

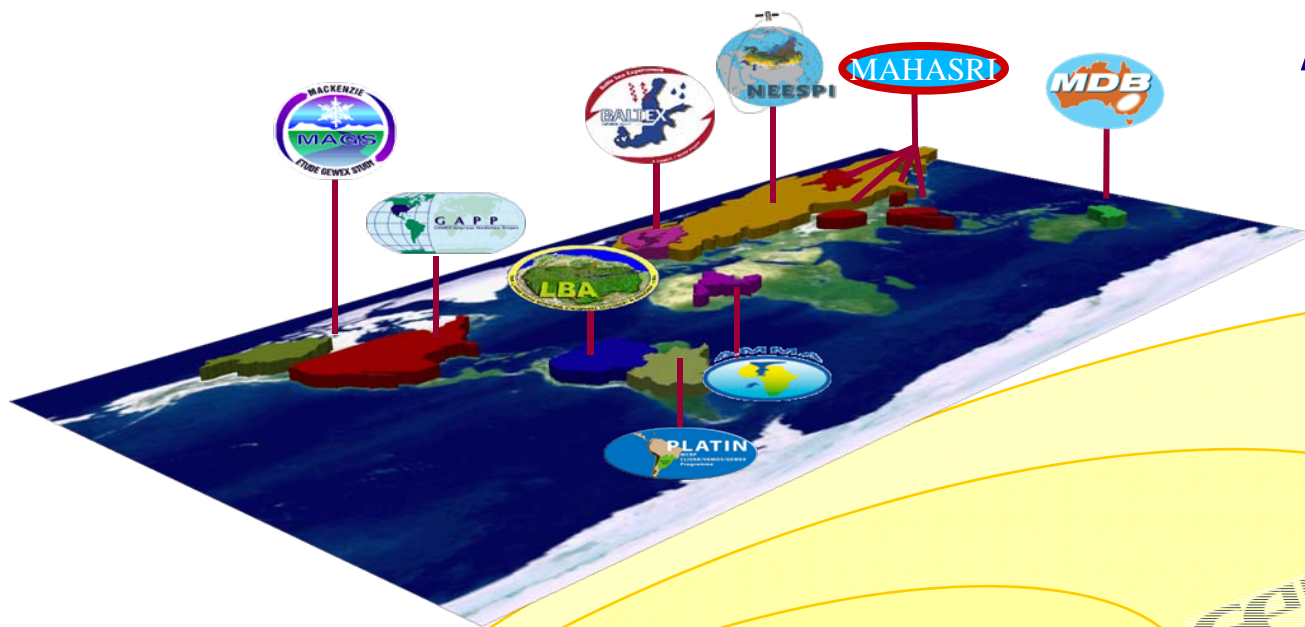


HE-CEOP in  
CEOP, GEWEX, WCRP,  
and the wider world  
(list of linkages cannot be exhaustive)

*Vladimir Ryabinin*  
(*Joint Planning Staff for WCRP*)



## HE-CEOP in WCRP





GEWEX 1988 →



SPARC 1992 →



*affected*



CLIC 2000 →



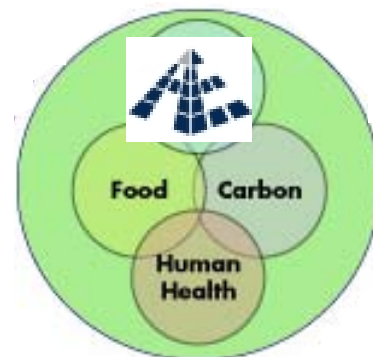
- ❖ Anthropogenic Climate Change
- ❖ Monsoons
- ❖ Extreme Events
- ❖ Seasonal Prediction
- ❖ Decadal Predictability
- ❖ Sea-Level Change
- ❖ Atm. Chemistry and Climate
- ❖ International Polar Year

*affected*

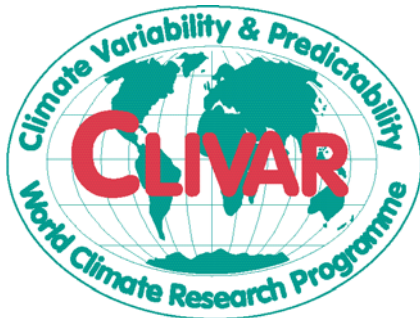
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# WCRP



CLIVAR 1995 → SOLAS 2001 →



WMP

WOAP

WGNE

AO-OPC  
(T)

