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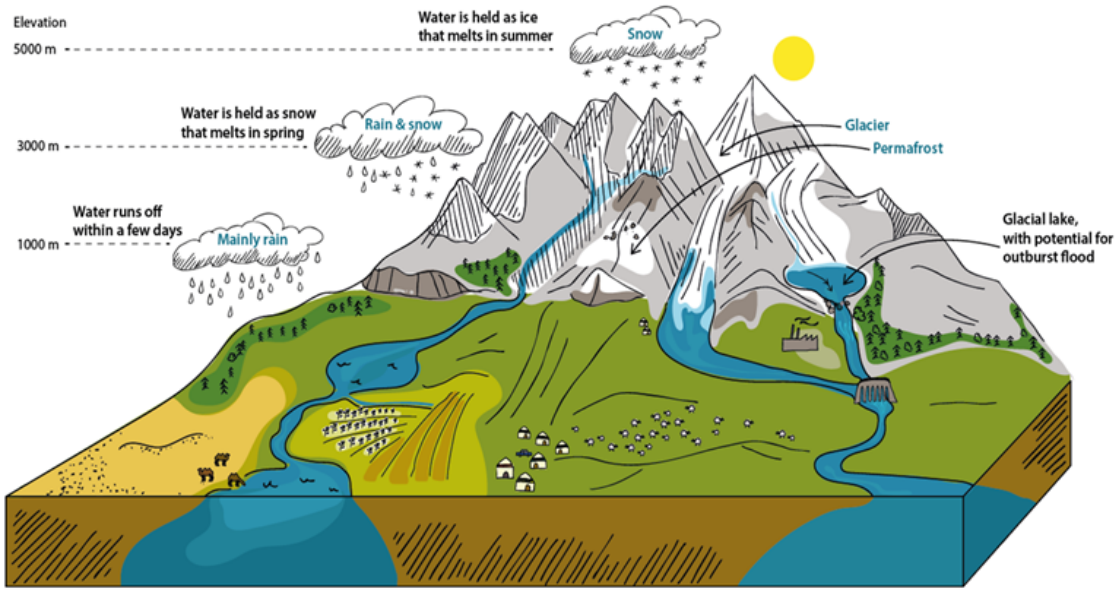
Hydro Climate research and Practice: Supporting Science-Based Decisions for Adaptation



zoi environment network

Dr. Anil Mishra
Division of Water Sciences
UNESCO

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Educational, Scientific and
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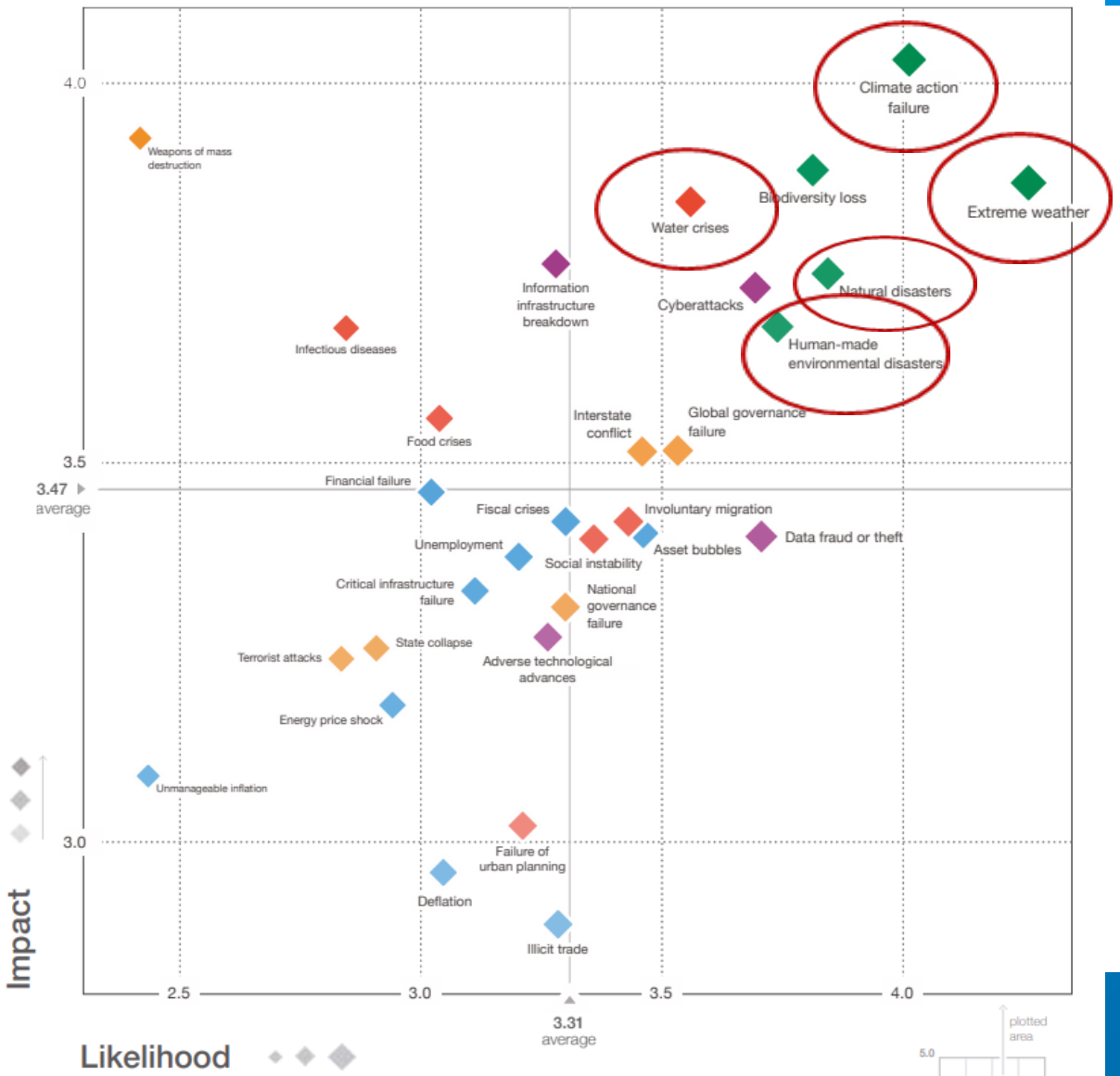
The Global Risks Report 2020

WORLD ECONOMIC FORUM



Top 10 risks in terms of

Likelihood

1. Extreme weather
2. Climate action failure
3. Natural disasters
4. Biodiversity loss
5. Human-made environmental disasters

