

# CEDAR

CENTRE FOR ECOLOGY DEVELOPMENT AND RESEARCH

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ANNUAL REPORT

2017-2018



# EXECUTIVE DIRECTOR'S MESSAGE

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This year, our work on 'Water Security in small and medium towns of the Western Himalaya' achieved some scale and got recognition. Our efforts in Nainital were showcased in a meeting attended by the Hon. Governor and the Hon. Chief Minister of Uttarakhand, where the state recognised the importance of preserving and protecting ecological services emanating from critical water recharge zones. This greatly validated Cedar's efforts and encouraged us to take forward our work to other hill cities including Mussoorie and Haldwani.

Strengthening linkages with civil society and school groups was an important feature of our efforts. Cedar believes that science must be democratised, and citizen science is the way forward for a better and more sustainable future for our towns and cities.

We continue to monitor and study our long term ecological plots in Nainital district. As these yield valuable temporal data on forest ecology and the impacts of disturbance, we are optimistic of contributing significantly to Himalayan forestry research in the years to come.

It has been a year since I wrote a forward to last year's report. It has also been a year since the tragic and terrible road accident of 11th August 2017 when we lost a beloved colleague – Dr. Devendra Chauhan. We continue to remember him and be reminded of him – especially as we build on some of the work he helped start.

This has also been a year when the process of leadership change was initiated. Young researchers working in the organisation have started taking leadership roles. For an organisation to grow and prosper, it is important to bring in new ideas and people. Equally, it is essential to retain the best and challenge them with new responsibilities.

CEDAR is today well positioned to make a long term impact through our action research, demystification of science, and outreach. We focus on strengthening partnerships with a wide variety of institutions, from those grounded in research, to those pushing for change through advocacy and grassroots work.

This was also a year of consolidation and strengthening of internal systems. The CEDAR team put in a lot of hard work and was able to achieve more impact than their limited numbers would indicate possible. I am thankful to our Governing Board which continues to provide us with inspiration and encouragement.

My sincere thanks to our Donors and supporters, without whom our work would not be possible.



RAJESH THADANI

Executive Director

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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 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. CEDAR was formed by a group of academics and development practitioners to bridge the gap between applied research and field based interventions or, to put it differently, 'balance theory and practice'. In this respect, CEDAR is a novel initiative and, brings many years of diverse experience under one roof.

## Mandate

The development sector has, for long, been caught in the divide between theoreticians and practitioners where each group underrates the work of the other. This artificial divide has set the sector back and deprived it of the opportunity to continuously assess and improve its work. This has also had implications for policy formulation whereby the lack of a right blend of lessons from the field, properly documented and analyzed, has led to information gap in policy formulation. Cedar sees it as a part of its mandate to straddle this divide and thereby plug the information gap in policy formulation. The need for an organisation like Cedar is especially acute in the Himalayan region, which suffers from limited capacity and a dearth of quality institutions.

## Structure

Cedar is guided by a Governing Board and a Research Advisory Committee. The operational and administrative issues are managed by the Executive Director. Cedar has a 'core team' of five members who are involved with strategy formulation, project execution, and project management. The core team relies on the help of a pool of experts and specialists from diverse fields Cedar has affiliated with Cedar.

# Governing Board

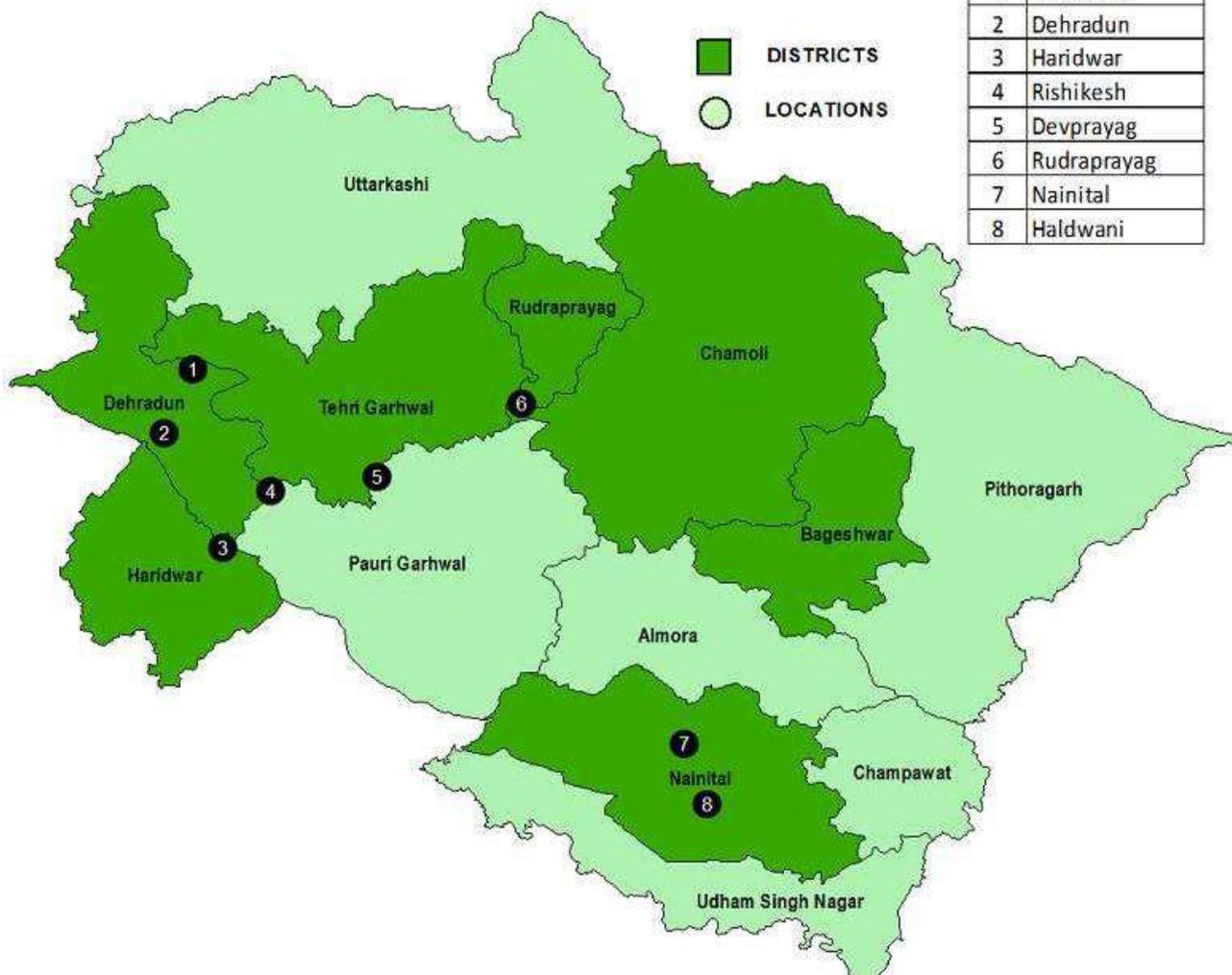
The Governing Board has experienced academics and development professionals including

1. Professor S.P. Singh, FNA (Chairman)
2. Professor B.K. Joshi (Vice Chairman)
3. Dr. Ravi Chopra (Member)
4. Dr. Ghazala Shahabuddin (Member)
5. Dr. Rajesh Thadani (Secretary & Executive Director)

# Research Advisory Board

- Prof. J.S. Singh, FNA, FTWAS, BHU, India,
- Prof. K Shivaramakrishnan, Yale University, USA
- Dr. Margaret Lowman, ESA, USA
- Professor Bhaskar Vira, Cambridge University, UK
- Dr. Rajendra Dobhal, DG, UCoST, India
- Dr. Himanshu Kulkarni, Director ACWADAM, Pune, India

## WHERE WE WORK



## 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. These gaps may then be filled by in-house resources, and by collaborating with like minded institutions and individuals.

## 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.



# THEMATIC AREAS

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:-



**Forests and  
Humans**



**Urbanisation and Water  
Security**



**Wildlife, People  
and Landuse  
Change**

## Overarching Theme

## CLIMATE CHANGE ADAPTATION



## 1. Forest and Humans

There is an increasing realisation across the world that the dependence of humans on forests and various ecosystem services provided by forests sustains lives and livelihoods. Himalayan forests, and the dependence of humans on these forests, form the first general theme of CEDAR. Impacts of human disturbance on forests, sustainable management, and valuation and ecosystem services are all components of this theme. On a macro scale the impacts of climate change on mountain ecosystems is also an area that CEDAR aims to explore. In order to obtain better spatial and temporal data, CEDAR has established long term monitoring plots across disturbance and altitudinal gradients in the Western Himalayan region.

