

HighNoon Delivery Report D 6.5i

Title	Workshop and Multi-stakeholder Platform Meeting Report M12
Work Package Number	WP 6
Delivery number	D 6.5i
Relative task(s)	o Documentation of discussions with stakeholders in case study sites
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Abstract

The objective of Work Package 6 is to develop multi-sectoral adaptation measures with the participation of identified stakeholders. The current deliverable is a working document that presents the report from multi-stakeholder meetings. It provides an outline of how the meetings in Phase I were carried out and a documentation of the discussions held with various stakeholders in the case study sites.

Table of contents

1. Introduction
2. Objective of Multi-stakeholder Meeting Report
3. Overview of Methodological Approach for Stakeholder Interactions under WP 6
4. Stakeholder Interaction Phase-I: First Consultation and Site Selection
 - 4.1 Objectives
 - 4.2 Method followed
 - 4.3 Stakeholders selected
 - 4.4 Phase I Multi-stakeholder interaction process
 - 4.5. Phase I Multi-stakeholder Meeting Reports
 - 4.5.1 Case Study 1 in Delhi (in progress)
 - A) State Level
 - A.1) List of stakeholders contacted
 - A.2) Meeting report
 - B) District Level
 - A.1) List of stakeholders contacted
 - A.2) Meeting report
 - 4.5.2 Case Study 2 in Udham Singh Nagar
 - A) State Level
 - A.1) List of stakeholders contacted
 - A.2) Meeting report
 - B) District Level
 - A.1) List of stakeholders contacted
 - A.2) Meeting report
 - 4.5.3 Case Study 3 in Allahabad
 - A) State Level
 - A.1) List of stakeholders contacted
 - A.2) Meeting report
 - B) District Level (in progress)
 - A.1) List of stakeholders contacted
 - A.2) Meeting report
 - 4.5.4 Case Study 4 in Purulia, Bankura, West Medinapur (in progress)
 - A) State Level
 - A.1) List of stakeholders contacted
 - A.2) Meeting report
 - B) District Level

D6.5i Multi-stakeholder meeting report M12

A.1) List of stakeholders contacted

A.2) Meeting report

1. Introduction

The Work Package (WP) 6 of the HighNoon project seeks to develop set(s) of multi-sector, adaptation strategies through a participatory approach with multiple stakeholders identified both at the institutional and the community level helping to identify set(s) of adaptation measures that are site specific and take into account the views and priorities of local people, including gender concerns. A close co-operation between WP 6 and WP4 is mandated, in order to assist the formulation and testing of new and innovative methods for stakeholder participation. While WP 4 aims to develop a new methodology for the prioritization of cross-sectoral adaptation measures, the actual application of the developed methodology is to be carried out in WP 6. The knowledge supporting the decision making process also seeks to combine the scientific knowledge derived from WP 1, 2 and 3 with the knowledge and perceptions of the stakeholders involved.

A case study approach is to be followed under WP 6. Using the information from the individual case sites, with characteristic hydrological and socio-economical conditions, adaptation measures will be elaborated and prioritised for the Basin. While TERI would be taking forward the case studies in the Upper and the Middle Ganga basin, IIT Kharagpur would be taking forward the case study in the Lower Ganga region¹.

The multi-stakeholder interactions, planned at each case study site under WP6, are aimed at capturing stakeholder perceptions on current and future vulnerabilities as well as assess their perception with respect to climate risks and impacts in respective sites. This would in turn provide critical inputs for the selection and prioritization of adaptation options in an interactive and iterative manner engaging this diverse set of stakeholders across the case study sites. The site selection is also based on extensive stakeholder consultations in addition to certain other criteria. Conducting multi-stakeholder meetings and workshops can ensure that relevant stakeholders at the state, district and community level are informed of the goals and objectives of the HighNoon project and activities that will be of direct relevance to them. It is also important to obtain the inputs and feedback of a multiple set of stakeholders to chart out the activities as part of Work Package 6 and eventually evaluate the selected adaptation options.

2. Objective of Multi-stakeholder platform report

This document presents the objective and process (method) of stakeholder interactions held in different phases in each case study site and also a gives a detailed recording of the minutes of the discussions held with them. It is to be taken as a working document, as stakeholder interaction is a process that is continual and will be executed in different phases (as explained in following sections) during the time period of the study. These

¹ The description of the various case study sites chosen in the study is elaborated in the Report Deliverable 6.1.

interactions with stakeholders will be held in the form of one-to-one discussions, group discussions and workshops using tools defined under WP 4.

The objective of the multi-stakeholder meeting reports is:

- To outline the objectives and process (method) followed for the stakeholder interactions
- To record stakeholder opinions, perception and expectations with respect to climate risks and adaptation in their region, thus providing critical inputs for the prioritization of adaptation options as part of WP 6
- To record multiple interests that exists within a diverse set of stakeholders
- To provide a feedback to WP 4 on the strengths and drawbacks of using specific methods, tools and techniques to elicit stakeholder response

3. Overview of Methodological Approach for Stakeholder Interactions under WP 6

As per the methodology developed under WP4, for each case study site, the interaction process with stakeholders has been distinguished into four phases (Table 1). Each phase will be executed at various decision making levels namely, state, district and community. Brief description of each phase is provided in the following paragraphs:

Phase I: Preparatory phase or First consultation phase

The preparatory phase includes activities such as (i) the preliminary understanding (by the work package investigators) of key issues in the basin (ii) a first round of stakeholder identification (iii) first contact with identified stakeholders (iv) a one-to-one consultation round using semi structures interviews; (v) and all of this culminating into the selection of districts and study sites within the districts. This round of first consultation is also expected to aid in developing a preliminary understanding of the stakeholders' perception of existing vulnerabilities and coping capacities in different regions of the basin as well as identification of other relevant stakeholders. This phase is to be carried out first at the *state level* (in order to identify study districts) and then at the *district level* (in order to identify study sites within the districts).

Phase II: Participatory vulnerability assessment and listing of a first set of adaptation strategies:

The second phase is aimed at revealing the perceptions of stakeholders regarding their vulnerability (present and future) to climate change. Given the likelihood of future changes, outputs from the modelling exercises will be shared with stakeholders and insight into the extent to which the current adaptation strategies are adequate to address the climatic risks in the future will be developed. In case the adaptation strategies are considered not to be effective, insight into required new adaptation strategies, policies

and programmes will be developed. Overall the methodology for the participatory vulnerability assessment will capture:

- Stakeholders' perceptions on past climatic hazards, adaptation strategies and their effectiveness
- Stakeholders' perceptions of their adaptive capacity (past, present and future situation) encompassing: their social- economic en institutional capacity, their biophysical capacity, their technological capacity, their willingness to adapt to and their perceptions on the availability of adaptation options
- Stakeholders' perceptions of the system's sensitivity (present and future)
- Stakeholders' perceptions of the potential impacts of climate change (present and future)
- Stakeholders' perceptions of new adaptation option

Phase II will involve stakeholder consultation at all three levels: State, District/block and Community Level. Different participatory tools such as the “climate hazard trend analysis matrix”, “community mapping”, “adaptive capacity assessment tool”, “what if analysis” etc will be used in various stages of assessment.

Phase III: Assessing and prioritizing adaptation strategies by stakeholders, including a first set of no regret adaptation options

The third phase involves prioritisation of options from the identified set of adaptation strategies. The prioritization methodology will aim to support the negotiation process on sets of adaptation measures between stakeholders. Participation of stakeholders in a prioritization process implies debating different values and contesting interests. As a consequence, the methodology for the prioritization of adaptation options will address the issue of negotiation between stakeholders operating within the same and/or different decision making level(s). The third phase will be executed at all three levels of decision making: state, district/block and community.

Phase IV: Organizing feedback from stakeholders on the modelled effects of adaptation strategies and define adaptation strategies of highest priority

In the final phase of the participative process, feedback from stakeholders will be sought on the prioritised adaptation options. Since the indicator framework developed in WP 5 will not only be used to describe current vulnerability of land and water resources to climate change, but also to assess the effectiveness of adaptation measures across scales and sectors, stakeholder feedback on these modelled effects will be integrated into the assessment in this phase. However, phase 4 might not be carried out at the community level.

