

# First Upper Indus Basin Network– India Chapter (UIBN–IC) Workshop



# About ICIMOD

The International Centre for Integrated Mountain Development (ICIMOD) is a regional knowledge development and learning centre serving the eight regional member countries of the Hindu Kush Himalaya (HKH) – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan – based in Kathmandu, Nepal. Globalization and climate change have an increasing influence on the stability of fragile mountain ecosystems and the livelihoods of mountain people. ICIMOD aims to assist mountain people to understand these changes, adapt to them, and make the most of new opportunities, while addressing upstream and downstream issues. ICIMOD supports regional transboundary programmes through partnerships with regional partner institutions, facilitates the exchange of experiences, and serves as a regional knowledge hub. We strengthen networking among regional and global centres of excellence. Overall, we are working to develop economically and environmentally-sound mountain ecosystems to improve the living standards of mountain populations and to sustain vital ecosystem services for the billions of people living downstream – now and in the future.



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# First Upper Indus Basin Network– India Chapter (UIBN–IC) Workshop

18–19 April 2019 | New Delhi, India

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# Executive Summary

Formed with the goal of making strategic contributions to the Upper Indus Basin Network (UIBN), the UIBN–India Chapter (IC) has called on experts in the physical and social sciences to reduce the gap in data on the Indus basin region of India.

The first UIBN–IC workshop comprised a day-long event during which participants discussed ongoing research on regional extremes, glacial monitoring, impact on ecosystems and the pressing issues of data management and biophysical changes, followed by an exploration of existing knowledge and related gaps in Upper Indus Basin (UIB) research.

The Indus Basin Initiative (IBI) and Jawaharlal Nehru University (JNU) organized the workshop in New Delhi, India from 18 to 19 April 2019. The first day saw participants come together in a series of pre-event meetings. The workshop was organized with support from the Department of Foreign Affairs and Trade (DFAT), Government of Australia, and the Swiss Agency for Development and Cooperation (SDC). The workshop, which revolved around the functioning and governance structure of the India chapter, also focused on:

- Formation and governance of the UIBN–IC in line with the UIB-N’s governance framework
- Strategic discussion on the UIBN–IC’s future and its functioning
- Share knowledge related to climate, cryosphere, water, and livelihood in the UIB
- Develop a work plan for the UIBN–IC

# Introduction: Pathways for the Indus basin

Although India's dependence on the Indus basin is overshadowed by Pakistan's owing to the huge contribution of the river to Pakistan's agricultural sector, the headwaters of many important tributaries of the Indus River originate in India. As Arun Bhakta Shrestha, ICIMOD, noted in his opening remarks, the region faces the risks of floods, glacial lake outburst floods, black carbon, and erosion, among other significant biophysical changes. Of the 215 million inhabitants that call the Indus basin their home, significant numbers live in the densely populated areas of the Indian and Pakistani portions of the basin. Furthermore, of the 440,000 km<sup>2</sup> (FAO, 2011) that the Indus basin covers in India, a significant portion lies in the six states of Chandigarh, Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, and Rajasthan. Some of these states, considered the "bread baskets" of the country, significantly contribute to the gross domestic product (GDP) through the agricultural sector (National Informatics Centre, 2018). These regions may face critical challenges in water availability due to the variability of climatic conditions in the near future. Along with projected changes in the food and water sector, population distribution within the basin is also expected to change. A significant shift has been observed in population densities as people shift to urban centres in the mountainous states of the Indus basin. This raises important questions regarding resource distribution and the impact of urbanization on natural water bodies.

Moving forward, the UIBN India Chapter is well positioned to contribute to the emerging trend of flagship research in the Hindu Kush Himalaya (HKH). In the chapter on pathways to prosperity, the Hindu Kush Himalayan Assessment report states that there are "diverging views among scientists, experts, and decision makers on how the HKH may prosper" (Wester et. al, pg. 117). Situating this understanding in the Indus basin, it is essential to address such diverging viewpoints, as the countries of the Indus basin would adopt adaptation pathways best suited to country specific needs. However, "actual effectiveness of the pathways will depend on...social acceptance, political agreements, and investment decisions" (Ibid).



