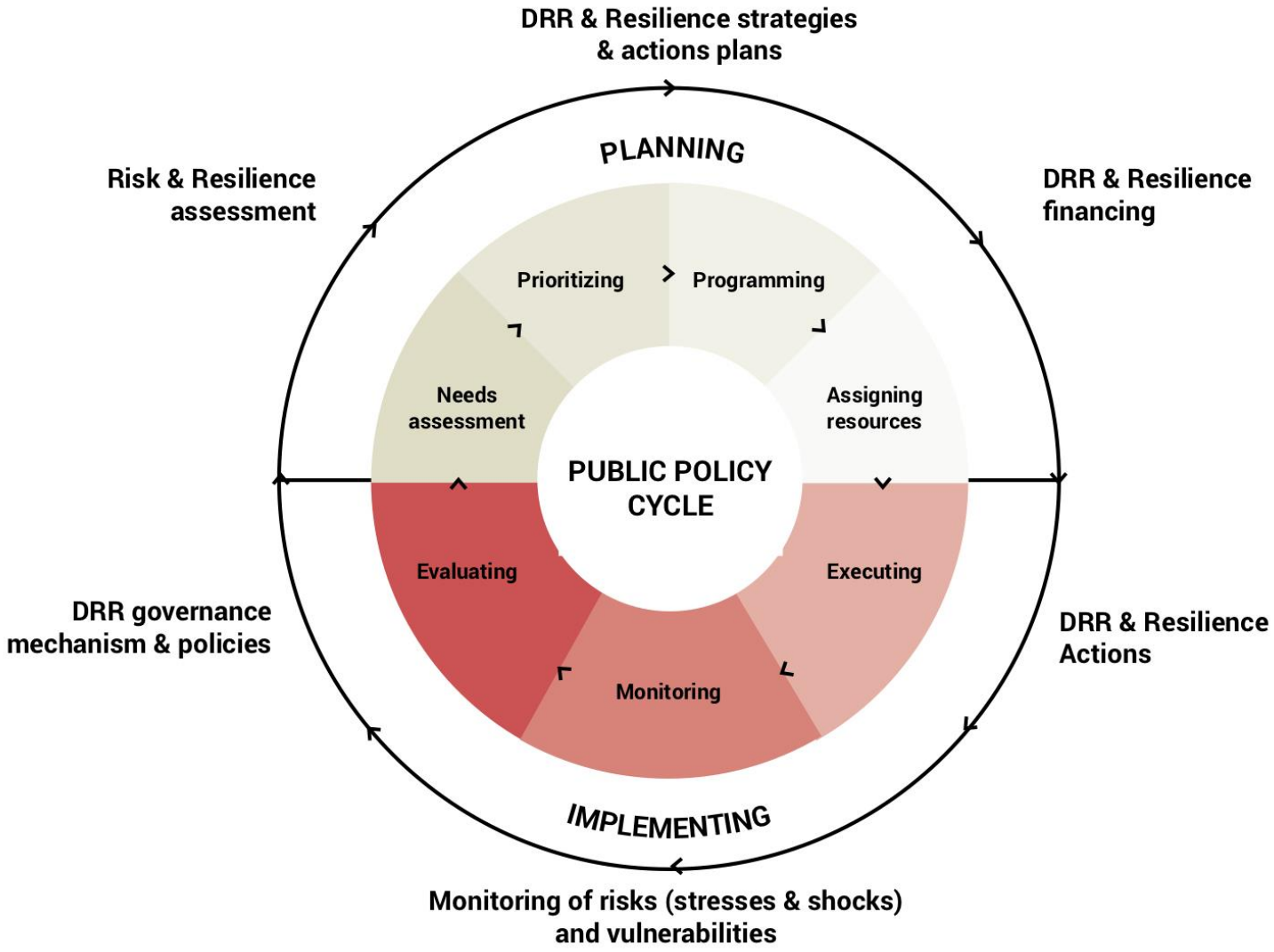


Socio-economic processes

Population growth
Economic development & distribution

FLOOD RISK MANAGEMENT

Policy cycle



FLOOD RISK MANAGEMENT

Strategies

Assess & Prioritize

- Risk & Resilience assessment
- Governance & Policies
- Financial resources & cost of inaction

