Climate Rationale for GCF Water Projects

Frederik Pischke, Senior Programme Officer International Climate Hydrology, GWP seconded to WMO

Outline

1. Background
2. What is a climate rationale?
3. Climate rationale for water projects
4. Case studies – climate rationale in successful project proposals
5. Relevant data sources, analytical methods and tools

→ *Material developed with sources from GCF and WMO*

Background

Water and Climate Change

Society is primarily impacted by climate change through changes in the hydrological cycle

Rainfall

Drought

Glaciation

Floods

Evapotranspiration

Storm frequency

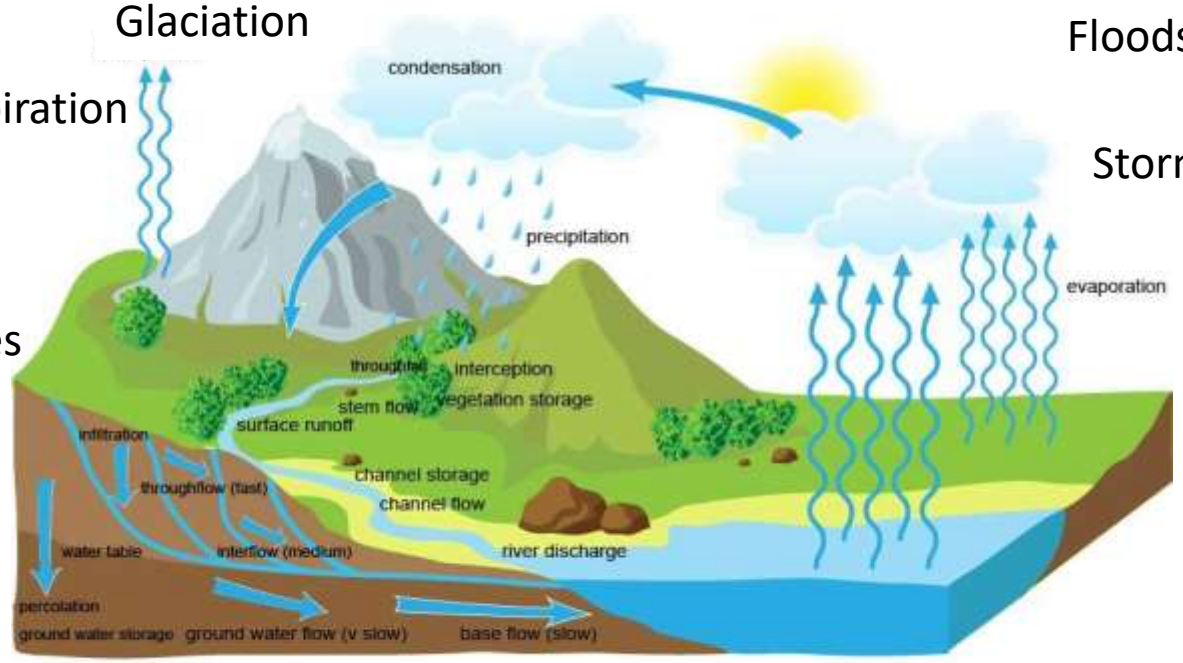
Erosion

Landslides

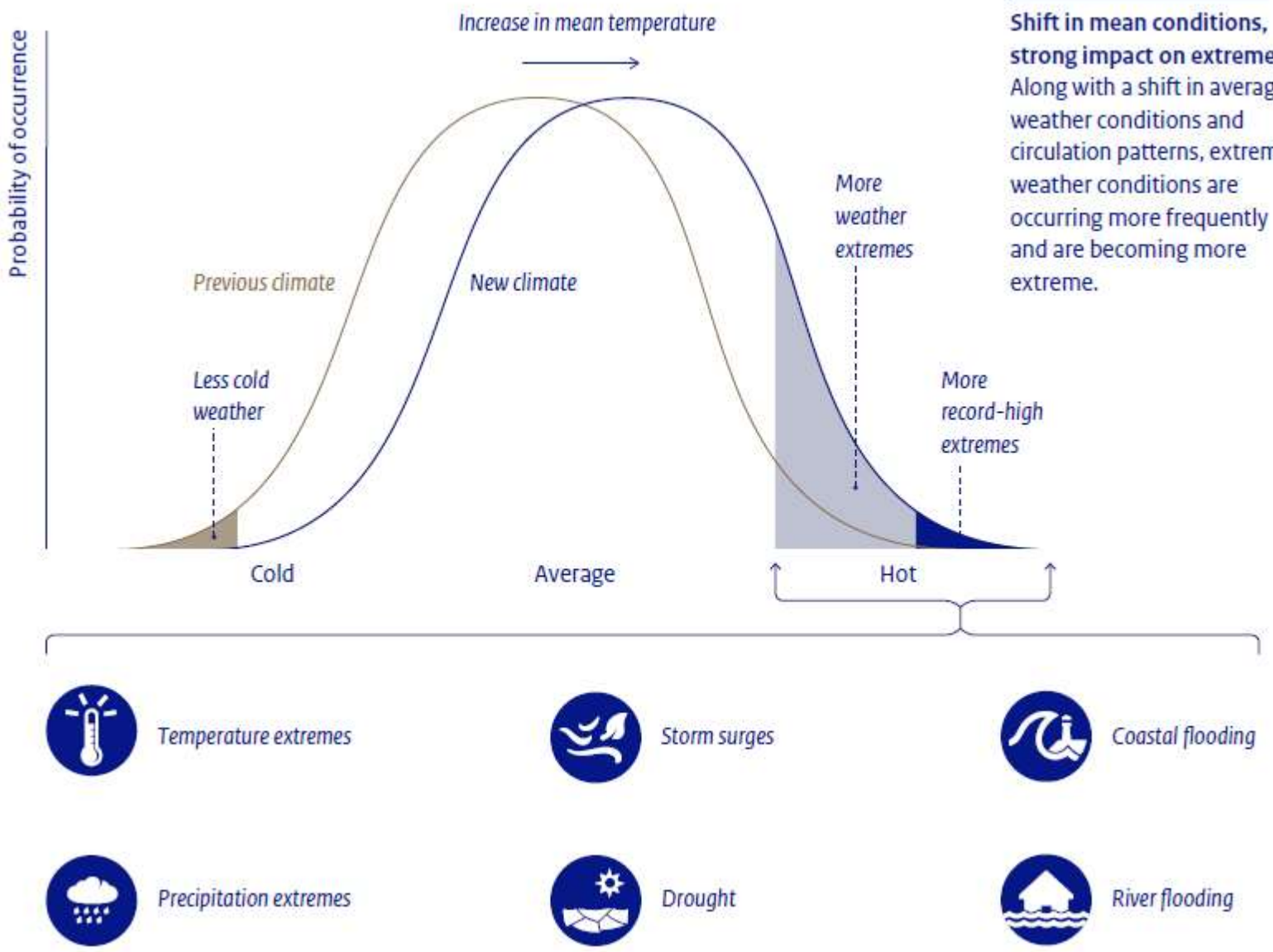
Wave heights

Sea levels

Water-related diseases



Runoff

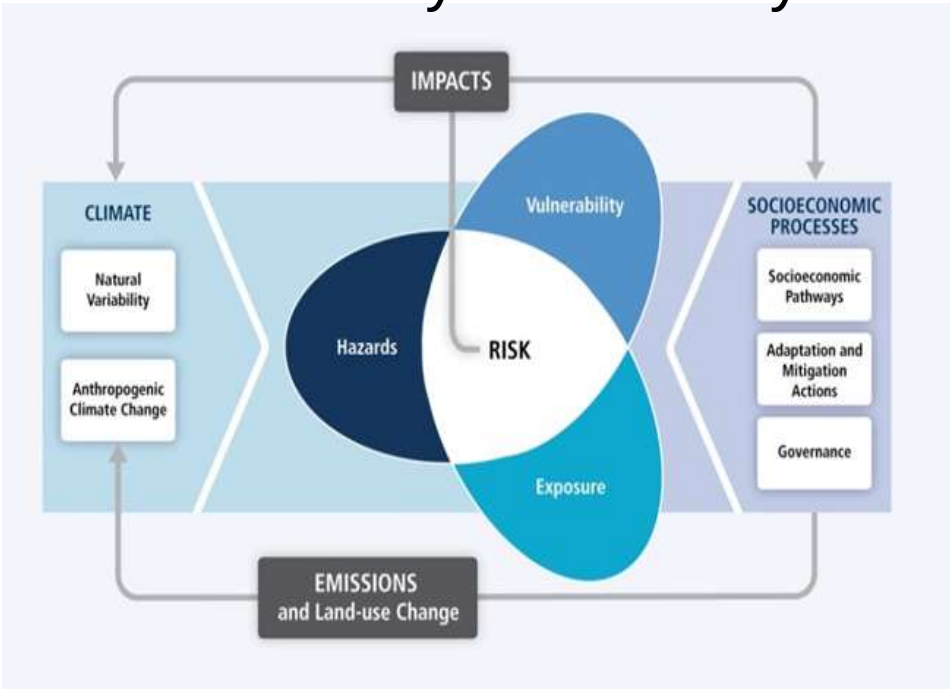


Shift in mean conditions, strong impact on extremes
