



**Regional Stakeholder Consultation on Climate Services for  
the Third Pole Region**

Jaipur, India  
9-11 March 2016

UNESCO,s Experience of Addressing Climate impacts,  
adaptation and vulnerability in Mountain Systems



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United Nations  
Educational, Scientific and  
Cultural Organization

UNESCO WORLD HERITAGE CENTER

International environmental institutions can't make states do what they don't want to do, but convince. It is increasingly clear that treaties rely not only on state for implementation but on citizen activities and national environmental leadership. If citizens don't demand strong environmental policy from their own governments, the number of treaties and payments will save the Earth.

Tim Waples

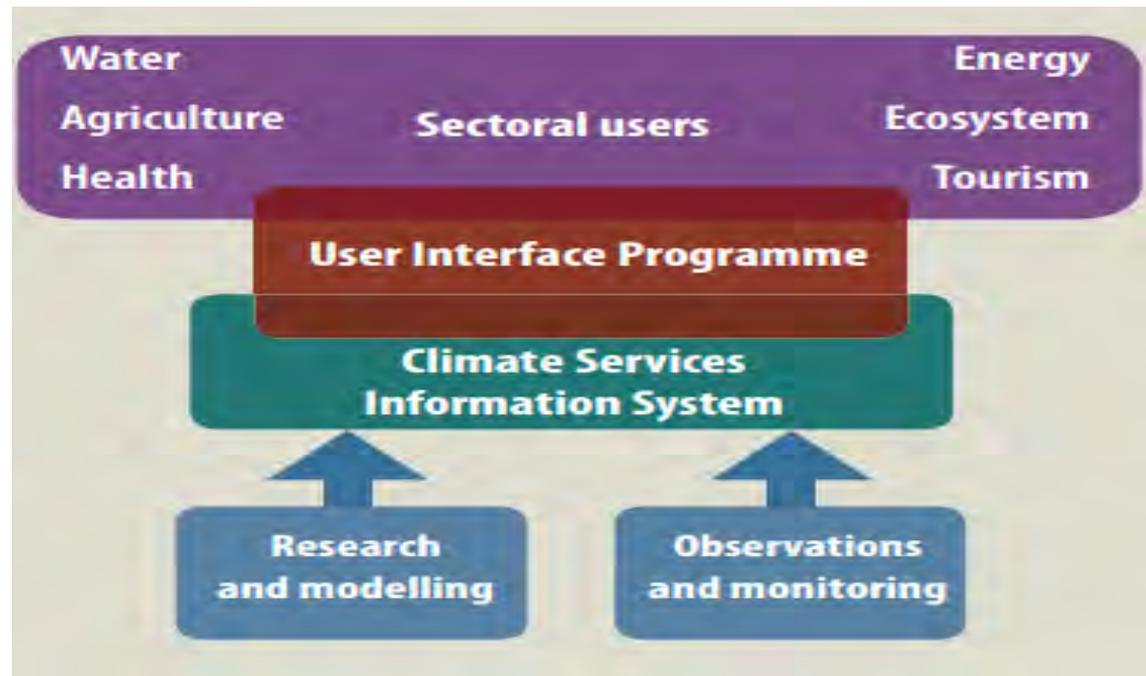
# The UNESCO STRATEGY FOR **ACTION** ON CLIMATE CHANGE

The UNESCO Enhanced Plan of Action for the Strategy for Action on Climate Change (through 2011) is structured around three main strategic objectives:

- 1 building, making available and maintaining the climate change knowledge base: science, assessment, monitoring and early warning;
- 2 promoting mitigation of and adaptation to climate change, including through enhanced education and public awareness; and
- 3 moving towards a climate-neutral UNESCO.

UNESCO and the World Meteorological Organisation are the co-conveners for the cross-cutting area within the United Nations System for climate knowledge: science, assessment, monitoring and early warning.

- UNESCO and WMO works together as part of UN-wide collaboration on Global Framework for Climate Services to guide and develop climate services to bridge the gap between the IPCC assessment reports and the services required to adapt to climate variability and change at regional and sectoral levels.
- UNESCO provides advanced educational training for the next generation of climate scientists, by both science-related category I centres/institutes, the UNESCO-IHE Institute for Water Education and the Abdus Salam International Centre for Theoretical Physics (ICTP), for water management and Earth science and meteorological modelling, respectively.