WGCM

WGOMD

<http://wcrp.wmo.int>



ICSU  
International Council for Science



## Regional Hydroclimate Projects

- AMMA: African Monsoon Multidisciplinary Analyses
- BALTEX: Baltic Sea Experiment
- CPPA: Climate Prediction Program for the Americas
- LBA: Large-Scale Biosphere-Atmosphere Experiment in Amazonia
- LPB: La Plata Basin Project
- MAHASRI: Monsoon Asian Hydro-Atmosphere Scientific Research and Prediction Initiative
- MDB: Murray-Darling Basin Water Budget
- NEESPI: Northern Eurasia Earth Science Partnership Initiative

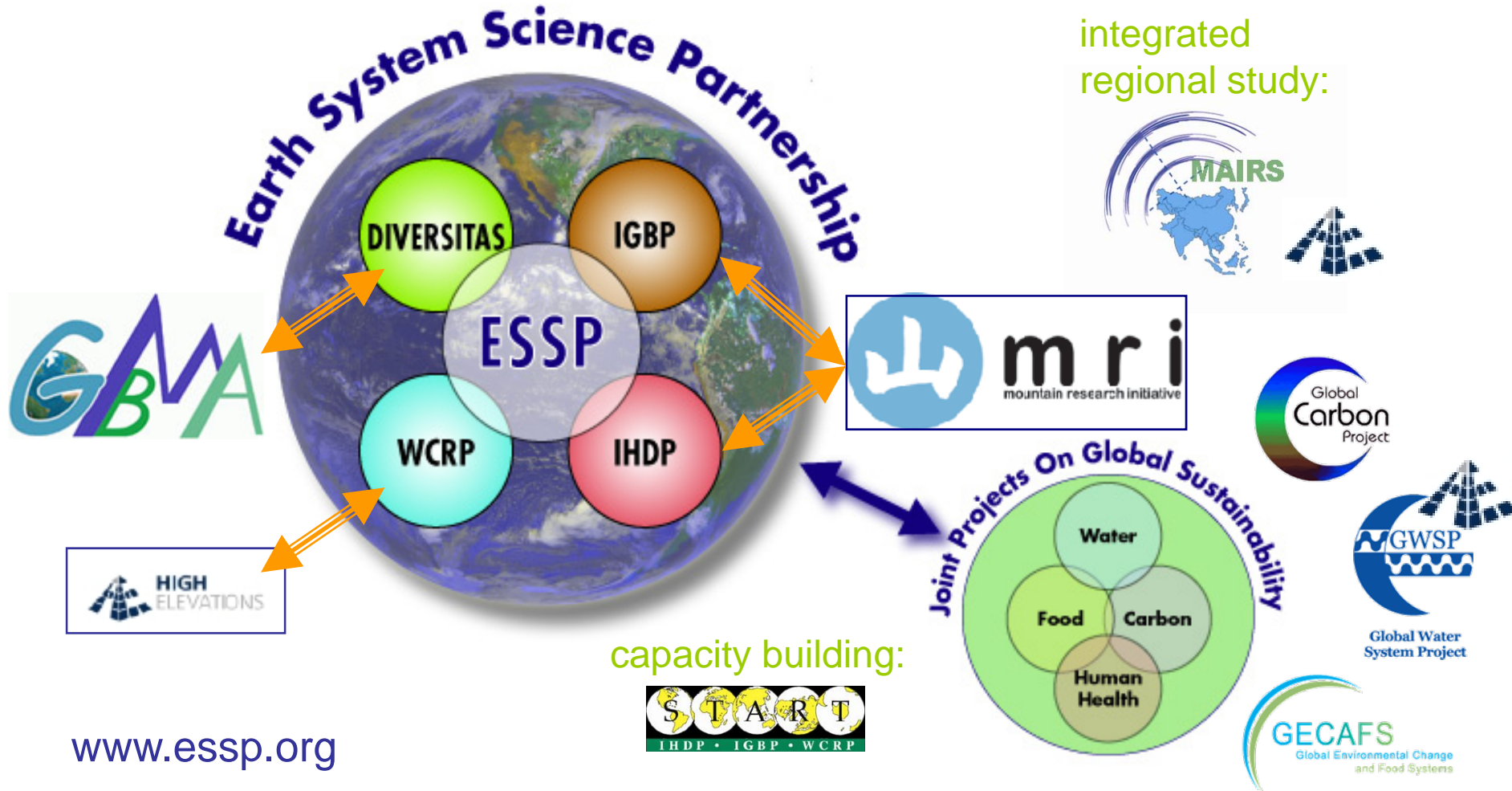


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# The IGBP Network





WMO



of UNESCO

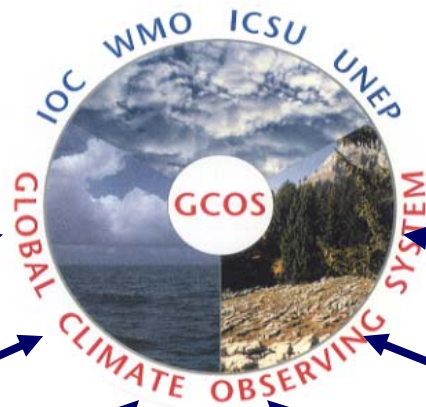


UNEP



ICSU

**GCOS is comprised of climate components of various global observing systems including both satellite and *in situ* observations**



**WCRP/GEWEX  
BSRN**



**WMO  
WWW  
Global  
Observing  
System  
(GOS)  
Atmosphere**



**WMO  
Global  
Atmospheric  
Watch  
(GAW)  
Atmospheric  
Chemistry**

**IOC/  
UNESCO  
Global  
Ocean  
Observing  
System  
(GOOS)  
Ocean**

**FAO  
Global  
Terrestrial  
Observing  
System  
(GTOS)  
Land**



**WMO  
World  
Hydrological  
Cycle  
Observing  
System  
(WHYCOS)  
Land/Water**

**Other**





## There are many other related initiatives and organisations:

- Consortium for Integrated Climate Research in Western Mountains (CIRMOUNT)
