MEET OF THE MOUNTAIN STATES

REPORT

WATER RESOURCES IN THE HIMALAYA-DISASTER RESILIENCE AND REDUCTION

MARCH 22, 2024

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DIKILA BHUTIA

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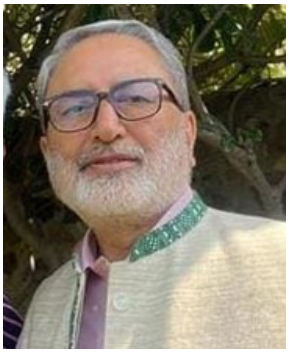
MESSAGE FROM THE PRESIDENT

- **MR RAMESH NEGI**
  PRESIDENT, IMI



The Meet of the Mountain States was organised on 22nd March 2024 in New Delhi on the theme, "Water Resources of the Himalaya – Disaster Resilience and Reduction". The MoMS24 was timely with the backdrop of increasing spate of water-based disasters in the Indian Himalayan Region with anthropogenic activities and climate change being major contributing factors.

The MoMS2024 served to remind us that the Himalaya is a multi hazard landscape with a complex interplay of events across timelines and ecosystems that need to be understood beyond single disaster events and relief and rehabilitation only.

At the MoMS2024, a wide range of stakeholders including the elected representatives across the Indian Himalayan Region as well as key policy makers, academia and civil society highlighted the urgent need to look at disasters in the Himalaya through the lens of water and sustainable development in an interdisciplinary manner at interstate/and also transboundary landscape levels. This discussion was held in the backdrop of the disasters in 2023 in Himachal, Uttarakhand, Sikkim, Darjeeling and Kalimpong. The discussions also called upon the need for acknowledgement of the gravity of disasters in the Himalaya to have sensitive policies, practices, appropriate resource allocation and rigorous monitoring.

Even as the monsoon approached the sub-continent this year in the month of May, a spate of disasters have hit Mizoram, Manipur and Assam. The rains have also aggravated the River Teesta and adversely affected all the relief and rehabilitation work from the GLOF of 2023 bringing in fresh disasters and a fear for the rest of the monsoon. This has led to the MP from Sikkim urging the Centre for a Himalayan centric approach.

I would like to place on record the support of the Government of Arunachal Pradesh and UCOST, DehraDun for their support for the MoMS 24 which enabled us to take forward the event. Key representatives from across the IHR participated in the MoMS2024 and I am grateful to all of them.

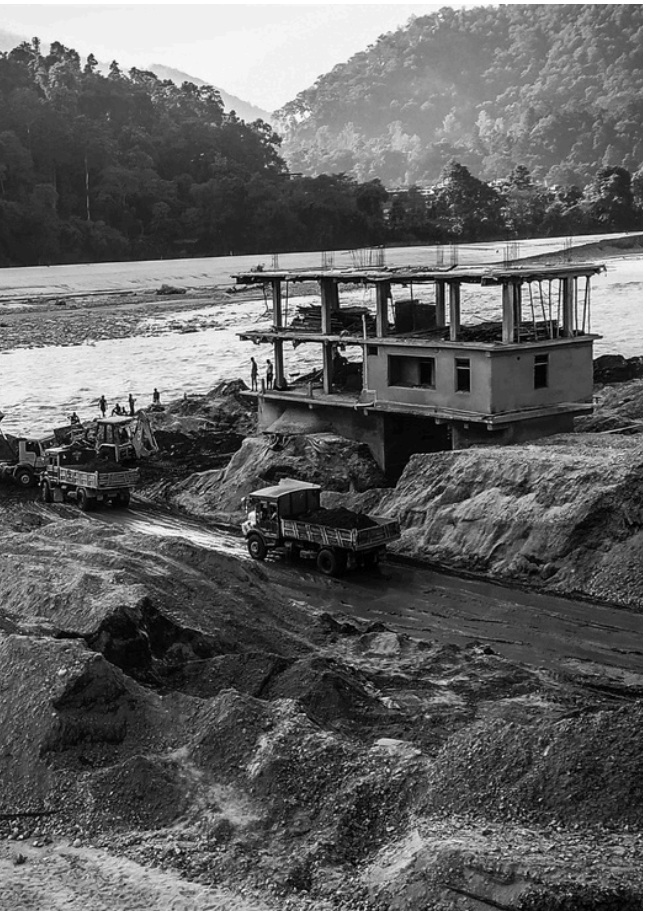
As we head towards monsoon with a newly elected Government at the Centre it is critical for us to impress on greater sensitivity, foresight and vision for the Himalaya that promotes resilience in the Himalaya as well as allocate appropriate resources for the Himalaya. We pray that we in the Himalaya sail through the 2024 monsoons safely and look forward to a resilient Himalaya.

ABOUT MEET OF THE MOUNTAIN STATES

Meet of the Mountain States (MoMS), an annual event of Integrated Mountain Initiative (IMI) is held in Delhi to share the outcomes of the immediately preceding Sustainable Mountain Development Summit (SMDS) with key stakeholders which include policy makers, elected representatives, partners of IMI and other relevant agencies to evolve joint commitment for priority actions on key mountain issues. MoMS2024 was held on March 22, 2024 with the theme 'Water Resources in the Himalaya: Disaster Resilience and Reduction. The event was supported by the Government of Arunachal Pradesh and Uttarakhand State Council for Science & Technology (UCOST), Uttarakhand, and the Sustainable Development Forum of Uttarakhand.

IMI has been highlighting the issues of disaster risk reduction (DRR) for the mountains through discussions and deliberations at Sustainable Mountain Development Summits (SMDS) since 2013 in Nagaland, with a curtain raiser event in Kalimpong, and in 2020 in Uttarakhand. These events had been organised with the main objective to foreground the increasing frequency and magnitude of disasters in the Indian Himalayan Region (IHR), as well as the need for mountain sensitive policies, practices and appropriate resource allocation. At the 6th World Conference on Disasters, Dehradun in 2023, IMI brought together voices from the communities to share their perspectives and experiences of living with disasters.

THE CONTEXT: INDIAN HIMALAYAN REGION - WATER TOWER AND DISASTERS



The Himalaya is the water tower of Asia that has nurtured civilisations playing a vital role in sustaining life, livelihoods and landscapes. Home to over 200 million mountain peoples, it is equally important to nearly 1.2 billion people (One-fifth of world's population) downstream for their sustenance (ICIMOD, 2019). It is intricately linked to food, water, biodiversity and energy security.

The Himalayan landscape is geologically young (Xu 1993) and active tectonically which manifests in earthquakes and frequent landslides. As the tallest mountain range of the world, it bears the brunt of the monsoon winds that bring a deluge of rain across its ranges, especially in the eastern extent, making it one of the wettest and biodiverse places. Combination of steep slopes, high intensity rains and tectonically active mountain regions still rising, result in regular landslides.