# UNESCO interdisciplinary climate change knowledge base

- UNESCO's International Hydrological Programme (IHP), International Geoscience Programme (IGCP), Man and the Biosphere (MAB) Programme, Intergovernmental Oceanographic Commission (IOC), provides valuable data, information and tools on key areas of concern in climate change
- It promotes the use of information and communication technologies and improved monitoring and modelling tools to predict and deal with floods and droughts, and the production of the United Nations World Water Development Report with many examples specific to Mountain regions and the third pole.

# UNESCO-SCOPE-UNEP Policy Brief on Third Pole Environment

**UNESCO**  
United Nations  
Educational, Scientific and  
Cultural Organization  
Division of Ecological and  
Earth Sciences

**SCOPE**  
Scientific Committee  
on Problems of the Environment

**UNEP**  
United Nations  
Environment Programme

**UNESCO - SCOPE - UNEP  
Policy Briefs**  
June 2011 - No. 13

## Third POLE ENVIRONMENT

Together with the Arctic and the Antarctic, the Tibetan Plateau and surrounding mountains, also called the Third Pole, carry one of the largest ice masses of the Earth.

The melt water from 12,000 km<sup>2</sup> of glaciers of the Third Pole ensures permanent flow of Asia's major river systems.

The current and future environmental changes at the Third Pole are likely to have major impacts on the lives of more than 1.5 billion people living in the region.

Chinese Academy of Sciences  
Ministry of Ecology and Environment  
United Nations Educational, Scientific and Cultural Organization  
International Centre for Integrated Mountain Development

# The 4th Third Pole Environment (TPE) Workshop April 2014 in Dehradun, India

- " Human-Nature Relationship in the Third Pole Region", "Climate changes in the past and at present in polar region on Earth ", "Ecosystem and Geology", as well as "TPE Mass Balance Working Group report" and the TPE Precipitation Working Group report.



