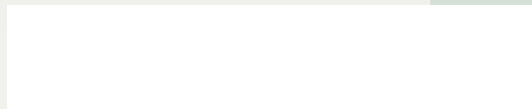




Annual Report



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ANNUAL REPORT

2019-2020



CENTRE FOR ECOLOGY DEVELOPMENT AND RESEARCH

201/1 VASANT VIHAR

DEHRADUN

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ABOUT US:

CEDAR is a not-for-profit organisation registered under the Societies Act XXI of 1860 since 2006. CEDAR is recognized as a Scientific and Industrial Research Organisation (SIRO) by the Department of Science and Industrial Research (DSIR), Ministry of Science and Technology, Government of India. The registered office of CEDAR is located in Delhi while the main field office is based in Dehradun.

FOCUS

CEDAR sees itself as being a platform to carry out research of relevance to people and their environment. We aim to get together a blend of researchers, development professionals, and visionaries to identify areas where gaps in information and knowledge exist.

VISION

CEDAR does not see itself as a research agency or a grassroots intervention agency, instead, as an agency with an ability to work closely with both. We link ecological knowledge to decision making by integrating biophysical and social science that untie today's complex environmental problems. CEDAR currently focuses on the Himalaya.

STRUCTURE

CEDAR is guided by the Governing Board and a Research Advisory Board. The operation and administrative issues are managed by the Executive Director. CEDAR has a core team of 7 members who are involved with project execution and management. The core team relies on the expertise of specialists associated with CEDAR.

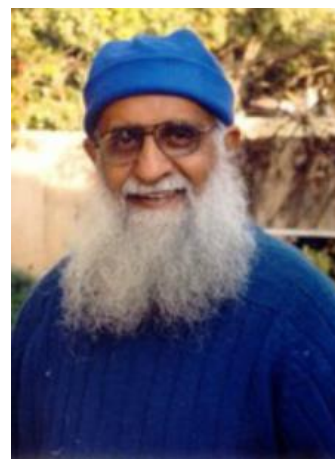
GOVERNING BOARD



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Ex Vice Chancellor, Kumaun
University, Nainital.
Director, Doon Library, Dehradun



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Senior Fellow, Centre For Ecology
Development And Research,
Dehrdun



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Founder, people's Science Institute
(PSI), Dehradun



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IFS, Former Managing Director
Forest Corporation, Dehradun



Dr. Ghazala Shahabuddin (Member)
Senior Fello, Centre For Ecology
Development And Research,
Dehradun



Dr. Vishal Singh
Ex Officio Secretary, Executive
Director, CEDAR, Dehradun

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Director ACWADAM, Pune



Dr. Rajendra Dobhal
Director General, UCOST,
Dehradun

Research Team

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*Dr. Ghazala Shahabuddin, Senior Fellow, Wildlife Ecology & Biodiversity
management*

Mr. Chetan Agarwal, Senior Fellow, Policy Analysis

Dr. Vijay Ramprasad, Senior Fellow

Dr. Vishal Singh, (Executive Director), Forest Ecology & Urban Development

Dr. Anvita Pandey, (Coordinator), Forest Ecology

Dr. Nidhi Singh, Soil Sciences and Nursery Management

Mr. Manish Kumar, Fellow, Ecohydrology & Hydrogeology

Ms. Manya Singh, Research Associate, Ecology and Environment Science

Mr. Himanshu Chinwan, Remote Sensing & GIS expert

Mr. Laraib Ahmed, Research Associate, Environment Management

Mr. Kshitiz Dobhal, Knowledge Management

Mr. Narendra Singh Raikwal Sr. Field Assistant

Mr. Bishen Raikwal, Field Assistant

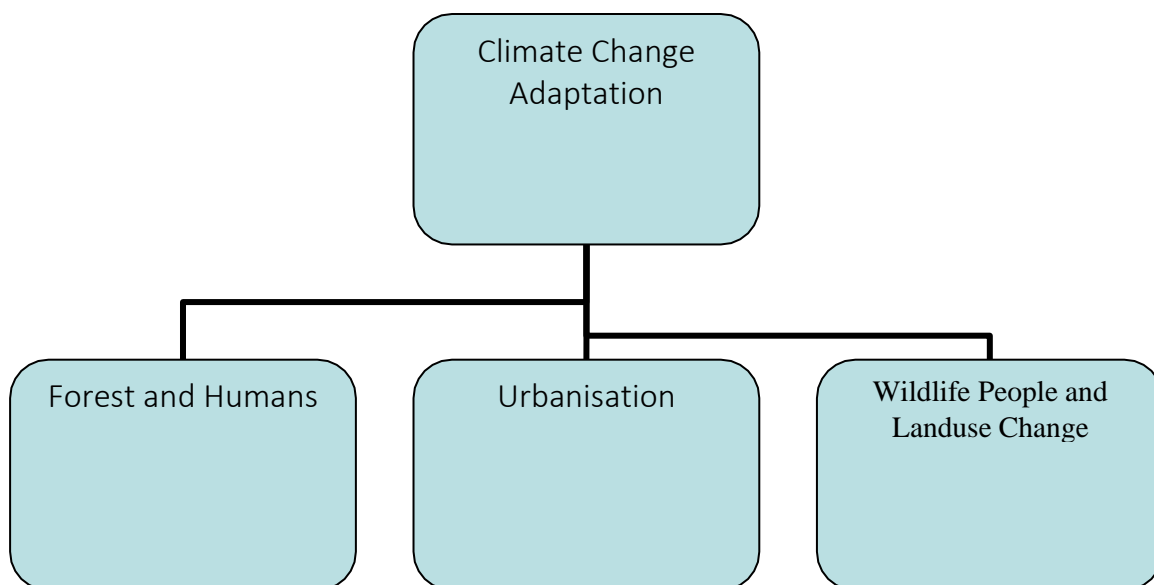
Mr. Anil Tyagi, Finance Officer

Mr. Amit Bhakuni, Office Manager

Mr. Dharmendra Singh, Assistant Accountant

THEMATIC AREA

CEDAR is a boundary-spanning research organisation created to conduct actionable research in Himalaya. While early interventions focused on forests and allied areas, of late CEDAR has broadened its scope of work. In order to focus and give direction to the range of research activities undertaken by CEDAR, we have identified three key research thematic areas with **climate change adaptation** as an overarching theme to address the needs of society. Today, our work can be broadly grouped into these thematic areas:



1. Forest and Humans

Himalayan forests are critical for the range of ecosystem services they provide that help sustain the heavily populated floodplains downstream. Equally, they are critical in the direct products and services they provide to the populations that live in and around these ecosystems. Mountain agriculture is heavily dependent on forests for nutrients inputs. Rural communities depend on forests for firewood, fodder for their animals, and a

range of products and services. Most Himalayan forests are used quite extensively by humans. Understanding the range of disturbances that impact these forests and determining interventions that allow for their sustainable management is important. CEDAR aims to understand these interventions, and particularly the impact of chronic disturbance by humans. A set of 40 long term monitoring plots, each 400m², constitutes the core of CEDAR's research strategy in the mid elevation Himalayan forests. On a macro-scale, the impacts of climate change on mountain ecosystems, and ways to value ecosystem flows from forests are areas of interest that fit into this, the first of the general themes on which CEDAR works.

2. Urbanisation

The rapid change in settlement and population patterns in the Himalaya has been fuelled by unplanned and haphazard development, differential allocation of resources, and urbanisation. A movement away from rural areas and agriculture-animal husbandry-based economy to towns and cities both within and outside the Himalaya characterise these growing trends of economic development and



migration patterns. Himalayan towns and cities traditionally showed higher levels of self-sufficiency compared to urban agglomerations of the plains. A dependence on springs and small streams and rivers for water; on nearby fields for larger proportions of food, a broader and more diverse resource base, and lower trade with the outside world compared to towns in the plains, describes hill towns. This is now changing. CEDAR began its understanding of urbanisation through the lens of water distribution systems and how natural sustainable sources of water, which were located close by, were being replaced by more energy-intensive and distant water sources. As our work expands to more mountain towns, and we liaise with more partners, our understanding of this issue has grown and evolved.

3. Wildlife People and Landuse Change

The Himalaya harbour rich faunal diversity, both due to the spatial heterogeneity of ecosystems as well as diverse human and biogeographic influences. Zoological surveys aimed at understanding faunal diversity patterns in the human-dominated forested landscapes of the Himalaya are necessary for initiating conservation planning in this region. Recently, large-scale studies of the effect of land-use change and ecosystem modification- due to expanding roads, dams and tourist resorts, pine expansion, horticultural expansion, and forest overexploitation - have been initiated by CEDAR using the rich birdlife as indicator taxa. A study was undertaken in the Western (Kumaon) and Eastern (Meghalaya) Himalaya, located in the middle altitudes which are densely populated zones significant for both livelihoods and biodiversity. A long-term monitoring approach is being adopted so that trends in local extinction and adaptation of bird species can be tracked. It is hoped that such a quantitative, landscape-based methodology can provide useful input for judicious land-use planning and wildlife policy in the Himalayan states.



COMPLETED PROJECTS



CONDUCTING SOCIO-ECONOMIC AND LIVELIHOOD ASSESSMENT SURVEYS OF PASTORALISTS OF HIMACHAL PRADESH

Funding agency: Forest Department, Himachal Pradesh

Duration: 5 months

Project Lead: Dr. Vishal Singh

Field site: Himachal Pradesh

Livestock production is a major socio-economic activity practiced in many dry lands of the world where it contributes to rural development particularly in

developing countries where it is a main contributor to wealth creation, crop yields, and food security. World Bank acknowledged livestock as the main contributor to agricultural Gross Domestic Product GDP in developing countries where the sector is rapidly increasing due to population increase, urbanization, and increasing income. This project explores the linkages between pastoralism, their socio-economic, cultural, political and ecological prospects in reference to their migration and conflict issues recently reported by United Nations' Food and Agriculture Organization (FAO) also highlighted that global pasture area has begun to decline in last 20 years.

Pastoralism in the Himalayas is based on transhumant practices and involves cyclical movements form lowlands to highlands to take advantage of seasonally available pastures at different elevation in the Himalayas. During the summer, when the snow melts in the higher alpine regions Himalayan pastoralists move up to these areas to graze there animal. After the monsoon they move down to occupy the low altitude pasture for the winter months. Movement of people and their livestock proceeds between previously earmarked site, which become more or less regular seasonal encampments or bases.

