UIB Network

# Working Group 4 – Hydrology

## Progress report

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with Contributions from
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International Centre for Integrated Mountain Development

Kathmandu, Nepal

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# PMD – Hydrolometeorological monitoring of Bagrot Valley

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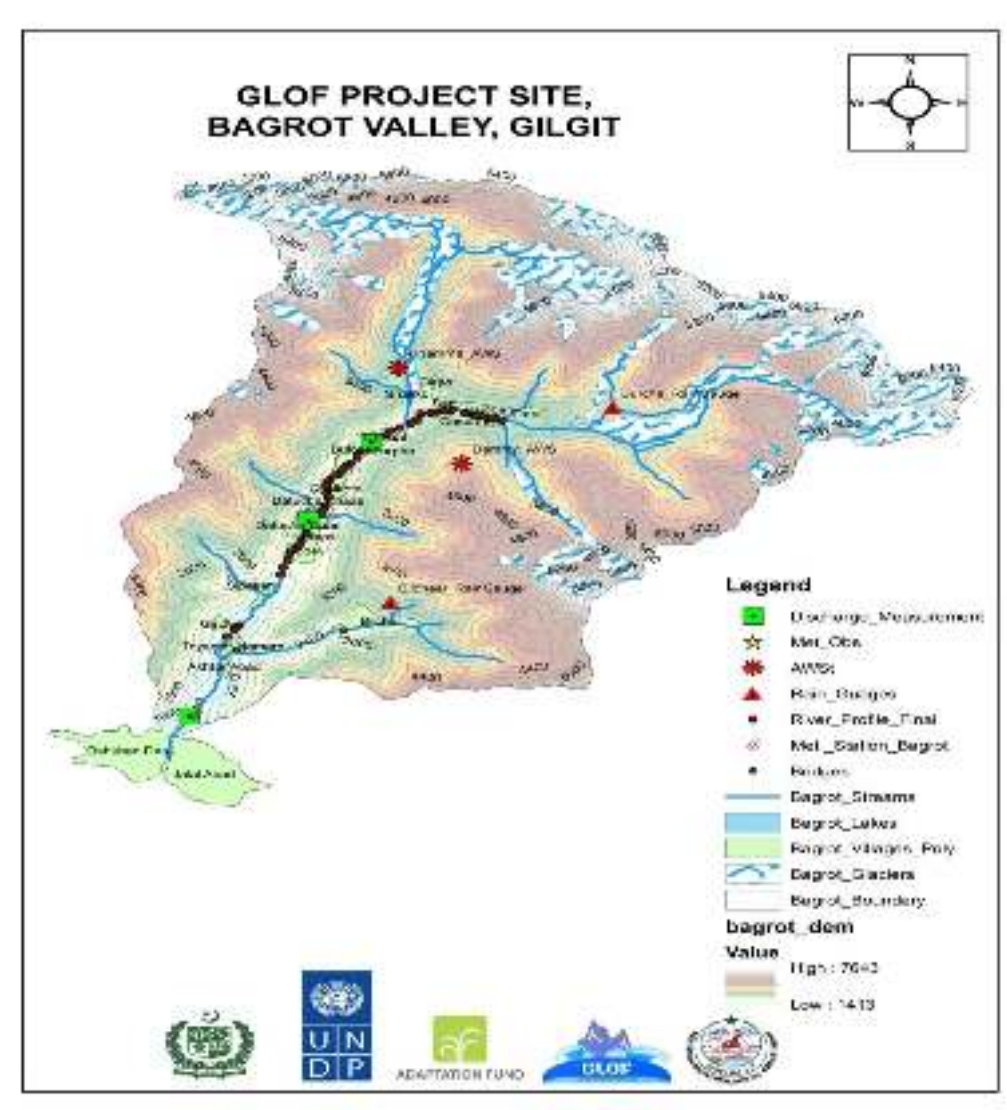

# Hydro-Meteorological Data Analysis Summer 2014 (MJJA)

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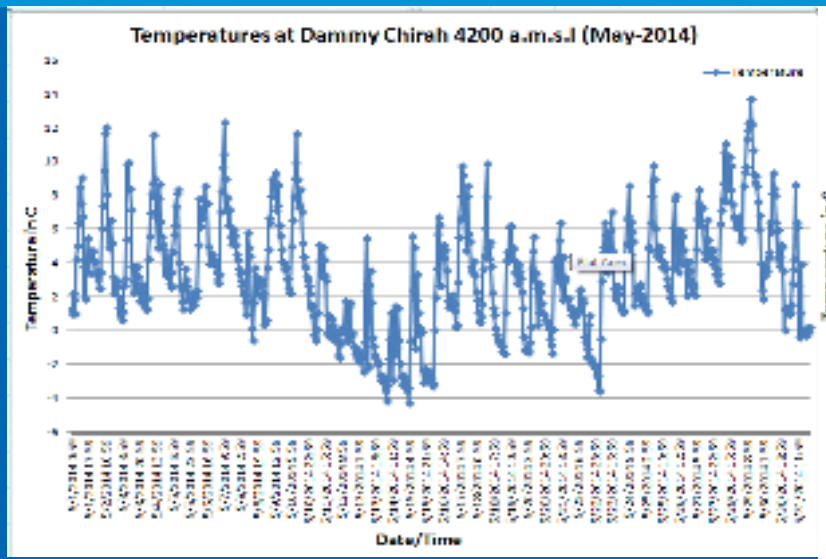