Anthropogenic actions and intensified development activities in the Indian Himalayan Region (IHR) have further increased the frequency and intensity of landslides and flash floods. Localised extreme weather phenomena and the resultant increased intensity and magnitude of precipitation, contributes to cloudbursts, landslides, flash floods, snow storms and Glacial Lake Outburst Flows (GLOF).

The region has a history of catastrophic disasters as recent as the devastating earthquake in Nepal (April 2015), landslides in Darjeeling Hills (June 2015), the earthquake in Sikkim (September 2011), the destructive floods in Uttarakhand (June 2013) and disasters in Himachal, Uttarakhand, Sikkim and West Bengal in 2023 to name a few.

The year 2023 has been a stark reminder that climate change triggered disasters are going to be a regular phenomena. It must be noted that several assessments have shown that IHR is more vulnerable due to its inherent fragility, higher warming, melting glaciers and increased frequency of cloud bursts etc. (IPCC AR 6, HIMAP Report of ICIMOD 2018, NMSHE of NAPCC, Down To Earth). The above-mentioned cases of Himachal, Sikkim and West Bengal disasters in 2023 highlight the challenges of disasters in the Himalaya and the need for going beyond business as usual in responding to disasters that impact life, livelihood and ecology of the Himalaya. The body count narrative of response to disasters vilifies the magnitude and impact of disasters in the Himalaya that is sparsely populated. This is one of the main reasons why mountain disasters do not get the necessary attention they deserve. Hence indirect and long term socio-economic and ecological losses of disaster in the mountains go unaccounted and unaddressed.

THE HIMALAYA IS A MULTI HAZARD LANDSCAPE WITH A COMPLEX INTERPLAY OF EVENTS ACROSS TIMELINES AND ECOSYSTEMS THAT NEED TO BE UNDERSTOOD BEYOND SINGLE DISASTER EVENTS AND RELIEF AND REHABILITATION ONLY.

THERE IS AN URGENT NEED TO LOOK AT DISASTERS IN THE HIMALAYA THROUGH THE LENS OF WATER AND SUSTAINABLE DEVELOPMENT IN AN INTERDISCIPLINARY MANNER AT INTERSTATE/AND ALSO TRANSBOUNDARY LANDSCAPE LEVELS. THE ACKNOWLEDGEMENT OF THE GRAVITY OF DISASTERS IN THE HIMALAYA HAS TO HAVE SENSITIVE POLICIES, PRACTICES, APPROPRIATE RESOURCE ALLOCATION AND RIGOROUS MONITORING.

OBJECTIVES

The MoMS was set within a larger goal of IMI to inform policymakers for a greater mountain sensitivity of policies on disaster, allocation of appropriate financial resources to mitigate the collateral as well as multi sectoral long-term damage. It had the following main objectives-

1. Highlight the interplay of water, development choices and increasing disasters in the Indian Himalaya by bringing together in dialogue: policy makers, key planning and implementing stakeholders and researchers on a single MOMS platform.
2. Inform and advocate for the urgency of mountain sensitive policies and practices with appropriate financial resource allocation at the intersection of water and disasters.
3. Propose new approaches to resilience -landscape based development, and a concrete plan for next 3 years engaging all stakeholders and enablers.

THEMATIC SESSIONS AT MOMS 2024

- Inaugural Session - Geo-Hydrology of the Himalaya and Disasters
- Disaster Risk Reduction and Building Resilience in the Himalayan River Basins
- Management of Water in IHR, Evidence based DRR and way forward

INAUGURAL SESSION - GEO-HYDROLOGY OF THE HIMALAYA AND DISASTERS

The inaugural session was to set the context for the meet and to outline the current disaster trends in the Himalayan, highlighting the gaps and the need for special focus on the intersect of water and increasing disaster in the Himalaya. The session had Mrs. Ritu Khanduri, Hon'ble Speaker of Uttarakhand Legislative Assembly as the Chief Guest with the keynote address being delivered by Padmashree Dr. Eklavya Sharma, former DDG of ICIMOD.

President IMI, Mr. Ramesh Negi and Secretary IMI, Mr. Roshan Rai provided the background and context to the Meet of the Mountains 2024 and its objectives through their respective addresses. Vote of thanks for the inaugural was presented by Mr. Jigmet Takpa, Vice President, IMI.

SETTING THE CONTEXT

- **MR. ROSHAN RAI, SECRETARY, IMI**

Mr. Roshan Rai, Secretary IMI warmly welcomed the dignitaries and participants to the Meet of the Mountain States 2024. He welcomed and introduced the Chief Guest, Smt. Ritu Khanduri, Speaker of Uttarakhand Legislative Assembly, and the keynote speaker Padmashree Dr. Eklabya Sharma, and also shared the objectives and session ouline for the meeting.

In his address, he outlined the history of disasters in the Himalaya, referring also to the recent big disasters in 2023 in Himachal Pradesh, Uttarakhand, Sikkim and West Bengal, mainly highlighting how disasters in the Himalaya have become a regular phenomena.

Mr. Rai mentioned that while the Himalaya is impacted more than other parts of the nation and disaster impacts are higher for marginal communities, disasters in the Indian Himalayan Region do not get due attention and the existing dominant lens of "body count of disasters" does not acknowledge the size and nature of the disaster in the Himalaya. He referred to the COP27 discussion of the need to create loss and damage funds for vulnerable countries impacted by climate change. This line of discussion needs to take place in India too where high vulnerable areas like the Himalaya, need to be acknowledged urgently. Currently, there is no acknowledgement of the socio-ecological importance and fragility of the Himalaya thus the loss estimation always remains miniscule to what is actually experienced by mountain communities.

The need for disaster response to go beyond single disaster events and relief and rehabilitation, as well as appropriate resource allocation with mountain sensitive policies and practices was also highlighted by Mr. Rai. He reiterated the intersection of water and disaster in the IHR which was the main theme of MoMS2024, and to highlight synergies and convergence that are taken forward with a transdisciplinary lens, inter-state and transboundary landscape perspective.

ADDRESS BY PRESIDENT, IMI

- **MR RAMESH NEGI**

Providing a brief introduction to the Integrated Mountain Initiative, President IMI apprised the gathering about IMI's vision to make India proud of its mountains. He traced the journey of IMI mentioning that it was an organisation established in 2011 that brought together top policy makers, elected representatives, bureaucrats, technical and research fraternity as well as the people working at the grassroots.

He mentioned that IMI was representative of the cultural and geographical diversity of the Himalaya which came together during the MoMS and SMDS every year. Speaking on disasters, he highlighted how the fragility of the Himalaya increased its vulnerability to disasters, and how similar development projects, such as hydropower, road expansion, etc. would have higher impacts in the Himalaya than in other states, while the recovery from such impacts would be very slow in the mountains. He further mentioned about the serious lack of media attention on any disaster events that occurred in the mountains.