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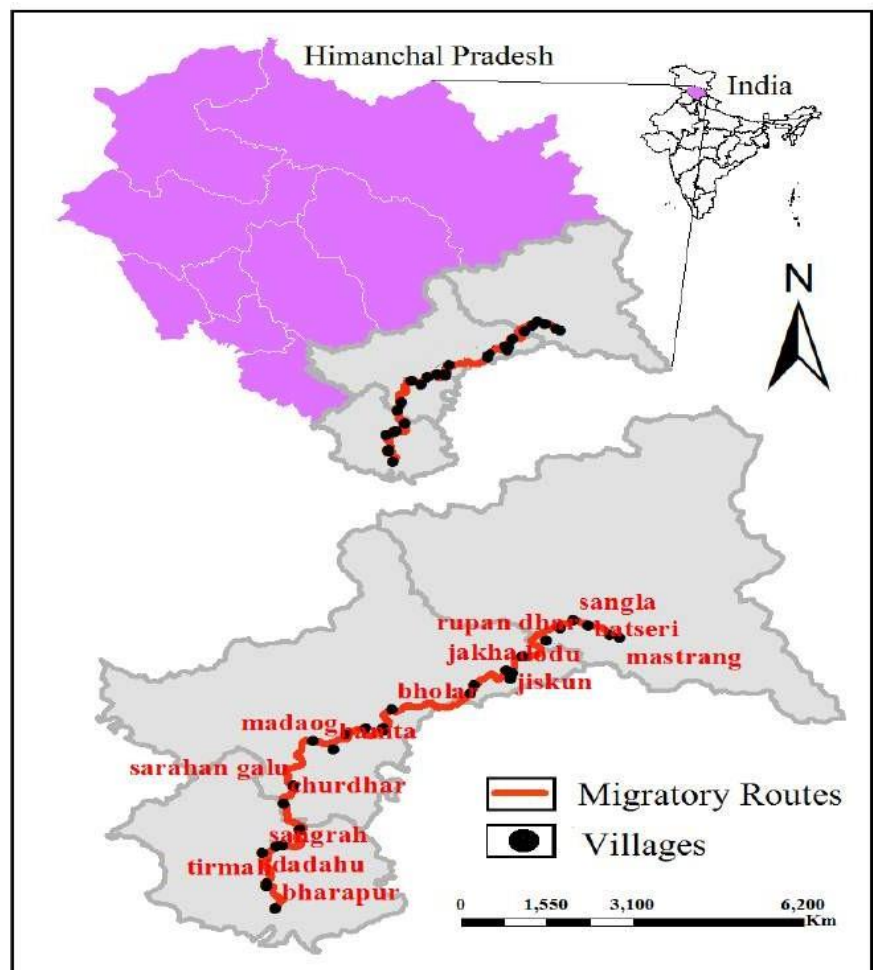
The proposed programme created a repository of primary data collection of 32 pastorals, which will cover sketch mapping, seasonal migratory trends, process framework and pilot activities for sustainable pastoralism management. Along with the scientific data related to livestock sustainability, the study will also bring out the livelihood dependence of pastoralism of the hill communities residing in Himanchal Pradesh (HP). From this, socio-economic and livelihood survey assessment of the communities. This survey will be feed into GIS-based thematic maps by HP Forest Department GIS Lab to support forest management.

Another important outcome was to document the migration stories of the communities and the associated challenges of the same. The oral documentaries of the migrated and left out families will be registered through, which will further inform policies and devise response for resource use planning and local adaptivity of the communities under climate change impacts and the findings will be used in supporting pastoral based livelihoods in the state.

Other than documentation of the scientific as well as socio-economic datasets for pastoral community, the project developed capacities of the community and related stakeholders such as minimizing social conflicts within communities and external factors during the movement.

PROJECT FINDINGS

Marking of pastoral routes



CLIMATE ADAPTIVE AND WATER MANAGEMENT PRACTICES FOR CITIES IN SOUTH ASIA (CAMPS)

Funding Agency : International Development Research Centre (IDRC)

Duration : 3 Years

Project Lead : Dr. Vishal Singh

Field Site : Haldwani, Mussoorie, Uttarakhand

Climate Adaptive and Water Management Practices for Cities in South Asia (CAMPS) The project was carried out in two countries India and Nepal in which four cities were selected for the study (Haldwani& Mussoorie in India and Dharan & Dhulikhel in Nepal). The project was funded by International Development Research Centre (IDRC), Canada. CEDAR being the Indian collaborating partner conducted research activities under the project for the two selected cities i.e. Mussoorie and Haldwani. The project was intended to address the water insecurity in the Mussoorie and Haldwani cities, Uttarakhand, largely aimed to develop climate adaptive and equitable water management practices and strategies (CAEWMPS). Main focus was given to institutional building or transformation, informed by a diagnostic analysis of social, political and biophysical dimensions of the urban water systems. Using an interdisciplinary and participatory approach, a variety of city specific CAEWMPS were developed and tested. Likely elements of CAEWMPS include: improving management of critical water zones and their catchments, informed city-scale water management planning, effective knowledge partnerships, and institutional frameworks and tools for enhancing water security under a changing climate.

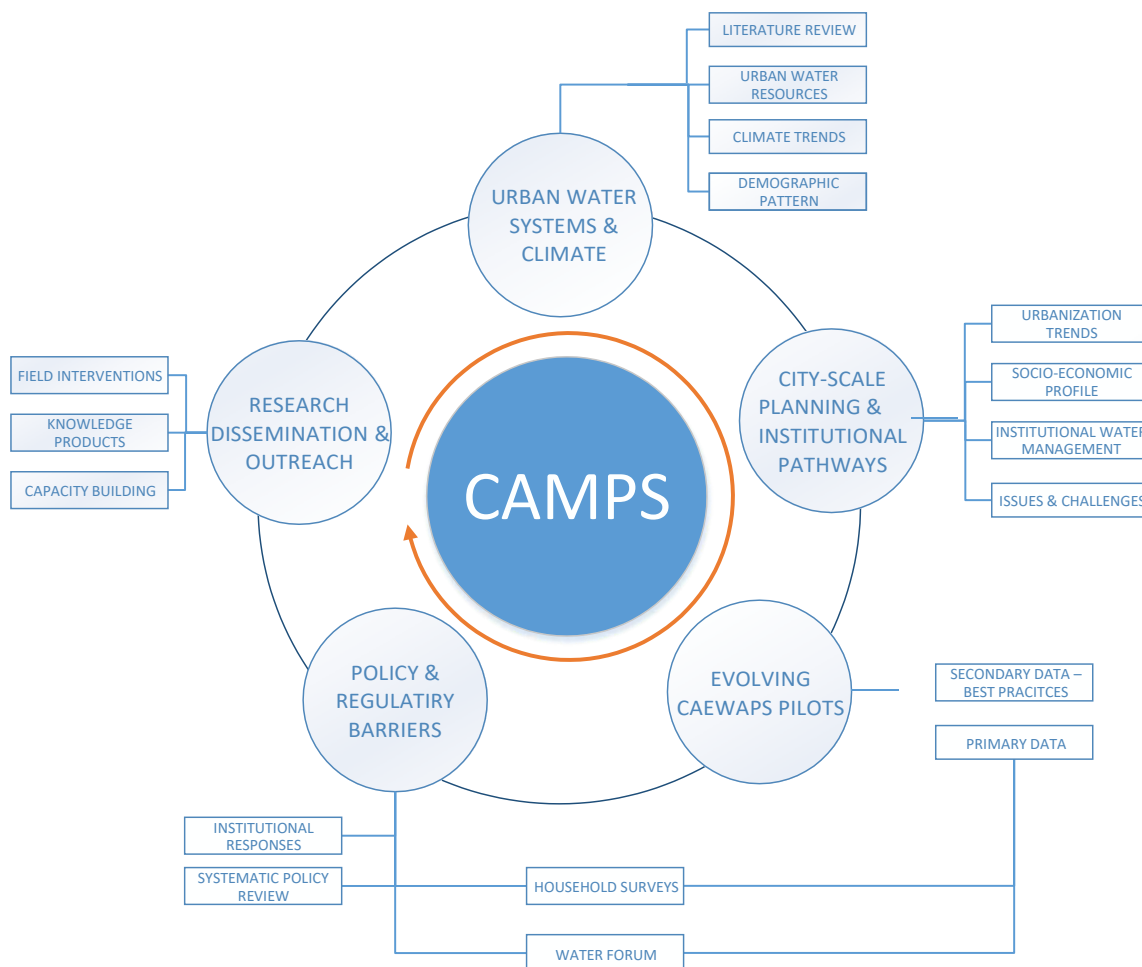
CAMPS are climate adaptive and gender sensitive nature based approaches that reduce water vulnerability due to climate conditions in a given area. CAMPS are developed via testing various city specific strategies, which include elements like improving management of critical water zones and their catchment, informed city scale water management planning, effective knowledge partnerships, institutional frameworks and tools for cities and towns in mountainous areas and foothills of Himalayas.

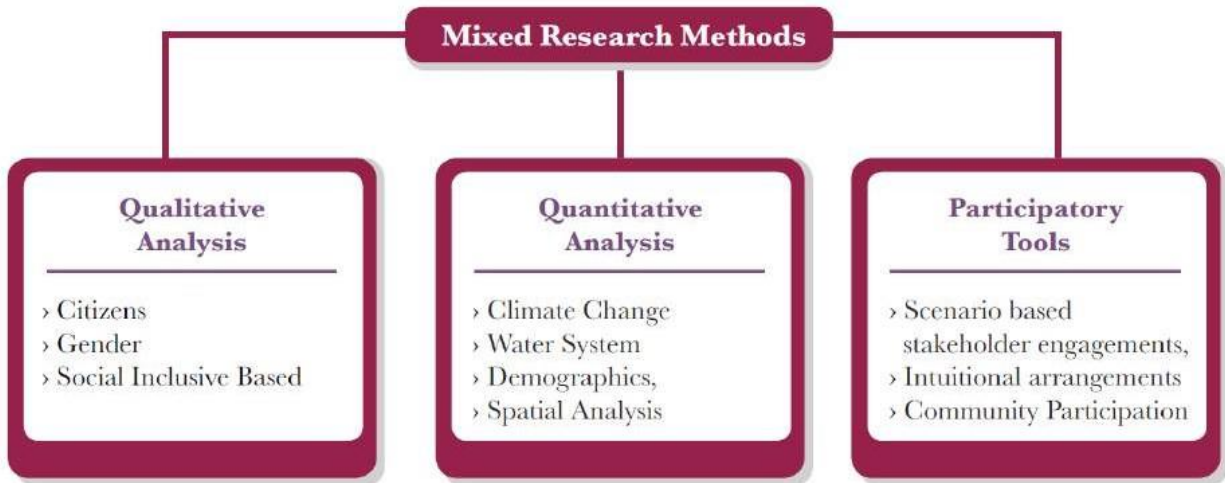
- 1) Analyze existing water management systems to identify adaptation issues and opportunities in relation to (a) existing and predicted impact of climate change on water cycles; (b) city-level planning and governance context; (c) socio-economic trends of urbanization in the region, and day-to-day water use practices;
- 2) Explore, experiment and develop Climate Adaptive and Equitable Water Management Practices and Strategies (CAEWMPS) focusing on priority critical water zones of the four cities;
- 3) Investigate city-scale planning and institutional change pathways for mainstreaming CAEWMPS, with particular reference to economic incentives, knowledge partnerships, and social enterprise innovations;