Top 10 risks in terms of

Impact

1. Climate action failure
2. Weapons of mass destruction
3. Biodiversity loss
4. Extreme weather
5. Water crises

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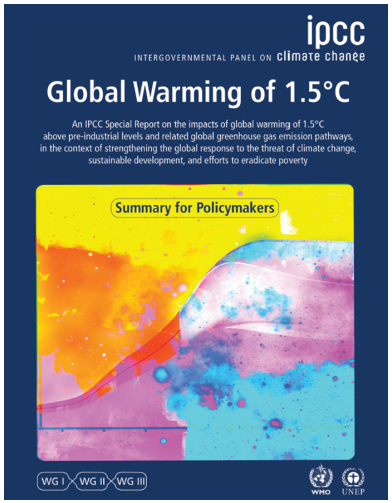
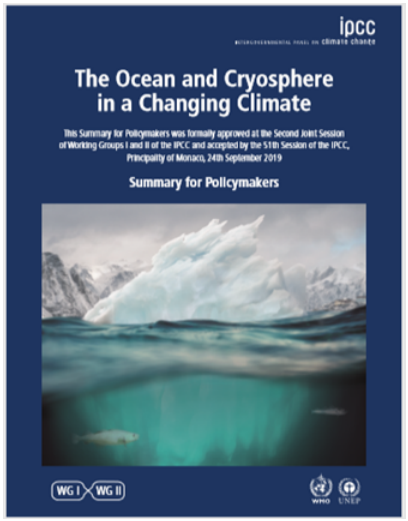
Hydrolo Climate Research and Practice: Where is the Harmony





Education and climate literacy, monitoring and forecasting, use of all available knowledge sources, sharing of data, information and knowledge, finance, addressing social vulnerability and equity, and institutional support are essential.

Investments in education and capacity building at various levels and scales facilitates social learning and long-term capability for context-specific responses to reduce risk and enhance resilience (high confidence).

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CHALLENGES

Mobilization and translation of scientific results for decision making?

Promote sustainable development under climate change?

Build capacity to manage and adapt for the impacts of climate change?

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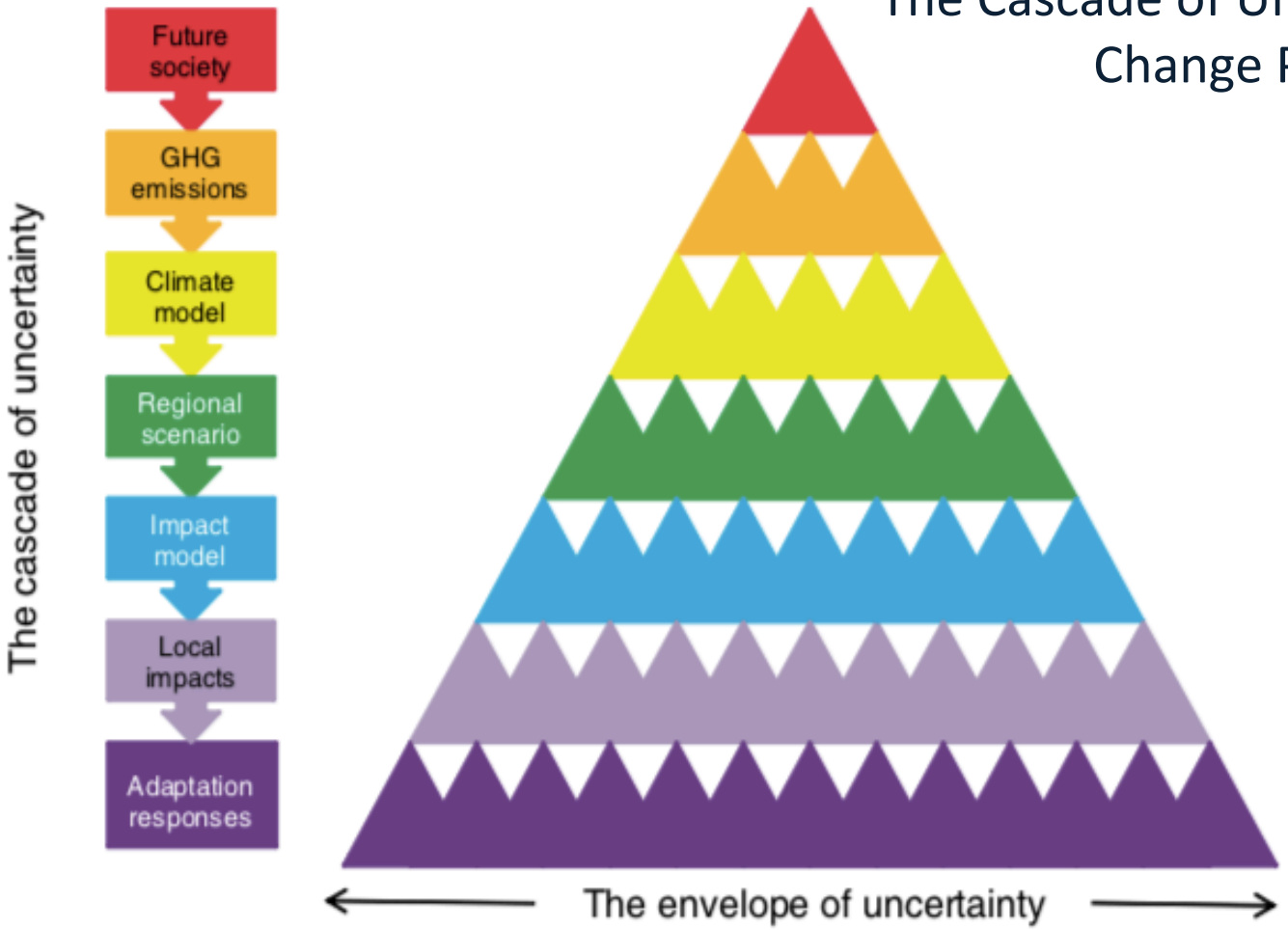
How to deal with the large uncertainty in the different model projections?