# Addressing deficiencies: From data gaps to ecological concerns



A.P. Dimri

The key concern of many participants at the inception workshop was data deficiency. As A.P. Dimri of JNU said in his opening address, data deficiency would further influence how research would be conducted in the region – was it possible then for participants to identify synergistic opportunities in ongoing and emerging research areas? As Dimri further explained, the UIBN can effectively act as a networking platform where researchers can congregate to map out existing strategies that contribute to the vision of the UIBN.

## Modelling of variabilities and extremes

The first session introduced ongoing research work in the UIBN and familiarized participants with a wide range of issues that experts negotiate over while conducting research in the basin. For example, modelling of extreme weather events would give early insight into the kinds of biophysical anomalies the basin could face. However Saurabh Bhardwaj (TERI) noted in his presentation that using global circulation models (GCMs) is ineffective as it is unable to capture observed precipitation figures for the Western Himalayan region. Seconded by Ashwini Kulkarni (IITM, Pune) in a latter presentation, the viewpoint was that there is a lot of uncertainty in model simulations. Rather the focus should be on selecting ‘bias-corrected’ models – this came with a cautionary note that due to the complex physiography of the basin, climate projections should be used with discretion. These variations also exist in the ongoing work on glacial mass balance – findings from the Chandra basin by the National Centre for Polar & Ocean Research (NCPOR) show that glaciers have experienced both positive and negative mass balance. However, there is consensus that an overwhelming number of glaciers have receded; the Geological Survey of India has noted that of the 9,575 Himalayan glaciers in India (Khandekar, 2015), 94.9% are under retreat. Some of these studies – for example, in the Upper Alaknanda basin – focus on glaciers that occur in the monsoon-dominated region. As the group noted, due to the region facing increased variability in precipitation, long-term monitoring of glacier thickness and movement is an essential area of research.

## Interactions at scale

The interlinked nature of resulting impacts on the cryosphere has lasting impacts on the landscape of the region. Communities that live in these landscapes are dependent on ecosystems, which are an integral component of the vulnerabilities that need to be studied. An assessment of the Asian highlands states that the region’s “vast scale, extreme topography, ecological diversity and resulting complex climatic conditions” (Xu & Grumbine, 2014) are bound to have staggered impacts on the adjoining areas. Furthermore, changing population patterns and an increasing propensity for dense urban centres developing across the HKH is also of concern. With respect to the Indian Himalaya, “the spatial pattern of urbanization has transformed during the last three decades as the process of urbanization extended from the mid-slopes and ridges to higher elevations and down to the valleys” (Tiwari, Tiwari & Joshi, 2018). Some studies – such as one conducted by the G.B. Pant National Institute of Himalayan Environment and Sustainable Development, which was presented at the event – have looked at interactions between eco-hydro-climatological processes to understand the impacts of climate change on forest ecosystems.. This concern also spreads to water bodies, where low to medium altitude lakes are under anthropogenic stress. Humaira Qadri spoke to participants about the build-up of nutrient levels in Dal Lake. Dal Lake, like many other lentic systems, is a source of livelihood for a number of communities. Nutrient buildup also encourages the spread of certain plants that some consider biological invaders (Ahad et. al, 2012). Such “weeds” could potentially be used as bio-fertilizer for crops, but this requires concerted efforts in research and outreach. More information on presentations in the first session can be found in the annex.

# Prioritizing research areas: Applied research

## Collaborative exercises are key

The UIBN is rooted in the belief that research should ultimately be of value to communities in the research area. More specifically, how can research findings be disseminated to be of use for the 215 million inhabitants of the Indus basin? In research published by the University of Oregon, trustworthiness, usability, accessibility and lack of quality are raised as issues related to research-practice gap (Carnine, 1997). Contextualized for the UIBN-IC, these issues could serve as core principles guiding the work plans of the thematic working groups (TWGs). In the following session, participants discussed these principles thematically and key concepts that would guide each of the working groups in their respective research domains.

Institutional and financial factors greatly determine data access and shareability. Data access has hampered research on climate change in the Indus basin and other mountain regions. A key factor in adaptive decision making in such circumstances is capacity building where, “international programs can play a critical role, but local authorities need also to be convinced to invest into such long-term high-effort-needed activities” (Salzmann et. al., 2014). Participants raised this concern while discussing the development of hydropower projects at the Chenab River. As members rightly pointed out, projections indicate that increased melting of glacial cover would also lead to an increase in sediment load. Therefore, long-term hydropower projects with operational lifespans of 50 years and more would face damage due to increased sedimentation. The UIBN-IC could directly help enhance understanding of resource management and provide strategic support to government entities like the National Hydroelectric Power Corporation. Here the focus could be two-fold: a. supporting work on differentiating between large hydroelectric projects and smaller run-of-the-river schemes; and b. sustainability of hydro projects affected by environmental impacts versus sustainability of dams and their impact on the environment.