Programming & Planning

- Social & Public health resilience
- Urban development & land-use planning
- Protecting ecosystems & Nature-based solutions
- Adequate & Resilient critical infrastructure
- Effective response & Building back better

Executing & Monitoring

FLOOD RISK MANAGEMENT

Non-structural measures

3 key areas of risk management planning to start with

Shocks & Stresses	Strategy & Actions	Financing mechanism

FLOOD RISK MANAGEMENT

Non-structural measures

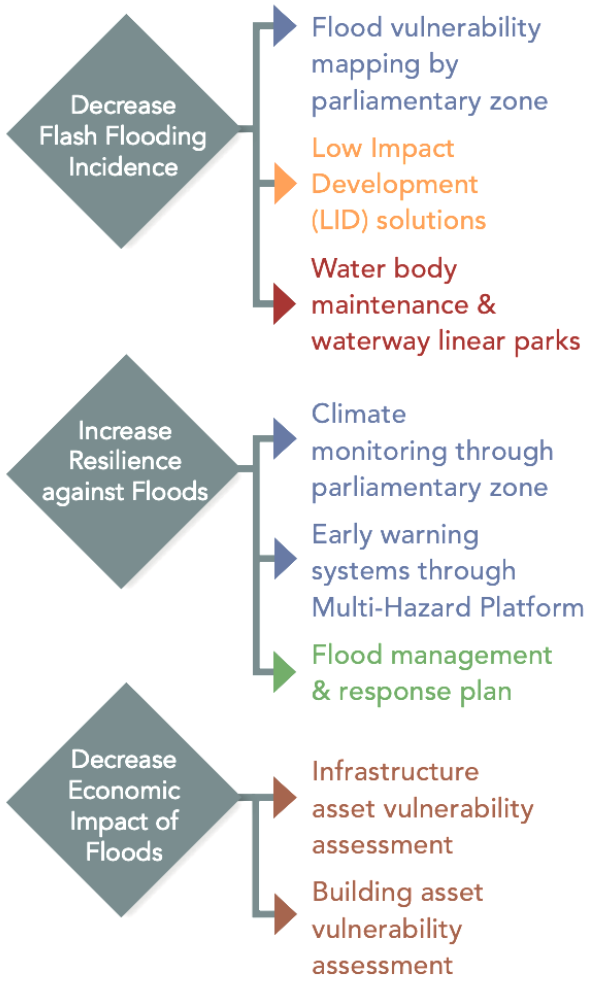
INTEGRATION
Interconnectedness and linkages between sectors and stakeholders

POLITICAL WILL
Formation of implementable policies and legislations

TRANSBOUNDARY CONCERNS
Consider the whole watershed and relationship between areas, districts, states and countries' water uses and flood risks

COMPREHENSIVE APPROACH BASED ON RISK ASSESSMENT
Preparedness, mitigation, response and recovery

