HI-AWARE Internal Report

Workshop Proceedings

Adaptation to Climate Change in the Upper Ganga Basin

4 March 2016, Dehradun, India

Consortium members

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).

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Executive Statement

The Energy and Resources Institute (TERI), New Delhi, along with Center for Ecology, Development and Research (CEDAR), Dehradun organized a workshop on Adaptation to Climate Change in the Upper Ganga Basin, under the Himalayan Adaptation, Water and Resilience (HI-AWARE) Research project on 4th March, 2016.The workshop aimed to understand the challenges of communities based in the Upper Ganga Basin, with respect to climate change.

Bringing together various experts from diverse domains, the workshop began with an inaugural session that introduced various dignitaries such as SP Singh, Fellow of the National Science Academy, and Ravi Chopra, from the People's Science Institute. While the first spoke of addressing climate change through management of running water in the Himalayas, Ravi Chopra spoke of changing water scenarios in the Upper Ganga Basin. The inaugural session was followed by a session on 'Good Practices on Adaptation'. This would focus on presentations by Vinod Kothari (Himmothan) on livelihoods, sanitation and hygiene, and Rajiv Pandey (Indian Council of Forestry Research and Education) on socio-ecological vulnerability in the Indian Himalayas.

A third session followed which was a primarily a participatory exercise that focused on prioritizing adaptation measures. This was done by reviewing a list of ongoing and recommended adaptation options in Uttarakhand, which were then categorized. Then four different criterion were applied to these adaptation options. Details of these are provided on page 2 & 3. A detailed annexure on the engagement and an event report is also attached on page 7.

Introduction

The HI-AWARE Academy, organised from 27 February–4 March 2016, in order to strengthen the expertise of researchers and students associated with Himalayan Adaptation, Water and Resilience (HI-AWARE), culminated in the "Adaptation to Climate Change in the Upper Ganga Basin", a day-long workshop that was jointly hosted by The Energy and Resources Institute (TERI) and the Centre for Ecology Development and Research (CEDAR). Like the Academy that immediately preceded it, the workshop aimed to improve the understanding of the challenges that communities in this arduous terrain—the Upper Ganga Basin—are facing with respect to climate change adaptation. The workshop brought experts from various sectors together to share valuable information on the climatic risks that the region—the Western Himalayas in general, and Uttarakhand in particular—is facing. The speakers also shared experiences from their respective domains related to adapting to current climate risks as well as those that are likely in the near future. While the first two sessions revolved primarily around climate risks and adaptation, the third session focused specifically on the de-listing of adaptation options by using the Multi-Criteria Analysis (MCA).

Session 1: Inaugural

The session began with a brief introduction to the HI-AWARE Research project by Philippus Wester, Principal Investigator for HI-AWARE. He highlighted the objective of the workshop, which was to come to an understanding of some good practices on adaptation in the region, and to prioritise adaptation measures and strategies. Later, Divya Mohan, from TERI, gave an overview of the scope of the work that falls under HI-AWARE's initiatives in the Upper Ganga Basin, including the specific sites and issues that need to be studied.

SP Singh, Chair of CEDAR and a Fellow of the National Science Academy, lay the groundwork for the following discussions by broadly outlining the criticality of the Himalayas for society at large and the changes that are being observed in this environment. He highlighted that addressing climate change in the Himalayas is largely an issue of managing running water, retaining it for human use and reducing damages from the runoff. He also spoke extensively about climate change impacts in the context of ecology by highlighting species movement, rising treelines and changes in seed germination induced due to changes in the monsoon. He ended by highlighting the impact of black carbon on glacial retreat, its mitigation and the co-benefits that will result from it.

During his presentation, Ravi Chopra, from the People's Science Institute, raised several issues pertaining to changing water scenarios in the context of the Upper Ganga Basin. He set the scene by talking about glacial retreat, changing river flows, drying springs and hydroelectric development, all of which seem to be affecting communities living in this region adversely. Upon setting a context through these issues, he moved on to the interventions. He spoke extensively about the success stories of watershed development and spring regeneration. He highlighted the fact that schemes such as the one promoting "more crop per drop" are important for a state like Uttarakhand, where water access in the rain-shadow and crestline regions is difficult. He further identified the revival and regeneration of traditional water harvesting systems as an important coping mechanism effective in the context of changing water scenarios. He also backed hydropower projects to specifically facilitate lift irrigation schemes in the region—a region where, in the aforementioned water scenario, access to water is a major adaptation challenge. Such hydropower projects would decrease local communities' dependence on rainfall, the patterns of which have turned erratic in recent years.

