United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

International Sediment Initiative

International Training Workshop on Integrated Sediment Management in River Basin
Beijing, China
November 6-10, 2018

# 2030 Development Agenda and International Hydrological Program (IHP)

Dr. Anil Mishra
Hydrological Systems and Water Scarcity Section
Division of Water Science
International Hydrological Programme of UNESCO

# UNITED NATIONS
# WORLD WATER DEVLOPMENT REPORT 2018

United Nations Educational, Scientific and Cultural Organization

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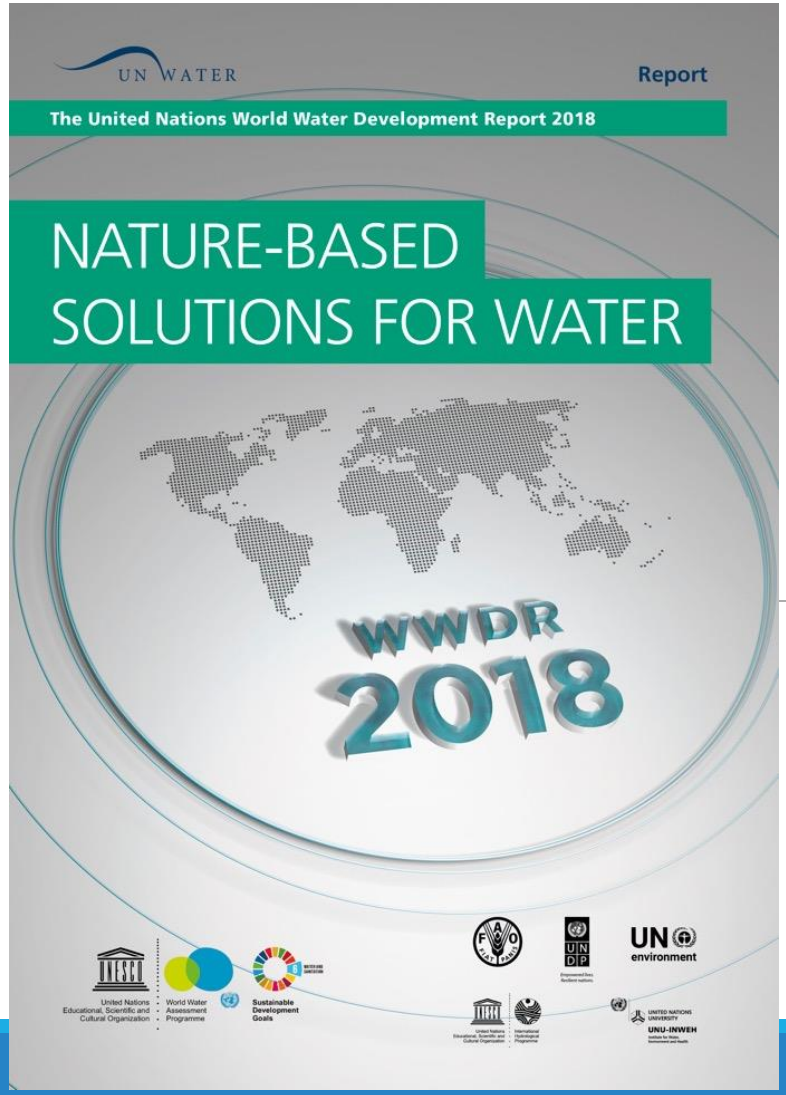


*The world's water: Rising demand, increasing scarcity, degrading quality and increasing risks*

# Changes in future rainfall patterns will alter drought occurrence, and consequently, soil moisture availability for vegetation in many parts of the world.

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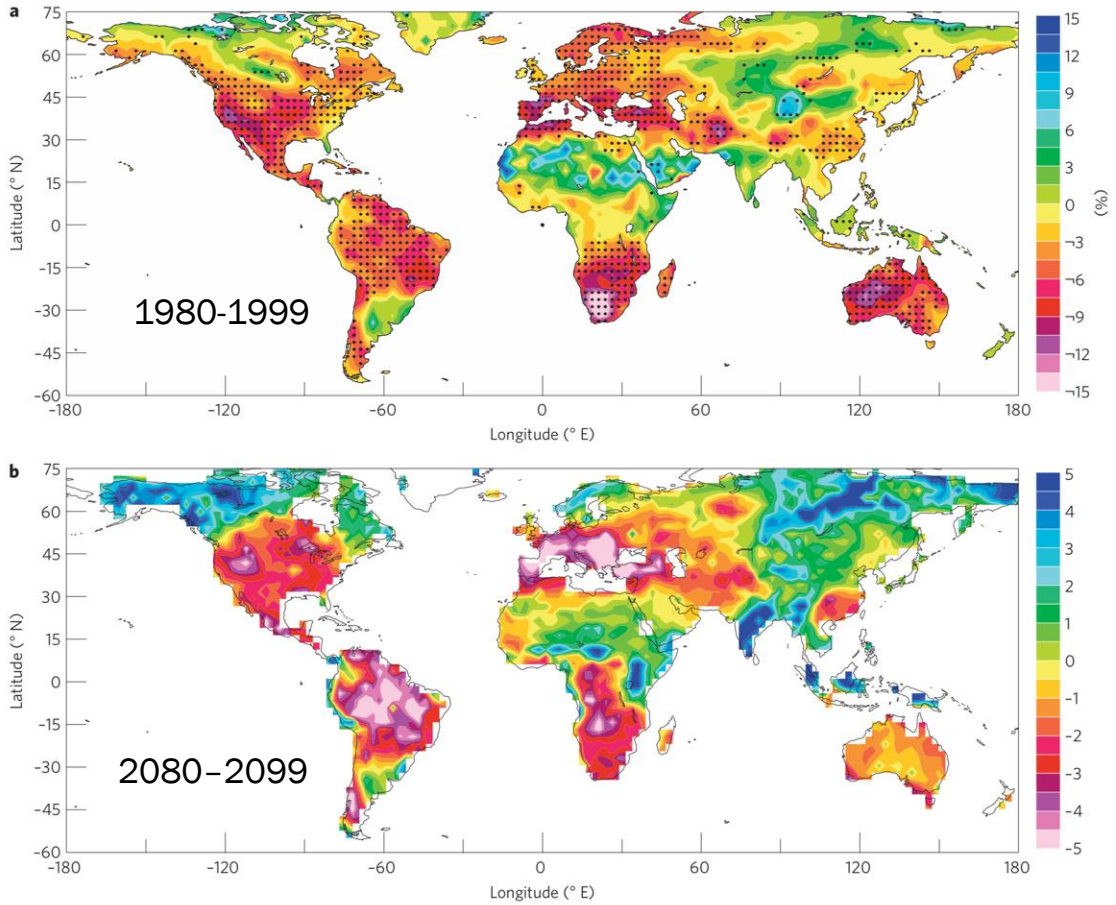
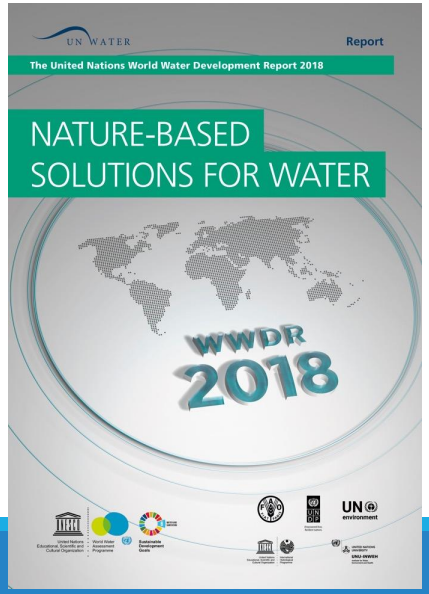
International Hydrological Programme

Predicted future changes in the mean soil moisture content in the top 10 cm layer in percentage change.




*WWDR, Source: Dai (2013)*

**The demand for water has been increasing and will continue to increase significantly over the coming decades**

# Water-related risks

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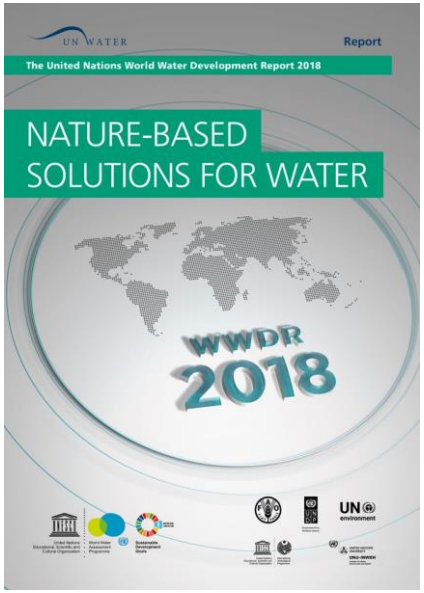
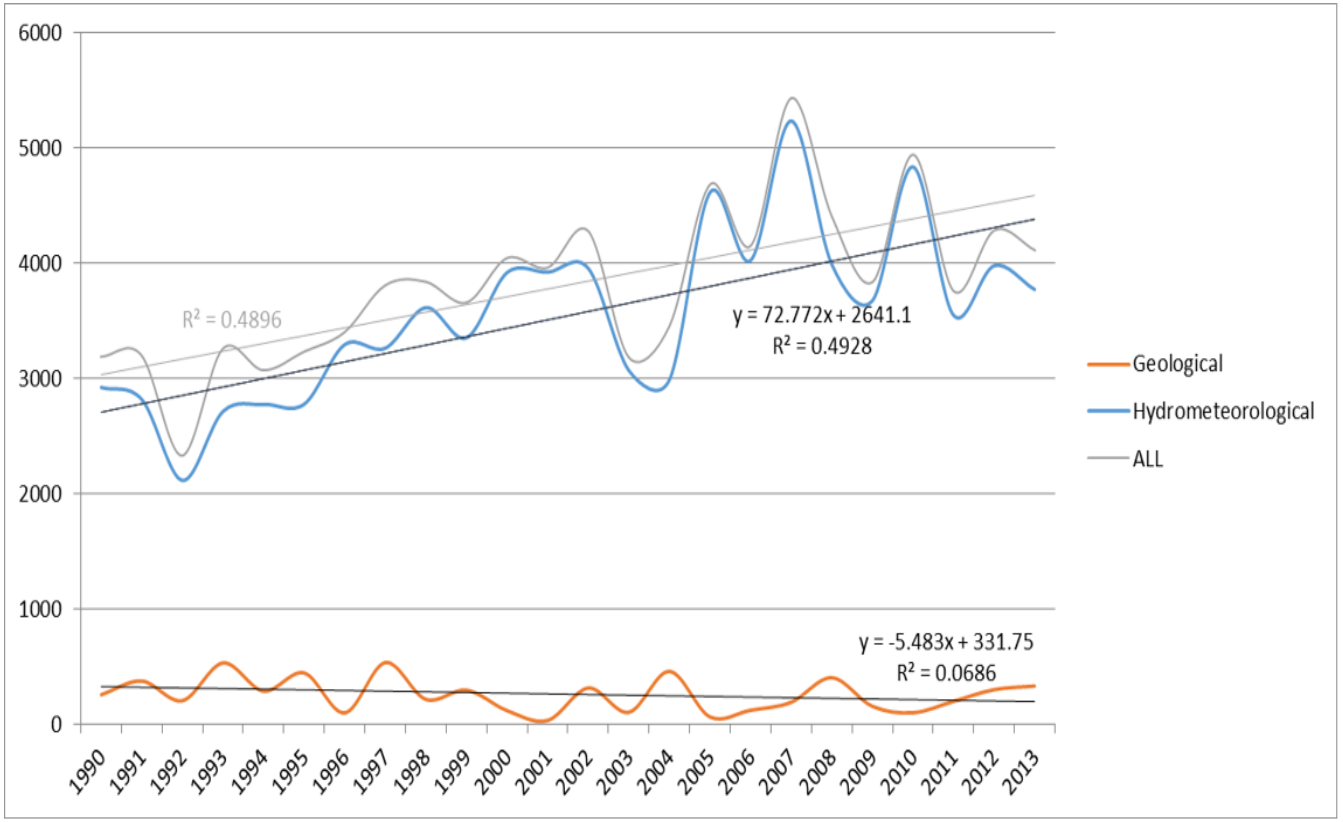
**Floods have accounted for 47%** of all weather-related disasters since 1995, affecting a total of **2.3 billion people**.



