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# Addressing Hydroclimatic Risk : Case studies from International Hydrological Programme (IHP)

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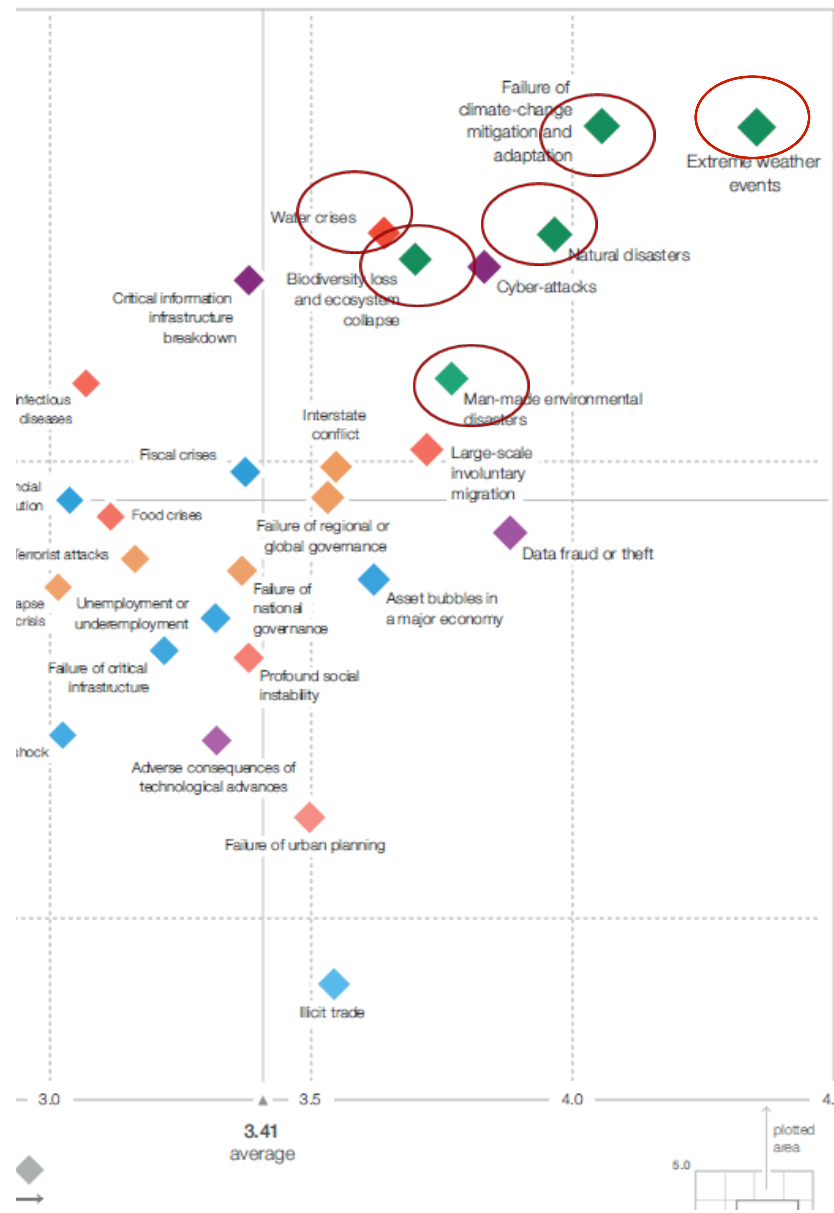
# GLOBAL RISKS LANDSCAPE 2019: RISK AND UNCERTAINTY

Top 10 risks in terms of

## Likelihood

1. Extreme weather events
2. Failure of climate-change mitigation and adaptation
3. Natural disasters
4. Data fraud or theft
5. Cyber-attacks
6. Man-made environmental disasters
7. Large-scale involuntary migration
8. Biodiversity loss and ecosystem collapse
9. Water crises



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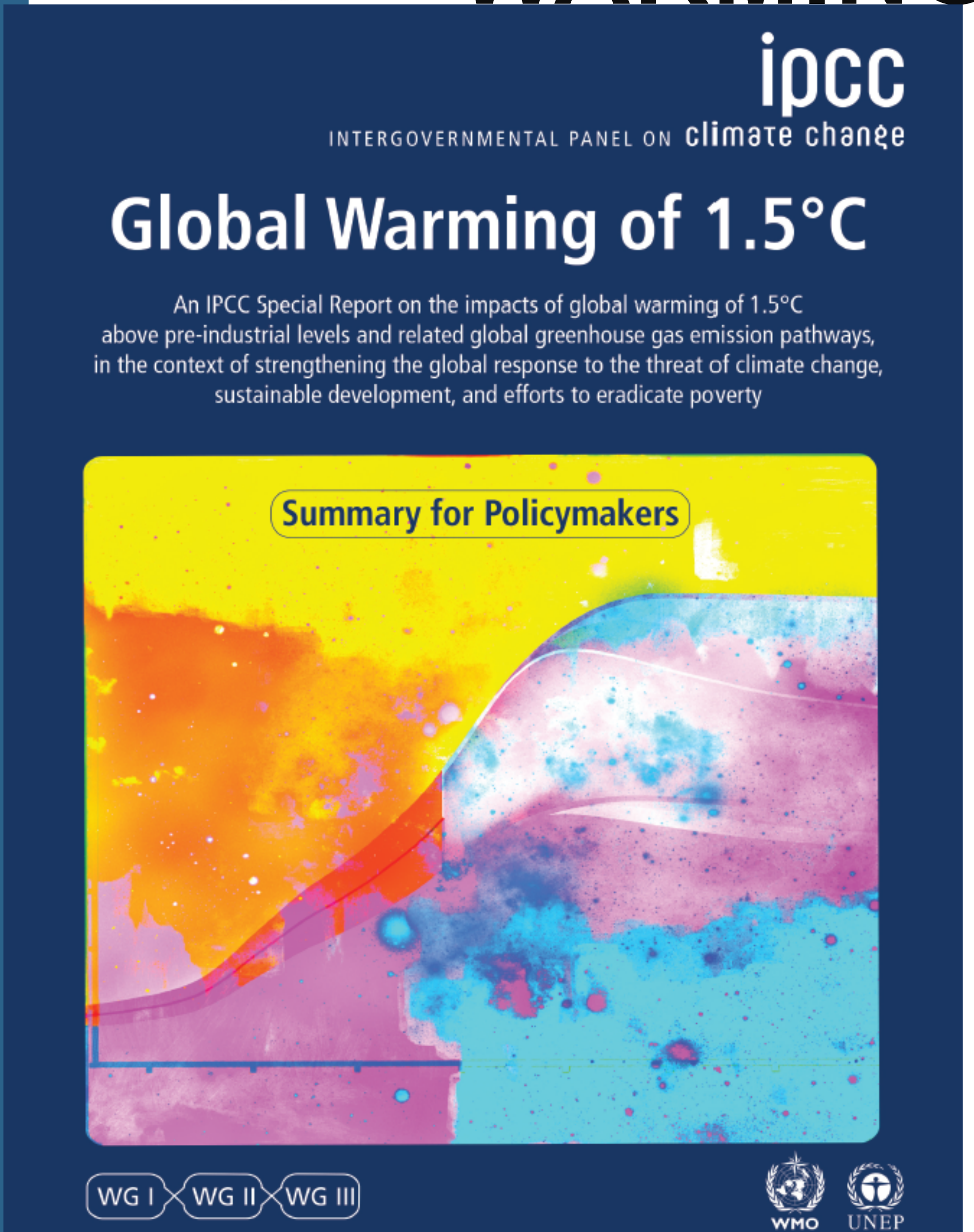
# INTRODUCTION: GLOBAL WARMING