Table 1: Four phases the Stakeholder Interaction Process in WP 6

Phase	Core Activities	Level and sequence
I	Preparatory/First consultation phase: Stakeholder identification, first consultation round and selection of study sites	1. State 2. District
II	Participatory vulnerability analysis and listing a first set of adaptation strategies	1. State 2. District/ Block 3. Community
III	Prioritizing adaptation strategies by stakeholders and identifying no regret strategies	1. State 2. District/ Block 3. Community
IV	Organizing feedback from stakeholders on the (modelled) effects of the adaptation strategies and define adaptation strategies of high priority	1. State 2. District/ Block 3. Community

Depending on the site and level and type of stakeholder interaction (for example group, individual, institutional) the methods, tools and techniques for stakeholder interaction would be selected. Some methods of interaction include:

- Individual and institutional consultations
- Surveys
- Use of Participatory Rural Appraisal tools
- Workshops
- Focus Group Discussions

Different methods, tools and techniques for stakeholder interaction for the different phases have been identified and elaborated in WP 4 reports.

Since we have completed “Phase I” of the interactive process at the “State and District Level”, this stakeholder consultation report (D 6.5i M12) gives details of the objectives, methods and outputs of that exercise. As further progress is made in terms of the methodology and execution, documentation will be extended to cover those.

4. STAKEHOLDER INTERACTION PHASE-I: First Consultation and Site Selection

This section describes the details of Phase 1 stakeholder interaction at state and district level that has been completed.

4.1 Objectives:

The main objectives of the Phase I interaction with stakeholders at the state and district level was to:

- Establish contact, initiate discussions and sensitize state and district level stakeholders about the study as well as the participatory approach adopted
- Get a preliminary understanding of the stakeholders' perception of existing vulnerabilities and coping capacity in the state
- Seek their recommendations for the selection of sites (districts and blocks/communities within districts) for carrying out detailed case studies
- Seek their continued co-operation and involvement throughout the progression of the study
- Seek their support in identifying additional stakeholders/references whose inputs may be relevant to the objectives of the study

4.2 Method followed:

A step-wise approach was followed for executing the Phase I interactions, as outlined in the following schematic (Figure 1)

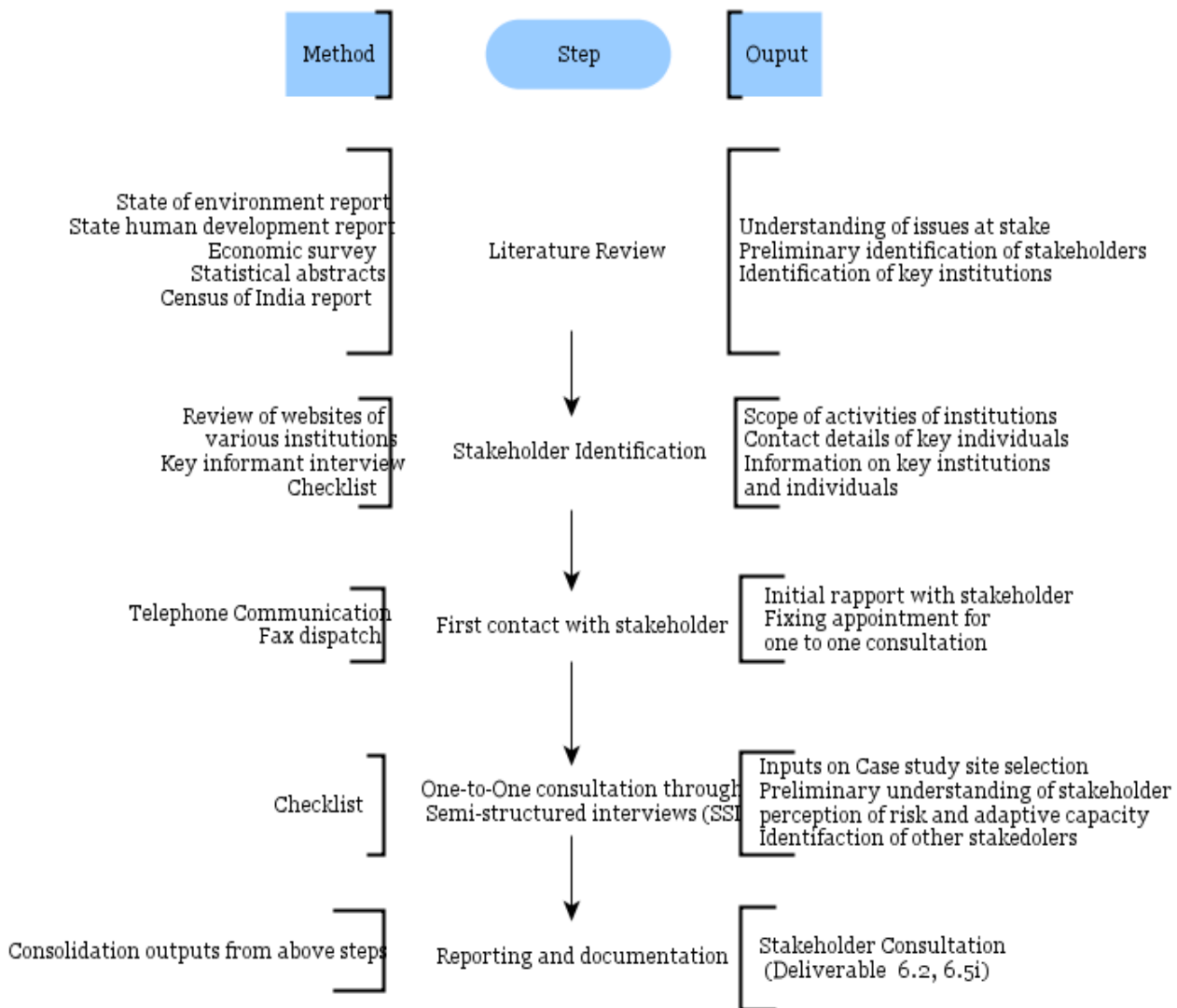


Figure 1: Phase I stakeholder interactions approach

4.3 Stakeholder Selection

WP 6 interactions envisage engagement of stakeholders at various levels. While interactions at the national and state level are important from a policy perspective, key inputs are sought from the stakeholders at the district and local level. The criteria for stakeholder selection under Phase 1 have been detailed out in table below (Table 2).

Table 2: Criteria for stakeholder selection in Phase 1 interactions

Criteria for stakeholder selection	State level	District level
Having an overview of local programs and various policies (for selected sectors)	Yes	Yes
Having an overview of local vulnerabilities and possible impacts	Yes	Yes
Close contact with various departments at the state level, district and community level	Yes	Yes
Should be able to understand the issue at stake (the project goals and focus) quickly	Preferably Yes	Preferably Yes
Should have an interest (stake) to advise and/or participate	Yes	Yes
Being involved in relevant (development) initiatives	Yes	Yes
Willingness and capacity to become involved in the HIGHNOON project	Yes	Yes
Having a degree of economic, social or cultural reliance on the area and/or sector	Yes	Yes

Though the following listing is not exhaustive, stakeholders identified on the basis of above criteria, for interaction during the Phase I, include the following:

At State Level:

- Department of Agriculture
- Department of Rural Development
- Department of Water Resources
- Department of Environment
- Department of Irrigation
- State Hydropower Authority
- Academic Institutes including State Agriculture Universities
- Non-Government Organisations
- Civil Society Organisations
- Public Sector Undertakings

At District Level:

- District Magistrate
- Chief Development Officer of the District

- District Officer for Department of Agriculture
- District Officer for Department of Rural Development
- District Officer for Department of Water Resources
- District Officer for Department of Irrigation
- District Officer for Department of Health
- District Officer for Department of Social Welfare

Detailed interactions with identified stakeholders at both state and district level will be a continuous process and will be conducted in an iterative manner till the end of the project cycle (M 36) as part of the next three phases also.

4.4 Phase I multi-stakeholder interaction process

The one-to-one stakeholder consultation rounds at the state and district levels were conducted in Delhi (Case Site 1), Uttarakhand (representing upper segment of the Ganges Basin where Case Site 2 will be located), Uttar Pradesh (representing middle segment of the Ganges Basin where Case Site 3 is located) and West Bengal (Case Site 4) between July to November, 2010.