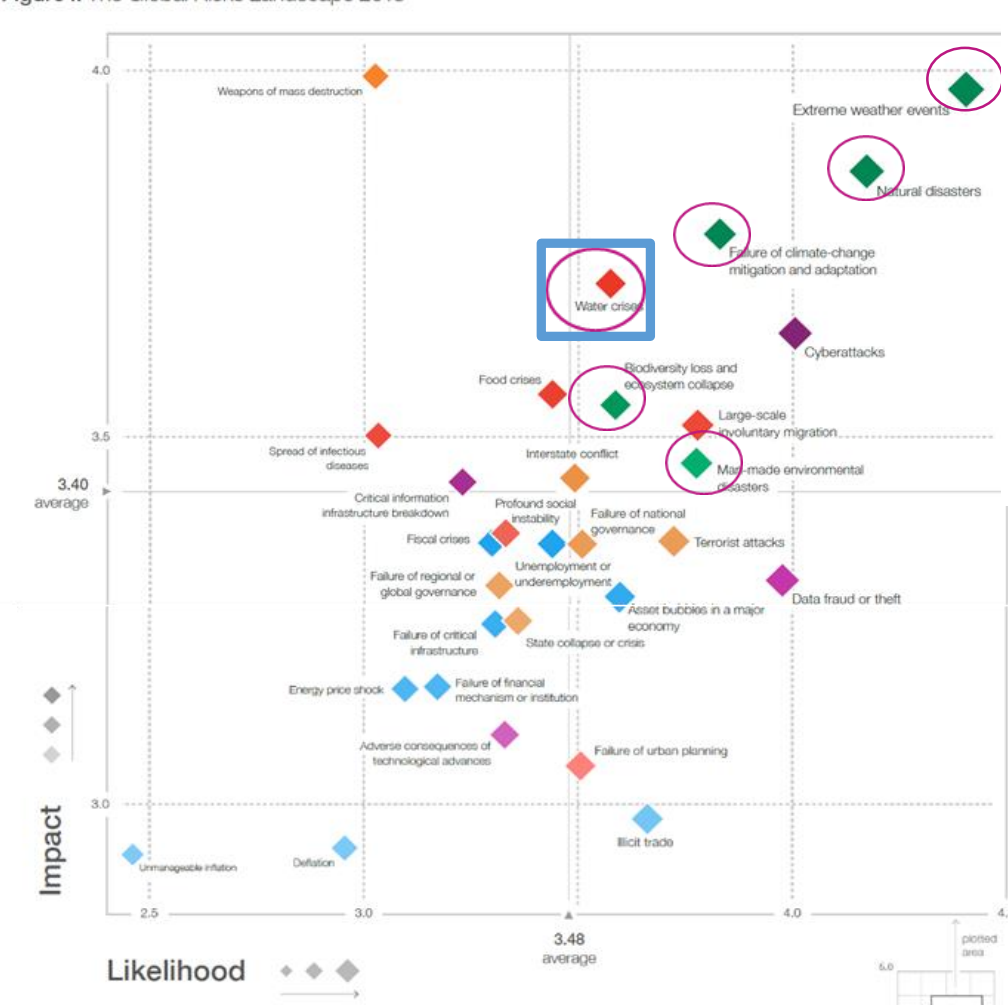

**Internationally reported global disaster mortality for events with fewer than 100 deaths (UNISDR 2015, based on EM-DAT)**

*WWDR, 2018*

# Global Risks Landscape 2018: Risk and uncertainty

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

**Figure I:** The Global Risks Landscape 2018




Top 10 risks in terms of **Likelihood**

1. Extreme weather events
2. Natural disasters
3. Cyberattacks
4. Data fraud or theft
5. Failure of climate-change mitigation and adaptation
6. Large-scale involuntary migration
7. Man-made environmental disasters
8. Terrorist attacks
9. Illicit trade
10. Asset bubbles in a major economy

Top 10 risks in terms of **Impact**

1. Weapons of mass destruction
2. Extreme weather events
3. Natural disasters
4. Failure of climate-change mitigation and adaptation
5. Water crises
6. Cyberattacks

WORLD ECONOMIC FORUM
COMMITTED TO IMPROVING THE STATE OF THE WORLD

Insight Report

**The Global Risks Report 2018**
13th Edition

**World Economic Forum Global Risks Perception Survey 2017–2018.**

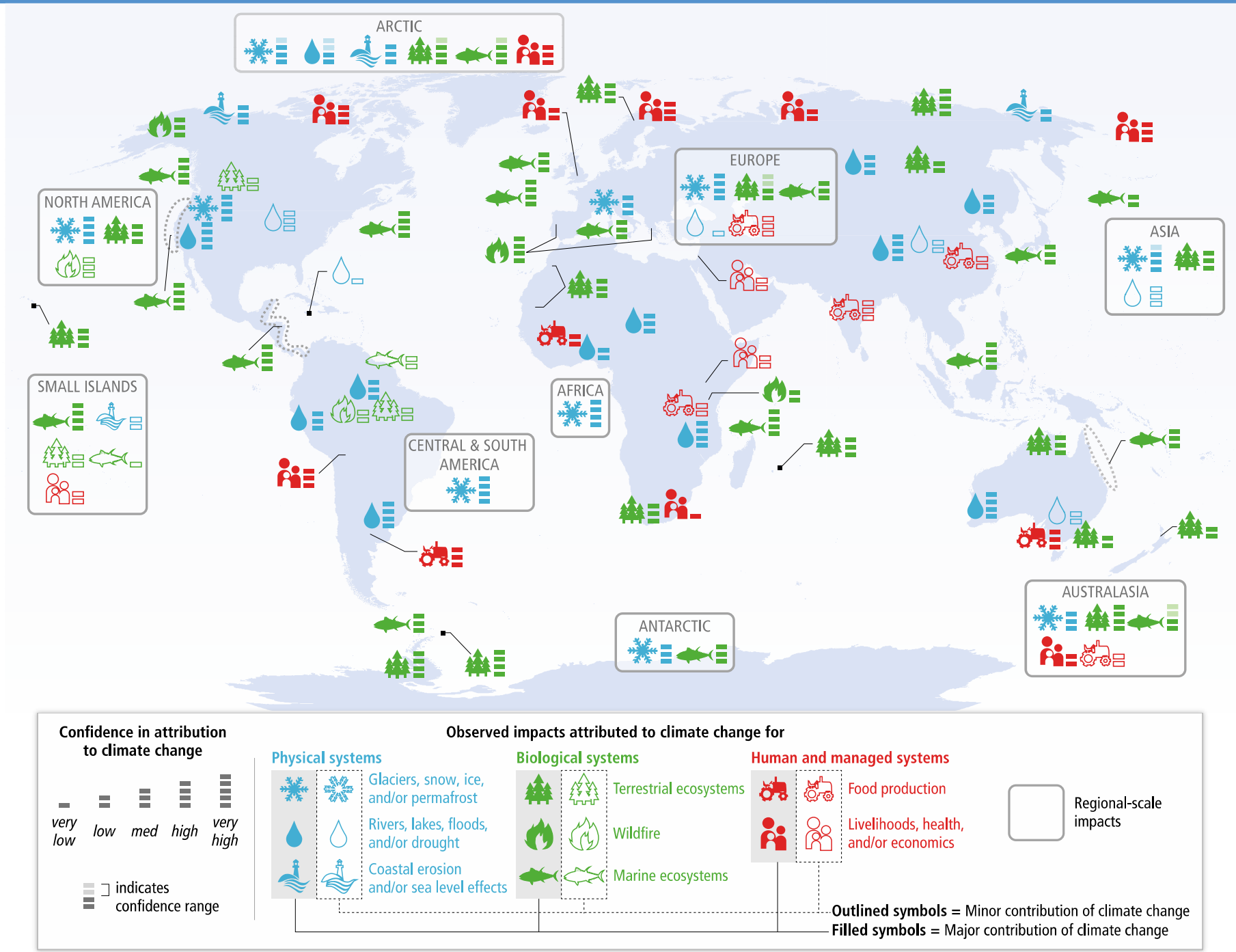
- Extreme weather events
- Natural disasters
- Failure of climate-change mitigation and adaptation
- Water crises
- Biodiversity loss and ecosystem collapse

# Understanding : Global Warming of 1.5°

A1. Human activities are estimated to have caused approximately 1.0° C of global warming above pre-industrial levels, with a likely range of 0.8° C to 1.2° C. Global warming is likely to reach 1.5° C between 2030 and 2052 if it continues to increase at the current rate. (high confidence)

**A1.2.** Warming greater than the global annual average is being experienced in many land regions and seasons, including two to three times higher in the Arctic. **Warming is generally higher over land than over the ocean.** (*high confidence*)

IPCC SR1.5, 2018


ARCTIC
NORTH AMERICA
EUROPE
ASIA
SMALL ISLANDS
AFRICA
CENTRAL & SOUTH AMERICA
AUSTRALASIA
ANTARCTIC
Confidence in attribution to climate change
very low
low
med
high
very high
indicates confidence range
Observed impacts attributed to climate change for
Physical systems
Glaciers, snow, ice, and/or permafrost
Rivers, lakes, floods, and/or drought
Coastal erosion and/or sea level effects
Biological systems
Terrestrial ecosystems
Wildfire
Marine ecosystems
Human and managed systems
Food production
Livelihoods, health, and/or economics
Regional-scale impacts
Outlined symbols = Minor contribution of climate change
Filled symbols = Major contribution of climate change

# SUSTAINABLE DEVELOPMENT GOALS

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International Hydrological Programme


17 Sustainable Development Goals and 169 targets

# Sendai Framework for Disaster Risk Reduction 2015-2030


United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

**Global Targets**

(a) Substantially reduce global disaster mortality by 2030,

(b) Substantially reduce the number of affected people globally by 2030

(c) Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030.