The Cascade of Uncertainty in Climate Change Projections



Wilby and Dessai, 2010

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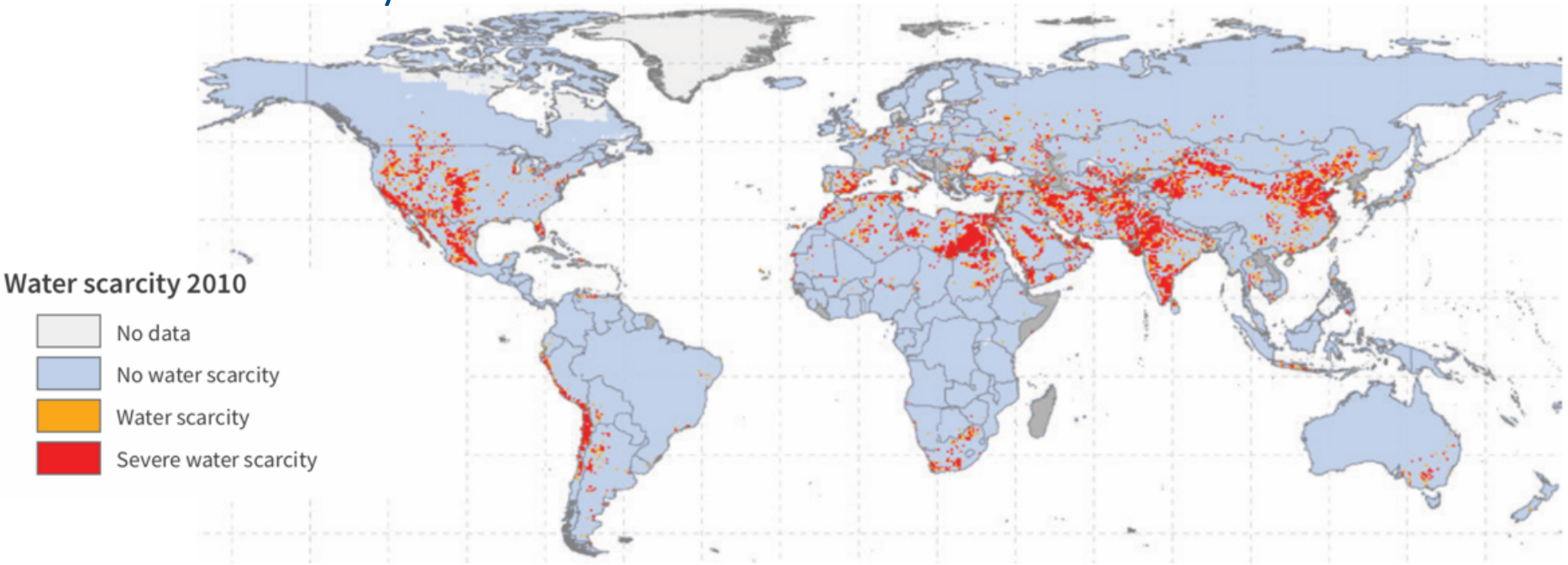
Water scarcity

At present, an estimated 3.6 billion people (nearly half the global population) live in areas that are potentially water-scarce at least one month per year, and this population could increase to some 4.8 to 5.7 billion by 2050.



Source: WWDR 2018, Burek et al. (2016)

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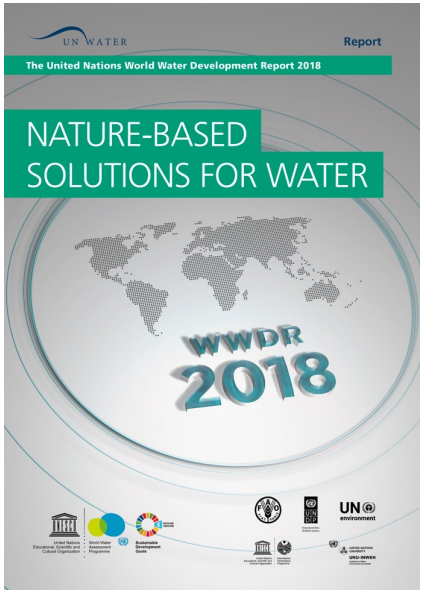
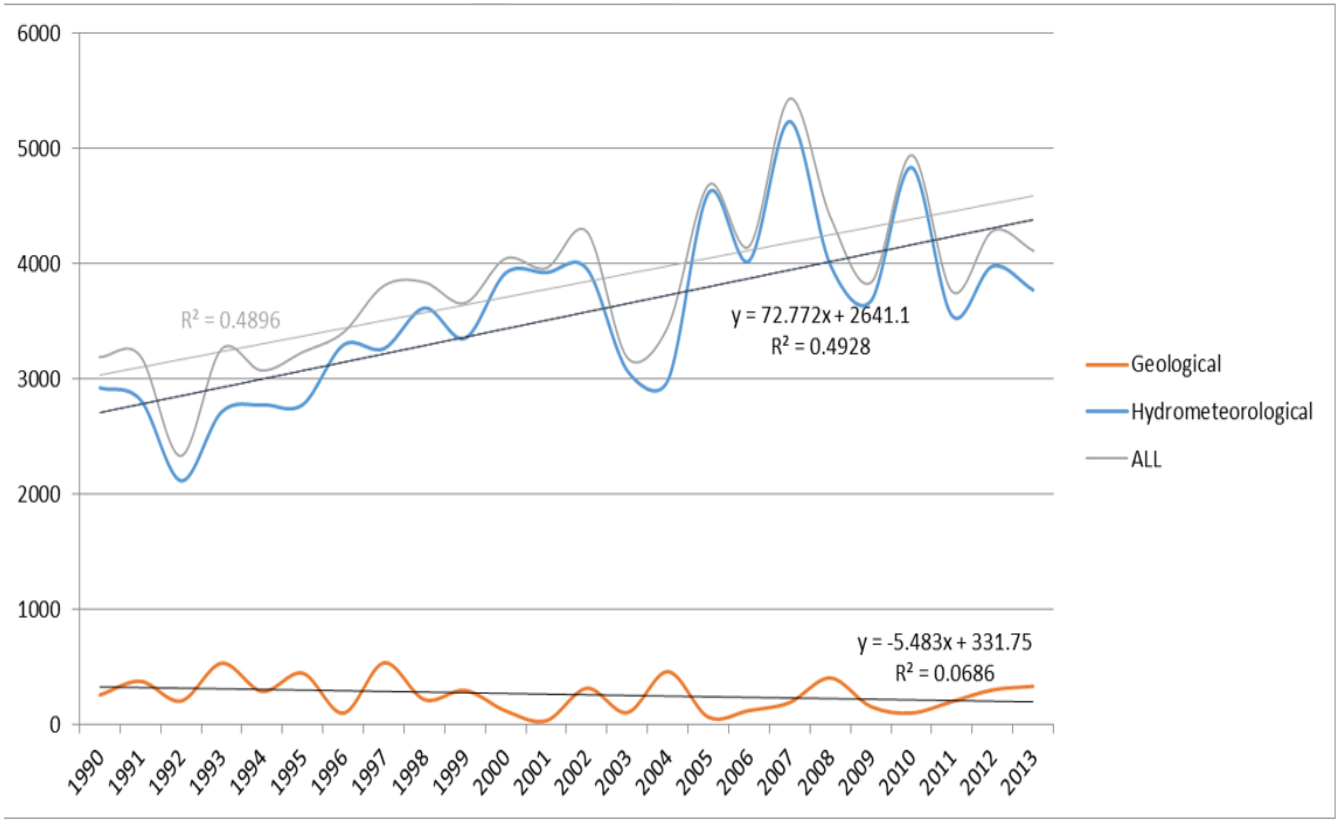
Water-related disasters