Session 2: Good Practices on Adaptation

Vinod Kothari from Himmothan Society spoke extensively about springs and livelihoods, apart from sanitation and hygiene. He highlighted the work Himmothan has been doing with regards to springshed development, an adaptation intervention, in the western Himalayas. The presentation dealt with the impact of climate change on groundwater resources and discussed how spring management can be an effective coping mechanism. Suneesh Sharma, while talking about a particular study on a watershed in Nainital, highlighted the fact that more springs are drying up in the upper portions of the watershed in comparison to the lower reaches of the watershed.

Rajiv Pandey, from the Indian Council of Forestry Research and Education (ICREF) spoke about "Socio-Ecological Vulnerability in the Indian Himalayas". His talk revolved around the notions of vulnerability and how it can measured, citing the development of a Comprehensive Vulnerability Index (CVI), which was later empirically evaluated through case studies that he and his team had carried out in the Indian Himalayas.

Session 3: Prioritisation of Adaptation Measures

Longlist of adaptation options

The third session of the workshop was primarily a participatory exercise for the prioritisation of adaptation measures. The exercise started with the presentation of a longlist of ongoing and recommended adaptation options in Uttarakhand, as identified from the literature. The options were reviewed beforehand to avoid repetitions and overlaps. The options were categorised into five major sectors—agriculture, water, forestry, disaster management and social. Since the workshop was organised at the state level, the adaptation options were broad and also a bit generic. However, site- and context- specific adaptation options can be identified in a participatory manner when the methodology is applied at the community level.

Criteria for scoring adaptation options

The next step, after the presentation on the longlist of adaptation options, included a discussion on the identified criteria for the ranking of adaptation options. For the purpose of this exercise, two criteria had already been identified and presented for discussion—Administrative Feasibility and No-regrets. Following an intensive discussion, the participants felt that the scope of 'Administrative Feasibility' could be widened by considering Feasibility as a criteria that may include administrative as well as physical or bio-physical feasibility. The participants also felt that two more criteria can be added—Cost-effectiveness and Sustainability.

The criteria can be defined as follows:

Criteria	Explanation
Feasibility	This looks at how feasible the implementation of a given adaptation option is in the current administrative, institutional and bio-physical contexts. It relates to the institutional and administrative complexities of realising an option, and whether or not radical institutional changes and adjustments are required. How feasible is the proposed action given existing laws, regulations, policies and the political climate? How technically feasible is it? Is there an opportunity to adapt existing strategy/actions, or will entirely new initiatives be needed?
No-regrets	Options for which non-climate-related benefits such as improved air quality, will exceed the costs of implementation. No-regrets solutions are those that will have a positive impact even if climate change impacts do not occur.
Cost-effectiveness	How cost-effective is the adaptation option going to be in the long term?
Sustainability	How sustainable is the implementation and operation of the adaptation option in the long term?

Criteria ranking

A pair-wise ranking exercise was done for the four identified criteria on a scale of 1-5 where 1 meant that both criteria A and B were equally important while 5 meant that A was overwhelmingly (or 5 times) more important that B.

Table 1: **Ranks given to the criteria**

	Feasibility	No regrets	Cost-effectiveness	Sustainability
Feasibility	1.00	1.00	2.00	1.00
No regrets	1.00	1.00	3.00	1.00
Cost Effectiveness	0.50	0.33	1.00	0.33
Sustainability	1.00	1.00	3.03	1.00

The ranks obtained by using pair-wise ranking were used to calculate the individual weights for each criteria using geometric mean. The weights were later used while calculating scores for each of the adaptation options.

Scoring of adaptation options

The next step in the prioritisation exercise was the scoring of adaptation options with respect to each identified criteria. The participants were divided into three groups with each group focusing on one or two sectors.