**0.5°C difference matters**

+1.0°C (today): impacts dedected

+1.5°C: serious impacts

+2.0°C: impacts considerably worse;
some will be irreversible

**+1.5°C can be reached**

with **45%** $CO_2$ reduction by **2030** and **0** net emission by **2050** (one of several emission scenarios)

IPCC SR1.5, 2018

ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP

# Linkages between mitigation options and Sustainable Development

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PHILOSOPHICAL TRANSACTIONS A

rsta.royalsocietypublishing.org

Review

Check for updates

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Accepted: 5 February 2018

One contribution of 20 to a theme issue 'The Paris Agreement: understanding the physical

## Climate and development: enhancing impact through stronger linkages in the implementation of the Paris Agreement and the Sustainable Development Goals (SDGs)

Luis Gomez-Echeverri

Transitions to New Technologies, International Institute for Applied Systems Analysis, Schlossplatz 1, 2361 Laxenburg, Austria

One of the greatest achievements in the global negotiations of 2015 that delivered the 2030 Agenda for Sustainable Development or Sustainable

**Tangible water solution** to inform the revision and implementation of 2020 NDCs – **case studies** in the field of ecosystem based adaption, **risk analysis** to improve long term **climate resilience**.

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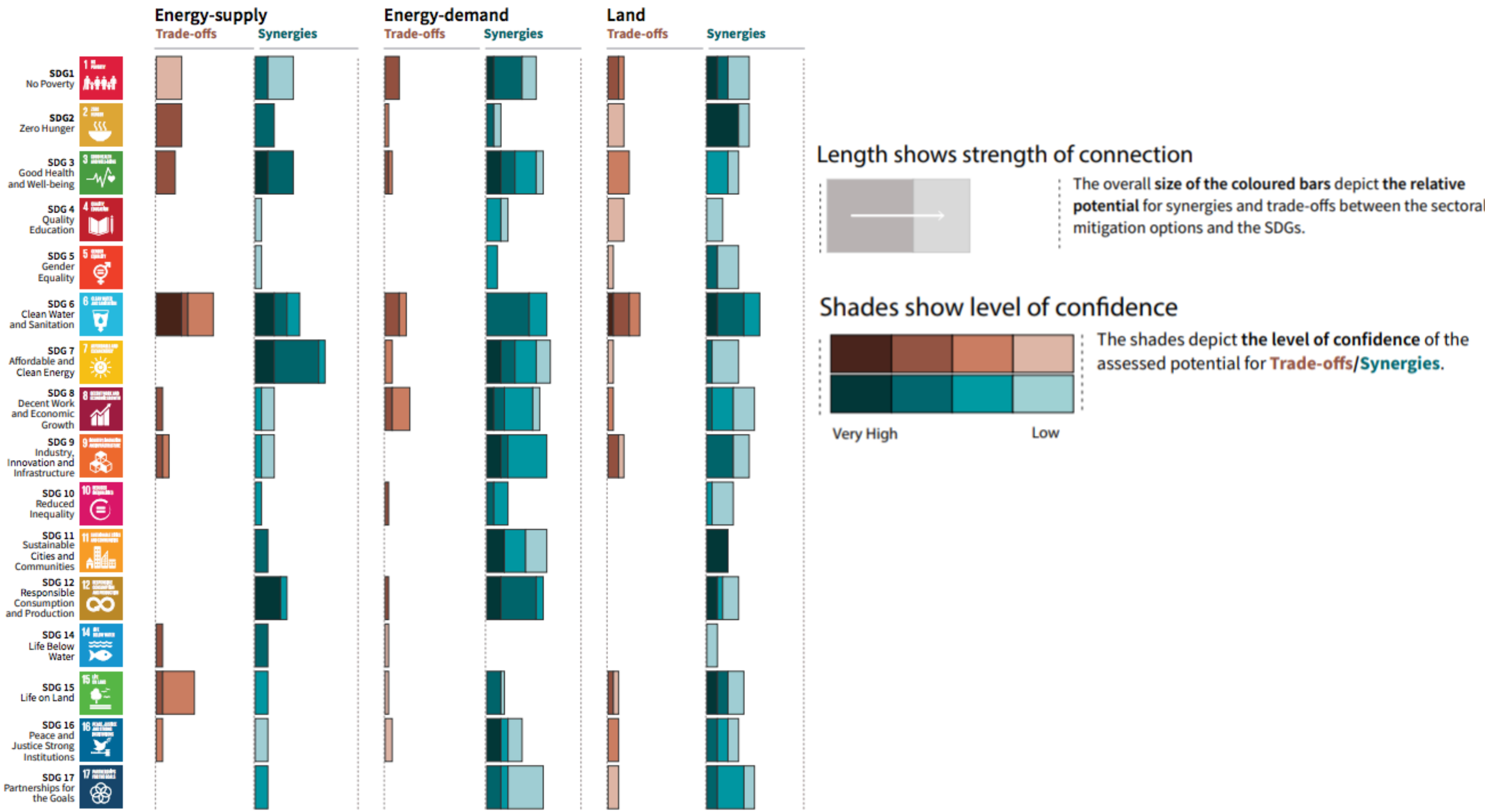
# +1.5°C EMISSION PATHS AND SDGS

## Indicative linkages between mitigation options and sustainable development using SDGs (The linkages do not show costs and benefits)