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

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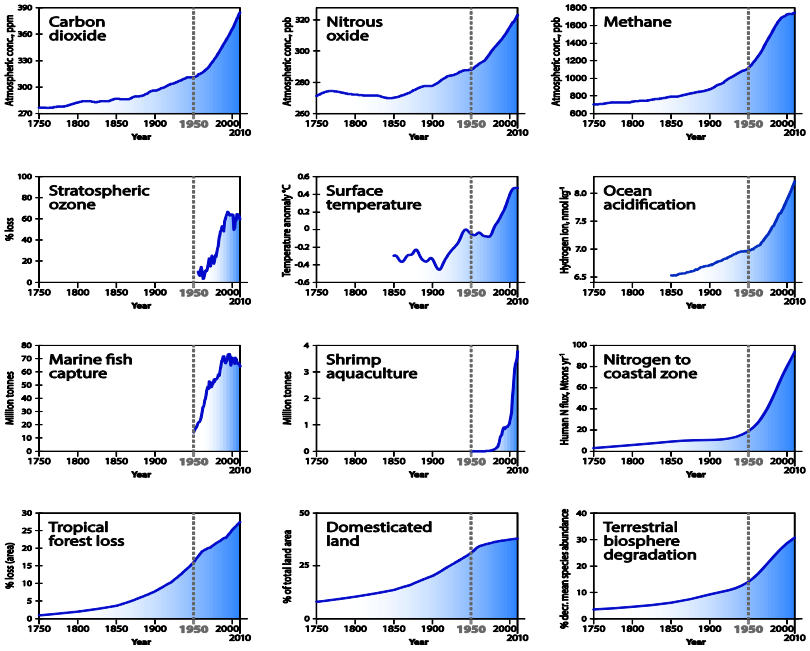
Anthropocene

Earth system trends



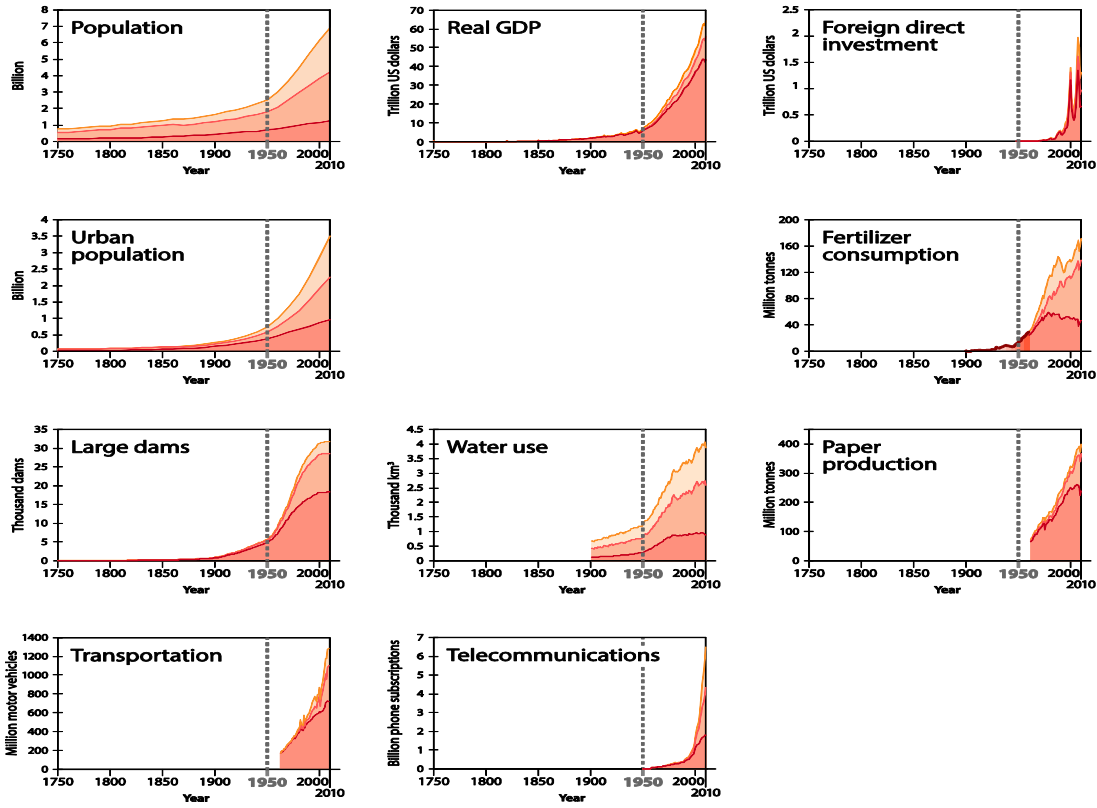
Global Environmental Change xxx (2015) xxx–xxx
Contents lists available at ScienceDirect
Global Environmental Change
journal homepage: www.elsevier.com/locate/gloenvcha

Re-conceptualizing the Anthropocene: A new call for collaboration

Eduardo S. Brondizio[1], Karen O'Brien[2], Frans Berkhout[3], Xuemei Bai[4], Maria Carmen Lemos[5], Christophe Cudennec[6], Frank Biermann[7], Jose Palma-Oliveira[8], Will Steffen[9], Alexander Wolfe[10], Chen-Tung Arthur Chen[11]