- 4) Analyze policy and regulatory barriers to CAEWMPs in the context of Nepal and the two States in India, and demonstrate actionable policy improvement pathways for up-scaling CAEWMPs
- 5) Develop and disseminate scientific outputs in aspects of (a) governance of critical urban water zones; (b) reframing institutions for urban water system adaptation; (c) effective planning pathways for urban water adaptation; (d) gender sensitive urban water management; (e) policy directions for effective urban water systems adaptation; (f) economic analysis of climate adaptive water management options,

Research Methodology

CAMPS PROJECT METHODOLOGICAL FLOWCHART





Project Outcomes

1. Knowledge products

ABOUT MUSSOORIE

- Queen of Hills
- Established in 1823 AD
- Population: 30,118 (2011)
- Major Water Source: 23 Springs
- Supply: 7.76 MLD (Million Liters/Day)
- Demand in Peak Tourist Season: 14.40 MLD

WATER STRESSES

Increasing tourist influx has led to high water demand in the season. This has resulted in differential wards in the city during off-season and tourist season.

POPULATION GROWTH VS TOURIST INFLUX

YEAR	Domestic Population	Tourist Population
1995	~10000	~1000
1996	~10000	~1000
1997	~10000	~1000
1998	~10000	~1000
1999	~10000	~1000
2000	~10000	~1000
2001	~10000	~1000
2002	~10000	~1000
2003	~10000	~1000
2004	~10000	~1000
2005	~10000	~1000
2006	~10000	~1000
2007	~10000	~1000
2008	~10000	~1000
2009	~10000	~1000
2010	~10000	~1000
2011	~10000	~1000
2012	~10000	~1000
2013	~10000	~1000
2014	~10000	~1000
2015	~10000	~1000

Urban Water Security in Mussoorie

Climate Adaptive Water Management Practices and Strategies (CAMPS)

- ★ CAMPS (Climate Adaptive Water Management Practices & Strategies) provide solutions for Water Insecurity in urban areas based around climate adaptation.
- ★ It includes improvement of critical water zones, city-scale water management planning and identification of policy barriers to enhance water security in urban contexts.

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Logos: IDRC | CRDI Canada, CEDAR, SIAS, TISS The Institute of Social Sciences

Mussoorie Brochure

ABOUT HALDWANI

- "Gateway to Kumaun"
- Established in 1934 AD
- Population: 154,078 (2011, census)
- Major Water Source: Gaura River, tube wells & Sheelshah spring
- Supply: 26.57 MLD (Million Liters/Day)
- Demand: 34.5 MLD [The gap in demand and supply is 7.93%]

ABOUT CAMPS

- ★ CAMPS (Climate Adaptive Water Management Practices & Strategies) provide solutions for Water Insecurity in urban areas based around climate adaptation.
- ★ It includes improvement of critical water zones, city-scale water management planning and identification of policy barriers to enhance water security in urban contexts.

WATER STRESSES

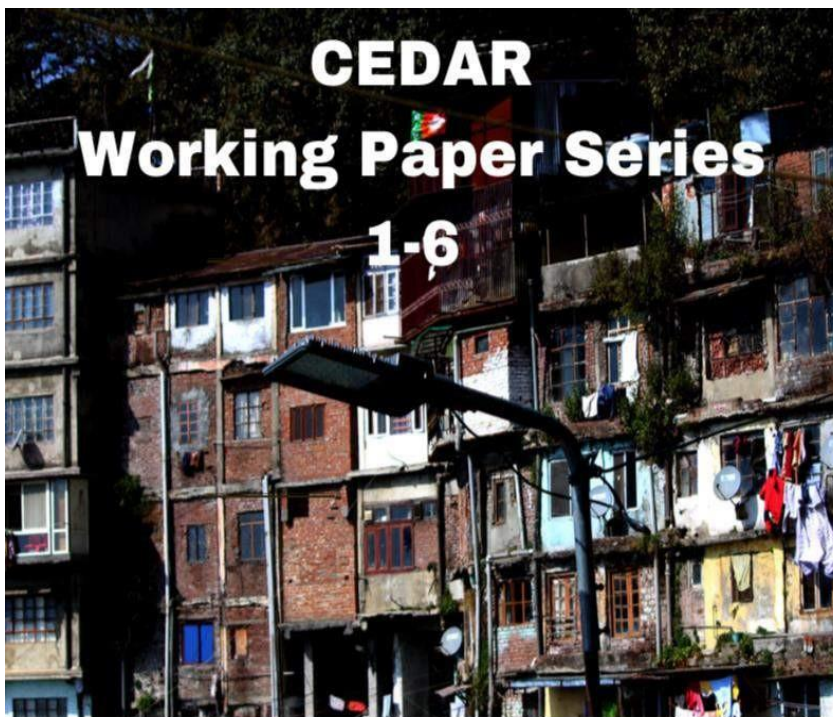
Demand for water is increasing, with urbanization and high population growth. The factors producing such a high demand are also adversely affecting sources of water supply. Over 50% of the city population faces irregular and insufficient water supply.

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Urban Water Security in Haldwani

Climate Adaptive Water Management Practices and Strategies (CAMPS)

Haldwani Brochure



CEDAR
Working Paper Series
1-6



Climate Adaptive Water Management Practices and Strategies



POLICY BRIEF

CLIMATE ADAPTIVE WATER MANAGEMENT PRACTICES AND STRATEGIES FOR WATER SECURITY IN UTTARAKHAND

- Issues & Barriers
- Future Vulnerabilities insights from research
- Need of climate adaptive measures
- What are the measures
- Recommended Practices as well as Strategies

NEED FOR POLICY

Climate Change (CC) and Urbanisation in the Himalayas are genuinely challenging in relation to water security. Where climate change has a direct impact on the water resources in numerous ways, water security problems are escalated due to the rising demand of the population and urban growth. Uttarakhand, being a Himalayan state, has characteristics of both hills and Terai region. The Himalayas harbors various water sources such as springs, lakes, river, and groundwater. From government documents, reports, academic and grey literature, and shreds of evidence from the on-going CAMPs Project under IDRC, Canada, different impacts of climate change are highlighted. For Springs, the discharge rate has shown a negative trend over the years; in case of lake system, the reduced capacity of critical recharge zones, as well as the differential precipitation, has shown a decline in lake level; and in case of river system, altered flow of rivers are reported due to seasonality. All these declining water resources then turn the pressure of meeting water demands leads to the tapping of new water sources, mainly groundwater. Groundwater depletion in Uttarakhand's Terai region is also evident because of the unregulated abstraction. Additionally, irregular intense rainfall has also impacted the quality of water sources in many areas.

Provided the sensitivity of Uttarakhand with respect to CC, it becomes imperative to evolve climate adaptive practices and strategies. Adaptation and adaptive measures are required to reduce the vulnerability and for devising a technological, social, institutional and educational solutions respectively.

BARRIERS

Either CC impacts are mitigated, or adaptive strategies are formulated for reducing the vulnerability. There are four significant barriers which interfere with smooth and effective water governance in an urban set up as investigated in the CAMPs study.

Policy Barrier– The state inability to draft a working Water Policy is one of the central barriers.

Regulatory barriers- Under-representation of mountain water sources such as springs in Govt. Rules & regulations is a prominent challenge. Lack of regulatory mechanisms such as water metering and pricing system are causes of inefficient water management. Alongside, unregulated development and land use management in the hills are aggravating the water crisis. The prescribed solutions like Rainwater Harvesting to adapt to water crisis are not being followed or implemented effectively.

Institutional Barriers– The evident disparity in water distribution shows a lack of capacity and inadequate institutional reforms to address water shortages and climate change impacts on water resources. Five different institutions are working in isolation for managing a single resource, i.e., water.

Geographical and Regional barriers– the presence of upstream and downstream conflicts and absence of economics tool to manage water resource.



CLIMATE ADAPTIVE WATER MANAGEMENT

2. Implementation activity



Installation of Biosand filter at Dholak basti in Haldwani



Rainwater harvesting



Mussoorie Water forum meeting



Installation of Rainwater Harvesting structure at Mussoorie Government degree College

3.

Awareness Programme



Media
communication
(Radio Khushi
90.4FM)



Live programmes on conserving water sources in collaboration with Radio Khushi

Summary

Knowledge products

Brochures
Videos

Capacity building

Training workshops
Participation in
International
conferences

Academic outcomes

5 research papers
1 Policy brief
2 blogs
2 articles
Master' s Dissertation
reports
Designing of CAMPS
logo

Collaborations

Jal Sansthan
Nagar nigam
Woodstock school
Government Degree
college
Radio Khushi 90.4 FM
- IBM

WATER RESOURCES STUDY OF GURGAON

Funding agency : Interglobe Foundation

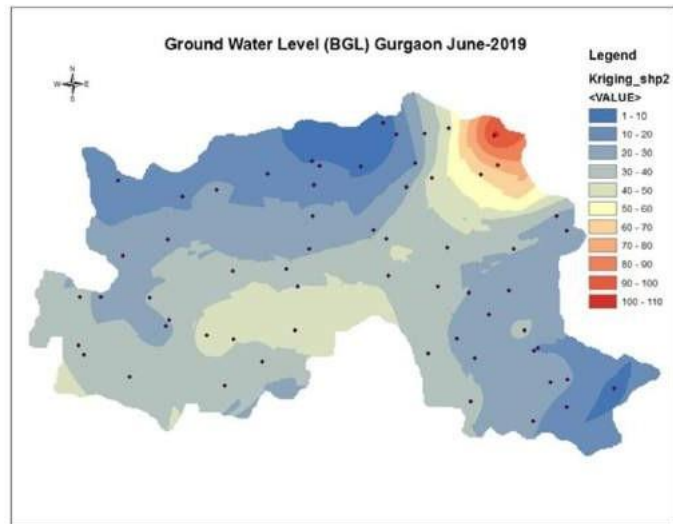
Duration : 1 Year

Project lead : Mr. Chetan Agarwal

Field site : Gurgaon, Haryana

Gurgaon is fastest growing city in Haryana in a low rainfall arid zone that faces a question mark on the sustainability of its water supply. It is over extracting groundwater by about 300% and is also dependent on canal flows from the river Yamuna, which face climatic threats and competing demands. In the study, CEDAR has collaborating with the Gurgaon Metropolitan Development Authority and prepared a report on the water scenario of Gurgaon, which looks at the current environmental scenario of Gurgaon vis-à-vis its water resources, the longer term scenarios till 2021, the extent to which they are managed as a

common pool resource, the role of communities in their management and options to enhance the water security and sustainability. The study has reviewed the water bodies of Gurgaon, the groundwater situation, and the water catchments and nullahs – the green infrastructure of the city. The study is first and foremost be a status report for Gurgaon's citizens on the current water scenario and options for the future.