Reiterating the need for adequate resource allocation, Mr. Negi highlighted that the proceedings of the MOMS24 would be helpful in making a case for the 16th Finance Commission, for specific water and disaster related allocations for the mountain states. He ended his address with a strong statement on justice for the Himalayan people, and the need for their security, safety and equity.

KEYNOTE ADDRESS

- **PADMASHREE DR. EKLABYA SHARMA**

Dr. Eklabya Sharma's address focussed on outlining the significance of mountain ecosystems, how climate change impacts these regions, and on providing key recommendations.

Dr. Sharma highlighted that mountains occupy more than one-fifth of the world's land area, are home to about one-eighth of the world's population and they support 25% of the world's terrestrial biodiversity and include nearly half of the world's biodiversity 'hotspots'.

He provided further details on the Hindu Kush Himalaya (HKH) Region,

- One of the most important mountain ecosystems of the world providing immense goods and services to humanity.
- Spans over 4.2 million sq km including Bhutan and Nepal in their entirety and parts of six other countries, namely Afghanistan, Bangladesh, China, India, Myanmar, and Pakistan with widely varying geographical terrain, ecosystems, and a plethora of cultures.
- Referred to as the "Third Pole" and the "Water Tower of Asia," as it stores a large volume of water, particularly in the form of ice and snow, while regulating the flow of the 10 major river systems in the region.
- Provides ecosystem services that directly sustain the livelihoods of 240 million people in the mountains and hills of the HKH. Nearly 1.9 billion people living in the river basins also benefit directly and indirectly from its resources, while more than 3 billion people enjoy the food produced in its river basins.
- Region is also home to some of the most diverse cultures, languages, religions, and traditional knowledge systems in the world.

Dr. Sharma's presentation highlighted that

- The region is a hotspot of climate change, and temperature-rise in mountains is much higher than the global and regional averages.
- Climate induced disasters like floods have increased both in terms of intensity and frequency in the region. The glacial lake outburst floods (GLOF) incidence have increased. Number of glacial lakes have increased phenomenally in the past three decades increasing the vulnerability of people living in mountains and downstream.
- The region is also prone to earthquakes and the entire Himalayan arch falls in seismic zone 4 or 5.

Referring to the recent incidents of floods in Kedarnath in 2013, Himachal Pradesh in 2023 and Sikkim in 2023, Dr. Sharma stated that these raised huge questions on the kind of development in the Indian Himalayan Region, and that all of these incidents clearly call for adoption of a river basin management approach in the Himalayan region and demanded an approach where geo-hydrology related vulnerabilities have to be built in development planning, designing and implementation.

He presented scenarios for the HKH region to be either going downhill, muddling through, or advancing toward prosperity, stressing that transformative changes would be needed to advance towards prosperity for resilience and sustainability. He further pointed out that maintaining biodiversity for enhanced ecosystem services, reducing disaster risk, mitigating and adapting to climate change, protecting the cryosphere and managing water, adopting good governance, were all central to ensuring resilience and sustainability in the HKH. Regional cooperation, transboundary sharing of information and knowledge, and capacity building among the eight HKH countries will be necessary to meet the challenges he further mentioned.

Stating that government policies lack mountain perspectives, Dr. Sharma firmly mentioned the need for specific policies and investments to be critical for mitigating disasters, building resilience and adopting pathways for sustainable development.

MOUNTAIN COMMUNITIES' VOICES AND EXPERIENCES SHOULD BE INTEGRATED IN POLICY PROCESSES THROUGH DIALOGUES AND CONSULTATIONS.

Dr Sharma stressed that sustainable solutions demand strong will to work together and to connect all facets of development and contemporary knowledge should be linked with traditional knowledge. Data and information sharing among the institutions and to move from disciplinary to multidisciplinary to interdisciplinary to transdisciplinary approaches. Further linking science with policy and practice, designing and planning for linking people with nature, linking upstream with downstream ecosystems and communities in river basins for reducing risks and vulnerabilities, linking mountain economies with outside markets for growth and sustainability; linking and integrating different types of ecosystems towards developing, restoring and maintaining multi-functional landscapes; and cooperation among the countries on transboundary issues.

He concluded his address with an urgent call to all the stakeholders to save the Himalaya, which was a global asset by proactive cooperation for developing a resilient and sustainable HKH.

ADDRESS FROM THE CHIEF GUEST

- **SMT. RITU KHANDURI BHUSHAN, HON'BLE SPEAKER, UTTARAKHAND**

Smt. Ritu Khanduri Bhushan highlighted the need to have a grounded perspective where seminars, researchers must be able to connect their data and research findings with the lives of local communities.

Mrs. Khanduri mentioned the need to instil the value of the sacredness of the Himalaya among children, quoting that to prepare for the next world war on water there is an urgent need to teach children the link between Himalaya and the major river systems, especially Ganga. She stressed on communication to sensitise people about the sacredness of the Himalaya, its importance for the country, and the urgent steps required to save it, using all data, facts and research findings.

She mentioned the important role of the Himalaya in terms of the rich biodiversity, precipitation as well as pilgrimage sites being revered by millions, highlighting that while there was a need to conserve forests, people also needed proper infrastructure, services and other development. Adoption of green technologies involving local communities, particularly women, was the need of the hour. Citing the example of Gauradevi, she spoke on the important role played by women in the mountains, that they not only look after their household, *samaj* (society) but also their neighbouring forests.

> LOCAL PEOPLE ARE AWARE OF THE NEED TO SAVE THE HIMALAYA AS THEIR LIFE AND LIVELIHOOD DEPEND ON IT. THE QUESTION TO ASK IS HAVE WE CONNECTED WITH THEM; ARE WE TRYING TO CONNECT WITH THEM AND HOW ARE WE GOING TO CONNECT WITH THEM?

She pointed out that the emotional connection people had with nature and environment was eroding, and the importance of forests was only talked about when disaster struck. Here she highlighted how old practices, principles and ancient culture have saved the earth for us till now, and therefore traditional good practices also need to be considered as modern ideas or technology. Further she added that stakeholders who are responsible in taking care of forests, and the Himalaya need to be involved in issues of natural and manmade disasters too.

Highlighting the importance of protecting the water sources, she mentioned that understanding carrying capacities for the tourism sector would be important for mountain states. At the same time, simple changes in the practices while going to Gaumukh, such as not discarding one's clothes into the landscape are important to reduce the waste load, as well as reducing consumerism. The importance of safeguarding groundwater through proper measures of recharge, regulation on excessive extraction, etc. with community engagement was also one of the focal points in her speech.

In conclusion, Mrs Khanduri mentioned that specific solutions that speak in the language of people needed to be brought out, linking research work with policies. Speaking from her own experience of how she actively raised her voice for tiger conservation as a college student being far from the actual habitat, she mentioned how on finally visiting the villages, she realised how differently community whose children had been taken by the tiger viewed the issue, and how important it was to be sensitive to communities who shared space with the animal and lived in fear.