*Trade-offs/synergies*

# Water-related risks

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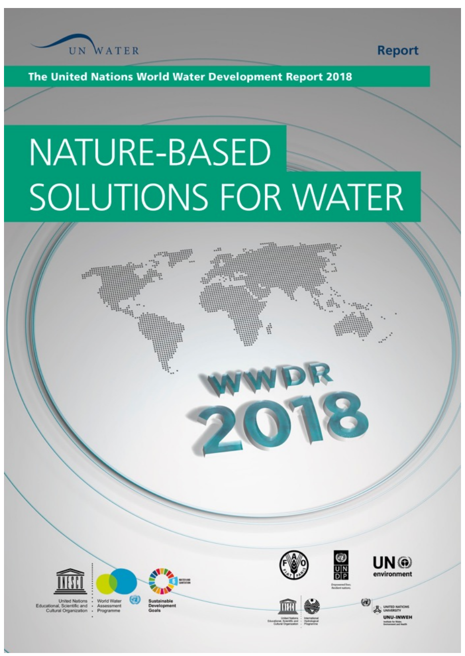
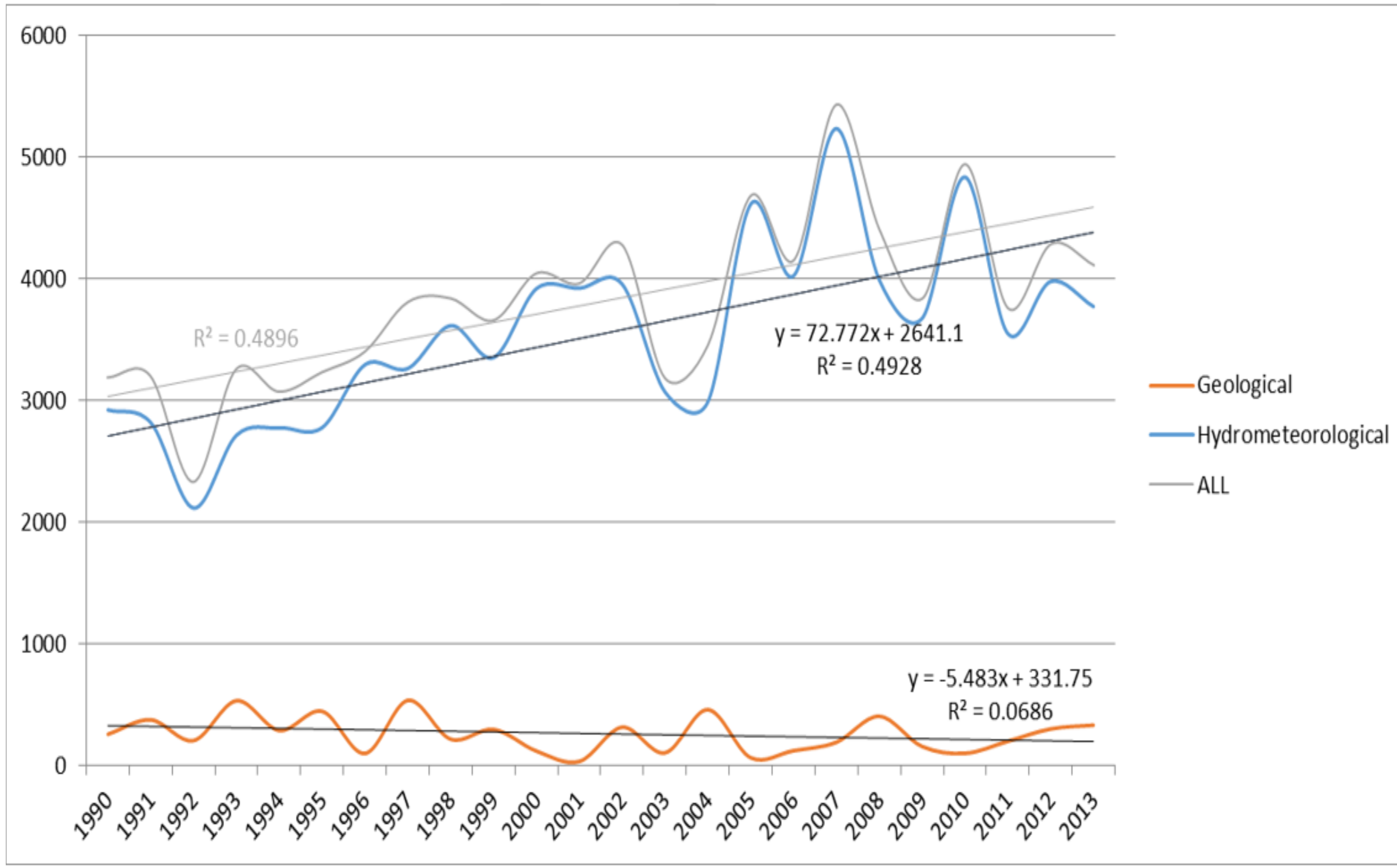
**Floods have accounted for 47%** of all weather-related disasters since 1995, affecting a total of **2.3 billion people**.



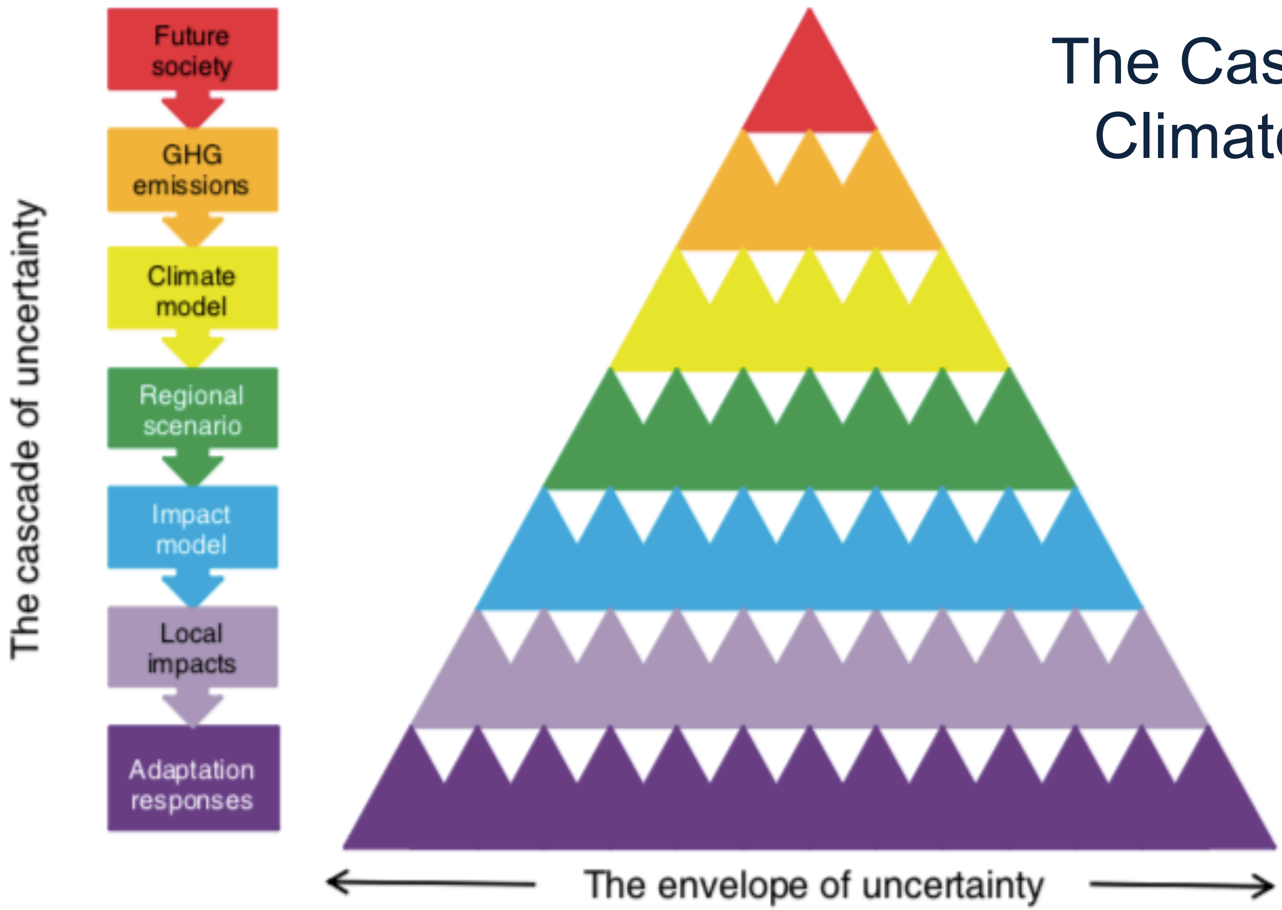




**Internationally reported global disaster mortality for events with fewer than 100 deaths (UNISDR 2015, based on EM-DAT)**