Theme Lead: Rajesh Thadani, Senior Fellow



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## 2. Urbanisation and Water Security

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 an 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 a 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 liase with more partners, our understanding on this issue has grown and evolved.

Theme Lead: Vishal Singh , Fellow

### 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 over-exploitation - 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.

Theme Lead: Ghazala Shahabuddin, Senior Fellow



# 1. Mainstreaming the Role of Ecosystem Services in Water Supply of Nainital

Funded :ICLEI South Asia

Nainital is located at 29°24" N latitude and 79°29" E longitude near the Main Boundary Thrust (MBT) that separates the Siwalik from the Lesser Himalaya. The elevation at lake level is 1938 m, and the surrounding hills rise from 2,139 to 2,611 m above sea level. The existence of a kidney bean shaped lake is the most prominent feature of the town. Water supplied to the population of Nainital, which is around 41000 individuals, comes from the 12 tube wells; 9 in Naini Lake and 3 in Sukhatal. In recent years, due to unplanned construction, encroachment and degradation of recharge zones, and also rainfall deficits in the winter of 2015-2016 and during the receding monsoon in 2015, a rapid decline in lake water level of upto 18ft occurred in the summer. This has been a matter of great concern to local citizens, environmental agencies, government authorities and the tourism industry. Concretisation over major parts of the recharge areas has led to low rates of infiltration of rain water. Sukhatal Lake, an ephemeral 2 hectare water body, which is a critical recharge area for Naini Lake has been rapidly encroached upon during the last two decades. This has resulted in low subsurface water inputs to Nainital. CEDAR undertook a process to map and understand ecosystem services concerns related to sustainability of water supply and the lake. To achieve this study, primary data collection in which geological mapping, ground water assessments and an understanding of geological connectivity between Sukhatal and Nainital lake was established. Potential recharge areas were mapped, springs were identified and Land use Land cover assessments were conducted to understand the temporal changes due to urbanisation.

## Key Issues

- Consistent decline in lake level
- Degradation of recharge zone
- Excessive withdrawal of water from the lake
- Poorly regulated Construction
- Excessive traffic and unregulated tourism
- Apathy towards heritage drains
- Lack of Governance and Unclear Institutional responsibilities

## Key solutions and citizens demand

## Key submissions and citizens demand

1. Restore Sukhatal and other recharge areas
2. Reduce water extraction from Lake
3. Regular drain cleaning
4. Regulate traffic, develop parking outside Nainital
5. Revive hill side safety committee
6. Water Metering to be introduced
7. Differential pricing systems

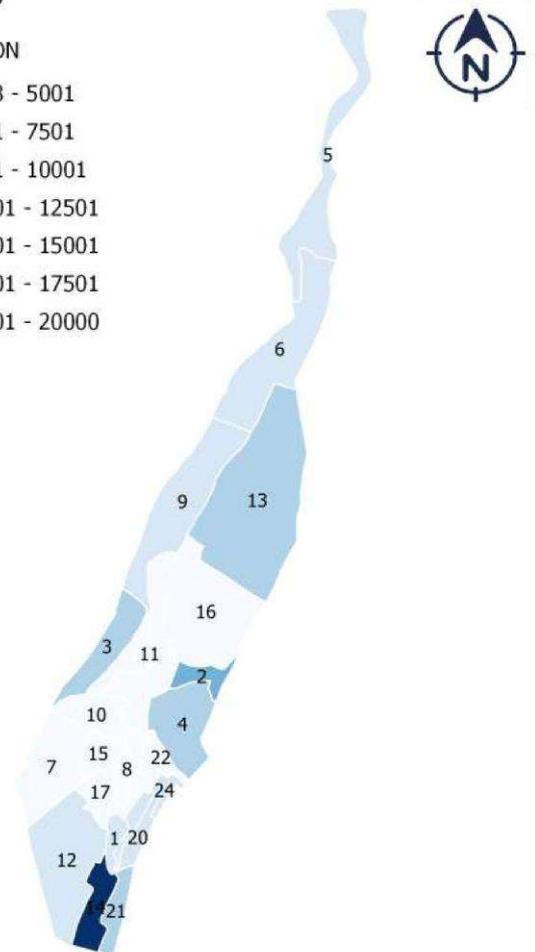
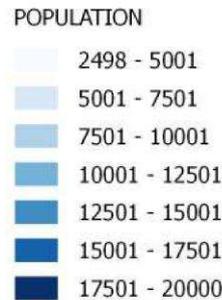


## 2. Climate Adaptive and Water Management Practices for Cities in South Asia (CAMPS)

Funding Organisation: International Development Research Centre (IDRC) Duration : 3 years

Water Security is one of the biggest challenges faced by the human race in today's world. In India most policies are oriented towards metropolitan, large cities or rural areas. Small and medium towns are largely neglected. The project focuses on Mussoorie and Haldwani as case studies to understand the problem of water security in view of rapid urbanisation and changing weather patterns. The project aims to develop Climate Adaptive Water Management Practices. The main focus is on institutional building and transformation, informed by a diagnostic analysis of social, political and biophysical dimensions of the two case studies.

### LEGEND



### HALDWANI WARD WISE POPULATION DATA

750 0 750 1500 2250 3000 m



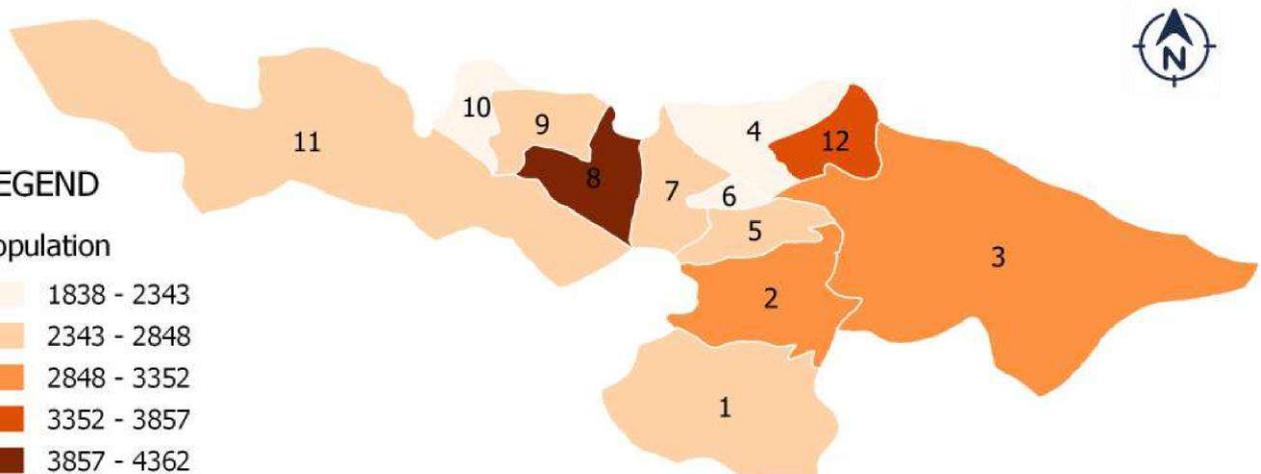
### LEGEND



1 0 1 2 3 4 km



### MUSSOORIE WARD WISE POPULATION



In order to achieve the objectives, CEDAR has had several stakeholder workshops and created city level water forums. We have completed two city level inception workshops, and conducted project implementation preparatory actions including the following activities: **1) preparation of base documents for each of the 2 case study sites, 2) conducted situation analysis, 3) identified critical urban water zones (CUWZs), 4) identified key issues of water insecurity as well as analysed the gender and social dimensions of the same.** Keeping the above in mind preliminary explorations of potential solutions and feasibility assessments of the solutions have been conducted.

City scale water forums have been established in the study sites, namely the Mussoorie Water Forum and the Haldwani Water Forum. The CAMPS project envisions water forums to be a crucial platform for all water stakeholders of the city to discuss and negotiate water conflicts, issues and challenges that the city is facing. It also works as a knowledge hub for sharing various water related findings from researchers/scientists and the indigenous knowledge at local level.

The key challenges that came into focus are the declining water discharge at various sources and urban management of water in bridging the gap between demand and supply. The activities were partaken as per the objectives and milestones of the project.