(d) Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030.

(e) Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020.

(f) Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this framework by 2030.

# UN Climate Change Conference of Parties (COP 21)

United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

## Paris Agreement

## Paragraph 7 (Article 7, 8):

- **(c) Strengthening scientific knowledge on climate, including research, systematic observation of the climate system and early warning systems, in a manner that informs climate services and supports decision-making**
- **(d) Assisting developing country Parties in identifying effective adaptation practices, adaptation needs, priorities, support provided and received for adaptation actions and efforts, and challenges and gaps, in a manner consistent with encouraging good practices;**
- **Loss and Damage in the Paris Agreement Provides a legal basis for long-term action on loss and damage.**

# SDG, Paris Agreement Sendai-Framework - Do we have adequate tools?

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- **How to translate those framework into measurable tools/ Indicators?**
- **Do we have sufficient tools and management option to identify risk and uncertainty of climatic/ non climatic projections including from policy framework provided by global commitment?**
- **Tools and methodologies with engagement by hydrological or meteorological agencies or other relevant institutions.**

# 2050 – The Challenge

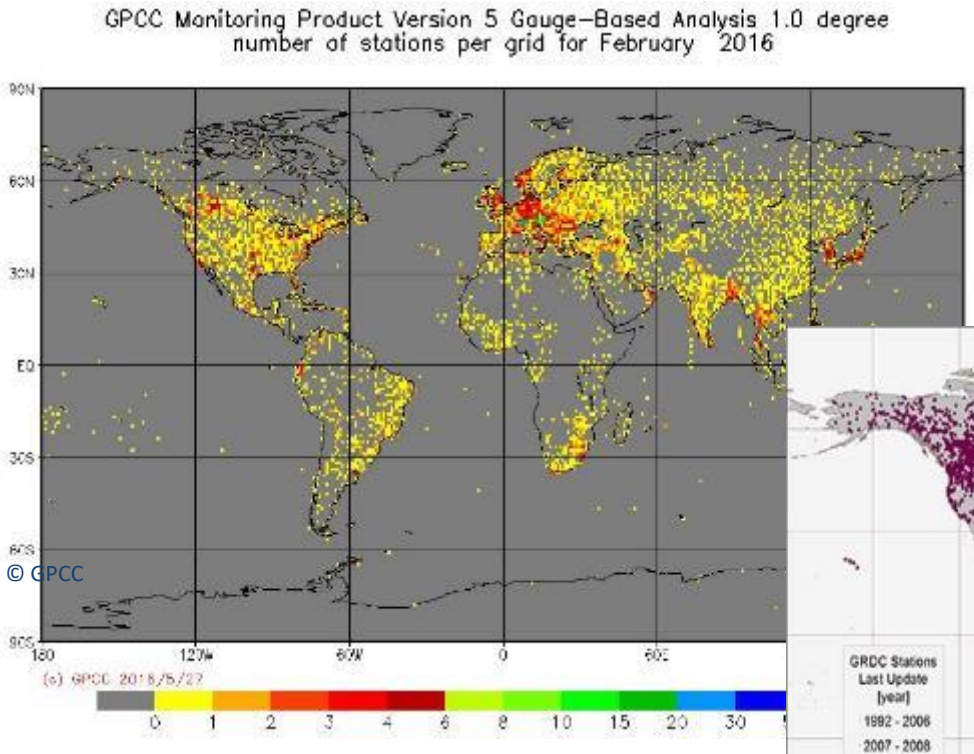
9 Billion People

60% More Food

55% More Water

80% More Energy

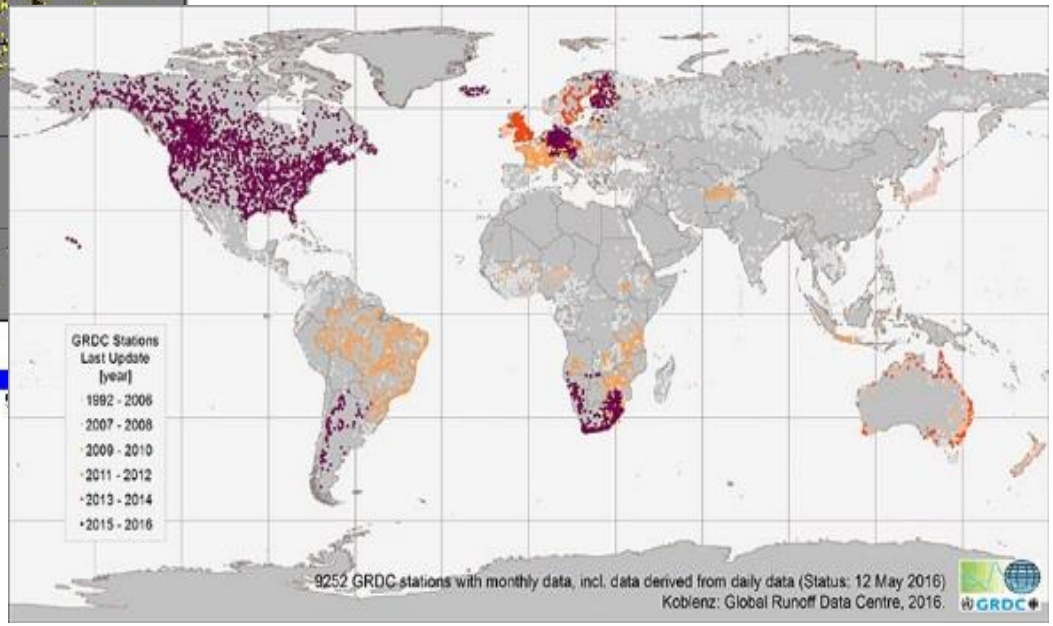
# Global In situ Observing Systems: Limited coverage!




© GPCC

Global Precipitation Gage Network (GPCC) (2016)

Global Runoff Gage Network (GRDC)