Along with a shift in average weather conditions and circulation patterns, extreme weather conditions are occurring more frequently and are becoming more extreme.

Source: Ligtvoet W. et al. (2018), The Geography of Future Water Challenges, The Hague: PBL Netherlands Environmental Assessment Agency

Disaster Risk, Climate Change and Climate-Resilient Development.

Climate disasters occur when **extreme climatic events** interact with **vulnerable social, economic and environmental conditions** leading to **severe alterations** in normal functioning of a community or a society.

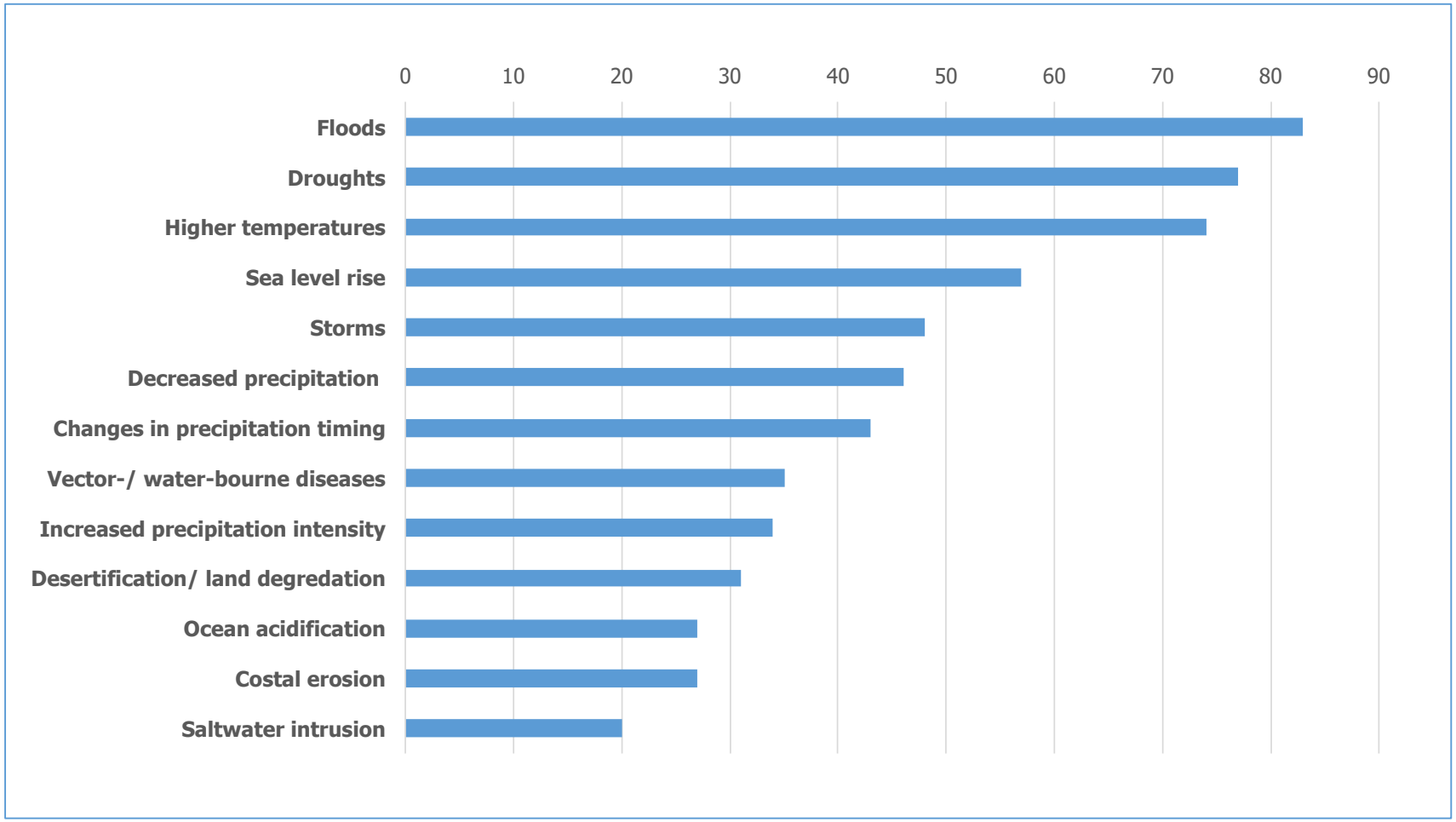


Source: IPCC, SREX 2013

- **Disaster risk** – intersection of exposure, vulnerability and hazard/extreme events
- Climate events affect vulnerability to future extreme events by modifying resilience, coping capacity, and adaptive capacity

Main climate hazards identified in the NDC adaptation component

UNFCCC, 2016; 137 countries



What is a Climate Rationale?