Following were the key findings:

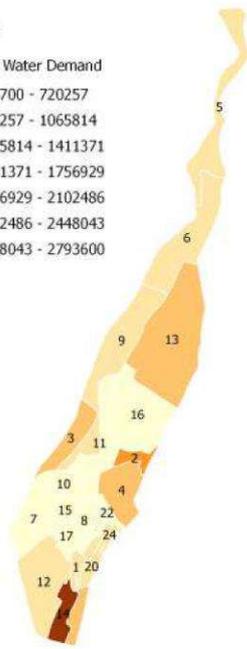
- \* Climate Change has contributed towards creating an uncertainty in supply of water.
- \* Shifting of sources and engineering based solutions are sought.
- \* Roles of institutions not clear.
- \* Lack of governance

Analysis of policy, practice and issues in relation to water management has highlighted critical gaps. These have helped us in preparation of knowledge outputs. In the case of Mussoorie, CEDAR was able to promote Rainwater Harvesting (RWH) as a CAMPS option which is now been taken up by Woodstock School. RWH appears to be the preferred intervention in case of institutions that have larger space to accommodate the infrastructure required. Woodstock is helping other schools to take up RWH as a practice for water conservation.



**LEGEND**

**Ward Wise Water Demand**



**WARDWISE WATER DEMAND**

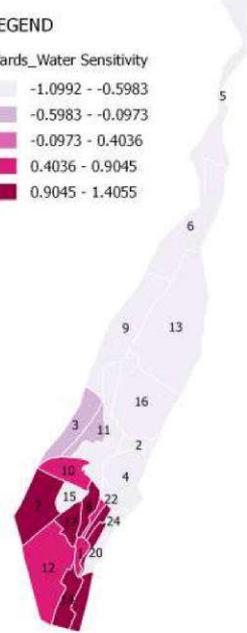
S. No.	Zone	Location area	Reservoirs Capacity (ML)
1	A & B	Sheerohat GSUR	1000
2	C	Zila Parishad Dak Bangala OHSR	400
3	D	Hydke Gate OHSR	1250
4	E	Shahmohal OHSR	750
5	F	Awas Vikas OHSR	600
6	G	Subash Nagar OHSR	750
7	H	Jai Saradhan Tikaraya OHSR	600
8	I	Degree college OHSR	600
9	J	Mahila degree college OHSR	1450
10	K	Near Cantt area OHSR	600
11	L	Pajpura OHSR	600
12	M	Kashyap OHSR	600
13	N	Hiranagar OHSR	600
14	O	Azadnagar OHSR	700
15	P	Govt. Girls high school OHSR	600
16	Q	Indiranagar 13 Bigha OHSR	600
17	R	Ujala nagar Dheeghat OHSR	600
18	S	Tehsil OHSR	600
19	T	Gravity Zone Existing GSURs	



**ZONEWISE WATER DISTRIBUTION**

**LEGEND**

**Wards\_Water Sensitivity**



**WATER DEFICIT WARDS**

**HALDWANI WARD WISE WATER DEMAND-SUPPLY**

750 0 750 1500 2250 3000 m



WARD NOS. 14,2,21, 3, 4 & 13 ARE THE ONE WITH HIGH WATER DEMAND. BASED ON WATER DISTRIBUTION AND ALLOCATION OF RESERVOIRS, WARD NOS. 14, 21, 7, 17, 8 & 25 ARE THE MOST DEFICIT ONES.

In Haldwani the general consensus is towards the implementation of RWH for reducing pressure on the Gaula river and for clear and implementable regulations for ground water extraction. The project was envisaged in three different phases – Phase-1 encompasses planning for interventions at source level through water systems assessments undertaken, Phase- 2 shall evolve planning for interventions at city level through the issues identified, Phase-3 shall conduct equity, gender and financial feasibility studies. Each of these phases have adhered to the key methodological aspects i.e. i) systematic data collection, data analysis, ii) literature reviews on climate change, institutions in relation to water supply/demand and water; iii) flagship implementation of research informed pilot interventions in each city; iv) engagement with key stakeholders and awareness; v) development of knowledge products for dissemination including blogs, policy/learning briefs, working papers on gender and water, cost-benefit analysis of CAMPS piloted, and journal articles.

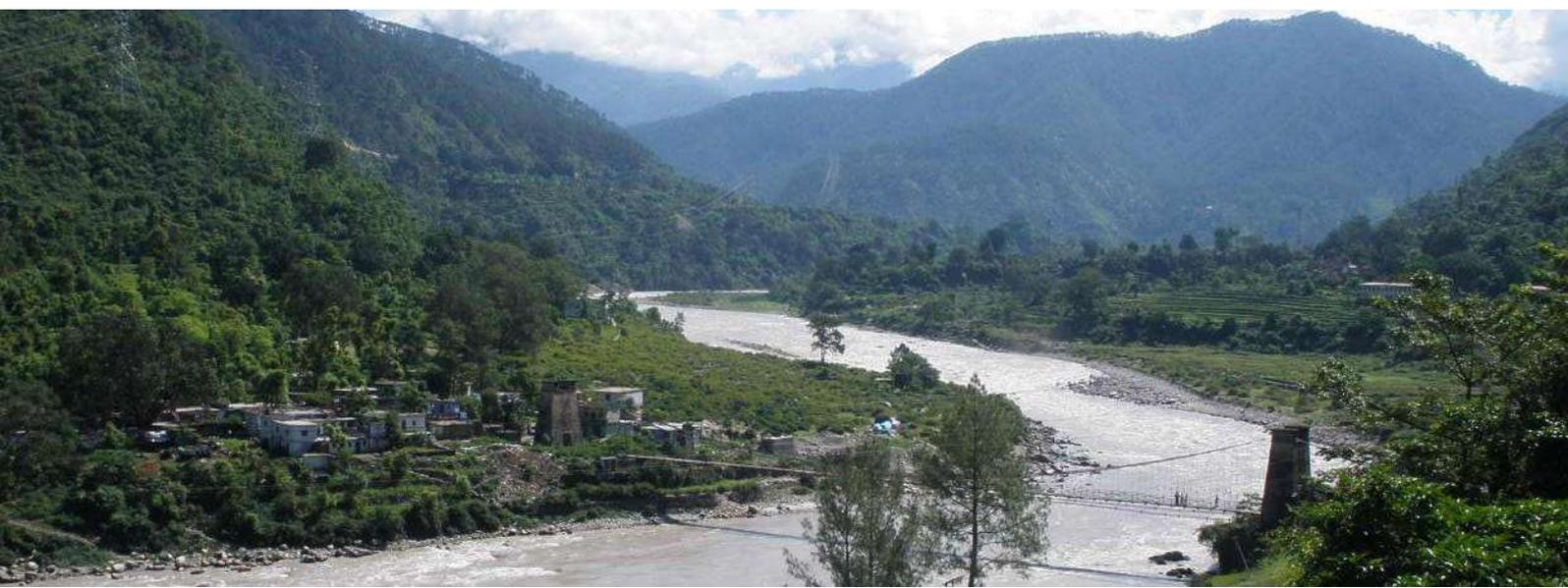


### **3. Himalayan Adaptation, Water and Resilience (HI-AWARE) Research on Glacier and Snowpack Dependent River Basins for Improving Livelihoods Funding organisation: ICIMOD**

HI-AWARE is a research initiative aiming at developing climate change adaptation approaches and increasing the resilience of the poorest and most vulnerable women, men, and children in the mountains and plains of the Hindu Kush Himalayan (HKH) region. The HI-AWARE consortium is conducting integrative research across scales on the biophysical, socioeconomic, gender, and governance drivers and conditions leading to vulnerability in order to understand climate change impacts and to identify critical moments for adaptation.

CEDAR was taken on board as a strategic partner for facilitating and assisting research in three altitudinal ranges, High-Hills (Rudraprayag), Mid-Hills (Tehri Garhwal) and Plains (Haridwar) of the Upper Ganga Basin in Uttarakhand in the year 2015. The team is engaged in an operational partnership in the Plains (Haridwar) and Mid-Hills (Tehri Garhwal) with TERI. Under this strategic partnership, CEDAR conducted research on Urban Water Management and Springshed Management Research in Mussoorie and Devprayag.

CEDAR conducted vulnerability assessments to determine the socio-economic, governance and gender drivers; and quantitative surveys to highlight the climatic stresses on the livelihoods of communities in Plains and Mid-Hills of the Upper Ganga Basin in partnership with TERI. With the help of HI-AWARE's ongoing research, CEDAR has been able to create awareness towards need for Climate Change Adaptation strategies at the State as well as community level through knowledge dissemination helpful in building resilience among communities. CEDAR built linkages at the State level through the Climate Change Cell of Uttarakhand under the State Forest Department. CEDAR carried out operations for the Expert Committee Consultation on 'Stakeholder prioritization of Adaptation Pathways and Turning Points in Upper Ganga Basin' in Dehradun.



