HI-AWARE Internal Report

HI-AWARE
Himalayan Adaptation, Water and Resilience Research

CARIAA
Collaborative Adaptation Research Initiative in Africa and Asia

Workshop Proceedings

Water Access and Availability in Mountain Areas of the Upper Ganga Basin

4 December 2015, Tehri Garhwal, India

Consortium members

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About HI-AWARE

The Himalayan Adaptation, Water and Resilience (HI-AWARE) Research Consortium conducts research and pilot interventions, capacity building and policy engagement to enhance the climate resilience and adaptive capacity of poor and vulnerable people living in the mountains, hills and flood plains of the Indus, Upper Ganga, Gandaki and Teesta river basins in Pakistan, India, Nepal and Bangladesh.

HI-AWARE aims to influence policy and practice to aid the climate resilience and adaptation of poor and vulnerable populations in the region by generating evidence-based knowledge on geophysical, socioeconomic, gender and governance drivers and conditions leading to climate vulnerability, as well as monitoring and assessing adaptation measures. It focuses on identifying 'critical moments' when communities are most vulnerable to climate risks, 'adaptation turning points' when existing adaptation strategies no longer work, and "adaptation pathways", sequences of policy actions that address both short-term responses to climate change and longer-term planning. It looks at strengthening the expertise of researchers, students and science-practice-policy networks to conduct as well as use research on climate/social vulnerabilities, resilience, and adaptation.

HI-AWARE comprises of five consortium members: The International Centre for Integrated Mountain Development (ICIMOD), the Bangladesh Centre for Advanced Studies (BCAS), Pakistan Agricultural Research Council (PARC), The Energy and Resources Institute (TERI)-India, and Alterra-Wageningen University and Research Centre (Alterra-WUR).

HI-AWARE is one of the four research consortia under the Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA) supported by the UK's Department for International Development (DFID) and Canada's International Development Research Centre (IDRC).

Acknowledgement

Overall coordination of the event was carried out by the CEDAR team with support and guidance from a team of members from The Energy and Resources Institute (TERI). We truly appreciate the support of the participants and their representatives who gave their valuable time in these discussions, provided vital information, and helped shape the ongoing research. We are most thankful the respectable speakers who helped initiate deliberations on issues of climate change. The following people were part of the core team of this research event:

- The Energy and Resources Institute, New Delhi, India
- CEDAR, India
- Aadhaar represented by Kamleshwor Chauhan

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Water Access and Availability in Mountain Areas of the Upper Ganga Basin

4 December 2015, Tehri Garhwal, India

Organised by

Himalayan Adaptation, Water and Resilience (HI-AWARE) Research
Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA)

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Executive Summary

The Energy and Resources Institute (TERI), New Delhi, along with Dehradun based Centre for Ecology Development And Research (CEDAR) organized a workshop on 'Water Availability and Access in Mountain Areas of the Upper Ganga Basin' under the Himalayan Adaptation, Water and Resilience (HI-AWARE) Research project on 4th December 2015 in Tehri Garhwal, Uttarakhand. The workshop aimed to understand issues regarding water in the Upper Ganga Basin from the perspectives of different stakeholders, identify response actions and their challenges and opportunities for implementation, and create an environment for shared understanding across stakeholders.

Divided into three sessions, the workshop began with a key note by Suruchi Bhadwal, Associate Director, Earth Science and Climate Change, TERI introducing the HI-AWARE research and a brief background of climate change related issues in the Hindu Kush Himalayan region. The first session introduced two esteemed speakers, Soukhin Tarafdar, Scientist, G B Pant Institute of Himalayan Environment and Development who discussed issues of urbanized-hillslopes and rural watersheds in the mid Himalayan region of the basin. Jagat Singh Chaudhary, a well-known environmentalist of Uttarakhand gave his grassroots view on the role of Mixed Forest in Restoring Biodiversity and his practiced methods of agro forestry to revive an area devoid of water sources.