***WWDR, 2018***

# How to deal with the large uncertainty in the different model projections?

## The Cascade of Uncertainty in Climate Change Projections




*A cascade of uncertainty proceeds from different socio-economic and demographic pathways, their translation into concentrations of atmospheric greenhouse gas (GHG) concentrations, expressed climate outcomes in global and regional models, translation into local impacts on human and natural systems, and implied adaptation responses.*

Wilby and Dessai, 2010

# How to translate uncertainty of climate projections to the watershed level?

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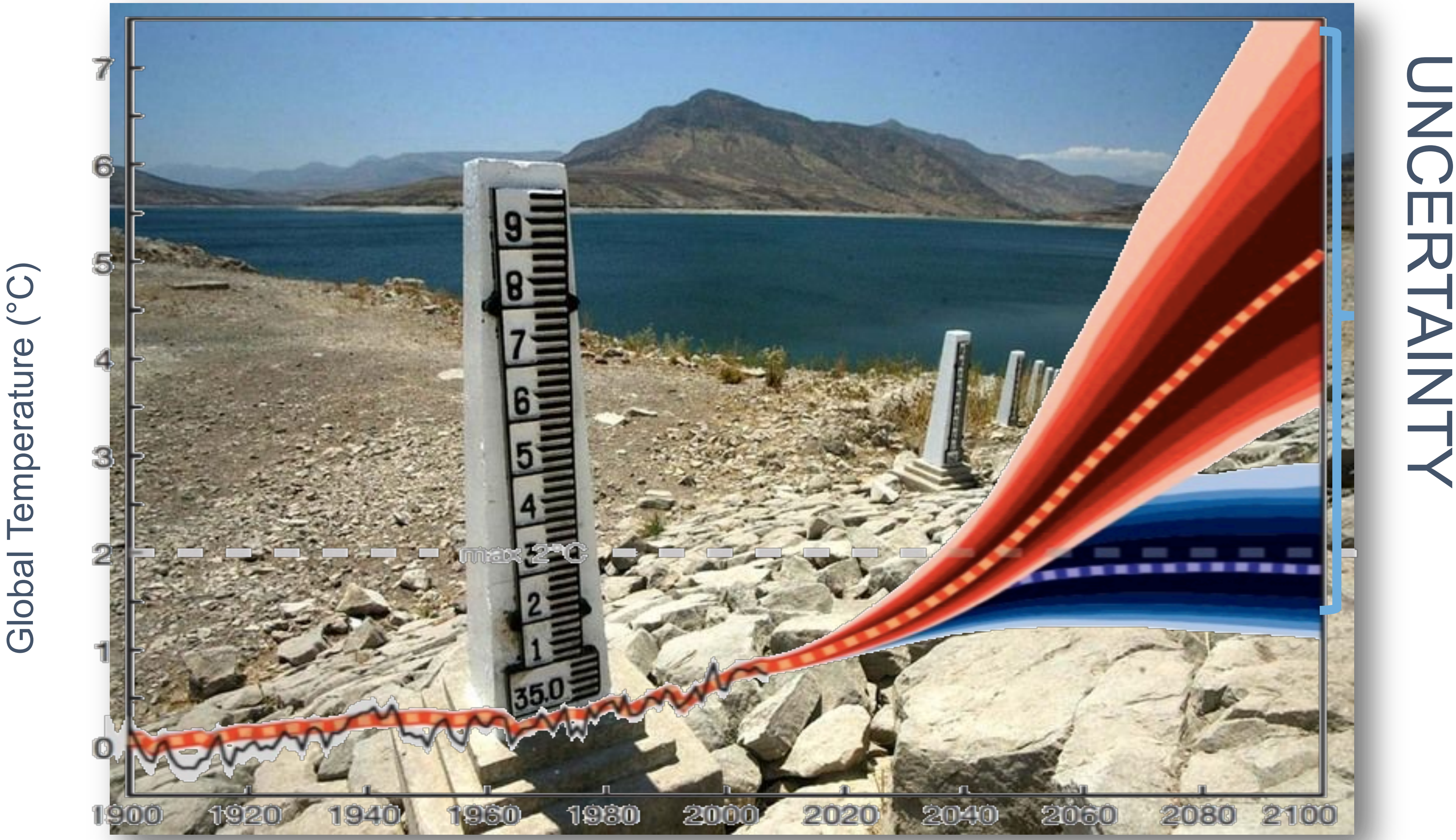

# Climate Risk Informed Decision Analysis (CRIDA)

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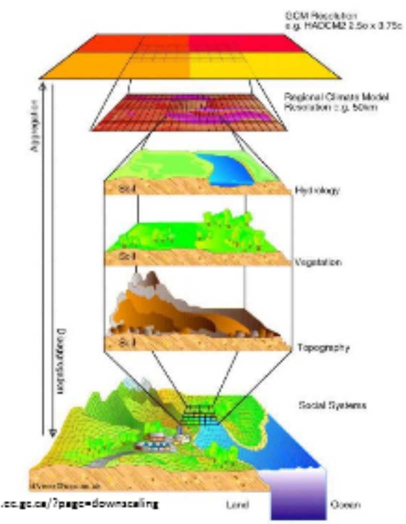
**Two different aproaches to utlize the information in the GCMS**

## Traditional Approach

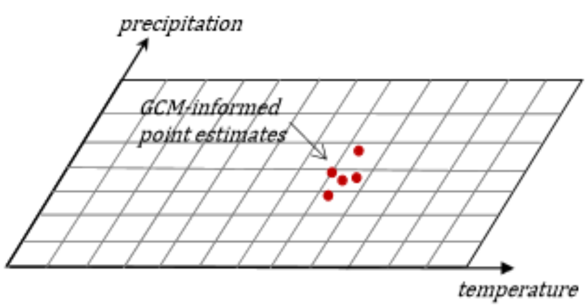
1. Downscale a few climate model projections

2. Generate a few water supply series




http://www.cccsn.ec.gc.ca/?page=downscaling

3. Determine whether system performance is acceptable for these series.

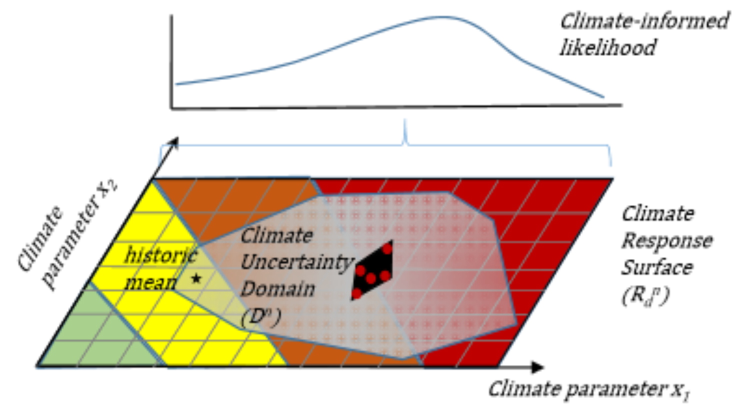



*Expected Net Benefits (ENB)*

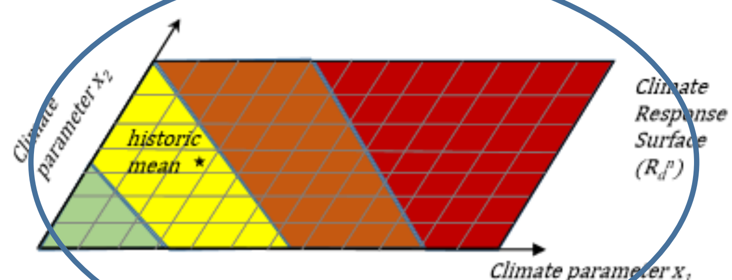
## Decision Scaling (CRIDA)