© GRDC

# The Eighth Phase of IHP (IHP-VIII, 2014-2021)
## Water Security: Responses to Local, Regional and Global Challenges

# Hydrological Services and Water Scarcity Section

## Initiatives

**FRIEND-Water** - Flow Regimes from International Experimental and Network Data

**IFI** - International Flood Initiative

**IDI** - International Drought Initiative

**WLRI** - World's Large Rivers Initiative

**G-WADI Global** - Network on Water and Development Information for Arid Lands

**ISI** - International Sediment Initative

**PCCP** - From Potential Conflict to Cooperation Potential

**Snow and Ice**

**Climate Change Adaptation**

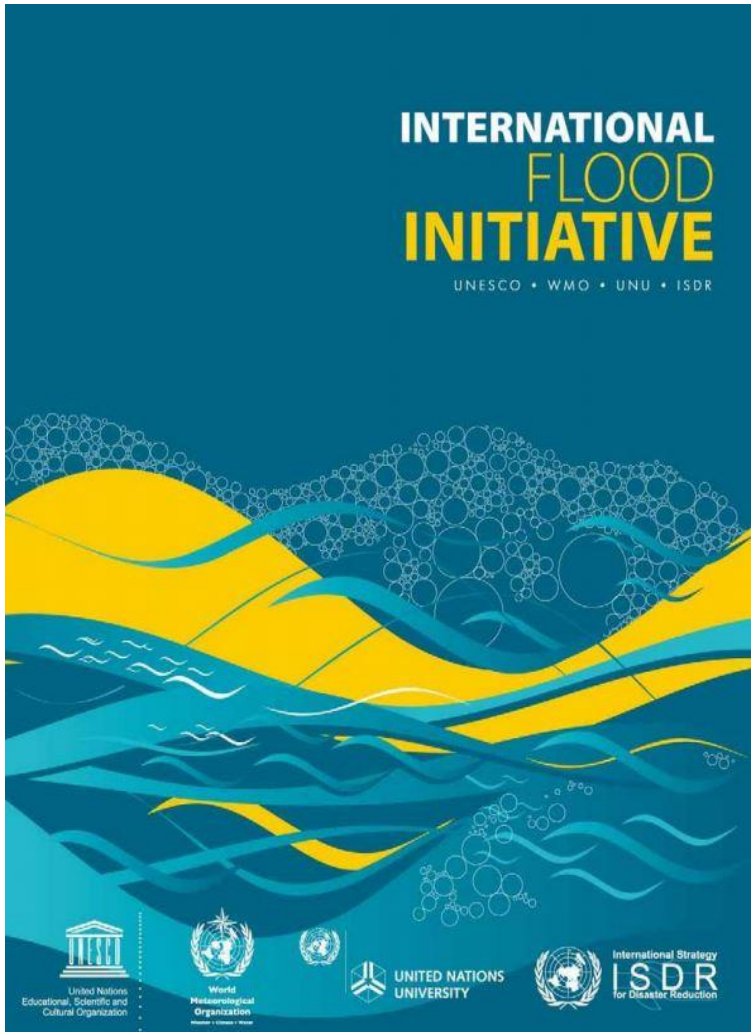
Knowledge

Capacity

Theme 1: Water-related disasters and hydrological changes

Theme 3: Addressing water scarcity

# International Flood Initiative (IFI)

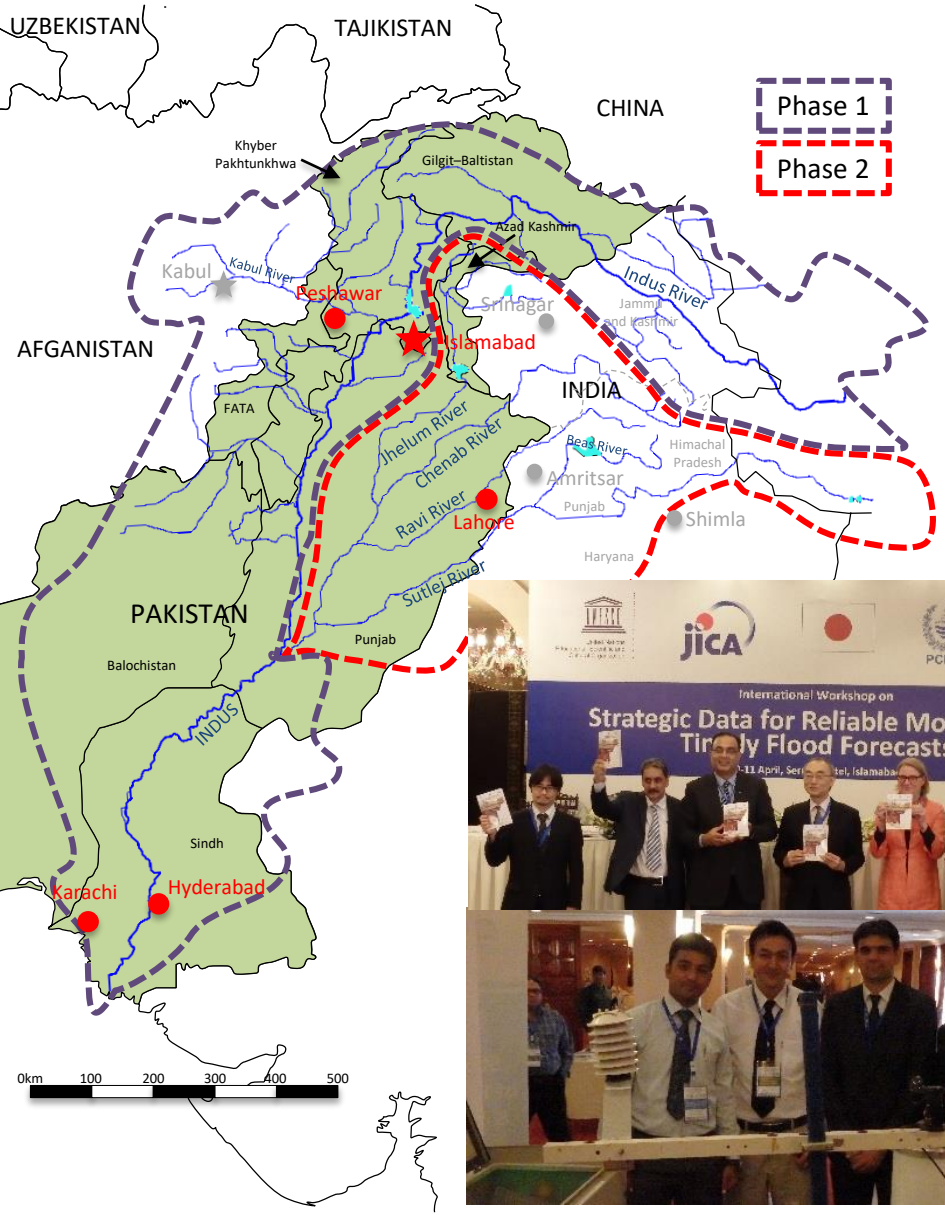




APP39-13
KOT ADDU: August 13 – An aerial view of flood hit areas. APP photo by Safdar Abbas

- Develops capacity building to better understand and respond to floods hazards while taking advantage of their benefits
- Focus on research, information networking, education and training to empower communities

# EXAMPLE: Flood Early Warning in Pakistan (Indus River Basin)



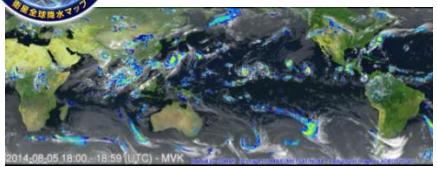

## Upgraded Flood Early Warning System based on Satellite Technologies

JAXA

ICHARM

**Global Satellite Mapping of Précipitation**

GSMaP

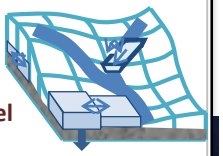


**Integrated Flood Analysis System**

IFAS


**RRI**

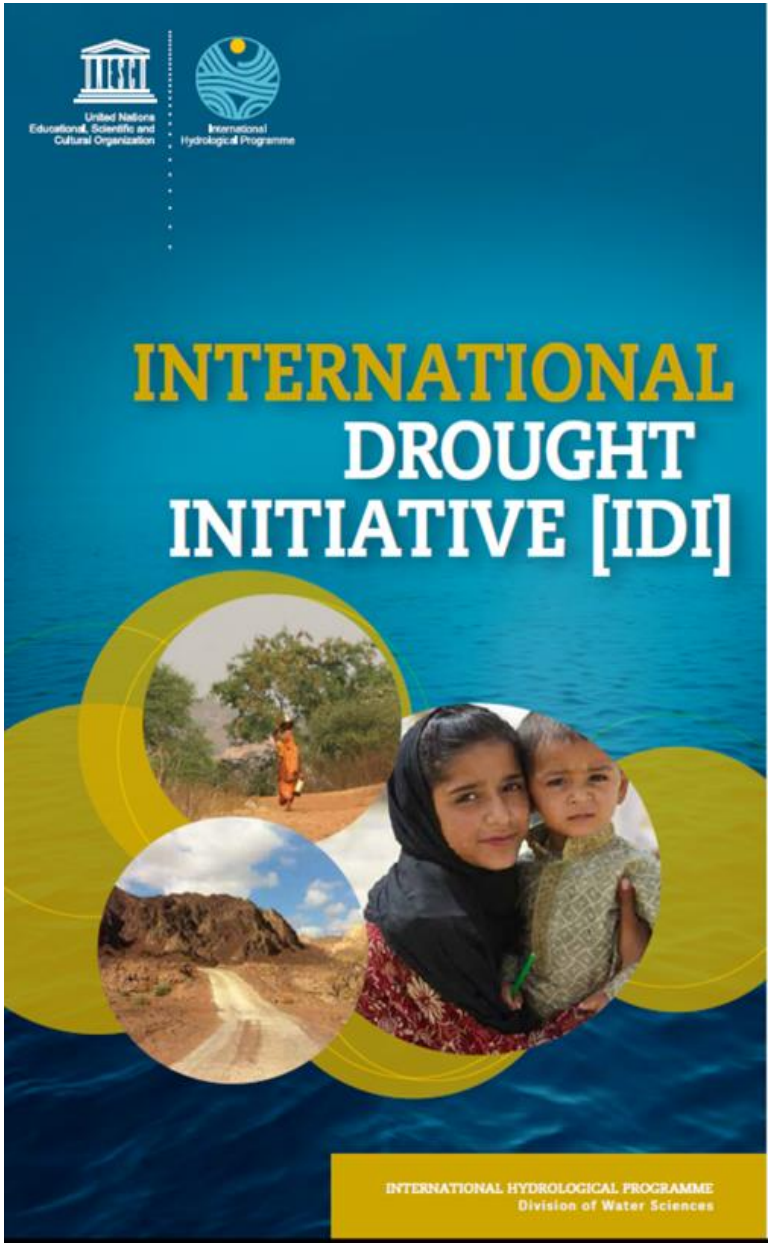
Rainfall-Runoff-Inundation Model




## Publications and technological developments

## Training programmes

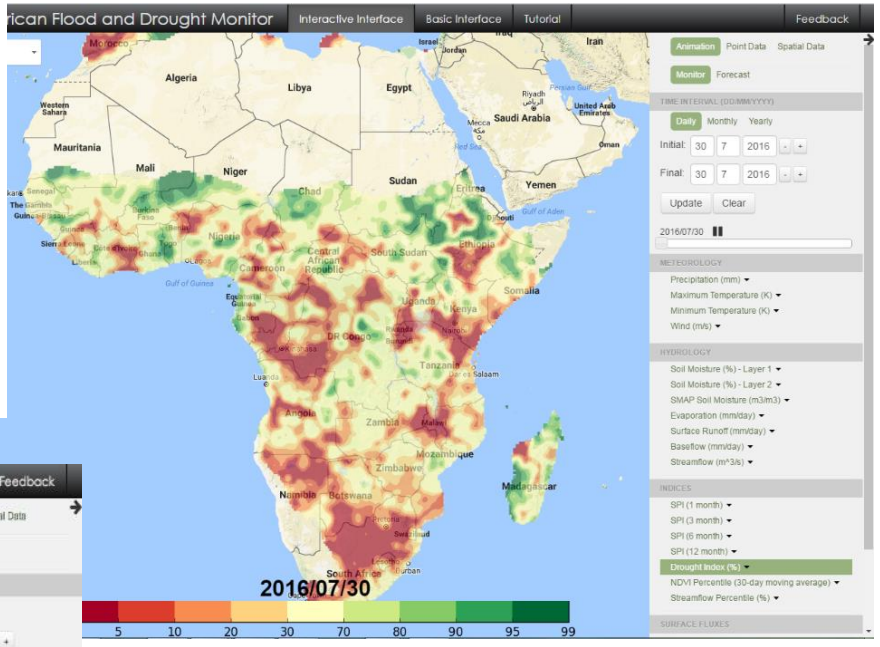
# International Drought Initiative




- Platform of global networking and knowledge sharing between international entities actively working on droughts (as UNESCO Category 2 centers and water chairs, WMO, WWC, FAO, UNDP, ISDR and GWP)
- Surveys drought management, collects information, helps affected countries, develops capacity building, strengthens public participation and promotes regional and international cooperation on drought issues.

# African and LAC flood and drought Monitors

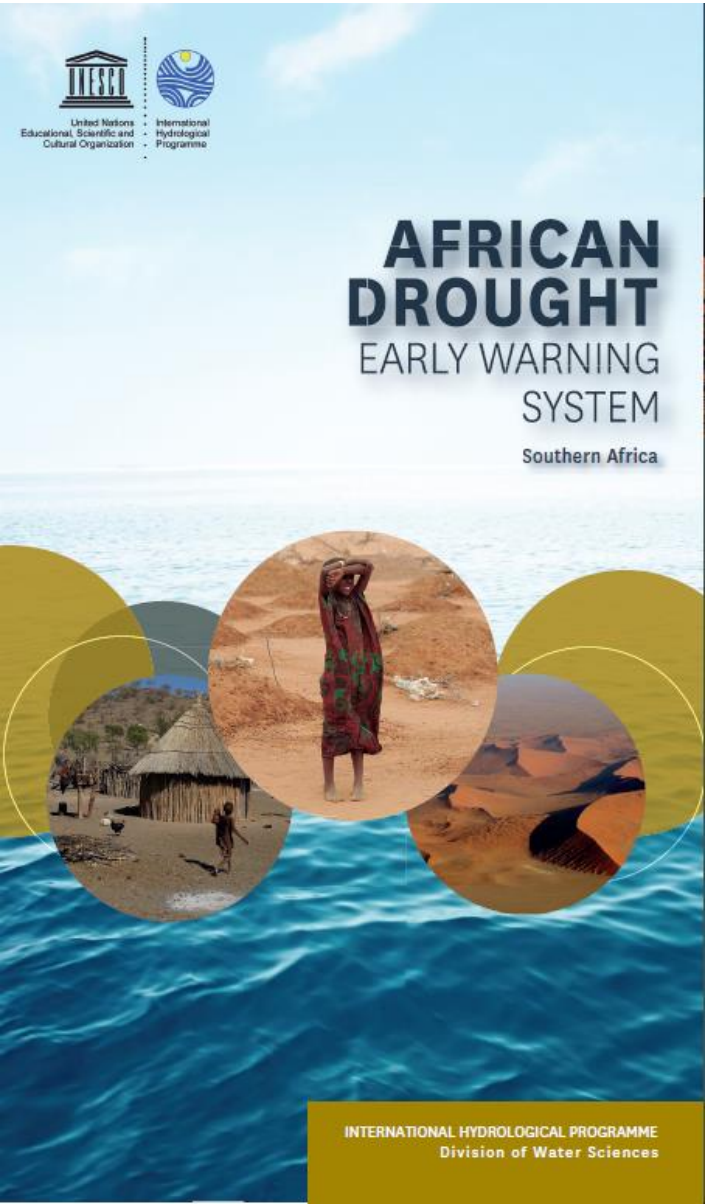
Desgined to strengthen the capacity of African and LAC countries for near real-time monitoring and seasonal forecasting to raise awareness of the impact of floods and droughts on vulnerable and disadvantaged groups.