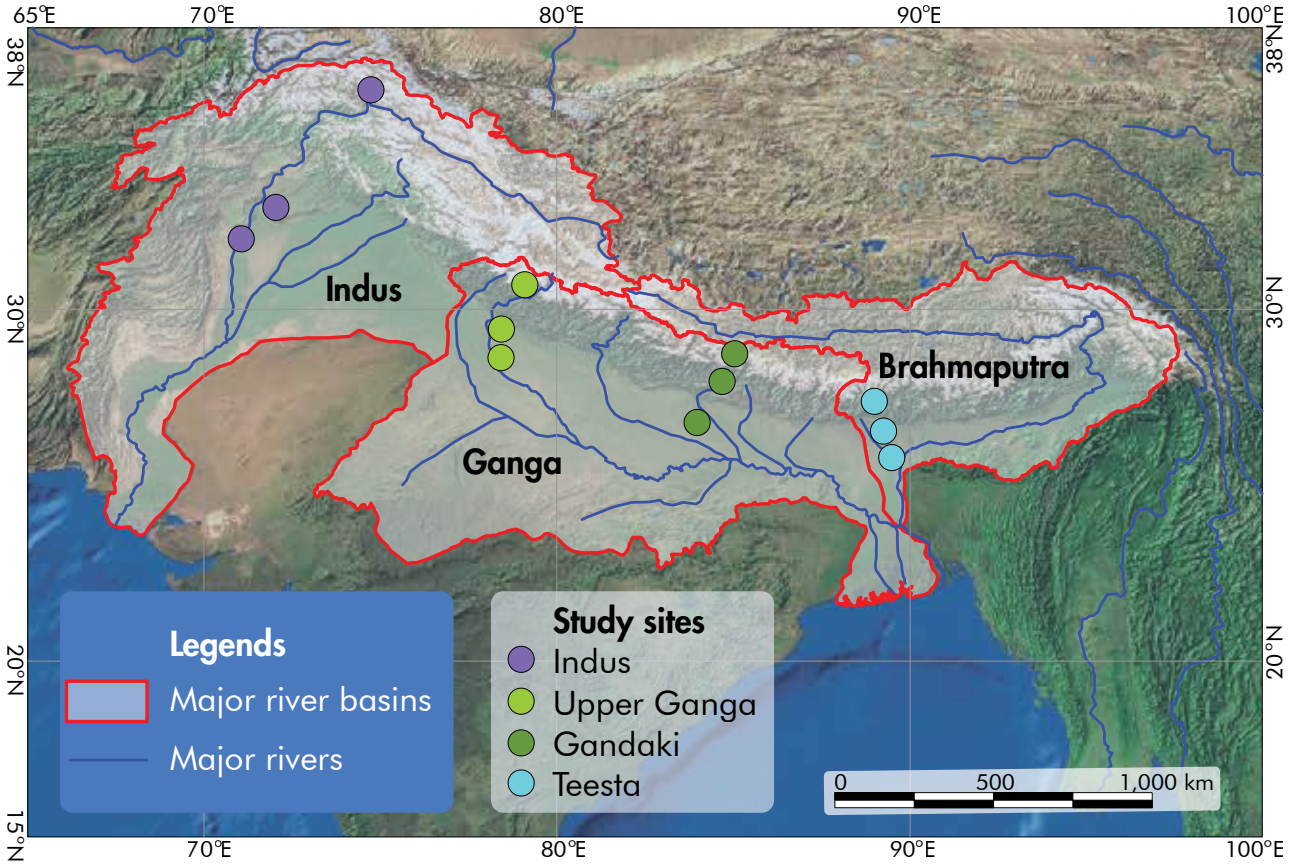
In the second session, a group activity conducted with the participants in groups as academicians and government officials in one and practitioners and civil society in the other, identified drivers, pressures and state of water resources in mountain areas of Upper Ganga basin and its impact on communities with the help of a problem tree diagram. During the exercise, the participants mentioned issues such as poor implementation and lack of hill centric development policies, unplanned development among many others. This was followed by a plenary that had an open group discussion about advanced methods of drip irrigation, rainwater harvesting, a *chaalkhaal* model and mixed forestry system.

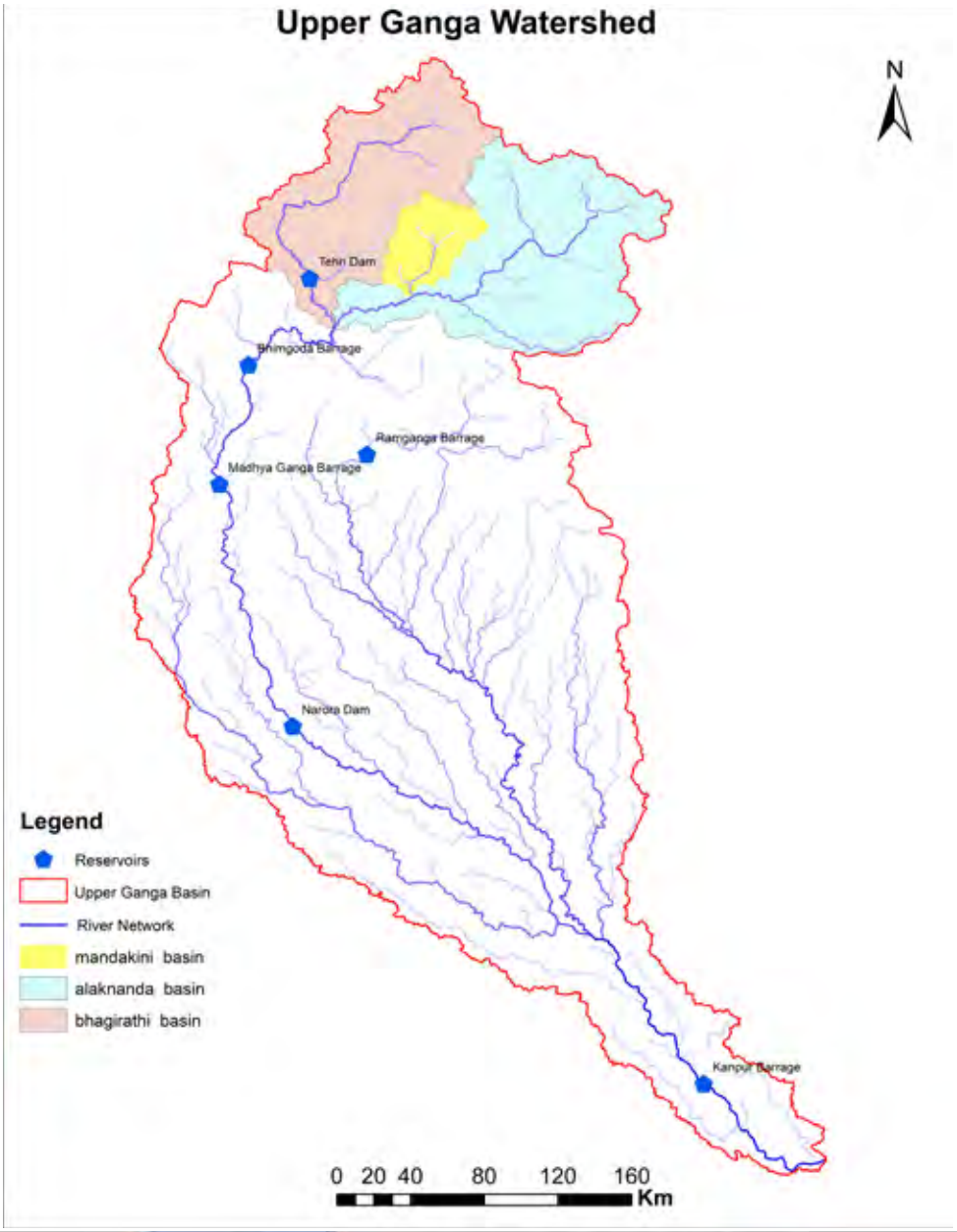
Group activity resumed post lunch in session three where participants in their respective groups prioritized one of their identified responses for a network map and provided their own logic for its selection. Each group identified actors involved in the same, along with the type of linkages between them, and the degree of power to influence a given response action. Finally, each group was given the opportunity to recommended change/s in their selection of response and/or network map in order to have better impact in terms of the problem's solution. This was followed by a plenary with open discussion taking place across the groups.