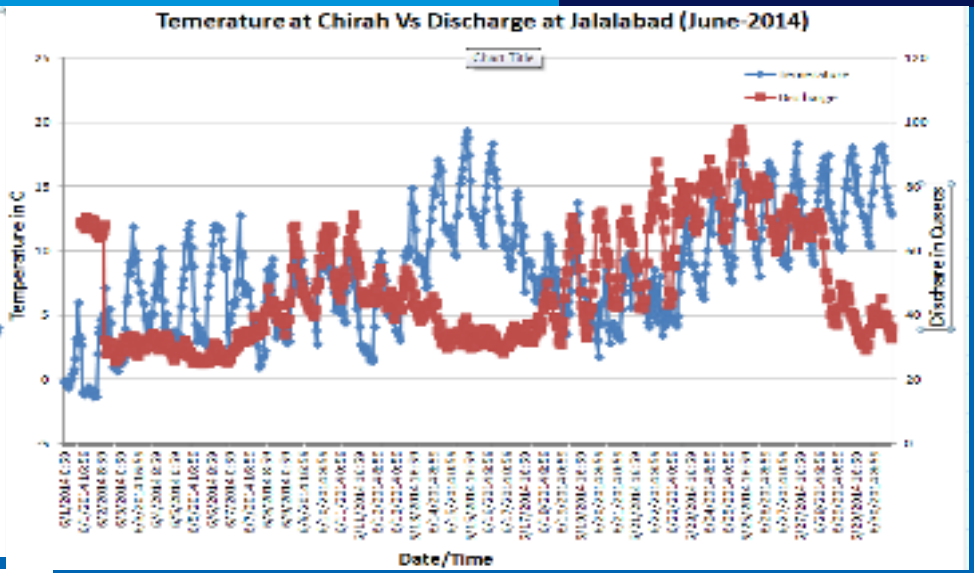


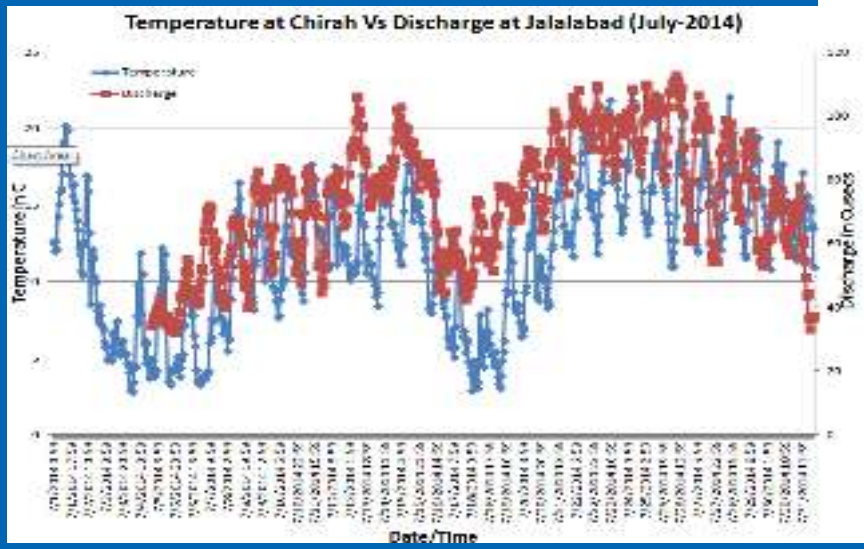


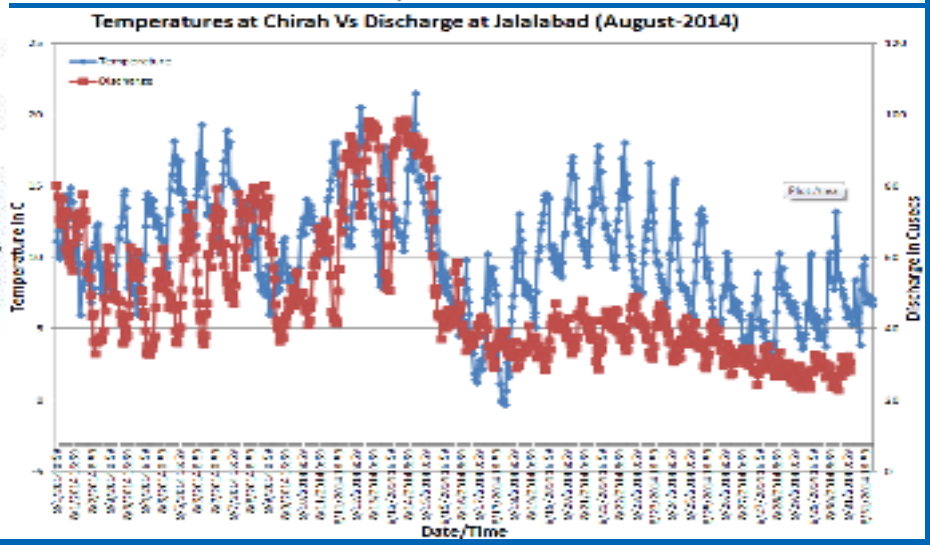

# Temperature Analysis at Dammy Chirah AWS From JUNE-SEPTEMBER 2013

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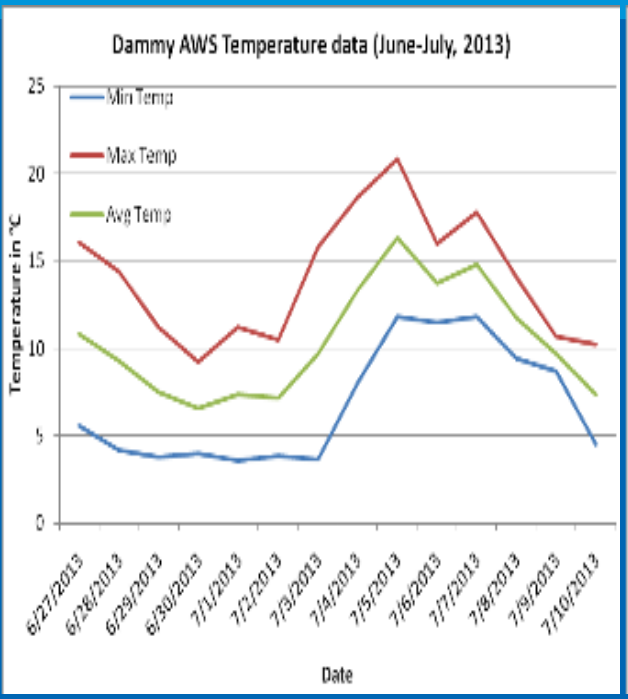


