NaDiMa Dialogue #3
Droughts, Sand & Dust Storms:
Challenges and Management
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Drought Management : Challenges and Opportunities

Arash Malekian
University of Tehran, IRAN
E-mail:malekian@ut.ac.ir

❑ *Drought*

- Creeping hazard: slow onset, long-duration, chronic, relatively large areal extent.
- Worldwide, not tied to certain geography, but more frequent in “semi-arid” climates.

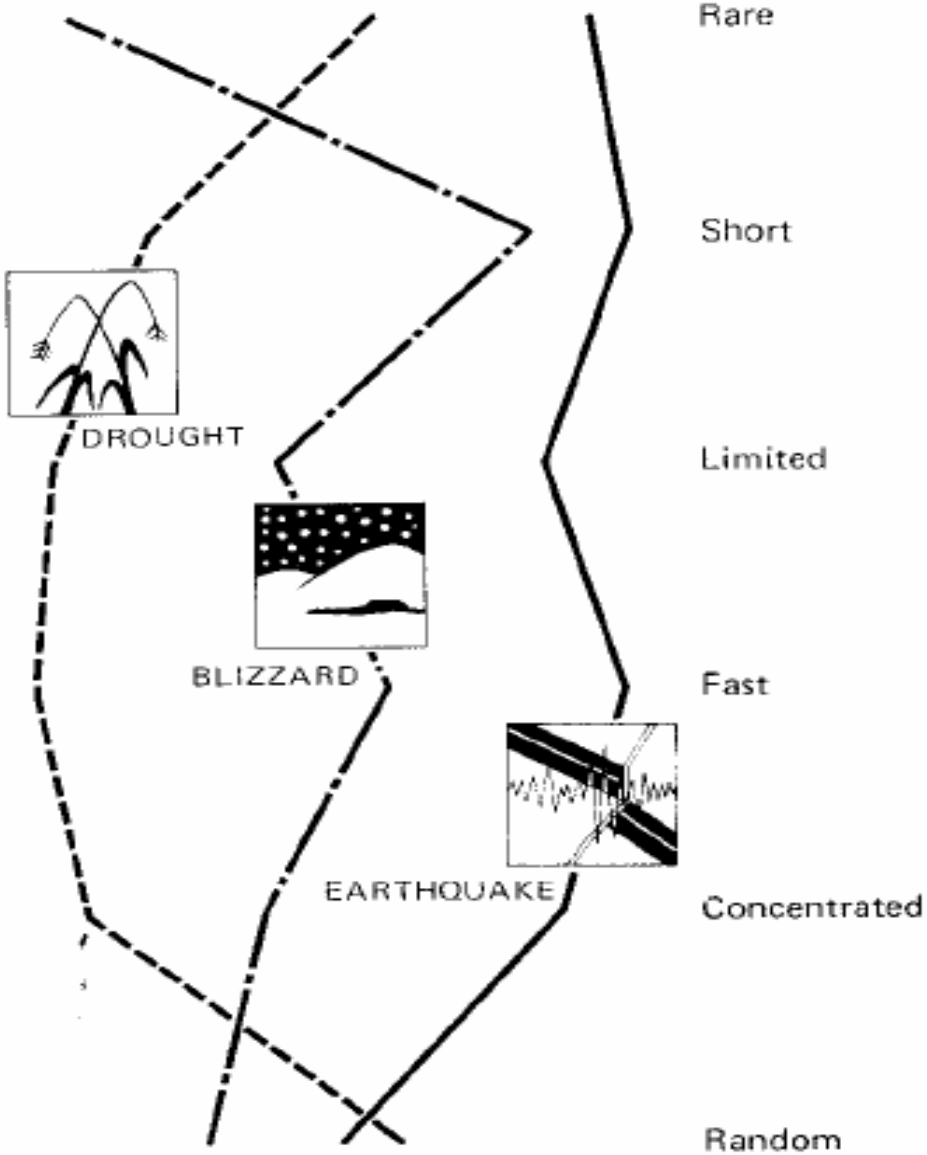
Definition

- A deficiency of precipitation from expected or normal that extends over a season or longer period of time and results in water supply that is insufficient to meet the needs of human activities and the environment.

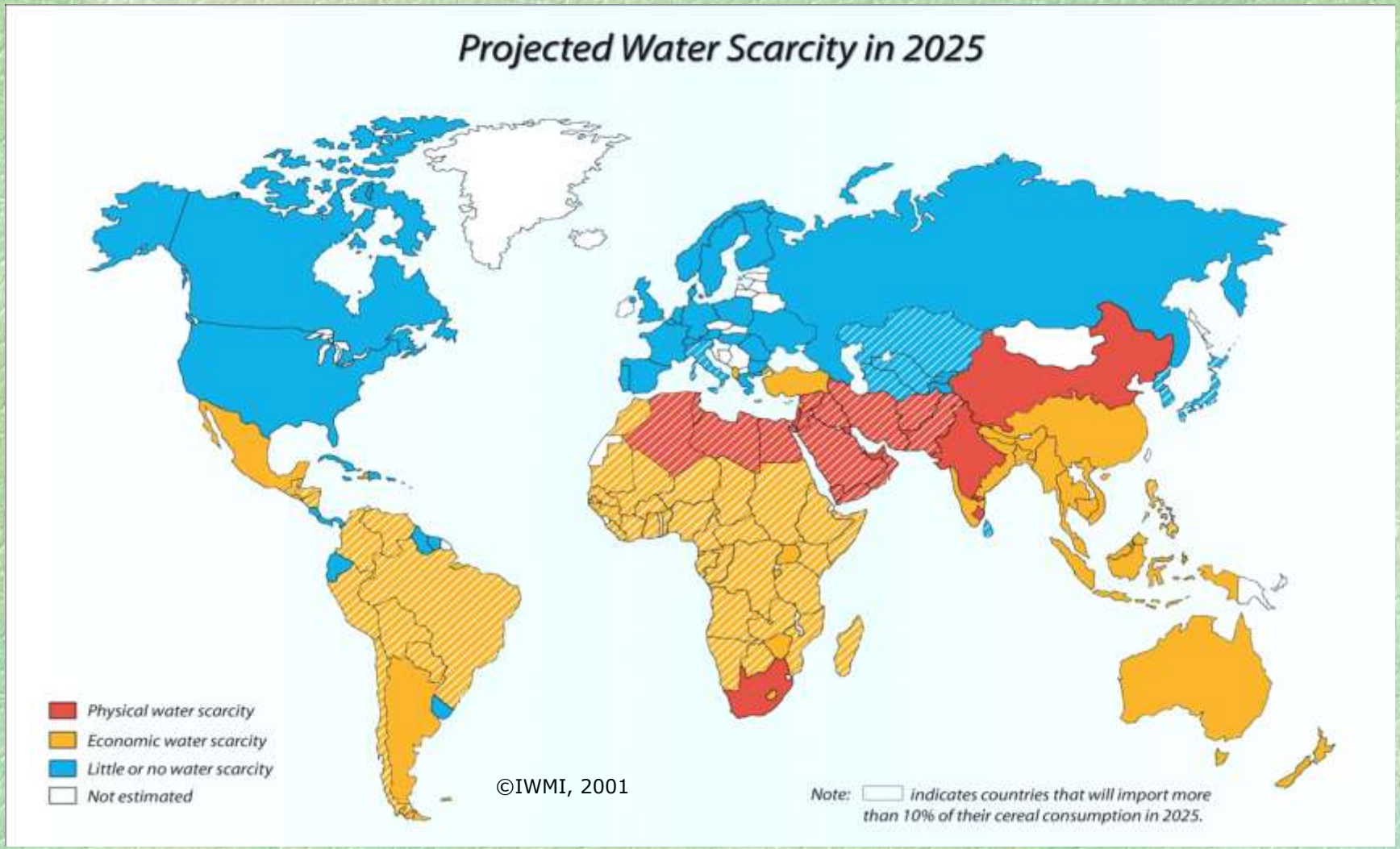
Drought

Simply stated, it's when 'demand exceeds supply'