Background

HI-AWARE–Upper Ganga Basin

Himalayan Adaptation, Water and Resilience (HI-AWARE) is a five-year research initiative aiming at developing climate change adaptation approaches and increasing the resilience of the poorest and most vulnerable women, men and children in the mountains and plains of the Hindu Kush Himalayan (HKH) region. The HI-AWARE consortium is conducting integrative research across scales on the biophysical, socioeconomic, gender and governance drivers and conditions leading to vulnerability in order to understand climate change impacts and to identify critical moments for adaptation. The project covers three major river basins—namely the Indus, the Ganga, and the Brahmaputra. The Energy and Resources Institute (TERI) is working in the Teesta Basin in Sikkim, and in the Upper Ganga basin in Uttarakhand.




Upper Ganga Watershed
N
Tehri Dam
Bhimgoda Barrage
Ramganga Barrage
Madhya Ganga Barrage
Narora Dam
Kanpur Barrage
Legend
Reservoirs
Upper Ganga Basin
River Network
mandakini basin
alaknanda basin
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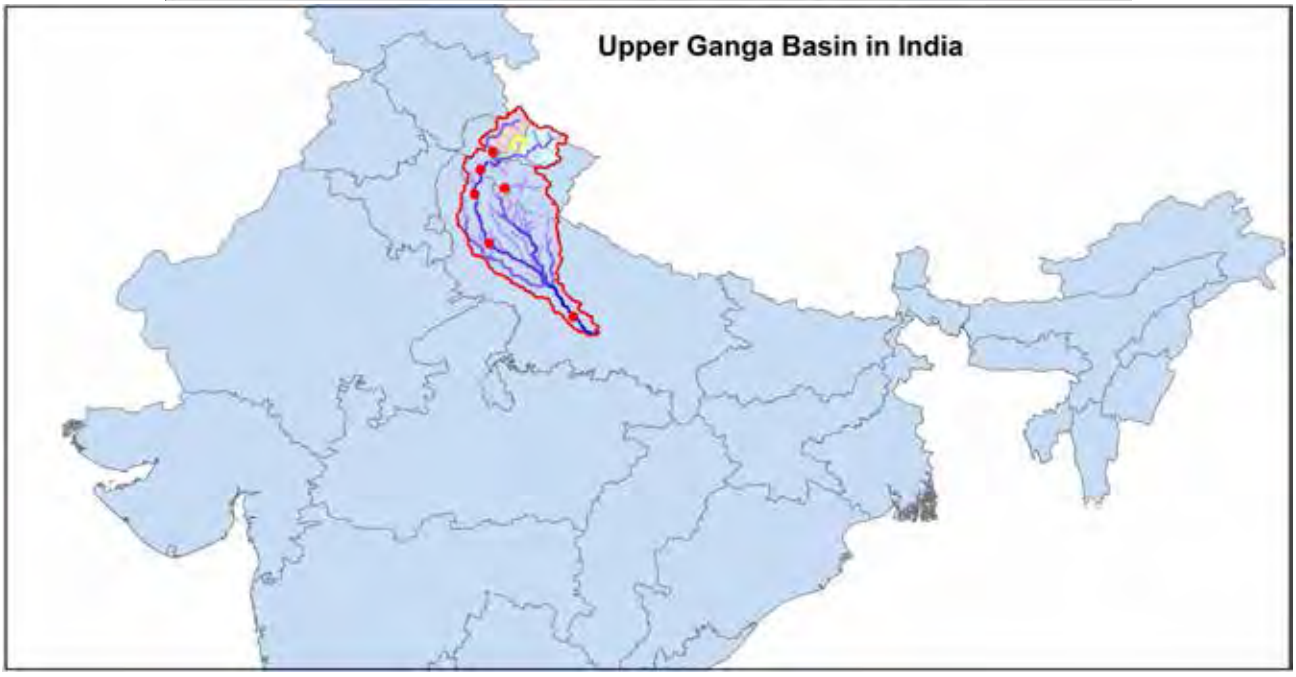

Upper Ganga Basin in India

The Workshop

TERI, together with their local partner for the Uttarakhand region, the Centre for Ecology Development and Research (CEDAR), Dehradun, conducted a workshop on 'Water Access and Availability in the mountain areas of the Upper Ganga Basin' on 4 December 2015 in Hotel Tehri Himalayan Residency in New Tehri.