Group A: Agriculture

Adaptation Option	No Regrets	Feasibility	Cost-effectiveness	Sustainability	Explanation
Agro-Meteorological Advisory Service	5	5	5	5	This option received high importance across all criteria since agro-meteorological services can, even without climate change, offer help to farmers. It is feasible as the institutions for implementation/distribution already exist, and only need to be utilised/ improved. It is cost-effective and sustainable since an initial small investment can yield positive results for the long term.
Changing and Diversifying Cropping Pattern	1	2	3	3	This option received lesser importance across all criteria since group members thought that given the climatic changes or the lack of them, this could turn into maladaptation.
Development of Integrated Farming Systems	5	4	3	5	Since this option can yield high returns in the face of climate change, or even without it, it was perceived to have high importance.
Crop Insurance	5	3	1	4	This option is useful with or without the incidence of climate change since it covers farmers' risks. However, low awareness and acceptance among farmers could pose challenges to feasible implementation. Members also seemed unsure of how cost-effective it might be for the insurers, but felt that it could be an option that will sustain in the long term.
Organic Farming	5	3	3	5	This option was looked at as important even without the incidence of climate change impacts since it does away with the need for harmful chemicals in agriculture, and it is sustainable as well. There were questions regarding how feasible and cost effective it might prove to be as organic farming requires a three-year long transition period and the productivity is low as compared to conventional farming methods.
Livelihood Diversification	4	3	3	4	Livelihood diversification was seen not just as an option to reduce the impact of climate change but also to diversify economic avenues and ensure a steady income. It is also sustainable that way.

Group B: Water

Water	No Regrets	Feasibility	Cost-effectiveness	Sustainability	Explanation
Promote traditional water sources and sharing systems	3	5	5	5	This option received high importance in all the criteria with the exception of 'No Regrets'. The group members agreed that the revival of traditional and local sources of water should be promoted as this can provide overall security during dry spells and contribute to other ecosystem services as well.
Promote aquifer/ springs management systems	4	3	4	3	This option works on gravity-based water management systems. The group members agreed that the promotion of such a concept increases the rate of recharge, which, in turn, will provide high benefits. However, regular scientific knowledge and technical experience are required to successfully implement and manage the system. It was thus was rated low in the 'Feasibility' and 'Sustainability' criteria.
Use of efficient irrigation practices	5	2	3	2	This option was rated high in terms of the 'No Regrets' criteria, and the group members remarked that this is the most important option with respect to hill communities. Since this type of practice involves high costs and the returns on such investments are low, they rated it low in terms of 'Feasibility' and 'Cost-effectiveness'. Issues related to managing the practice also rate it low on 'Sustainability'.
Rainwater harvesting	5	5	3	5	Roof line and drip rainwater harvesting methods were highly acceptable to all members because of factors such as natural occurrence, ease of practice and high benefits. However, the methods came with their own drawbacks in terms of cost— rainwater harvesting structures require high initial investment. The members also felt that this practice requires training of the community and isn't high on the scale of acceptability.
Efficient drinking water supply	5	4	5	4	The members rated this option highly in terms of 'No Regrets' and 'Feasibility' due to the pressing need for potable drinking water in hilly communities, the scarcity of which is a leading cause of migration. They also related this to the internationally recognised 'Right to Water'. The option involves less cost as it is based on gravity, but is relatively less feasible due to technological barriers. The members also mentioned that its sustainability depends on the user as it often lies forgotten, ignored and mismanaged by communities.

Group C: Disaster Management and Forestry

Group C was given the task of ranking adaptation measures falling under two categories: (i) Social adaptation measures and (ii) Disaster management. The criteria that they were ranked under, as had been discussed and given weights beforehand, were 'No Regrets', 'Feasibility', 'Cost Effectiveness' and 'Sustainability'. The measures were provided beforehand and were to be scored on a scale of one to five.

To ensure the scores were given in a fair manner, every measure was discussed within the group and the score subsequently decided upon by voting. Before the process began, it was assumed that the adaptation measures that were under discussion were properly designed and appropriate to the context, wherever applicable. The following is an account of the discussion that took place and the issues that came up during the process.