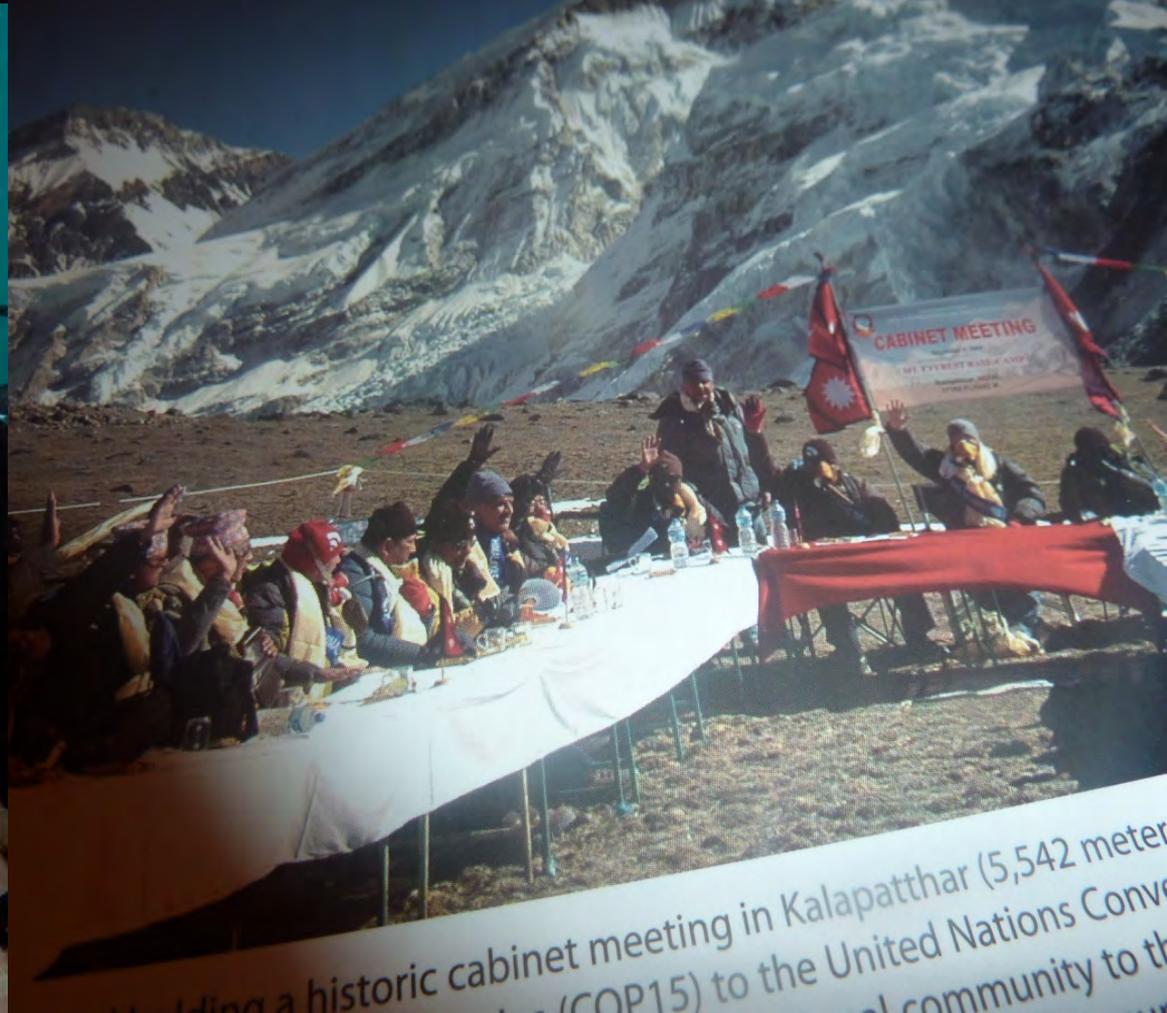
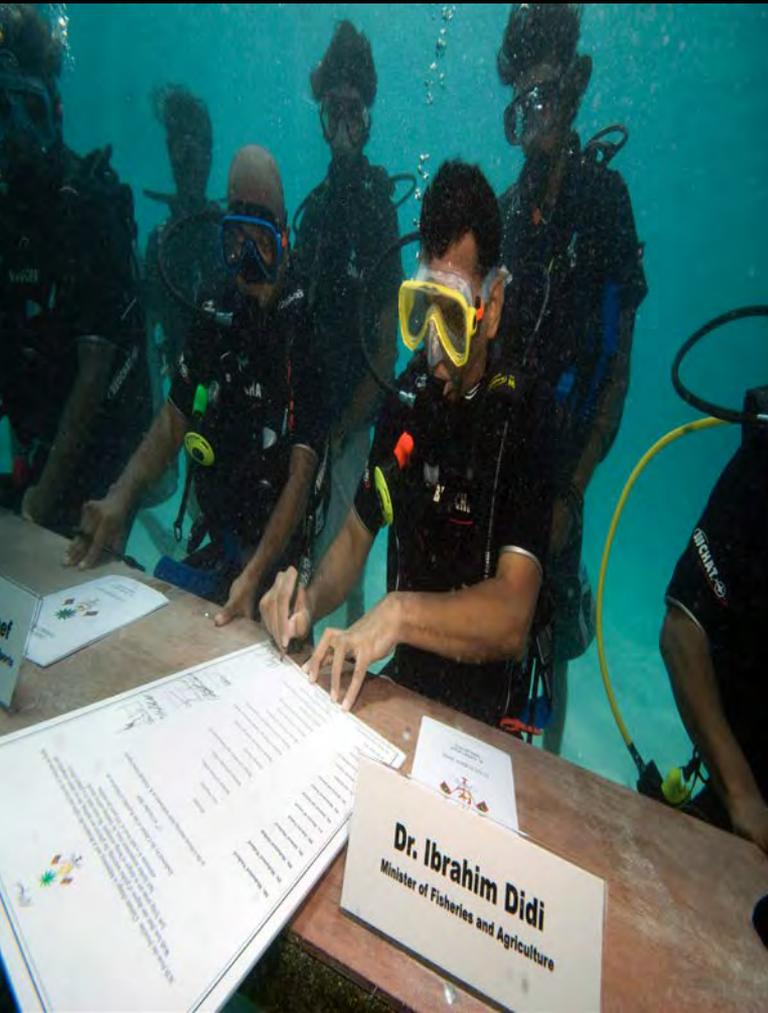
# UNESCO Sites: A Climate Change Observatory

- UNESCO sites serve as global field observatories for climate change.
- Studies are currently on at several sites, and the results are used to plan tailored adaptation and mitigation measures.
- The iconic value of these sites means they also serve as a useful platform to share information on applied and tested monitoring, mitigation and adaptation processes, and to raise awareness on the impacts of climate change on human societies and cultural diversity, biodiversity and ecosystem services, and the world's natural and cultural heritage.



