Technical Working Group 3

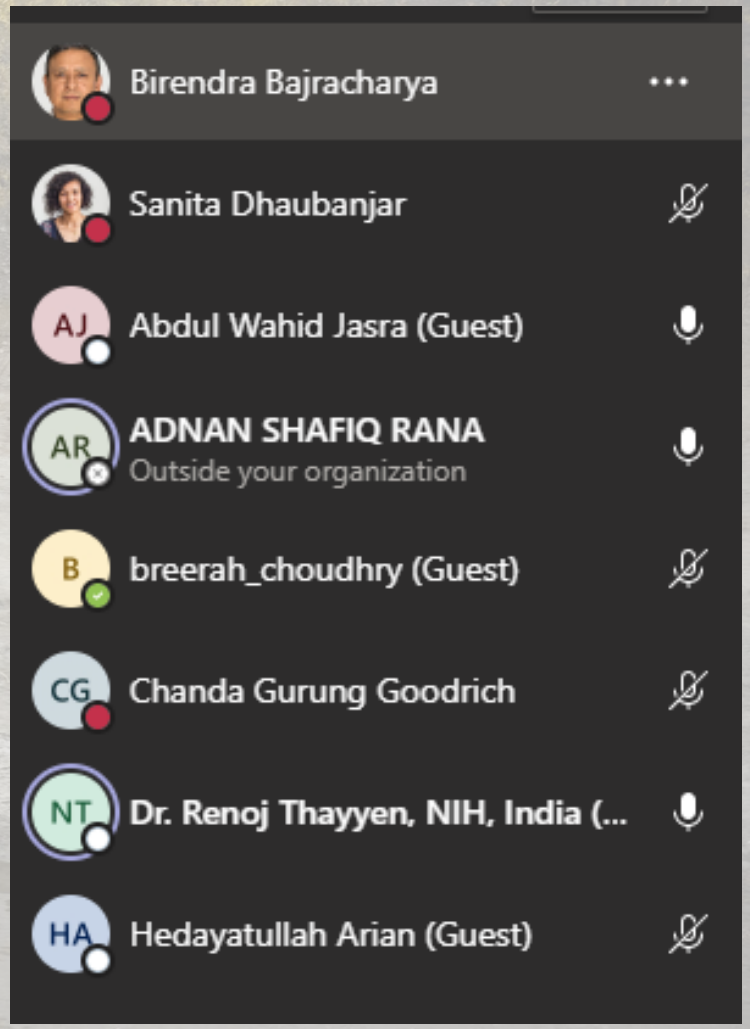
Cryosphere

Second Regional Upper Indus Basin Network Annual Meeting (RUAM)

27 January 2021

Group members

(missing inputs from China)



	Gaps across UIB
	Data gap on various cryospheric processes
	Estimates of mass balance, esp on large glaciers
	What does Karakorum anomaly mean
	Study of permafrost
	Impact of black carbon
	Impact of climate change on glacier and snow
	Combine local traditional knowledge with scientific knowledge
	Implications of anthropogenic activities on the cryosphere
	Need to document local knowledge
	Missing quantitative information on glacier and snow
	Need experts in meteorology, glaciology and remote sensing
	Lack of data collection and monitoring programs
	Forecasting of seasonal snow water equivalent to quantify water availability for WRM and disaster management
	Limited research in or research studies on cryosphere
	Need integrated studies looking at the whole HKH region
	Cryosphere-hydrology-society linkage need to be identified and addressed. (E.g. for livelihood linkages in Ladakh)
	Management and promotion of sustainable eco-tourism to minimize impact on cryosphere
	Who are winners and losers in the cryosphere-society nexus?
	Temperature and precipitation gradients
	Need to understand Climate-glacier-snow-permafrost feedbacks in the cryosphere

Potential bilateral/regional collaborative interventions

What are potential bilateral/regional collaborative interventions the group should focus on during the coming years?

- **Science-based partnerships** like the HUC forum and UIBN are good examples to bypass practical challenges
- Focus on **university-to-university bilateral collaboration**. Examples already exist in all country chapters
- Do **comparative studies to repeat an agreed method** by country chapters
    - This way orgs in different countries can still work independently but collaborate (e.g. Baltistan-Ladakh comparative study presented yesterday)
- Collaboration under **student thesis based research** would be good. e.g. AFG universities are teaching students the skills (technical and field data collection) but need for further student capacity building in conducting cryosphere research
- **Country-Country collaboration** where possible. E.g. India-Afg, Afg-Chn, Pak-Afg.

Potential capacity enhancement and offerings to other country chapters

What are the potential capacity enhancement and offerings to other country chapters?

All countries are working on strengthening cryosphere research. We should identify specific areas that some countries are focused on and share these specialized experiences across countries

Country	Seeking	Offering
Afghanistan	• Co-supervision of PhD, MSc studies • Capacity building in glaciology	• Students with skills in technical analysis and field data collection for cryosphere research
India		• Permafrost monitoring • Permafrost modelling • Snow cover duration estimation using ground T monitoring

Pakistan	• Institutional capacity building to:
	  • Gather data
	  • Use data in research
		• Lots of learning in GLOF management that can be shared
		• Community based monitoring experiences
		• Expertise in upscaling of community based techs:
		  • Hydraulic ramp pump + drip irrigation
		  • Climate and water smart livelihood opportunities that have been incorporated by GB govt, INGOs, even Pak govt.
		• Damming of glaciers (field based and remote-sensing based learnings)

Key TWG focus areas in the respective country chapters

What are the key focus areas for the TWG to consider in their respective country chapters plan?

Country	Key focus areas
Afghanistan	• Mass balance research • Snow cover modeling • Field data monitoring for glaciers, glacial lakes and snow • Implications of changes in glacial lake formations under climate change • Impact on livelihoods, irrigation water availability, hydropower downstream • Management of GLOFs and minimizing their risks and impacts
Pakistan	• Study of permafrost, black carbon and Karakorum anomaly phase and their implications for Pakistan • Water demand scenarios *(cross cutting)* • Dynamics of snowmelt and springs, their implications for water supply • Need to integrated management of glaciers, snow and rivers • Harvesting of Glacial lake waters for irrigation • Set up cryospheric interaction group for local researchers

India	• Monitoring of glaciers and mass-balance research on glacial shrinkage
	• Ground-surface temperature monitoring for snow duration estimation
	  • Study of implications for springs and ground water
	• Establish precipitation and temperature gradient (e.g. very high in Ladhak) to better capture diversity in climatological regimes in the UIB
	  • Use this to improve hydro-climatic modeling in the UIB
	• Extension of permafrost study in whole of UIB
	• Investigate the extent of elevation-dependent warming in the UIB to understand Karakorum anomaly
	• Capacity building on permafrost monitoring and modeling


Thank you