Climate rationale answers

- What are the climate change induced risks and vulnerabilities?
  - What is happening / will happen due to climate change?
- What is the additionality of the proposed interventions due to climate change?

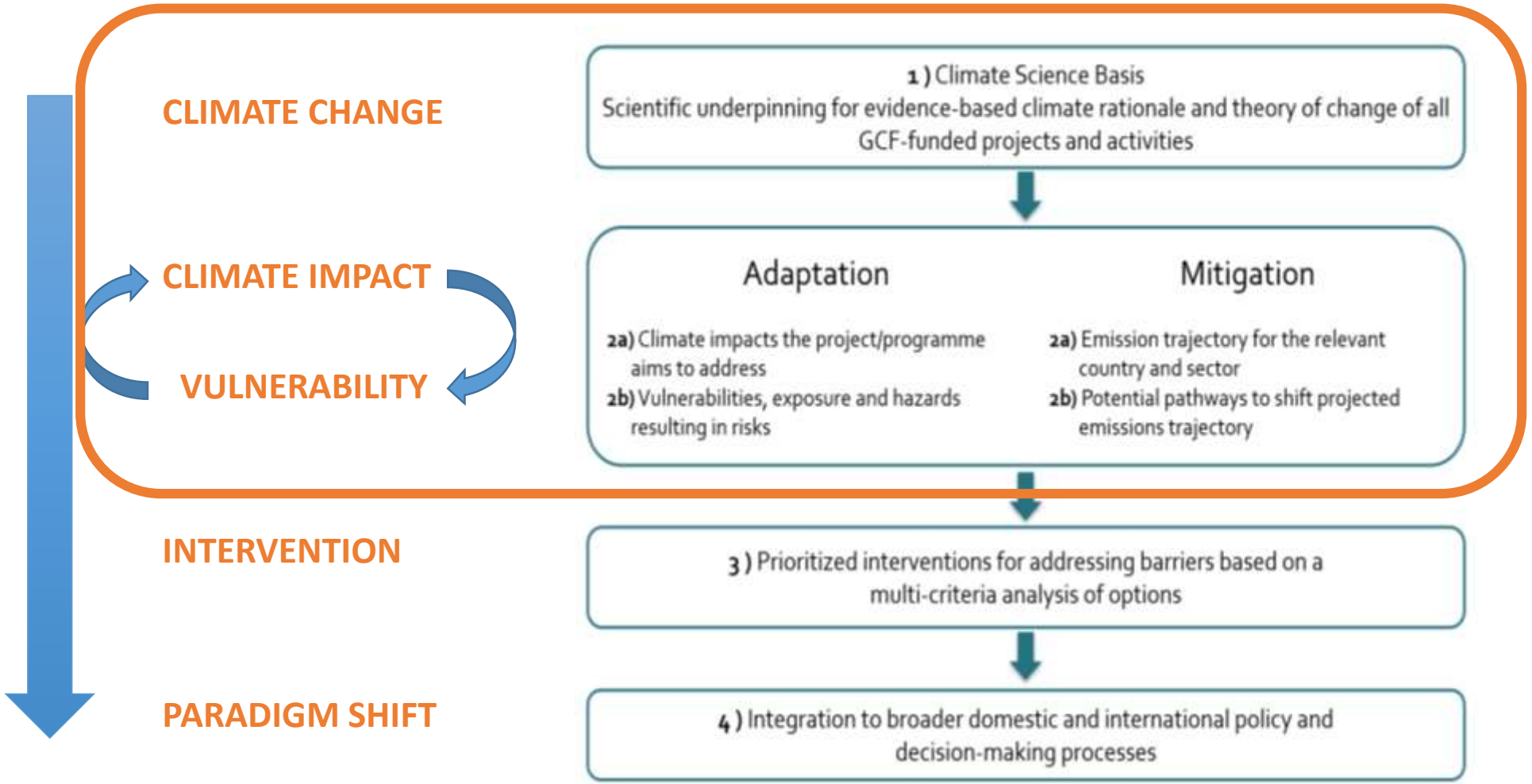
A climate rationale

- Assesses climate change impacts, risks and vulnerabilities
- Is the foundation of an impactful GCF project

Elements of a strong climate rationale

- Draws on credible science
- Provides evidence of climate change impacts and vulnerabilities
- Presents a set of optimal measures to address climate change risks
- Aims for simplicity in approach, methodology and presentation of data and results
- Makes use of common standards for measuring achievements and impacts (ease of sharing and comparing results)

Climate Rationale and the Project Intervention



Take-aways:

→GCF only covers the additional cost due to climate change

→Differentiate between development and climate outcomes

→Need for a logical argument that links climate change and the proposed interventions

Tip: Put climate change challenges first in the project idea/concept note, then describe how to address these through the project interventions

Climate Rationale for Water Projects

Climate Rationales

Providing for an increased demand for water:

- Due to higher global temperatures (not urban heat islands)
- More evaporation, evapotranspiration, increased domestic water use

- Not Increasing population (unless migration induced by climate change)

- Not industrial and agricultural expansion
- Not deteriorating infrastructure

Climate Rationales

Adapting to sea level rise:

- Thermal expansion of the oceans
- Melting icecaps

- Not Land subsidence due to groundwater extraction –
  - unless extraction was a result of another climate change impact
- Not geological movements – e.g. post-Ice Age rebound

Climate Rationales

Managing coastal and river erosion:

- Changing storm frequencies and magnitude
- Changing river flows
- Higher rainfall intensities

- Not land use changes
- Not sediment transport blocked by dams, groynes and breakwaters
- Not river flows reduced by abstractions
  - unless abstractions impacted by climate change themselves
- Not sand mining

Climate Rationales

Adapting to Saline intrusion:

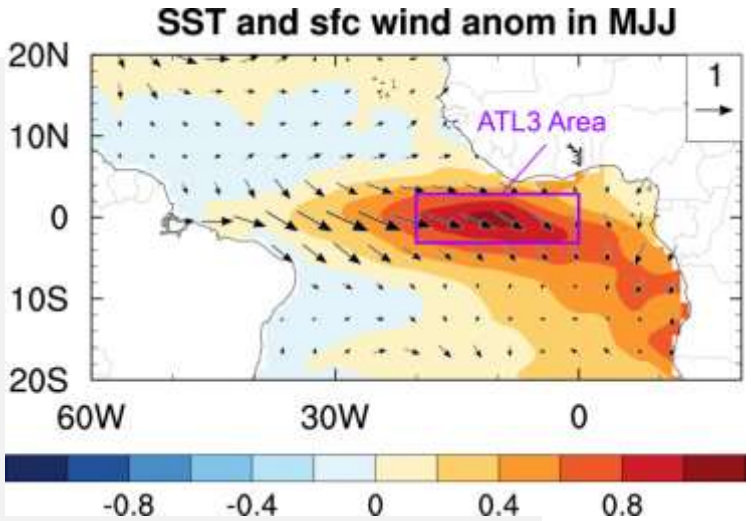
- Rising sea levels
- Stronger and more frequent cyclones
- Larger storm surges
- Reduced fresh water flows
  - but not if caused by (most) upstream water abstractions

- Not overpumping of coastal aquifers

Climate Rationales

El niño / La niña:

- Long term phenomena – since records began
- Not in itself GHG climate change induced
- Need evidence of trends



- But impacts may be greater when combined with other climate change impacts, e.g. glacial retreat and temperature rises leads to more rain, less snow, and higher runoff

Additionality

Additional costs that are being incurred as a result of climate change

Summary

- What would be happening if there were no GHG induced climate change?
- What is happening / will happen due to climate change?
- What extra impacts need to be addressed?