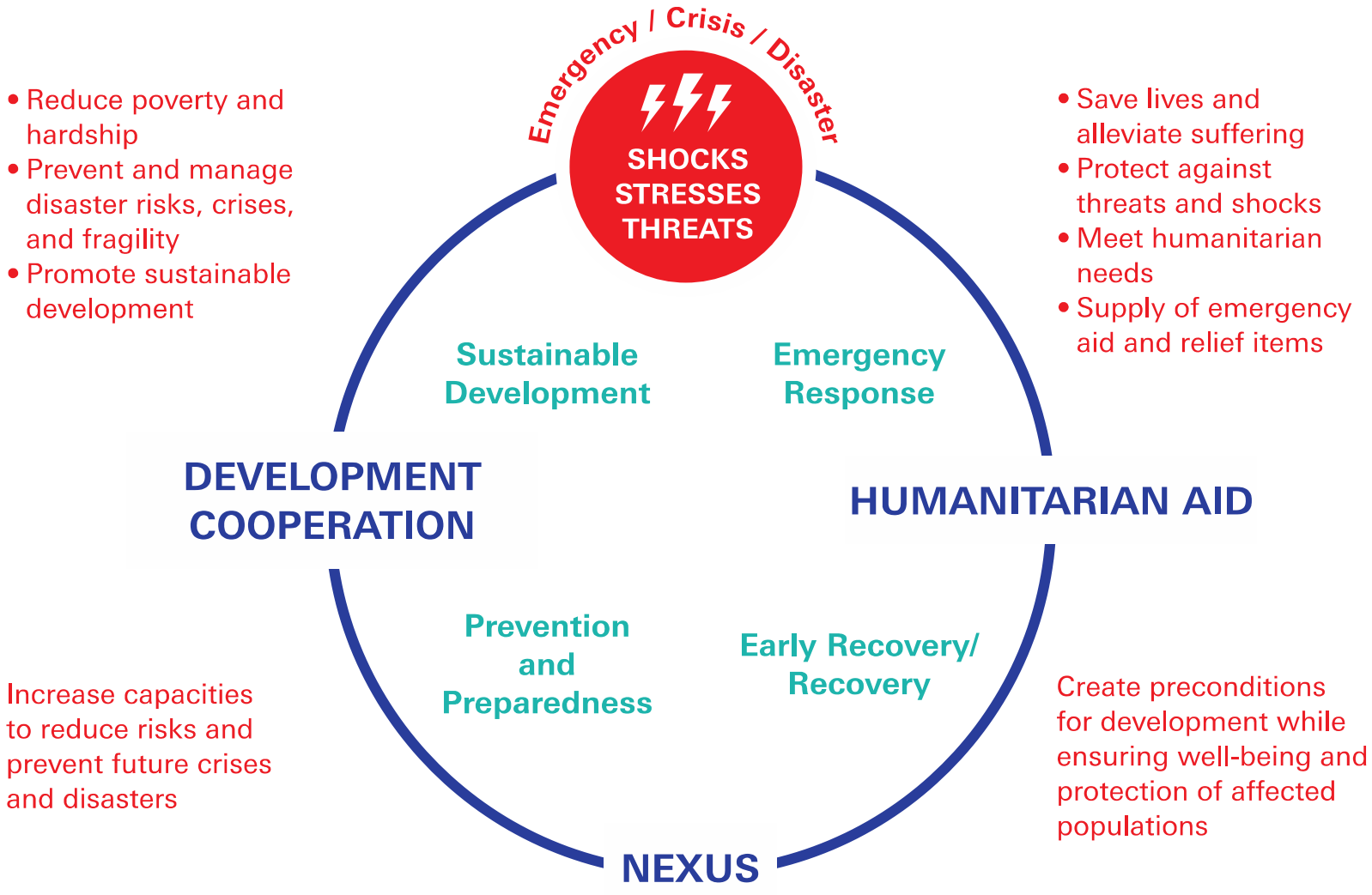
PARTICIPATION
Inclusion of all stakeholder groups



FLOOD RISK MANAGEMENT

Non-structural measures

THE HUMANITARIAN – DEVELOPMENT NEXUS APPROACH



THEORY AND PRACTICE OF DISASTER RISK MANAGEMENT

Disaster risk management is the application of disaster risk reduction policies and strategies to prevent new disaster risk, reduce existing disaster risk and manage residual risk, contributing to the strengthening of resilience and reduction of disaster losses.