Linked to sustainability, Meeta Mehra urged others to link research activities to the sustainable development goals (SDGs). Along with changes in biophysical factors, the urbanization of certain regions in the Himalaya can be attributed to, “many ‘rural-push’ and ‘urban pull’ factors” (Banskota, 2000), including infrastructure, education, and easier access to basic services. Furthermore, referred in certain studies as a ‘megatrend’, urbanization is mostly “unplanned” and “proceeding at a rapid pace in the HKH” (Mukherji et al., 2018). This has led to the growth of particular urban centres in the HKH as tourist hubs. These hubs have been embraced as centres of growth where local economies can look for diverse opportunities to tap into potential consumers. However, as participants pointed out, tourism related activities in Ladakh, for example, are having an adverse impact. For example, waste dumping on trekking trails and off-road driving pose a threat to the wetlands and water resources in the region. As can be expected, in the rush to cater to demands created by tourism, “[h]otels and other tourist infrastructures are encroaching (sic) the agricultural land in middle and upper Leh” (Geneletti & Dawa, 2009).

Chanda Gurung Goodrich emphasized the need to identify the critical gaps in understanding these various social dimensions including the ones on gender. Mehra added that studying these impacts would give greater insight into vulnerabilities faced in the region, especially by women, and their interrelated impacts on health, well-being, decision making and access to resources. A cross-sectional analysis of the town of Ladakh would also then examine the various socio-economic dimensions while relating the study to SDGs such as SDG 13 on climate action. In the following sessions, the TWG leads identified key research areas and each of the TWGs presented its indicative work plan.

## Focus of thematic working groups (TWGs)

**TWG 1:** Framework of data collection, quality and standardization

**Lead:** G. Jeelani

**Co-lead:** P.G. Jose

**Key areas:** As identified in discussions by the first technical group, there were primarily three areas of concern: knowledge gaps, prioritization of research topics and identifying potential research activities.

With respect to knowledge gaps, the group identified a lack of short-term and long-term stream flow data, data on water quality and most importantly gender disaggregated data. There were concerns raised about the quality of existing data as well as current practices including the use of different methodologies. To overcome this, certain research topics were prioritized, e.g., data generation using automated equipment and through standardization of a data collection framework. A special focus would be put on studying impacts of the cryosphere on human settlements.

**Output:** Technical reports and research papers on climate change impact on water resources and resulting impacts on vulnerable groups in the UIB.

**Integration:** As data sharing is key to driving research activities forward, WG1 will be interacting with all groups.



**Lead:** G. Jeelani

**Co-lead:** P.G. Jose

**TWG 2:** Climate change, air pollution variability and black carbon

**Lead:** A. Kulkarni

**Co-lead:** F. A. Lone

**Key areas:** The knowledge gaps identified focused on long-term regional climate variability, datasets of air pollutant sources, and black carbon concentration in the cryosphere. Group members prioritized research topics such as the development of extreme climate profiles, sensitivity of land-use-land-cover-change to future warming, and impact of air pollution and climate change on biodiversity, agriculture and human health.



**Lead:** A. Kulkarni

**Co-lead:** F.A. Lone

**Output:** Collection, collation and synthesis of available climate data, along with a review report on air pollution impact on biodiversity and human health. Furthermore, a status paper will also be developed.

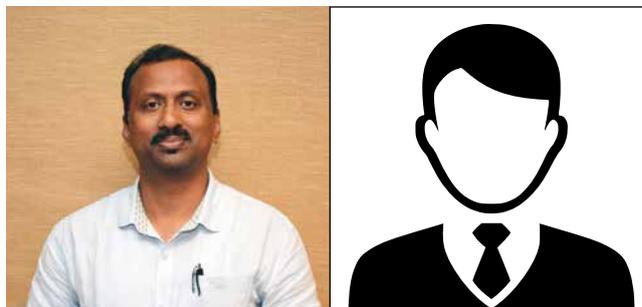
**Integration:** As suggested, integration will take place across all TWGs; participants also suggested setting up a data and knowledge sharing platform. Keeping in mind the crosscutting nature of gender, efforts will be made to ensure that women and men get equal opportunities in research activities.