#### 4. Effects of Land Use Change and Fragmentation on Himalayan Bird Communities in Banj Oak Forests of Kumaon, Uttarakhand Funded by: Department of Science and Technology (DST) Government of India

The banj oak (*Quercus leucotrichophora*) and chir pine (*Pinus roxburghii*) forest ecosystem of the Western Himalaya (1500-2500 m a.s.l.) form a biologically diverse region with unique floral and faunal communities. These forests have been declared an eco-region of high conservation importance by WWF-International. These elevations support high human populations and the oak-pine forests support local livelihoods to a large extent, providing fodder, fuelwood and several commercial NTFPs. However, this forest type is also undergoing rapid degradation due to over exploitation for biomass, conversion to horticulture, construction of resorts, and road-building and widening activities. This field-based project is quantitatively evaluating the ecological impacts of forest modification and conversion on the native forest bird communities through intensive field surveys and statistical analysis. Three field seasons of data have been collected on bird communities and forest vegetation characteristics in six prevalent land uses, including protected natural oak forest. Over the last two years of surveys, 136 bird species have been identified in the forests of this altitudinal zone, 51 (38%) of which are endemic to the Indian Himalaya and 35 species (26%) are habitat-restricted to hardwood oak forests.

Analysis showed that protected oak forest had the highest diversity of birds, while pine forest stands and built-up sites had the lowest.

Data analysis reveals 22 (16%) species that are highly vulnerable to forest degradation and conversion and thus may be used as surrogates for large-scale conservation planning at this altitude. The results of this study have been published (partially) and have been presented in a seminar to the Uttarakhand Forest Department officers, who may be able to use the data in future forest conservation planning.

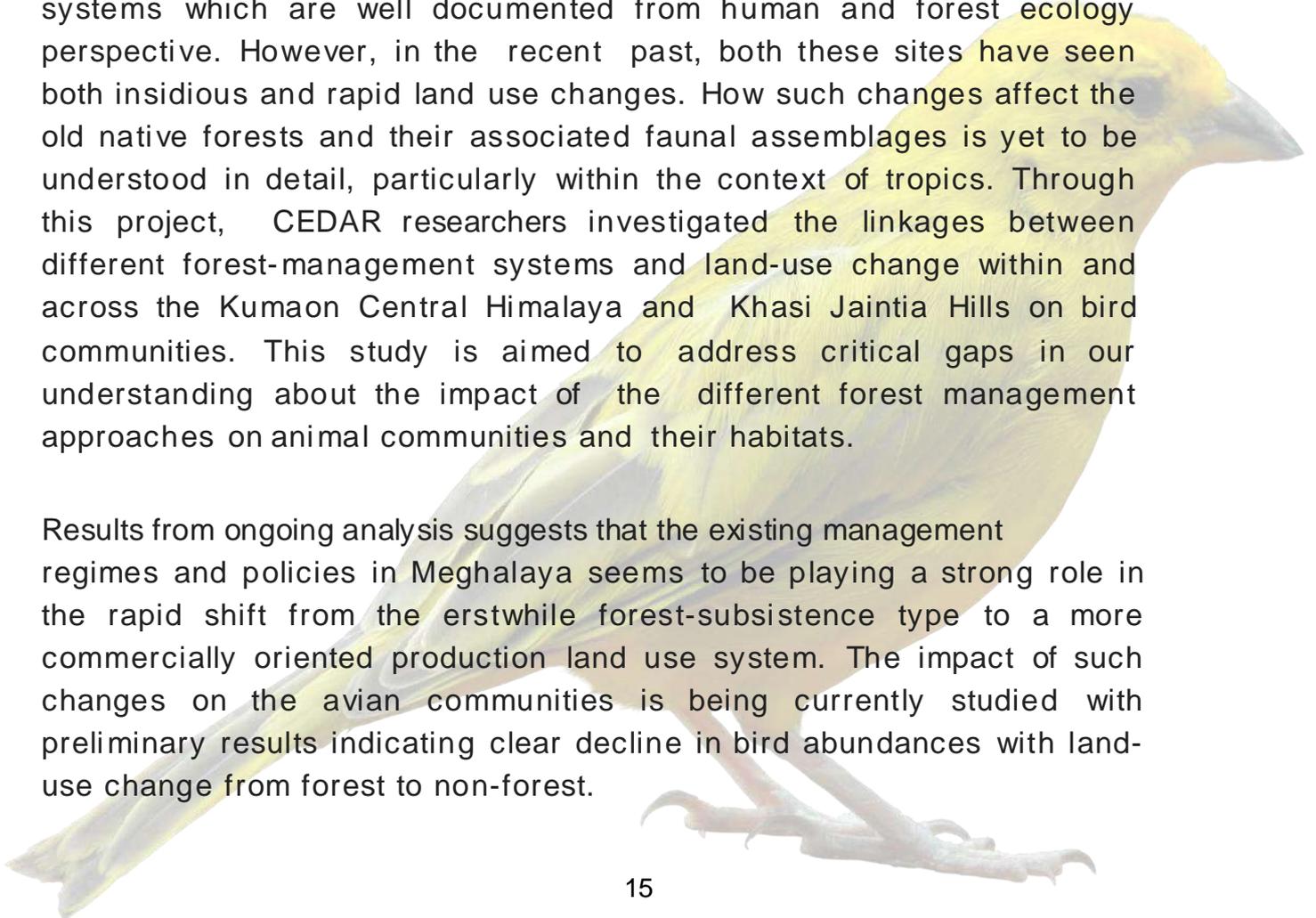


## **5. Extinction Vulnerability of Bird Communities along Land Use and Management Gradients: A Comparative Approach in the Forests of Northeast and Central Himalayan Regions of India.**

**Funding organisation: (SERB), Department of Science and Technology, Government of India**

Land use change is one of the biggest threats to tropical biodiversity. Driven by logging, grazing, fuelwood collection, mining and shifting cultivation, such changes accelerate species extinction rates. The intensity and extent of such activities are often determined by the conservation efficacy and priorities of different forest management systems and this in turn impacts abundance and composition of faunal communities. A wide variability occurs in management systems of both state and community forests, which ranges from protected to intensive-use. The mid-elevation forests of the Kumaon Central Himalaya, Uttarakhand (1700-2200 m asl) and Khasi- Jaintia Hills, Meghalaya (50-1938 m asl) are 'biodiversity hotspots' and 'Important Bird Areas'. Both have a long history of indigenous forest protection and management systems which are well documented from human and forest ecology perspective. However, in the recent past, both these sites have seen both insidious and rapid land use changes. How such changes affect the old native forests and their associated faunal assemblages is yet to be understood in detail, particularly within the context of tropics. Through this project, CEDAR researchers investigated the linkages between different forest-management systems and land-use change within and across the Kumaon Central Himalaya and Khasi Jaintia Hills on bird communities. This study is aimed to address critical gaps in our understanding about the impact of the different forest management approaches on animal communities and their habitats.

Results from ongoing analysis suggests that the existing management regimes and policies in Meghalaya seems to be playing a strong role in the rapid shift from the erstwhile forest-subsistence type to a more commercially oriented production land use system. The impact of such changes on the avian communities is being currently studied with preliminary results indicating clear decline in bird abundances with land-use change from forest to non-forest.