# CLIMATE CHANGE IN HIMALAYA

- Nepal organized a Cabinet Meeting at Kalapatthar, near the base camp of the Mount Everest, and issued the “Kalapatthar Declaration” following Maldivian underwater Cabinet meeting



...holding a historic cabinet meeting in Kalapatthar (5,542 meters) ... (COP15) to the United Nations Convention ... community to the

# SAGARMATHA NATIONAL PARK- MELTING OF GLACIERS AFFECTING WILDLIFE SUCH AS SNOW LEOPARD



Para la vida, para el futuro

**For life, for the future**  
Biosphere reserves and climate change  
A collection of good practice case studies

Pour la vie, pour l'avenir

Für das Leben, für die Zukunft



## Case Studies on **Climate Change** and World Heritage



## UNESCO-MAB Project:

➤ **GLOCHAMOST (Global and Climate Change in Mountain Sites – Elaborating Coping Strategies for Mountain Biosphere Reserves), on-going**

➤ **Follow-up project to GLOCHAMORE (Global Change in Mountain Regions), 2003-2005, 6<sup>th</sup> Framework Programme of the EU + University of Vienna, MRI and UNESCO-MAB**

- Nandadevi Biosphere Reserve in India, Sagarmatha in Nepal

Rikha Samba Glacier, Mukut Himal, Nepal

Source: M.Nakawo, Almaty (2006)





MR/UNESCO INTERNATIONAL WORKSHOP  
GLOBAL CHANGE RESEARCH

*in Mountain*  
**Biosphere  
Reserves**



BIODIVERSITY

CONSERVATION

RESEARCH

MONITORING

EDUCATION

TRAINING

SUSTAINABLE  
DEVELOPMENT

Mountain Biosphere Reserves for global change study



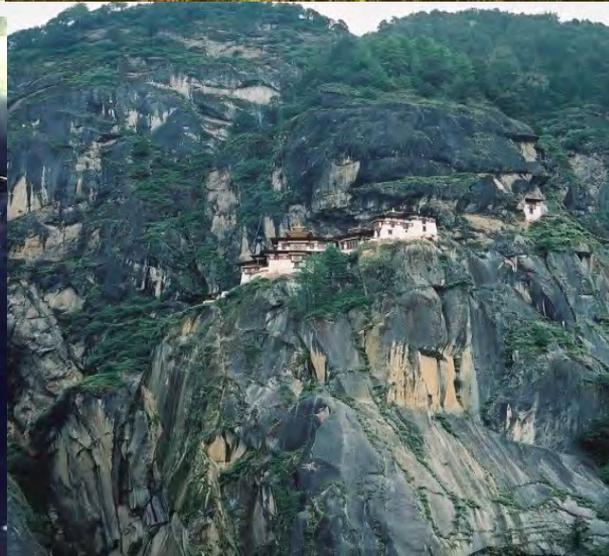


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# SACAM

## South & Central Asia MAB Network



**SACAM**  
South and Central Asia MAB Network

Sub-Regional Network for UNESCO'S  
Man and the Biosphere Programme (MAB)

 Afghanistan	 India	 Nepal
 Bangladesh	 Iran	 Pakistan
 Bhutan	 Maldives	 Sri Lanka

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MAB



## **Mountain biosphere reserves as study/monitoring sites for global change:**

- **contain protected areas (natural or near-natural environments);**
- **contain areas that are economically used;**
- **most BRs dispose of long-term climatic data and species list;**
- **BRs contain also people → impact of global change on human societies;**
- **Partnership of biosphere reserve managers and scientists.**