Several visits were made to the state capitals and district headquarters for phase I level consultations. Location of stakeholder consultations in the two states is given in Table 3 below:

Table 3: Location of state and district level stakeholder interactions

<i>Case Study</i>	<i>State</i>	<i>Location of Stakeholder Interactions at State Level</i>	<i>Location of Stakeholder Interactions at District Level</i>
CS 1	Delhi/ NCR	Delhi (in process)	
CS 2	Uttarakhand	Dehradun City (State Capital) in Dehradun District along with districts of Rishikesh and Haridwar (Roorkee City)	Udham Singh Nagar District
CS 3	Uttar Pradesh	Lucknow City (State Capital) in the Lucknow District and Gorakhpur City in Gorakhpur District	Allahabad District
CS 4	West Bengal	Kolkata (state capital) and Midnapore in West Midnapore district	Midnapore, Bankura, and Purulia districts

For all Phase I interactions, semi-structured consultations were carried out. The broad structure of the interactions includes (Figure 2);

- Sensitising stakeholders about the study through a description of the study objectives, scope, relevance (utility) of the study, explaining the broad methodological framework and the progress so far
- Explaining the rationale of the meeting to the stakeholders and the participatory process that the High Noon team intends to follow at various levels of decision making (state, district and community)
- Discussing with them the local contexts, get a preliminary understanding of the stakeholders' perception of existing vulnerabilities and coping capacities including the various policies and programs in the state, vulnerable areas based on regions prone to disasters, vulnerable groups etc., general questions on issues related to water availability in the state and specific questions relating to the sector/domain in which the stakeholder's interests lie
- Obtaining recommendations for selection of districts/blocks within districts for carrying out case studies. The objectives of the study were reiterated in order to extract only relevant information from the interviewee on this topic.
- Seeking stakeholder's assistance in identifying additional stakeholders whose inputs may be relevant to the study
- Providing the stakeholder with information on the next phases of the study and finally asking them about their willingness to extend continued co-operation throughout the course of the study over the two years

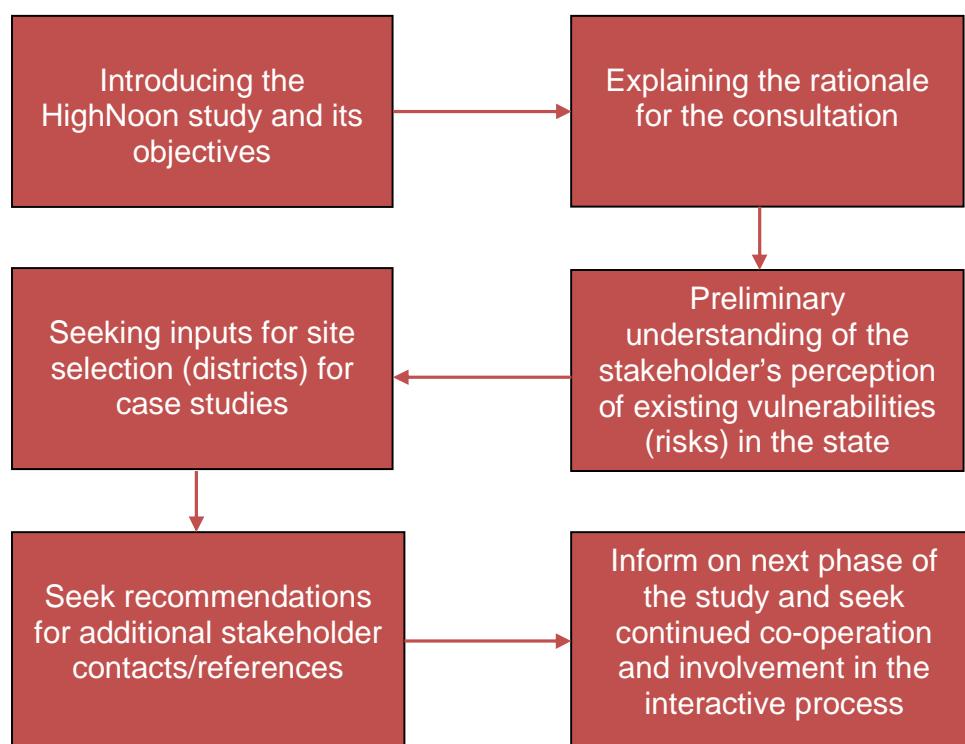


Figure 2: Broad structure of the Semi structured Consultations carried out in Phase I

Detailed notes were taken during the consultations, and elaborated by undertaking some degree of analysis that has been reported in the deliverable D6.2 which marks work in progress. This report serves as the meeting report for the Phase I interactions: multi-stakeholder platform meetings conducted at the state and the district scales.

4.5. Phase I Multi-stakeholder Meeting Reports

4.5.1 Case Study 1 in Delhi

4.5.2 Case Study 2 in Udham Singh Nagar

A) State Level

A.1) List of stakeholders contacted

Table 4 provides a list of the stakeholders consulted in Uttarakhand for the phase I interactions at state level.

Table 4: List of State Level Stakeholders for CS 1

Name	Department/Designation
Mr V.K. Bhagwat	Principal Secretary, Department of Rural Development
Mr. N.K.Sharma	Executive engineer, Irrigation Research Institute, Tubewell Division, Roorkee, Government of Uttarakhand.
Mr. B.P.S. Panwar	Assistant Engineer, Irrigation Research Institute, Tubewell Division, Roorkee, Government of Uttarakhand.
Mr. G.M. Prasad	General Manager (Design-Civil), Tehri Hydro Development Corporation Ltd.(THDC)
Mr. Shailendra Singh	Assistant General Manager General Manager (Design-Civil), Tehri Hydro Development Corporation Ltd.(THDC)
Mr. Vineet Pangtey	Additional Chief Executive officer Bhagirathi River Valley development authority, Government of Uttarakhand. Also Additional Conservator of Forests Government of Uttarakhand
Mr. W. Longwah	Project Director (Administration), Watershed Management Directorate Government of Uttarakhand
Mr. Om Prakash	Secretary,

	Department of Agriculture, Government of Uttarakhand.
Mr. Ravi Pandey	Project officer Department of Rural Development Government of Uttarakhand
Mr. K.K. Singh	Director (Project) Uttarakhand Jal Vidyut Nigam Government of Uttarakhand
Dr Ravi Chopra	Director People's Science Institute

A.2) Meeting report

Visit I: Dehradun, Uttarakhand

Dates for the consultation: 31st August - 2nd September, 2010

Team from TERI

Ms. Suruchi Bhadwal, Ms. Sambita Ghosh, Mr. G.J. Lingaraj

a) Consultation with Executive engineer and Assistant engineer (Tubewell Division) Irrigation Research Institute, Roorkee, Uttarakhand: Mr. N.K. Sharma & Mr. B. P.S. Panwar

- Groundwater levels are decreasing in the state
- Most of the irrigation in Uttarakhand is either rainfed or through groundwater
- Surface flows (discharges) are decreasing in the state, not due to overconsumption but due to land use changes and changes in rainfall patterns.
- Impacts of glacier melt are mainly felt in the summer; discharges increase in May-June.
- **Agriculture is mainly undertaken in plains, which include areas like Udham Singh nagar, Nainital, Haridwar and Dehradun.**
- Demands for lift irrigation schemes are increasing in Dehradun. 30% of area in Dehradun has no groundwater reserves.
- The Respana River has transformed from a perennial river to a monsoon river.

b) Consultation with General Manager and Asst Manager, Tehri Hydro Development Corporation Ltd., Rishikesh, Uttarakhand: Mr G. M Prasad & Mr Shailendra Singh

- All the water tapped by the dam at Tehri on the river Bhagirathi goes to Uttar Pradesh through the Eastern Ganga Canal. Water from this canal is released at Bijnor.
- The Hydroelectric power generation output of the plant at Tehri is 1000MW. 12% of this goes to Uttarakhand at state royalty as the plant is situated in Uttarakhand. Out of the remaining Power, 75% goes to the Government of India and 25% goes to the State of Uttar Pradesh as THDC is a joint venture of the Government of Uttar Pradesh and the Government of India.
- The balance unallocated quota is allocated by the Government of India on a short-term basis to states based on their requirement/demand.
- Out of the total amount of water released from the dam, 500 cusecs is earmarked for drinking water supply. Out of the 500 cusecs, 200 goes to the Delhi and NCR region and 300 cusecs are allocated to the Uttar Pradesh.
- Another dam is located at Vishnu Prayag, which is a Jaypee enterprise, is downstream of Badrinath. Hydropower generated goes to the Northern Power Grid which includes states of Jammu and Kashmir, Haryana, Rajasthan, Punjab, Himachal Pradesh, Delhi, Uttarakhand, Uttar Pradesh and Chandigarh (There are 9 states in all). The allocation of power is calculated by the Gadgil formula.
- Supply of the 200 cusecs of drinking water to Delhi is routed through Uttar Pradesh. **The state of UP proportionately decreases supply of water to Delhi if it receives lesser water than 500 cusecs.**
- They calculate electricity production potential of the dam using historical river discharge data. According to the engineers, the electricity production potential has been decreasing as more data values are considered in the assessment.