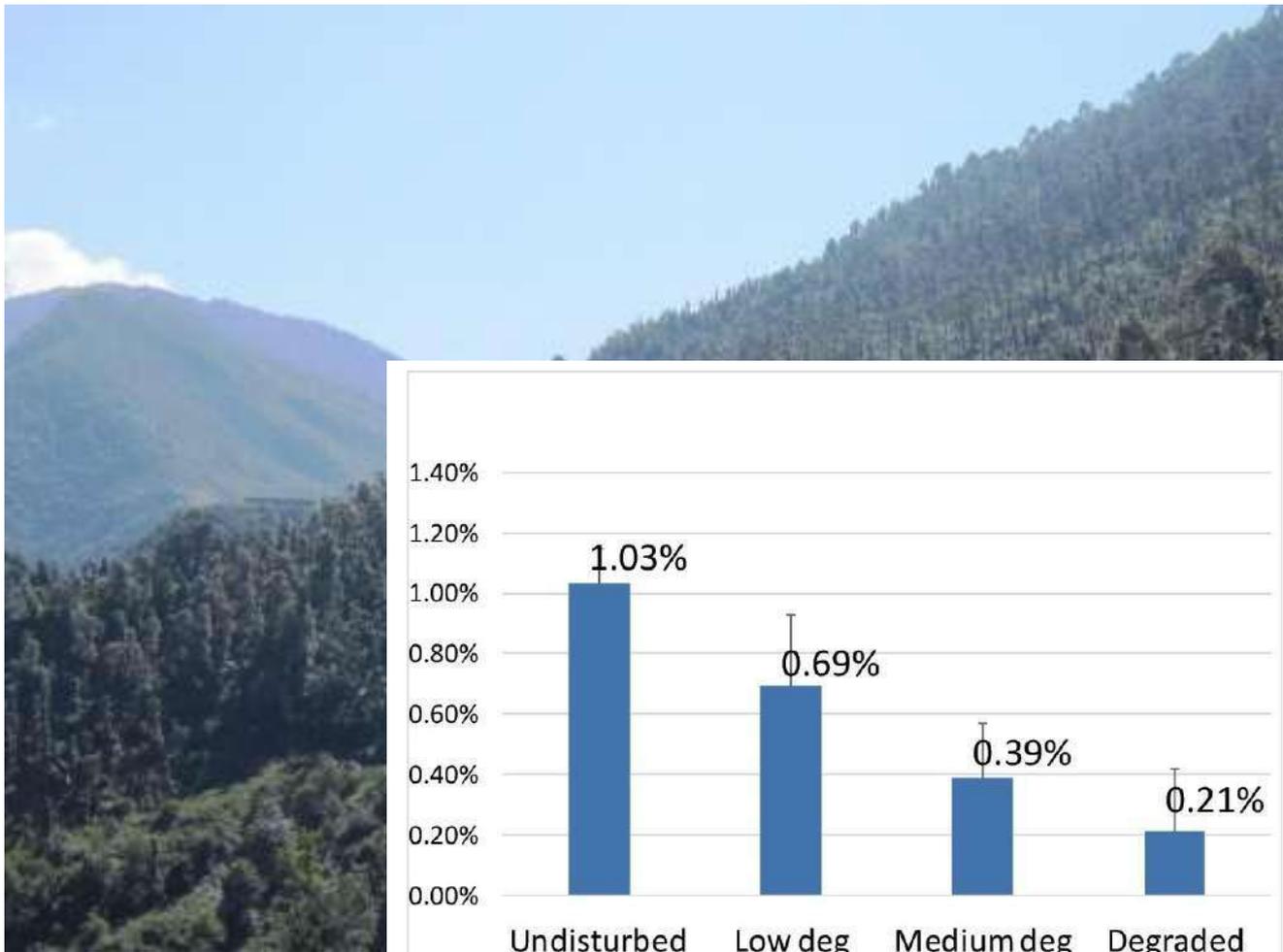
## 6. Understanding the impacts of Climate change and Forest Degradation on carbon stock and population dynamics in the Oak zone of the Central Himalaya

Funding agency: SERB Department of Science and Technology, Government of India

The study focused on the impact of climate change and forest degradation on carbon stock and population dynamics in the Oak zone of the Central Himalaya. One hundred sample plots, each sized 400 m<sup>2</sup>, were laid down across a range of disturbance regions between 1600- 2100 m altitudinal range. Forty of these plots (ten in each disturbance category) were monitored for growth and stand development over multiple years, while the remaining 60 plots were measured one time for biomass, regeneration and disturbance indicators. In the permanent plots, the focus was on monitoring annual changes in tree diameter (DBH), biomass, canopy closure, regeneration levels and ground cover. Seasonal litter fall was also being followed along with ectomycorrhizal density and presence of sporocarps and nutrient analysis of soil.

Oaks are most prone to degradation as they are preferentially lopped for fuelwood and fodder. Thus in areas where anthropogenic disturbance is common, the oaks are among the first species to be impacted. Consequently, as would be expected, the growth rate of oaks gets impacted in areas where degradation is high. The percentage change in basal area of oaks was almost five times higher in undisturbed plots as compared to degraded plots.

# Key Findings



**Percentage Annual Change in Oak Basal area**

## Impact of Chronic disturbances

S.No	Trait	Undisturbed (±Std. error)	Low degradation (Mod-A)	Medium degradation (Mod – B)	Degraded
1	% Litter cover	69.7 (+3.1)	46.6 (+5.3)	41.0 (+6.5)	40 (+6.2)
2	% Grass & Pine needles	8.8 (+2.2)	8.7 (+1.9)	30.8 (+8.6)	34.6± (7.9)
3	% Annual increase in oak Basal area	1.03 (± 0.11)	0.69 (± 0.24)	0.39 (±0.18)	0.21 (±0.21)
4	Avg Basal Area of oaks (m <sup>2</sup> /ha)	30.73 (±2.65)	24.45 (±2.41)	17.65 (±4.24)	12.50 (±3.40)
5	Basal area (total) m <sup>2</sup> /ha	43.2 (±2.03)	29.3 (±2.90)	31.1 (±4.68)	21.4 (±2.55)

## 7. Monitoring of Biomass Stocks and Forest Community Structures in temperate Zone of Western Himalaya

**Funded By: Ministry of Environment, Forestry and Climate Change (MoEF,CC).**

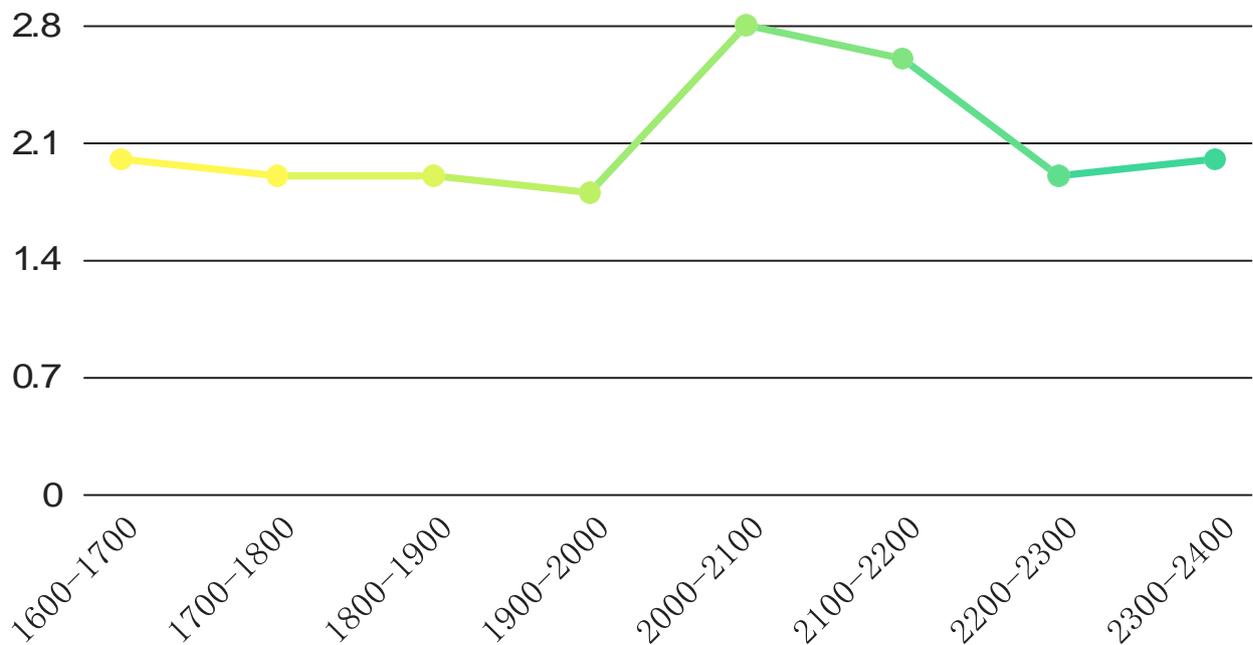
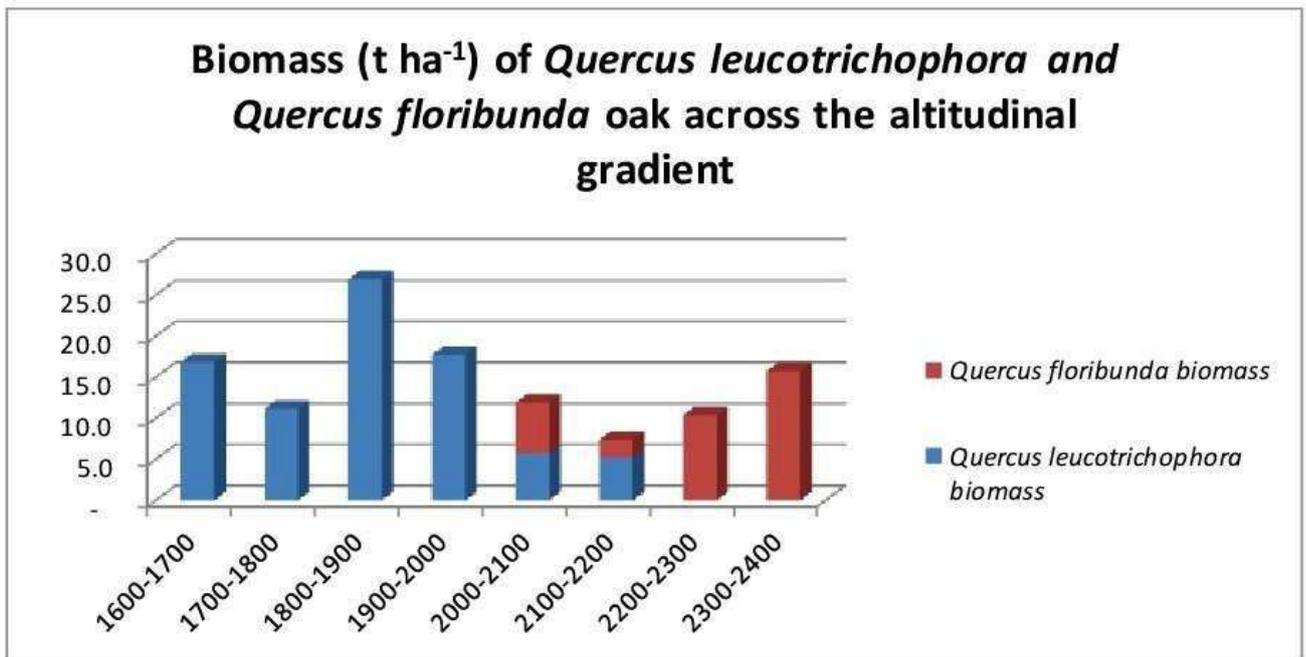
This study aimed to provide more accurate data on biomass and carbon sequestration rates in relatively undisturbed forest sites, while developing a method to rapidly access the same using leaf area index (LAI) as an indicator of productivity. The project also attempted to understand the shift in altitudinal belt of important tree species due to changes in climatic regimes and future composition of the forests. The project may contribute and expand CEDARs network of permanent plots and the data is available to Himalayan researchers. These plots and data assume importance as a result of REDD + and related mechanisms suggested by UNFCCC. The study was being conducted in Nainital district of Kumaun Himalaya between 1600 and 2400 m. 48 permanent plots of 400m<sup>2</sup> nested with 100m<sup>2</sup> plots for intensive study were established at an interval of 100m rise in altitude. These data include information on altitude, tree diameter (DBH), total basal area, and dominant vegetation, Slope of the plot, number of trees, seedlings, saplings and poles.