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Climate Rationale in successful projects

*examples provided by GCF Secretariat

Maldives- Vulnerable Community Support Project

Location : Indian ocean

Small-low lying coral islands : 1190 (24 atolls)

Inhabited islands : 194

Population/beneficiaries : 399,000/105,000

Maldives Project – Climate Rationale

The rationale was based on - historic meteorological records , output of GCM's , studies by different organizations

- **Rainfall - decrease and change in pattern**

  Greater extremes (dry periods and heavy rainfall) - risks of droughts and floods
- **Groundwater- vulnerable**

  Freshwater lens decrease (at least 50% or complete) - during the dry season or successive low rainfall years.
- **Sea level rise – island overtopping and coastal erosion**

  Increase saline intrusion into freshwater lenses
- **Hydro-meteorological disasters**

  Storm surges and coastal flooding - 90 islands (at least once every year)

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Maldives- Impacts & Interventions

Primary Impact: Available drinking water supplies

Project Interventions : Climate resilient water supply system

1. Rainwater harvesting systems
2. Desalination plants
3. Groundwater recharge systems & monitoring protocols
4. Early warning systems

Senegal - Integrated Urban Flood Management Project

Location: Senegal, West Africa

Population: 15.85 million /25% in Greater Dakar region

Background issues: rapid urbanization-unplanned urban development, intense population growth and urban migration.

Primary Impact: frequent urban flooding- high intensity rainfall events

Senegal Project – Climate Rationale

The rationale was based on – Ensemble model project outputs, past studies and statistical projections

Temperature change:

- Mean annual temperature - increased by 0.9°C since 1960, an average rate of 0.20°C per decade.

Rainfall decrease and change in pattern:

- Significant decreases -10 to 15 mm per decade in the southern regions of Senegal – longer dry periods
- Overall decrease, but a greater proportion of this precipitation will occur in heavy rainfall events - flooding

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Senegal Project Interventions

- Flood risk mapping and awareness raising campaigns
- Regulatory recommendations – guidebooks – proposition of incentives
- Tools for adequate investment in flood management infrastructure
- Drainage and sanitation infrastructure in Pikine Irrégulier Sud
- Real-time hazard monitoring in Greater Dakar.
- Support to integrated flood risk management policy-making.
- Project management assistance

Samoa - Integrated Flood Management to Enhance Climate Resilience of the Vaisigano River Catchment

Location : Samoa (SIDS), Pacific ocean

Population/beneficiaries : 190,000/65,528

Coastal areas : 70% population

Economy : Agriculture, fisheries, development aid and remittances

Samoa Project – Climate Rationale

Projected climate change scenarios cited by the Australian Commonwealth Scientific and Industrial Research Organization (CSIRO) and other reports,

Rainfall pattern:

- More frequent and extreme rainfall events
- Frequent and longer drought events

Extreme events:

- Increased air and water temperatures
- Sea level rise
- More frequent extreme wind events- cyclones and storms

Samoa Impacts & Interventions

Impact :

- Cyclone Evan (Category Three)-2012, damages- more than US$200 million.
- Flooding of the Vaisigano River - drainage system was unable to cope resulting in extensive flooding of lower Apia

Project Interventions:

- Developing an integrated sewage system for Aua village.
- Resilient key infrastructure development along the Vaisigano River.
- Support climate resilient livelihood options in the Vaisigano River catchment.
- Developing a climate resilient drainage master plan and also upgrading drainage systems in specific high priority hazard area.

Ethiopia- Responding to the increasing risk of drought: building gender-responsive resilience of the most vulnerable communities

Location : Ethiopia (60% dry land)

Impacted by: Droughts

Beneficiaries : 300,000 (50% women)

Agriculture : Rainfed

Ethiopia Project – Climate Rationale

Climate projections, IPCC, UNFCCC and other studies reports that;

1. Increasingly high variability in rainfall between years
    - incidence of droughts and floods - increased in the last 10 years
    - low food and water security
2. Changing weather patterns +land overexploitation+ deforestation
    - increased soil degradation and water stress, drought, and crop failure.
3. Temperatures increases
    - mean annual temperature, increase in the range of 0.9-1.1°C

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Ethiopia Impacts & Interventions

Impacts:

2015/16, a severe drought threatened 1/10th of the country's population (c.10.3 million people) with catastrophic food shortages.

Project Interventions:

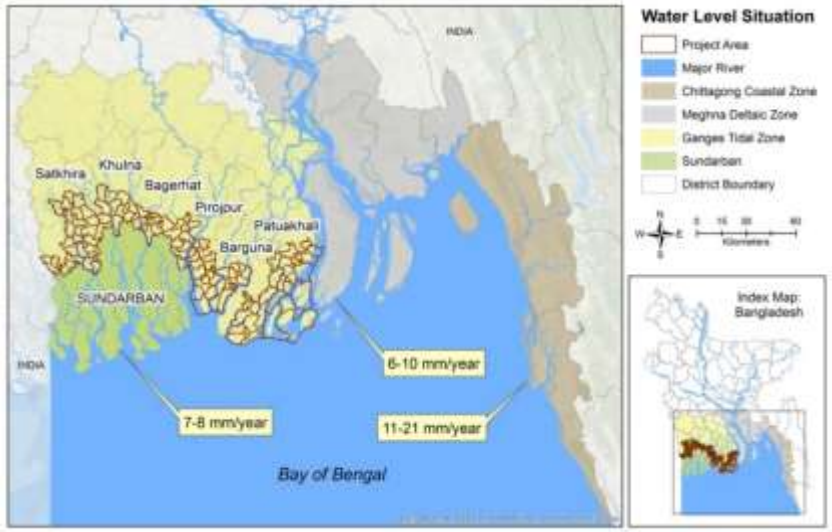
- Develop water schemes
- Small scale irrigation and water retention structures
- Manage degraded lands around the water sources
- Improved capacity development of both men and women - management and administration of irrigation and potable water schemes and enhanced communication and learning
- Institutional framework and local management instruments strengthened

Bangladesh- Enhancing adaptive capacities of coastal communities, (women) to cope with climate change induced salinity

Location : Khulna and Satkhira, Bangladesh

Coastal zone : 38.52 million people

Beneficiaries : 719,229



Bangladesh Project – Climate Rationale

The rationale was based on - meteorological records ,several climate models, studies by different organizations