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

# African Drought Early Warning System Expansion to Southern Africa – Review of SADC drought mitigation plans




**Training on the Africa Early Warning System,** November 2016, Harare, Zimbabwe

- 35 participants (23% women)
- 12 countries (Angola, Botswana, Democratic Republic of Congo, Lesotho, Malawi, Mauritius, Namibia, South Africa, Swaziland, United Republic of Tanzania, Zambia, Zimbabwe)

# World's Large Rivers Initiative (WLRI)

- During its 23rd session of the Intergovernmental Council of IHP (11-15 June 2018), IHP approved a resolution (**Resolution XXIII-3**) for the continuation of the World's Large Rivers Initiatives (WLRI) as part of the IHP's work plan.
- Together, with the UNESCO water family, decision makers and Member States are working hand in hand to protect the world's largest rivers, exchanging best practice in managing large river basins, sharing experience in monitoring large river basins and sharing responsibility for our common future.

Technical Anavilhanas Archipelago (© WLR)

The collaborative and multidisciplinary World´s Large Rivers Initiative aims :

- To create the knowledge base for a holistic, scientific assessment of the status of the World's Large Rivers
- To promote integrated and sustainable management.

# Flow Regimes from International Experimental and Network Data (FRIEND)

# 8th Global FRIEND-Water: Hydrological Processes and Water Security in a Changing World

## 6 - 9 November 2018, China, Beijing

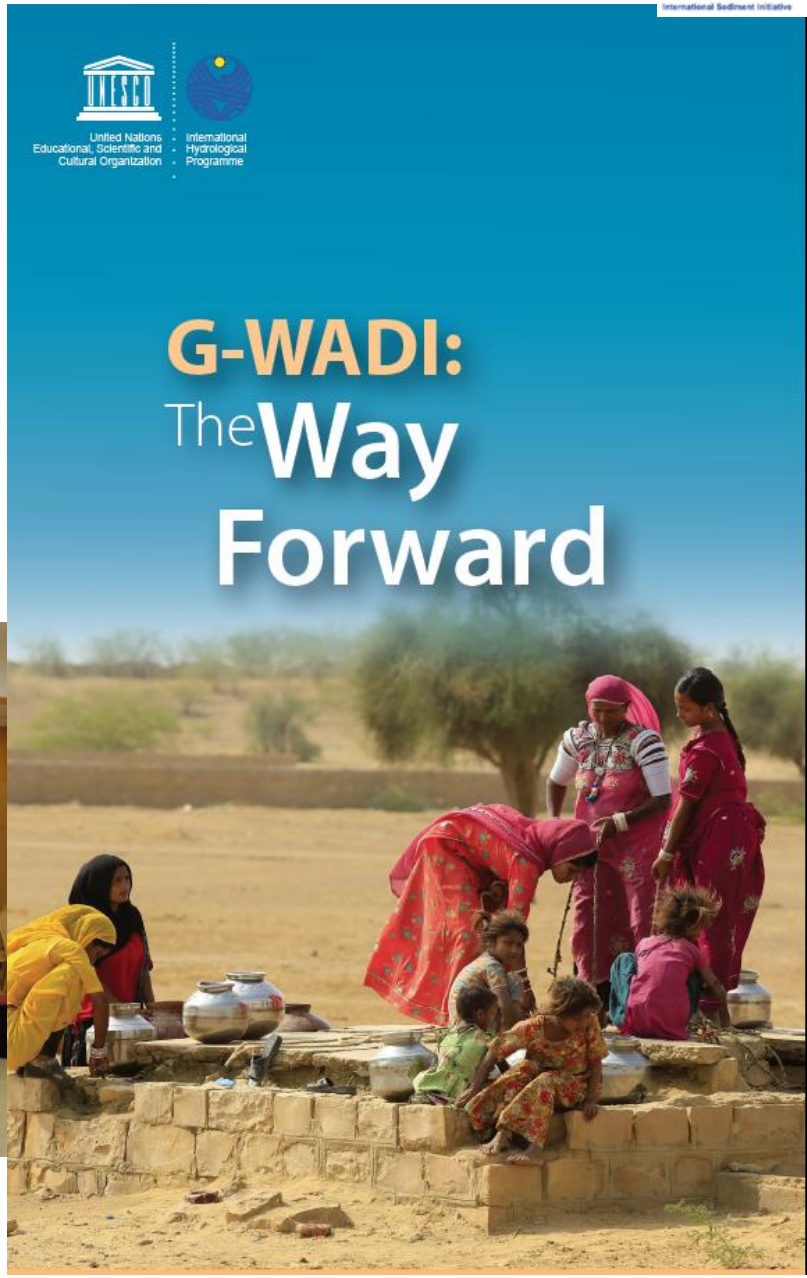
The main topics of the conference are:

- Hydrological observations under the changing environment and scarcity
- River regimes and hydrological extremes under the changing environment
- Simulation and prediction of surface water and groundwater processes under the impact of human activities
- Urban hydrology and sponge city
- Multi-objective water resources allocation and operation
- Integrated watershed management including eco-hydrology and socio-hydrology
- **Water quality and sediment transport including coastal hydrology: changes under climate change and human activities**
- River health and ecological baseflow under changing environment.

# G-WADI Activities

**International Conference on G-WADI**
October 2016
Beijing, China

36 participants
(18% women)

# G-WADI Networks

Center for Hydrometeorology and Remote Sensing (CHRS) - University of California, USA, Princeton University, International Center for Integrated Water Resources Management

Water for Sustainable Development and Adaptation to Climate Change - Serbia

**Asian G-WADI Network** Cold and Arid Regions Environmental and Engineering Research Institute Chinese Academy of Sciences


Ministry of Regional Municipalities and Water Resources Sultanate of Oman

International Center for Integrated Water Resources Management

Managing Water Resources in Arid and semi-Arid Regions of LAC and the Caribbean

The Water Center for Arid and Semi-Arid Zones in Latin America and the Caribbean

African Network AGRYHMET Regional Centre - Niamey, Niger.

# The LAC Drought Atlas

Accessible on-line in Spanish and English

Data Library Maproom | Maproom LAC Drought Atlas | Language: english

## LAC Drought Atlas

Historical drought frequency analysis for the countries of Latin America and the Caribbean.

This maproom shows the results of the Regional Frequency Analysis using L-Moments. The complete analysis is described in Nuñez et al. (2010).

The Drought Atlas was de
colaboration with the Inter
Integrated Water Resourc
(ICIWaRM) and the Europ
Centre (JRC).

Regional workshops were organized with support from the Flanders-UNESCO Trust Fund (FUST) and in collaboration with the EU-funded projects Euroclima and RALCEA.

**References**

Nuñez, J.H., K. Verbist, J. Wallis, M. Schaeffer, L. Morales, and W.M. Cornelis. 2011. Regional frequency analysis for mapping drought events in north-central Chile. J. Hydrol. 405 352-366.

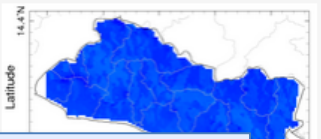
### Maximum Expected Precipitation

**Argentina**

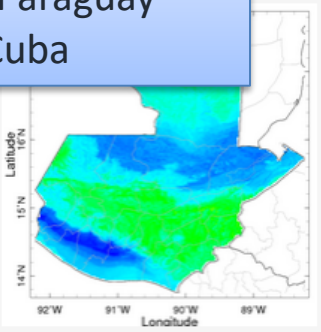
This map shows the maximum precipitation amounts for multiple return

**El Salvador**

This map shows the maximum precipitation amounts for multiple return periods for El Salvador using a Regional Frequency

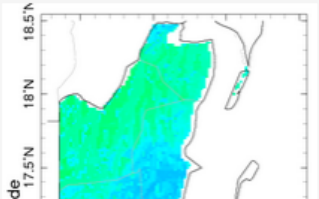



periods for Guatemala using a Regional Frequency Analysis using L-moments (RFA-LM).



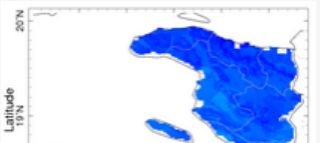

**Belice**

This map shows the maximum precipitation amounts for multiple return periods for Belice using a Regional Frequency Analysis using L-moments (RFA-LM).




**Haiti**

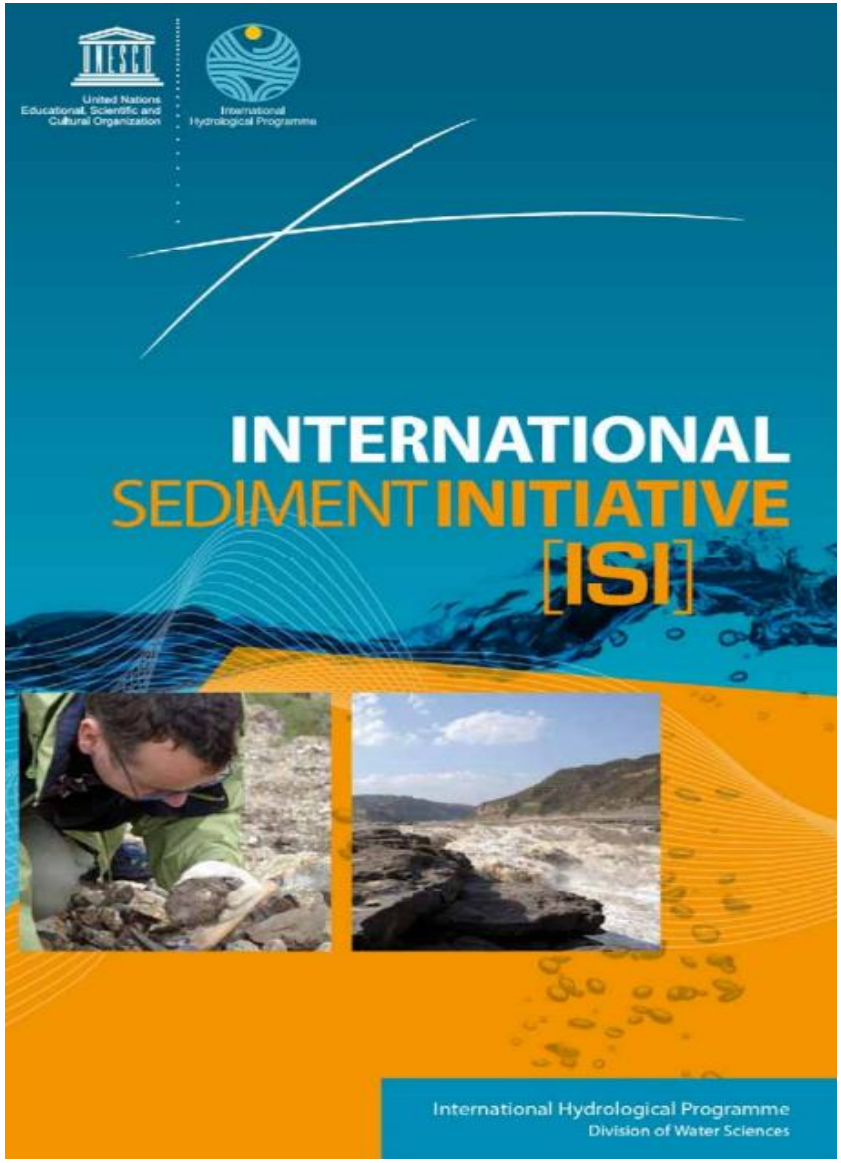
This map shows the maximum precipitation amounts for multiple return periods for Haiti using a Regional Frequency