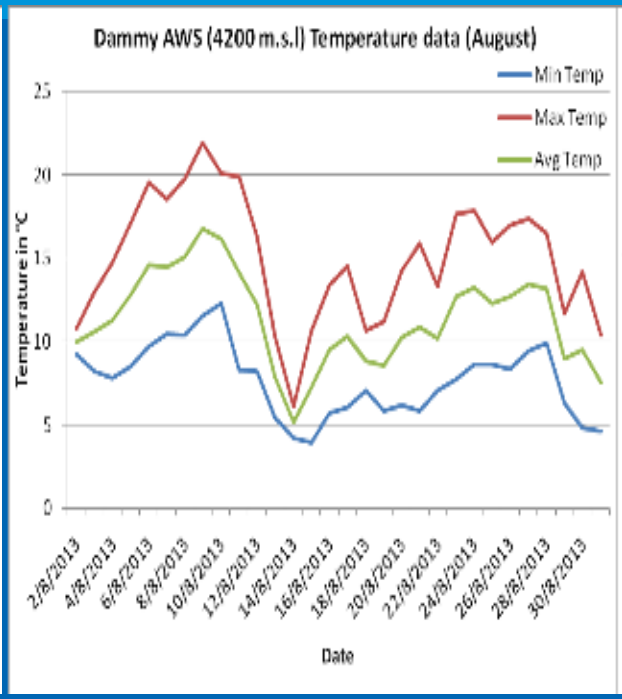


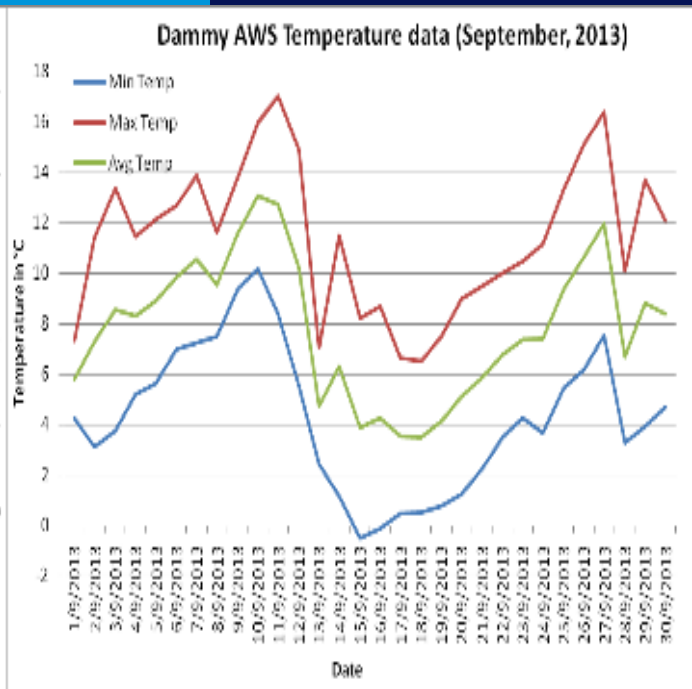


- Maximum range of temperatures at Dammy Chirah during summer 2014 is between 20-23°C.
- Maximum range of Discharge at Jalalabad during the same period is 100-120 $m^3$/sec.

# WAPDA
# (Hydromet Data sharing WG1)

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- WAPDA shared UIB Metadata with the WG-II
- Daily Discharge Data from the outlet of Hanza basin at Dainyour, covering period from 1966 to 2010, has been shared with Working Group –II .
- Daily Weather Data from all three Hunza Stations ( Khunjerab, Ziarat and Naltar) for period 1995 – 2012 has also been shared with Working Group -II
- Efforts are underway to share the rest of UIB Data with the ICIMOD Partners

# ITP – Hydrological Anaysis

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- 4% of the basin area is covered by glaciers
- Snow cover can reach to 80-85% of the basin area
- Therefore, more than 75% of the annual basin runoff depends on melt-water
- The overall calculated glacier change was -0.3% during 1973-2013 (within uncertainty limit)
- The glacier thickness changes during 2003 to 2008, estimated by use of the GLAS-ICESat laser altimetry data, also revealed stability or even a slightly growing trend in glacier thickness.
- Cooling in annual and summer mean temperatures during the years 1980 to 1995

Suhaib B.F., Zhang Y.S, Ma Y.Z., Guo H.F. Ma N., Hydrological regimes under the conjunction of westerly and monsoon climates-a case investigation in the Astore Basin, Northwestern Himalaya. *Climate Dynamics*, 10.1007/s00382-014-2409-9. (IF= 4.619)

# ITP -continuied

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- Slight warming during the 1996-2010 period.
- Annual, winter and summer precipitation, and annual mean discharge increased during the period 1980 to 1995 but, in the years from 1996 to 2010, a slight decrease in annual, winter and summer
- Stream flow fluctuations in the Astore River during the years 1980 to 2010 were predominantly influenced by variations in precipitation rather than the alteration in catchment temperatures
- Glacier fluctuation did not play major role