The workshop aimed for shared understanding on the issue across stakeholder groups and deliberation on challenges and opportunities for response actions. The workshop was held over three sessions:

Session 1: Technical Session

Suruchi Bhadwal, Associate Director, Earth Science and Climate Change Division, TERI

The session began with a brief introduction of the HI-AWARE project by Suruchi Bhadwal. Beginning with the current climate change scenario in the Hindu Kush Himalayan region, Bhadwal introduced HI-AWARE research to the participants and gave an overview of the areas being considered under this study. According to the data presented, Asia has the maximum number of large flowing rivers. A population of 210 million is dependent on rivers in the Hindu Kush Himalayan region with a further 1.3 billion people living in the downstream region. Bhadwal emphasised on the need to study water-related issues in the hills due to their direct dependence on glaciers, upstream-downstream issues, and their vulnerability to natural disasters. The Himalayas, particularly, have been a focal point of climate change evidence and the impacts are starkly visible through various events such as erratic weather patterns, changing temperatures and the upward shifting of a few tree species, among others.

Bhadwal explained how the research aims at developing people-centred, gender-sensitive cases and evidences that provide various perspectives on climate change. Such recorded evidence could potentially aid in the formulation of better policies and programmes for hill communities. In her presentation, Bhadwal stated that global warming is a fact and a deviation from normal temperatures as it is being observed. Since such changes are going to continue and cannot be reversed, there is an urgent need to prepare ourselves for upcoming challenges posed by rapidly changing climatic conditions.

Bhadwal shared the expected outcome of this study as bridging the gap between scientific research and ground realities. The research will be able to provide evidences supported by scientific facts and guide future policies keeping in mind the struggles of the communities residing in the mountainous regions being considered by the ongoing programme. It shall handpick innovative solutions and practices being adopted to counter climate change and frame them as adaptation models for building the resilience of communities. It shall also acquire scientific data regarding climate trends from the past decades, glacier and hydrological assessments and participatory exercises. The approach of the research would be highlighting the vulnerability drivers, livelihood patterns and adaptation methods. Bhadwal acknowledged the research partners—with ICIMOD as the lead organisation—working with TERI, while identifying CEDAR and Society for Human Awareness and Rural Development (SHARD) as local partners in Uttarakhand.

In the session, problems associated with water as a resource in the hills of Uttarakhand from a scientific perspective were introduced by inviting speakers working on relevant issues in the study area.

Soukhin Tarafdar, Scientist, GB Pant Institute of Himalayan Environment and Development

Soukhin Tarafdar presented on the topic 'Water Resourcthe es and Sustainable Development in Mid Himalayas' wherein he discussed issues related to urbanised hillslopes and rural watersheds. He highlighted the concerns observed in these two areas and their cause and effect relationship in the hill terrain. A lack of recorded evidence, "data deficiency", is a major concern that has led to unscientific urban planning, resulting in the depletion of resources. According to Tarafdar, scientific research needs input from stakeholders. A serious issue requiring evidential data of 10-30 years to make analysis of events is necessary, he said. He enumerated on concerns such as the declining trend of monsoonal rainfall, changes in land cover/use regimes, lack of coordinated efforts, and most importantly, lack of supportive datasets of cause and effects.

He shared images of a study being carried out by the GB Pant Institute in collaboration with Indian Space Research Organisation (ISRO) in the Paschim Nayar sub-basin, which involved the gauging of micro catchments with the help of hydrological equipment and also measuring spring flows. He shared observations of declining rainfall water as well as stream and spring flow pattern from 2009–2014. The year 2010 recorded the highest amount of rainfall whereas 2015 has been declared a Drought Year.

His concerns regarded the insufficiency of data for the Himalayas, limited gauging stations and disparity in data. He stressed on the fact that variations in elevation in the mountains/hills are an important factor to be considered while conducting any research. Changing productivity due to change in water sources has been an issue for a long time. A dependence on springs for farming is a prevalent factor in hill communities and its effects are directly visible on drinking and other water uses. Construction of roads without proper understanding of their impacts on sources of water such as springs, have been another important factor in terms of impact on water sources.

He raised an important question about whether ground water recharge structures are really recharging hill slopes. A huge amount of resources has been spent on ground water recharge in various areas but an absence of post implementation data has been greatly felt. Tarafdar concluded by mentioning prerequisites for the implementation of artificial recharge structures such as detailed geological mapping before implementation, process-based understanding of spring flows, proper identification of source area and the conservation of surplus water available during the monsoon.

To this presentation, AK Saxena (HIHT)[1] voiced a concern saying that often the sources of such data are unverified and unreliable. Shrimali (ICAR-IISWC)[2] added that there is a dire need to integrate all the information collected by various organisations/agencies to make a consolidated database. The actual worth of all the money spent on research and other such developmental activities shall be realised when it is mutually shared. Most of the audience agreed that collated information collected by various institutes carrying out research on such issues could produce a useful and meaningful data.

The second speaker for the session, Jagat Singh "Jangli", shared his methods and approaches to reviving water using mixed forestry in the Rudraprayag region.

Jagat Singh Chaudhary

Jagat Singh Chaudhary, popularly known as Jangli or 'Protector of the Forest', is one of India's top environmentalist with over 40 years of experience in the Uttarakhand region. He is also known as the 'Green Ambassador of Uttarakhand' and has shown how practicing mixed forestry can revive even the most barren of lands. He bagged the prestigious Indira Gandhi Vrikshmitra award in 1998 and has received awards such as the *Pariyavaran Premi* and the *Him Gaurav*. At the HI-AWARE workshop, he discussed the role of Mixed Forest in restoring biodiversity and his practiced methods of agro forestry to revive areas devoid of water sources. He also stressed on their role in raising the flow of streams. In his presentation, he drew a strong linkage between water and forests as being interdependent for survival. In his opinion, water and forests cannot be studied in isolation. Being a practitioner with a strong connection to ground realities, he discussed how claims of ground experiences get ignored due to lack of data in the research arena. He went on to elaborate upon the importance of forests in maintaining soil moisture and preventing soil erosion as well as impeding the decline of biodiversity in Uttarakhand.