Socio-economic trends

OECD BRICS Others



ICSU INTERNATIONAL COUNCIL FOR SCIENCE

GLOBAL CHANGE IGBP International Geosphere-Biosphere Programme

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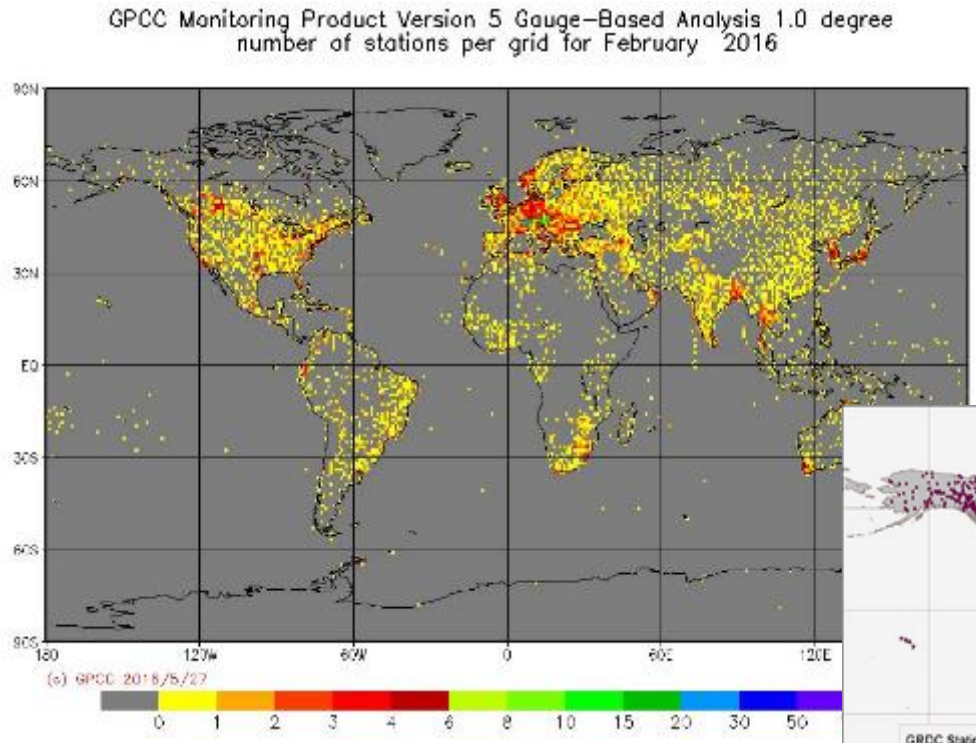
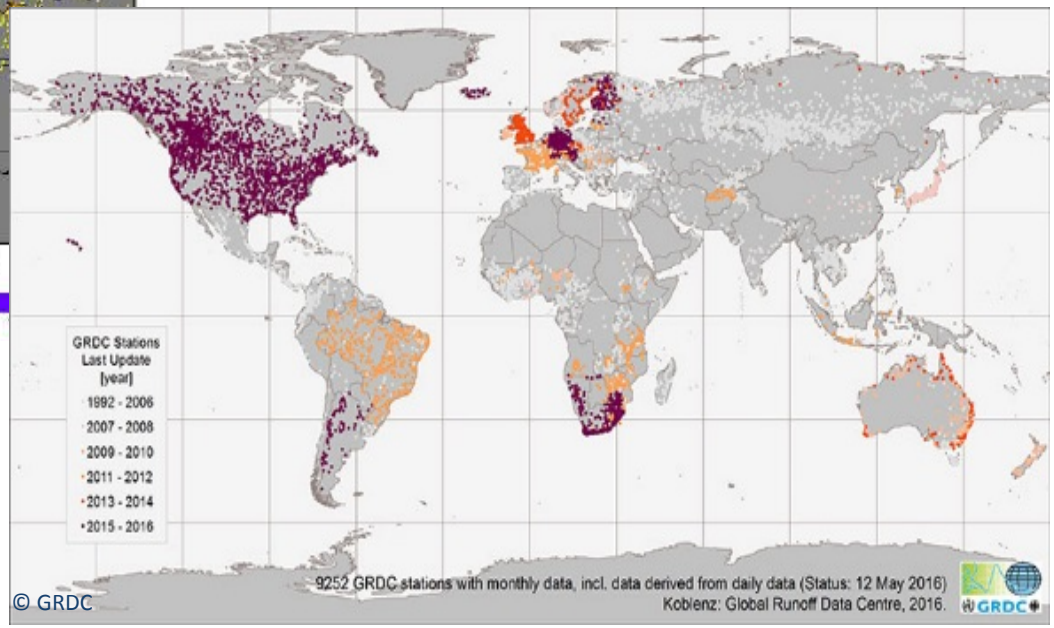
Global In situ Observing Systems: Limited coverage!



Global Precipitation Gage Network (GPCC) (2016)

Global Runoff Gage Network (GRDC)



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IHP-VIII Responses: 6 Themes, 3 Axes 2014-2021

Axis Improve knowledge and innovation to address water security challenges

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APPROACHES

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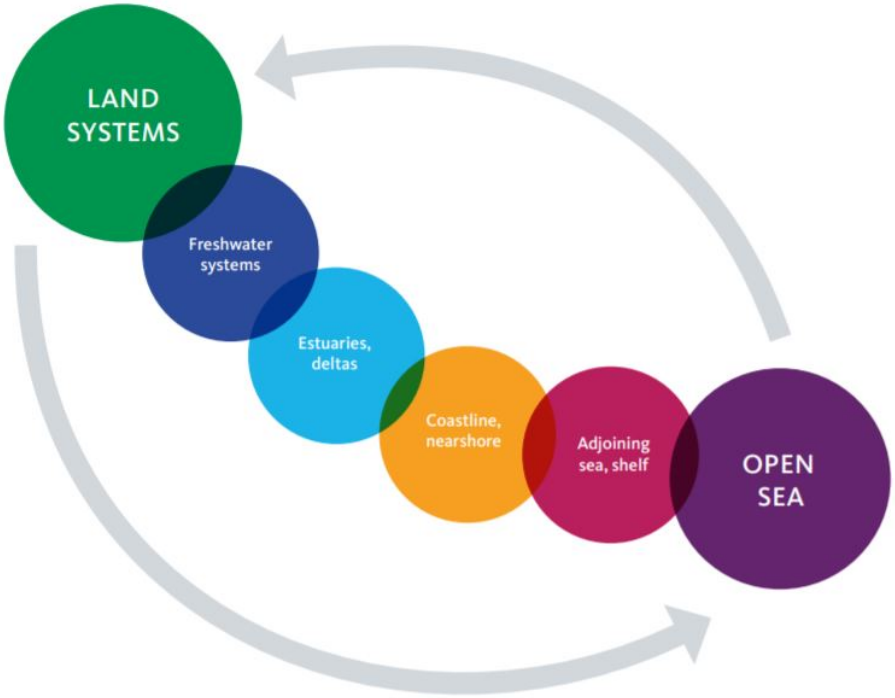
Source-to-Sea and Climate Action

S2S PLATFORM

The source-to-sea system

A source-to-sea system is the land area that is drained by a river system, its lakes and tributaries (the river basin), connected aquifers and downstream recipients including deltas and estuaries, coastlines and near-shore waters, the adjoining sea and continental shelf as well as the open ocean (Figure 2). A source-to-sea system can also be defined at a larger scale to include a sea and its entire drainage area, which may include several river basins.



The source-to-sea concept

The source-to-sea concept defines key flows found within a source-to-sea system; describes six steps to guide analysis and planning; and presents a framework for elaborating a theory of change; all with an aim of designing initiatives that support healthy ecosystems and sustainable green and blue economies.

Key source-to-sea flows

The source-to-sea concept identifies six key flows that connect the source-to-sea system from land systems to open oceans: water, sediment, pollutants, biota, materials and ecosystem services (Figure 3).