Social Adaptation Measures

Social	No Regrets	Feasibility	Cost-effectiveness	Sustainability
Climate change awareness programme	5.00	3.00	2.00	4.00
Resilient institutions for better livelihood opportunities, for example, fodder development and dairy production, backyard poultry and women's self-help groups (SHGs).	5.00	2.00	4.00	4.00
Promotion of eco-friendly rural technologies and capacity building	5.00	3.00	4.00	4.00
Ecotourism promotion and development	4.00	3.00	4.00	5.00
Compensation for the rural poor through payment/reward for protecting/providing environmental services.	4.00	2.00	5.00	2.00
Developing traditional knowledge and promoting traditional lifestyle (e.g. Homestays)	5.00	3.00	3.00	5.00

It was agreed upon that all the adaptation measures provided to the group ranked very high with respect to the 'no regret' criterion.

Direct awareness programme: It was discussed that the means of successfully implementing such a programme—radio, visual media, integration into school curriculum etc.—especially when such a programme would need to be tailored to local contexts, would be expensive, and therefore low on 'Cost Effectiveness'. This would also affect its sustainability, which raised the issue of the interdependency of the criteria. This point reoccurred several times during the process, particularly with regard to cost-effectiveness and sustainability. It was also decided that it would not necessarily be very politically feasible.

Resilient institutions: While there would be numerous issues related to the feasibility of creating such institutions, they would be highly sustainable once created.

Ecotourism: There was a debate on what exactly constitutes ecotourism, and whether nature-oriented tourism and ecotourism are the same or separate, and what the various aspects of an ecotourism venture are. Consensus was hard to reach due to lack of information, but examples from regions such as Nepal and Kashmir were discussed to gain clarity on the issue.

Compensation for ecosystem services: It was decided that this measure was not very feasible due to several issues such as the conflicts of interest that may arise and the danger of exclusion of certain communities. It was ranked fairly cost effective, but low on 'Sustainability', due to the challenges of maintaining such an arrangement.

Traditional knowledge: Two main issues pertaining to the 'Feasibility' and 'Cost-effectiveness' of such a measure were raised. First, will the new generation be willing to revert to traditional knowledge, especially if they are not accustomed to it. Second, there may be market forces at play that prevent communities from going back to traditional knowledge systems. The example given was that of the high costs involved in organic farming that may dissuade farmers from abandoning modern agricultural practices for traditional ones.

Eco-friendly rural technology: It was agreed upon that such technology was sustainable and cost effective by its very nature.

Disaster Management

Disaster Management	No-regrets	Feasibility	Cost-effectiveness	Sustainability
Efficient early warning systems (Data fed through the sharing of hydro-meteorological information in a regional trans-boundary, upstream-downstream context)	5.00	2.00	4.00	4.00
Preparation of disaster management plans at all levels, and establishment of local quick response teams	5.00	1.00	2.00	2.00
For disaster preparedness, better building and land zoning codes with strict monitoring	5.00	1.00	4.00	4.00
Establishment of an effective monitoring network for the assessment and prediction of future changes in glaciers and glacial lake outburst floods (GLOFs)	5.00	2.00	2.00	2.00
Construction of climate-resilient houses with sanitation facilities.	5.00	3.00	4.00	4.00

Here too, it was agreed upon that all the given measures were positive and unlikely to cause regrets in the future, and were all ranked high in the 'No Regrets' criterion.

Disaster management plans at all levels: Due to the complicated nature of this measure, it was decided to be unfeasible. Also, its feasibility would depend on the geographical context. Since in Uttarakhand, disasters such as the 2013 floods are rare, it would not be particularly cost-effective. Due to these reasons, its sustainability would be low.

Better building and land zoning codes: Due to difficulties in implementation, it was voted to be unfeasible, but cost effective.

Monitoring glacier health and GLOF assessment: Ranked low on all three categories except 'No Regrets'. Due to the expensive nature of the equipment required, the difficulty of accessing the affected/target areas, and diplomatic hurdles involved in both importing the necessary equipment and visiting sites, it was voted to be unfeasible, expensive and unsustainable.

Climate-resilient housing: Lack of political will may make implementation difficult, so the feasibility of the measure would be an issue. If the materials used were local and regionally appropriate, then the measure would be cost-effective and sustainable.