c) Consultation with Additional Chief Executive Officer and Additional Chief Conservator of Forests, Bhagirathi River Valley Development Authority and Forest Department, Uttarakhand: Mr. Vineet Kumar Pangtey

- The Bhagirathi River Authority is not very active at the moment. Certain permissions are pending with the Chief Minister for the past 2-3 years.
- The entire rural community is dependent on forests and forest products, mostly for fuel.
- Report on power generation in Himachal Pradesh and Uttarakhand is available in their website.
- The option of payment for ecosystem services should be explored as an adaptation strategy and implemented. Vegetation cover should be ensured and encouraged in the upper reaches of the mountain. To ensure that the vegetation cover is maintained, payment should be promised to individuals/groups or villages who would oversee the maintenance and management of the vegetation cover. The scale of payment would vary depending on the areas in which work is undertaken

(more inaccessible = more payment) and also species that are planted to maintain the vegetation cover. For example if lantana (which is an invasive species and spreads rapidly and requires little effort to maintain) is planted, the payment would be relatively lesser than if more compatible species are planted which not only maintain but enrich the biodiversity of the area. The several advantages of enhanced recharge rates of water resources was also highlighted.

- The Government of India has a scheme through which it attempts to discourage migration from international boundary areas by providing incentives. For eg. an amount of approximately 7000 Rupees is allocated to people for them to reside in Lakshadweep to discourage encroachment of land by neighbouring countries. (Maldives in this case.). Maybe a similar incentive-based scheme could be introduced in areas along the Himalayas that mark India's boundary and where migration is predominant.
- Some resources on Bhagirathi river could be found at their website. Link: <http://gov.ua.nic.in/brvda/>

d) Consultation with Project Director, Watershed Management Directorate, Uttarakhand: Mr. W Longvah

- Watershed management directorate is currently implementing the Uttarakhand Decentralized Watershed Management project in about 234,800 hectare in the middle Himalayas, ranging from 700m to 2000m above sea level.
- About 468 Gram Panchyats in 18 developmental blocks are in the project.
- The project is highly participative nature and aims to promote soil conservation, better crop management practices, afforestation drives, water-harvesting measures to enhance rural livelihoods.
- Details of the project is available at <http://www.gramya.in/>

e) Consultation with Secretary, Department of Agriculture, Uttarakand: Mr. Om Prakash, Secretary

- Total rainfall **during the *Kharif* period has shrunk from three to two and a half months. The peak has also shifted from mid-July to mid-August.**
- **Winter rainfalls are highly erratic** and have started to coincide with the harvesting season, which leads to a **loss in total produce.**
- Weather typical to hilly regions i.e. cloudy days followed by clear mornings is no longer observed.
- **Effects are mostly observed in apple crops**, which require temperatures below 4°C for a minimum period of 40 days. Increased winter temperature in the region has lead to a drop in the production apples. The government is considering a shift from alpine apple varieties, which is currently grown to more heat resistant Mediterranean apple verities.

- **An increase in pest incidences has been observed** though productivity rates of crops have not suffered.
- **Uttarkashi and Chamoli are most vulnerable.** The plains (Haridwar and Dehradun) are 90% irrigated and only 10% of the hills are irrigated.
- Average land holding size is 0.4 hectare. Land is highly fragmented where 0.4 hectare is further divided into 10 plots.
- Almost all crops can be grown in Uttarakhand except coastal crops.
- The state needs longer duration crops with higher productivities.
- Before the construction of the Tehri dam, the flow in the Ganga canal was 3000 cusecs during the lean period whereas after the construction of the dam, the flow during Rabi was 12000 cusecs. Thus, constructions of large dams would solve the water availability problems for agriculture otherwise *rabi* prospects would decrease over time.
- Mr. Ajay Sharma, Joint Director, Statistics has all the data related to Agriculture.
- The secretary has agreed to be one of the stakeholders in the study. For further visits he said, we should take the appointments on a Saturday.

f) Consultation with Director, People Science Institute: Dr. Ravi Chopra (and Ms. Chicu)

- They have been observing more abrupt weather events in the recent past. It was stressed that in the context of climate change
- Since the Highnoon study has a long time frame, it was suggested that the study incorporate migration and urbanization as key parameters in the assessment. Lack of recognition that this is a discontinuity.
- It was stressed that the people in fragile ecosystems of the high mountains in the districts of **Pithoragarh, Chamoli, Rudraprayag and Uttarkashi** are vulnerable for many reasons, including remote locations and the various sources from which livelihoods are drawn and the case study could provide crucial insights about local actions in dealing within such circumstances
- Impact of local actions such as deforestation on the Terai region and habitation of farmers in the Terai region on glaciers was identified as areas to be studied.
- Owing to the complexity of the issue that the study is investigating, a variety of expertise is required for such deliberations and maybe a common forum to advice and deliberate on the study would be useful

B) District Level

B.1) List of stakeholders contacted

Table 5 provides a list of the stakeholders consulted in Udham Singh Nagar (USN) district in Uttarakhand for the phase I interactions at district level.

Table 5: List of district level stakeholders in USN district

Name	Department/Organization
Sh BVRC Purushottam	District Magistrate, Udham Singh Nagar
Sh B K Mishra	Agriculture and Soil Conservation Officer, Watershed Department, Udham Singh Nagar
Sh Y K Pant	Chief Development Officer, Udham Singh Nagar
Sh Rajendra Tewari,	District Statistical Officer, Udham Singh Nagar
Dr Dharendra Shah	Project Manager, Uttarakhand Institute of Rural Development (UIRD)

B.2) Meeting reports

Visit 1: Udham Singh Nagar (USN) district ,Uttarakhand 10-11 Nov 2010

TERI Team: Ms Sambita Ghosh, Ms Sneha Balakrishnan & Mr G J Lingaraj

a) Meeting with Dr BVRC Purushottam (IAS), District Magistrate (DM), USN

- Briefly discussed the framework and main objectives of the project
- Informed the DM about the requirement for holding a district level stakeholder workshop (As part of phase 2 consultations)
- DM's office has agreed to arrange for a meeting on 29th Nov 2010, in Vikas Bhawan, Rudrapur, Udham Singh Nagar (11 a.m.), where representatives from all identified district level departments (such as agriculture, irrigation, water supply, rural development etc) will be invited.

b) Meeting with Shri B K Mishra, Agriculture and Soil Conservation Officer, Watershed Department, USN

- Water scarcity in terms of drinking water and for agriculture is not an issue of concern in the district. Only one gram panchayat (the Bara panchayat in Sitarganj block) has reported lowering of ground water levels, which is primarily due to overexploitation.
- The district has high water table levels, with many places having artesian wells, for example, in the blocks of Gadarpur, Khatima and Kashipur
- 98% of the agriculture is irrigated (using both ground water and canals)
- The district has always been a flood prone district. Whenever there is a good monsoon rainfall, the local rivers experience flooding thus affecting the adjacent

villages. This year too Udham Singh Nagar was amongst the flood affected districts of the state. Usually the affected blocks are: Sitarganj, Kashipur (Dhela River), Jaspur (Phikka River) and Khatima.

- Major crops grown in the flood prone areas are Rice (summer paddy and seasonal paddy), wheat, sugarcane, pea etc.

c) Meeting with Shri Y K Pant, Chief Development Officer (CDO), USN

- The CDO suggested that the district does not face the problem of water scarcity. Instead it is water rich with many of the blocks having artesian wells to draw out ground water.
- Most of the agriculture is irrigated.
- During discussion on selection of case study sites, it was suggested that selecting any one of the hill districts in the state would be more appropriate if impacts of water scarcity on livelihoods and other aspects are to be studied. As almost all hill districts in the state are facing water scarcity, useful insights and observations on impacts as well as coping strategies can be recorded if district and community level consultations were to be held in the hill districts. The vulnerability of the hilly areas is compounded by lack of accessibility due to the difficult terrain.

e) Meeting with Dr Dharendra Shah, Project Manager, Uttarakhand Institute of Rural Development (UIRD), Rudrapur, USN.