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Source-to-Sea and Climate Action

- **Source-to-Sea phenomena incorporating the cryosphere, the terrestrial hydrological cycle, water quality, sediment and erosion processes and deposition in deltas and coasts**
- **Source-to-Sea interconnections.**

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IHP IX (2022-2029)

Addressing the gap between data and information in support of water resources management

Supporting science-based decisions for adaptation and mitigation

Achieving sustainable water management (SWM)

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

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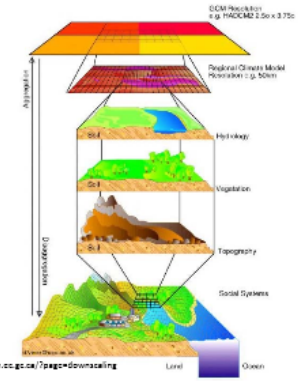
Climate Risk Informed Decision Analysis (CRIDA) Collaborative Water Resources Planning for an Uncertain Future

Climate Risk Informed Decision Analysis (CRIDA)

Collaborative Water Resources Planning for an Uncertain Future

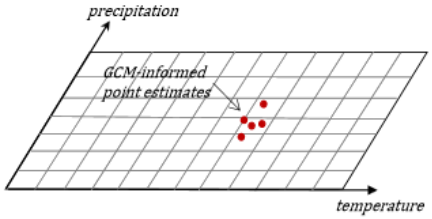
Traditional Approach

1. Downscale a few climate model projections



2. Generate a few water supply series

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

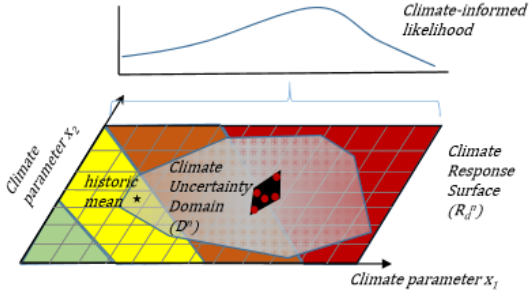


→ *Expected Net Benefits (ENB)*

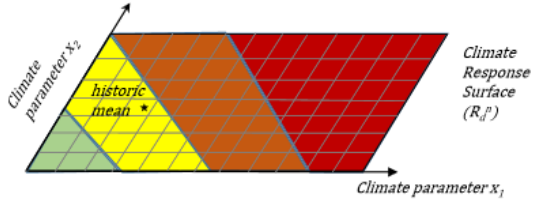
Decision Scaling

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

3. Determine climate risks to project performance



2. Map climate domain onto vulnerability domain



1. Determine the vulnerability domain

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Droughts in the Anthropocene and UNESCO IHP responses

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

PRINCETON UNIVERSITY

G·R·I·D ARENDAL

NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM NIDIS

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Droughts and their social, environmental and cultural impacts

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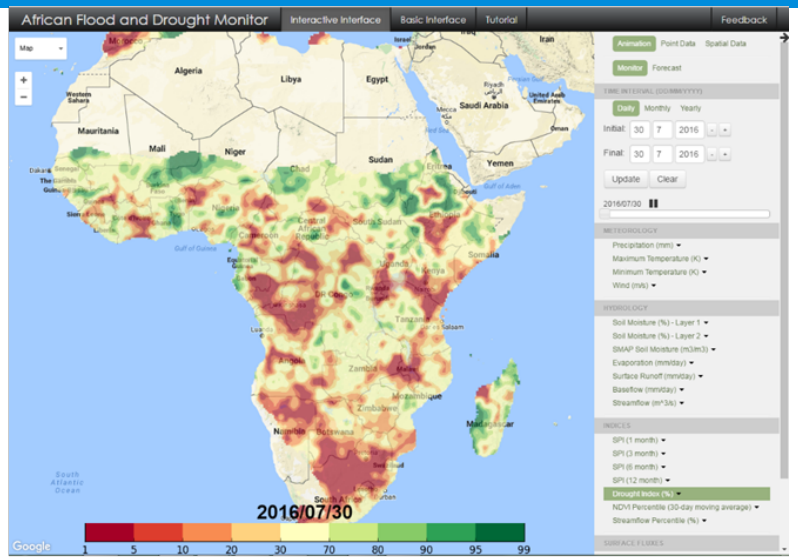
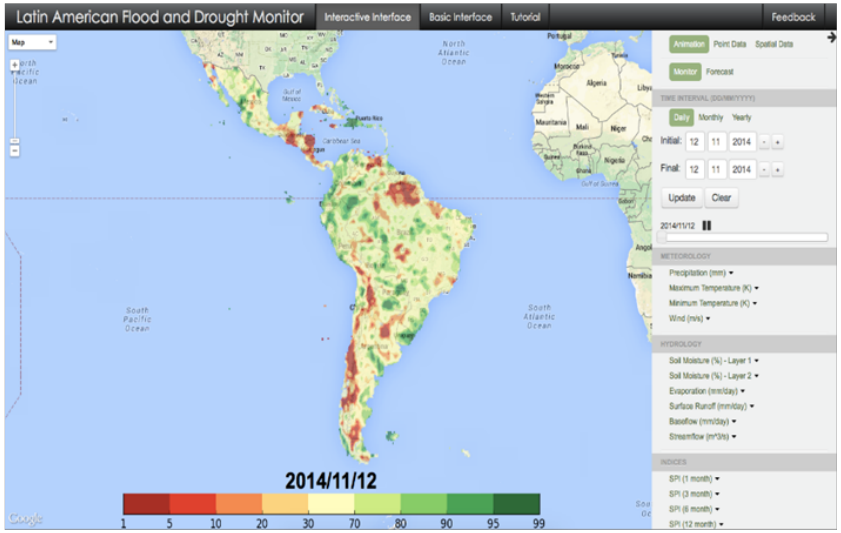
Improved climate services for risk management : African and LAC flood and drought Monitors

- Designed to 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.