Disaster risk management actions can be distinguished between:

PROSPECTIVE DISASTER RISK MANAGEMENT

CORRECTIVE DISASTER RISK MANAGEMENT

COMPENSATORY DISASTER RISK MANAGEMENT

Theory of disaster risk management

Theory of disaster risk management

DISASTER RISK MANAGEMENT plans set out the goals and specific objectives for reducing disaster risks together with related actions to accomplish these objectives.

They should be guided by the **Sendai Framework for Disaster Risk Reduction 2015-2030** and considered and **coordinated within relevant development plans, resource allocations and programme activities.**

National-level plans need to be specific to each level of administrative responsibility and adapted to the different social and geographical circumstances that are present. The time frame and responsibilities for implementation and the sources of funding should be specified in the plan.

Linkages to sustainable development and climate change adaptation plans should be made where possible.

Theory of disaster risk management

PROSPECTIVE DISASTER RISK MANAGEMENT activities address and seek to avoid the development of new or increased disaster risks. They focus on addressing disaster risks that may develop in future if disaster risk reduction policies are not put in place. Examples are better land-use planning or disaster-resistant water supply systems.

CORRECTIVE DISASTER RISK MANAGEMENT activities address and seek to remove or reduce disaster risks which are already present and which need to be managed and reduced now. Examples are the retrofitting of critical infrastructure or the relocation of exposed populations or assets.

COMPENSATORY DISASTER RISK MANAGEMENT activities strengthen the social and economic resilience of individuals and societies in the face of residual risk that cannot be effectively reduced. They include preparedness, response and recovery activities, but also a mix of different financing instruments, such as national contingency funds, risk insurance and social safety nets.

Sendai Framework for Disaster Risk Reduction (SFDRR)

Target A: Substantially reduce global disaster mortality

Target B: Substantially reduce the number of affected people globally

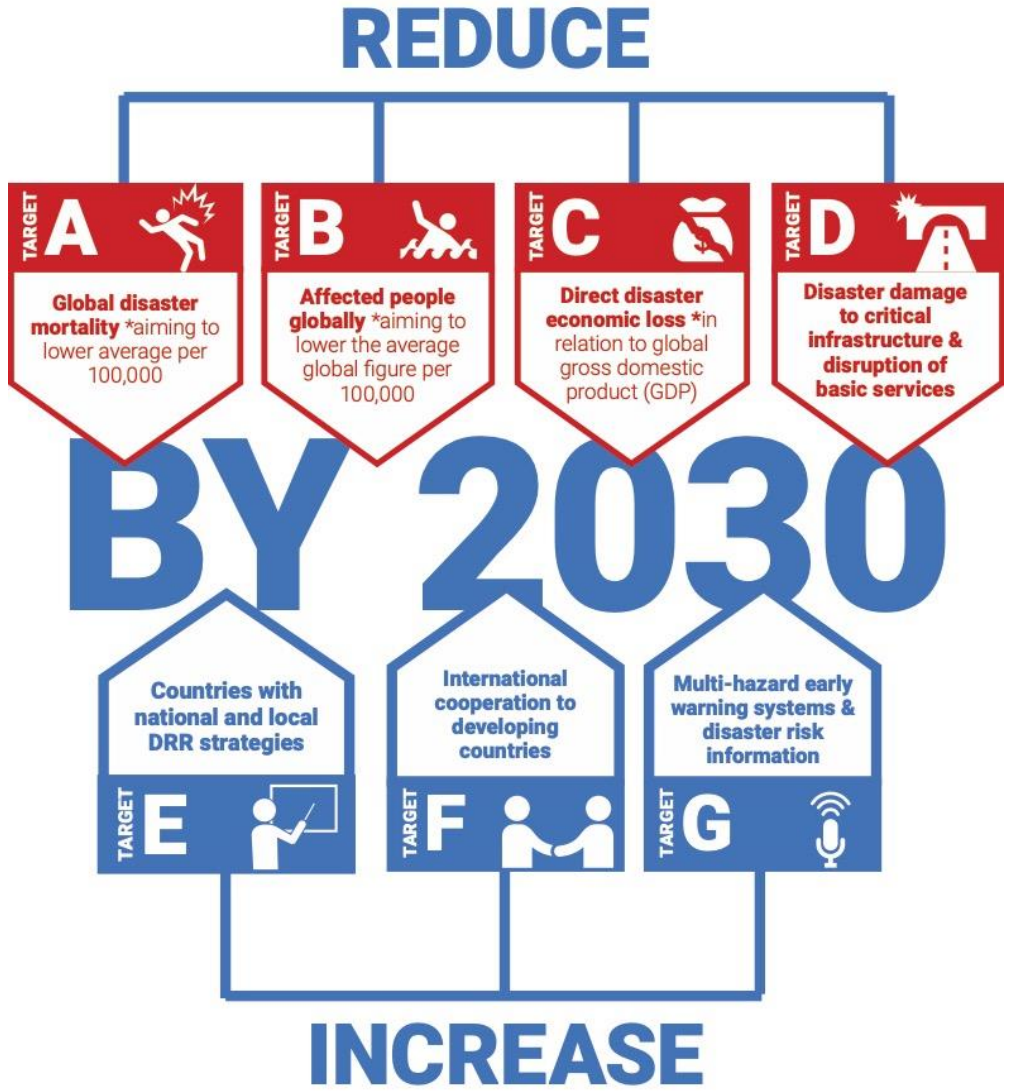
Target C: Reduce direct disaster economic loss