**TWG 3:** Cryosphere monitoring and modelling

**Lead:** R. J. Thayyen

**Co-lead:** R. Kumar

The group identified knowledge gaps on snow dynamics, permafrost, linkages between precipitation and orography, and sediment load characterization. As suggested by group members, a two-year-long snow cover dynamics study is planned. Furthermore, group members suggested widening the scope of the research to include socio-economic objectives.



**Lead:** R.J. Thayyen

**Co-lead:** R. Kumar

**Output:** Besides publishing papers on the status of the cryosphere in the Indian UIB, TWG 3 will also focus on studying cryospheric changes and their impacts on water use.

**Integration:** Support is needed from TWG 3, 4 and 6

**TWG 4:** Surface and groundwater hydrology and water availability and demand

**Lead:** A. K. Pandey

**Co-lead:** D. S. Arya

The group identified data gaps on precipitation, temperature, spatial variability of snow and glacial melt, among other areas. However, a key shortcoming the group identified is the lack of gender disaggregated data. Along with an assessment of surface water quality and pollution monitoring of lakes in the UIBN, streamflow estimation and characterization, and health impacts would also be of priority.



**Lead:** A.K. Pandey

**Co-lead:** D.S. Arya

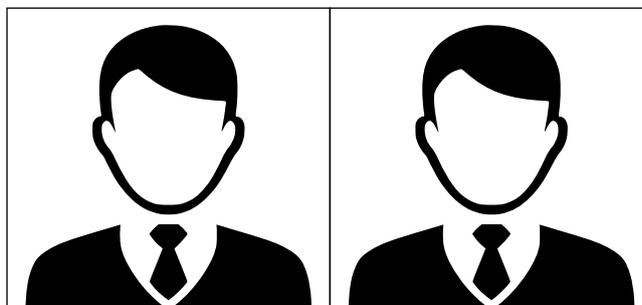
**Output:** A status report on surface and groundwater availability to be prepared along with a review paper on the same topic.

**Integration:** With TWG 1 and 2 for climate data, TWG 3 for glacial data, and TWG 6 for socioeconomic data

**TWG 5:** Understanding and managing hazards and risks

**Lead:** S. Mal

**Co-lead:** To be confirmed



**Lead:** S. Mal

**Co-lead:** TBC

**TWG 6:** Managing gendered socioeconomic impacts through adaptation measures

**Lead:** M. K. Mehra

**Co-lead:** S. Babu

Focus would be on gender vulnerability with respect to longstanding issues of climate induced nutritional security, human migration, and interdependence of communities and ecology that are focused on variable weather patterns, hazards and their impacts on human wellbeing. Data availability and gaps would be assessed based on secondary data from NSSO and India Human Development Survey as well as primary data gathered from household surveys.



**Lead:** M.K. Mehra

**Co-lead:** S. Babu

**Output:** The group aims to analyze available data and produce a report by September 2019; data will be stratified based on factors such as rural, urban, riverbed area, hill area, etc.