1. **Storm surges and cyclones:**
   - increased intensities of tropical storms
   - surface water salinity
2. **Sea Level Rise :** increase of 6-21 mm/ year
   - Increased coastal flooding, erosion and saltwater intrusion
3. **Rainfall and temperature :** higher than average monsoon rainfall
   -winter months becoming warmer and drier
   -monsoon months become warmer and wetter.
   -Increased monsoon rainfall may lead to high intensity floods
4. **Salinity :**
   - increase surface and groundwater salinity
   - soil salinity (agriculture affected)

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Bangladesh Project Interventions

- Enterprise and community-based implementation of climate-resilient livelihoods for women - for enhanced adaptive capacities of coastal agricultural communities
- Strengthened climate-resilient value-chains and market linkages for alternative, resilient livelihoods
- Community-based monitoring and last-mile dissemination of EWs for climate-risk informed, adaptive management of resilient livelihoods

To sum up - Robust Climate Rationales

- Credible science, robust assessment of impacts and disaster risks
- A set of optimal interventions that comprehensively addresses underlying climate risks
- Integrating interventions into decision-making for long-term low-emission climate resilient development

Relevant data sources, analytical methods and tools

Climate Rationale foundation of an impactful GCF project

- Need for high-quality data and information

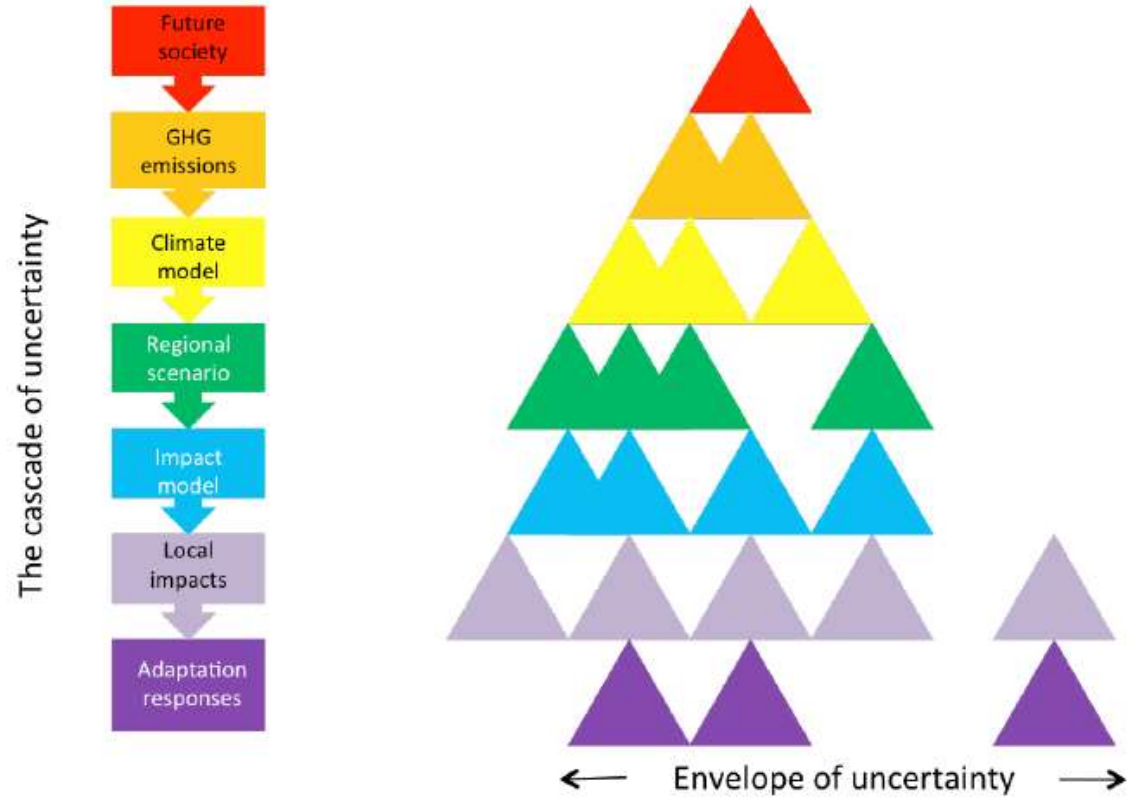
Forthcoming: GCF – WMO Climate Rationale guidance on data sources, methods, tools

- Also consider uncertainty

What about uncertainty?

Sources of uncertainty:

- GHG emission scenarios depend on future human behaviour
- Uncertainties in Global Climate Models' parameters and structures
- Limited understanding of interactions of earth system
- Climate variability
- Coarse spatial and temporal resolution (limited value for water resources planning, particularly for extremes)



The Cascade of uncertainty (Wilby and Dessai 2010 cited in García, L.E. et al. 2014 *Beyond Downscaling: A Bottom-Up Approach to Climate Adaptation for Water Resources Management*)

Handout listing data sources, analytical methods and tools

- Overview of data sources, analytical methods and tools for climate change related water challenges
- Does not endorse information provided by sources
- Check appropriateness, quality, uncertainty and prediction capabilities with regard to its intended use!
- Starting point to examine and help design relevant climate resilient water projects
- Is the handout complete? Continuously updated

Further improvements once Climate Rationale guidance and *Catalogue of Maturity-Assessed Climate Datasets* released

Data, Analytical Methods and Tools on Climate Change and Water

Produced for the Technical Workshop on Project Preparation "Technical Workshop on Project Preparation for Transformational Climate Resilience Water Project Concepts in Asia"

October 2018

This handout aims to provide a succinct overview of data sources, analytical methods and tools for climate change related water challenges. A listing of a website is not an endorsement of the information the website provides. The handout is rather a starting point to point to possible data sources, information and tools. The data and information from these sources needs to be vetted in terms of its appropriateness, quality, uncertainty and prediction capabilities regarding its intended use.

This handout will be continuously updated. It has been developed by the Global Water Partnership (GWP) with inputs from the World Meteorological Organization (WMO) for the Technical Workshop on *Project Preparation for Transformational Climate Resilience Water Project Concepts in Asia*.