- Mandate of UIDR: The Uttarakhand Institute of Rural Development (UIRD) is an organization for training, education, extension, research and consultancy in the field of Rural Development and Panchayati Raj in the State. The institute has experience in conducting evaluation studies under various water shed programs, livelihood assessments in the region, also involved in the implementation of some government projects.
- Briefly discussed the scope and objectives of the HighNoon study and the process of stakeholder consultations at various levels.
- Dr Shah has promised co-operation of the Institute, in terms of inputs towards the district and community level interactions for the coming phases.
- Has also agreed to participate in the proposed meeting on 29th Nov.
- Suggested additional contacts at Uttarakhand Academy of Administration, Nainital: Dr Om Prakash and Dr J C Dhondyal (Disaster Management)

4.5.3 Case Study 3 in Allahabad

A) State Level

A.1) List of stakeholders contacted

Table 6 provides a list of the stakeholders consulted in Uttar Pradesh for the phase I interactions at state level.

Table 6: Detailed Contact List of State Level Stakeholders in CS 3

Name	Department/Designation
Dr R S Rathore	Dy. Director, Uttar Pradesh Council of Agricultural Research (UPCAR)
Dr Yashpal Singh,	Director, Directorate of Environment, Govt of UP
Mr Hemant Kumar,	Publication Incharge, Directorate of Economics and Statistics, Govt of UP
Mr A K Srivastava,	Managing Director, Uttar Pradesh Jal Nigam, Govt of UP
Mr A K Rohatgi,	Chief engineer (Water Resources), Department of Irrigation, Govt of UP
Mr Alok Tandon, ,	Chairman and Managing Director, Uttar Pradesh Jal Vidyut Nigam Ltd., Govt of UP
Mr D K Gupta and Mr Satish Kumar	Experts on the Rihant Dam, Uttar Pradesh Jal Vidyut Nigam Ltd., Govt of UP
Mr Shiraz Wajih	President, Gorakhpur Environmental Action Group
Mr Kapil Dev,	Principal Secretary, Department of Agriculture, Govt of UP
Dr O P Dubey	Water and Land Management Institute
Mr V.K. Bhagwat	Principal Secretary, Department of Rural Development

A.2) Meeting Reports

*VISIT I: Lucknow, Uttar Pradesh
13th – 15th July, 2010*

Team from TERI:

Ms Suruchi Bhadwal, Ms Sneha Balakrishnan and Mr Lingaraj G J

Detailed minutes of meetings

a) Consultation with Deputy Director, Uttar Pradesh Council of Agricultural Research (UPCAR): Dr R S Rathore,

Minutes:

The discussion focused on the following:

1. Insight into selection of case study sites

<i>Point of Consideration</i>	<i>Site</i>		
	<i>Bijnor</i>	<i>Jhansi</i>	<i>Unnao</i>
<i>Location</i>	Falls in the upper Ganges basin (Represents the entry of Ganges river into Uttar Pradesh).	In the Bundelkhand region of UP; water resources are directly dependent on total rainfall received.	Falls around midstream in the Ganges basin.
<i>Water Resources</i>	Water resources in the region dependent on glacier fed river water, therefore impact of climate change on glaciers and associated melt water may be the main concern at this site.	One of the worst affected regions in Uttar Pradesh with respect to impact of climate variability on agriculture and water resources. ((<i>Changes in rainfall patterns will be a more significant impact to study in this region as compared to impact on glaciers</i>))	Mostly irrigated land, very little area is rainfed
		Mata Tila dam, a reservoir based dam, (collects rainwater from the catchment area) is the major	

D6.5i Multi-stakeholder meeting report M12

		source of drinking water for the district.	
	Overexploitation of groundwater reserves is another concern due to intensive agriculture and agricultural subsidies (as is the case in most of the Tarai region).	Ground water availability variable. Lithology such that the most of drains off as runoff ultimately leading to poor reserves	
	Predominantly a “connected” aquifer system	“Confined” aquifer system	
<i>Agriculture</i>	Irrigated agriculture (mostly canals and tube wells; not rain dependent).	Predominantly a rainfed agriculture system; very little area under irrigation, therefore impact in terms of decreasing rainfall is expected to be high.	
	Fertile alluvial soil (deposited by the river).	Soil is not very fertile; soil erosion rates also high in the region.	
	Average land holding size is small but high productivity leads to higher returns.	Though average size of land holdings is comparatively larger, productivity is low which leads to small returns.	
		Because of very low groundwater levels, diesel pumps are mostly ineffective in drawing out water. Farmers are dependent on electric pumps (at least 10HP) for which steady supply of electricity is required which is unavailable at most times.	
<i>Other issues</i>		Poor infrastructural	

		support in many of the villages for example, little access to quality power supply which limits water pumping capacity	
		High migration rates; mostly seasonal and climate induced leading to a low population density in this region and reduced value of land resources	
<i>Support for the study from local agricultural body</i>		Krishi Vigyan Kendra (KVK) in Jhansi is under C.S. Azad Agricultural University; UPCAR can assist in establishing a contact at this KVK which will be crucial for the study.	KVK run by a local NGO, with limited expertise.
<i>Local support (at survey stage) for the study</i>		Availability of already established links of UPCAR with some local bodies and NGOs.	Will have to establish new links.

2. Water quality issues in the region

- Impacts on water quantity)are also linked to the subsequent quality of water available; for example, through processes that lead to dilution of pollutants (natural or anthropogenic). This may lead to adverse impacts on health if the water is used for consumption or through indirect impacts on soil fertility, crops and agricultural productivity. So it would be important to look at this dimension while carrying out the case studies.
 - Districts that having geologically poor quality water (saline water): all districts downstream Kanpur, Mathura, Agra, Eta, Kanpur, Unnao, Rai Bareily
 - High levels of Arsenic: In many districts of Eastern U.P
 - High levels of Fluoride: In some districts such as Unnao

3. Inputs for conducting case studies

- It was suggested that a comparative analysis of two villages within a given case study site can be undertaken to understand underlying vulnerabilities and identifying strategies for dealing with current variability in climate. For example, within the Bijnor district one can identify a pocket where irrigation facilities are inadequate and then compare it with a cluster that has adequate irrigation infrastructure in place.
- Similarly a comparative study can be undertaken for a site at the head end of a canal and a site at the tail end of the same canal (For e.g. Betwa canal in the Bundelkhand Region)

4. Contact suggested by Dr R S Rathore to collect other related information

Dr Mathur, Remote Sensing Applications Centre, UP

b) Consultation with Director, Directorate of Environment, Uttar Pradesh: Dr Yashpal Singh

The key discussion points are as follows:

1. Mandate of the Directorate of Environment:

Environmental Management in the State; Pollution related issues though the main body is the State Pollution Control Board; Environmental clearance of Projects, preparing the State of Environment Reports, managing the Environment Information System in the state.

2. Suggestions for selecting case study sites

- It was suggested that choosing a site downstream of Kanpur district may be important to study issues and impacts related to water quality and quantity in the river basin.
- The district has a high density of industries (especially tanneries) that are water intensive and water polluting. A case study at this site may also help in highlighting health implications of changes in water quality and availability.
- The district is also dependent on groundwater resources, however water is mostly saline in the region

3. Contacts suggested by Dr Yashpal Singh to collect other related information

- Dr C S Bhatt, State Pollution Control Board, UP
- Mr Alok Ranjan, Principal Secretary, Department of Urban Development & Environment; Ganga River Basin Authority
- Mr T N Dhar, IIPA, Lucknow office

4. Documents collected

Issues of GREEN, Quarterly Newsletter from Directorate of Environment (Envis Centre) (Distilleries in UP; Fluoride in Water and public health issues; Pollution and waste management in UP; Leather Tanning and Environment; Envis Centres)

c) Consultation with Publication Incharge, Directorate of Economics and Statistics, Planning Department, Uttar Pradesh: Mr Hemant Kumar

The meeting primarily resulted in the identification of specific data and information sources that are going to be extremely useful for the study. The highlights of the discussion are as follows:

1. Functions of the Directorate

Some of the key functions the Division are as follows:

- Collect, compile, analyze the data and publish the reports related to various socio-economic indicators
- Provide data/ information to various Central and State Government departments
- Help in collecting, verifying and monitoring various on-going development schemes
- Monitor the progress of district plans.