# ICIMOD and FutureWater
# Water availability scenario or upstream basins (IGBSM)

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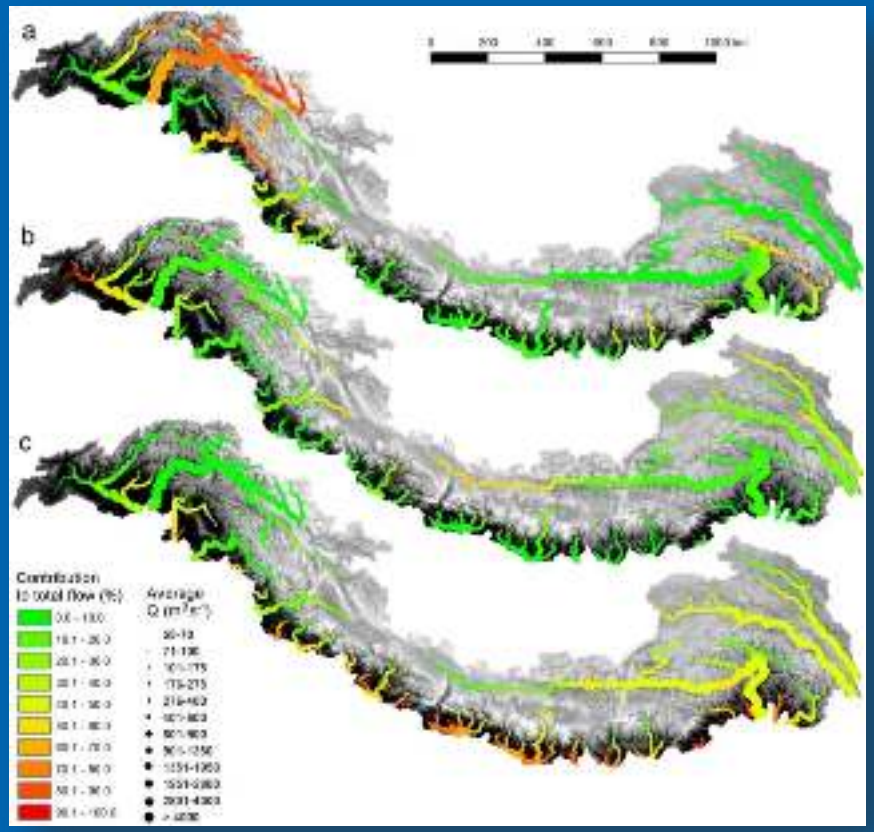


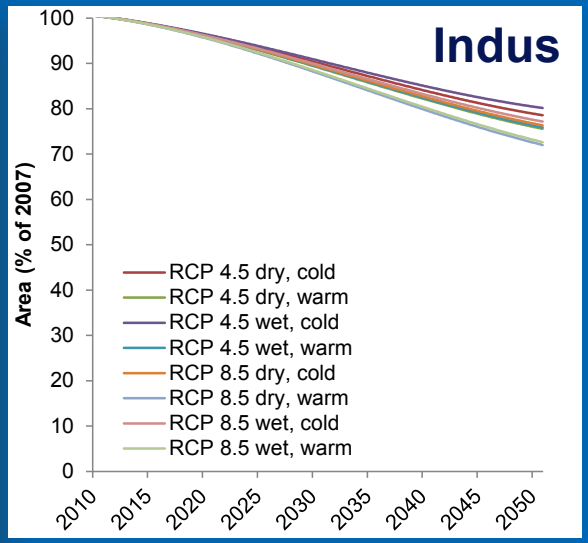


Lutz, A. F., W. W. Immerzeel, A. B. Shrestha, and M. F. P. Bierkens, 2014: Consistent increase in High Asia's runoff due to increasing glacier melt and precipitation. *Nature Climate Change 4, 587-592 doi:10.1038/nclimate2237*

# Changes in hydrological regime

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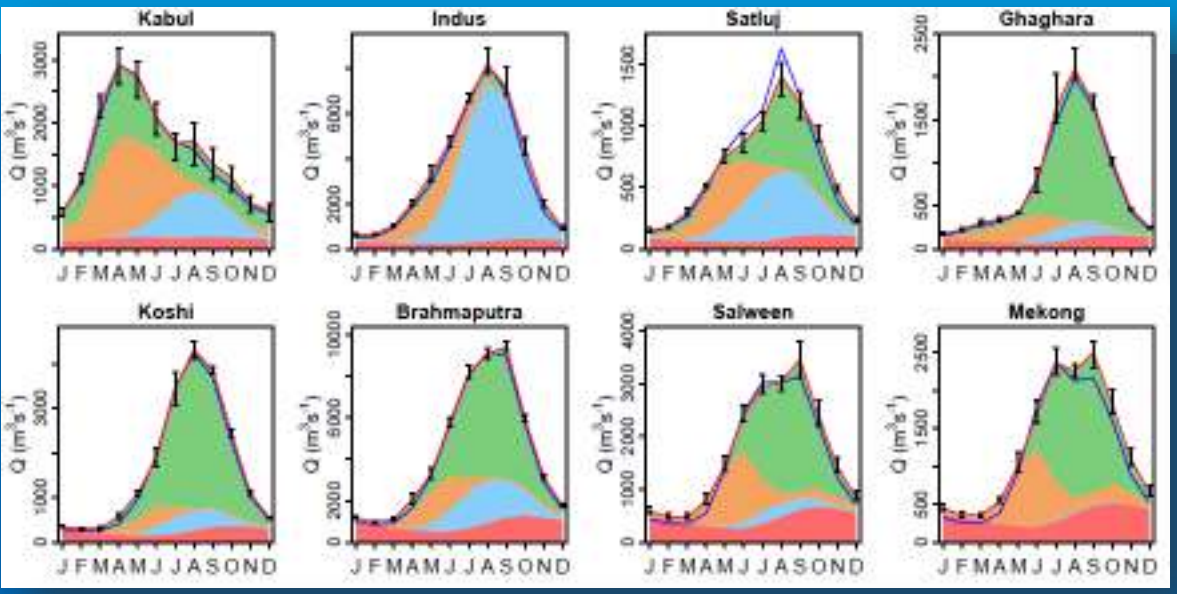
RCP4.5