She ended by stating that IMI could play a big role in coordinating between politicians, bureaucracy, scientists and the local people and to work towards raising the importance of the Himalaya among all people. If this is done while being sensitive to people's issues, people will understand and respond to the call, she said.

DISASTER RISK REDUCTION AND BUILDING RESILIENCE IN THE HIMALAYAN RIVER BASINS

Session lead: Dr. GS Rawat, IMI GC member
Chair: Prof. Durgesh Pant, Director General, Uttarakhand Council for Science & Technology

Panelists
Dr. Asim Sattar, Assistant Professor, IIT, Bhubanaeswar
Dr. Smriti Basnett, Deputy Director, Future Earth, Divechha Center for Climate Change
Mr. Stanzin Chosphel, Executive Councillor, Ladakh Autonomous Hill Development Council
Mr. Anil Raj Rai, Secretary, Land Revenue and Disaster Management Department, Govt of Sikkim

WELCOME AND CONTEXT SETTING

- **DR G. S. RAWAT, IMI GC MEMBER**

The purpose of this session was to review the recent trends in water related disasters in the Himalayan region including flash floods, GLOF, Landslides, and Landslide linked lake outburst floods and strategies to mitigate the impacts. Dr. G.S. Rawat explained the context of the session and welcomed the panellists and also introduced them to the audience.

PRESENTATION ON THE 6TH WORLD CONGRESS ON DISASTERS

- **PROFESSOR DURGESH PANT, DG, UCOST**

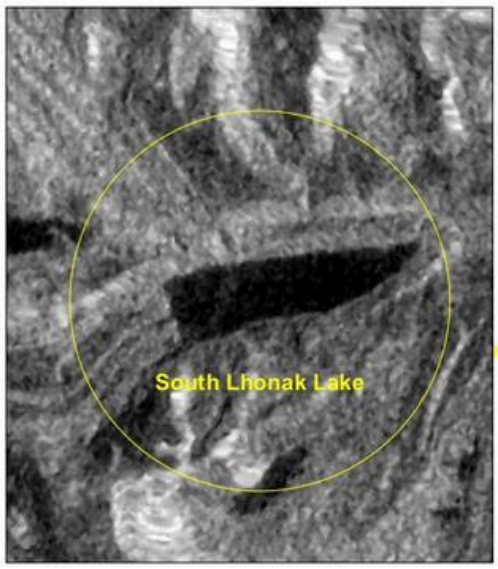
Prof. Durgesh Pant highlighted that Himalayan mountains and river systems symbolise immense geohydrological, biological, cultural and aesthetic values strongly influencing lives and livelihoods of millions of people living in the region as well as in adjacent plains. Recognized as the third pole and water towers of Asia, the Himalayan region is a global asset on account of numerous ecosystem services, especially fresh water that flows from here. This is the reason, most of the Himalayan rivers assume the status of Goddesses but at the same time, several river basins have been increasingly suffering from too-much too little water syndrome owing to extreme climate events induced by global warming. The extreme climate events and other anthropogenic drivers thus affect the ecosystems and local communities alike, some of them taking the shape of disasters. Despite an immense advancement in science and technology our ability to predict extreme climate events and develop efficient early warning systems and nature based solutions for building resilience is limited.

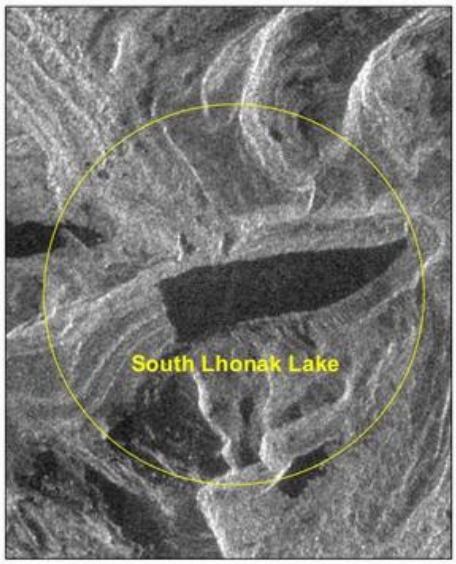
Realising the need for developing science based solutions to disasters in the Himalayan region, the 6th World Congress on Disaster Management was held in Dehradun during November 28 – December 1, 2023 hosted by Uttarakhand State Disaster Management Authority (USDMA), Disaster Management Initiatives and Convergence Society (DMICS) and Uttarakhand Council for Science & Technology (UCOST), focussing on mountain ecosystems and communities. In line with the vision of the United Nations Office for Disaster Risk Reduction (UNDRR) and SDG 13 (Climate Action), the congress focussed on three pronged climate action strategies to strengthen disaster resilience viz., Innovation, Collaboration and Communication.

Prof Pant's presentation summarised the key recommendations of the 6th WCDM relevant for the Himalayan region: disaster preparedness, empowering mountain communities, protecting mountain ecosystems, advocating for policy integration, and fostering innovation. He stressed that integrating indigenous knowledge and modern technologies, along with fostering innovation and community engagement, are essential for addressing water governance challenges and ensuring the resilience of mountain ecosystems and communities.

He also shared that actions undertaken and efforts being made in Uttarakhand by UCOST to rejuvenate water resources.

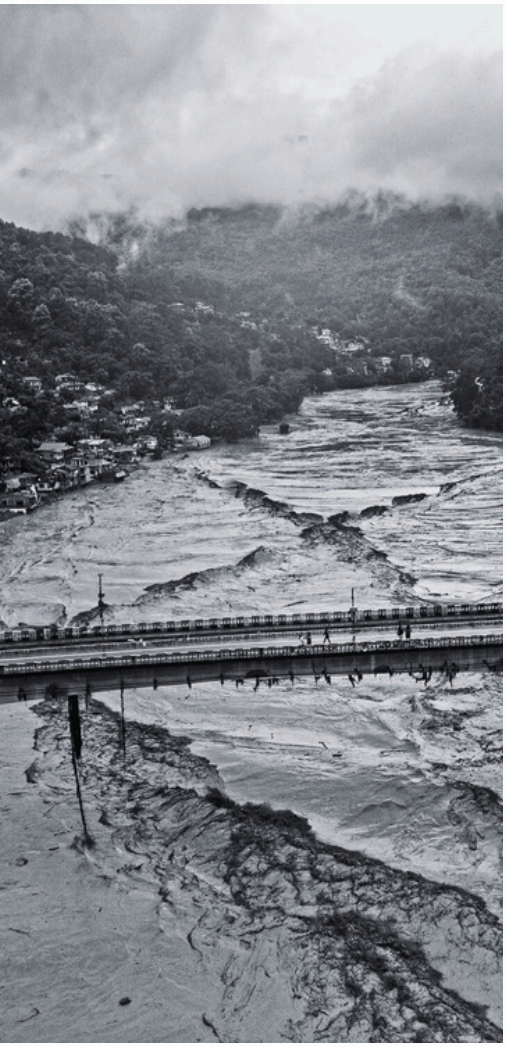
- Collaboration with NRDMS to rejuvenate the Kosi River. Similarly in Setlakhet along with Mahila Mangal Dal.
- Naula Prehri- Naula rejuvenation in Champawat.
- Labs on wheels initiative, to provide hands on access to labs in remote areas in every district in Uttarakhand.
- A science centre in all 13 districts of Uttarakhand. Recent inauguration of the Manaskhand Science Centre, Almora, has a designated gallery for Climate Change.