Chaudhary gave examples of the currently endangered *Prunus cerasoides* species, the house sparrow (*Passer domesticus*) and of worm infestation on oak species. He also discussed the threats posed to bees—key role players in the Himalayan ecosystem for the pollination services they provide, the fast melting of glaciers and lessening snow cover in high altitudes, and the gradually increasing presence of plastic and other waste materials in the mountain regions of Kedarnath. As does HI-AWARE, Chaudhary identified women as the backbone of the Himalayas, and shared that women are the ones who are greatly affected by the changing climate.

Established in 1974, Chaudhary's mixed forest, covering an area of five hectares, comprises of herbs, evergreen grasses etc. at a height of 4500 metres above sea level in the village of Kot Malla, Rudraprayag. Quoting examples from his mixed forest, he displayed the varieties of plants that aid in the regeneration of water sources in an area as well as revive its nearby springs. He has adopted both traditional as well as scientific methods of water conservation including the traditional structure of a tri-wall reservoir, locally known as Naulaa; watershed management through vegetation bunds, contour terracing and dug up embankments; check dams and vertical disposal drain for rainwater harvesting. Through his mixed forestry practice, he has been able to achieve successful recharge of ground water aquifers through the plantation of moss and mushroom species that are well known for their water retaining quality and entrapment of morning dew. These species help create micro climate conditions which eventually helps in moisture conservation. He drew comparisons between the rapidly vanishing oak tree species and the dominant pine species saying that while the former possesses the ability to hold soil moisture due to its morphological characteristics and extensive root system, the latter is incapable of doing so.

[1] Himalayan Institute Hospital Trust
[2] Indian Council of Agricultural Research - Indian Institute of Soil and Water Conservation

Chaudhary's model of mixed forestry and organic farming comprises of multi-faceted techniques which could bring about a considerable change on a community level leading to a positive change in the micro climate of a region. His model has been implemented in various places including villages in Tehri, Srinagar, Agra (UP) etc. and is slowly gaining popularity in Northern India as well.

Session 2: Group Exercise

The next session saw the participants break into two groups to discuss and identify the causes and impacts of, and responses to current water related problems.

Group 1 – Academia

This group comprised of academicians, individuals from institutes such as GBPIHED, CSWCRTI, HNBGU and HIHT[3] who collectively identified water scarcity as the main problem in the hilly regions of Uttarakhand. During the discussion, many noteworthy points were mentioned. There is a lack of data on the carrying capacity of the hills, and sectoral demand and supply of water. This leads to ineffective hill-centric development policies and contributes to unplanned development. A piecemeal approach is followed as far as development programmes are concerned. Road construction, for example, does not take into account its impacts on a watershed or a spring shed area, in turn affecting the discharge of springs located in the area. There is also no protocol for the disposal of muck (soil waste) and debris that are a result of road construction. One of the participants, SP Sati, remarked that 20,000–60,000 cubic metres of muck is generated as a result of the construction of one kilometre of road. This can accelerate the depletion of water sources such as springs. Dumping of debris into streams can also lead to floods downstream. Sunesh Sharma observed that most livelihoods are dependent on first and second order streams, and that these are left out in the discussions on rivers, which focus mostly on major rivers such as the Ganga.

Apart from the absence of pertinent policies, there are issues of poor implementation of existing policies. For example, afforestation efforts were mobilised on ground as a blanket recommendation without specifying which species had to be used for this purpose. Chir pine (*Pinus roxburghii*) was selected for this purpose and therefore today, most of Uttarakhand's hills are blanketed in pine. Overtime, pine has replaced the indigenous species i.e. the Banj Oak (*Q. leucotrichophora*) and other such broad-leaved species of tress of environmental and social relevance. Moreover, pine has impacted the hydrology of the Uttarakhand hills by not allowing as much water percolation in the ground. In fact, it doesn't support the growth of other plants in the understory of the forest.

There is also an observable shift in the agricultural pattern that has impacted the hydrology of the hills. This is, in part, driven by the allure of city life, which leads people to abandon their fields in rural areas. Cases of abandonment of fields can also be attributed to incidents of human-wildlife conflict, extreme weather events, etc. Uncertainty and change in seasons have led to confusion and shift in the conventional agricultural pattern.

[3] GB Pant Institute of Himalayan Environment and Development; Centre for Soil and Water Conservation Research and Training Institute; HNB Garhwal University; and Himalayan Institute Hospital Trust

The participants agreed that erratic weather patterns could be attributed to climate change, and also that such patterns exacerbate water scarcity. In this light, many technological interventions made to alleviate the problems of access to and availability of water might have actually acted perversely due to poor planning and implementation. The installation of handpumps without consideration of underground aquifers is an example.

Another reason identified for water scarcity was the changing ownership of resources, where the rights over resources have been transferred from communities to the government. Therefore, there is a disconnect between the communities and their resources, and they do not invest as much effort in maintaining the health of those resources.

Impacts

Having identified the causes of water scarcity, the group proceeded to identify the impacts of the problem. The availability of drinking water and water for irrigation purposes has been adversely impacted. This has led to out migration in a considerable number of cases, and in some others has also been the reason for social conflict/discord. This not only impacts intra- and inter- community relations, but also increases the drudgery of women by increasing the amount of effort required to procure water. Water scarcity also has negative impacts on the biodiversity of a given region. It is very common to hear about incidents of confrontation with wildlife on agricultural fields. Such reports are bound to increase with the depletion of resources in their natural habitat. The high percentage of areas covered in pine makes these locations susceptible to forest fires and also affects the hydrological regime of the area. The above can be said to be some of the major reasons behind changing livelihoods in the region.