ONGOING PROJECTS:

PLANNING PLANTATIONS: PAST LEARNING, TOWARD TRIPLE WINS IN CARBON, BIODIVERSITY AND LIVELIHOODS WATER & LIVELIHOOD

Funding Agency: National Academy of Sciences, Washington, DC

Duration: 1 Year

Project lead: Dr. Rajesh Thadani

Field Site: Kangra District, Himachal Pradesh

India's forests house globally important biodiversity and carbon stocks. The study of afforestation is important for three reasons. Firstly, the country has a long history of large-scale afforestation programs enabling measurement of long-term outcomes. Secondly, India has committed to massive afforestation programs and aims at creating carbon sinks amounting to 2.5-3 billion tonnes of CO₂ equivalent through the Green India Mission. Thirdly, a large number of people at the base of the pyramid in India meet their daily livelihood needs from forests, and they represent a significant share of the poorest people in the world.

This project addresses an important research gap by assessing the success of afforestation projects against their three intended goals of forest carbon storage,

ecosystem health, and ecosystem services for rural livelihoods. The results of the project will provide important data on carbon and biodiversity in plantations of multiple age cohorts, and in diverse habitats,...

Field research was initiated to assess forest plantations established between 1985 and 2015 in different altitudinal and ecological zones in Kangra district in the Indian Himalayan state of Himachal Pradesh to quantify some aspects of their biodiversity and standing tree and soil carbon storage potential.



PROJECT ACTIVITIES

Towards Triple Wins in Carbon, Biodiversity and Livelihoods - CEDAR researchers trained local youth in measuring biomass and carbon in plantations of Palampur, Kangra district Himanchal Pradesh by two day on site training programme - funded by National Academy of Sciences (NAS) United States under PEER Cycle 8, Grant #: 25

The field work was impacted due to COVID-19, but the team was able to conduct the field study with the help of local researchers based at Palampur. The following activities were undertaken during r 2019-2020:

- Inception meeting with all project partners including USAID PEER researchers
- Field training on CBH Measurement and Soil sample collection for organic carbon
- Data collection for standing carbon stock and organic carbon in soil
- Preliminary analysis of data collected

Project findings

Vegetation Data analysis

Objective 1: To measure carbon in tree plantations 60 plantations across a mid-altitudinal zone in Kangra District of Himachal Pradesh)

Methods:

1. Setting up ofVegetation plots of 100 m² (10m X 10 m) in 60 plantations



2. Biomass estimation from tree girth using species allometric equations

Results:

1. Basic summary statistics

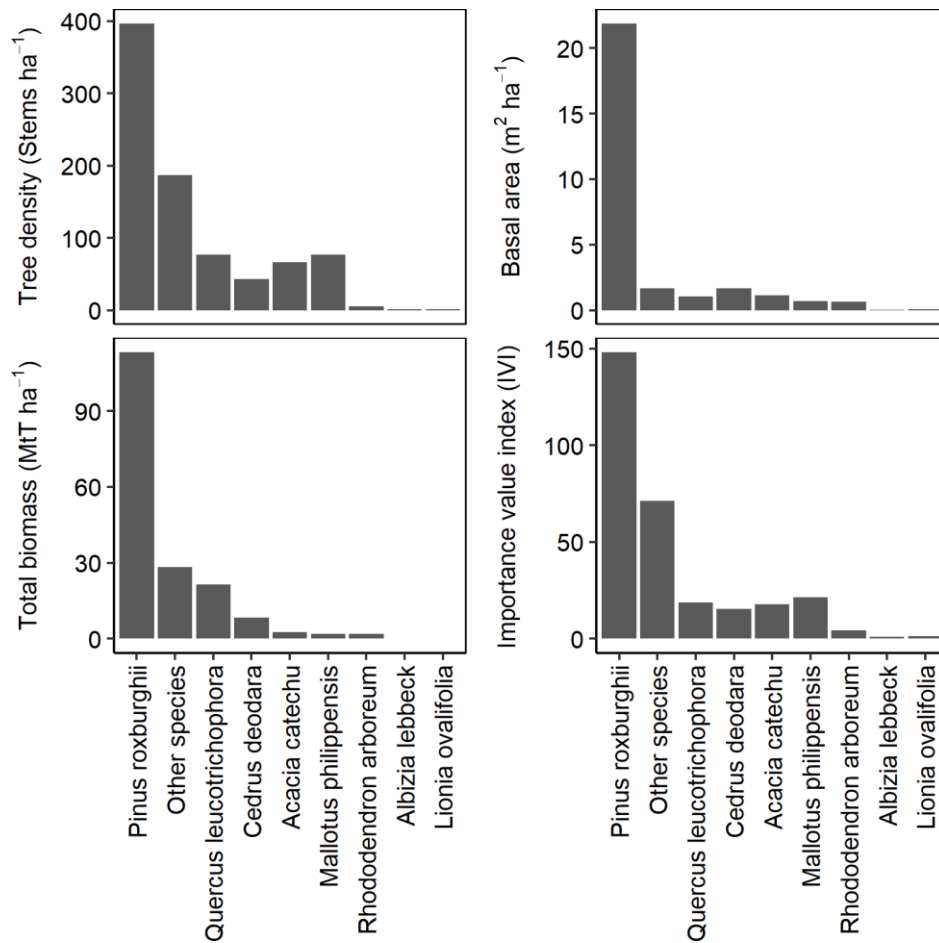


Figure 1. Species-wise summary statistics of vegetation in the PEER plots: Tree density, Basal area, Total biomass, and Species Importance value index

Pinus roxburghii is the most dominant species in terms of biomass in the plots followed by *Q. leucotrichophora*, whereas *Mallotus philippensis* and *Acacia Catechu* have better IVI scores after *Pinus roxburghii*.

CREATING CLIMATE-RESILIENT COMMUNITIES IN MID-HILLS: INTERVENTIONS TOWARDS FOREST, WATER & LIVELIHOOD SECURITY

Funding Agency: National Mission on Himalayan Studies (NMHS)

Duration: 3 years

Project Lead: Dr. Vishal Singh

Field Site: Nathuakhan, Nainital District, Uttarakhand

In the mid-Hills of the Uttarakhand Himalayas, agriculture, animal husbandry and NTFP commerce are all strongly linked to forests

and water security and approximately 78% of the population practice hill agriculture. Most of the agriculturists depend heavily on forests for a large range of goods (both for subsistence and for cash) and the degree of dependency may increase with poverty level, due to lack of access to modern amenities. Moreover, the depletion of glaciers,



increasing frequency of natural disasters, unsustainable use and degradation of watersheds are reducing water availability, changing seasonal flow patterns and increasing conflicts over dwindling natural resources. These adverse changes will be felt disproportionately by poor mountain communities, who currently have little capacity to cope with and adapt to these changes.

The goal of this project is to facilitate forest- dependent rural communities in Uttarakhand hill districts to develop and implement need-based choices to build resilience against climate change through (a) the conservation of natural resources and ecosystem services and (b) improvement and expansion of livelihoods that are primarily sustained by natural resources and ecological integrity. The project is an attempt to seek a union between conservation and the local economy involving interaction amongst biophysical, social and economic components. Specifically, there will be 4 main foci for outcomes in this project:

(1) Forests and Biodiversity Conservation; (2) Soil and Water Conservation (3) Improved/ Alternative Livelihoods and (4) Local capacity-building, with each of these 4 components feeding into, and strengthening the other two.

The project is implemented with the help of Central Himalayan Rural Action Group (CHIRAG), which is located in the project site. While CEDAR is administering the entire project and governing the initial research activities, CHIRAG is acting as the implementing arm of the project (jointly with CEDAR). Therefore, CEDAR is leading role in action research and planning, while CHIRAG is leading the implementation activities though this will be done in partnership with CEDAR.

PROJECT ACTIVITY

Selection of sites
Identification of village leaders
Household Surveys
Hydrological mapping
Spring Discharge measurements
Demarcation of critical water zones
Feasibility assessment for implementation
Rainwater Harvesting
Recharge pits/ponds

Measurement for making recharge pits of the selected spring

HYDRO-GEOLOGICAL ASSESSMENT AND SOCIO-ECONOMIC IMPLICATIONS OF DEPLETING WATER RESOURCES IN NAINITAL

Funding Agency : Ministry of Water Resources (MoWR)

Duration : 3 Years

Project Lead : Dr. Vishal Singh

Field site : Nainital City, Uttarakhand

The project titled “Hydro-geological Assessment and Socio-Economic Implications of Depleting Water Resources in Nainital”, the water scenario for Nainital, Uttarakhand is commissioned to Centre for Ecology Development and Research (CEDAR) by Ministry of Jal Shakti, Department of Water Resources, RD and GR. The project started in December 2019. CEDAR with its partner organizations Indian Institute of Technology, Roorkee (IITR) and Forest Research Institute, Dehradun (FRI) aims to examine the drivers for the altered regimes of water supply in the lake town Nainital and the mechanism to deal with it. The objectives include social, ecological, and technical and policy components which will further advocate better water governance and awareness.