  - Consortium for the Sustainable Development of the Andean Ecoregion (CONDESAN)
  - Commission Internationale pour La Protection des Alpes (CIPRA)
  - Global Mountain Biodiversity Assessment (GMBA)
  - Global Observation Research Initiative in Alpine Environments (GLORIA)
  - International Centre for Integrated Mountain Development (ICIMOD)
  - Mountain Invasion Research Network (MIREN)
  - Mountain Research Initiative (MRI)
  - Mountain Forum
  - Mountain Partnership
  - Swiss Alpine Studies (ICAS)
  - UNESCO Man and the Biosphere Programme (MAB)
  - UNESCO Mountain Programme
  - The Mountain Institute (TMI)
- ... (this list is not exhaustive)

There are many initiatives dedicated to mountains and GCR. Do we need one more?

Well, ... yes.





WCRP pedigree in mountain meteorology:  
Global Atmospheric Research Programme (GARP)  
and its last 1982 Alpine Experiment (ALPEX)  
designed to improve understanding of  
air flow over or around mountains,  
development of cyclones,  
and local mountain winds



20 countries, SOP March-April 1982, 34 stations established  
Unique dataset, widely used in research and forecasting



Mesoscale Alpine Programme (MAP):  
a study to improve understanding of  
atmospheric processes over the Alps



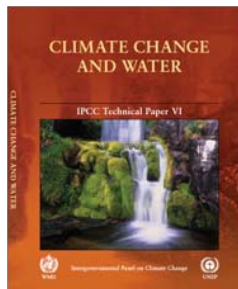
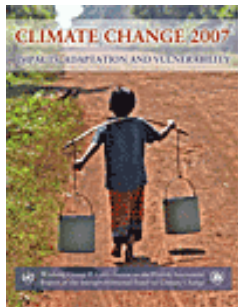
Demonstration of Probabilistic Hydrological and  
Atmospheric Simulation of flood Events  
in the Alpine region (D-PHASE)



D-Phase Operations Period:

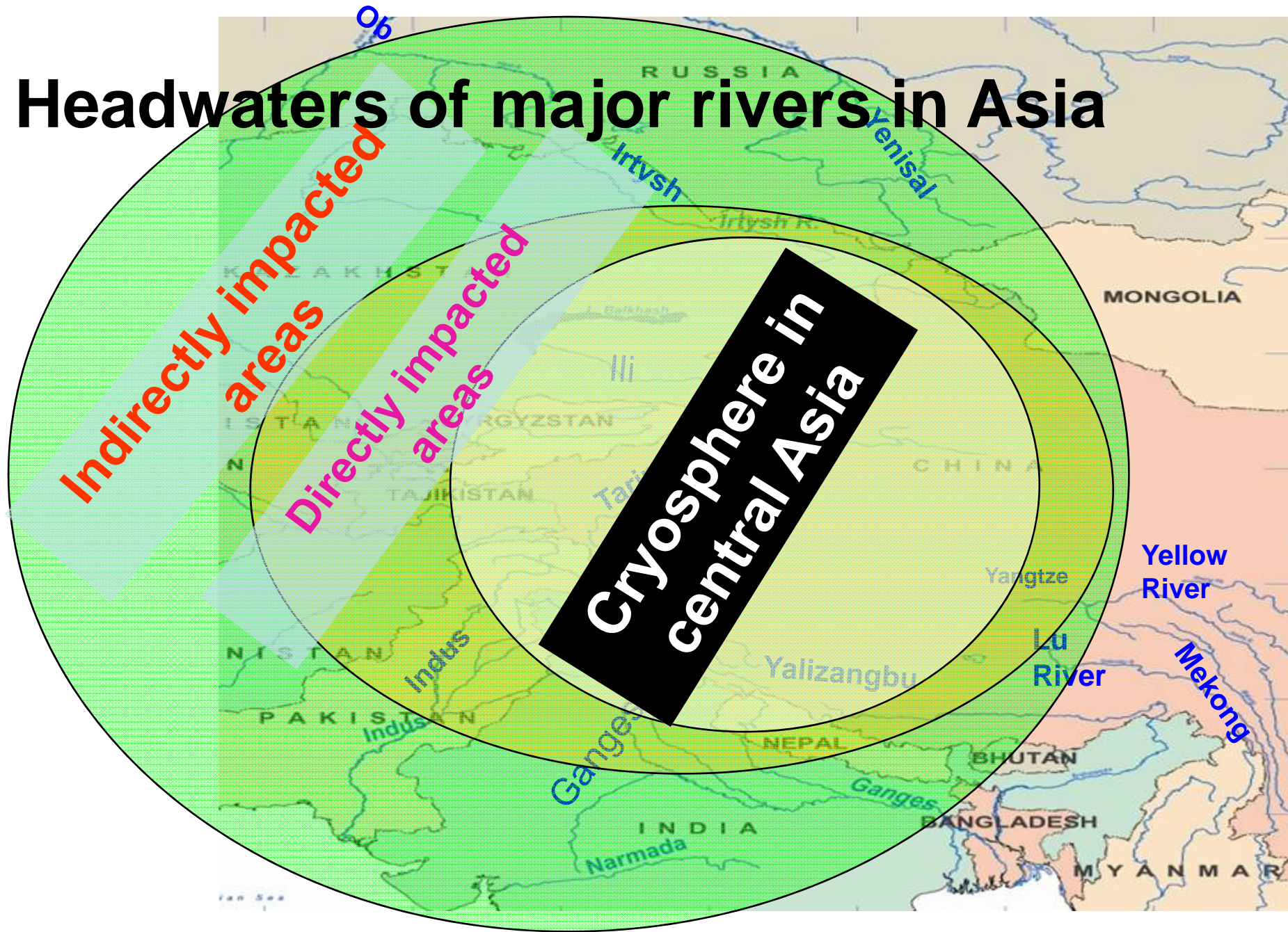
June - November 2007

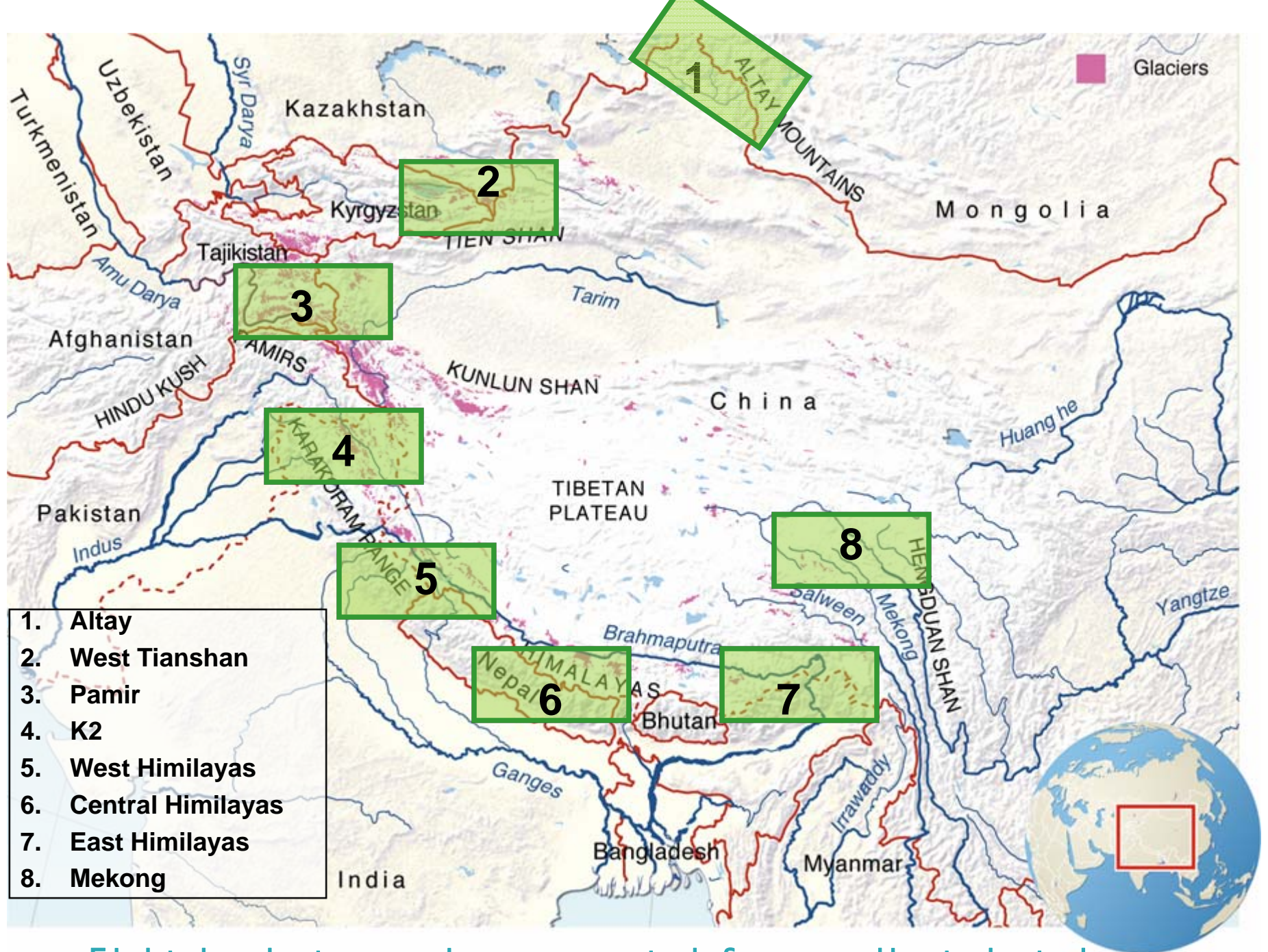
> 30 hi-res probabilistic and deterministic atmospheric and hydrological forecast models operated to serve the needs of more than 60 end users.



- Few studies have addressed climate change in alpine regions.
- Projections of precipitation in mountains are unreliable in most GCMs because the controls of topography are not adequately represented.
- Decadal variability is significant but its effect on precipitation in HEs is badly resolved in GCMs. Some hi-res RCMs and GCMs are capable of representing observed mesoscale patterns of the precipitation climate that are not resolved in coarse-resolution GCMs.
- Hi-res RCM simulations (5-km and 1-km grid scales) are too costly to operate in a 'climate mode' in mountains. Empirical and statistical downscaling are often seen as the way to generate climate change information there.
- Cryosphere is key.

# Headwaters of major rivers in Asia





Eight headwater regions suggested for coordinated study



## Conclusions

- Spatial resolution (~1 km) required for GCMs to adequately simulate Water & Energy Cycle (WEC) in HEs is not reachable in foreseeable future.
- There are several indications that WEC is not represented adequately in modern GCMS. Finding a way of doing this is a **big challenge and a needed task for WCRP**.
- WCRP **does need a HE-CEOP** to find a way to adequately represent WEC in HEs in studies of climate predictability at seasonal and decadal scales including monsoon prediction and climate change research. HE-CEOP also can contribute to the research on climate extremes.
- It seems that a possible **way forward for HE-CEOP** may be associated with intercomparison of **WEC down-scaling and up-scaling** in GCMs based on comprehensive dedicated observations (check ICARP II WG7 approach to the hydrological and cryospheric research for the Arctic - based on nesting).
- Handicap: observational database for WEC in HEs is hugely undeveloped. HE-CEOP is starting by developing observations (beyond CEOP reference stations).
- A strong community behind the project needs to be formed. There are many potential partners inside and outside WCRP and ESSP.
- Involvement of leading modelling groups is required; their commitment should be sought.
- A meaningful HE-CEOP **needs support** of the bigger CEOP and **strong intellectual corporate input, including during the discussion today**.