Time limitations made in-depth debates on the rankings difficult, but the exercise greatly helped understand the application of the MCA tool.

Suggestions

After the exercise, the final scores for adaptation options were discussed to share the findings on the topmost prioritised options. The participants gave some comments and feedback on the exercise. They highlighted that more clarity is required in terms of the definition of criteria and their selection. They also said that there needs to be a distinction between current and desired options. The scoring process also needs to be well-defined. The comments received in this workshop will be useful in further refining the methodology.

Annex 1: **Events/stakeholder engagement report**

Purpose of the event/engagement: The workshop aimed for getting an understanding on on-going good practices and interventions which can positively contribute to adaptation of communities in Uttrakahand. It also aimed at developing shared understanding on prioritization of adaptation practices in Uttarakhand by relevant stakeholders. The workshop helped in identifying key criteria for scoring adaptation practices and sector-wise prioritization of adaptation interventions.

Contribution to HI-AWARE results: The workshop facilitated the HI-AWARE research primarily in application of the 'multi-criteria analysis' methodology at state level in Uttarakhand (Upper Ganga Basin). The methodology and key findings will be part of activity 3.2.1 under the Task 3.2 on Identification and prioritization of important adaptation practices and approached by stakeholders. The workshop also facilitated presentation and discussion on BMPs which can contribute to adaptation in the region covering one of the milestones for 2016 for Indicator 3 in the logframe. The workshop engaged members of civil society and researchers in a brainstorming to have a shared understanding on priorities on possible adaptation interventions and criteria to score them.

Event/engagement statistics

Participants

Disaggregated by gender			Disaggregated by affiliation					Disaggregated by location			
Male	Female	Total	Resear-chers	Policy makers	Practiti-oners	Govt. Officials	Media	Intern-ational	Regional	National	District / Local
10	2	12	4	0	11	0	0	0	11	4	0

Figure 1: **Participants disaggregated by location**

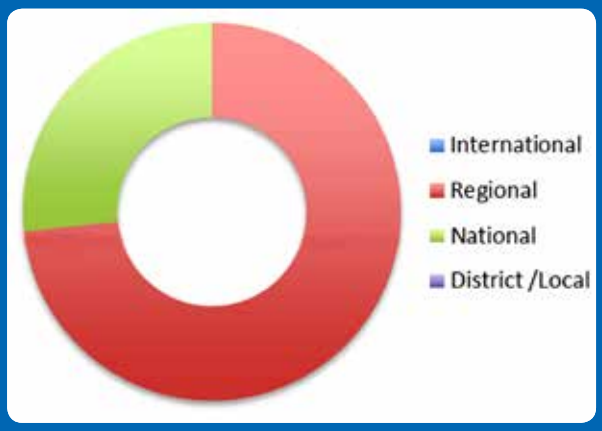
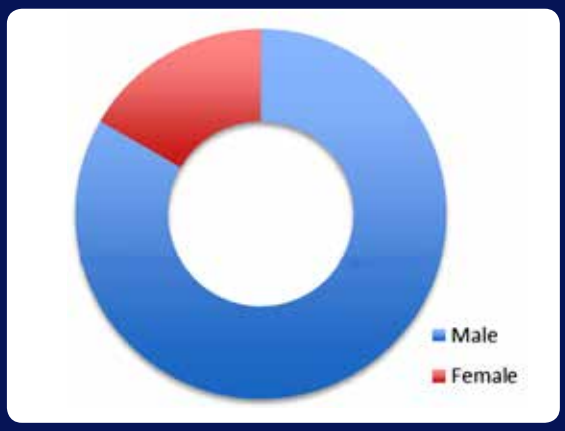


Figure 2: **Participants disaggregated by gender**



Highlights of the event/engagement evaluation:

Most of the participants found the workshop to be very relevant to their work (Fig.4). About 3/4th of the participants had attended a HI-AWARE event earlier (Fig. 5).