System was deployed in:

- LAC
- West Africa
- East Africa
- Southern Africa
- Currently been adapted for Lake Chad Basin with higher spatial resolution

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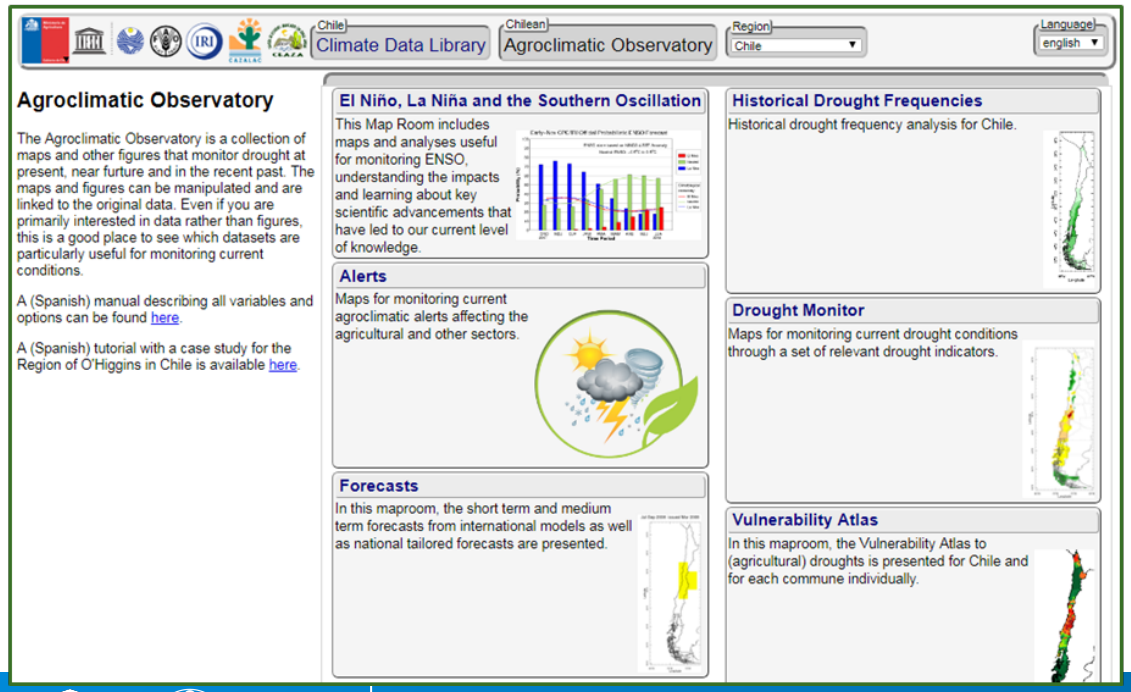
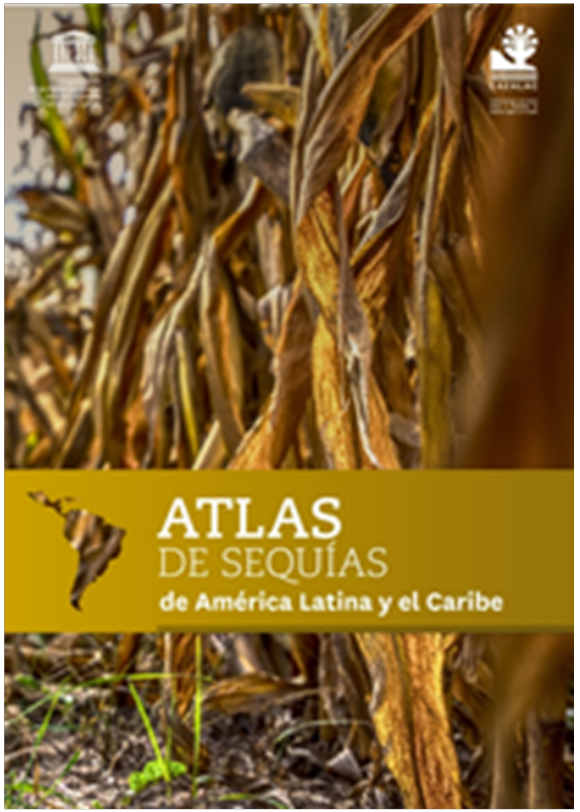
National drought monitoring and flood and drought early warning strengthened

- Development of relevant, timely and actionable information
- High resolution local versions in pilot countries
- Support governments in LAC and Africa to integrate information in decision-making
- Publication of guidelines





Drought Vulnerability Atlas

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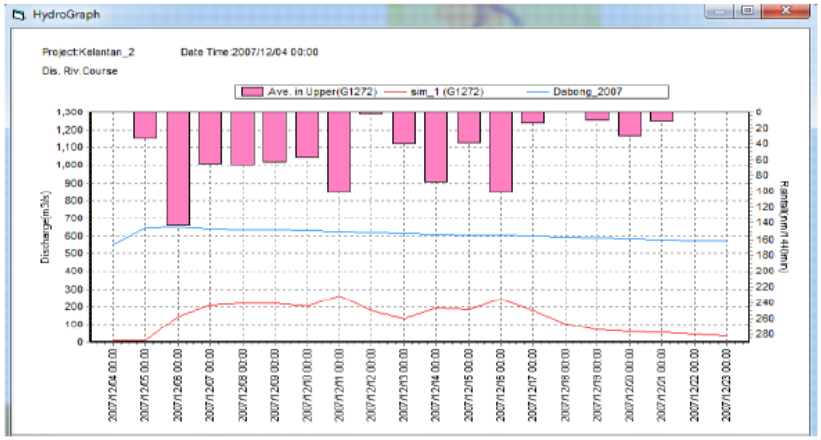
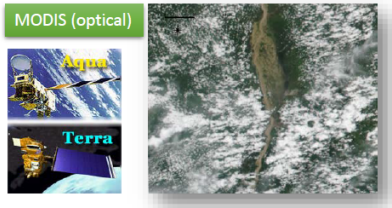
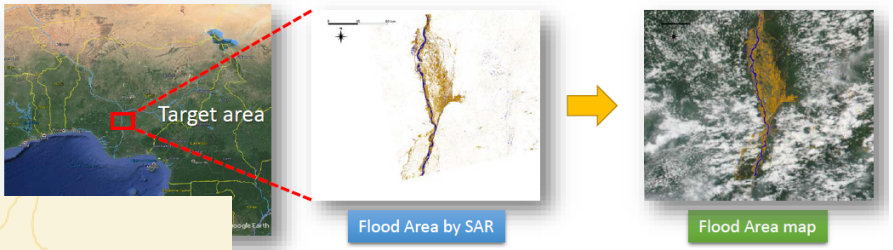
Water disaster Platform to enhance climate resilience





Easily identification & high frequency
but covered with cloud

All weather & high spatial resolution
but low frequency



NEWS / NIGERIA

Nigeria floods kill 100 people across 10 states

A national disaster has been declared in four states after devastating floods hit different parts of Nigeria.