Comparison of some natural hazards



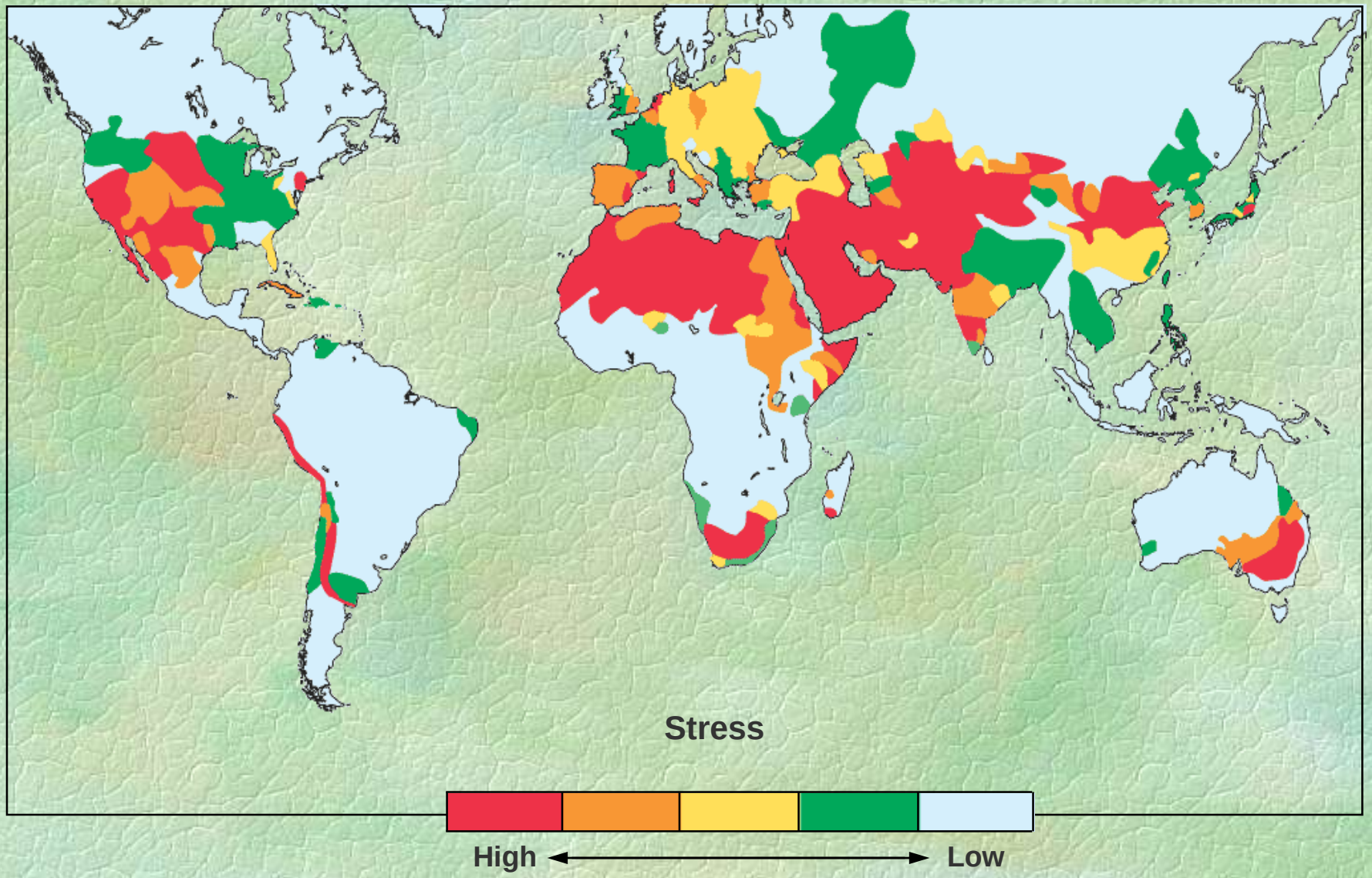
Water shortage in 1950



Water shortage in 2025

Water shortage in 2050

Water stress in the world



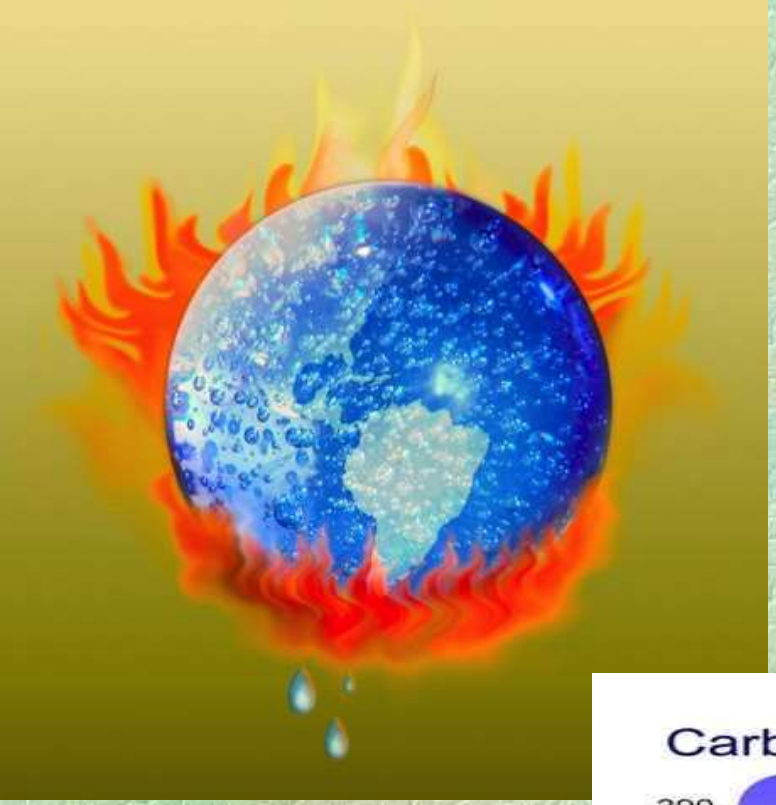
Challenges

- ✓ The first rainless day in a spell of fine weather contributes as much to the drought as the last day.