# Partnerships between people and the nature

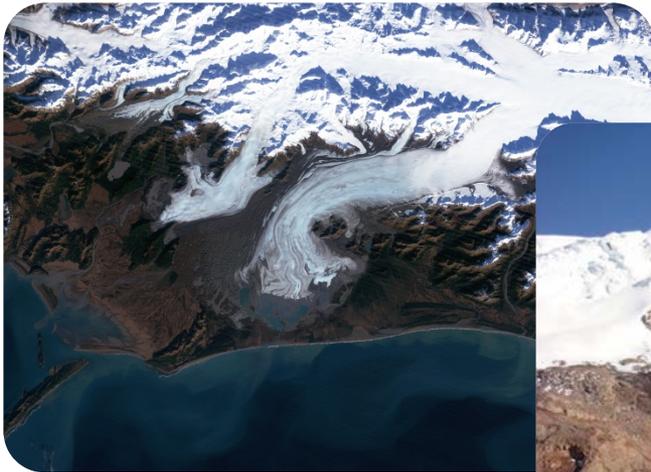


## Nanda Devi Biosphere Reserve



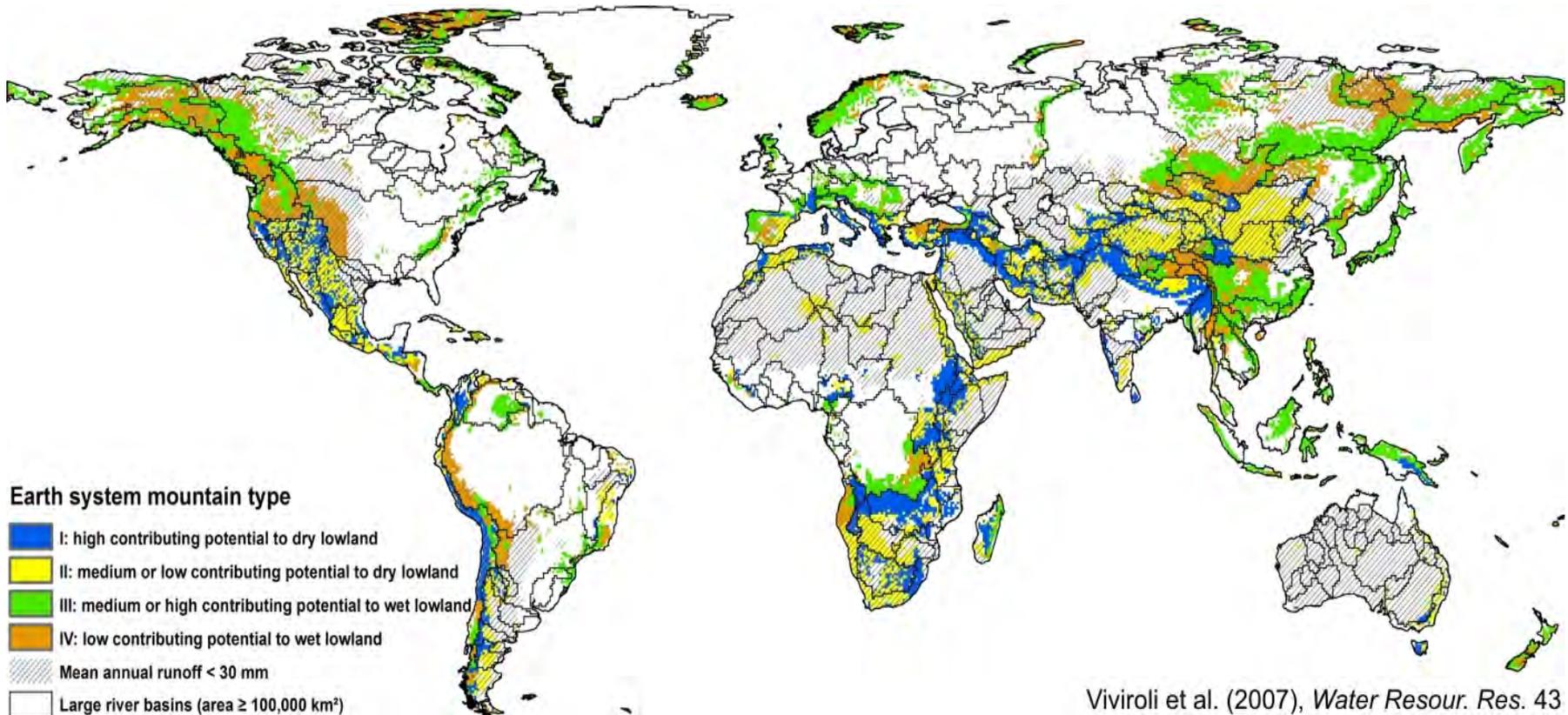
# Worldwide inventory of existing perennial ice and snow masses

The **need** for a **worldwide inventory** of existing **perennial ice and snow masses** was first considered during the International Hydrological Decade, declared by UNESCO for 1965-1974.



# Mountain Ecosystem Services

## Provisioning services: Water



# Water Security: key challenges of the 21st century

## Some key facts



In many regions, changing precipitation or melting snow and ice are altering hydrological systems, affecting water resources in terms of quantity and quality (*medium confidence*).