Responses

The participants then listed the current responses to these problems in terms of government/private programsmes, civil society initiatives, etc. SS Shrimali said that this situation has called for, and therefore seen increased public investments. Rainwater harvesting techniques have been introduced in some areas, and advanced methods of irrigation such as drip irrigation and use of sprinklers are being adopted in some others. Other interventions include the *chaal khaal* (water collection pits) programmes for promoting recharge of water. In the view of the participants, most of these efforts have been rather unsuccessfully implemented. Instead, they said that individual efforts like Sachidanand Bharti's *chaal khaal* model and Jagat Singh Jungli's mixed forestry model had been more successful in promoting water recharge.

In some areas, underground pipes have been laid to minimise conveyance loss. Terrace farming, even though it may be on the decline, and existing community institutions such as *Van Panchayats* (community-managed forests) might work to reduce the water stress situation.

Table 1: **The major causes, impacts and responses of water scarcity as identified by Group 1**

Problems	Causes	Impacts	Responses
Water Scarcity	Lack of data	Decline in drinking water availability	Rainwater harvesting
	Lack of hill-centric development policies	Decline in water availability for Agriculture (Irrigation)	Increased public investment
	Unplanned development	Social Conflict	Introduction of advanced methods of irrigation such as drip irrigation/ sprinkler methods
	Depleting water resources	Out migration	Terrace farming
	Climate change	Change in Biodiversity	Advanced methods of drip irrigation
	Erratic weather patterns	Changing hydrological regimes	Chaudhary's mixed forest approach
	Poor implementation of policies	Changing livelihoods	Sachidanand Bharti's *chaal khaal* model
	Change in vegetation pattern	Forest Fires	Minimising conveyance losses through underground pipes etc.
	Poor/poorly implemented technological interventions		Research by various organisations
	Change in ownership of resources		*Van Panchayats*/Community forestry

Group 2

This group comprised of civil society members and local government representatives (*sarpanch*), who collectively identified five major problems in the hilly region of the upper Ganga basin.

- Problems relating to the building of dams, tunnelling and road construction
- Monoculture in forestry and agriculture
- Installation of handpumps and tube wells
- Climate change issues

After listing the problems, the reasons or factors leading to these issues were identified. According to the participants, improper government policies relating to water and development have led to the construction of dams. Participants also pointed out that in 1803 pine was introduced to the area. Pine is an invasive species and as a result, the species composition of hilly forests has been converted. Due to the expansion of this invasive species, the dominance of pine in hilly forests is clearly evident now. These trees are fire resistant and very resilient to climatic changes. The stakeholders also highlighted that no research is done prior to the installation of handpump and tube wells, in order to decide the locations. Most of the installations are politically motivated instead of scientifically researched, leading to a relocation of the problem rather than the solution.

The next step was to identify the impacts of these problems.

The participants elaborated on the adverse impacts

of dam construction and underlined that big dams do more harm than good. The Tehri dam has created a micro climate in the region and has reduced crop productivity. Conversion to monoculture forests has resulted in more frequent forest fires and reduced bio diversity. Practice of monoculture in agriculture has led to increased use of pesticides and insecticides. It is also leading to more soil erosion. The installation of handpumps has led to water scarcity in downstream villages.

Session 3: Group Exercise

The groups returned to continue the activity post lunch. In this session, one response was identified and stakeholder mapping was done. These stakeholders were categorised into Government (state and central), Funding Agencies, Local Government and Civil Society/NGOs/local actors by using differently coloured sticky notes for each group.

Following this, the actors were linked depending upon the flow and direction of Funds and Resources, Advice and Information, and Command. The individual actors were then rated on how influential they are on a scale of 0–5 by sticking the desired number of coloured round stickers (*bindis*) next to the sticky notes, '0' being the least influential actor, and '5' being the most influential. Once this was done, the participants of each group were asked to identify the changes they would like to see in the current scenario represented by the stakeholder map and the linkages.

Group 1

The Academia group chose rainwater harvesting as the response option and identified the Oil and Natural Gas Corporation (ONGC), India, the World Bank, the International Centre for Integrated Mountain Development (ICIMOD) and Corporate Social Responsibility (CSR) initiatives of corporate bodies as the main funding agencies for projects in the sphere of rain water harvesting. These funds are channelled through many civil society initiatives such as HIHT, Central Himalayan Environment Association (CHEA), Swajal and Himmotthan. The National Bank of Agriculture and Rural Development (NABARD) and the Central Water Commission were identified as government funding bodies for Jal Nigam, the larger watershed management directorate, and other NGOs. The Department of Science and Technology (DST), Uttarakhand State Council for Science and Technology (UCOST) and CPART were identified as funders of projects led by HNB Garhwal University (for example) and other NGOs.

Government bodies and research institutes such as the Indian Institute of Soil and Water conservation, India Meteorological Department (IMD), GBPIHED, National Institute of Hydrology (NIH) and DST, among others, are sharing information and research with other government departments such as the Jal Nigam, and local bodies at

the community level—water user groups and *van/gram panchayats*. The forest department also shares information with the *panchayat* bodies. The Central Ground Water Board (CGWB), WIH and Forest Research Institute (FRI) also share information with the Jal Nigam. Sharing of research and information also takes place between civil society bodies such as Himmotthan and Sri Bhuvneshwari Mahila Ashram (SBMA), and Himmotthan and HIHT, among others.