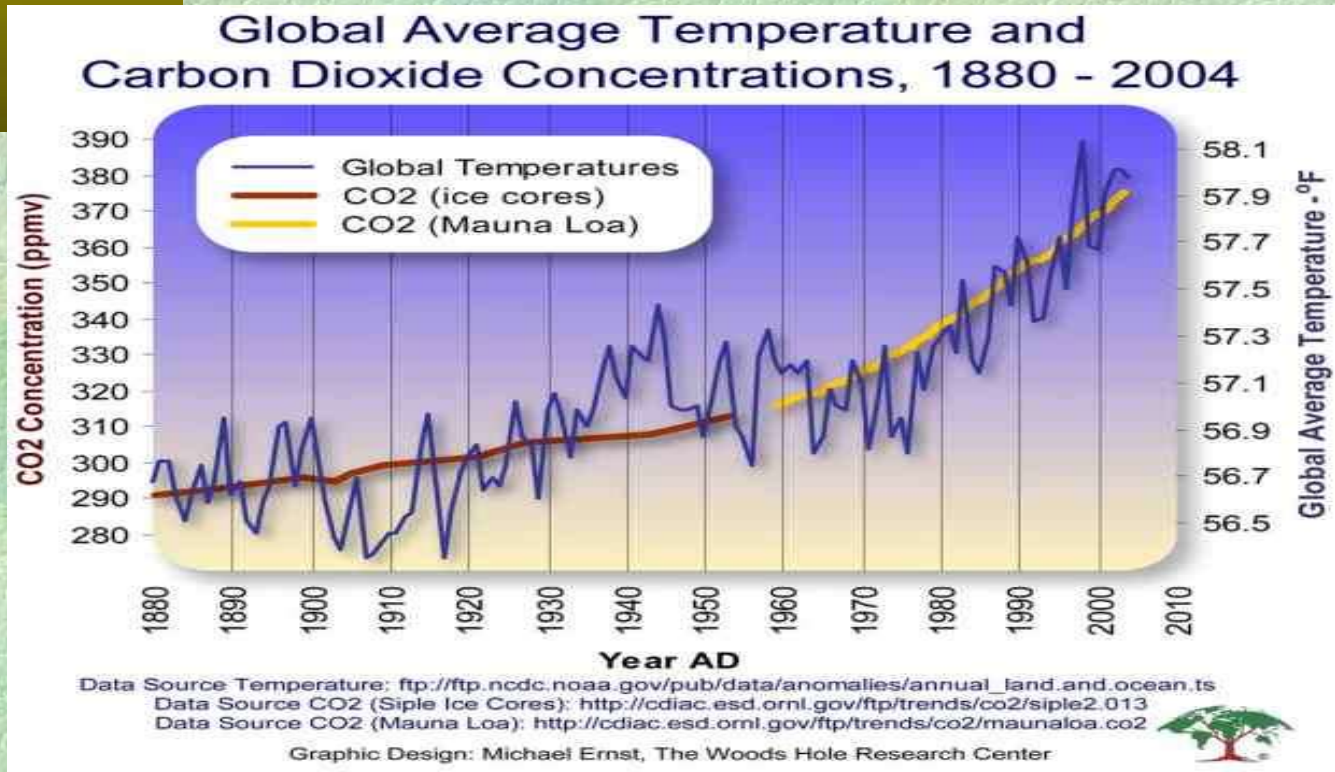
- ✓ No one knows precisely how serious it will be until the last dry day has gone and the rains have come again.

Uncertainty issues

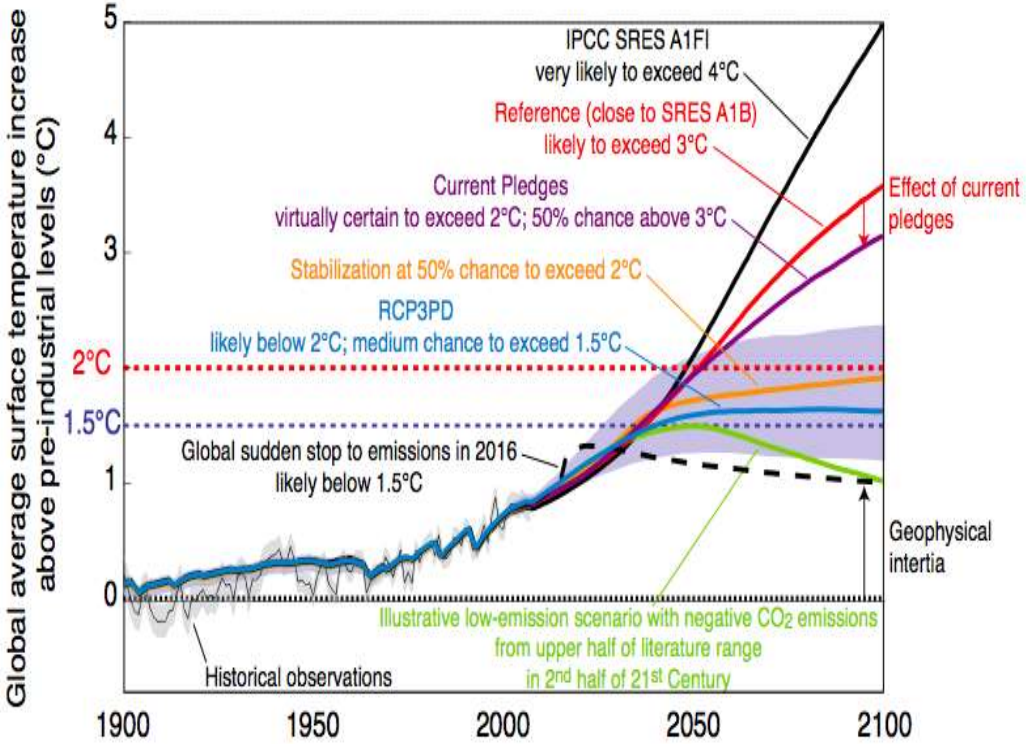
- ***Drought Knows No Country Borders !***
- ***So:***
- ***What Can We Do?***