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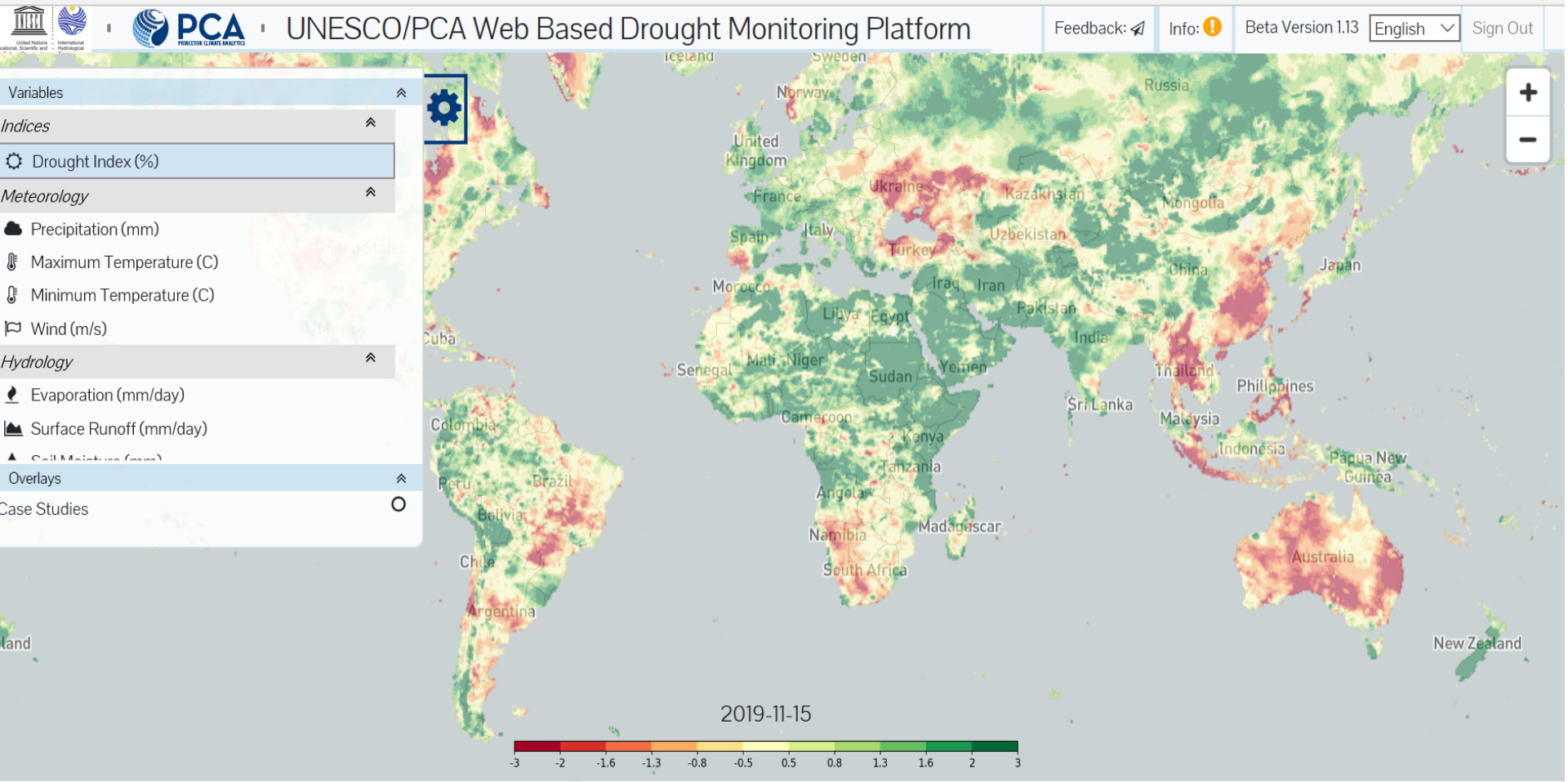
WEB BASED DROUGHT MONITORING PLATFORM



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Assessment of Snow Glacier and Water Resources in Central Asia

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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International
Hydrological
Programme

GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET

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Strengthening the resilience in Central Asia in response to melting glaciers in a changing climate

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SCIENCE BASED CONSENSUS AMONG COUNTRIES

- Creating and updating national and regional assessment of the status and changes of cryosphere systems.
- Synthesis research results underpinned by national monitoring of environmental and non-environmental vulnerability factors .
- Adaptation to Climate Change.
- Preparation of a coordinated agreement on national and regional glaciers monitoring programme

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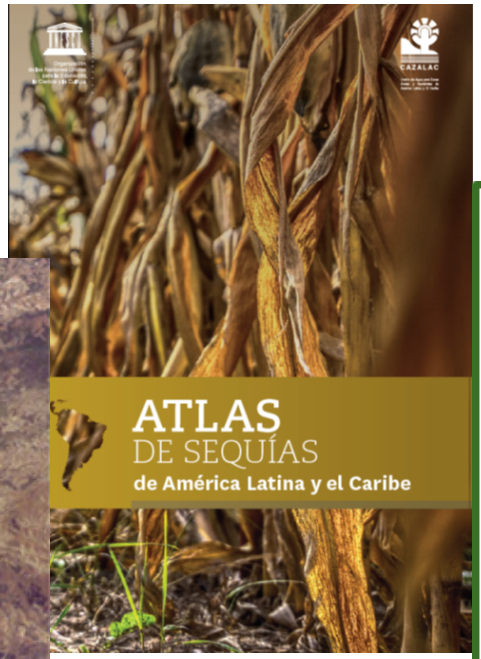
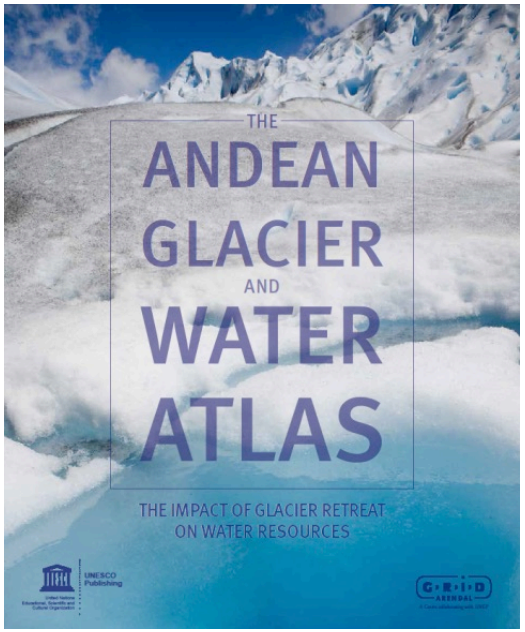
UNESCO provides a key a platform to develop global knowledge base on climate- human interconnections particularly related to water resources.

IHP provides knowledge base for the Climate services





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Planet in peril: Transform the course of climate action

52nd Session of the IPCC

UNESCO Headquarters, Paris, France

from 24 to 28 February 2020

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Upcoming key events.

- **Central Asia Glacier Project validation workshop , 16-17 March, Paris**
- **SCIENCE SESSION : 40th Session of the IHP council, 18-22 May, Paris**
- **Source to Sea – Key science discussion, October Paris**
- **Climate-Resilient Water Management Approaches: Application Towards Climate Action and 2030 Development Agenda, November Paris**
- **Side events during COP-26, November Glasgow UK**

THANK YOU :

- https://en.unesco.org/themes/water-security/hydrology