Contact: Frederik Pischke frederik.pischke@gwp.org

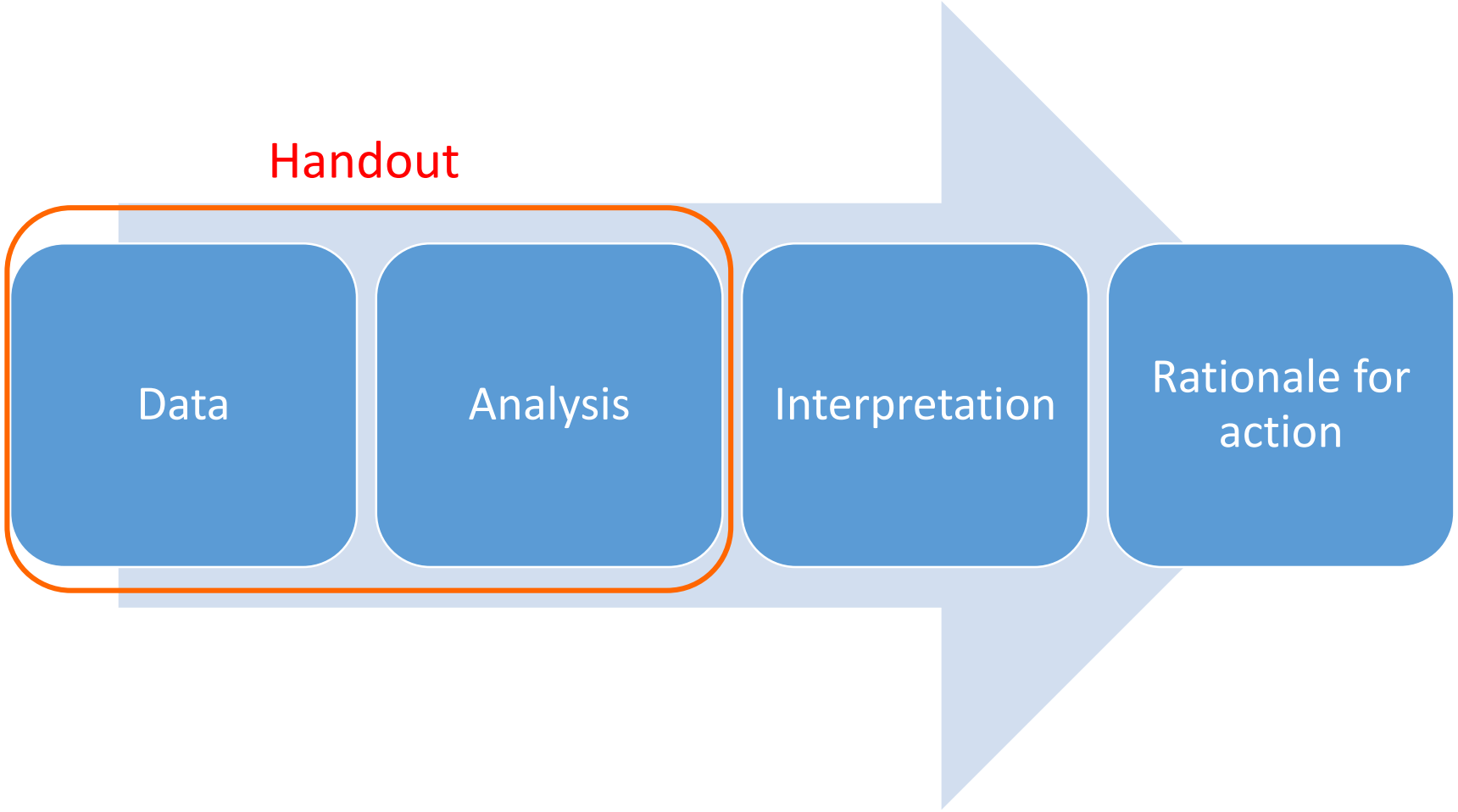
1. Climate Data and Tools with Relevance to Water Management

1.1 **Essential Climate Variables (ECVs)** of the Global Climate Observing System (GCOS) are the physical, chemical or biological variables critical to characterize the earth's climate https://public.wmo.int/en/programmes/global-climate-observing-system/essential-climate-variables

1.2 **IPCC 5th Assessment Report Working Group I on the Physical Science Basis** includes observations and projections of water cycle change and changes in extremes and detection and attribution of climate change (including the water cycle and extremes) on global and regional level; **Working Group II on Impacts, Adaptation and Vulnerability** includes observed impacts, vulnerability and adaptation with freshwater-related risks of climate change with continental overviews https://www.ipcc.ch/report/ar5/

1.3 **Coordinated Regional Climate Downscaling Experiment (CORDEX)** was initiated in 2009 to respond to the need for a coordinated framework for evaluating and improving regional climate downscaling (RCD) techniques and producing a new generation of RCD-based fine-scale climate projections for specific regions worldwide. http://cordex.org/

Climate Rationale Value Chain



Handout structure

1. Climate Data and Tools with relevance to Water Management
2. Water Data, Tools and Models
3. Regional Institutions and Mechanisms with technical resources
4. Conceptual framework of a Climate Services Information System (WMO)

Data, Analytical Methods and Tools on Climate Change and Water

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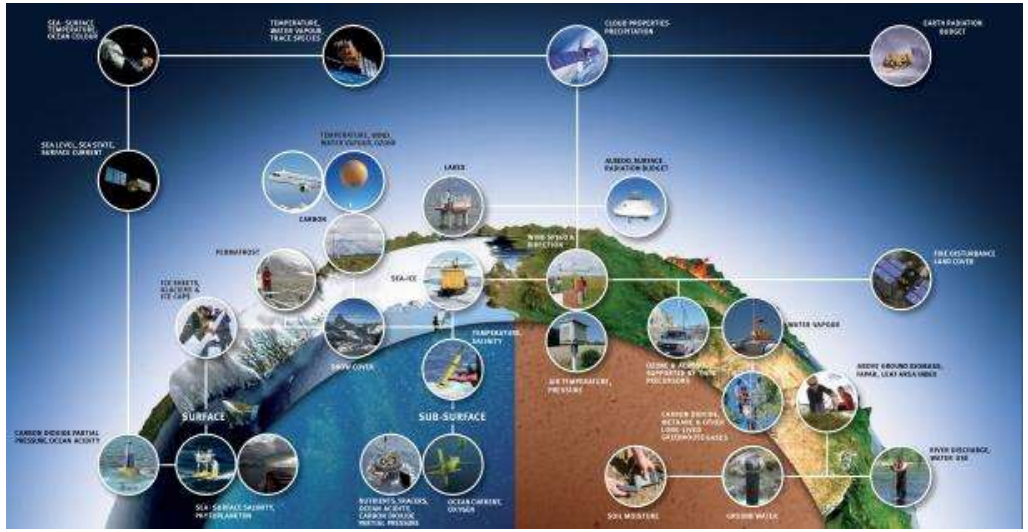
Selected examples from Handout - Section 1. Climate Data and Tools with Relevance to Water

- GCOS Essential Climate Variables (ECVs)
- Coordinated Regional Climate Downscaling Experiment (CORDEX)
- EU Copernicus Climate Change Service (C3S)
- CCAFS-Climate data portal

[12 resources listed in Handout]



Under development:

Catalogue of Maturity-Assessed Climate Datasets, WMO

Maturity of datasets to be assessed on (1) Accessibility, (2) Usability, (3) Quality Management, (4) Data Management

- Enhancing discoverability, access and use of high quality climate data
- Provide transparent information on source of data and metadata
- One-stop platform for assessing maturity and quality of climate datasets
- Increasing visibility of the best data

Source: WMO Draft Manual on High Quality Global Data Management Framework for Climate (under development)