2. Some important publications available on the website (<http://updes.up.nic.in/>)

- State Statistical Abstract
- State Statistical Diary
- District-wise Development Indicators
- District and Divisional Sankhyakiya Patrika
- District and Divisional Statistical Handbooks
- U.P. at a Glance (in figures)
- State Economics and Statistics Review

3. Useful data sources

State Accounts Statistics http://updes.up.nic.in/sas.htm	State Domestic Product; District Domestic Product
Socio-Economic Statistics http://updes.up.nic.in/ses.htm	National Sample Survey Reports
Industrial Statistics http://updes.up.nic.in/Indus_sts.htm	Survey of Industries Reports
Agricultural Statistics http://updes.up.nic.in/otherstats.htm	Agricultural Production Index

4. District and Block Level Database

4.1 SPIDER (Sankhyakiya Patrika: Internet Based Data Entry and Retrieval System)

<http://upgov.up.nic.in/spatrika/>

- Sankhyikiya Patrika (SP) is an annual publication of Economics & Statistics Division of Planning Department, Government of Uttar Pradesh. It is published from data compiled at the level of the office of Divisional Deputy Director, District Economics and Statistics Officer and Block level officers in the state. The publication gives information on more than 3500 parameters at the village, village *panchayat*, block, district, division and state level in the form of more than 100 tables/subtables.
- Broadly the sectors covered in the SP are: *Area and Population, Agriculture, Animal Husbandry, Co-operatives, Industry, Education, Public Health, Electricity, Transportation, Finance, Water Supply, Panchayati Raj, Urban and Rural areas etc.*
- The SP is available at 4 levels: Divisional, District, Block and Village Panchayat
- Data is available in both hard and soft form for time period 1995-2009.

4.2 SRISHTI (GIS-UP) developed by National Informatics Centre, Lucknow, UP

<http://gis.up.nic.in:8080/srishti/>

GIS-UP is an effort to link various data from different departments with village boundaries, so that thematic maps can be generated for viewing the whole area at a glance for appropriate grass root planning. Maps for Blocks, Tehsils/Talukas, Districts, Divisions and State are being generated.

Data of the following sectors from Census-2001 has been linked with village level maps:

- Education
- Health
- Drinking Water
- Post & Telecom
- Communication
- Banking
- Recreation
- Approach to Villages
- Power Facility
- Irrigation Facilities

Natural Resources Information System (NRIS): Spatial data prepared under NRIS has been linked with this framework, with the following layers:

- Rail Track
- Road
- Canal
- Forest
- Structural Lineament
- Drainage Line
- Drainage Polygon
- Land Category
- Ground Water
- Lithological
- Land Use-Land Cover
- Watershed
- Geo-morphological
- Soil
- Settlement Area

5. Other information

Two new districts have been created in the state, namely, Kanshiram Nagar and Chatrapati Shahuji Maharaj Nagar

6. Contacts suggested

Mr P N Shah, Senior Scientist, Remote Sensing Application Centre, State Remote Sensing Agency, Kursi Road, Lucknow, UP.

d) Consultation with Managing Director, Uttar Pradesh Jal Nigam (Water Resources): Mr A K Srivastava

The main points from the discussion may be noted down as follows:

1. Mandate of the Jal Nigam:

- Deals with drinking water supply in the state
- Covers both surface and ground water resources
- Also responsible for water quality monitoring at tubewell/borewell sites

2. Sectoral water allocation

- The responsibility of allocating water to different users (domestic, agriculture, industry) is borne by the Department of Irrigation. Water demand is calculated by

different users and the requisition is sent to the Irrigation Department and Central Water Commission for consideration.

- During allocation, highest priority is assigned to drinking water demands as per the National Water Policy.
- Currently per capita supply in the urban areas of the state (which includes towns that are sewerage) is around 135 lpcd and around 78 lpcd in rural areas and towns without sewerage (does not include livestock demand).
- Almost all towns in the state, except 3-4, have piped water supply.
- Differential tariff structure is in place for different users.

3. Key Concerns

- Water demand is very high in highly populated and industrial districts such as Kanpur and Ghaziabad.
- Bundelkhand region is the major region that faces problems of water scarcity.
- Groundwater depletion rate is high in the urban areas due to indiscriminate use of tubewells/ borewells.
- Deficient rainfall puts pressure on the available water resources. In such a scenario, agriculture and industry are the main sufferers.
- Eastern parts of the state are also prone to flooding especially after heavy rainfall events and surplus water release from Nepal.

4. Some state initiatives for water conservation

- Rain water harvesting has been made mandatory in all plots that are larger than 300sq ft in area in urban areas
- Lining of canals to reduce water loss through seepage
- Ban on boring new tubewells/borewells in urban areas with very high water extraction rates
- Promoting use of water efficient devices in homes and offices

e) Consultation with Chief engineer (Water Resources), Department of Irrigation, Uttar Pradesh: Mr A K Rohatgi

Key points of discussion are as follows:

1. Water availability situation in the state:

- State depends on both surface and ground water sources for meeting its water demands.
- Extensive irrigation infrastructure in place for meeting demands from the agricultural sector.

- Most tributaries of the Ganges River serve locally to the districts through which they flow.
- Overall water available is just enough to meet the demand within the state.
- There is not much scope to increase potential of surface water resources in the state except through restoration and renovation of existing structures.
- Any increase in water demand or reduction in overall availability of water will result in putting additional stress on existing water systems.
- Responsibility of distributing water between different users lies with the Irrigation Department.
- There are some arrangements for sharing some of the state's water resources with neighboring states such as Delhi; however for such practices to continue in the future there is a need to reduce water wastage and conserve as much of the resource as possible.
- Bundelkhand region faces chronic water scarcity while the Vindhya region also faces some water scarcity.

2. Irrigation in the state

- Annually, the water available for irrigation depends on the rainfall received and the storage capacity of reservoirs in the region/state.
- 73,000 km long network of canals (major and minor) exists in the state.
- Western and Central UP are very well developed in terms of irrigation infrastructure.
- Region wise distribution plans for irrigation water are drawn up in advance based on the area under cultivation, crops grown, cropping systems in use etc. Such a type of planning is not based on rainfall predictions but on reservoirs capacity.
- Most of the water used in the state is from the Tehri dam in Uttarakhand. Certain regions, such as the Bundelkhand, do not receive any share from this source. This region is mostly served by smaller local reservoirs (such as the Mata Tila Dam) or minor rivers.
- At present, large subsidies on electricity and water are provided to farmers.

3. Some State actions for efficient water management

- Participatory irrigation management being practiced in some districts such as Jaunpur and Sultanpur.
- Lining and regular de-siltation of canals undertaken by the Irrigation Department.

f) Consultation with Chairman and Managing Director, Uttar Pradesh Jal Vidyut Nigam Ltd. (Hydropower): Mr Alok Tandon (Also present were Mr D K Gupta and Mr Satish Kumar (experts on the Rihant Dam)

Key points of discussion were as follows:

1. Hydro Power in the state:

- Tehri is a major source of hydropower in the state with upto 500 MW being fed into the main grid from this source; MoU signed between the two state governments of UP and Uttarakhand (UP Power Corporation Ltd. is the concerned body for matters regarding power supply from Tehri).
- Rihant is the major hydro-power project within the state (capacity of 300 MW)
- Another large project is the Obra Project with 99MW capacity.
- There also exist some minor hydro-power plants such as the Mata Tila Dam in Jhansi

2. Key issues and concerns:

- Out of the total power demand in UP, the major share is met by thermal power plants, with the contribution from hydro-power plants being very small.
- While “Run of the river” power projects, such as the Tehri, are dependent on steady availability of river waters (in turn dependent on glacier melt), reservoir based power projects are dependent on storing water from rainfall received in the catchment. Therefore both kinds of hydro-power projects face threats posed by climate variability and change.
- Rainfall scarce years in the past decade have already adversely affected hydro-power generation in the state, especially in reservoir based plants (as can be deduced from the U-shaped map that correlates water height in reservoir with the power generated).
- The reduction of water levels in reservoirs in the state may be attributed to two reasons: firstly, reduction in rainfall and secondly increase in consumptive use of water by various sectors.
- Potential for development of new hydro-power projects within the state is limited, especially after the division that separated Uttaranchal into a new state. However, the state has potential to exploit solar energy, followed by wind and natural gas.

3. The case of the Rihand Dam

- It is a reservoir-based dam with most of its catchment in the state of Chattisgarh.
- The primary function of the Rihand project is to generate power, while release of water for irrigation is a natural but secondary purpose.
- However, the Rihand reservoir is vital from another angle. A share of water from the reservoir is supplied to some important thermal power plants, located in the Singrauli

area; the proper functioning of these thermal plants is essential to meet the power demand in the state.

- Thus as long as enough water is available in the reservoir, needs of both hydro and thermal power plants may be met. However, in a situation where water becomes scarce, supply of water to large thermal power plant will become a priority rather than the use of reservoir water for hydro-power generation.