Target D: Substantially reduce disaster damage to critical infrastructure and disruption of basic services

Target E: Substantially increase the number of countries

Target F: Substantially enhance international cooperation

Target G: Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information



Sendai Framework for Disaster Risk Reduction (SFDRR)

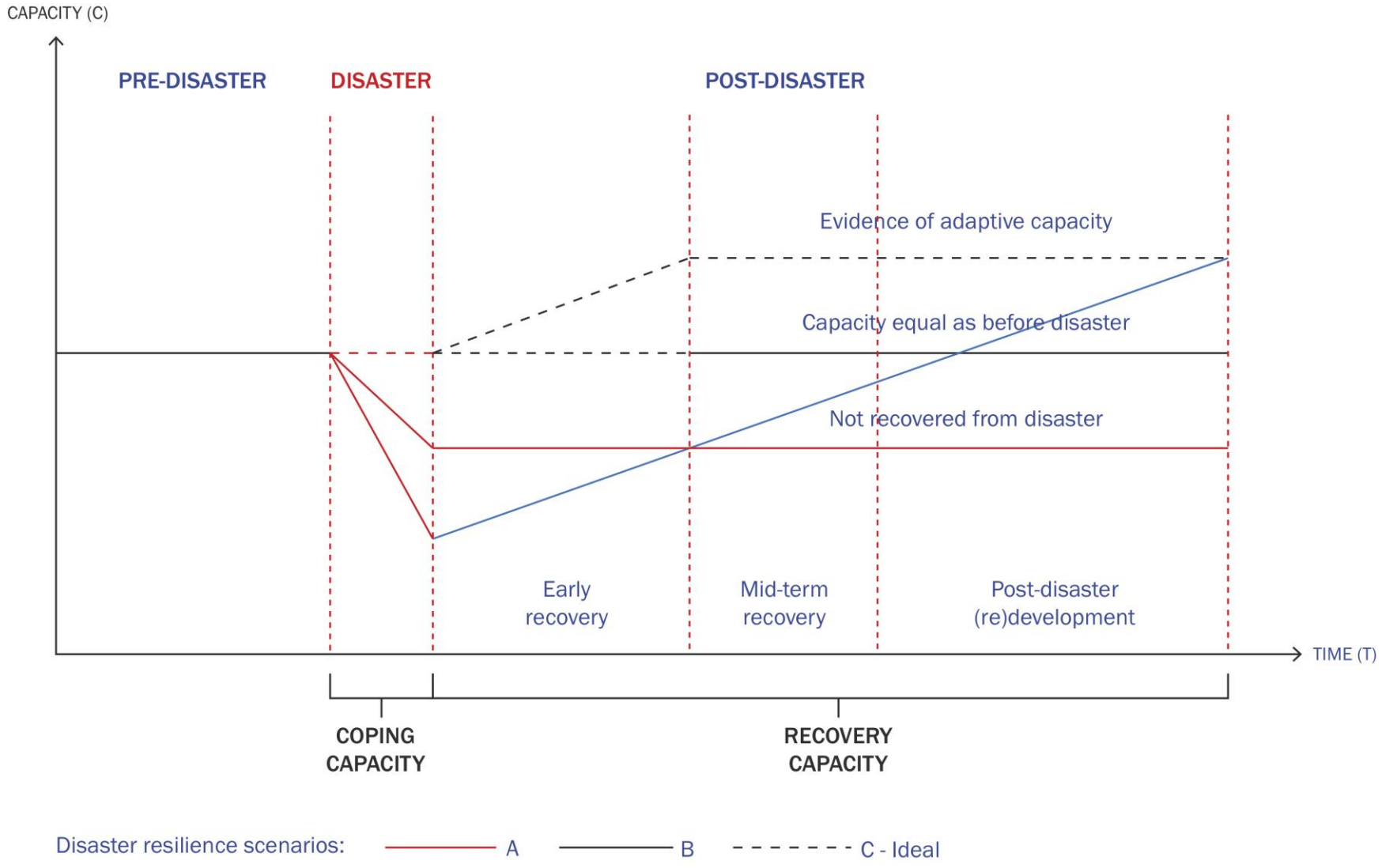
Priority 1: Understanding disaster risk

Priority 2: Strengthening disaster risk governance to manage disaster risk

Priority 3: Investing in disaster risk reduction for resilience

Priority 4: Enhancing disaster preparedness for effective response, and to Build Back Better in recovery, rehabilitation and reconstruction

Disaster resilience



Practice of disaster risk management

COMMUNITY-BASED DISASTER RISK MANAGEMENT promotes the involvement of potentially affected communities in disaster risk management at the local level. This includes community assessments of hazards, vulnerabilities and capacities, and their involvement in planning, implementation, monitoring and evaluation of local action for disaster risk reduction.