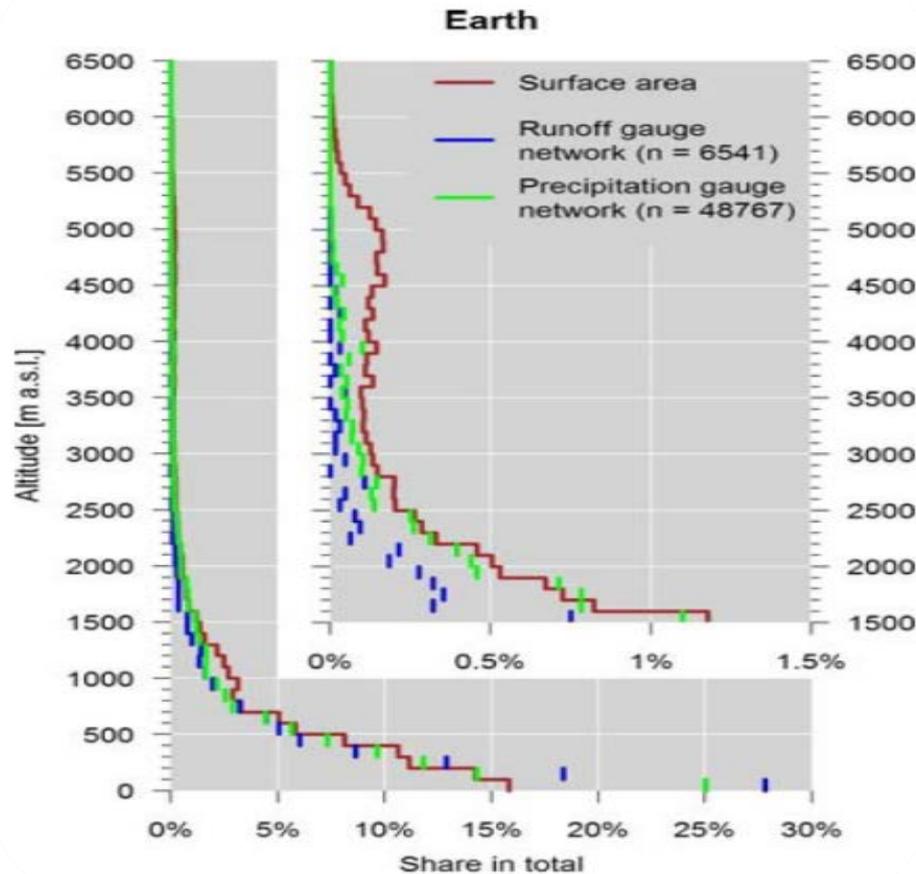


Glaciers continue to shrink almost worldwide due to climate change (*high confidence*), affecting runoff and water resources downstream (*medium confidence*).



Climate change is causing permafrost warming and thawing in high-latitude regions and in high-elevation regions (*high confidence*).

# Alpine Regions are Data Scarce



Altitudinal distribution of global runoff stations represented in the GRDC archive and global precipitation station network represented in the GPCP archive compared to global hypsography of the land surface area (without Greenland and Antarctica). The inset shows a magnification for altitudes above 1500ma.s.l. (Viviroli et al. 2011).

# Delivering responses: IHP-VIII

IPCC's Fifth Assessment Report  
WG-2 on Impacts, Adaptation  
and Vulnerability (AR5) 2014:  
**Risks and Challenges**

***IHP-VIII:**  
Water security: Responses to  
local, regional and global  
challenges*

“the capacity of a population to safeguard access to adequate quantities of water of acceptable quality for sustaining human and ecosystem health on a watershed basis, and to ensure efficient protection of life and property against water related hazards — floods, landslides, land subsidence and droughts.”

Water Security is  
defined by UNESCO as:

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

Improve knowledge and innovation to address water security challenges.



# Snow and Ice Networks



Regional Glaciological Centre in Almaty Kazakhstan



Working Group on Snow, Ice and Glaciers (GTNH)-LAC

High Level Panel session: Climate Change Impacts on Water Resources and Adaptation policies in Mountainous regions



# Project: The Impact of Glacier Retreat in the Andes: International Multidisciplinary Network for Adaptation Strategies 2012-2016

“The Impact of Glacier Retreat in the Andes: International Multidisciplinary Network for Adaptation Strategies” Lima, Peru 29-30, May 2012



“Melting snow and glaciers in the Andes: Science, technology and policy for adaptation to cope with complexity in the context of climate change”, 12-15 September 2011, Santiago, Chile