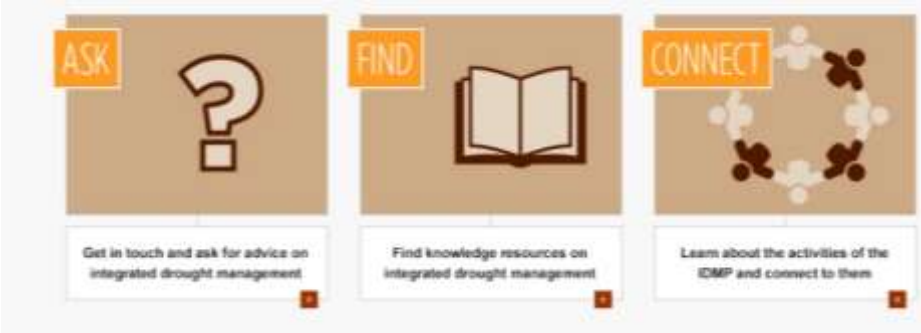
Selected examples from Handout - Section 2. Water Data, Tools and Models

- WMO Hydrological Observing System (WHOS)
- Global Runoff Data Centre (GRDC)
- International Data Centre on Hydrology of Lakes and Reservoirs (HYDROLARE)
- IGRAC Global Groundwater Information System (GGIS)
- Consortium of Universities for the Advancement of Hydrologic Science (CUHASI)
- Group on Earth Observations System of Systems (GEO SS) Portal
- Integrated Drought Management Help Desk
- Integrated Flood Management Help Desk

[27 resources listed in Handout]

Managing Water Extremes

Drought and Flood Management HelpDesks



www.droughtmanagement.info

Focus on strengthening three Pillars:

1) Monitoring and Early Warning Systems
2) Vulnerability and Impact Assessment
3) Drought mitigation and preparedness

www.floodmanagement.info

Focus on Project Preparation;

Build up strength on End-to-End Early Warning Systems

Synergies of Partners

WORLD METEOROLOGICAL ORGANIZATION

Global Water Partnership

ASSOCIATED PROGRAMME ON FLOOD MANAGEMENT

IDMP
Integrated Drought Management Programme

Technical Support Unit by WMO and GWP

Over 30 expert partner organizations in each programme

Global Water Partnership

Join the Partnership!