DISASTER RISK GOVERNANCE through the integration of disaster risk reduction into the core of development and finance policies, legislation and plans is important to address what makes us exposed and vulnerable to disasters: poverty and inequality, environmental degradation, rapid and unplanned urbanization, weak building codes, population growth in hazard-exposed areas.

CLIMATE RISK MANAGEMENT integrates climate forecast information into national and subnational disaster risk reduction strategies, aligning them better with the national adaptation goals into developing capacities of governments for cross-sectoral planning, and ensuring vertical alignment.

CAPACITY BUILDING IN DISASTER RISK MANAGEMENT

Community-based Disaster Risk Management (CBDRM)

CAPACITY BUILDING IN DISASTER RISK MANAGEMENT

School Preparedness Program (SPP)

CAPACITY BUILDING IN DISASTER RISK MANAGEMENT

Resilient Health Infrastructure (RHI)

CAPACITY BUILDING IN DISASTER RISK MANAGEMENT

Resilient Private Sector

CAPACITY BUILDING IN DISASTER RISK MANAGEMENT

Resilient Local Government

CAPACITY BUILDING IN DISASTER RISK MANAGEMENT

Disaster Simulation Exercise

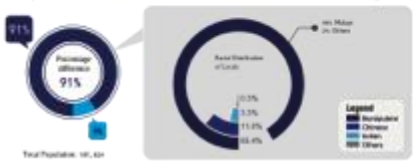
CAPACITY BUILDING IN DISASTER RISK MANAGEMENT

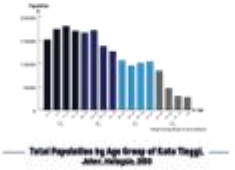
Disaster Risk Mapping

Total Population of Kota Tinggi
Johor, Malaysia

Introductory
Location: Kota Tinggi, Johor
Total Populations: 187, 824
Resilient against: Flood (Natural Disaster)
Main Economic: Agricultural