GLACIER LAKE OUTBURST FLOOD OF SIKKIM

- **DR ASIM SATTAR, ASSISTANT PROFESSOR, IIT, BHUBANAESWAR**



In his presentation, Dr. Sattar brought his experience of monitoring the South Lhonak Lake in Sikkim and its growth trajectory that had been showing signs of an impending outburst. He mentioned that in light of the 2023 GLOF in Sikkim which impacted Sikkim, Bengal and Bangladesh, all people, researchers and laypersons in the mountains need to understand what is happening in the mountains and how the glaciers are behaving.

He explained how glacial lakes were formed by the melting of glaciers, and how GLOFs occurred, mentioning that glaciers in the Indian Himalaya are melting at faster rates, and these melting waters either contributed to the river systems or were stored in the form of glacial lakes at high altitudes. With increased melting, the risk of glacial lake outburst floods is greatly enhanced.

He highlighted recent studies which reported that 3 million people in India are at risk from glacier lake outbursts, which is higher than in other mountains like Andes or Alps, also pointing out that the population is as close to the lake as 5 to 10 kms increasing their exposure. This was witnessed in the Kedarnath disaster in 2013, and in 2016 transboundary glacier lake outburst in China, that had the most impact in Nepal, which destroyed the Bhote Koshi Hydropower in Nepal. This also highlighted the need for policies that are transboundary in nature, and reviewing of GLOF risks and hazards.

Dr. Sattar also highlighted the cascading transboundary impact of the GLOF event, that in Bangladesh, there was high sediment discharge, thereby there was a need to look into transboundary policies, assessment systems and institutional arrangement with China, Nepal and Bhutan as GLOF in these countries will impact India.

Speaking on the October 2023 GLOF event, he mentioned how the GLOF originating in the South Lhonak Lake had been predicted in research papers of 2019 and 2021. The GLOF originating in North Sikkim had a cascading impact till around 380 km in West Bengal and Bangladesh, with many lives lost and grievous damage to infrastructure. He highlighted how pre-warning studies are very important to determine the risks and the hazards levels of these glacial lakes located in the high mountains, provided the research findings are converted into action for risk minimisation.

Citing the 2019 paper, he mentioned that the modelling results had predicted what was witnessed on 4th Oct, and that in Chungthang most of the buildings that were damaged were in the high risk zone as mapped, and most had been constructed in the last decade. Committees or scientific groups had to factor in cryospheric hazards as part of environmental impact assessments to clearly define infrastructure planning. GLOF triggered landslides in multiple areas along the river, and the debris also formed another lake, which became a secondary hazard.

He concluded with a warning note about the presence of many high-risk GLOF lakes in Sikkim, especially Shako Cho which was only 10 Kms upstream of Thangu village and that there would be limited warning time for any action. Predictive modelling gives information on the high exposure area in Thangu which could be used for preparedness and future action.

- **DR. SMRITI BASNETT, DEPUTY DIRECTOR OF FUTURE EARTH GLOBAL SECRETARIAT OF SOUTH ASIA AND SCIENTIST AT DIVECHA CENTRE FOR CLIMATE CHANGE**

Dr. Smriti Basnett talked about the gaps between research and policy and highlighted the work of Future Earth in integrating science, social science, policy makers, business and NGOs. She referred back to the National Cryosphere Conference organised in Sikkim 2019 through IMI and DCCC partnership, wherein one of the efforts was the potential formation of a mountain solution lab in Indian Institute of Science.

Sharing her experience and findings as a glaciologist, Dr Basnett described how glacial lakes are rapidly changing with altered water regime that affected many people and livelihoods. In her interactions with communities in the immediate downstream of glaciers, she found that they were unaware of the changes in the glaciers, and how their lives would be impacted in the future. The change in the pastoral lands in the high mountains due to climate impacts, and how higher temperature affects both yak and yak herders were also highlighted. Action on data on the glaciers, the yak herders and yaks are critical, she mentioned, adding that since the Himalayan region was a zone that was still shifting, there was a need to reflect on development pathways downstream.

GLACIER LAKE OUTBURST FLOOD OF SIKKIM

- **MR. ANIL RAJ RAI, SECRETARY, LAND REVENUE & DISASTER MANAGEMENT, GOVERNMENT OF SIKKIM**

Mr. Anil Raj Rai shared his experience coming out of the Sikkim GLOF disaster, providing key insights on the gap between scientific findings and on ground implementation. He acknowledged that there was a disconnect between the scientists and the implementers, and that there had to be improved communication and coordination if similar disaster events were to be avoided.

Mr. Rai reiterated that the relief and rehabilitation for disasters needed to go beyond the numbers of people affected. In states like Sikkim, the devastation from the GLOF or any other disaster were wide ranging and grievously affected the socio-economic situation of the state, though the affected numbers could be low. He cited how the state was still reeling from the aftermath of the GLOF with bridges still missing, and popular tourist sites like Lachen being totally cut off. Therefore mountain forums would need to collectively work together to advocate for policies that were relevant for the mountains.

He also placed the need for good communication (IEC) that translated technical information for everyday actions, also highlighting the need for engaging children from a young age. Water management was also a key issue for mountain regions, Mr. Rai stated, and there much that could be learnt from the springshed management programme that had been implemented in many mountain states including Sikkim.

He focused on the urgent need to integrate all these crucial issues into the Gram Panchayat Development Plan, which is the most important planning process that happens at the grassroots level. In places where significant populations still depended on springs for their water requirement, it was important that these traditional water bodies are recognised and measures taken for their recharge, so that we have water for our children. People had to be sensitised on these issues so that their water conservation programmes and other similar issues found a suitable place in the Gram Panchayat Level Development Plan.

SHARING FROM LADAKH

- **MR. STANZIN CHOSPHEL, LADAKH AUTONOMOUS HILL DEVELOPMENT COUNCIL**

Mr. Chosphel shared about the LAMA (Ladakh Specific Modelling and Space Applications) project that was being implemented in Ladakh in collaboration with ISRO. He mentioned that this was a dynamic Ladakh specific geoportal for assessment and management of natural resources by utilizing EO technology for improving decision support activities for the Ladakh Administration. Mr. Chosphel stated that through remote sensing, this project would help in gathering much needed information on glaciers and water systems, which would also be used for monitoring any impending disaster risk.