Science policy workshop  
Impacts of Global Climate Change on Snow, Glaciers and Water Resources in the Andes: Policy recommendations for Adaptation Strategies **Quito, Ecuador 20-21 November 2013**



**CONDESAN**  
Consortio para el Desarrollo Sostenible de la Ecorregión Andina

# International Network for Alpine Research Catchment Hydrology INARCH-GEWEX

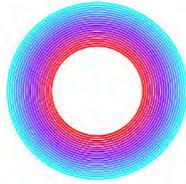
- ❄️ INARCH: to better understand alpine cold regions hydrological processes, improve their prediction and find consistent measurement strategies.
- ❄️ To achieve this objective it is necessary to develop transferable and validated hydrological model schemes of different complexity that can support research in data sparse mountain areas dominated by elements of snow, permafrost and glacier cover.
- ❄️ **INARCH was accepted by The Global Energy and Water Cycle Exchanges Project (GEWEX) )**



CORDILLERA BLANCA Los 180 kms. de longitud de la Cordillera Blanc a fueron fotografias Especial Europea, en agosto del 2010.



# From COP20 to COP21: Exhibition



LIMA COP20 | CMP.10  
CONFERENCIA DE NACIONES UNIDAS  
SOBRE CAMBIO CLIMÁTICO 2014



COP21- CMP11  
PARIS 2015  
UN CLIMATE CHANGE CONFERENCE

'Climate change impacts on mountain regions of the world'

'Mountains: early warning systems for climate change'



**The Cotopaxi Glaciers** ECUADOR [More info](#)

The image shows two side-by-side photographs of a glacier. The left photo is labeled '1986' and shows a large, white, snow-covered mountain peak. The right photo is labeled '2007' and shows the same mountain peak, but the snow has significantly melted, revealing more of the dark rock and vegetation below.

The dwindling glaciers of the Cotopaxi Volcano (5900 m in elevation) have had a crucial contribution to Quito's water supply. Antisana, a similar volcano with glaciers of a similar size also contributes in the same way. Until the late 70s, these glaciers were in equilibrium. Since then the glacier has been shrinking rapidly. This threatens the water supply in Ecuador's capital. Already by the end of the 90s, Ecuadorian glaciers have shriveled to less than half their size. The Cotopaxi and Antisana volcanoes lost almost 40% of their area from about 1979 to 1997.

The melt-water from the glaciers is particularly important in the dry seasons to compensate for the lack of rain. This is because the melting of glaciers peak in the warmest and driest periods. As the glaciers disappear, the compensation effect ceases. In the mountains, however, the melting of the glacier has caused a temporary increase in water supply. Quito has a rising population of 2.7 million people and thousands are moving to the city from the countryside every year. The increased demand is adding pressure to water availability in the city. In combination with these trends, climate change is creating a need for substantial investment in water infrastructure in the years to come.

They need here. This is not the only one. The dwindling glaciers of the Cotopaxi Volcano (5900 m in elevation) have had a crucial contribution to Quito's water supply. Antisana, a similar volcano with glaciers of a similar size also contributes in the same way. Until the late 70s, these glaciers were in equilibrium. Since then the glacier has been shrinking rapidly. This threatens the water supply in Ecuador's capital. The melt-water from the glaciers is particularly important in the dry seasons to compensate for the lack of rain. In the mountains, however, the melting of the glacier has caused a temporary increase in water supply. Quito has a rising population of 2.7 million people and thousands are moving to the city from the countryside every year. The increased demand is adding pressure to water availability in the city. In combination with these trends, climate change is creating a need for substantial investment in water infrastructure in the years to come.

# Publications



Policy Brief

## Our global water towers: ensuring ecosystem services from mountains under climate change



Martin F. Price and Paul A. Egan  
 Co-chairs, Mountain Ecosystems Thematic Group, IUCN Commission for  
 Ecosystem Management






Policy Brief

## Challenges in Sustainable Water Supply in the Tropical Andes due to Climate Change



Sven Nezhad, Al Casey, Rogay, Colleen and Patrick CCRCSA10

  
 UNIVERSITY  
 OF ALBANY  
 SUNY  
 ACCIÓN

## Motivating Research on the Science Communications Front

CONVEYING THE NATURE AND IMPACTS OF  
 RAPID CHANGE IN ICE-DOMINATED EARTH SYSTEMS  
 TO DECISION MAKERS AND THE PUBLIC



A WORKSHOP REPORT AND  
 RECOMMENDATIONS FOR FUTURE RESEARCH





JULY 2015



# Inception meeting Paris 9-10 February 2015

“Addressing Water Security: Climate Impacts and Adaptation Responses in Africa, the Americas, Asia and Europe”