Mean Q reference period (1998-2007)

Mean Q 2041-2050 (mean of 4 GCMs)

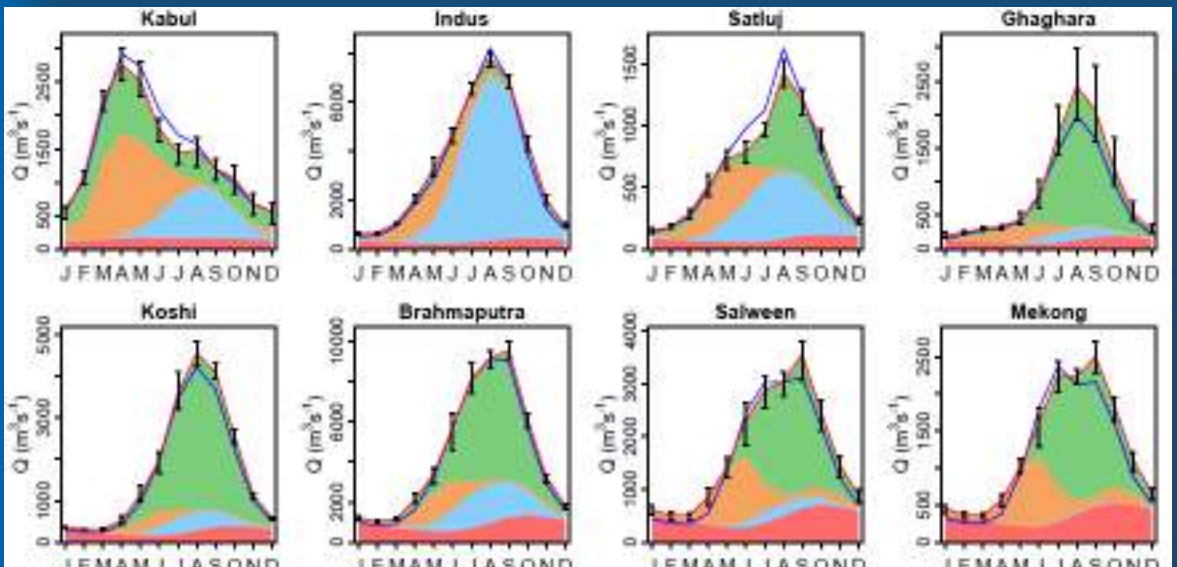
Rainfall-runoff

Glacier melt

Snow melt

Base flow

RCP8.5




No significant change in water availability

# ICIMOD-FutureWater-PMD-WAPDA

## Gridded Meteorological Datasets and Hydrological Modelling in the Upper Indus Basin

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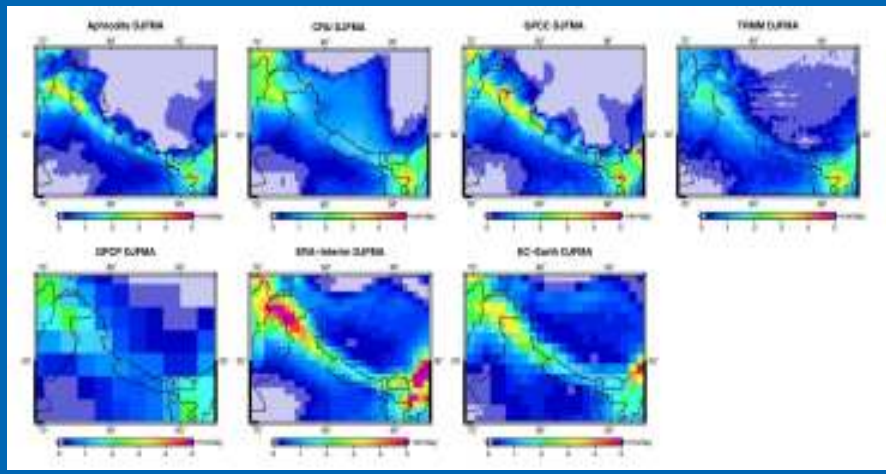
- To develop a high-quality meteorological forcing dataset (temperature and precipitation) for the UIB by merging existing gridded datasets and high-altitude climate observations.
- To improve the existing large-scale SPHY model and recalibrating the model with additional observations (geodetic mass balance, time series of river runoff, time series of reservoir inflow data).
- Test a new approach for statistical downscaling
- To use the recalibrated SPHY model to examine shifts in the basin hydrology under CMIP5 climate change scenarios.