**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

# International Sediment Initiative (ISI)




**Mission:**

Linking science with policy and management needs

**Objectives:**

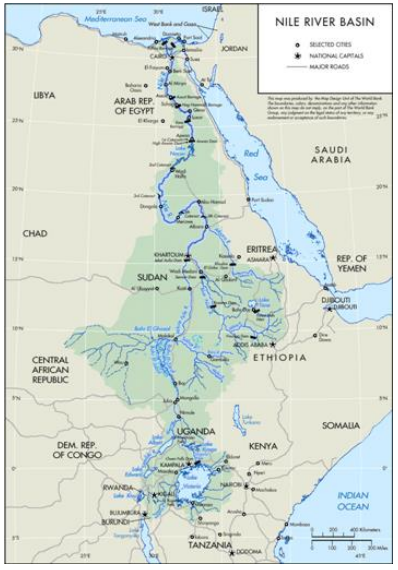
Monitoring, Analysis & Policy Advice:

- ISI encourages international cooperation in managing regional sediment problems and in finding local solutions, such as better advice for policy development and implementation.
- ISI promotes the collection, analysis and interpretation of sediment data, as well as the exchange and use of appropriate methods and procedures for sediment management.

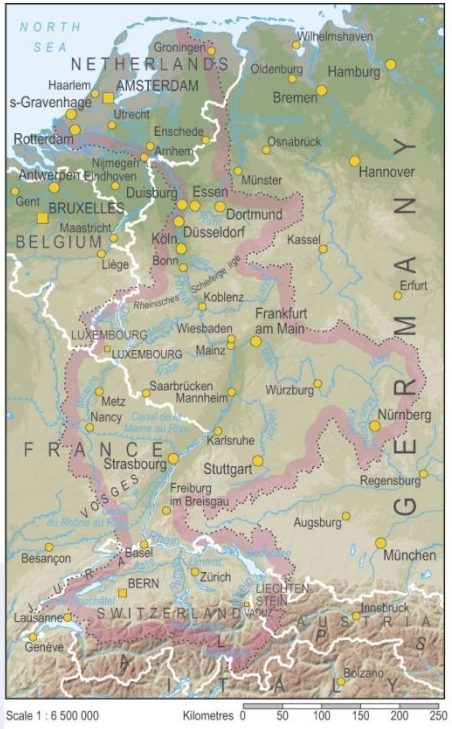
# ISI: Large river basin case studies

## The Yellow River Basin


## The Nile River Basin




## The Rhine River Basin





## The Mississippi River Basin


## The Volga River Basin

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

International Sediment Initiative

# Sediment Problems and Strategies for their Management

## Experience from several large river basins

# The impact of glacier melt on water resources: International Network for Adaptation Strategies


Capacity building in Andean Countries

New Publication:
Mass Balance Manual (2015)

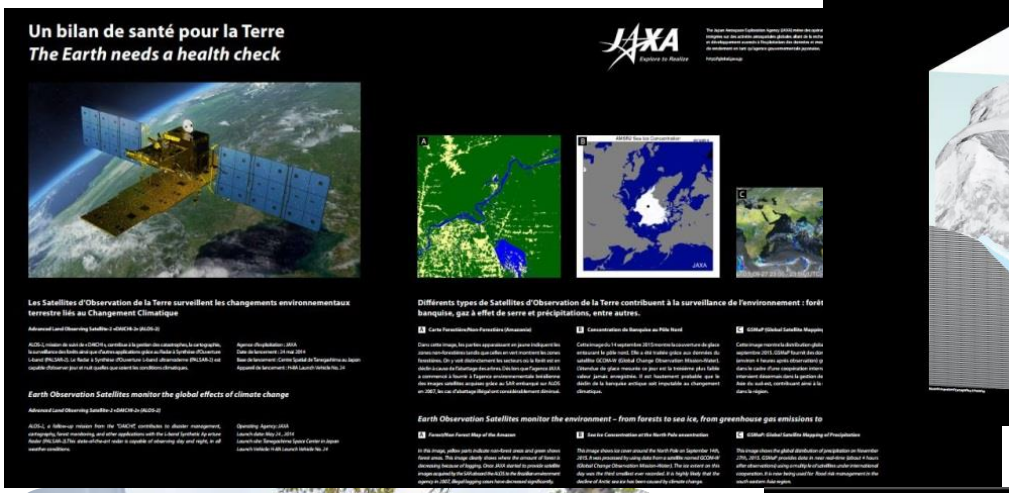
# Innovative tools to support informed decision-making

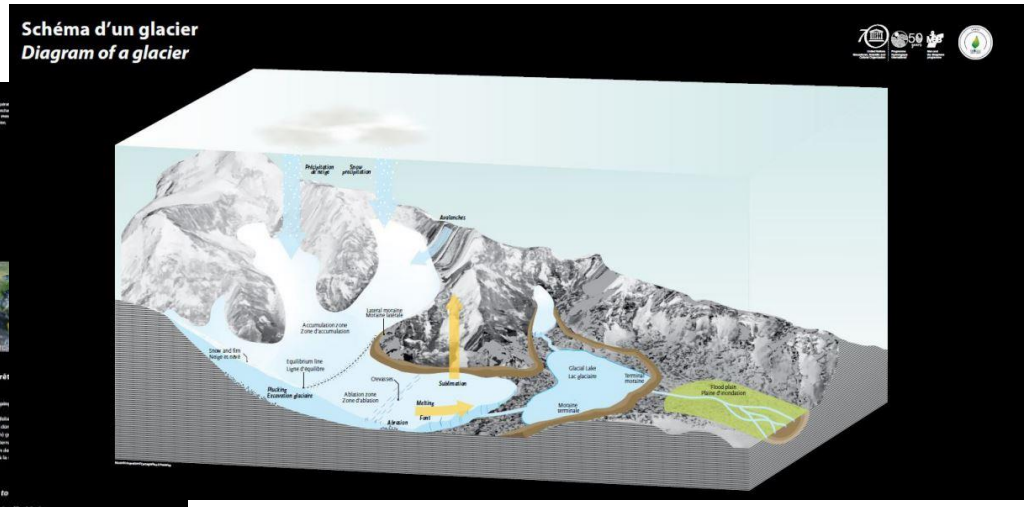


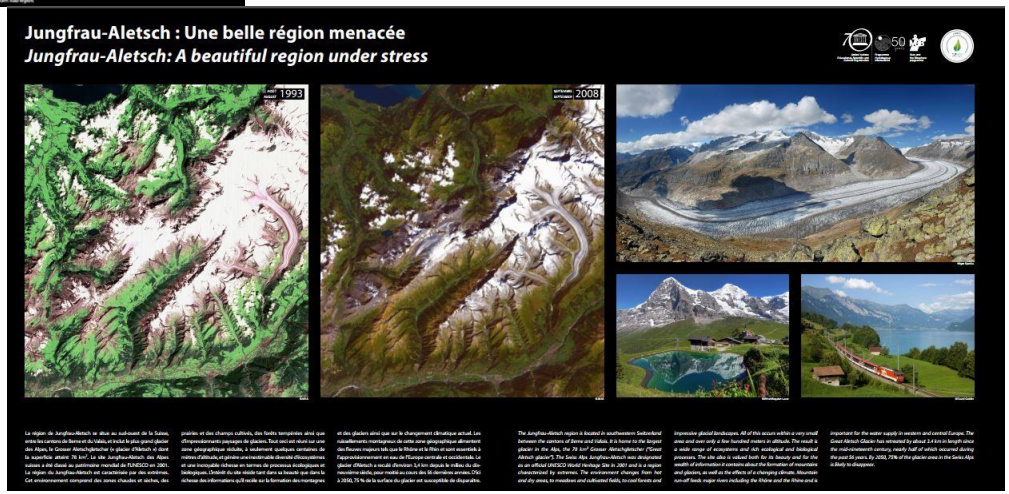
**iRain launched at UNFCCC COP22**

# Mountains Exhibition: Early warning systems for climate change

An exhibition showcasing satelite aerial images and ground pictures was presented during UNFCCC COP21 in Paris



United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

world hydropower congress


# World Hydropower Congress 2019

**The World Hydropower Congress brings together industry, government, finance, academia and civil society to set priorities for the future direction of the hydropower sector.**

The seventh Congress, organised by the International Hydropower Association (IHA), is to be hosted in partnership with UNESCO's International Hydrological Programme.

With the theme of 'The Power of Water in a Sustainable, Interconnected World', the biennial event in May 2019 will focus on hydropower's role in delivering on the Paris Agreement and the Sustainable Development Goals.