The components include:

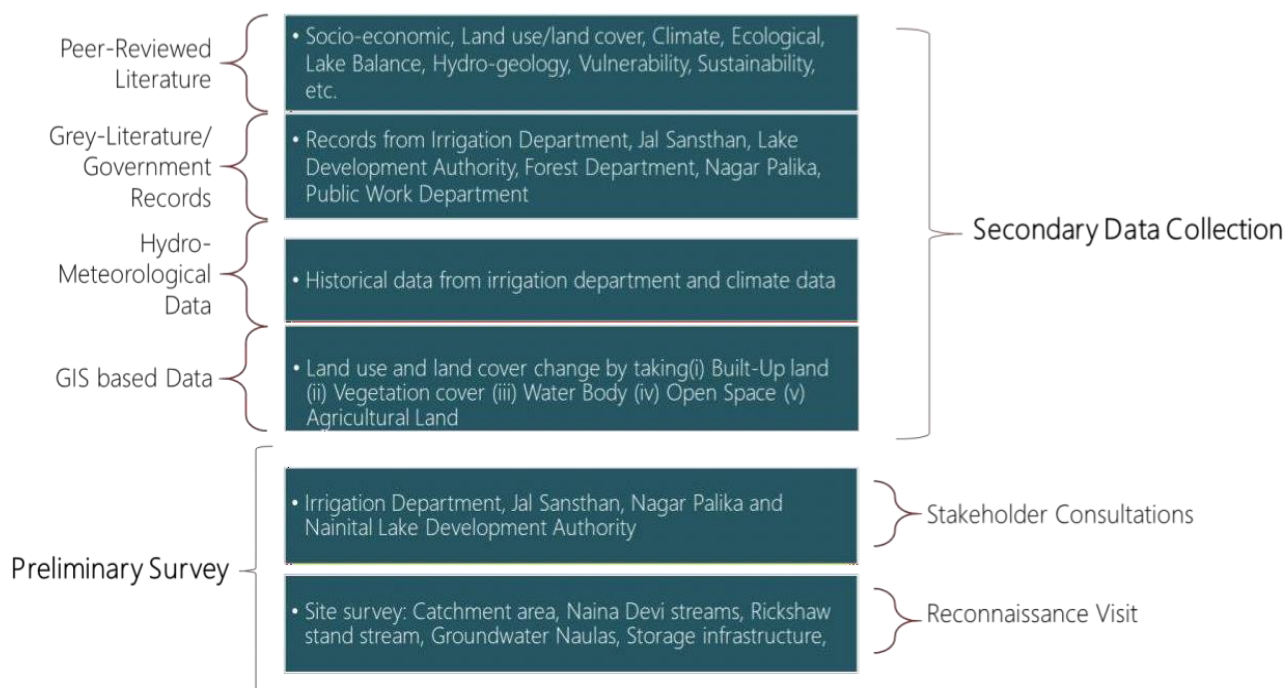
S.	Socio-economic	Ecological	Technical	Policy
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No				
1	Demand-Supply	Water Balance	Water Balance	Citizen Science Initiative
2	Economic Dependency on Nainital Lake	Biological condition	Water Recharge Zones	Pressure Groups
3	Socio-economic impacts	Water Recharge Zones	Climate variability w.r.t Rainfall and Temperature	Policy Change
4	Vulnerability Assessment	Forest/Catchment Degradation		

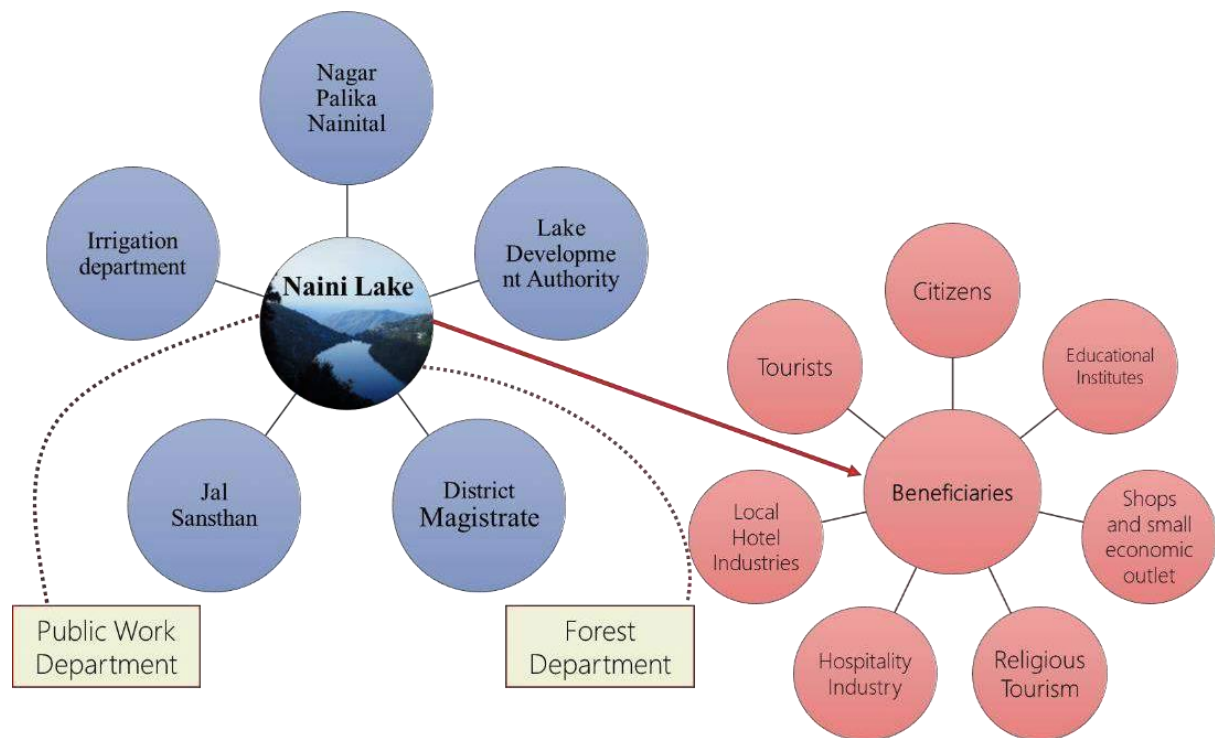
PROJECT ACTIVITIES

Finalisation of team

S. No	Name and Project Designation	Institution
1	Dr Vishal Singh (Principal Investigator)	CEDAR
2	Dr Sumit Sen (Co-Principal Investigator)	IIT Roorkee
3	Dr Rajiv Pandey (Co-Principal Investigator)	FRI Dehradun
4	Ms. Anvita Pandey (Research Associate)	CEDAR
5	Mr Manish Kumar (Research Associate)	CEDAR
6	Ms Manya Singh (Junior Project Fellow)	CEDAR
7	Ms. Stuti Shah	IIT Roorkee
8	Mr Shudhish Bijalwan	FRI Dehradun



Stakeholder identification



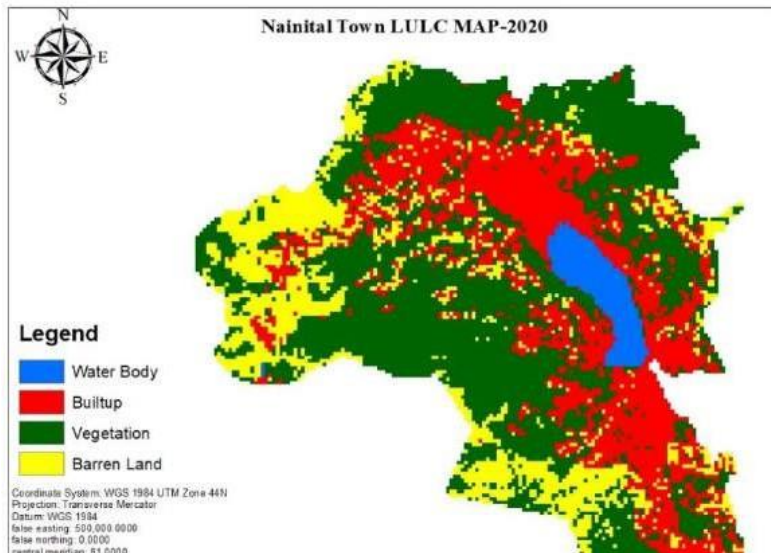
Dissertation completed

In December, CEDAR engaged a master's dissertation student as intern under the project.

The objectives taken under the project was a fragment of the overall project-

1. To understand the Land Use Land Cover Dynamics of Nainital Town using GIS techniques.
2. To estimate the Surface Runoff according to Land Use and rainfall analysis from 1990-2019.
3. To identify Rainwater harvesting potential as well as policy compliance in Nainital town.

The methodology and analysis adopted for the study included- Land Use & Rainfall Analysis, Mann Kendall Trend Test, Quantitative and Qualitative Survey and Rainwater Harvesting Potential Analysis.



LAND USE LAND COVER CHANGE IN NAINITAL 2020

Results

1. EXPANSION OF BUILT UP AREA
2. LAKE COVER DECLINED
3. VEGETATION DECLINED
4. RUN-OFF INCREASED
5. HIGH POSITIVE AND HIGH NEGATIVE TREND FOR RAINFALL
6. HIGH RAINWATER HARVESTING POTENTIAL IN EACH SEASON

ASSESSMENT OF ECOSYSTEM SERVICES PROVIDED BY THE RENUKA WETLAND AND THE SURROUNDING COMMUNITIES' DEPENDENCE ON THESE SERVICES FOR THEIR LIVELIHOOD AND CULTURAL PRACTICES

Funding agency: People Science Institute, Dehradun

Duration: 5 Months

Project lead: Dr. Vishal Singh

Field site: Renuka Wildlife Sanctuary, Himachal Pradesh

Wetlands exist as transitional ecosystem at land and water interface which are represented by various types including lakes, marshes, reservoirs, mangroves, lagoons, estuaries, etc. As highly productive ecosystems, wetlands are vital for hydrological cycle and support rich biological diversity. Globally, wetlands are threatened by reclamation and degradation through drainage and landfill, pollution, hydrological alteration, over-exploitation, and climate change resulting in loss of biodiversity and disruption in ecosystem benefits to the society.

In order to facilitate project implementation, Wetland Research and Training Centre, Chilika Development Authority (CDA) has been identified as a resource centre in partnership with the respective State Wetlands Authorities and site level management institutions. Wetlands International South Asia (WISA) is the technical partner in project implementation. Three main output areas define the implementation approach of the project:

- Integrated management planning for 4 pilot Ramsar sites based on biodiversity, ecosystem services and climate change risks.
- Capacity development of national, state and site level stakeholders for integrated wetland management.

- Development of a wetland monitoring system, including an instrument to track management effectiveness

PROJECT ACTIVITY

Stakeholder Consultations and Inception Workshop: Renukaji Wetland

On 23rd January 2020, CEDAR team made a reconnaissance visit to Renukaji Lake, a Ramsar Site in Dadahu, Himachal Pradesh to gauge the interdependence and the relationship between the Renuka wetland and the communities. The trip was conducted as part of the project, “Assessment of ecosystem services provided by the Renuka Wetland and the surrounding communities’ dependence on these services for their livelihood and cultural practices” funded by GIZ (Gesellschaft für Internationale Zusammenarbeit), Germany.