# Improve historical climate datasets

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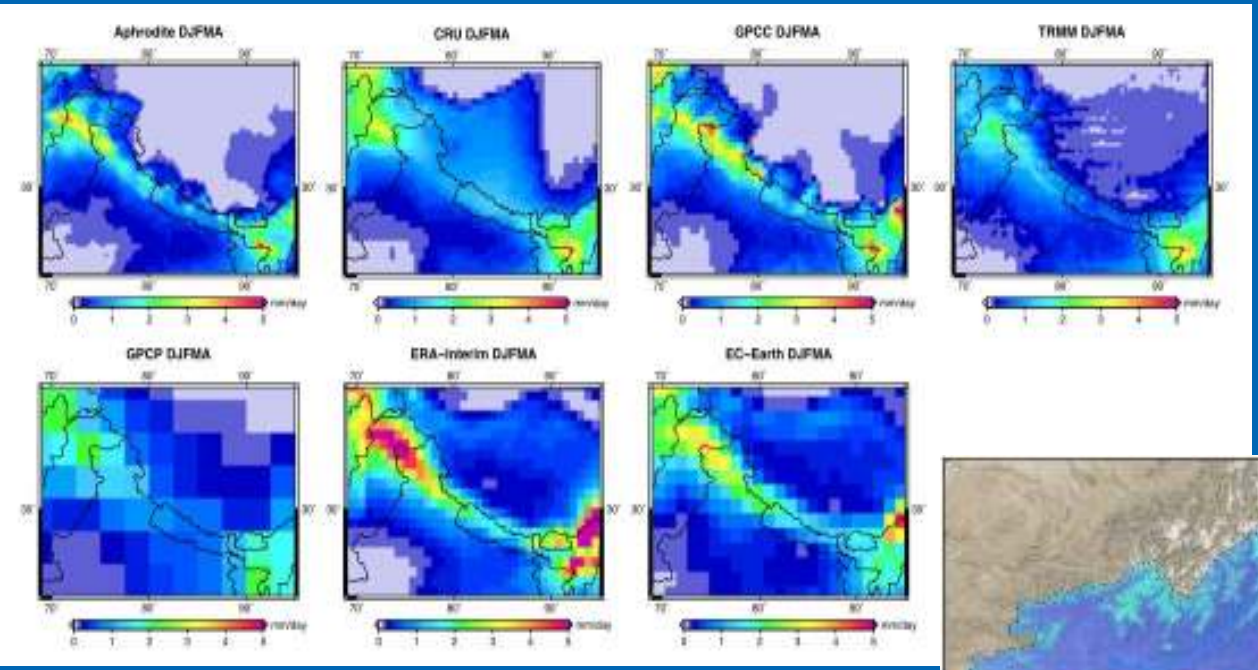