Organisers:

iha international hydropower association

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

**Strategic partners:**

EDF · GE

**Supporting partner:**

VOITH

Information for delegates:

# Focus Session:
# Sediment management

## Managing sediment in the context of climate change and integrated river basin development

UNESCO Headquarters, Paris

Wednesday 15 May 2019 | 15:45-17:00

world hydropower congress

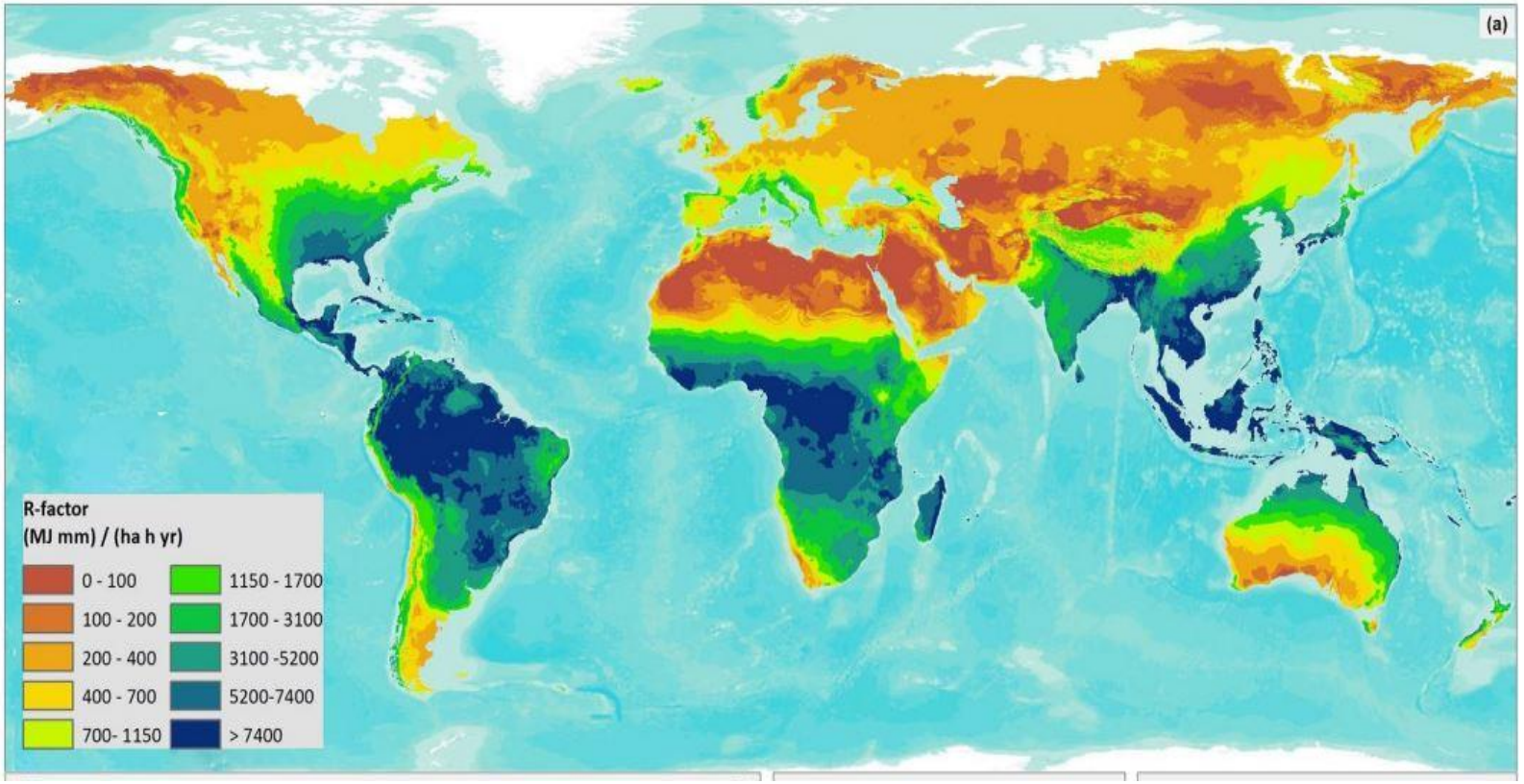
International Sediment Initiative

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

# EROSION AND SEDIMENT PROBLEMS: GLOBAL HOTSPOTS

**Authors: Valentin Golosov and Desmond E Walling**
**Editor: Anil Mishra**

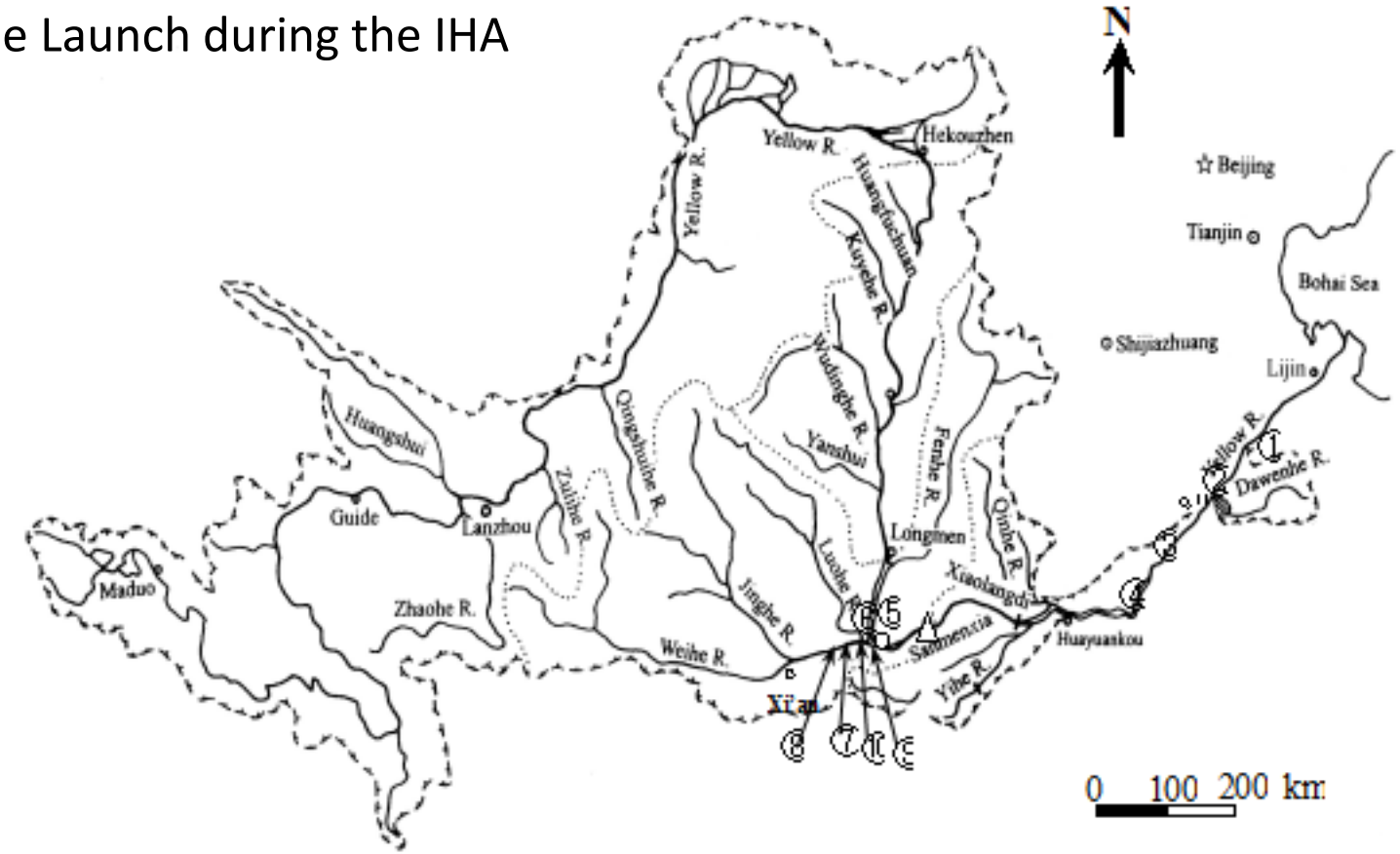
To be Launch during the IHA

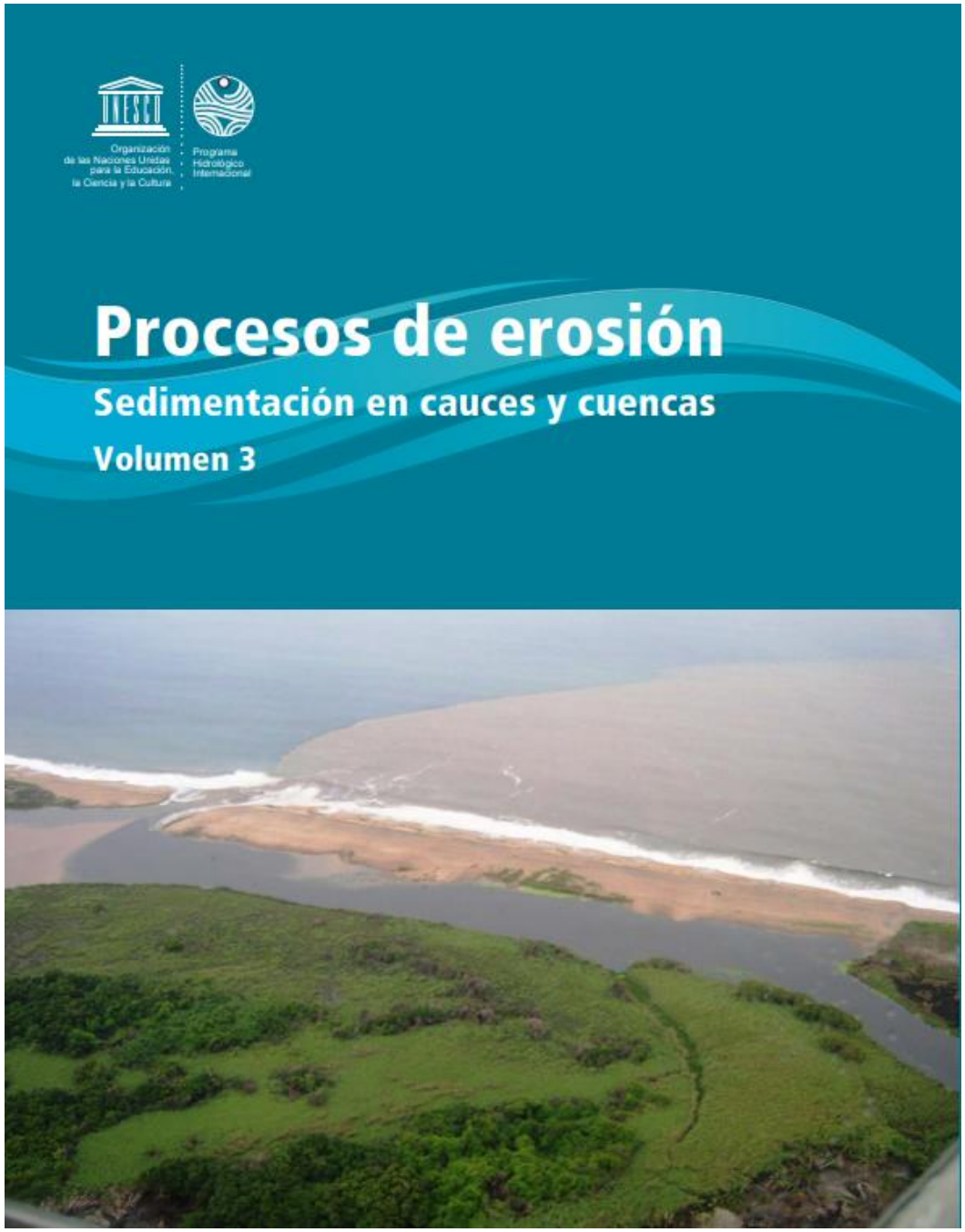


# CONTROLLING THE YELLOW RIVER AND 2000 YEARS OF DEBATE ON CONTROL STRATEGIES


## Authors: Zhaoyin Wang and Cheng Liu


To be Launch during the IHA






# Erosion processes

## Sedimentation in riverbeds and basins

## Volume 3

August 2017

International Sediment Initiative

United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

# IX Ibero-American Congress on Erosion and Sediment Control

# II Ibero-American Sediment and Ecology Congress

September 26-28,
Santiago, Chile


IX CICES
SANTIAGO DE CHILE

Congreso Iberoamericano sobre Sedimentos y Ecología

International Sediment Initiative

United Nations
ucational, Scientific and
Cultural Organization

International
Hydrological
Programme

# IHP contributes to SDGs and 2030 Agenda

United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

PARIS 2015

IHPI contributes to SDGs and the 2030 Agenda as a whole

REAL TIME PRECIPITATION ESTIMATES

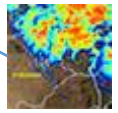
HYDROLOGIC MONITORING & FORECASTING

FREQUENCY ANALYSES

CHEMICAL & ISOTOPIC TRACERS

WATER HARVESTING

CLIMATE CHANGE