Figure 3: **Participants disaggregated by affiliation**

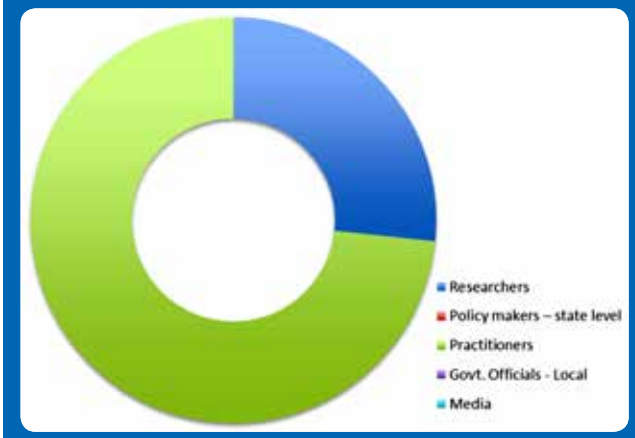


Figure 4: **Relevance of the event's focus and content to the participant's work**

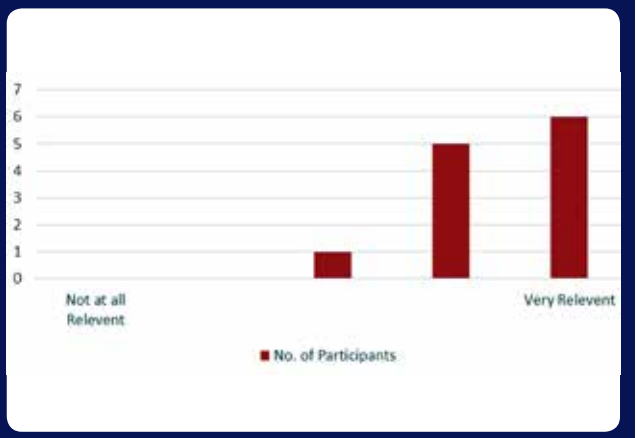
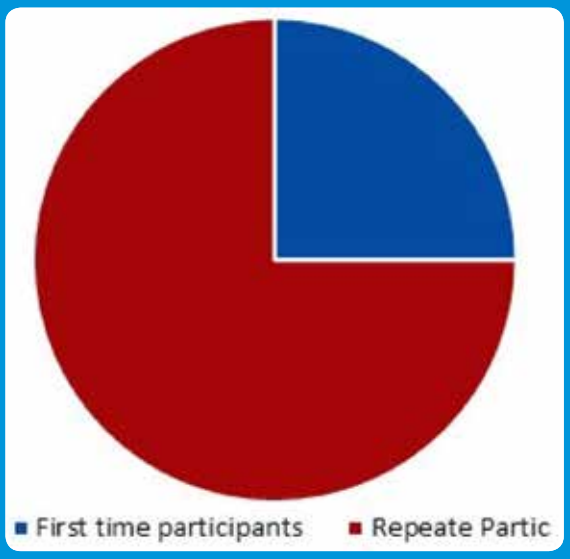


Figure 5: **Participation frequency in HI-AWARE event**



Annex 2: **List of participants**

S.No.	Name	Designation	Organisation	Contact Number
1.	A K Saxena		Himalayan Institute Hospital Trust (Rural Development Institution - Water & Sanitation)	9412057182
2.	Bharat Patwal	LEAD Fellow, Executive Director	Institute for Development Support	7500279072
3.	Kashinath Vajpai	National Project Coordinator	UNIDO	7607481242
4.	Manoj Kumar	Research Officer – Incharge Geomatic Centre, Forest Informatics Division	Forest Research Institute	9458122164
5.	Rajeev Pandey	Scientist	Indian Council of Forestry Research and Education, FRI	9412918634
6.	Ratna Singh		CBED	9319056012
7.	Ravi Chopra	Director	People's Science Institute	9411135976
8.	S P Singh	Chair of Excellence	FRI	9758765300
9.	Satyendra Srivastava	Trustee	Himalayan Desk	9412058272
10.	Shashi Uniyal		Himmotthan	8937059308
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12.	Vinod Kothari	Coordinator, Monitoring & Evaluation	Himmotthan	9412409463
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14.	Nitesh Kaushik		Himalayan Institute Hospital Trust (Rural Development Institution - Water & Sanitation)	9837021771
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