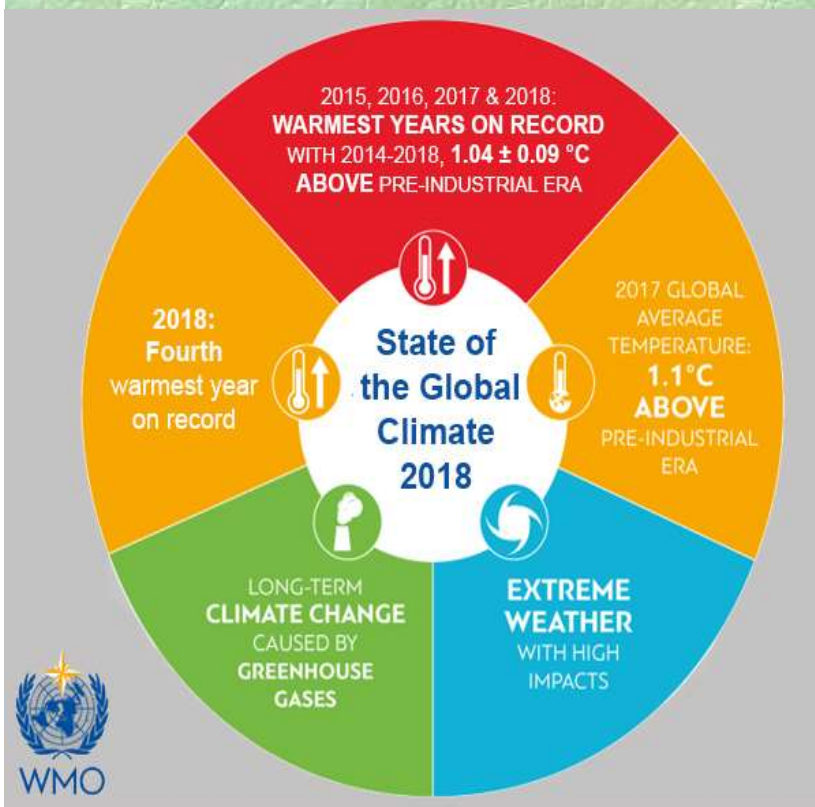


Greenhouse Effect and Global warming



Emission Scenarios and temperature increase

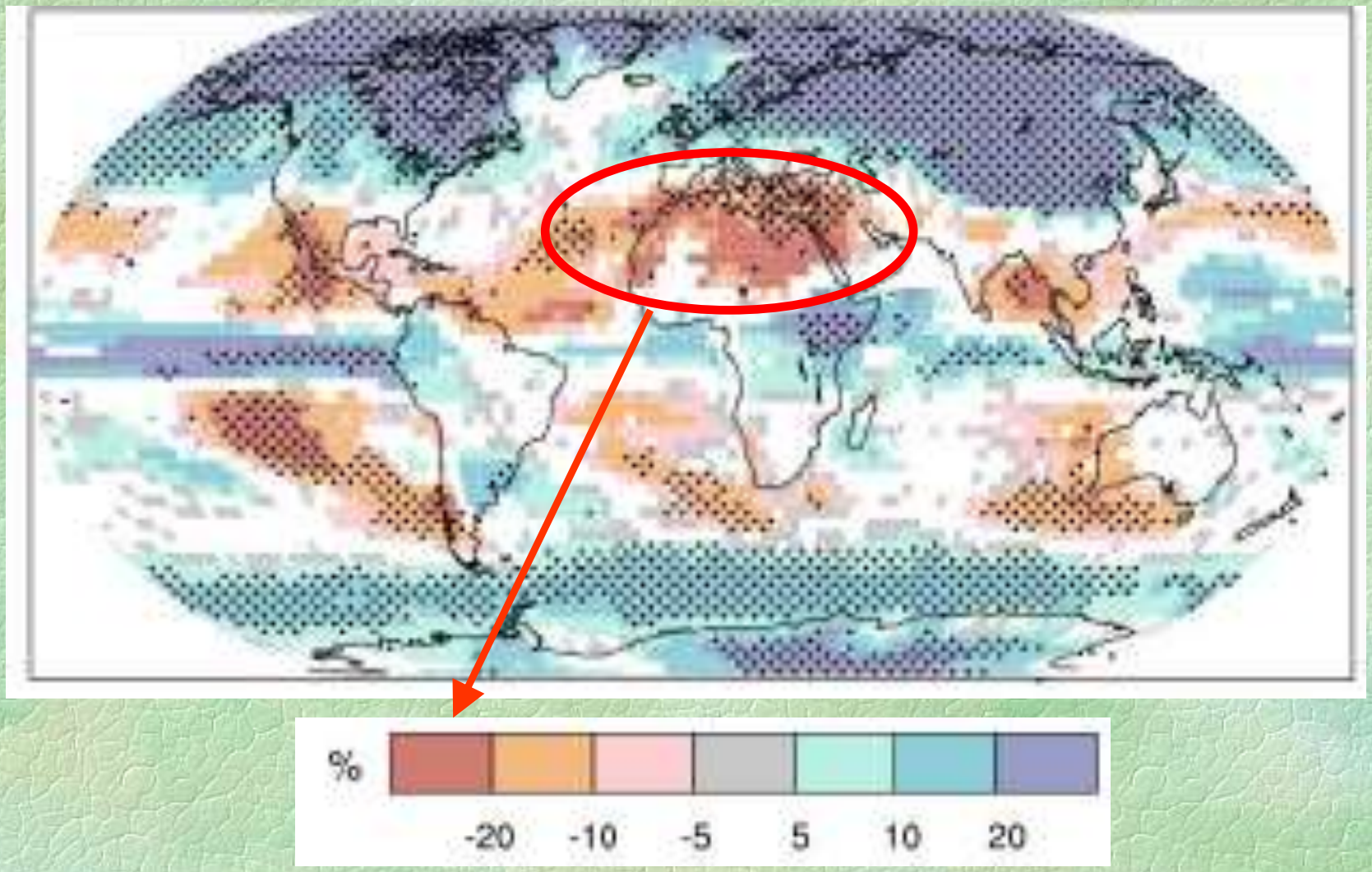




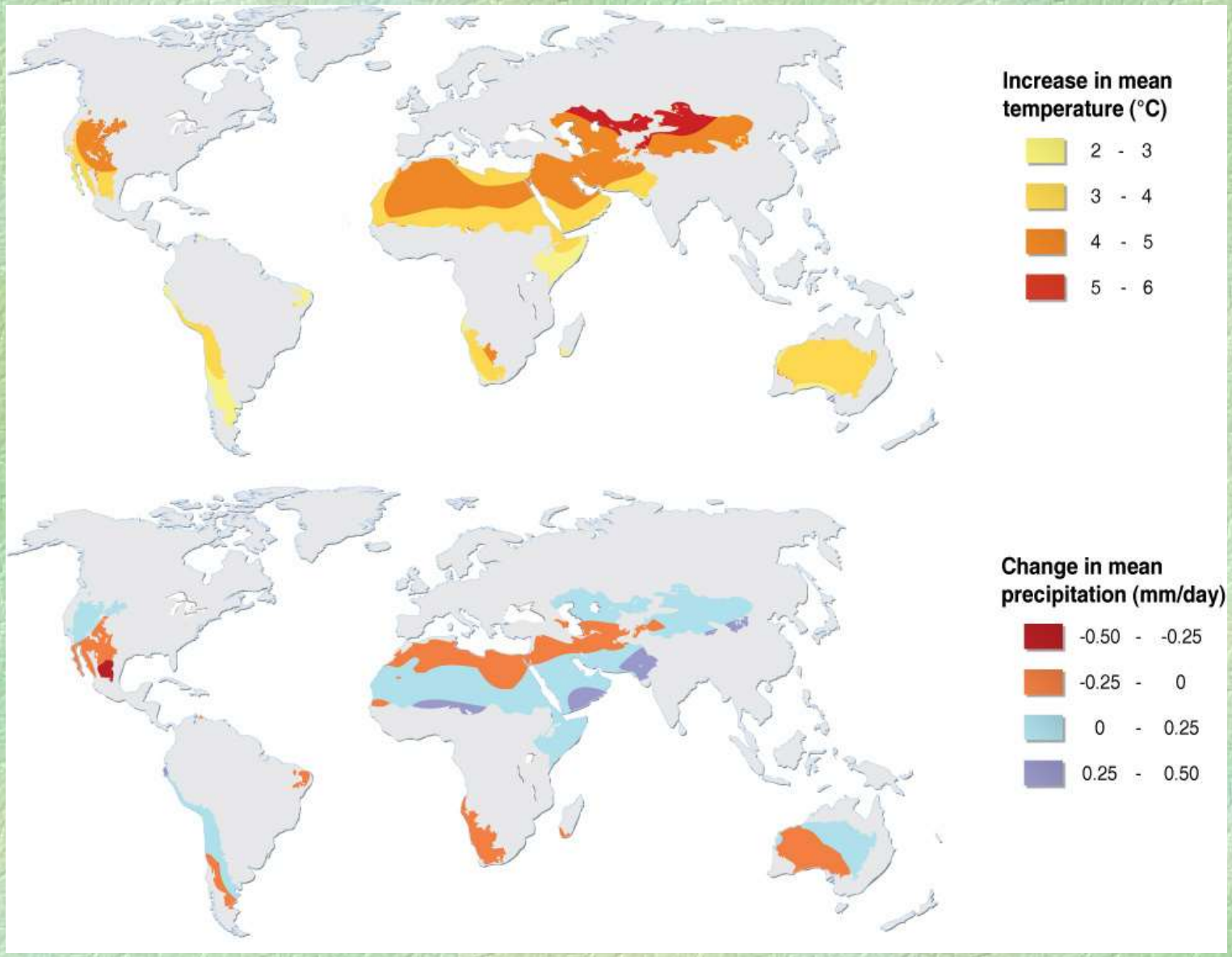
- **20% likelihood of exceeding 4°C by 2100**
- **50% chance of temperature rise above 3°C by 2100**