4. Mata Tila Dam

- Unlike the Rihand dam, the Mata Tila dam is an irrigation linked project where generation of hydro-power is only a secondary function. Water release from the dam depends primarily on the demand of water for irrigation rather than on the power demand.

*VISIT 2: Lucknow, Uttar Pradesh
5th - 6th August, 2010*

Team form TERI

Ms. Suruchi Bhadwal and Ms. Sambita Ghosh

Key outputs from the stakeholder consultations

The main focus of the discussions was to

- Inform senior officials about the project and getting their perspective on the water availability situation in Uttar Pradesh
- To get their views and suggestions about the selection of case study sites that are best suited to achieve the study objective.

Outlined here are the main recommendations for the case study sites and the reasons behind suggesting them:

1. WALMI: Dr. O.P. Dubey

- Jhansi, Bundelkhand: The area continues to be drought prone and northwards migration of the agricultural labor force as rice can only be grown once every year.

2. Department of Agriculture, Principal Secretary, Shri Kapil Dev & Director, Department of Agriculture, Shri Dev Mitra Singh

- Rather than going with Jhansi, which is a geographically drought prone area, it would be better to go with Allahabad as a case study site as it has both drought like conditions and is also prone to floods.

- The Director of Agriculture, Shri Dev Mitra Singh, also present in the meeting suggested that it might be prudent to use Varanasi or Jaunpur as a case study site.
- The principal secretary and the director also agreed that if we wanted to study the impact of pollution, Kanpur would prove to be a good study case study site.

3. Department of Rural Development, NREGA: Director; Shri V.K. Bhagwat

- He was of the opinion that if we wanted to study impacts of water pollution, Kanpur would be a better study site than Unnao.
- In case of floods affected regions, it would be good to study regions such as Bahraich, Lakhimpur, Khiri and Kushinagar. In places like Bahraich, even 20% of rainfall causes the area to flood

4. UPCAR: Deputy Director General, Dr. R.S. Rathore

- Bahraich falls in the Ghagra basin which joins the river Ganga in Ballia. This might be relevant in the case of the Kharagpur case study but maybe not in case of Uttar Pradesh.
- Fatehpur, which is downstream of Kanpur, showed a 27 quintal of wheat production which is only slightly less than the state average of 30 quintals. It might be concluded from this that pollution levels in irrigation water and the corresponding alteration in the absorption capacity by the plant might not be a major factor in deciding the crop yields.
- After Kanpur, presence of heavy metals ions like chromium etc. in the water system in the water stream may pose a significant threat to crop yields and this angle could be explored.
- To study the impacts of water quality on agriculture, an area where we know that the irrigation water comes straight to the river should be chosen as a case study site.
- Rae Bareilly is one such place where a lift canal irrigation system works at Dalmau. Rae Bareilly also falls between Kanpur and Allahabad and would therefore be ideally suited to study the impacts of water pollution on agricultural yields.
- Unnao, Rae Bareilly or Fatehpur are suitable to study the impacts of water pollution on agricultural yields.

Detailed Minutes of Consultations

a) Consultation with Water and Land Management Institute (WALMI): Dr. O.P. Dubey

Dr. Dubey has mostly been associated with the Roorkee University and is an academician. He sounded some concerns that about the modeling exercise for conducting

the assessments. He was of the opinion that since India has weather/climate records for only the past 200-250 years which itself inherently shows variability in a lot of places, simulations for projecting the climate in the coming 200-250 years cannot be done using such data. In the meanwhile also, there have been a lot of variations and the climate has been changing constantly. In such a case how would it be possible to discern which are observed values and which have been influenced by human interventions like urbanization, land transformation etc?

As time progresses, land holdings are getting smaller and the allure of an urban life (better life) is causing agricultural population to migrate to the cities. Dependency on agriculture has gone down in the state as families are slowly ceasing to recognize it as a lucrative option. The migration from Eastern UP, Bundelkhand region is high whereas it's lesser in Muzzafarnagar. Almost 50% of agricultural workers migrate from eastern UP to Punjab. Out of this 50%, 80% of those who migrate do agricultural work whereas the remaining 20% do non-agricultural work. The migration can be called temporary or seasonal as the labourers migrate back during festivals like Diwali or during the summer months as there is lesser agriculture in Punjab. In a sense, they can be called as floating population.

Apart from very valid land fragmentation reasons climate variability or change driven reasons could also be the reason for migration from certain regions like Bundelkhand. Due to acute drought like conditions and limited rains, only the rice crop is grown once a year in the rainy season. Rest of the population migrates to Mumbai. Earlier, there used a system of water tanks which has deteriorated over time. Rainwater harvesting has to be revived and care should be taken to ensure that the appropriate structure and technology is used that is suitable for the location in which the structure is built. The GSI has already published guidelines which have to be used in a scientific manner. There has to be coordinated effort between researchers, academia and implementers/ executors. Interlinking of rivers as an option is scientifically possible, technologically feasible but economically questionable. There is a problem of political will and funding initiatives in the case of such projects.

b) Consultation with Principal Secretary, Department of Agriculture, Uttar Pradesh: Mr Kapil Dev.

He suggested that rather than going with Jhansi, which is a geographically drought prone area, it would be better to go with Allahabad as a case study site as it has both drought like conditions and is also prone to floods. The Director of Agriculture, Shri Dev Mitra Singh, also present in the meeting suggested that it might be prudent to use Varanasi or Jaunpur as a case study site. The principal secretary and the director also agreed that if we wanted to study the impact of pollution, Kanpur would prove to be a good study case site. The principal secretary also said that for further guidance regarding the

project, the Deputy Director General of UPCAR and the director of Agriculture, could be consulted. The director of the department of agriculture also added that water pollution might also have an impact on crop production as the increase in certain pollutants in the water alters the ion concentration of the water and thereby affects the absorption of requisite minerals by the plants. This leads to alteration in growth cycle of the plant and eventually affects the final yield of the crop. The principal secretary also mentioned that the impacts of climate variability has lead to losses in crop yields citing the example of a 3-4 degree centigrade rise in temperatures during the month of March lead to almost a loss of 15% in the wheat yield.

c) Consultation with the Indian Red Crescent Health Care Society: Mr M.Y. H. Khalidi

Mr Khalidi's organization is mainly involved in awareness programmes and seminars in the jhuggi-jhopdi, temporary settlements and with self help groups. The district centers are very actively involved in such activities. The organization has worked in areas of water resources conservation, rural development, conducted programmes to augment farm yields by creating awareness about better ways to grow crops using lesser resources and also conducted programmes aiming to help farmers in maximizing the returns from their crops through strengthening of the post harvest management chain. The organization also aims to convert rural areas into economic zones in collaboration with the local self help groups. The organization works in areas such as Sitapur, Barabanki, Aligarh, Badayun, parts of Lucknow, Unnao etc. Health impacts influenced by water quality are observed in parts of Unnao and along the banks of the river in Sitapur. The water in the upper strata of the water table is infected due to shallow which is used by the populace in due to shallow boring. Cases of jaundice are prevalent in Daliganj. The organization also runs as institute by the name of 'Institute of Vocational Training and Rural Development'.

d) Consultation with Director, National Rural Employment Gaurentee Act (NREGA), Department of Rural Development, Uttar Pradesh: Mr V.K. Bhagwat

He was of the opinion that if we wanted to study impacts of water pollution, Kanpur would be a better study site than Unnao. In case of floods affected regions, it would be good to study regions such as Bahraich, Lakhimpur, Khiri and Kushinagar. In places like Bahraich, even 20% of rainfall causes the area to flood. Since the operationalisation of the National Rural Employment Guarantee Scheme, the migration of workforce from the State has decreased to a large extent. The migration of labourers from the Bundelkhand region has also decreased. Activities under the NREGA are mostly non-agricultural in nature where the workforce in engaged in construction of ponds, canals, roads and in activities of forest conservation, agro-forestry and minor irrigation. An amount of 8000-10,000 Crores has been allocated under to the NREGS for the financial year 2010-2011.