**Integration:** among all working groups

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Concept Note

# First Upper Indus Basin Network India Chapter (UIBN-IC) Workshop

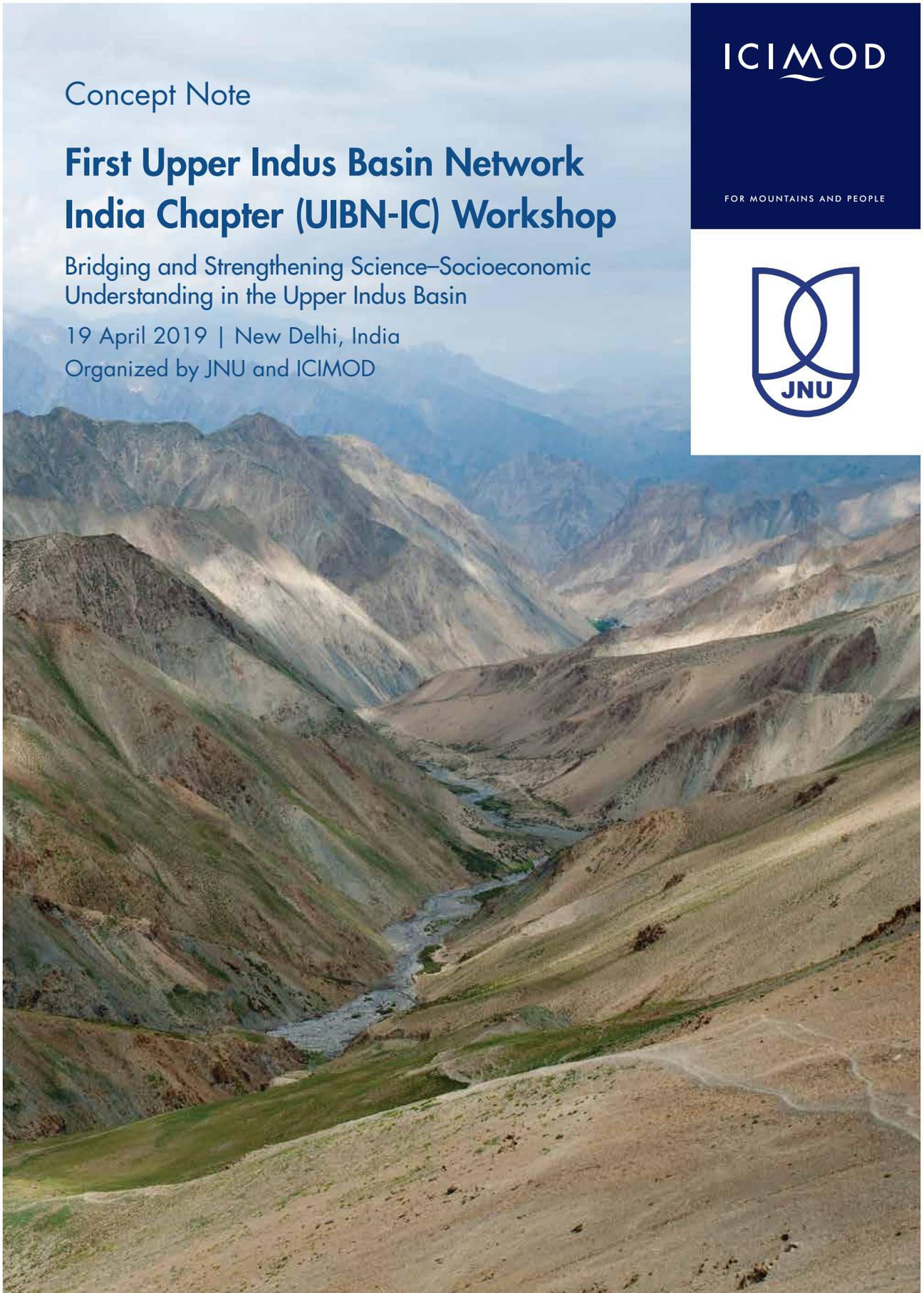
Bridging and Strengthening Science–Socioeconomic  
Understanding in the Upper Indus Basin

19 April 2019 | New Delhi, India

Organized by JNU and ICIMOD

ICIMOD

FOR MOUNTAINS AND PEOPLE



## BACKGROUND

The Upper Indus Basin Network (UIB-N) is a voluntary and informal knowledge and research network of national and international researchers working in the Indus basin. It aims to foster coordination and collaboration among organizations working in the Upper Indus Basin (UIB) for improved understanding of present and future water availability, demand, and hazards and to develop gender-sensitive solutions for all the stakeholders. Under the aegis of the International Centre for Integrated Mountain Development (ICIMOD), Nepal, the UIBN covers the Indus basin areas of Afghanistan, China, India, and Pakistan. Given climate change and related global, regional, and local impacts, this basin, which comprises distinct riparian regions, faces various issues such as water stress and declining agricultural productivity.

The UIB-N consists of six Technical Working Groups (TWGs) under country chapters. The Upper Indus Basin Network India Chapter (UIBN-IC) aims to promote collaboration among government and non-government institutions, academia, and the private sector to understand issues related to climate change, water availability, disasters, and sustainable development. This collaborative platform will provide an understanding of cross-cutting concerns and regional challenges and foster coordination among researchers working in the UIB region.