IPCC (2018)

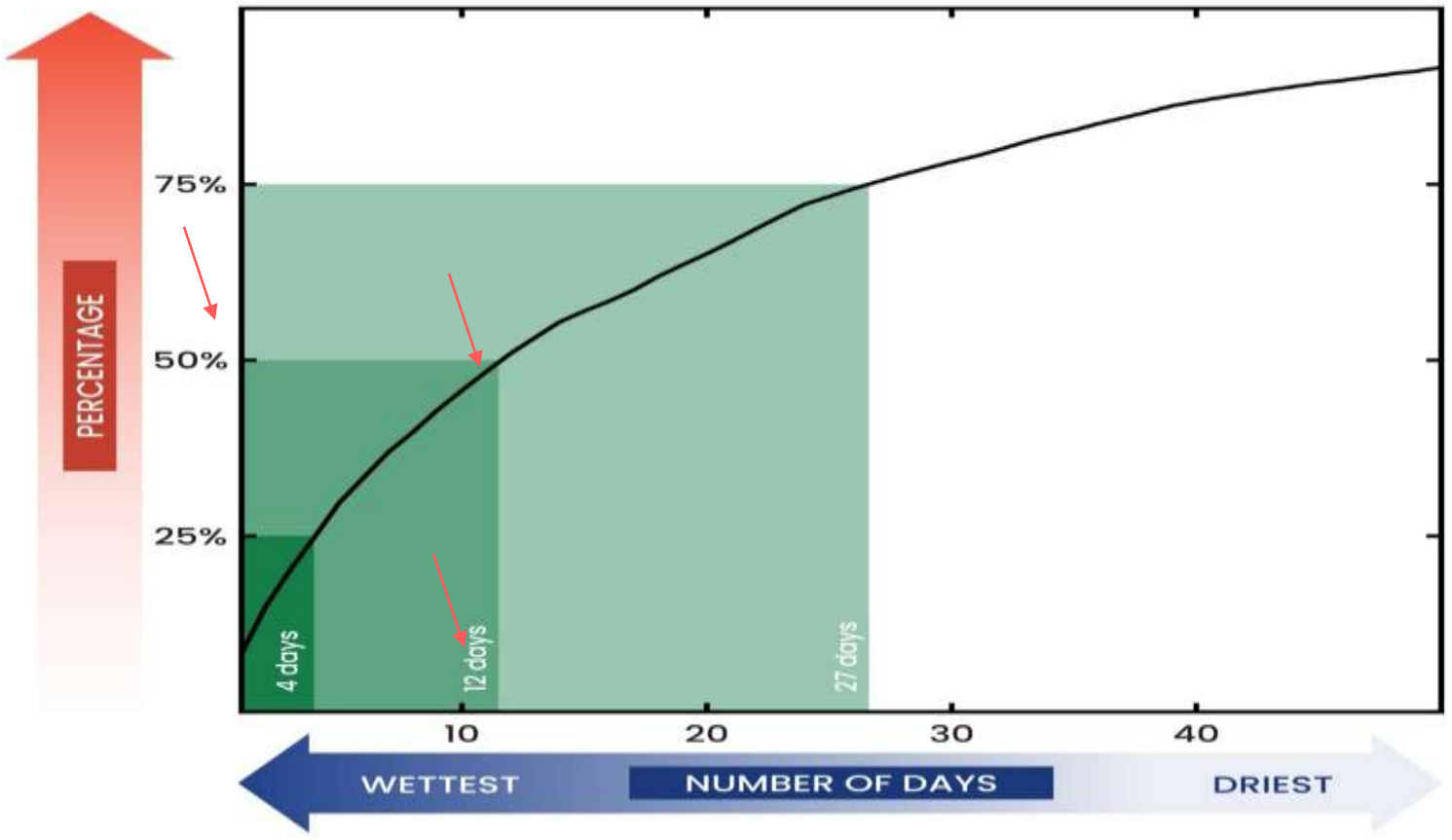
Projected Future Precipitation



Variation of Temperature and Precipitation

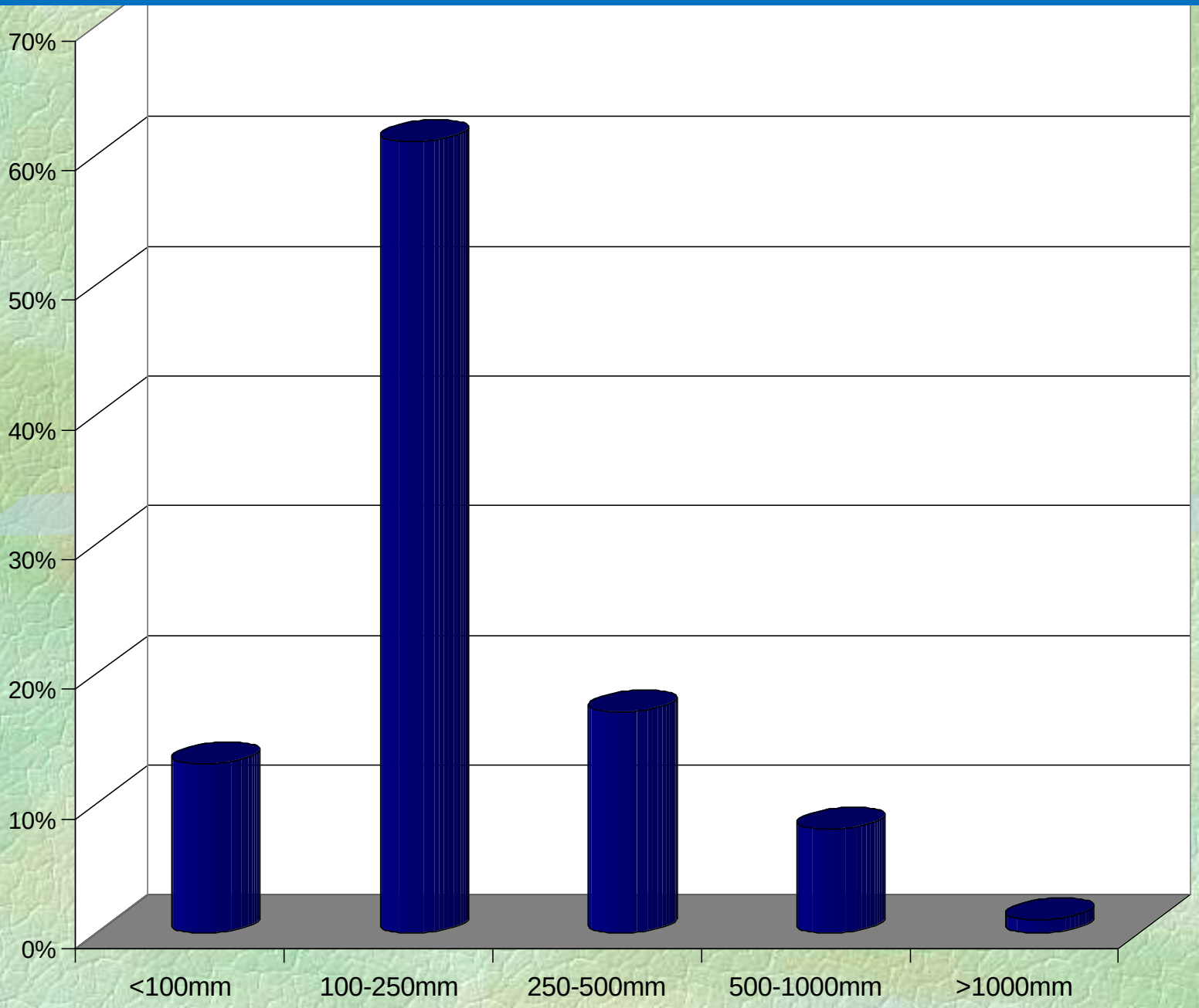