$$Risk\ to\ ENB = \sum_{s=1}^{\Omega} Impact \times Probability$$

3. Determine climate risks to project performance




2. Map climate domain onto vulnerability domain

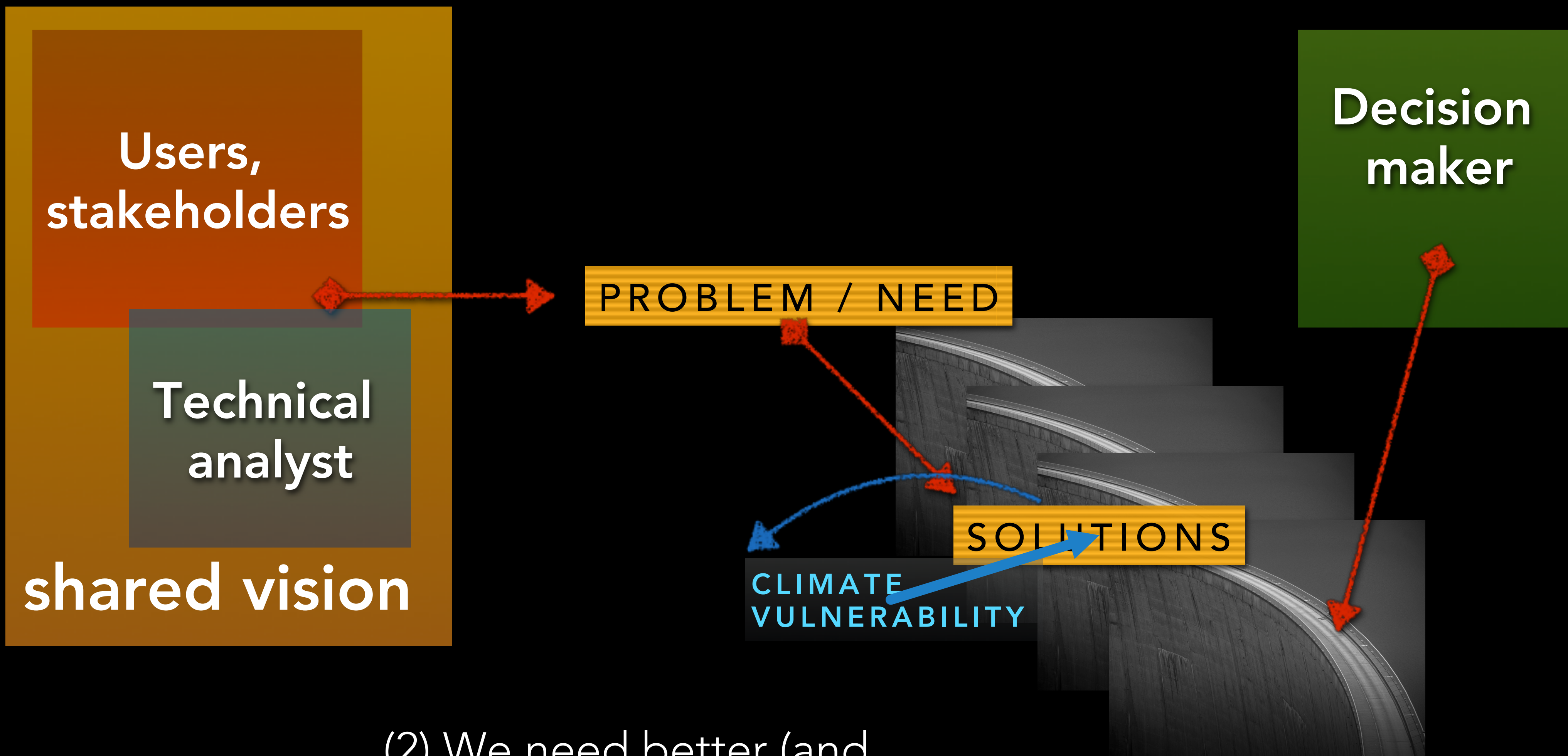



1. Determine the vulnerability domain

**Identify the Water Security Risk first**

# DECISION MAKING IN THE POST-OPTIMIZATION ERA

(1) users & stakeholders need
to be involved earlier.




(2) We need better (and
probably multiple) solutions.

john Matthews, 2018

# Climate Risk Informed Decision Analysis (CRIDA)
# Collaborative Water Resources
# Planning for an Uncertain Future

Climate Risk Informed
Decision Analysis (CRIDA)

Collaborative Water Resources
Planning for an Uncertain Future

# International Hydrolgical Programme (IHP, VIII 2014-2021)

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# IHP provides a scientific knowledge platform

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IHP plays a vital role in providing a scientific knowledge base for policy advice to manage and cope with challenges to water resources,

including disasters and floods, and to increase the resilience of natural and human systems with an emphasis on vulnerable communities, and

THE GLOBAL GOALS
For Sustainable Development

Promoting international cooperation to mobilize research and supporting human and technical capacity building, IHP contributes to the implementation of UN goals and commitments such as the Sustainable Development Goals.