The group identified NABARD, the World Bank, Swajal, and Jal Nigam as the most influential actors. Although government research institutes carry out very important research as well, they do not get an equivalent say in decision-making, so the group marked them as very low on the influence scale.

This led the group to the final stage of the interactive session where they made the following recommendations:

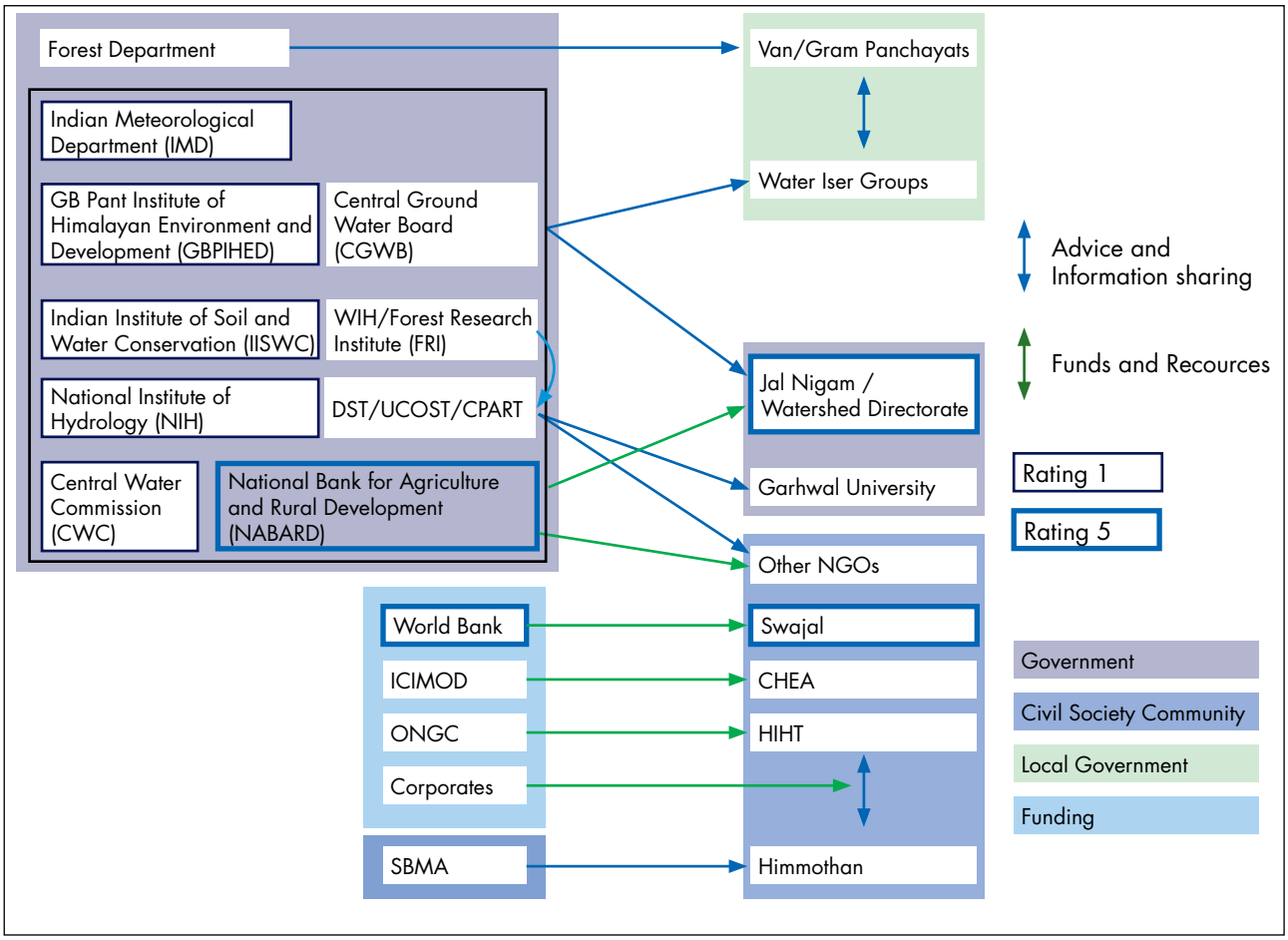
- Research institutes should be given more importance and included in the decision-making process.
- Information sharing should be two-way—between government research institutes and implementing departments.
- There is an information deficit when it comes to spring mapping, snowfall data, discharge data, the mapping of sectoral demand of water, and vulnerability mapping.
- There should be a central repository of information, interventions and actions.
- Coordination is required between different departments and institutions so as to avoid duplication of efforts and ensure holistic coverage.
- Any intervention made should take into account any natural disasters that may occur in the region.

Group 2

In this session, the participants were asked to come up with the most relevant response they would like to take up as a solution to the problem identified in the previous exercise. The intension was to identify networks of actors required to implement such a response, or for making a policy that would facilitate that response. The intention was also to analyse the perception of the stakeholders in terms of identifying actors and their connections.