Half of the annual precipitation in the global scale occurs just in 12 days of the year.

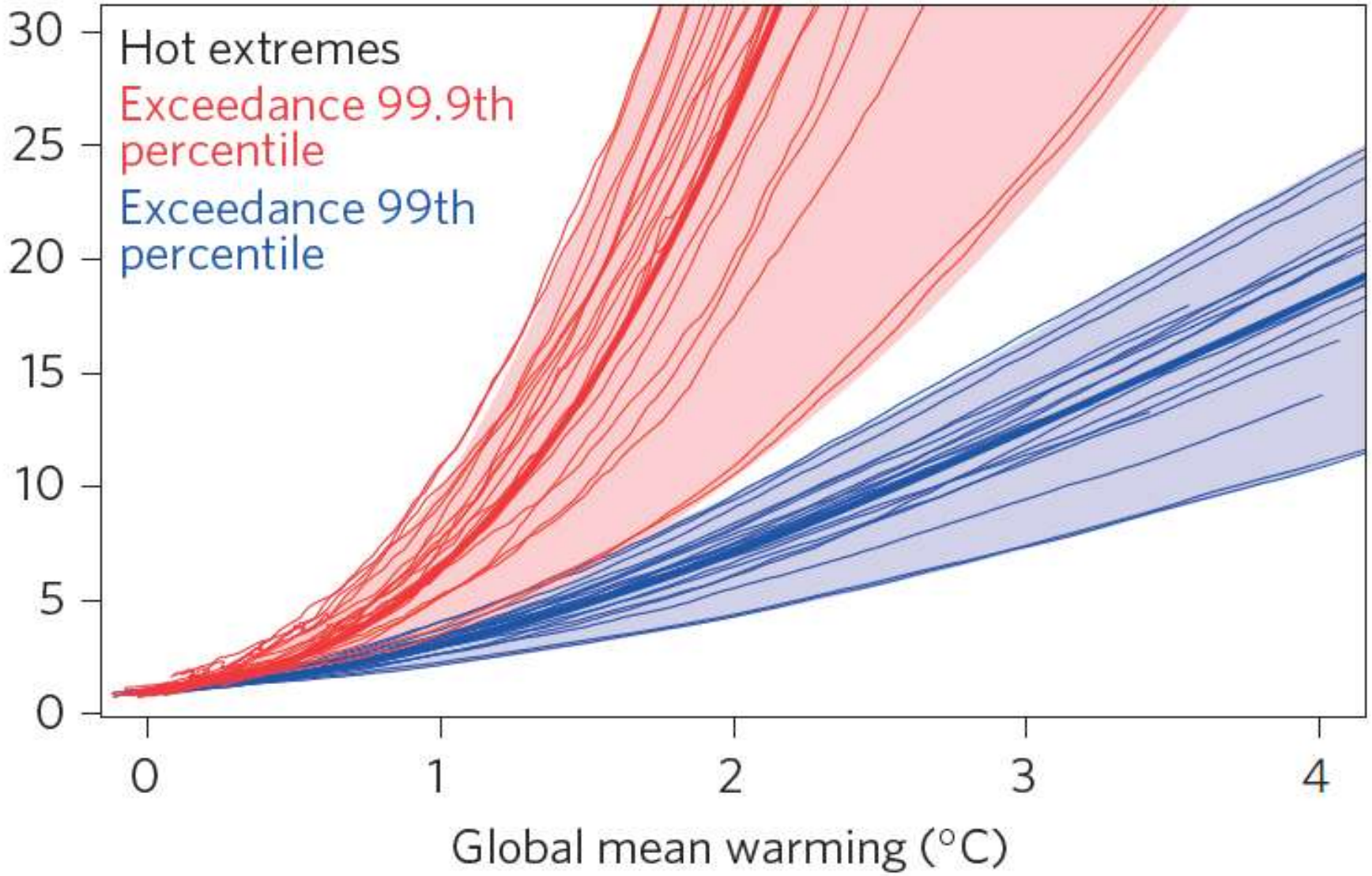


Pendergrass and Knutti (2018)