The six TWGs are as follows:

Number	TWG
Group 1	Framework of data collection, quality, and standardization
Group 2	Climate change, air pollution variability, and black carbon
Group 3	Cryosphere monitoring and modelling
Group 4	Surface and groundwater hydrology and water availability and demand
Group 5	Understanding and managing hazards and risks
Group 6	Managing gendered socioeconomic impacts through adaptation measures

## WORKSHOP OBJECTIVES

Jawaharlal Nehru University (JNU) and ICIMOD are organizing the first UIBN-IC workshop in New Delhi, India. This workshop's main objective is to discuss and formalize the UIBN-IC, its functioning and its governance structure. The workshop's specific objectives are as follows:

- Formation and governance of the UIBN-IC in line with the UIB-N governance framework
- Strategic discussion for the future of UIBN-IC and its functioning
- Share knowledge related to climate, cryosphere, water, and livelihood in the UIB
- Develop a work plan for the UIBN-IC

## TENTATIVE AGENDA

Time	Programme	Facilitator
9:00–9:30	Registration	<i>A. Shakya</i>
	<b>Rapporteurs: TBD</b>	
9:30–10:00	<b>Opening Session</b> <ul style="list-style-type: none"> <li>• Briefing on objectives of the meeting – <i>Prof. A. P. Dimri, Co-Coordinator, UIBN-IC</i></li> <li>• Presentation on the UIB-N’s governance framework – <i>Dr A. B. Shrestha, Regional Programme Manager, River Basins and Cryosphere, ICIMOD</i></li> <li>• Remarks by Government of India representative (TBC)</li> </ul>	<i>Dr F. A. Shaheen</i>
10:00–10:30	<b>Tea Break and Group Photograph</b>	
10:30–12:10	<b>Session 1: Presentations on UIB Research</b> (10 minutes each followed by 30 minute discussions) <ul style="list-style-type: none"> <li>• Modelling regional extremes for better preparedness – <i>S. Bhardwaj</i></li> <li>• Glacier monitoring in the Indus basin – <i>A. L. Ramanathan</i></li> <li>• Glaciological studies in the Upper Alaknanda basin, Central Himalaya: Present and future activities – <i>H. C. Nainwal</i></li> <li>• Himalayan Cryospheric Observations and Modelling – NCPOR initiatives – <i>T. Meloth</i></li> <li>• Mass balance status of the Chandra basin in the last two decades – <i>P. Sharma</i></li> <li>• Scale interaction between ecosystem carbon exchange and micro-meteorological parameters of a Central Himalayan pine-dominated forest – <i>S. Mukherjee</i></li> <li>• Monitoring of hydrology, pollution stress, and remediation in the surface waters of the Indus basin – <i>H. Qadri</i></li> </ul>	<i>Dr F. A. Shaheen</i>
12:10–13:10	<b>Lunch Break</b>	

13:10–14:40	<p><b>Session 2: Technical Presentation by TWGs on Existing Knowledge and Related Gaps</b> (10 min each followed by 20 min discussion)</p> <ul style="list-style-type: none"> <li>• TWG 1: Application of water isotopes in assessing water resources in the UIB – <i>G. Jeelani</i></li> <li>• TWG 2: Climate variability and change over the India region of the UIB – <i>A. Kulkarni</i></li> <li>• TWG 3: Climate change and its impact on agriculture in the north-western Himalaya of the UIB – <i>F. A. Lone</i></li> <li>• TWG 3: Status of cryospheric research in the UIB – <i>R. Thayyen</i></li> <li>• TWG 4: Geomorphology of the UIB – the reservoir of surface and groundwater – <i>A. K. Pandey</i></li> <li>• TWG 5: <i>TBD</i></li> <li>• TWG 6: Gendered socioeconomic impacts of climate change: A case study of Ladakh – <i>M. K. Mehra</i></li> </ul>	<i>Prof. A. P. Dimri</i> , Group Lead, and Co-Leads
14:40–15:00	<b>Tea Break</b>	
15:00–17:00	<p><b>Session 3: TWG Plan of Action</b></p> <ul style="list-style-type: none"> <li>• Overview of the UIB-N by <i>Dr F. A. Shaheen</i> (10 min) <ul style="list-style-type: none"> <li>i. Break-out group discussion (80 min) <ul style="list-style-type: none"> <li>– Formation of the TWGs on the basis of members’ interests and expertise</li> <li>– TWG action plan by each TWG</li> </ul> </li> <li>ii. Presentation of the TWG plans (30 min)</li> </ul> </li> </ul>	<i>Dr A. B. Shrestha</i>
17:00–17:30	<p><b>Closing Session</b></p> <ul style="list-style-type: none"> <li>• Recap of the key decisions and action points of the day and decision on the next meeting date and venue</li> <li>• Closing remarks</li> <li>• Vote of thanks</li> </ul>	<i>Dr F. A. Shaheen</i>
19:00 onwards	<b>Dinner</b>	