He reiterated that it was a known fact that mountains and their glaciers would face the major impact of climate change, and for this there was a greater need for research and action, requesting IMI and other stakeholders for regular deliberations and dialogue.

He also informed the house that with the formation of the Union Territory, Ladakh had set up disaster management authority, that was now working on awareness generation, setting up committees and equipment support at the community level, while adding that there was still much left to be done. Giving the example of there was lack of data for regulating the number of tube wells, he ended his address by saying policies for the mountains were very important, which had to be backed by data.

MANAGEMENT OF WATER IN IHR, EVIDENCE BASED DRR AND WAY FORWARD

Session lead: Dr. Rajan Kotru, IMI GC member
Chair: Mr. Arvind Mehta, (IAS), Member Secretary, 15th Finance Commission

Panelists
Prof. P.K. Joshi, Jawaharlal Nehru University, New Delhi
Mr. Nand Kishore Agarwal, ICIMOD
Mr. Sushil Ramola, Former President, IMI

WELCOME AND CONTEXT SETTING

- **DR RAJAN KOTRU, IMI GC MEMBER**

Dr Rajan Kotru initiated the session by highlighting the need for an alternative paradigm for the "Third Pole Status" given to the Himalayas as it did not seem to attract enough attention of policymakers. It was only serving the purpose of getting funds for research projects but given the type of development investments that are being made in this mountain landscape it did not appear to be in sync with sustainable development paradigm.

To identify with future welfare of upstream and downstream communities, he stressed on the need for next generation issues to be brought to the attention of one and all (e.g., expected challenges of disasters, water and food insecurity, degraded socio-cultural and socioeconomic scenario, etc.). He introduced the panellists briefly while pointing out that there is expectation for solution-orientation rather than problem analysis alone.

PROF. P.K. JOSHI, JAWAHARLAL NEHRU UNIVERSITY, NEW DELHI

Prof. Joshi started his presentation linking the significance of water to food and energy, and a whole set of ecosystem services which the Himalayas provide. Climate change was one of the biggest challenges and its impact in the mountains is evident. This challenge is in addition to the demographic changes in the mountains, and rapid urbanisation that is taking place, which all need a serious look from the perspective of disasters, hazards and water. Specifically with respect to dams, it is now well understood that there is no need for big dams in the mountains, but rather scale water storage that is suited to the terrain, as well as what the world is talking about.

From a meteorological lens, the total amount of annual precipitation might not have dramatically changed, but with changing socio-ecological systems and cropping patterns shifting to more water intensive crops, water demand has gone up. There is a need to relook at water security from availability, access and usage perspectives, and a longer term perspective. With regard to springs, the challenge is not always about the physical structure, but also institutions and governance and local ownership and responsiveness to local needs.

Prof. Joshi reiterated the need for an interface between science and policy, as the scientific community's messaging was only indicative of hazards and risks, and not trained to give authoritative messages. He cited Sikkim's disaster case of how the research findings were there but not able to churn out the actual policy message, with limited action taken. Key recommendations were as follows -

- Inclusion of all stakeholder groups for basin level discussions from valleys, steep slopes and hill tops who may have limited access to resources.
- Multi-scale vulnerability assessment that is taken forward at sub-national level or maybe sub-district level.
- Vulnerability frameworks that translate into day-to-day lifestyle at village and household level are needed to strengthen existing socio-ecological systems and not only sectoral ones.
- Deeper bureaucratic reform looking at socio-ecological frameworks and implementation and just not super imposing something which is very successful in Delhi.
- Revision of district disaster management plans wherein the village disaster management committee have well established linkages that are being implemented.

In conclusion, he stressed on the need to go beyond mere policy of governance to action-oriented policies, adding the need also to acknowledge that local communities are the first responders. District disaster management plans should be reviewed for these village disaster management committees to be strengthened with well established linkages, so that we move away from only forecasting or predicting to using the tools and techniques available towards the path of resilience.

MR. NAND KISHORE AGARWAL, ICIMOD

Mr. Nand Kishore started his talk with a story about a lost key with the lesson that one needed to search for anything lost in the exact place where it went missing, and not anywhere else, drawing parallels to how the meeting of the mountains was taking place in Delhi, while the key to many of the challenges being discussed was in the mountains.

Mr. Kishore then outlined the main findings from two assessment reports prepared by ICIMOD as part of their Himalayan Monitoring and Assessment Report (HIMAP) and Himalayan Water, Ice, Society and Ecosystem (HIWISE) projects.

- Glaciers disappeared 65 percent faster in the last decade, 2011 to 2020, compared with the previous decade.
- Glaciers will lose up to 80 percent of its volume by 2100.
- Water availability is not going to reduce until 2050. It will peak in 2050 and then it will start reducing.
- Current funding levels are extremely low, and this was a challenge that needed immediate recourse.

He further also referred to the WMO report that recorded 2023 as the hottest year, and this decade as the hottest decade, further highlighting that the world has already witnessed 1.4 - 1.45 degree (+/- 0.12 degree) temperature rise. He concluded that despite best efforts, the agreement on the 1.5 degree target would not be met, and therefore work on alternative energy to fossil fuels, adaptation measures were important along with continued reduction of carbon and methane emissions. He presented the following focus areas that were being implemented by ICIMOD as part of climate-change solutions.

Adopting River basin Approach
which is based on holistic planning Adopting this would require a transboundary approach with groups of experts from relevant countries, including non-political people to come together, discuss and align their work, share their viewpoints from the government perspective and align their discussion also keeping national priorities in mind. Such efforts are already ongoing. For example, post Kosi flood in 2008, the affected countries got together and developed the understanding of priority data-sharing between China, Nepal and India so that the risk or damage can be controlled and minimised.

Springshed management
There are 10 million springs in the entire Hindu Kush Himalayan region and approximately 4 million springs in the Indian Himalayan region. Half of these are almost dry, and almost half are also in the human inhabited areas. ICIMOD's six-step protocol which not only involves technical aspects of how to revive the springs, how to regenerate the spring, but also gender issues, monitoring was a tool that could be used by all.

Early warning system for flood
This had been developed by ICIMOD and trialled in Assam, Bihar, Nepal and several other places such as Afghanistan and Malawi. The mechanism involves sensors embedded in rivers that send automatic SMSes to various receivers once the water level crosses a certain mark. The receiver sends further messages to the downstream villages giving them a lead time of about 1 to 2 hours to plan for evacuation, and sometimes saving lives also.

SHRI ARVIND MEHTA

Mr. Arvind Mehta shared his experience of 40 years of civil service and his interaction with society. He expressed his love for the mountains and his connection to Shimla, which was instilled from childhood.

He provided insights into increasing the 7.5% allocation under 14th FC to states for forest cover to 10% for forest and ecology in the 15th FC, mentioning that though the 2.5% rise may seem insignificant, the total devolution currently that goes through the formula is about 10 lakh crore, which is significant for the states.