Precipitation distribution in Iran

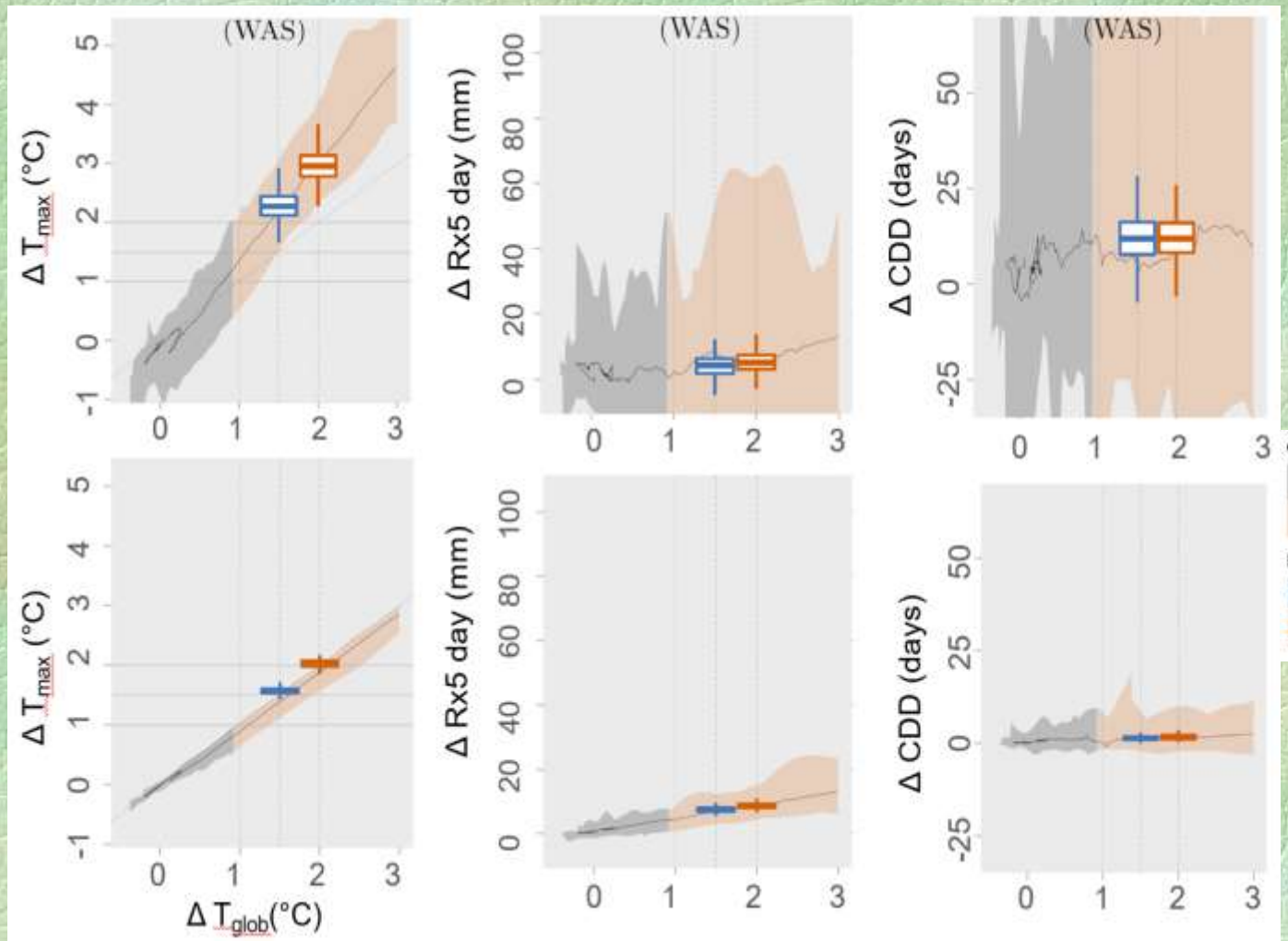


Hot extremes



Fischer & Knutti (2015)

Annual maximum daytime temperature (T_{max}), annual 5-day maximum precipitation (Rx5day) and consecutive dry days (CDD) as a function of global warming



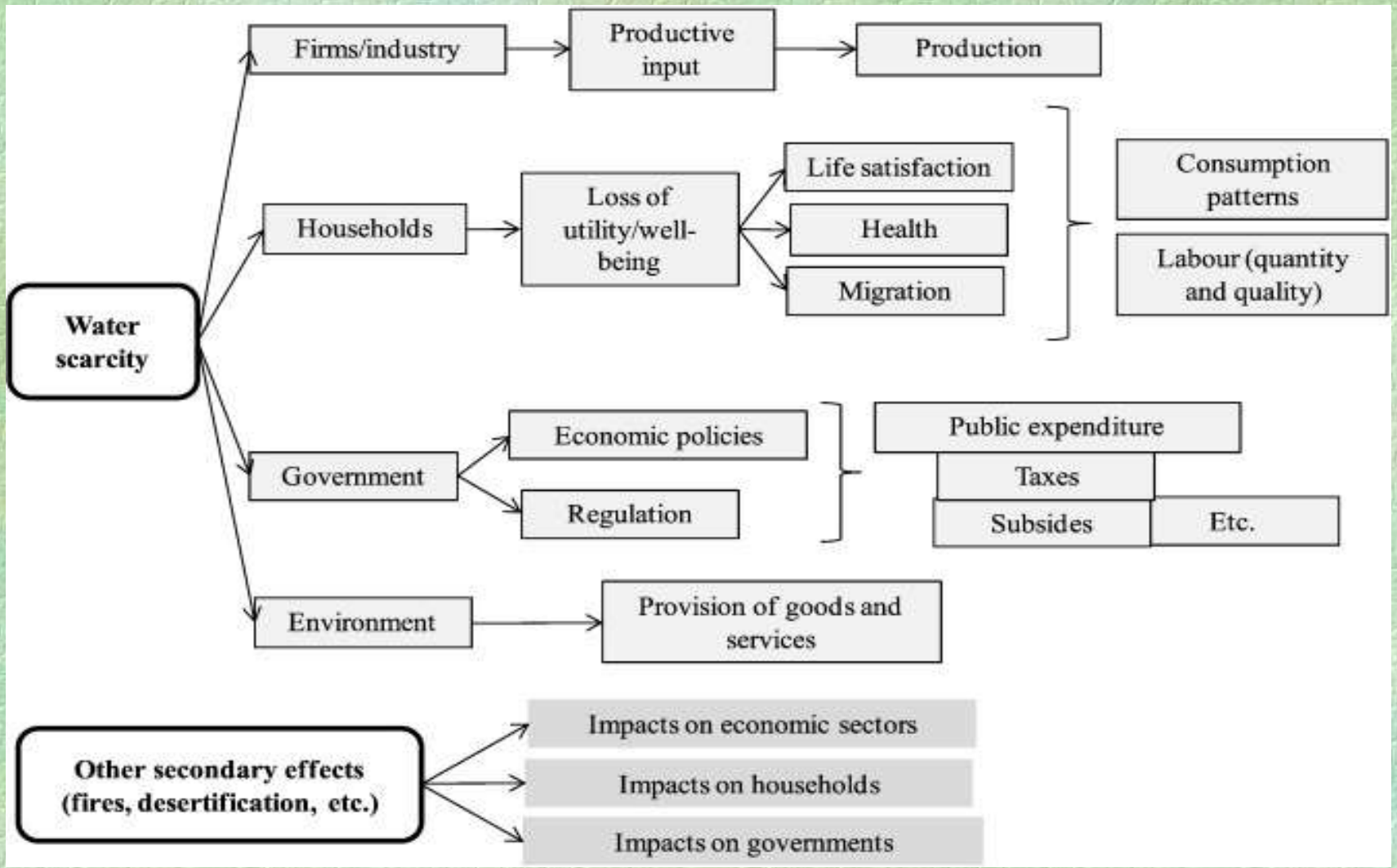
IPCC (2018)

- **Droughts in South Asia affected more than 100 million people with severe impacts felt in Western India, Pakistan, Afghanistan and Iran.**

- **Iran:**
  - **Water levels in rivers dropped during this period and of the rural population were affected.**

- **Research shows that by 2025, 48 countries will face water stress and of these countries, 40 are in West Asia, North Africa and Sub-Saharan Africa**

Economic effects of water scarcity



Freire-González et al.,2017

➢***Solutions and the way forward:***

- Some countries in the region such as Iran have established their own drought monitoring networks.
- Need to address the key issues necessary for regional networks such as DROUGHT-SPI&R
- Need to identify the gaps in regional scale in addressing our preparedness, response and recovery when drought occurs.
- Need to coordinate planning, monitoring and evaluation of drought in a relatively uniform manner.
- Risk reduction through coordinated drought management actions.