**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

## SDGs

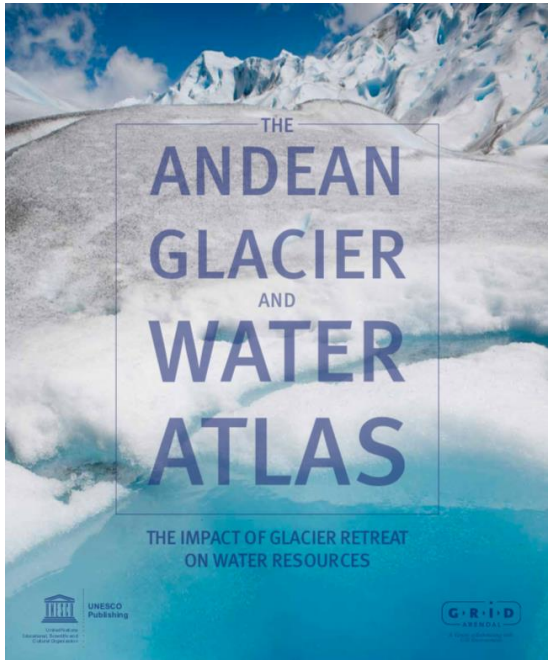

Sendai Framework for Disaster Risk Reduction

2015 - 2030

United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

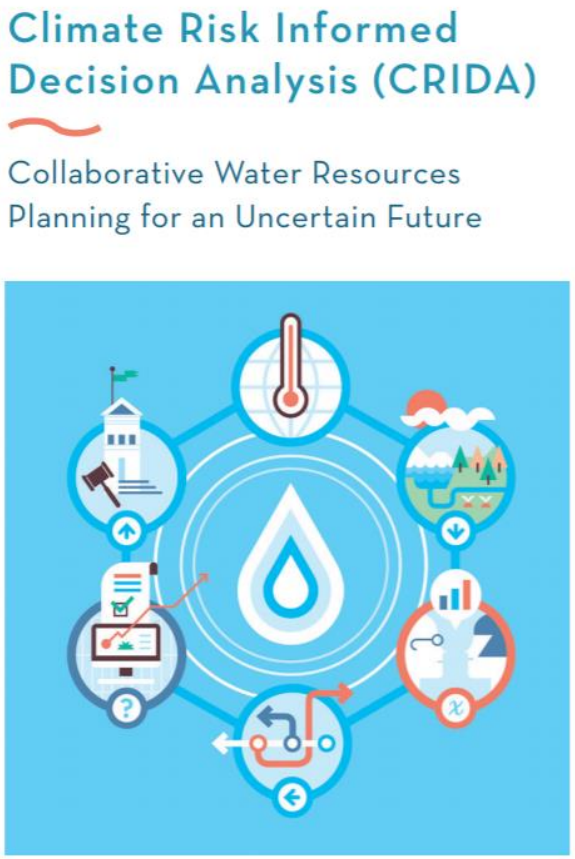
GRID ARENDAL
A Centre Collaborating with UNEP




## *The Andean Glacier and Water Atlas – the Impact of Glacier Retreat on Water Resources*

- Based on the work of UNESCO-IHP "The Impact of Glacier Retreat in the Andes: International Multidisciplinary Network for Adaptation Strategies" and "Addressing Water Security: Climate Impacts and Adaptation Responses in Africa, Asia and Latin America and Caribbean" supported by Flemish UNESCO Trust Fund for Science (FUST).
- Uses latest peer reviewed literature and existing database sources (e.g. WGMS)
- Covers entire Andes

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

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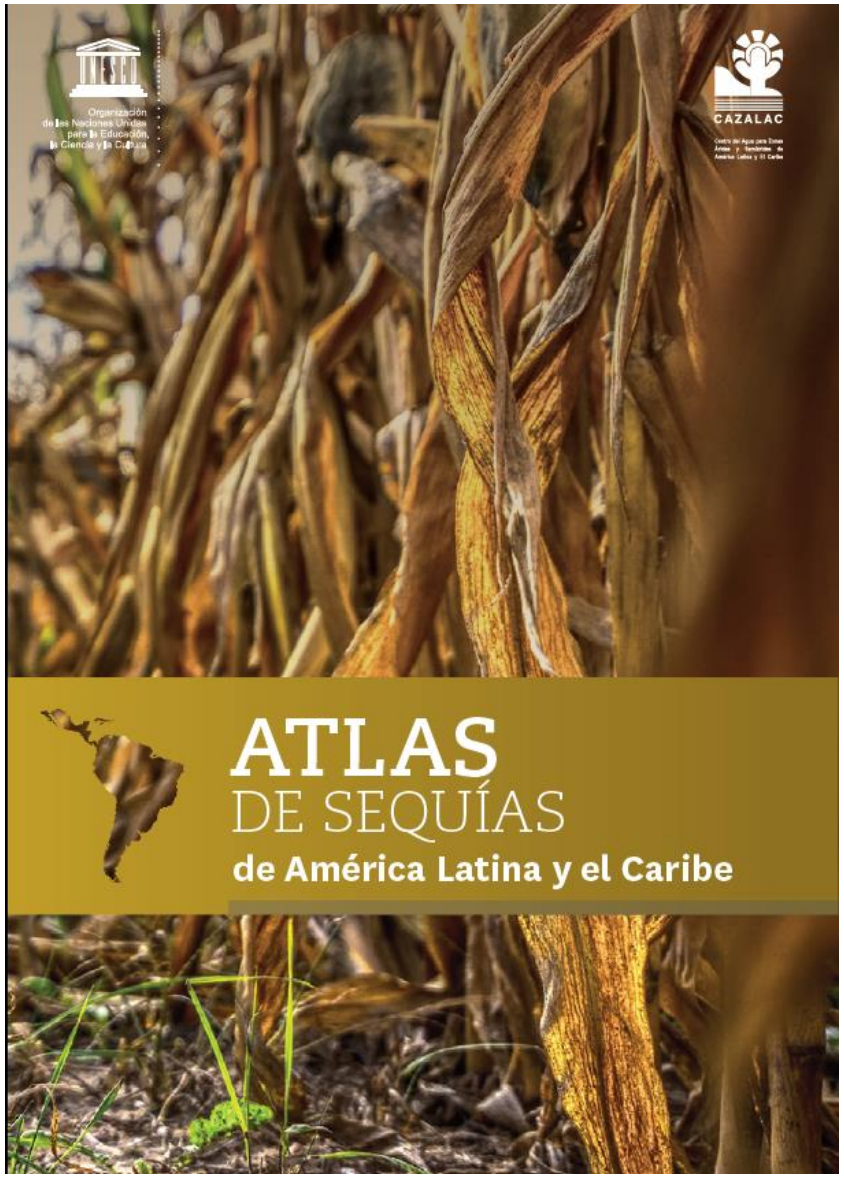
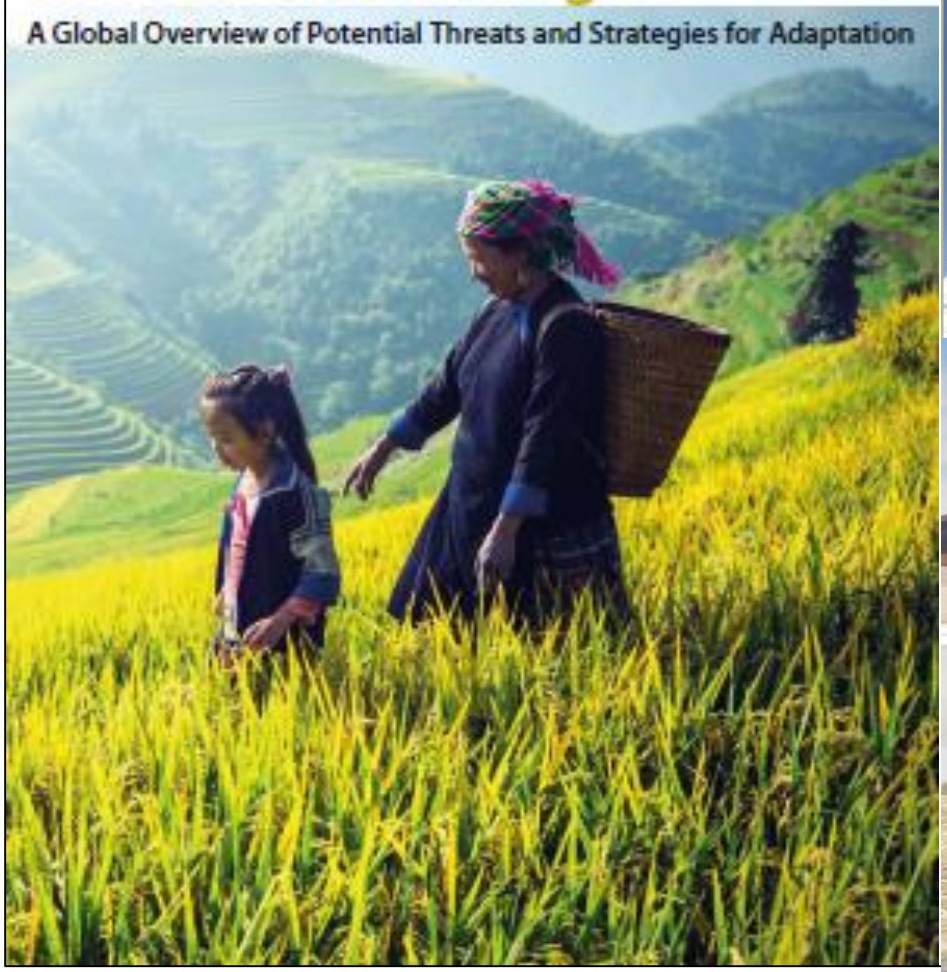
Programme




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

# Mountain Ecosystem Services and Climate Change

## A Global Overview of Potential Threats and Strategies for Adaptation



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International Hydrological Programme

Flanders State of the Art

ACCOMPLISHMENT REPORT

# THE IMPACT OF GLACIER RETREAT IN THE ANDES

International Multidisciplinary Network for Adaptation Strategies

# THE IMPACT OF GLACIER RETREAT IN THE ANDES:

International Multidisciplinary Network for Adaptation Strategies

BACKGROUND PAPERS

*on climate change adaptation practices, national policies, research needs and education*

# ISI - WAY FORWARD

- Case Studies and research support
- Education and Training
- Scientific Publications
- Policy brief and Outreach

**Thank you for your attention**

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