Mr. Mehta further shared his experiences of integrating disaster mitigation in hydro power projects that were being planned through World Bank support, looking at a river basin approach, that worked on the idea to have a series of cascading ways of holding that water for whatever purpose, flood mitigation, irrigation, drinking water, power, all things multi-purpose. He further mentioned that holding water at different points of storage could minimise floods or also reduce downstream impact of any cloudburst or lake outburst related incident. Here he also gave the example of the Tehri Dam that stopped flooding in many parts.

Water harvesting by whatever means was now a necessary step to be taken, he stated, whether it's small check dams or large storage projects, as with climate impacts, changing rain cycles, and the cloud bursts water supply would be hampered in the future. He further stated that large storage projects should not be viewed as something which is absolutely antithetical to our environmental needs.

Appreciating the efforts of SJVN Nathpa Jhakri project to increase the green cover in the upstream area of the dam, he said that it is not only about corporate social responsibility but also for their own commercial success, as hydropower project needs clean water to come into the turbines, for high silt content coming in the river flow would damage its turbines leading to extra expenses.

He mentioned that the government was looking at increasing the overall material well-being of a society through hydropower, which is essential for people, and hydro power is green and renewable power. Citing the example of the Chimera Dam in Chamba, he shared how apprehensions of the soil not being fit for dam building were overcome through proper consultations, and how the series of dams had stopped the river from flooding, as well as providing electricity. There was enough scientific knowledge that could build infrastructure to withstand the forces of nature, and mitigate any risks, he said.

Mr. Mehta also highlighted the need for community involvement in all interventions and that they should feel as partners in sharing the benefits that will come through relief and rehabilitation, or through even annuity systems. He mentioned that India has potentially close to 1,50,000 megawatt of hydropower of which about 50,000 was tapped. Giving the example of hydropower potential estimated at 20,000 megawatt for Himachal, he mentioned that this would help in generating revenue for the state and not depend upon central funding. Such revenue would support building schools, hospitals, providing scholarships, etc. but it would need to have disaster resilience and disaster mitigation built into the planning, and would have to be done in an intelligent fashion.

As a way forward, he suggested that IMI should work closely with government authorities of (CWC, NITI Aayog, NDMA, Ministry of Finance, etc) to work out comprehensive strategies for river basin management.

CONCLUSION AND WAY FORWARD

Mr. Sushil Ramola chaired the summing up session and he started with a quick recapitulation of the earlier sessions mentioning that MOMS had brought together people from policy to research to practitioners and the execution sector, who all realise that climate change is real, and water related disasters are real. He referred to Dr. Eklabya Sharma's presentation that spoke in a very powerful way how it is going to get worse as time passes. He stated that it was like almost standing on a burning platform, and it was time to jump into action.

The Session Leads presented the key action points from the earlier sessions-

KEY ACTION POINTS FROM SESSION I

- **DR. GS RAWAT**

- DRR and disaster risk preparedness connecting community to education focusing on children to District Science Centre. School children to be taught about the DRR issue and climate change.
- Identification of high GLOF risks and take immediate safety measures.
- Design early warning system for most critical glaciers in Himalayas.
- Develop an urgent basis transboundary GLOF policy of India and neighbouring countries. Develop a GLOF zones for entire Himalaya for regulations on construction.

- Identify GLOF exposed infrastructure and build resilience.
- Think beyond traditional matters and convert hazard vulnerability and the risk assessments into high mountain regulation zones to regulate development.
- Set up state level Glacier Commission in each Himalayan state to facilitate research and integration into the policy.
- Institutionalise public or community forum, include local stakeholders and research institutions for stakeholder consultations/discussion before implementation.
- Cryospheric GLOF hazard assessment report of all Glacier rivers in the Himalayan region to be made mandatory. In many places like Uttarakhand, which reported to have rapid recession in glaciers but there is no hazard zonation and risk assessment.
- Need to build community based activities to build resilience such as Dhara Vikas Yojna i.e. Spring-shed management which was successfully conducted in Sikkim.
- Building capacities on Gram Panchayat level and integration of DRR into planning processes.

KEY ACTION POINTS FROM SESSION I I

- **DR. RAJAN KOTRU**

Dr. Kotru presented the main message that IHR needs thoughtful development, and that ecosystem benefits have to be managed in an equitable manner for all including the upstream-downstream. He summed up the following action points-

- Ensure alignment of local level plans based on local context with national and sub-national level climate resilience requirements. For this available data must be used in sync with available local wisdom that is sought by involving local stakeholders.
- Planning with the authentic data that can be used systematically and maintain the standard operating procedures and socio-ecological safeguards.
- While using the potential of remote sensing data, community-based knowledge must be up taken and actions customized accordingly.
- Monitoring data must be collated, analysed and used for corrective and innovative courses ahead. It must also be used for triggering policy-nudging.
- Ensure improvement in program developments as well as investment and management of programs on the ground.
- While planning for water security and disaster management, in addition to adoption of the River Basin Approach, we must complement Spring-shed management so that climate resilience building is across ecosystems delivering other numerous ecosystem services.




OPEN HOUSE SESSION

- Dr. Vimal Khawas from JNU gave his insights into how there were limitations to research in certain parts owing to certain sites being restricted areas. This same thing also reflected in working in transboundary spaces as data availability was a challenge for many areas.
- Dr. Smriti Basnett highlighted the need for institutionalising public forums, and Dr. Asim Sattar shared the Sikkim experience of “Aapada” event, which was a disaster preparedness event done in a fun way involving students and parents. He further pointed out that there was a need for longer term funding for monitoring of any equipment that was being set up in the mountains.
- Dr. John, IMI member from Mizoram spoke about the necessity of elevated roads in the mountains and his interaction with NHIDCL on this issue.
- Ms. Archana Vaidya reflected on the need for engaging the youth through various forums and for them to have ownership, and shared her experience of working with youth in her area on the issue of legal and environmental rights.
- Mr. Alemtemshi Jamir, IMI member from Nagaland mentioned that inclusion and involvement of Government was important, and there was a need to work towards advocacy and sensitisation to ensure that research findings were not only well received but also implemented.

RECOMMENDATIONS FROM MOMS 2024

The following are the recommendations coming out of MOMS 2024 and from earlier deliberations-

Mainstreaming DRR in planning processes with financial allocations

- Disaster risk reduction and resilience must be mainstreamed in the planning and development processes, with adequate resource allocation.
- Ensure alignment of local level plans with national and sub-national plans and intersecting for climate resilience requirements at the Block level.
- Existing data available used for development investments / programmes that are being implemented. Rigorous monitoring of the standard operating procedures and socio-environmental norms.
- While using the potential of remote sensing data, community-based knowledge must be taken and actions customised accordingly and used for corrective and innovative solution oriented actions.
- Since water security will be the key challenge, adoption of a river basin approach complemented with holistic planning must be mainstreamed. Collaboration and innovation with neighbouring states/countries need to be strengthened (e.g., in river basins of Chenab, Jamuna, Ganges, Brahmaputra etc.). Multi-Stakeholder identification and strengthening of such existing stakeholder platforms/institutions must be strengthened while taking on board government perspectives and national priorities.
- Water security and disaster management planning, must integrate spring-shed management for climate resilience building.