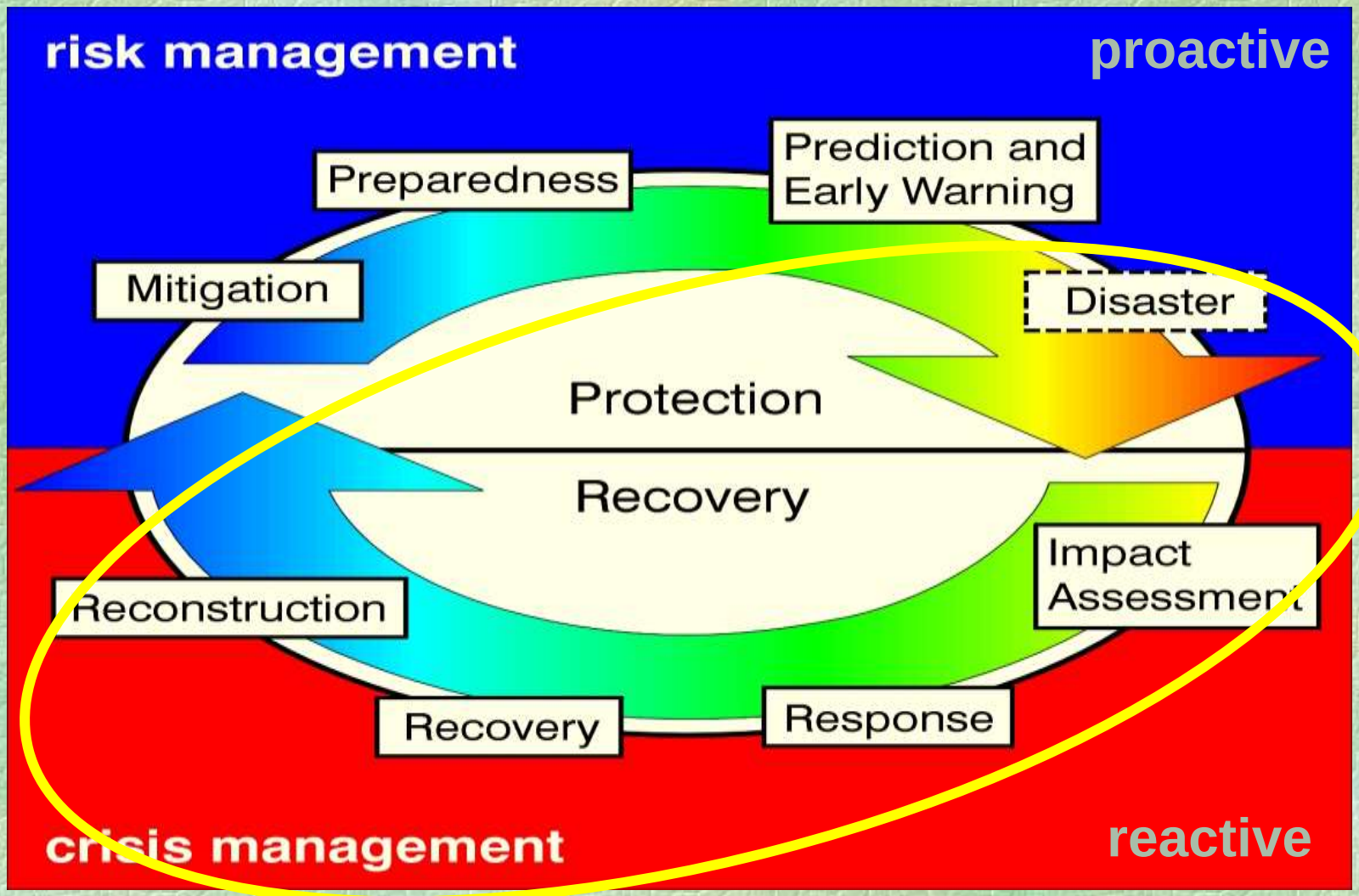
- A *Regional Framework* for Better *Collaboration for Drought Management is Necessary.*

- *The need for improved preparedness for drought consequences is reinforced by the vulnerability of the region.*

Regional Drought Alert Information Network

The Cycle of Disaster Management

Risk management increases coping capacity, builds resilience.



Crisis management treats the symptoms, not the causes.

Components of Drought Risk Management

Risk = Hazard x Vulnerability

(natural event) (social factors)

Intelligent Drought Management System (IDMS)

- An important aspect of "Intelligence" is the way and efficiency how humans are able to adapt to their environment or assimilate their environment for solving problems.

- Intelligence manifests itself in logical thinking, computations, the memory capabilities of the brain, through the recognition of things and events.

- The combination of information, creativity, and new problem solutions is crucial for acting "intelligent".

Knowledge-Based Decisions for Drought Management :

Intelligence + Expert Systems

Indigenous knowledge and rich historical experience on drought and water scarcity management

Ecosystem-based adaptation (EbA)

Ecosystem-based adaptation (EbA) as ecosystem services approach in the context of an overall adaptation strategy

green options
e.g. mangrove conservation & restoration, coral reef management

green-grey options
e.g. dam construction & wetlands

green-brown options
e.g. wood fences & wetlands

grey options - engineering
e.g. cement dykes & walls, houses on stilts

political & social options
e.g. early warning systems

coherent strategy for climate change adaptation & risk reduction

Source: GIZ / Th. Amend, 2019

Climate-Risk Informed Decision Analysis (CRIDA)

APPROACH

- Define critical thresholds
- Stress Test the system to find breaking points
- Plan for those breaking points
- Use climate science to determine levels of concern

Future projections

Trends, GCMs, Sensitivity

Historical climatic observations

Establish confidence ranges

1. Identify problems and opportunities

i) Define Critical Thresholds

2. Inventory and forecast conditions

ii) Vulnerability assessment - STRESS TEST

iii) Assess plausibility w/ climate science

3. Formulate alternative plans

4. Evaluate alternative plans

iv) Develop climate mitigation action strategies that build resilience to system performance

v) Explore and structure actions into possible adaptation pathways

5. Compare alternative plans

6. Select alternative plans

vi) Design climate resilience adaptation strategy that builds system robustness or flexibility

vii) Provide implementation and monitoring recommendations with applicable justifications to decision maker

Decision


Thank you for
your attention