## UPPER INDUS BASIN NETWORK INDIA CHAPTER (UIBN-IC)

### Regional Strategic Committee Members:

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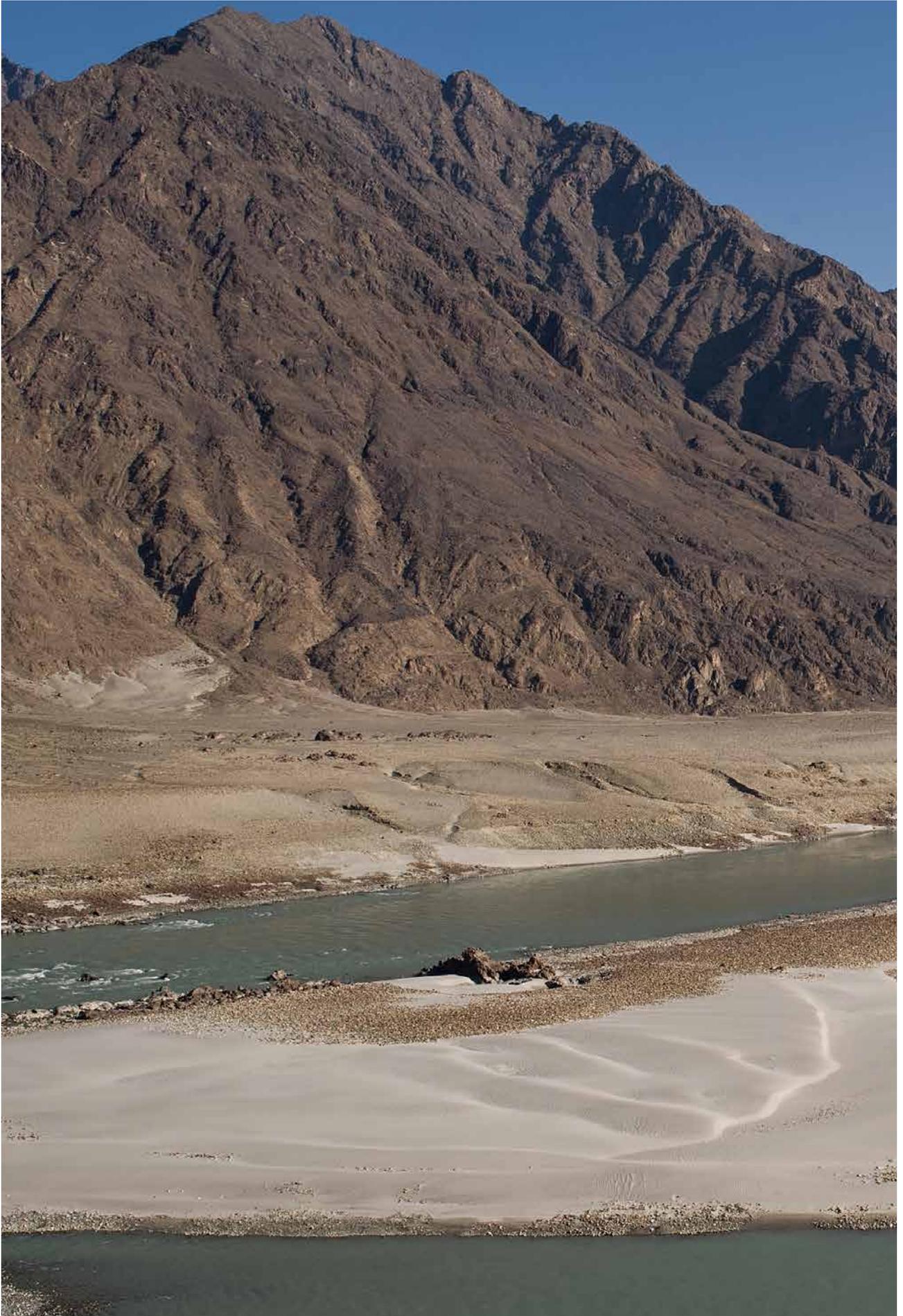
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### Technical Working Groups (TWGs)

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