Continued research and assessment of the landscape for hazards, vulnerability and risks

- Develop a GLOF hotspot mapping for the entire Himalaya to identify GLOF exposed infrastructure and other assets and invest in resilience building by designating vulnerable landscape zones, use of traditional knowledge and remote sensing inputs to minimise hazards and risks.
- Cryospheric GLOF hazard assessment reports of all Glacier rivers in the Indian Himalayan Region must be made mandatory. Any expected/or rapid recession in glaciers must lead to design of hazard zonation and risk assessments and mitigation measures to be taken.
- Micro Level disaster and vulnerability mapping using state of the art technology as well as people's participation from a multi-hazards lens continually taken forward to influence disaster policy and action.

Recovery, rehabilitation and resilience building

- The process of rehabilitating the affected people in the face of the approaching monsoons and impending disasters, addressing trauma and loss of livelihoods should be given priority.
- Rehabilitation and relocation of people impacted by disaster needs to be planned and looked into very closely.
- Resilience is integral to all infrastructural work as well, which needs to be factored into the planning of all infrastructure projects.

Capacity building / Education and awareness

- Disaster risk reduction and preparation must invest in children and youth education via District Science Centres in each district. (Use Uttarakhand model). Disaster studies must be introduced as a part of school and college curriculum to generate awareness among the youth of IHR.
- Capacity building among both the rural and urban communities needs to be increased to make mountain people more resilient.
- CBDRM training and first aid, practice drills, home insurance, investment in power rescue tools, solar lighting, use of Go bags etc. all would be immensely helpful in building a more resilient community.

Institutional processes and mechanisms

- To ensure water security and its efficient management, a state level Glacier commission (in each Himalayan state) needs to be established to facilitate research and ensure that research findings are integrated into policy through inter-sectoral coordination.
- Institutionalise public, community forums, local stakeholders and research institutions and engaged these with infrastructure development planning before implementation.

Regulations for pilgrimage and tourism

The Himalaya attracts a large number of people for pilgrimage and tourism, and with increasing disaster incidents, the vulnerability of these sectors to disasters have become evident. There is an overlap of peak footfalls that happen during summers with the monsoons when disaster events are also high. This calls for a need for stringent regulations for both sectors through stakeholder consultations and policy support looking at carrying capacity and preparedness plans, as well as for rescue.

Early warning and dissemination of hazard information

- Identification of potential GLOF sites must lead to dedicated state-wide safety measures with early warning systems especially be put in place for most critical glacial lakes.
- The fast changing mountain weather needs better monitoring systems such as Doppler Warning Radars especially in the Eastern Himalaya and a network of AWS which will increase the accuracy of weather forecasts.
- At the same time, a quick and reliable means of dissemination of information needs to be in place where disaster information will reach quickly and accurately in order to save lives.
- To mitigate loss and damage aspects of future disasters, mainstream simple flood /forest fire/ drought early warning systems which are connected with upstream and downstream communities are made functional by creating consistent communication, local ownership for management and timely actions.

Policy support

- States proactively impress the national government to seek transboundary GLOF and other water based disasters regional policy of India and neighbouring countries.
- Infrastructure development must acknowledge the multi- hazard nature of the Himalaya which is prone to extreme rainfall, landslides, GLOFs, high seismicity, socio-ecological fragility as well as climate change impacts.
- Policy for disaster risk insurance for insuring community assets and infrastructure with the involvement of financial institutions and local bodies.

CLOSING REMARKS

- **MR. SUSHIL RAMOLA - FORMER PRESIDENT, IMI**

Mr. Ramola stressed on the need to build ownership across all stakeholders, engaging with community, civil societies as well as at the Government level and financial institutions, investing in building awareness and interest, providing the right technologies, moving towards holistic, longer term approaches to solutions. He said that IMI had been working along these lines for some of these activities.

Building specific forums for bringing people together to actualise key action points that were emerging, and also to reconnect with people was crucial. These could also look at developing proposals such as the one that IMI had done for the 15th Finance Commission, which resulted in the allocation based on forest and ecology to the states. Similarly, a case for allocations based on water and disasters could be put forward, and IMI would work toward that end.

He further mentioned that declarations into action on the ground were necessary to create any impact, and this had to be taken up by various groups at multiple levels. For example, the disaster risk insurance that had been initiated at the Kohima SMDS that looked at insuring community infrastructure and assets (with KFW and SDC), could be relooked at and revived.

He concluded that IMI worked as a facilitating institution, and for all these issues that were discussed there was a need for all stakeholders to be engaged. If we come together as specific focus and action groups, we could multiply the power of the initiatives and achieve the desired results.

VOTE OF THANKS

- **MS. BINITA SHAH, TREASURER, IMI**

Fondly remembering Dr. RS Tolia- IMI's founding President, Ms. Shah mentioned in the vote of thanks about how his positive attitude always made things right. It was this positive spirit of IMI, despite having a very small team, that had made this event possible even with the last minute change in venue.

On behalf of IMI, Ms. Shah expressed her gratitude to Hon'ble Speaker, Uttarakhand, Smt Ritu Khanduri for gracing the event as the Chief Guest of MoMS 2024. She also thanked Dr. Eklabya Sharma for delivering the keynote address which laid the foundation for the day's discussion. She added that the IMI family was highly grateful to all the Government officials, civil society members, volunteers and others for their presence.

She thanked all the speakers, panellist, participants from various institutions and organisations and mentioned their insights and inputs in the various thematic sessions. She thanked all the GC members and the ex GC members of IMI for the guidance in the process of planning and coordination of the event.

She expressed her gratitude to the Government of Arunachal Pradesh, UCOST and SDFU for their support in organising the successful meeting.

‘LEST WE FORGET - THE TEESTA DISASTER, 2023’

“Lest we forget - the Teesta Disaster 2023” a visual narrative of the October 4, 2023 Glacial Lake Outburst Flood, dam breach and the subsequent flooding of Teesta river was part of the MoMS2024. Curated by Praful Rao and Praveen Chettri from Darjeeling Himalaya Initiative and SaveTheHills, the photo exhibition had been part of the International Mountain Day event in Kalimpong, and also traveled in Darjeeling.

The visual narrative documented in detail the aftermath of the disaster and became part of the Report and recommendations on GLOF affected areas between Chungthang, Dikchu in Sikkim, and the Teesta Low Dam Project III in Kalimpong (West Bengal) by SaveTheHills and Darjeeling Himalaya Initiative.

The complete report and recommendations can be found here:

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