The wage rates under the NREGS are the same for males and females. The State decides a minimum wage rate based on the agricultural wage rate. At present, the wage rate stands at Rs. 100 per day per family. As per the NREGA guidelines, the scheme guarantees employment to one family for 100 days per year. The NREGS is just an implementation wing which takes technical inputs/help from the Department of Agriculture for carrying out relevant activities like watershed development. The NREGS in its first phase covered 22 districts in the State, 39 districts in its second phase and now in its third phase covers all districts in the state.

e) Consultation with Deputy Director General, UPCAR: Dr. R.S. Rathore

Bahraich falls in the Ghagra basin which joins the river Ganga in Ballia. This might be relevant in the case of the Kharagpur case study but maybe not in case of Uttar Pradesh. Fatehpur, which is downstream of Kanpur, showed a 27 quintal of wheat production which is only slightly less than the state average of 30 quintals. It might be concluded from this that pollution levels in irrigation water and the corresponding alteration in the absorption capacity by the plant might not be a major factor in deciding the crop yields. After Kanpur, presence of heavy metals ions like chromium etc. in the water system in the water stream may pose a significant threat to crop yields and this angle could be explored. To study the impacts of water quality on agriculture, an area where we know that the irrigation water comes straight to the river should be chosen as a case study site. Rae Bareilly is one such place where a lift canal irrigation system works at Dalmau. Rae Bareilly also falls between Kanpur and Allahabad and would therefore be ideally suited to study the impacts of water pollution on agricultural yields. Unnao, Rae Bareilly or Fatehpur are suitable to study the impacts of water pollution on agricultural yields. Rae Bareilly and Fatehpur KVKs belong to the Chandrashekhar Azad Agricultural University. Two copies of the same letter to be sent to the Principal Secretary and the Director General of UPCAR informing that we would be requiring the support of the Director of the Department of Agriculture and Deputy Director General of UPCAR for the Purpose of this study and would like to involve them as consultants. Also outline the terms and conditions and the areas in which cooperation is required and the roles of UPCAR and Department of Agriculture.

*VISIT 3: Gorakhpur, Uttar Pradesh
18th - 19th August, 2010*

a) Consultation with Dr. Shiraz Wajih, President, Gorakhpur Environment Action Group (GEAG), Gorakhpur, UP

Team from TERI: Ms. Sreeja Nair, Ms. Sambita Ghosh

The minutes of the meeting are as follows:

1. Case study site suggestions

- Based on the project objectives, Dr Shiraz suggested that it would be ideal to choose districts Ballia and Allahabad as case study sites as they both lie in the Ganges basin.
- Allahabad has been experiencing more frequent droughts in the recent past. Almost the entire Vindhya region can be considered drought prone. Water is the only constraint to agriculture in the Allahabad.
- Ballia and Ghazipur districts are more prone to floods. The floods that are caused in Ballia are not due to release of water in Nepal, as is the case in the Bahraich districts and neighboring areas, but are caused due to flooding of the Ganga.
- A lot of land related conflicts have taken seed in Ballia, which lies on the border of Uttar Pradesh and Bihar. A change in the course of the river at the interstate border causes the existing village/district boundaries to blur causing renewed conflict when redefining the boundaries.
- Land holdings in the Tarai Region are larger than those in the Southern peninsular region of the State. The tarai region is more vulnerable to migration. Land holding sizes are larger in Allahabad than in Ballia.

2. Livestock status

- Continuous decrease in common lands for grazing and decreasing fodder availability due to practices like mono-cropping has led to a decline in livestock.
- Earlier, almost 70% of the livestock was with small landowners. Since the practice of keeping captive livestock has gained momentum, maintaining livestock has ceased to be economically viable for small landholders. Majority of the livestock is now owned by large landowners.

3. Changing cropping patterns

- Over a period of time, the cropping pattern has changed in the districts. The areas that regularly experience floods have stopped growing pulses. Most of the region follows a rice-wheat cropping pattern.
- Among other crops, sugarcane production has significantly declined due to lack of adequate processing infrastructure. After sugarcane, another crop that is widely grown is potato. More recently, vegetables and other horticultural crops have gained prominence in the cropping pattern. But market infrastructure has to be strengthened for meeting the potential of success of these ventures.

4. Other issues

- Implementation of crop and livestock insurance schemes in the districts is not strong.
- Contextualization of adaptation options is a crucial requirement in all districts
- Adequate supply of inputs at the field is a problem in the state.

B) District Level (in Allahabad)

4.5.4 Case Study 4 (Kangsawati River Basin: Purulia, Bankura & West Midnapore districts of West Bengal)

*VISITS: Kolkata, Midnapore and Bankura
August-November, 2010*

Team Members-IIT Kharagpur

Ashok Mishra, Ajay Ganan Bhawe and Ms. Neha Mittal

Key outputs from the stakeholder consultations

The main focus of the discussions was to

- Introduce the HighNoon project and its objectives to local, district and state level stake holders and getting their views/perceptions on the agricultural production and water availability situation in West Bengal in general and Purulia, Bankura and Midnapore districts in particular.
- To get their views and suggestions about the suitable climate change mitigation/adaptation options in CS4 area to achieve the study objective.

Outlined here are the main recommendations for the case study sites and the reasons behind suggesting them:

Consultation with various stakeholders regarding choice of districts Purulia, Bankura and Paschim Medinipur in the study area

Consultation with Assistant Director- Agriculture and Soil Conservation (Ext.), Midnapore: Mr. Dibendu Samanta

- Water availability is the major concern for rice cultivation. This is critical for upland areas where retention of water for long period is a problem.
- Soil is sandy loam and does not support long time water availability in subsurface *i.e.* root zone, as it drains fast.
- Soil loss is also a problem because of intense rainfall and concomitant high runoff.
- Watershed development could be a solution to manage the resources in an integrated approach.

- Better to start working from micro-level watersheds for better result rather than going on broad area development in which efficiency reduces.

Consultation with General Manager (Officer on Special Duty), Natural Resource Management Center, NABARD, West Bengal: Smt. T.S. Raji Gain

- The districts of Purulia, Bankura and Paschim Medinipur were informed to be one of the drought prone districts of West Bengal
- NABARD conducts projects on rain-water harvesting and promotes orchard based crops like cashew nut, mango, tushar etc. to make optimum use of the available water in Purulia, Bankura and Paschim Medinipur districts.

Consultation with Manager, Natural Resource Management Center, West Bengal: Mr. Prashant Dubey

- Water is a major constraint and this region is considered a dry area. This is especially true for Purulia, which also partly explains the poverty in the region.
- The soil depth in the region is very less hence rendering conditions for agriculture to be non-conducive. The sub-surface geology is also not favorable, especially in Purulia and Bankura districts, as hard rock exists very close to the surface.
- There is a very low availability of ground water resources in this region, although, Paschim Medinipur has reasonably good aquifer conditions compared to Purulia and Bankura.
- The region in general is resource confined, but there is also lack of land, capital, technology and other important inputs necessary for agriculture in these districts.

Consultation with Assistant General Manager, Natural Resource Management Center, West Bengal: Mr. S. K. Nanda

- The western part of the state of West Bengal (consisting of Purulia, Bankura and Paschim Medinipur) has several infrastructural issues, but the lack of access to credit and lack of access to hybrid varieties of seeds are the major issues.
- Empowerment of the farmers was understood to be the missing link for ensuring development in the region.

Consultation with Technical Officer, Krishi Vikas Kendra, Sonamukhi, Bankura, West Bengal, Mr. Satyendranath Singh

- Bankura lies in a dry part of the state. The soil depth in the region is less and hence it is a resource constraint for agriculture.
- The current role of the KVK in Bankura is to engage farmers in assessment and refinement of technologies through on farm trials and testing.

Consultation with Farmers (individual) of Kapgadhi Village, Bankura districts, West Bengal.

- There is a general perception amongst people in these districts and especially farmers that **“Baarish bharpoor nahi ho rahi hai”** (it is not raining aplenty nowadays) and **“Garmi badh rahi hai”** (the climate is getting warmer).
- Rainfall extremes has changed the pattern and availability of water.
- Availability of water has reduced in general due to non-uniformity in rainfall in rain-fed agricultural areas.
- Upland areas (relatively high elevation) have experiencing fast drying conditions and loosing cultivation possibility even during the Kharif (monsoon) season.
- Changing from tradition rice cultivation to some orchard plantation or even floriculture could be one solution to sustain the agricultural activities.

Consultation with Officials of Seva Kendra NGO, West Midnapore, West Bengal.

- Extremes are creating troubles to natural resources.
- Areas nearby the river channel are prone to deposition of sand and thus reduction in cultivable area of some specific locations.
- Prediction of extremes and preparedness of control measures to avoid deposition may be helpful to the rural community in these areas.
- Living supporting mechanism through empowering women in most under-developed regions may improve the livelihood conditions as well as the sustainability conditions up to a great extent.

D6.5i Multi-stakeholder meeting report M12

- Small scale technical skill development may also support to control the migration of rural/agriculture work force in these areas.