Total Population by Etnic Group of Kota Tinggi, Johor, Malaysia, 2010





Malaysia (Based on 2010 Consensus)

Kota Tinggi
There are 9 major areas in Kota Tinggi that makes up the whole area. Namely:

1. Bandar Kota Tinggi
2. Taman Kota Jaya
3. Kg Kelantan
4. Taman Sri Lalang
5. Kg Sri Lalang
6. Kg Makam
7. Kota Kecil
8. Tg Putus
9. Kg Ponn

Areas Dispersion of Kota Tinggi
Johor, Malaysia

Purpose & Reasonings
Purpose: To identify the important area to be listed as buffer zone from the flood
Reason: To be able to identify approx. density of population thus determining better evacuation route/ transit point.
Importance: Protect areas with high monetary losses (flood aftermath)

Water Elevation:
affecting the surrounds areas

Synthesis
Analysis:
The elevation happens along the river. However there are those areas in which it happens outside of the river stream suggesting that the water is also flowing underground and increases (as leakage) during the flood.

Synthesis:
Buffer zone and safe spot should be identified

Conclusion:
Actions should be taken upstream the river

Data Analysis
Analysis:
The main bridge of Kota Tinggi is both submerged under water in case of flood. Thus escape is dangerous.

Synthesis:
Buffer zone and safe spot should be provided in both separating areas.

Speed of water
towards the sea

Analysis:
Running through the curb, speed of water is constant, however the containment is too limited to sustain the flow of water. Thus the rate of water collection decreases - which leads to the overflowing of river water and flooding the surrounding areas.

Water Body:
affecting the flow rate

Synthesis
Analysis:
Being in the geographic fault of downstream, flood is unevitable. But there is always the up sides of every negativity. Quote from Sun Tzu, Art of War, "supreme excellency consists of breking the enemy's resistance without fighting". Similarly with the current technology, we should utilize the water usage.

Synthesis:
Reducing the rate of water flow into the site through intervention.
-Watermill
-Water cachment
-Water channeling

Conclusion:
Actions should be taken upstream the river

CAPACITY BUILDING IN DISASTER RISK MANAGEMENT

Disaster Risk Mitigation

CAPACITY BUILDING IN DISASTER RISK MANAGEMENT

Water, Sanitation and Hygiene (WASH)

CAPACITY BUILDING IN DISASTER RISK MANAGEMENT

Post-disaster Recovery and Reconstruction

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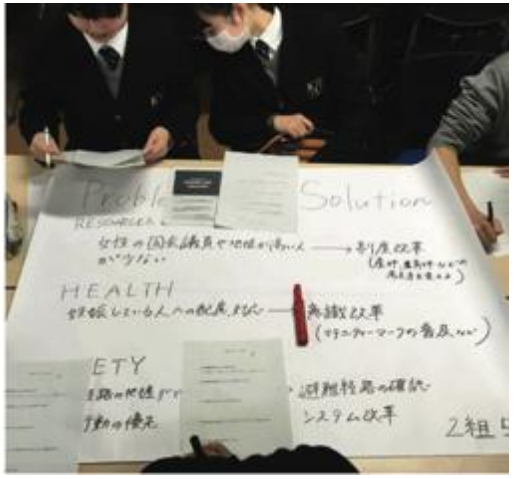
Post-disaster Livelihood Support

CAPACITY BUILDING IN DISASTER RISK MANAGEMENT

Nature-based Solutions for DRR

CAPACITY BUILDING IN DISASTER RISK MANAGEMENT

Advocacy



CAPACITY BUILDING IN DISASTER RISK MANAGEMENT

Knowledge Management

Thank you