G-WADI | 

gwadi.org

# G-WADI

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SEARCH

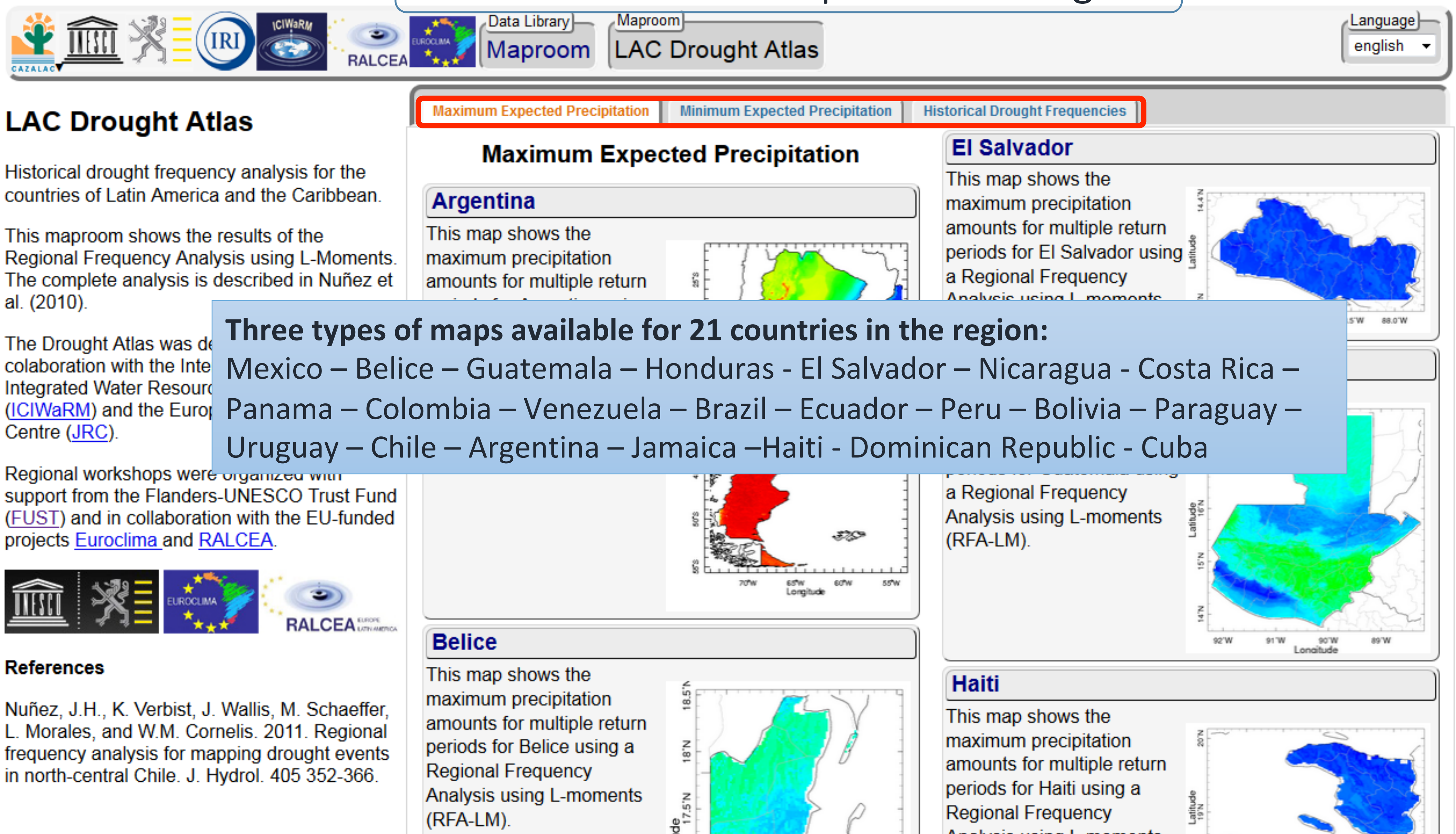
HOME ABOUT TECHNICAL SECRETARIATS TOOLS & RESOURCES ARCHIVE


G-WADI's mission is to strengthen the capacity to manage the water resources of arid and semi-arid areas around the globe through a network of international and regional cooperation.

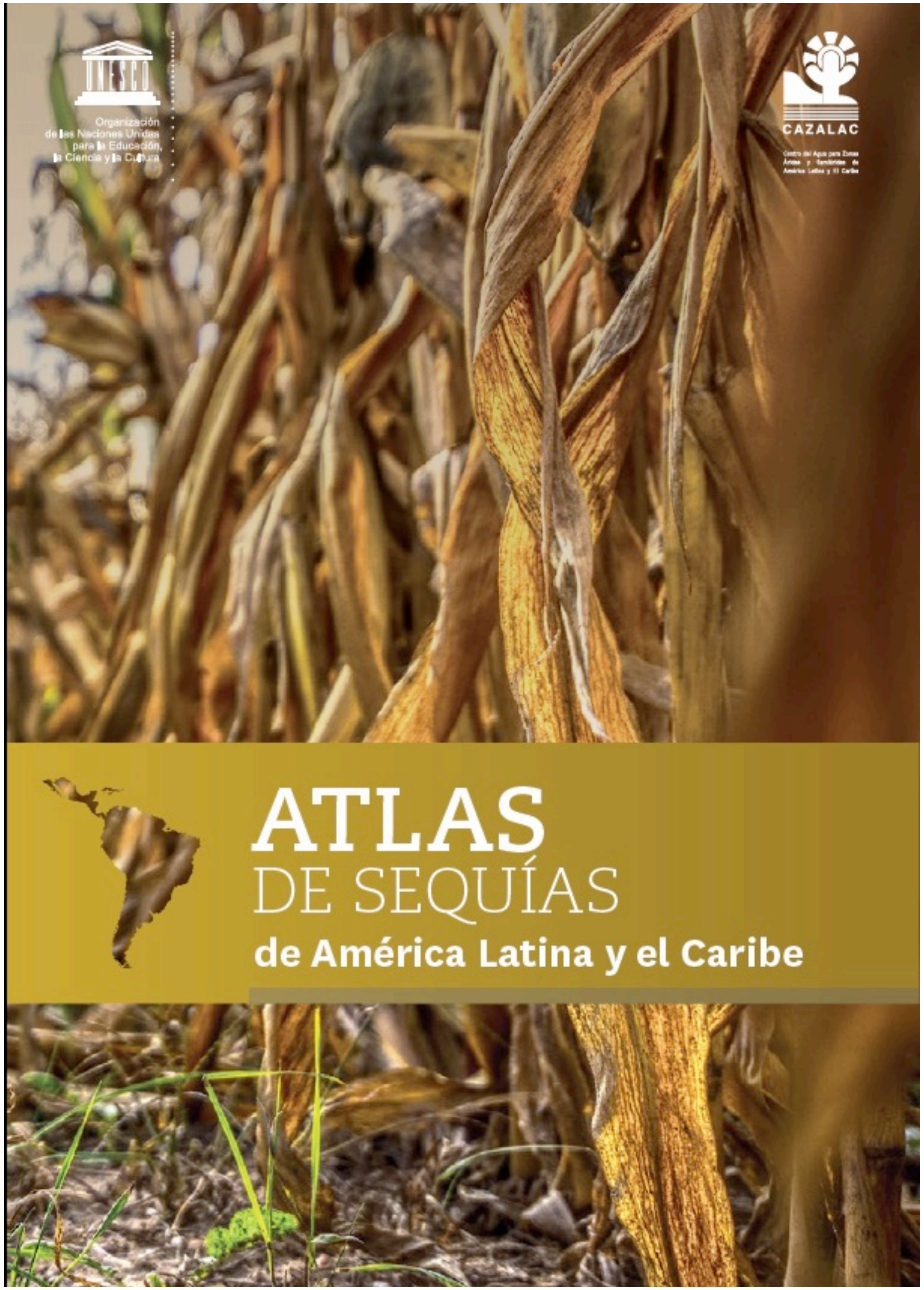
# The Latin American and Caribbean Drought Atlas

United Nations Educational, Scientific and Cultural Organization · International Hydrological Programme

Accessible on-line in Spanish and English




**Three types of maps available for 21 countries in the region:**
Mexico – Belice – Guatemala – Honduras - El Salvador – Nicaragua - Costa Rica – Panama – Colombia – Venezuela – Brazil – Ecuador – Peru – Bolivia – Paraguay – Uruguay – Chile – Argentina – Jamaica –Haiti - Dominican Republic - Cuba