During the visit, a stakeholder meeting of the project was held in Renukaji Wildlife Sanctuary. It was attended by twenty-five stakeholders from the village communities, Renukaji Development Board, Renukaji Wildlife Sanctuary administration, Himachal Pradesh Forest Department, Brahmchari Ashram of Renuka ji Temple, Himachal Pradesh Tourism Development Cooperation, and Hotel Associations along with the project partners and funders. Ms. Anvita Pandey of CEDAR presented an introductory session on ecosystem services and emphasized on the need for ecosystem services valuation and conservation. Further, a group exercise was facilitated by the CEDAR and team from People’s Science



Institute, Dehradun, which aimed at listing and prioritization of the direct and indirect benefits as understood by the beneficiaries/stakeholders of Renukaji Lake.

PROMOTION OF NATURE-LINKED ECOTOURISM AS A RURAL LIVELIHOOD IN INDIAN HIMALAYAS

Funding agency: The Silent Foundation Ltd., Singapore

Duration : 2 years

Project Lead : Dr. Ghazala Shahabuddin

Field site : Benog Wildlife Sanctuary, Mukhteshwar Landscape and Thano-Laldhang-Jhilmil landscapes

Future preservation of ecological security in the Himalayan region necessitates developmental approaches that are minimally intrusive and least damaging to the fragile ecology. Nature-based ecotourism activities, such as guided bird-watching, hiking and nature photography are slowly becoming an important means for sustainable livelihoods for rural youth. Given the presence of rich biodiversity, extensive trekking trails and scenic mountain landscapes suitable for recreation, nature-based ecotourism is a promising livelihood option for the Himalayas. This project aims to develop and promote nature-based ecotourism in a participatory, holistic and economically sustainable way that involves larger sections of the local community. This project involves skill development of 75 village youth in nature-guiding.

In three landscapes in the lower and middle Himalayas- Mukhteshwar-Peora-Ramgarh landscape (Nainital District); JhilmilJheel-Thano-Laldhang (Haridwar & Dehradun Districts) and Benog-Devalsari-Dhanolti (Dehradun District) landscape. The programme focuses on training in bird, tree and butterfly identification in addition to production of nature interpretation material, based on continual engagement over a period of two years. This project is being carried out in collaboration with the Titli Trust, Dehradun and the Uttarakhand Forest Department and is



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Training program for bird identification

COLLABORATIONS

1. KALAMAZOO COLLEGE & FLAME UNIVERSITY

Bee Census Video Tutorial

We cannot conserve what we don't know. And for knowing and a better understanding of our bees, researchers at CEDAR, Kalamazoo College and FLAME University co-produced this video-guide for bee census. It details the field methodology to observe the bee population and type of pollinators.

This is under the Citizen Science initiative for a large-scale data collection in Mukteshwar region for understanding pollinators in apple production.



Stakeholder Consultations for Apple Production in Mukteshwar Region

Researchers from CEDAR Dehradun, Kalamazoo College (Michigan) and Flame University (Pune), aka Apples and Bees Team, indulged in a 12-day research trip to Mukteshwar, GB Pant University, Bhasana Gaon (Nainbagh) and Myrtola Ashram (Almora). We interviewed apple growers from the region and met with fellow researchers for primary study to understand the effect of climate change and pollination on declining apple production in Uttarakhand Himalaya.





2. STEER PROGRAM OF NATIONAL UNIVERSITY OF SINGAPORE

Under Study Trips for Engagement and EnRichment (STEER) Program of National University of Singapore, CEDAR facilitated the excursion trip to familiarise students with the diverse socio-cultural-economic environments of new and fast-evolving regions.

CEDAR team members (Vishal Singh Anvita Pandey and Laraib Ahmad) and students of NUS participated in an immersive educational as well as a cultural experience.

3. OTHER ACTIVITIES: WORKSHOPS, TRAININGS, FIELD ACTIVITIES CONDUCTED BY CEDAR

WORKSHOP: ECOSYSTEM SERVICES IN CONTEXT OF GREEN BONUS AND GANGA BONUS

CEDAR organized a seminar on "Ecosystem Services in the context of Green Bonus and Ganga Bonus", an initiative taken by Dr. Bharat Jhunjunwala, Prof. S.P Singh and Dr. Ravi Chopra. Eminent academicians and development practitioners took part in the deliberations on Ecosystem Services and Ganga Service in the interest of Uttarakhand.

PUBLICATIONS

Scientific Publications

Singh, V. and Pandey, A. 2019

Urban Water Resilience in Hindu Kush Himalaya: Issues, Challenges and Way Forward.
Water Policy, IWA

Abstract: The urban population is expected to rise up to 68% by 2050, adding 2.5 billion people to the urban areas of the world. The majority of the rise is expected to be in the low-income countries of Asia and Africa. Several cities/towns in the Hindu Kush Himalaya (HKH) region are expanding at a rapid pace, putting additional pressure on water services and basic amenities for urban dwellers. Selected case studies undertaken by the authors suggest that the demand for water far exceeds municipal supply. Water governance in the HKH region remains a blind spot and challenges pertaining to urban water resilience are poorly understood. The paper is divided into three parts: the first outlines the development of towns and their water infrastructure through selected cases in the HKH, followed by key issues and challenges faced by urban systems and suggested measures to build urban resilience in order to deal with the projected rise in population, governance issues and anticipated changes in climate.

Keywords: [Climate](#), [Hindu Kush Himalaya \(HKH\)](#), [Population](#), [Resilience](#), [Urban](#), [Water](#)

Kovács, E.K., Ojha, H., Kaustuv, R., Neupane, K. R., Niven, T., Agarwal, C., Chauhan, D., Dahal, N., Devkota, K., Guleria, V., Joshi, T., Natasha, K.M., Pandey, A., Singh, N.,



Singh, V., Thadani, R. and Vira B. 2019

A political ecology of water and small-town urbanisation across the lower Himalayas.

Abstract: This paper traces the logic, goals and changed socio-ecological relations and water norms introduced by donor- and state- led drinking water supply schemes to small urbanising settlements across the lower Himalayas of India and Nepal. While urban development and water planning tend to boundarise needs and interventions to city limits and city- dwellers, we adopt a hydro-social lens to trace the impacts and consequences of infrastructure and water as both travel through the landscape. Investments into water supply introduce new scales, spatialities and visions for urban development that actively peripheralise rural needs and interests, and introduce new dependencies for infrastructural maintenance that stretch the institutional and governance capacity of towns, such as around energy, finance, and expertise. We find that water supply projects give rise to new power differentials and development trajectories between more- powerful, typically urban and down-stream communities, and rural, up- stream source regions. Projects bring new potentials but also disrupt old relations and customs around water, resulting in the emergence of conflicts within and beyond towns as water availability and access opportunities change. Application of a hydro-social and urban metabolism focus to Himalayan waterscapes makes visible the environmental and societal trade-offs associated with resource provisioning to urban development centres.

Urbanisation, Water, Political ecology, Himalayas, India, Nepal

Singh, S.P., Pandey, A. and Singh, V. 2019

Nature and extent of forest degradation in Central Himalayas. Springer, JNU

Abstract: Forest degradation is widespread in developing countries, as poor people depend on forest biomass collection on a “day-to-day” basis, giving little respite to forest ecosystems to recover. In the Himalayas, collection of firewood, tree leaf fodder, and leaf litter from forest floor is one of the main causes of forest degradation, particularly in oak (*QUERCUS LEUCOTRICHOPHORA*) and pine (*PINUS ROXBURGHII*) elevation belt (1000–2200 m elevation) of the Western and Central Himalayas. In this area, whole tree cutting is uncommon, but most trees are lopped until they become severely denuded, with little crown left. Compared to healthy forests, generally such degraded forests have 40–50% less biomass but about 80% less net primary productivity and 86.4% less leaf area. As degradation progresses, the biomass extracted from the forest declines, but in proportional terms it increases, resulting in a rapid disintegration of ecosystem structure and functions. Some of the observed effects are (1) reduction of soil carbon and nitrogen by 40–50%; (2) desiccation of oak acorns lying on forest floor well before the arrival of monsoon; (3) about 40% reduction in leaf litter decomposition; (4) 35% reduction in ectomycorrhizal association with roots, as indicated by fungal sporocarp density; and (5) 25% reduction in soil water holding capacity and 25% increase in soil bulk density (these values are in comparison to a relatively undisturbed forest). Recovery of a degraded forest (chronic disturbance) has not yet been investigated but is likely to be slower than that of a clear-cut (acute disturbance) forest. However, some interventions can result in a faster recovery.

Keywords: Forest degradation Forest biomass Leaf litter and net primary productivity Himalayas Oak and pine Recovery

Bajracharya, R. M., Dahal, N., Neupane, K.R., Singh, V. and Habeeb, R. 2019

Urban Water Security Challenges in the Nepal and Indian Himalaya in the Context of Climate Change 2019. Resources and Environment p-ISSN: 2163-2618 e-ISSN: 2163-2634 2019; 9(1): 9-18

Abstract:South Asia is home to over a fifth of the world's population that is increasingly becoming concentrated in urban and peri-urban areas. Small to medium-sized cities in the Himalayan regions of Nepal and India are undergoing rapid urbanization. The increasing population, changing lifestyles, economic status of people, and effects of climate change are all contributing to the ever-growing water shortages, leading to a situation of water insecurity in the region. Four cities, namely, Dhulikhel and Dharan in Nepal, and Mussoorie and Haldwani in India were chosen for study as representative of urban areas in the low to medium elevation in the Himalaya that are dependent on springs, streams, rivers and groundwater for meeting domestic and commercial water needs. The present situation and future prospects suggest that ensuring adequate supplies of acceptable quality water for these cities will become ever more challenging in the decades to come unless city specific climate adaptive and equitable water supply measures are employed effectively. Moreover, certain segments of city dwellers face greater difficulties in gaining access to potable water due to socio-cultural and economic factors. Therefore, to achieve sustainable, equitable and climate resilient water management, measures such as, protection of critical urban water zones, stream bank and gully stabilization, water harvesting and groundwater recharge will be needed along with augmentation of infrastructure, increased storage capacity, appropriate policies and institutional arrangements at local, state, and national levels for effectively addressing the issues of equitable water access to each of the households in the cities.