At the plot level, the majority of plots showed uneven diameter distributions. While a minority of plots (less than 33%) showed relatively homogenous diameter distributions, where most stems of banj were likely from a similar age class. Most plots had some large stems (typically over 30-35 cm diameter) and several smaller stems (less than 15-20 cm diameter) indicating uneven age class. This is indicative of small disturbances and single tree removals, or felling of a small group of trees.

Plots with more homogenous size class, indicating simultaneous recruitment were more often found in areas where agricultural abandonment may have occurred in the distant past.

Data was divided into four altitudinal zones to minimize the variability and stochasticity. About 755 of the total stems were from three species – banj oak, tilonj oak (*Quercus floribunda*) and chir pine (*Pinus roxburghii*). *Rhododendron arboreum* (burans), *Myrica esculenta* (kaphal) and *Lyonia ovalifolia* (Aangyar) were the other three common species together making up an additional 20% of the stems.

The three canopy forming species varied across altitudinal zones with banj reaching its peak dominance and IVI at 1800-2000 metres, chir being largely confined to elevations below 2000 metres and tilonj becoming common only in forests above 2000m elevation. A comparison of these stems with regeneration data helped give indications of an upward migration of these species.



LAI at different altitudinal gradient

# Workshop and Seminars



## **Rejuvenation of Nainital Lake** **Venue: Raj Bhawan, Dehradun** **Date: 27.11.2017**

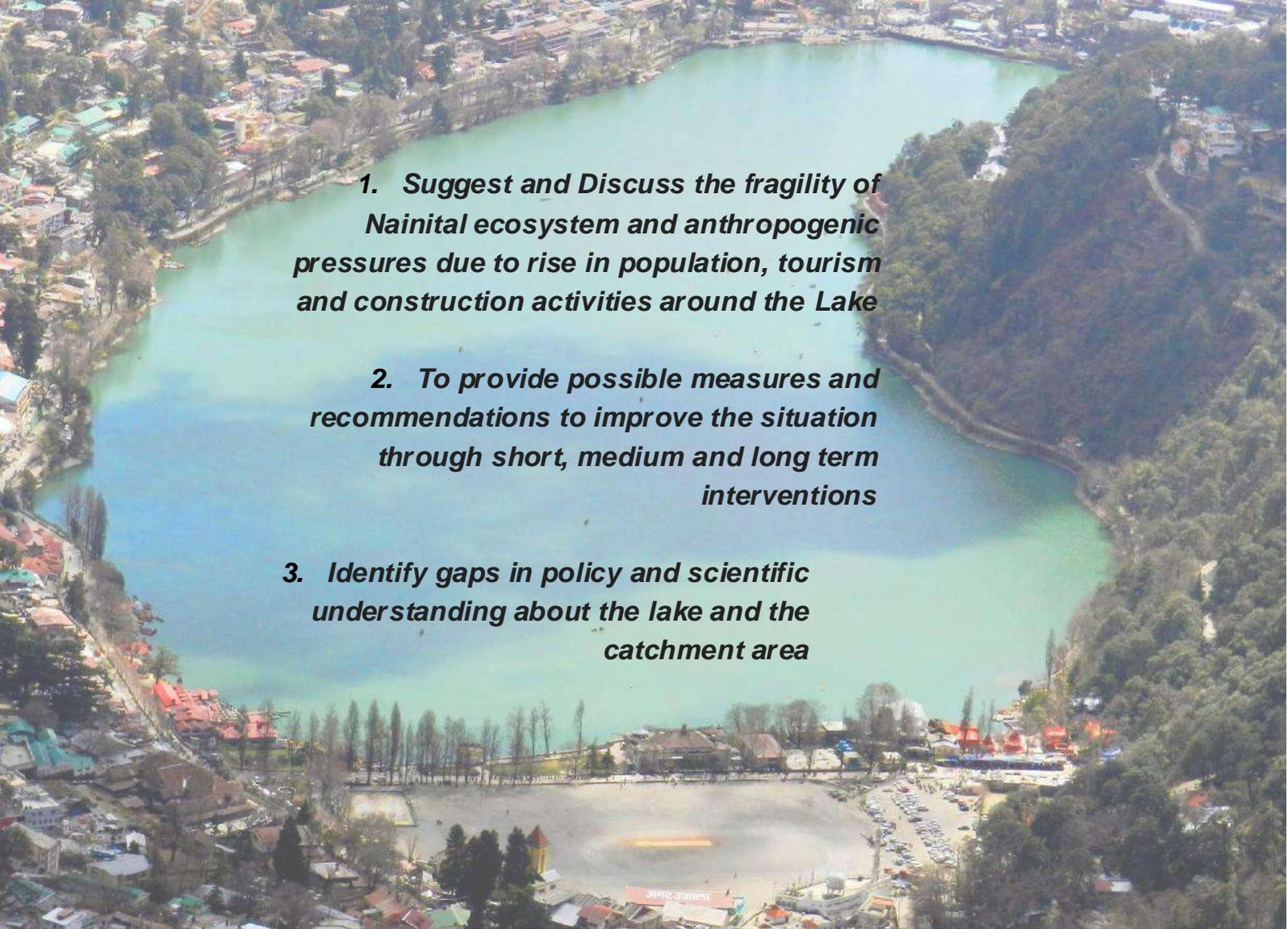
The overall environmental degradation of Nainital is a result of unsustainable development driven by sectoral and departmental approach with little focus towards the natural ecosystem, geological character and associated environmental fragility of the town. The lake has a special significance to the people in the living in the city, it provides life sustaining water and a huge proportion of the economy of the town depends upon the lake. Visible impacts of environmental degradation had started unravelling itself by consistent decline in the lake levels 21st century. Between 2000 and 2017 the lake level experienced declines below zero level 10 times. The maximum decline of 18 feet below zero level was observed in 2017.