**It is these antecedents that have led to the need to generate a special UNESCO publication to address the issue of drought in this region of America. This is: The Drought Atlas of Latin America and the Caribbean**

# The African and Lac flood and drought Monitors

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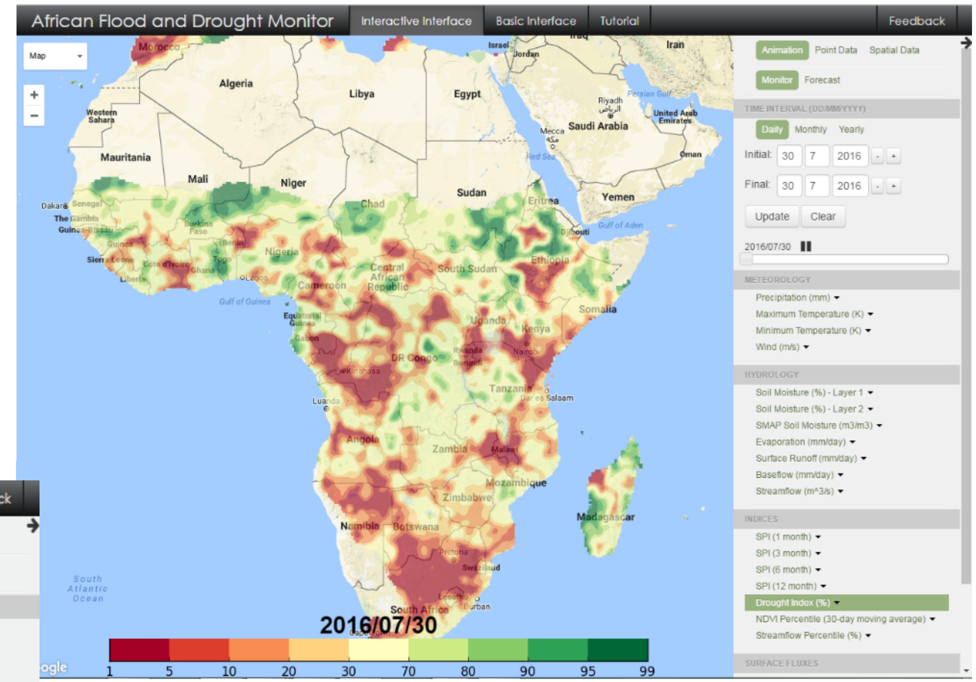
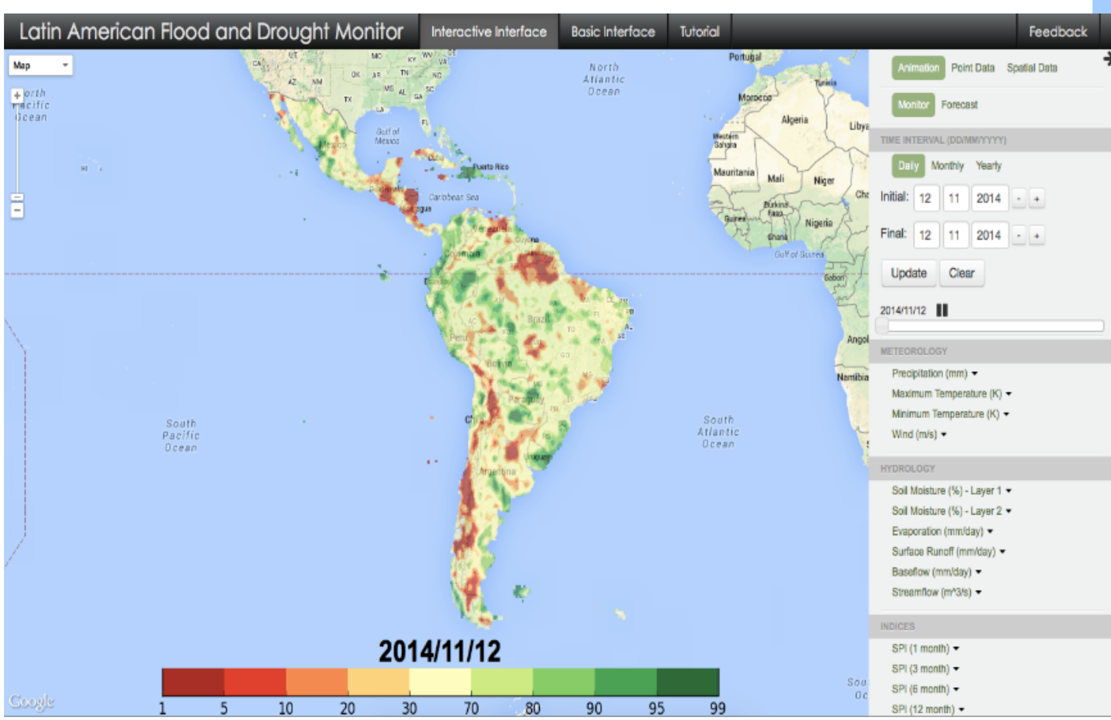
**African and LAC Droughts monitors**:

Strengthen the capacity of African and LAC countries for near real-time monitoring and seasonal forecasting to raise awareness of the impact of floods and droughts on vulnerable and disadvantaged groups.




User Interface: http://stream.princeton.edu

# Innovative tools to support decision making- COP22

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# G-WADI Geoserver application in Namibia

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Programme

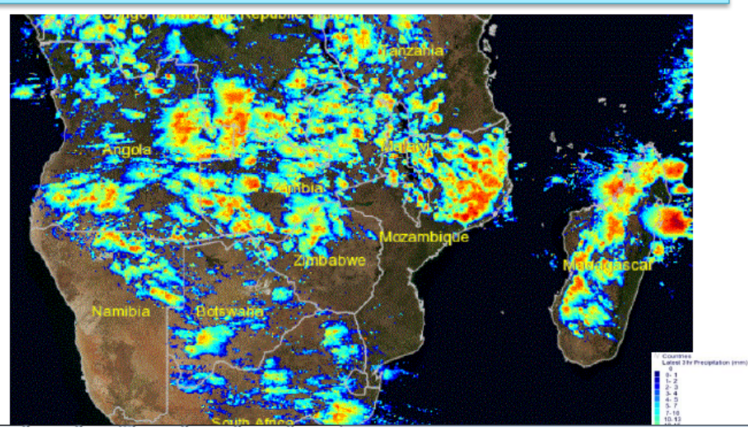

## HYDROLOGICAL SERVICES NAMIBIA

**DAILY FLOOD BULLETIN** 26 January 2018

Private Bag 13184, Ministry of Agriculture, Water and Forestry, Government Office Park, Namibia

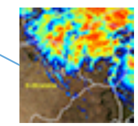
Satellite images over the last 24 hours showed isolated showers over the north-central, northeast and eastern parts of Namibia.