Keywords: Hill towns, Sustainable, Climate resilient, Adaptive management

Pandey, A., Arunachalam, K., Thadani, R. and Singh, V. 2019

Forest degradation impacts on carbon stocks, tree density, and regeneration status in Banj oak forests of Central Himalaya. Ecological Research, Springer

Abstract: The oak forests of the Himalaya are an important repository of carbon. Forest degradation, in terms of loss in biomass and carbon, is a more pressing problem than loss of forest area in the Himalaya. The altitudinal gradient between 1,000 m and 2,200 m is dominated by chir pine and banj oak forest. As a result of small-scale chronic disturbances the structure and function of banj oak forest is rapidly changing, leaving few pristine patches. Forty permanent plots of 400 m² in four disturbance categories of Central Himalayas (1,400 m–2,300 m asl) were studied over 3 years (2015, 2016 and 2017) to understand the impact of disturbance on banj oak forests. The study indicates that tree biomass declined by 62% from undisturbed to degraded forests, carbon sequestration rate declined by 73% and was maximum for Moderately disturbed-A forests, total soil carbon dropped by 79% and mycorrhizal sporocarps declined by 78% from undisturbed to degraded forests. There was an overall decline in tree density by 56% from undisturbed forests to degraded forests. In degraded forests, the invasion of pine, a species tolerant of disturbance, helps in maintaining the forest status but the population structure changes and significant decline in carbon sequestration rate and total biomass stocks (above ground biomass and below ground

biomass) was observed. The study indicates that moderate level disturbance promotes better carbon sequestration rates, tree density and the survival of seedlings.

Habeeb, R., Gupta, Y., Chinwan, H. and Barker, H. 2019

Assessing Demographic and Water Sensitivities Arising due to Urban Water Insecurity in Haldwani, Uttarakhand (India): a GIS-Based Spatial Analysis. *Journal of Geovisualization and Spatial Analysis*

Abstract: Urban water security is a growing concern in fast urbanizing Indian cities. Increasing population, urbanization and changing climatic patterns have great impact on urban water systems, such as surface and underground water resources. Although water insecurity is faced by all, population with lower socio-economic strata tend to be worst affected by the water woes. In this regard, it is imperative to assess water insecurity as sensitivity of residents towards water supply and management in the city at sub-administrative levels. The paper, thus, attempts to assess the rising water insecurity in Haldwani, a medium-sized city located on the foothills of Uttarakhand Himalayas (India), in conjugation with demographic and institutional water supply from the available secondary data sets. Using statistical and GIS-based spatial analysis, the study attempts to evolve a water sensitivity scale at ward level, simultaneously identifying lower socio-economic wards in the city through demographic sensitivity. The result is the delineation of those wards and population that show high water insecurity at the city's administrative level, thus aiding in further facilitation of equitable water management at the urban level. From the study, it is evident that marginal populations continue to face water stresses since they are highly dependent upon municipal water supply and the water supplied is insufficient for their daily needs. These wards also show high demographic vulnerability with respect to low literacy and high unemployment rate. The city faces threats of climate change, decreasing precipitation as well as shifting hot months will further escalate the problem. A continuation of this trend will worsen the water security in the city making the marginal population most vulnerable to the foreseen risks. The paper, thus, elaborates a methodological approach to assess the municipal water supply along with demographic patterns to aid in equitable and climate-adaptive water management in the city

Habeeb, R. and Javaid, S. 2019

Social Inclusion of Marginal in the Great Climate Change Debate: Case of Slums in Dehradun, India

Abstract: In times of climate change, it is said that the marginal population shall be the most adversely affected. This article attempts to explore the state of slums in Dehradun city and their susceptibility to climate change events, especially urban flooding. Taking the case of the state capital, we attempt to identify and demonstrate how the slum population is vulnerable to climate change events in the present and the future. Following risk-hazard approach, this article identifies and distinguishes vulnerable slums, per their sensitivity toward climate-led events using geographic information system (GIS) spatial analysis. Climate change trends show increasing precipitation and temperature trends, which is in agreement with current events of such phenomena in the city. Through GIS, the slums were mapped and their proximity to streams and roads were taken into account to generate vulnerable hotspots with respect to numbers, population, and location. The article then inquires into the inclusion of such vulnerable slums in various relevant state- and national-level policies discussing

challenges and issues in implementation. The article finally derives the possibilities for inclusion of such marginalized classes through ongoing Government of India missions.

Keywords: [slum](#), [Uttarakhand](#), [GIS](#), [climate change](#), [inclusion](#)

Pattanayak, S. K. et al. 2019

Experimental evidence on promotion of electric and improved biomass cookstoves.

Abstract: Improved cookstoves (ICS) can deliver “triple wins” by improving household health, local environments, and global climate. Yet their potential is in doubt because of low and slow diffusion, likely because of constraints imposed by differences in culture, geography, institutions, and missing markets. We offer insights about this challenge based on a multiyear, multiphase study with nearly 1,000 households in the Indian Himalayas. In phase I, we combined desk reviews, simulations, and focus groups to diagnose barriers to ICS adoption. In phase II, we implemented a set of pilots to simulate a mature market and designed an intervention that upgraded the supply chain (combining marketing and home delivery), provided rebates and financing to lower income and liquidity constraints, and allowed households a choice among ICS. In phase III, we used findings from these pilots to implement a field experiment to rigorously test whether this combination of upgraded supply and demand promotion stimulates adoption. The experiment showed that, compared with zero purchase in control villages, over half of intervention households bought an ICS, although demand was highly price-sensitive. Demand was at least twice as high for electric stoves relative to biomass ICS. Even among households that received a negligible price discount, the upgraded supply chain alone induced a 28 percentage-point increase in ICS ownership. Although the bundled intervention is resource-intensive, the full costs are lower than the social benefits of ICS promotion. Our findings suggest that market analysis, robust supply chains, and price discounts are critical for ICS diffusion.

Menon, T., Sridhar, H. and Shahabuddin, G. 2019

Effects of extractive use on forest birds in Western Himalayas: Role of local and landscape factors. *Forest Ecology and Management* 448 (2019) 457-465.

Abstract: Rural populations in developing countries depend on forests for fuelwood, fodder and other non-timber forest products. Such dependence has significant effects on faunal diversity and composition, primarily due to alteration of vegetation structure. While earlier studies have assessed the consequences of extractive activities for forest fauna, very few simultaneously acknowledge the role of landscape context, which includes agricultural land-uses and managed forests. This study was carried out in oak-dominated forests located in the middle elevations of the Western Himalayas to investigate effects of extractive activities on avifaunal communities, taking into account the role of landscape composition. Birds were sampled at 74 sites, six times each, over two seasons using fixed-radius point counts. We analysed avian species richness, abundance, composition and guild abundances (based on foraging and habitat preference) as a function of vegetation structure and proportion of dense oak forest around each site. Our results suggest that extractive activities in forests can result in reduced species richness, abundance and altered composition of forest avifauna, brought about by changes in vegetation structure. We also find that these effects may be intensified by the loss of dense oak forests in the landscape. Insectivorous birds and forest specialists were

most sensitive to extractive activities and landscape composition. Decreasing canopy cover and proportion of oak forest in the landscape had strong negative effects on insectivorous and forest specialist species. Other local factors such as vertical stratification and understory density also had effects on these avian guilds. Our study indicates that in order to conserve bird species in an increasingly human-dominated landscape of the Western Himalayas, it may be necessary to control extractive activities that affect forest structure as well as retain protected forest stands within a continuum of harvested forest and agricultural landscapes.

Press Release

Shahabuddin, G. 2019

The Tiger's Last Stand Challenges for Protected Area Management in Sariska

Dissertation

Gaur, A. 2020

Impact of land cover changes on the ecosystem services provided by the Renuka Wetland TERI, School of Advanced Studies, Delhi

Abstract: Ecosystem services are the benefits that we people obtain from the ecosystem. These services are a critical component of human survival. According to the Millennium Ecosystem Assessment, these services are classified into four major categories. These include provisioning services, regulating services, cultural services, and supporting services. So these services range from necessities like food, fuel, and water to inherent services like soil formation. The study focusses on a high altitude wetland and wildlife sanctuary in the western Himalayas, Renuka Ji. With the place getting its name on the list of Ramsar sites, it has experienced rapid growth in developmental activities and the conversion of forest cover into barren lands which is destroying the ecosystem landscape and functions. To maintain the present condition and understand the causes of increased siltation, a land cover analysis was done for an area of 16 km² within close proximity to the wetland. The satellite images for 1990, 2008, and 2018 were used for LULC supervised classification. For the classification, five LULC classes were taken. Accuracy assessment and Kappa analysis was done to ensure better reliability on this classification. The most extensive class of the area is forest cover i.e. 69.95%, followed by barren land at 23.93%. The overall accuracy of the classification for 1990, 2008, and 2018 is 92.50%, 95%, and 95% respectively and Kappa statistics is 0.9062, 0.9375, and 0.9375 for the following years. This quantitative data was then followed by the qualitative data in the form of PRA exercises which tells the trend of the change in ecosystem services. It complements the LULC data and the changes observed through exercises such as spatial mapping, the timeline of the events, trend analysis, seasonality, and ranking and scoring method. The long-term variation in rainfall provides seasonality and changes in the trend using R software. This is then verified with the data collected through PRA.

Keywords: Wetland, Renuka Ji, Land Use, Land Cover, Participatory Rural Appraisal, Temporal Variation.

Raghav, P. 2020

Impact of urbanisation on water resources & opportunity of RWH structure in Nainital TERI, School of Advanced Studies, Delhi

Abstract: This study is aimed at to understanding the relationship between urbanization growth and surface run-off generation, thus to explore the scope of rainwaterharvesting potential in the study area of Nainital. The rapid urbanization due to increased tourists' inflow, population, growth in infrastructure facilities has made the town susceptible to the risks of change in climatic conditions. The rapid urbanization has created a threat to water security in Himalayan towns. The current challenge in this century is to control the shortage of water through Rainwater Harvesting Structure and making it sustainable as well as viable for the end-users. The study projects combine the approach of Remote Sensing technology and Geospatial techniques to understand the change in Land Use/Land Cover pattern of the tourist town Nainital between the years 1990 to 2020 over four decades. The SCS-CN method has been used to generate surface run-off from the rainfall data available between 1990-2010. The surface run-off has been generated according to the Land Use/ Land Cover andsoil group for the Nainital town. The rainwater harvesting potential for different scales has been calculated season-wise and compared with lake supply data for those seasons to estimate the volume of water that can be stored using rainwater harvesting (RWH) structures in the built-up area as well as to reduce the supply from the lake. OneRWH Structure has been designed for a commercial property, estimating the volume of water that can be stored according to the area of the rooftop.

Keywords: Rapid Urbanization, Himalayan towns, Water Security, Remote Sensing, Surface Run-off, Rainwater Harvesting Structure

DONORS

National Mission on Himalayan Studies (NMHS), Govt. of India

Ministry of Water Resources (MoWR), Govt. of India

Ministry of Environment and Forest, (Climate Change), Govt. of India

M.G. Shahani & Co (Delhi) Ltd.