Go to **PARTNER** at: www.gwp.org

And visit our online library for water reources management: www.gwptoolbox.org

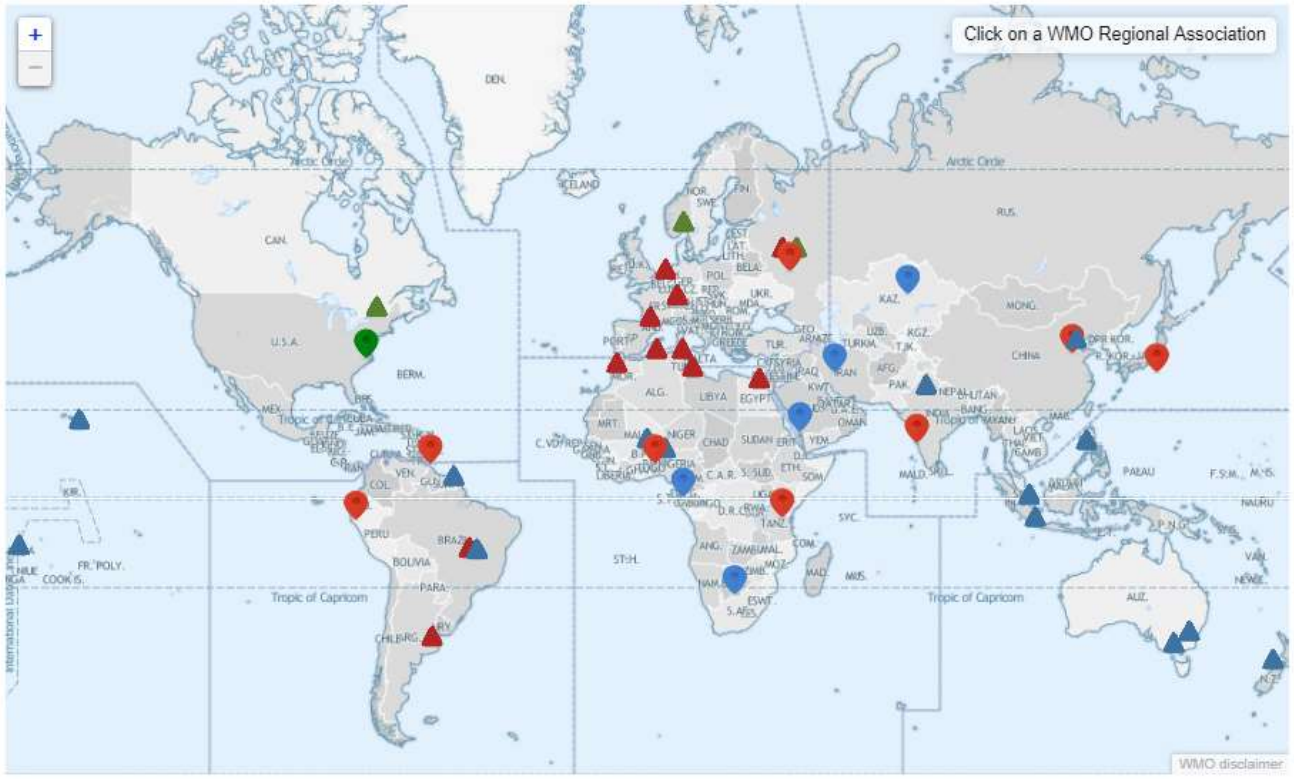
GFCS

GLOBAL FRAMEWORK FOR CLIMATE SERVICES

Global Water Partnership

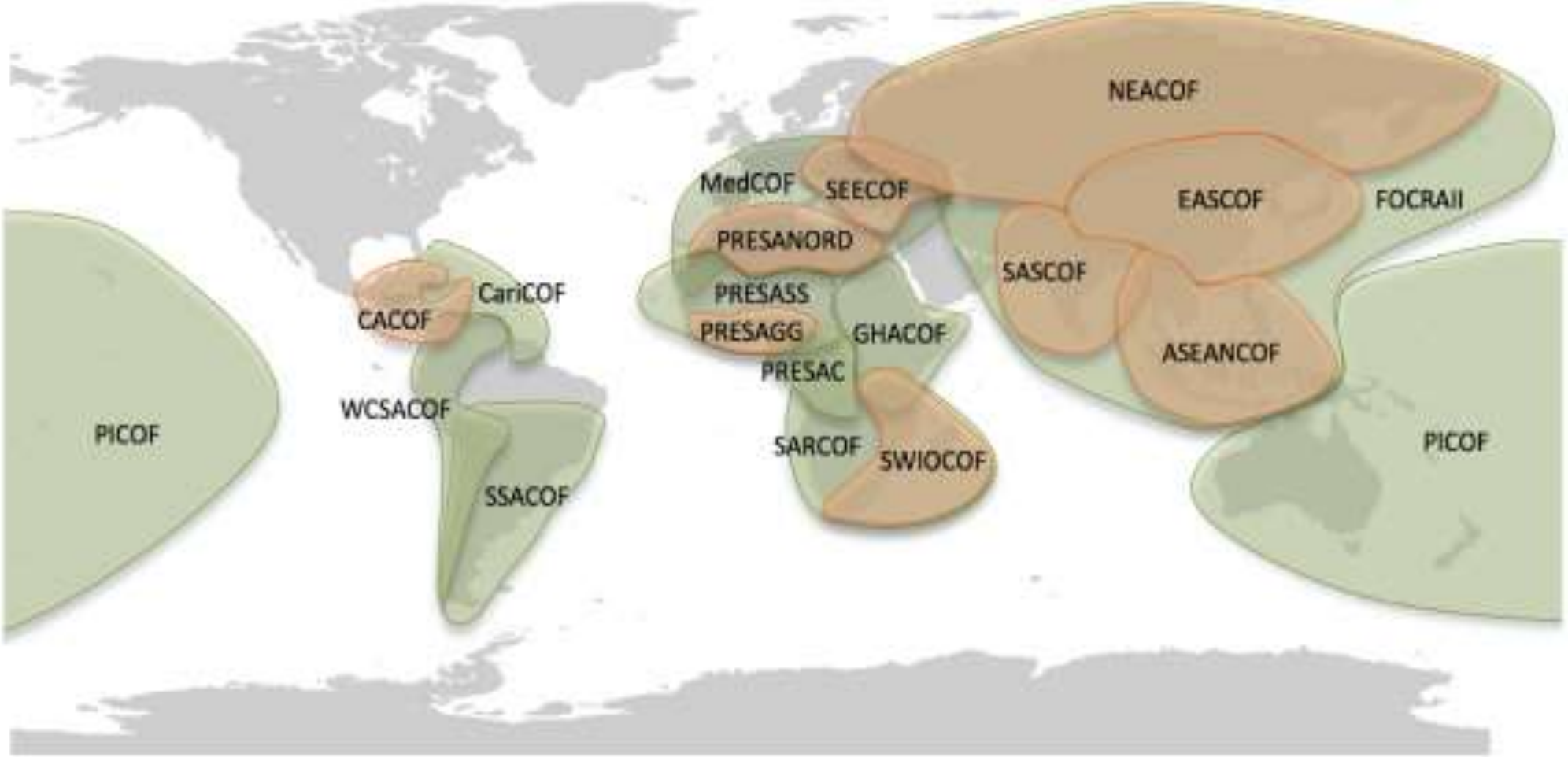
Section 3. Regional Institutions and Mechanisms

WMO designated Regional Climate Centres (RCCs) to generate and deliver more regionally-focused high-resolution data and products as well as training and capacity building.

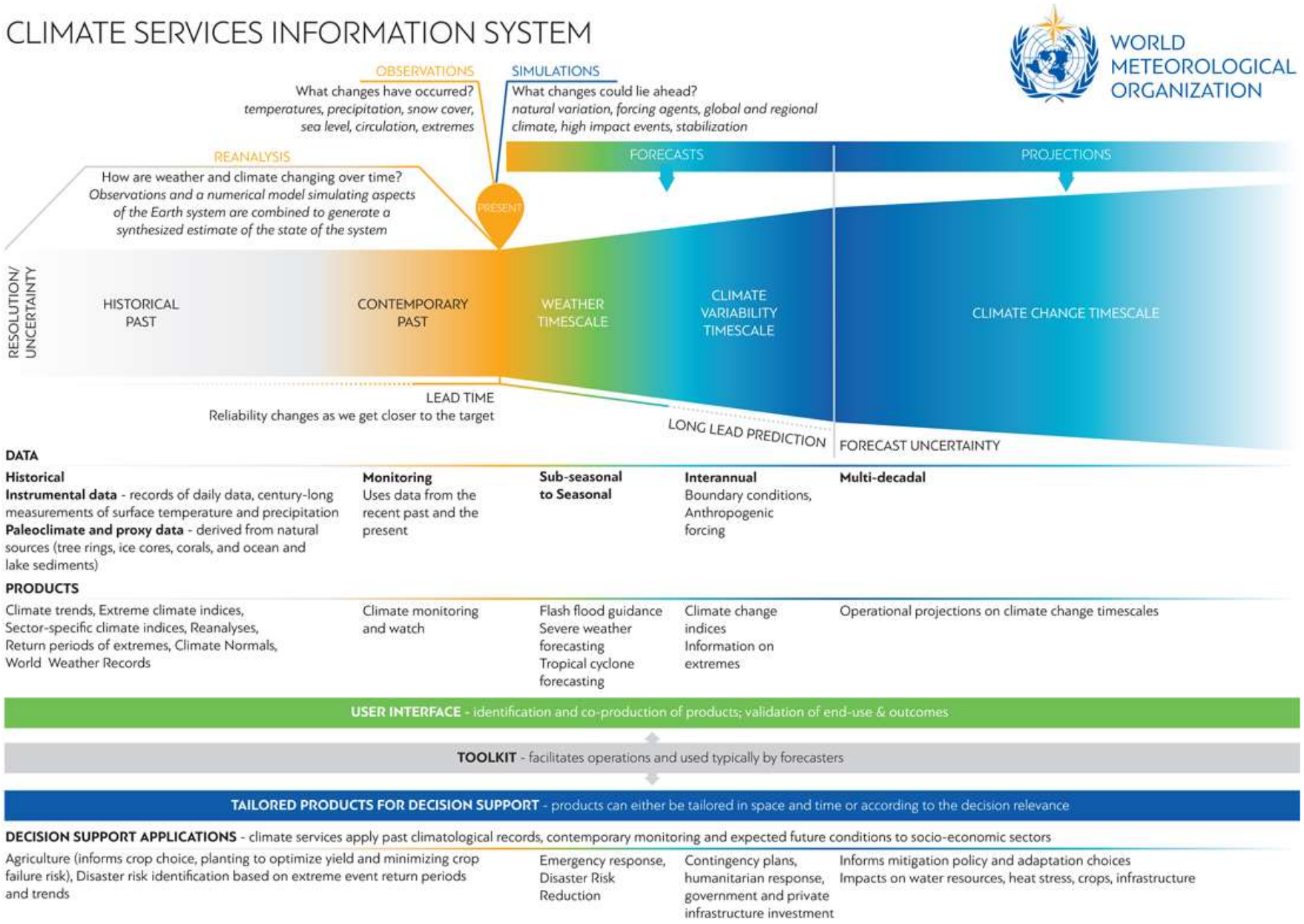


Section 3. Regional Institutions and Mechanisms

Regional Climate Outlook Forums produce consensus-based, user relevant climate outlooks for the coming season on a regular basis.



Section 4. Conceptual framework of a CSIS



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