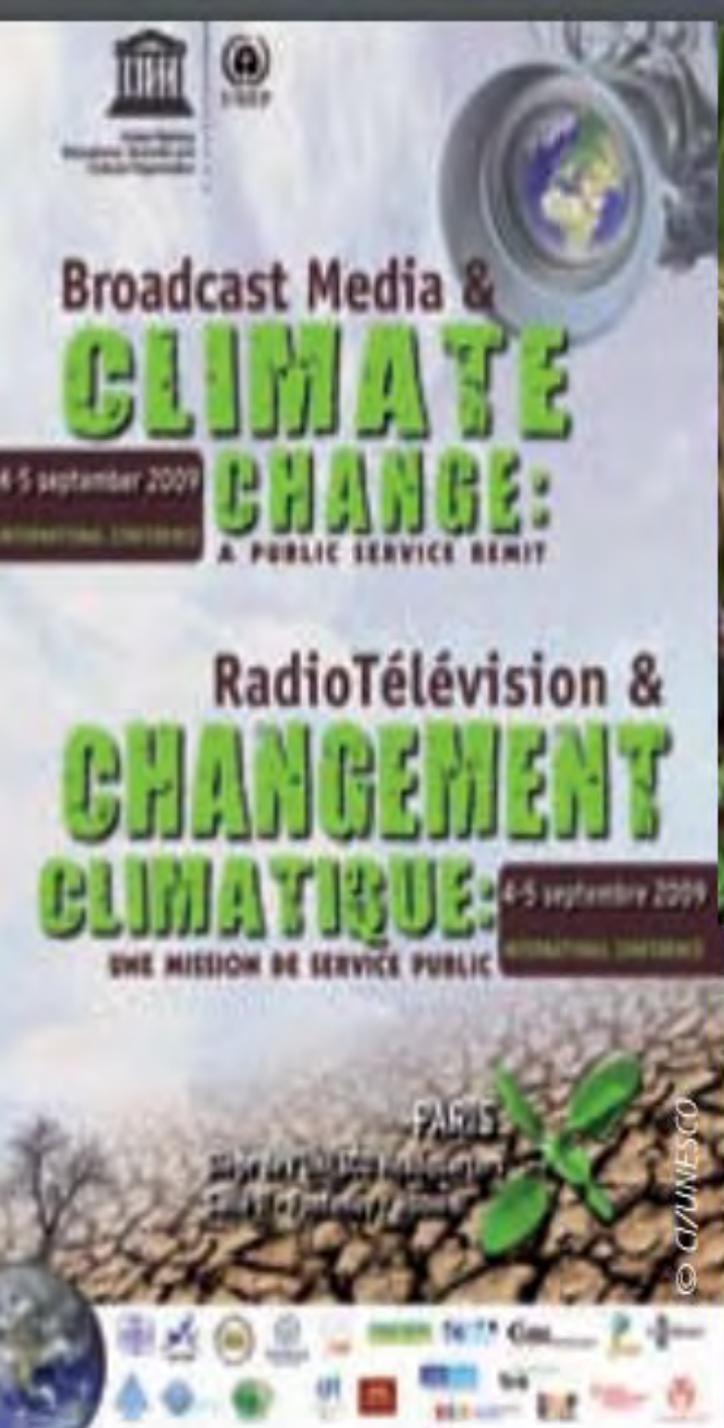
# Addressing Water Security: Climate Impacts and Adaptation responses in Africa, the Americas, Asia and Europe

**VULNERABILITY  
ASSESSMENT,  
MAPPING AND  
IMPLEMENTATION  
OF ADAPTATION  
STRATEGIES**

**RAISE AWARENESS  
ON POTENTIAL  
IMPACTS OF CLIMATE  
CHANGE ON  
MOUNTAIN  
GLACIERS AND  
DOWNSTREAM  
WATER SUPPLY**

**DEVELOPMENT  
OF A GLOBAL  
KNOWLEDGE  
FORUM**





© L.A. Brooks

Biologists conducting the 2009 Mycoblitz in the Atherton Tablelands, Queensland.

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Changing Minds  
**not** the Climate

*education, science  
and culture for  
sustainable development*



Thank you