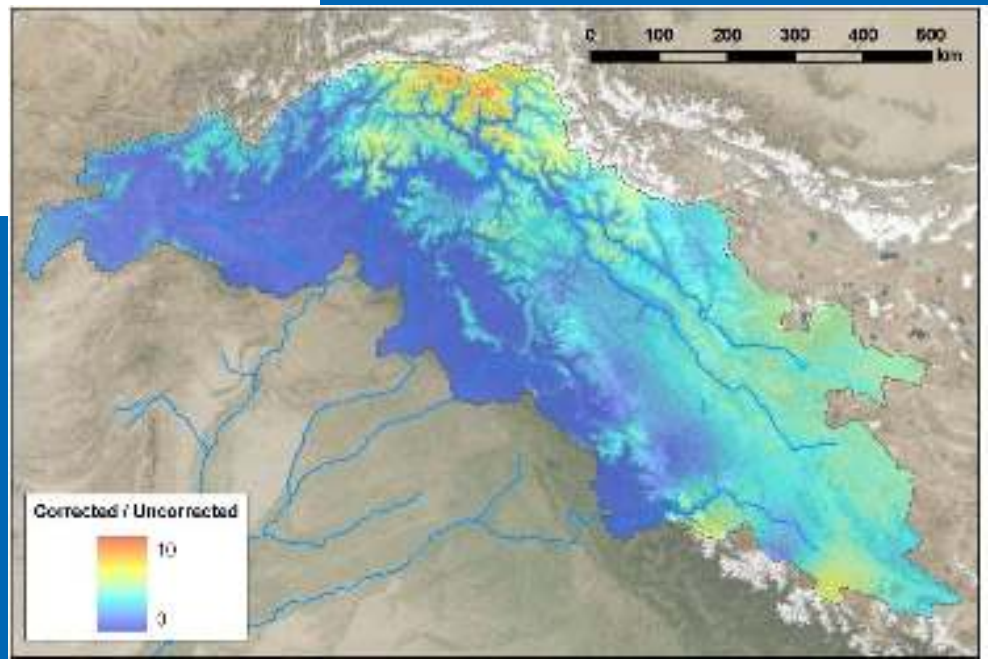

# Understanding the past

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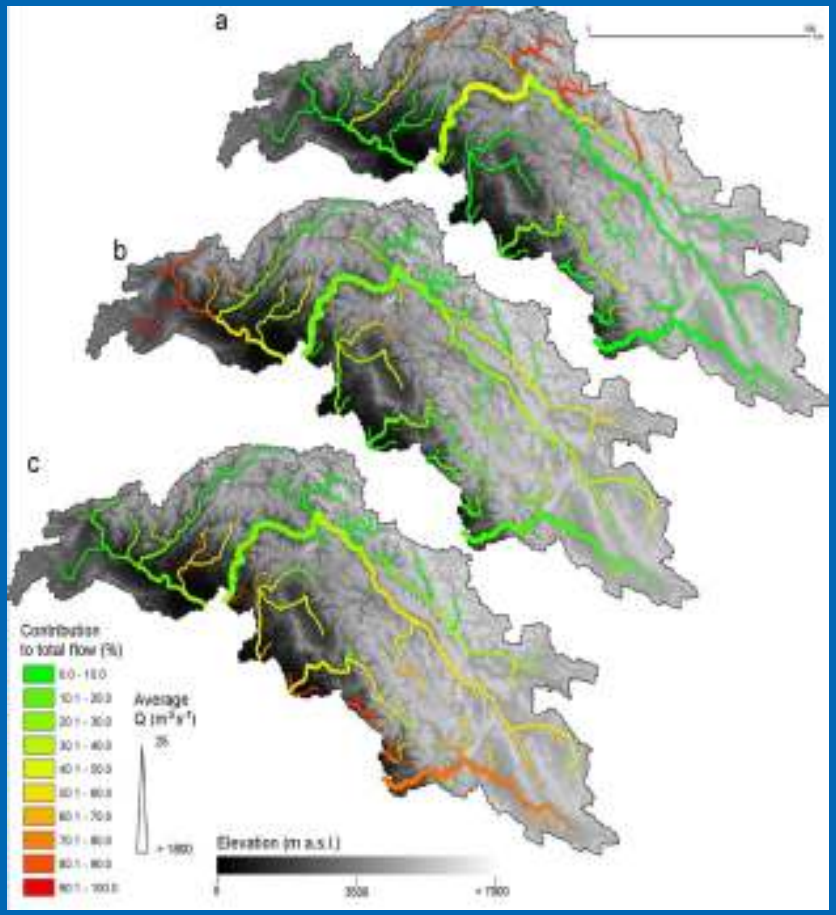


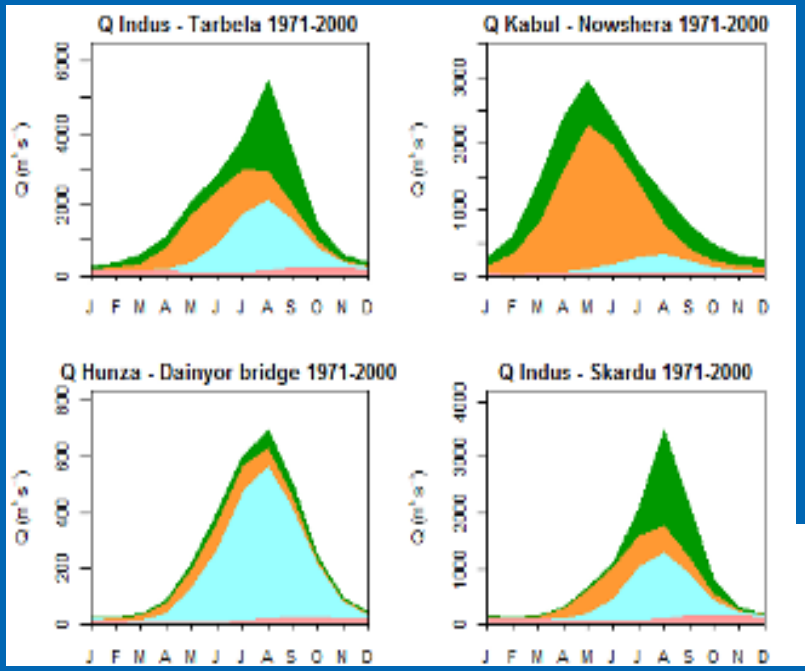


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# Future hydrological projections

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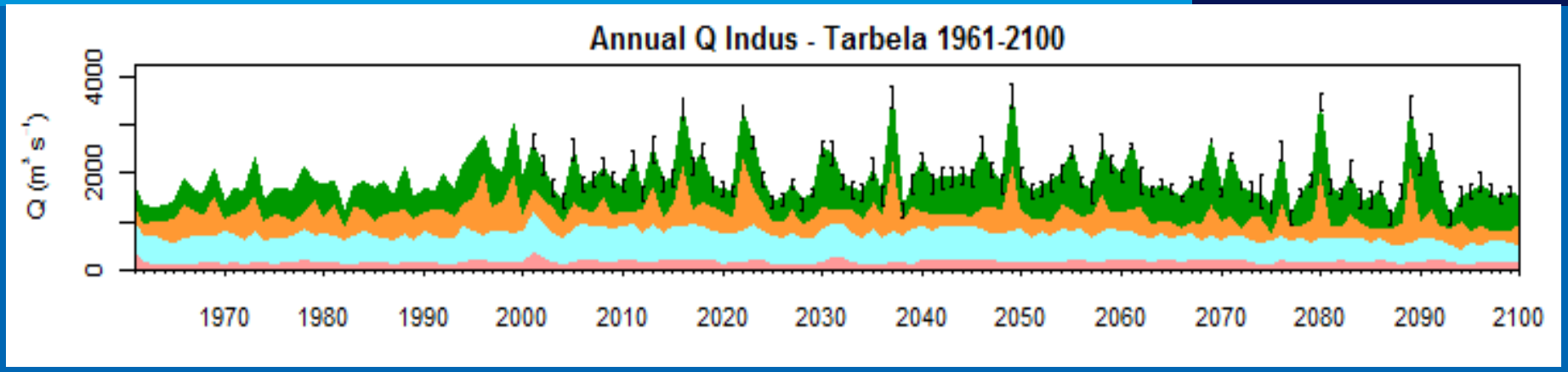