Pevibai Motiram Shahani Trust, Delhi

The Silent Foundation, Singapore

The Nature Conservancy (TNC)

University of Minnesota, USA

Kalamazoo College, USA

PARTNERS

Indian Institute of Technology, Roorkee

Forest Research Institute, Dehradun

FLAME University, Pune

Kalamazoo College, USA
Himalayan Adaptation, Water and Resilience (HI-AWARE)
University of Cambridge, Department of Geography, United Kingdom
Yale Himalayan Initiative (YHI), Yale School of Forestry, USA
South Asia Institute of Advanced Studies (SIAS), Kathmandu Nepal
Central Himalayan Rural Action Group (CHIRAG), Simayal, Nainital
The Energy Research Institute (TERI), New Delhi
University of New South Wales (UNSW), Australia
Tata Institute of Social Sciences (TISS), Mumbai
The Mountain Institute (TMI), Sikkim, India
Megh Payne Abhiyan (MPA), New Delhi
Himalayan Nature and Adventure Foundation, Siliguri, India
People's Science Institute (PSI), Dehradun
Himachal Pradesh Forest Department

MEMORANDUM OF UNDERSTANDING

Department of Forestry, Kumaun University, Nainital, Uttarakhand
Department of Forestry, HNB Garhwal University, Srinagar, Uttarkhand
Forest Department, Uttarakhand
Indian Veterinary Research Institute (IVRI), Mukteshwar, Uttarakhand

REGISTRATIONS

Cedar is registered under Societies Registration Act XXI of 1860 Registration No S-54758 of 2006.

We are registered under the Foreign Contribution Regulation Act (FCRA),
Registration No. 347900178 (Educational Social).

CEDAR holds the status of a Scientific and Research Organisation (SIRO) registered under Department of Scientific and Industrial Research (DSIR), Ministry of Science and Technology, Government of India.

VOLUNTARY COMPLIANCE

We are in voluntary compliance with the norms of the Credibility Alliance, which has evolved minimum and desirable to promote better governance within the voluntary sector. While, CEDAR is not a member of the alliance, we declare this information voluntarily to promote accountability and transparency.

Governance:

None of the Governing board members are related to each other or related to any of the senior salaried staff by blood or by marriage. None of the Governing Board members (including the Chairman and Executive Director) have received any salary, consultancy or other remuneration from CEDAR. Travel costs, as per actual ticket submitted that were budgeted into projects, were however reimbursed.

The Governing Board has met more than twice in the last year with the required quorum.

12th Annual General Meeting held on September 25th 2019,

Time: 5 pm

Venue: 201, Phase I Vasant Vihar Dehradun

Salary: Maximum salary paid was of were Rs 99,000 month.

Travel: Maximum cost of any single rail ticket purchased was less than 2000 Rupees .

International Travel: Maximum ticket was NIL

Statutory Auditor: Mr. R. Balasubramanian Partner, S. Ramanand Aiyar & Co. 708, Surya Kiran, Kasturba Gandhi Marg, New Delhi 110001

Our Bankers: ICICI Bank, New Delhi; Indian Overseas Bank, Dehradun; Axis Bank Dehradun (Details and account numbers)

CENTRE FOR ECOLOGY, DEVELOPMENT AND RESEARCH

**BALANCE SHEET
As at March 31, 2020**

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
	Rs.	Rs.
<u>LIABILITIES</u>		
<u>Corpus Fund</u>	2,00,000	2,00,000
<u>Reserve Fund</u>		
As per last Balance Sheet	8,15,015	9,41,627
Add: Transferred from Income and Expenditure Account	(11,87,038)	(1,26,612)
	(3,72,023)	8,15,015
<u>Current Liabilities</u>		
Projects in Progress (Schedule - 1)	74,93,967	5,59,589
	73,21,944	15,74,604
<u>ASSETS</u>		
<u>Fixed Assets (Schedule - 2)</u>		
Gross Block	9,33,394	8,44,595
Less: Depreciation	1,45,796	1,41,743
Net Block	7,87,598	7,02,852
<u>Current Assets, Loans and Advances</u>		
<u>Current Assets</u>		
Bank Balances		
With Scheduled bank - In saving accounts	62,89,628	5,09,906
Fixed Deposit	10,000	2,13,846
Tax Deducted at source	1,87,700	50,000
Advance to Others	12,018	63,000
Security Deposit	35,000	35,000
	73,21,944	15,74,604

Significant Accounting Policies and Notes - Schedule 3

Chairman

Vice Chairman

Executive Director

In terms of our report of even date annexed.

For S. Ramanand Aiyar & Co.

Chartered Accountants

Firm Registration No - 000990N

R. Balasubramanian

Partner

Membership No. 080432

Place: New Delhi

Date:

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED MARCH 31, 2020		
PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
	Rs.	Rs.
<u>INCOME</u>		
<u>Project Funding</u>		
<u>Receipts during the year</u>		
ICIMOD :- (International Centre for Integrated Mountain Development) HI-AWARE	-	2,39,914
DST WSS :- Effects of land use and fragmentation on forest Biodiversity : case study of Himalyan bird communities in Oak-pine forest of Kumaon, Uttarakhand.	-	8,50,000
IDRC :- Facilitating and Conductiing research on water security issues in four mid-sized cities in India.	-	38,00,960
ICLEI :- Mainstreaming the role of eco-system services in water suply of Nainital.	-	5,40,300
ICIMOD-02 :- (International Centre for Integrated Mountain Development) HI-AWARE	-	1,99,990
MOEF :- Monitoring of biomass stocks and forest community structures in temperate zone of western Himalaya.	-	27,698
IGF :- To conduct a action research study on "Gurugram city state of environment: water" with the support of Gurugram metropolitan development authority.	5,00,000	15,00,000
ICIMOD :- (International Centre for Integrated Mountain) Development Analysis of pollution related policies, India	8,23,915	-
UNDP :- (United Nations Development Programme) : Status of Plastic waste management in Char Dham Region	9,13,965	-
NHMS :- (National Mission on Himalayan Studies): Creating Climate-resilient Communities in Mid-Hills of Uttarakhand: Interventions Towards Forest & Water	12,46,746	-
MOWR :- Hydro-geological assessment and socio economic implications of depleting water resources in Tourist Towns of Uttarakhand	32,19,668	-
TNC :- (The Nature Conservancy Centre) : Scoping and Prioritization of Assisted Natural Regeneration (ANR) opportunities in India	16,94,000	-
PEER :- Planning plantations: past learning, toward triple wins in carbon, biodiversity and livelihoods	55,78,977	-
TSF :- (The Silent Foundation Ltd): Promotion on Naturre-Linked Ecotourism as a rural livelihood in India Himalayas	5,08,807	-
SDTT :- (Sir Dorabji Tata Trust): Bridge grant to sustain CEDAR	9,30,000	-
HPFD :- (Himachal Pradesh Forest Department): Conducting socio-economic and livelihood assessment surveys of pastoralists of Himachal Pradesh	2,97,000	-
	1,57,13,078	71,58,862
<u>Projects in progress brought forward</u> (brought forward from unutilised funds of last year)	5,59,589	5,25,836
<u>Other Receipts</u>		
Donation	10,15,000	5,50,000
Administrative cost Realised	8,00,685	4,79,799
Facilitation & Support Cost	5,08,324	-
Interest Income	94,123	65,571
Project Consultancy Received	1,83,000	-
Interest on income tax refund	3,500	4,500
	26,04,632	10,99,870
TOTAL INCOME	1,88,77,299	87,84,568

EXPENSE		
Expenditure on Projects		
IGF :- To conduct a action research study on "Gurugram city state of environment: water" with the support of Gurugram metropolitan development authority.	6,63,442	10,42,060
ICIMOD-02 :- (International Centre for Integrated Mountain Development) HI-AWARE	-	2,95,747
TERI :- (The Energy & Resources Institute) HI-AWARE : Himalayan Adaptation, Water and Resilience Research	-	3,15,617
DST WSS :- Effects of land use and fragmentation on forest Biodiversity : case study of Himalyan bird communities in Oak-pine forest of kumaon, Uttarakhand.	65,294	8,27,402
IDRC :- Facilitating and Conductiing research on water security issues in four mid-sized cities in India.	4,85,612	38,03,335
ICLEI :- Mainstreaming the role of eco-system services in water suply of Nainital.	-	1,08,716
MOEF :- Monitoring of biomass stocks and forest community structures in temperate zone of western Himalaya.	-	27,698
SERB :- Extinction vulnerability of bird communities along land use and management gradients : A Comparative approach in the forests of northeast and Central Himalaya regions of INDIA.	-	23,025
ICIMOD :- (International Centre for Integrated Mountain) Development Analysis of pollution related policies, India	8,23,915	-
NHMS :- (National Mission on Himalayan Studies): Creating Climate-resilient Communities in Mid-Hills of Uttarakhand: Interventions Towards Forest & Water	10,53,991	-
MOWR :- Hydro-geologocal assessment and socio economic implications of depleting water resources in Tourist Towns of Uttarakhand	22,54,347	-
TNC :- (The Nature Conservancy Centre) : Scoping and Prioritization of Assisted Natural Regeneration (ANR) opportunities in India	12,42,535	-
PEER :- Planning plantations: past learning, toward triple wins in carbon, biodiversity and livelihoods	13,44,797	-
TSF :- (The Silent Foundation Ltd): Promotion on Naturre-Linked Ecotourism as a rural livelihood in India Himalayas	4,39,282	-
SDTT :- (Sir Dorabji Tata Trust): Bridge grant to sustain CEDAR	7,03,720	-
	90,76,935	64,43,600
OTHER EXPENSES		
Communication Expenses	9,110	6,638
Community Work Expenses	-	31,000
Consultancy and Honorarium	-	12,400
Depreciation (Schedule - 3)	1,45,796	1,41,743
Employee Costs	23,93,290	10,56,500
Office Expenses	95,162	70,696
Insurance	21,541	25,801
Audit Fees	20,650	20,650
Printing and Stationery	15,810	1,865
Rent	3,36,000	3,04,850
Travel and Conveyance	3,18,346	1,32,099
Fixed assets Written off	-	62,732
Telephone & fax	14,539	22,490
Other Expenses	1,23,191	18,527
	34,93,435	19,07,991
TOTAL EXPENSE	1,25,70,370	83,51,591
Balance	63,06,929	4,32,977
Less: Transferred to Project in Progress (As per Schedule - 1)	74,93,967	5,59,589
Surplus transferred to Reserve Fund	(11,87,038)	(1,26,612)
Significant Accounting Policies and Notes - Schedule 3	In terms of our report of even date annexed.	
Chairman	For S. Ramanand Aiyar & Co.	
	Chartered Accountants	
	Firm Registration No - 00990N	
Vice Chairman	R. Balasubramanian	
	Partner	
	Membership No.080432	
Executive Director	Place: New Delhi	
	Date	



CEDAR

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