Prior to this only two such events were recorded in 1923 and 1980. The recurring lake level decline caught the attention of the concerned citizens of Nainital, scientists, policy makers, non- Government organisations, media and concerned political faces. More than 1000 Citizens for Nainital walked barefoot in order to sensitise the government regarding this crucial issue

His Excellency, Dr. K.K. Paul, The Governor of Uttarakhand showed deep concern about deteriorating conditions in Nainital lake and took cognisance of the situation by conducting a brain storming meeting with scientists on the 20th of June, 2017. The Honourable Chief Minister of the Uttarakhand Shri Trivendra Singh Rawat also took personal interest in resolving the situation.



With the above backdrop, a team led by the Additional Country Director of United Nations Development Program (UNDP), India Dr. Rakesh Kumar, IAS took the initiative of conceptualising a high level meeting under the leadership of His Excellency at the Raj Bhawan Auditorium, Dehradun on the 27th of November 2017. Keeping in mind the magnitude of the problem and specific issues to be tackled a select but inclusive group of experts representing premier research organisations and Universities, Government Departments, Non Government Organisations and some prominent Citizens of Nainital were invited to deliberate upon critical issues related to Nainital. The objective was to:



**1. Suggest and Discuss the fragility of Nainital ecosystem and anthropogenic pressures due to rise in population, tourism and construction activities around the Lake**

**2. To provide possible measures and recommendations to improve the situation through short, medium and long term interventions**

**3. Identify gaps in policy and scientific understanding about the lake and the catchment area**

Based on the inputs by the panellists and participants, action points have been prioritised and segregated into short (1 year) medium (2-3 years) and long term (upto 5 years) for implementation. Some activities would be regular in nature

Short term (within 1 year) and regular

1. Revisiting the Terms of Reference of the recently revived “Hillside Safety Committee” to meet the current needs
2. Sediment traps in all major drains to be installed.
3. Removal of construction debris (overburden) from the Sukhatal lake bed.
4. Overland pumping from Sukhatal to be stopped.
5. A strict ban on further construction of commercial and residential buildings. Building bylaws to be revised.
6. One way traffic mechanism should be made mandatory round the year.
7. Display of lake level and meteorological through electronic hording
8. Installation of automatic weather station adjacent to Nainital lake
9. Water rostering system to be imposed.
10. Differential water taxing system and metering to be introduced. Incentivising mechanisms for those adopting water management practises to be encouraged.
11. Leakages taking place in sewage system to be checked within 24 hours of any complaint filed.

## **Regular interventions to be initiated within the first year**

1. Drainage system involving small and big drains to be cleared of obstructions.
2. Removal of silt from the deltas in lean season- to be conducted every year.
3. A dynamic knowledge repository through an open access website to be created.
4. Identification of drivers of forest degradation , forest regeneration/recovery programs in consultation with researchers and forest department

## **Medium Term (2-3 years)**

1. Rain water harvesting in schools, government buildings and hotels should be made mandatory.
2. A cap on tourist entering the town should be imposed based upon the number of registered hotels and available parking area
3. Water metering system to be introduced.
4. Development of a robust Solid Waste Management Program
5. Areas of historical and cultural significance to be conserved

## **Long Term (upto 5 years)**

1. Bioengineering technology to be used to restore Balia Landslide
2. Parking areas outside Nainital catchment to be constructed





### Research Studies

1. Lake Bathymetry to be conducted – repeated every alternate year
2. Water balance of the Nainital lake and Sukhatal – every 3 years
3. Assessment of biological and chemical composition of water quality of the lake post aeration analysis – every alternate year
4. Assessment of activity across the lake fault through satellite imagery and tracers
5. Geo-physical survey of Sukhatal lake through ground penetrating radar
6. Carrying capacity assessment of Nainital to be conducted
7. Land Use and Land Cover Change (LULC) map for different time periods to be developed
8. Recharge area mapping of springs through hydro-geological technique. Identify areas to protect from anthropogenic pressure. Those already in degraded condition to be rejuvenated.



## 2. Review and Learning Synthesis Workshop

**Date: 11-13 December, 2017**

**Venue: Dehradun, India**

The CAMPS project has already been in the implementation phase for over 18 months—the mid-point of the three-year initiative of action research on the issues of climate change, water security and urbanisation. The workshop brought together the key partners of the project including lead and implementing partner institutions, site-specific stakeholder representatives and the International Development Research Centre (IDRC) of Canada, the funding partner, to share and retrospect about what has been implemented so far, and what remains to be carried out, as well as, to develop the roadmap for effective implementation of the remainder of the project.

Each of the implementing partners presented the progress of the project from their respective organisations. As the lead partner, Southasia Institute of Advanced Studies (SIAS) provided the overall project overview including the site-specific updates and challenges of Nepal. CEDAR, the implementing partner from India, presented on the progress of the two case study sites of India.

In addition to the project progress updates, the thematic experts of the project highlighted on the key themes of the project which included gender and water, institutions and water management, public private partnerships for climate adaptation and research communication. The key stakeholders of the four study sites presented their views regarding the engagement and the changes taking place in their communities so far.

Key objectives

*The key objectives of the workshop were:*

- 1. Sharing of mid-term project progress updates for reflection and designing effective plans for further implementation.*
- 2. Getting critical insights from site-specific stakeholder(s) for continuous collaborative partnership to implement pilots for large scale, impacts and to ensure future sustainability of implemented pilots.*
- 3. Sharing the learning experience and research insights and gaps between the research teams of SIAS and CEDAR.*
- 4. Exploring the views and suggestions from thematic experts.*
- 5. Field visit of the research team members to Mussoorie for co-learning pilot designs and co-creating knowledge.*

## Key messages

The three day long workshop clearly emphasized that the CAMPS project must focus on innovative research and at least one transformative pilot flagship product as an outcome for each of the case study city. The project team needs to prioritize achieving tangible impacts through gender empowerment and transformation, local stakeholders' engagement, and private sector investment for climate adaptation and flagship pilots and policy mainstreaming. The key issues discussed during the three-day-long event are highlighted below:

(i) Knowledge generation and dissemination: New, novel, innovative scientific outputs to inform scientific community. Knowledge generation is not only an end product of the project but it has to impart large-scale positive change on the ground, policy clout, and in the field of knowledge dissemination. The research teams need to focus on how to package and communicate the action research findings as credible, robust scientific outputs, which are valuable for policy implication and upscaling.

ii) Innovative and inclusive flagship CAEWMPS for each city: — One flagship innovative activity for one city needs to be the mantra for CAMPS implementation. A flagship product that is solution oriented, demand-driven, site appropriate, integrated and mainstreamed in policy level should emerge from each study city. This is a critical as well as challenging issue. These flagship products will challenge the status quo/business as usual and give space to the innovative and transformative element. The CAEWMPS needs to be holistic, gender friendly, inclusive, innovative and transformative initiatives and processes. It should be able to pose impact on the city level as well as in regional and national level climate adaptive and equitable water management as appropriate.



# 3. Mussoorie Water Forum

March, 2018

## Venue: Woodstock School, Mussoorie

The third Mussoorie water forum meeting was organized earlier in March 2018 at Woodstock. After the collaboration with Woodstock it is the second meeting at their campus. The meeting held in March laid the foundation of our upcoming plans to implement city specific CAEWMPs in the town. Several new people joined the forum and among them was Mr. Dana M. Crider, founder of a grass-root NGO called KEEN committed to keep the ecology & environment of Mussoorie clean. Recently a new organisation has become active in Mussoorie called ANGAAR with a similar agenda of waste free surroundings. Mr. Sudhanshu Rawat founder of ANGAAR joined in too and shared his upcoming plans for a cleaner Mussoorie. One of his agendas is to keep the watersheds of the town clean, where on slopes it is common to find solid waste dumped and contamination of water is happening.

**Objective(s):** To have a collective consensus on specific CAMPS option of RWH to be implemented in the next reporting period. To discuss upon the first steps for implementation of institutional level Rainwater Harvesting System in Mussoorie.

### Way forward:

1. Identifying the school or institution, where the RWH system will installed from scratch. Kaplani High School was the first suggestion from the participants as some have witnessed shortage of water in Girls Hostel campus and associated issues of hygiene.
2. In order to finalize the area/ institution for installation the Woodstock has called for an intra-school meeting where it will be decided among various schools/ institutions of the town that from which campus to start with. The meeting is going to be held later in April. After the identification of the location, CEDAR will support the school/ institution to have their functioning rainwater harvesting system.
3. Second step for institutional rainwater harvesting implementation was suggested that apart from installing a RWH system from scratch in a campus, the members of the forum and participants in the upcoming meeting can identify existing non operational/functional structures of rooftop rainwater harvesting in Mussoorie. Once identified, CEDAR and the forum will support in restoring these structures; if not for storage at least for recharging groundwater.