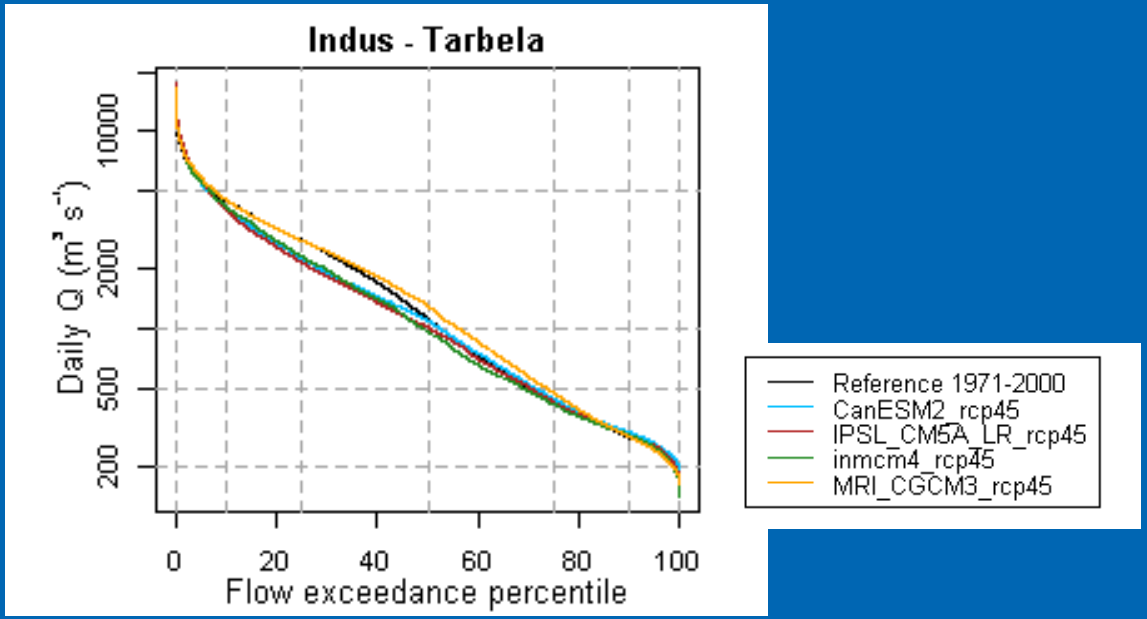

# Future hydrological projections

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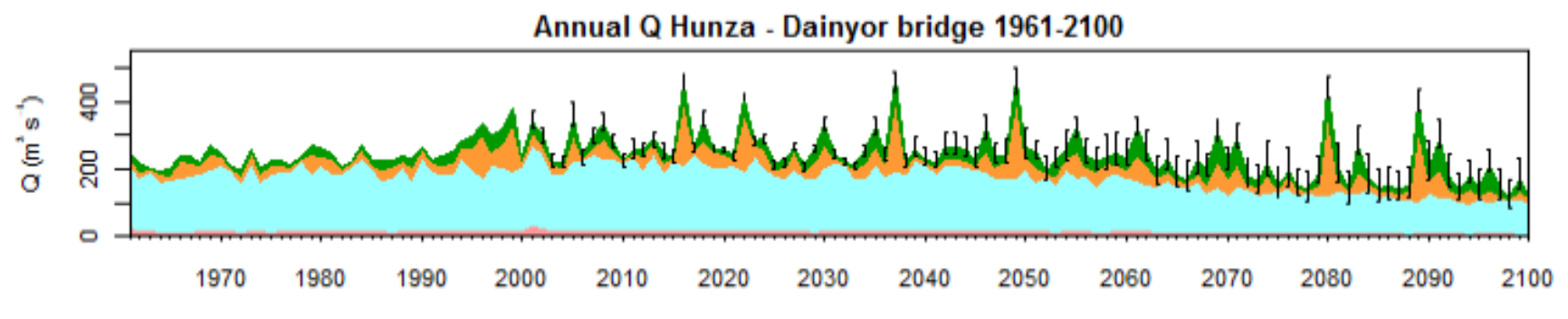


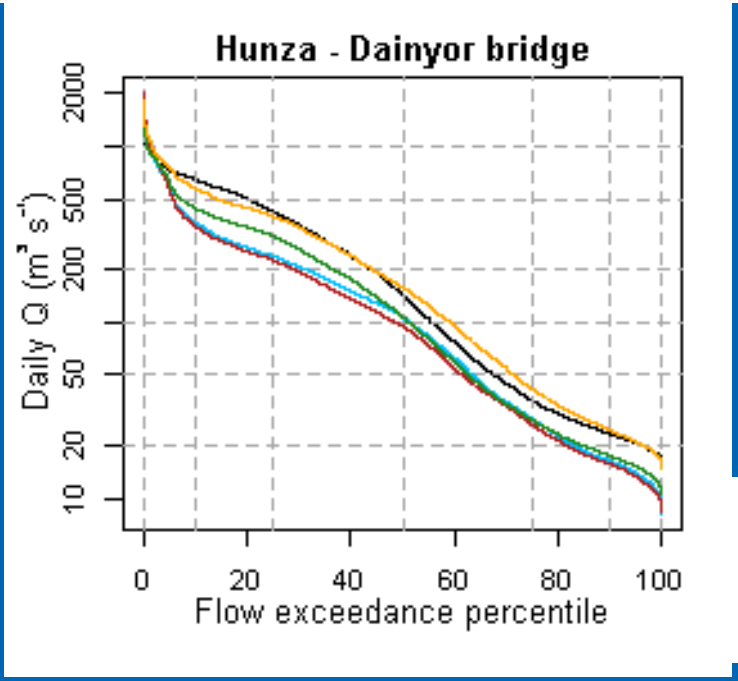


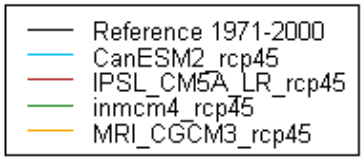

# Future plan

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- Improve hydromet monitoring of Simshal and Nagar valley
- Improve understanding of precip distribution
- More detailed hydrological scenario analysis including extreme events
- Link with downstream demand and use
- SPHY training in 2nd week of December

sphy

# Thank you

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THREE DECADES
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