G-WADI-rainfall accumulation for the past 24 hours preceding 08h00 on 26.01.2018



# IHP contributes to SDGs and 2030 Agenda



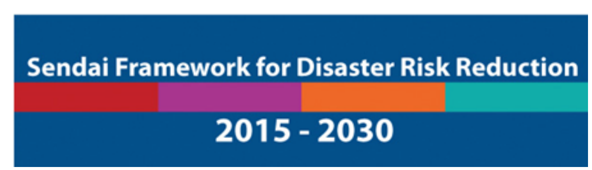


**Namibia** Uses IHP-supported G-WADI's Precipitation Estimates in their Daily Flood Bulletin

**Rainmapper** A New Mobile Device Application for Real-time Global Precipitation Monitoring

**New brochures** for 'Latin American Flood and Drought Monitor' and 'Latin American & Caribbean Drought Atlas'

**Technical training** session on PERSIANN held during Thai Hydrologist Association's (THA) 2015 conference



# THE ANDEAN GLACIER AND WATER ATLAS

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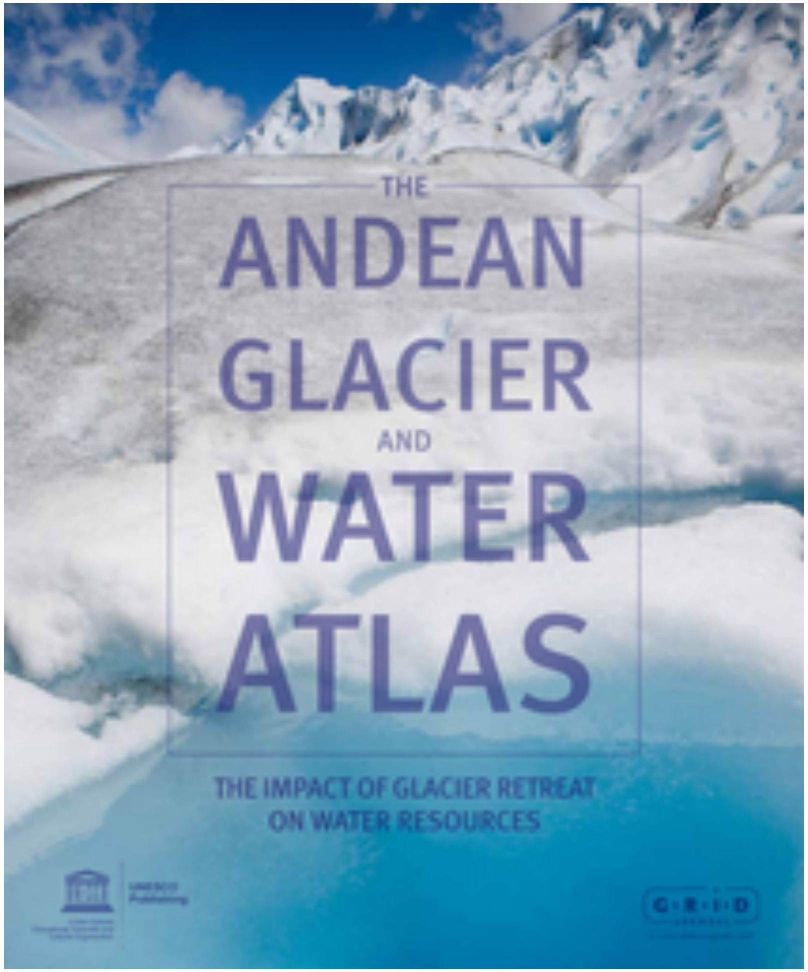


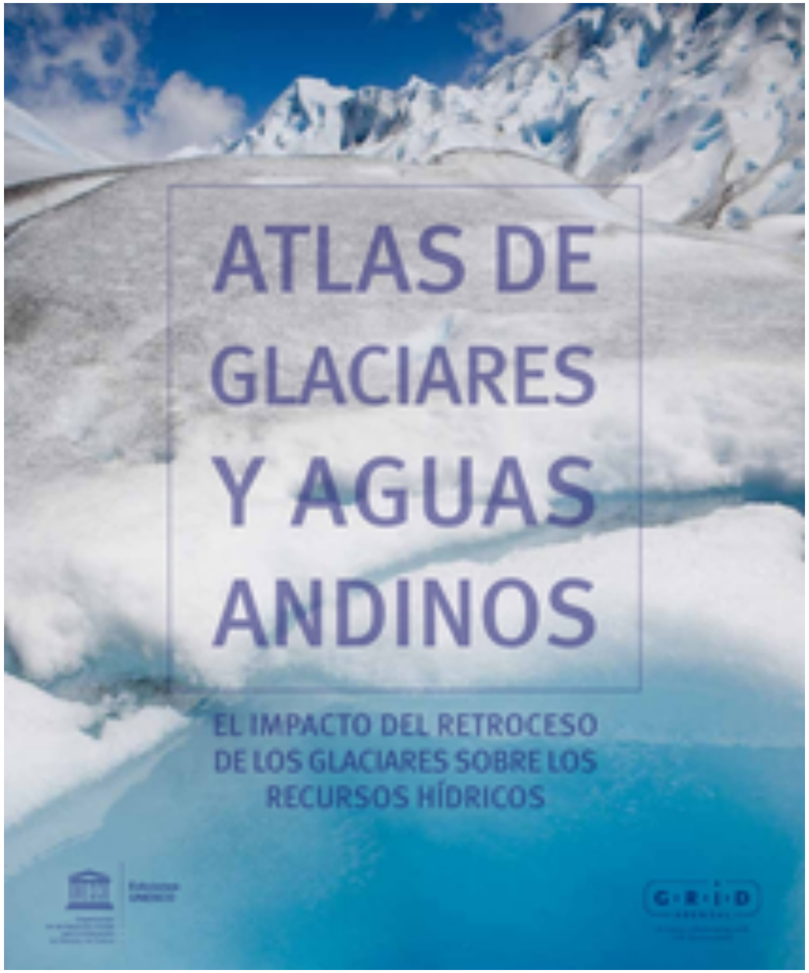

# ASSESSMENT OF SNOW GLACIER AND WATER RESOURCES IN CENTRAL ASIA

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## Strengthening the Resilience of Central Asian Countries by Enabling Regional Cooperation to Assess High Altitude Glacio-Nival Systems to Develop Integrated Methods for Sustainable Development and Adaptation to Climate Change

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UNDP

gef

GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET

# Fifth Workshop on Water Resources in Developing Countries: Hydroclimate Modeling and Analysis Tools

ICTP

**27 May - 07 June 2019**
**Trieste, Italy**

CHRS — Center for Hydrometeorology & Remote Sensing, UC Irvine

UNESCO — United Nations Educational, Scientific and Cultural Organization · International Hydrological Programme

UNESCO — United Nations Educational, Scientific and Cultural Organization · ICIWaRM — International Center for Integrated Water Resources Management under the auspices of UNESCO

International Union of Geodesy and Geophysics — IUGG UGGI — Union Géodésique et Géophysique Internationale

## Topics:

- How can precipitation measurements be used to validate model simulations.
- How to use ensembles of high-resolution regional climate model as input of a hydrological model.
- Which is the role of the coupled water cycle in the Regional Earth System models.
- How can the uncertainty in global and regional climate projections be taken into account for hydro-climate simulation.

**Deadline:**

**15 March 2019**

ICTP — The Abdus Salam International Centre for Theoretical Physics
www.ictp.it
Trieste, Italy

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# UNESCO Water on the Map

United Nations Educational, Scientific and Cultural Organization · World Water Assessment Programme

NATURAL SCIENCES