The participants in the second group identified that there should be an Integrated Mountain Policy (Himalayan Niti) instead of individual policies for water, mountain ecology and urban structures (Jal-Jangal-Jameen). They identified 12 actors for the development of such a policy, namely:

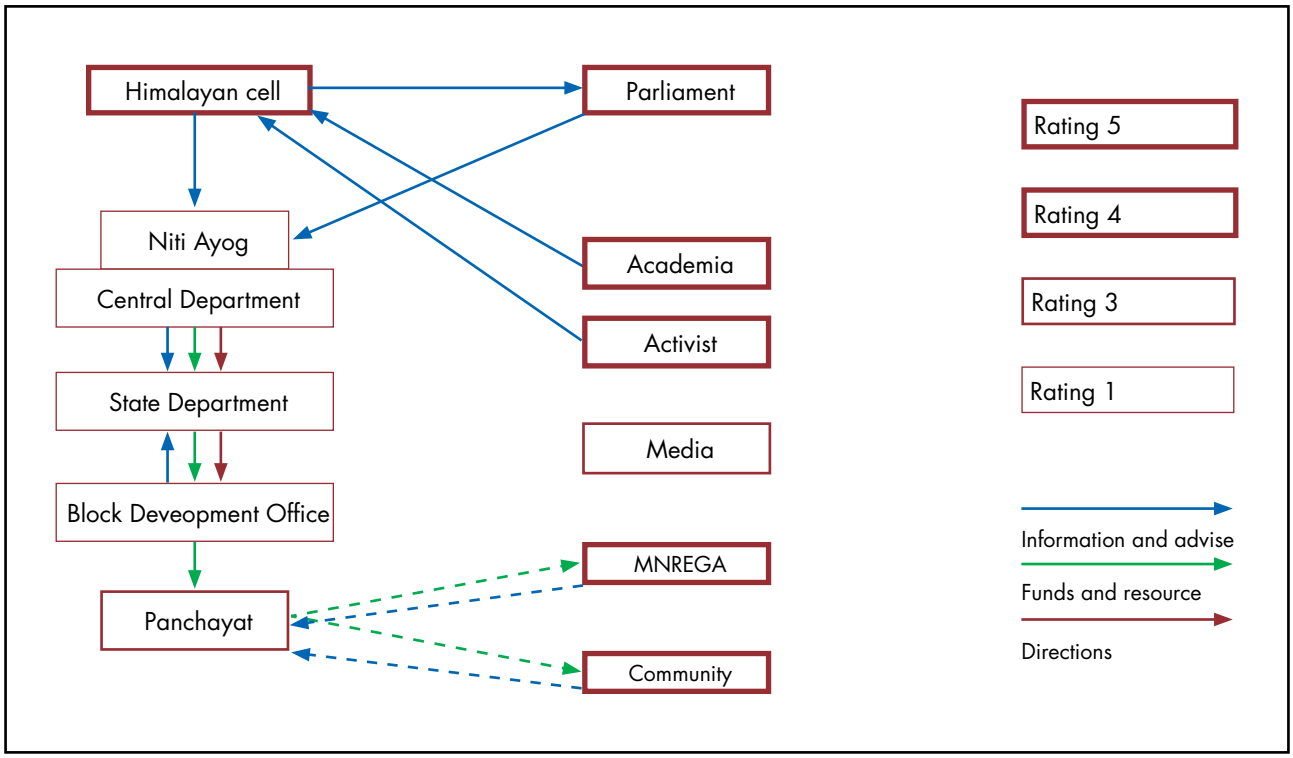
- Community
- Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA)
- Panchayat
- Block Development Office
- State department
- Niti Ayog



- Central Department
- Himalayan Cell
- Parliament
- Activists
- Academia
- Media

The participants also identified the influence each actor should have in creating such a policy. They underlined the fact that in order to have an effective policy, the policy formulation process should incorporate inputs from all the relevant actors. They were of the opinion that the community should be given the highest priority in designing such a policy. Participants gave equal influential weightage to Academia and activists, but the weightage was a notch lower than that given to the Community, Himalayan Cell and the Parliament. The participants also highlighted the fact that the intermediate departments such as the block office, the state department and the central department should have less influence in the making of the integrated mountain policy.

The participants were also asked to create connections between actors and mark these with different colours in order to represent information, funds and directional flow. The participants underlined the fact that in order to have an effective mountain policy, information and advice should flow from the academia and activists to policy makers (the Parliament, the Himalayan Cell, the Niti Aayog). They also said that all funds and resources should flow from the Ntti Aayog to the state department, then from the state department to the block office to the Panchayat and ultimately to the community. They agreed that there should also be a mechanism to ensure the flow of information and advice from the community to Panchayat.


Himalayan cell
Parliament
Niti Ayog
Academia
Central Department
Activist
State Department
Media
Block Deveopment Office
MNREGA
Panchayat
Community
Rating 5
Rating 4
Rating 3
Rating 1
Information and advise
Funds and resource
Directions

Annex 1: Agenda of the workshop

Time	Schedule
09:30–10:00	Registration
	Inaugural session
10:00–10:10	**Inaugural address and overview HI-AWARE** Ms. SuruchiBhadwal, Associate Director, Earth Science and Climate Change Division, The Energy and Resources Institute (TERI)
	Session 1: Technical Sesstion
10:10–10:25	**Status of water in mountain areas of the Upper Ganga Basin** Anil Gautam, Head, Environmental Quality and Monitoring, PSI
10:25–10:45	**Role of mixed forestry in restoring biodiversity** Jagat Singh Jangli
10:45–11:00	**Open Discussion**
	Session 2: Group Exercise
11:00–11:15	*Tea/Coffee break*
11:15–12:15	**Break-away groups for understanding issue and identifying responses for water access and availability in mountain areas**
12:15–13:00	**Plenary** Chair–SuruchiBhadwal, Associate Director, Earth Science and Climate Change Division, TERI
13:00–14:00	*Lunch*
	Session 3: Group Exercise
14:00–15:00	**Break-away groups for discussion on operationalising identified responses**
15:00–15:15	*Tea/Coffee break*
15:15–16:00	**Plenary** Chair–Suruchi Bhadwal, Associate Director, Earth Science and Climate Change Division, TERI
16:00–16:15	**Wrap up and feedback** Divya Mohan, Associate Fellow, Earth Science and Climate Change Division, TERI

Annex 2: List of participants

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