4. The next important step suggested by the participants is also an objective of the CAMPS project viz. 'recognizing the champions'. It was suggested to identify and recognize the best success stories of water conservation in Mussoorie. Recognize them on media in order to generate awareness.

5. Some other suggestions to take a holistic approach in taking initiatives of water conservation were given by participants. Awareness programs, murals & graffiti arts were suggested to generate awareness. It was suggested that once the RWH installation commences mass awareness drives should be organized. Afforestation drive was also advised.



## **4. Exchange Visit (CEDAR visit to Nepal)**

**Venue: Kathmandu, Nepal**

**Date: 5th March – 8th March, 2018**

An exchange visit to Nepal was arranged by SIAS for the purpose of Scientific research Workshop under CAMPS-IDRC project. This was 5 days' workshop organised by SIAS. In this workshop discussions and deliberations were carried out between CEDAR and SIAS team members. In which we share the ideas of writing the scientific research papers, structures of modelling the policy and the tasks had to be done during this quarter. Along with this field visit was also carried out through which the basic idea of constructing recharge ponds and related knowledge has been shared. Some tasks like structuring the policy brief for brochures has been given to develop some new ideas. Various presentations were also given by different peoples on different topics mostly related with (drafting policy brief and cost benefit analysis).

### **Objective of the Workshop:**

- 1) To examine and learn from the success story of a selected water champion.
- 2) To visit and learn about the implemented CAEWMPS in Dhulikhel.
- 3) How to draft the policy brief, research papers linking with CAEWMPS and contribution of partners.
- 4) To discuss the project activities updates and timelines.

### **Key Messages:**

1. Generating knowledge & political process
2. Engage with local people
3. Focus on questions of injustice and deprivations
4. Experiments
5. Link theory with practice

# Voluntary Compliance

Voluntary Compliance with the Norms of Credibility Alliance The Credibility Alliance 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.

11th Annual General Meeting held on 27<sup>th</sup> September, 2017

Time: 5 pm

Venue: 201, Phase I Vasant Vihar Dehradun

Salary: Maximum salary paid was of were Rs 79,000 per month.

Travel: Maximum cost of any single rail ticket purchased was less than Rs 1865 rupees

**National Travel:** Maximum ticket was Rs 7,111

**International Travel:** Maximum ticket was Rs, 19,697

**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

**CENTRE FOR ECOLOGY, DEVELOPMENT AND RESEARCH**

**INCOME AND EXPENDITURE ACCOUNT  
FOR THE YEAR ENDED 31st MARCH 2018**

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
	Rs.	Rs.
<b><u>INCOME</u></b>	-	
<b><u>Project Funding</u></b>	-	
<b><u>Receipts during the year</u></b>	-	
ESPA: The Political Economy of Water Security	-	28,49,542
ICIMOD : HI-AWARE project (Himalayan Adaptation, Water and Resilience Research)	26,26,661	33,13,924
TERI HI-AWARE projectr	5,00,000	5,00,000
DST WSS : Effects of land use and fragmentation on forest Biodiversity : Himalyan bird communities in Oak-pine forest of Kumaon, Uttarakhand.	-	6,00,000
IDRC : Facilitating and Conductiing research on water security issues in four mid-sized cities in India.	17,58,330	35,37,530
ICIMOD: Analysis of pollution related policies in India.	-	4,36,181
WRI : To assess water catchments and Forest cover of Aravalli hills of Gurgoan and Faridabad.	-	2,63,705
ICLEI - Mainstreaming the role of eco-system services in water suply of Nainital.	-	21,61,280
MOEF : Monitoring of biomass stocks and forest community structures in temperate zone of western Himalaya.	3,55,240	5,53,880
ICIMOD- RST Forum : Rejuvenation of Naini Lake	1,99,705	-
UNDP Workshop : Valley of words	6,06,338	-
DST (SERB) – Extinction vulnerability of bird communities : A Comparative approach in the forests of northeast and Central Himalaya regions	9,10,000	9,60,000
	69,56,274	151,76,042
<b><u>Projects in progress brought forward</u></b>		
(brought forward from unutilised funds of last year)	29,44,964	14,37,707
<b><u>Other Receipts</u></b>		

Donation	1,45,000	40,000
Administrative cost Realised	3,52,822	14,99,793
Interest Income	1,03,973	1,28,617
	6,01,795	16,68,410
<b>TOTAL INCOME</b>	<b>105,03,033</b>	<b>182,82,159</b>
<b>EXPENSE</b>		
<b><u>Expenditure on Projects</u></b>	-	
DST (SERB)- Understanding the impacts of Climate change and Forest Degradation on carbon stock and population dynamics in the Oak zone of the Central Himalayas	4,36,415	2,73,355
ESPA: The Political Economy of Water Security	-	29,51,263
ICIMOD : HI-AWARE project (Himalayan Adaptation, Water and Resilience Research)	32,59,093	31,58,743
TERI HI-AWARE projectr	5,71,215	3,55,364
DST WSS : Effects of land use and fragmentation on forest Biodiversity : Himalyan bird communities in Oak-pine forest of Kumaon, Uttarakhand.	81,322	8,78,214
IDRC : Facilitating and Conductiing research on water security issues in four mid-sized cities in India.	27,66,862	21,92,928
ICIMOD: Analysis of pollution related policies in India.	-	4,36,181
WRI : To assess water catchments and Forest cover of Aravalli hills of Gurgoan and Faridabad.	-	2,63,705
ICLEI - Mainstreaming the role of eco-system services in water suply of Nainital.	12,08,666	13,84,198
MOEF : Monitoring of biomass stocks and forest community structures in temperate zone of western Himalaya.	4,42,135	5,40,648
DST (SERB) – Extinction vulnerability of bird communities : A Comparative approach in the forests of northeast and Central Himalaya regions	8,34,976	9,52,562
ICIMOD- RST Forum : Rejuvenation of Naini Lake	1,99,705	-
UNDP Workshop : Valley of words	6,06,867	-
CINI – NTFP assessment	-	1,73,635

	104,07,256	135,60,796
<b>OTHER EXPENSES</b>	7,79,446	5,86,364
<b>TOTAL EXPENSES</b>	<b>111,86,702</b>	<b>141,47,160</b>
<b>Balance</b>	<b>(6,83,669)</b>	<b>41,34,999</b>
Less: Transferred to Project in Progress (As per Schedule - 1)	5,25,836	29,44,964
Surplus transferred to Reserve Fund	<b>(12,09,505)</b>	<b>11,90,035</b>

**Chairman**

**For S. Ramanand Aiyar & Co.  
Chartered Accountants  
Firm Registration No - 000990N**

**Vice Chairman**

**Executive Director**

**R. Balasubramanian  
Partner  
Membership No. 080432  
Place: New Delhi  
Date**

## **Our Donors:**

- Ministry of Environment and Forest, (Climate Change), Govt. of India
- Department of Science and Technology (DST): Science and Engineering Research Board (SERB), Govt of India.
- International Development Research Centre (IDRC), Canada
- International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal
- International Council for Local Environmental Initiatives (ICLEI), South Asia, New Delhi.
- The Energy Research Institute (TERI), New Delhi
- United Nations Development Programme (UNDP), New Delhi, India
- World Resources Institute (WRI), US
- M.G. Shahani & Co (Delhi) Ltd. , New Delhi
- Pevibai Motiram Shahani Trust, New Delhi

## **Our Partners:**

- Himalayan Adaptation, Water and Resilience (HI-AWARE), ICIMOD, Kathmandu Nepal
- 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), Nainital, Uttarakhand
- University of New South Wales (UNSW), Australia
- Tata Institute of Social Sciences (TISS), Mumbai
- The Mountain Institute (TMI), Sikkim.
- Megh Payne Abhiyan (MPA), New Delhi
- Himalayan Nature and Adventure Foundation, Siliguri, West Bengal
- Woodstock School, Mussoorie
- Citizens for Nainital, Nainital
- Nainital Nagrik Association (NNA)

# ACKNOWLEDGEMENTS

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CEDAR works in partnership with other organisations and individuals. Without all our partners, our work would just not be possible or of relevance. We have listed above our Donors and Partner organisations and are grateful for their support. However, equally we would like to acknowledge all our civil society partners, particularly the citizen groups of Nainital, Mussoorie and Haldwani who have helped, supported and facilitated our work on water. Our forestry research is supported by the Van Panchayats of several villages, including Simayil, Chatola, Sunkiya, Meora and others. We are very grateful to all the experts from various research institutions and agencies who have provided us with advise, and the Government officials, especially from the Jal Nigam and allied departments of the towns and cities where we work. Our grateful thanks to our Governing Board and Research Advisory Board for providing direction.

***Photo Courtesy:***

*Shri Anup Sah*

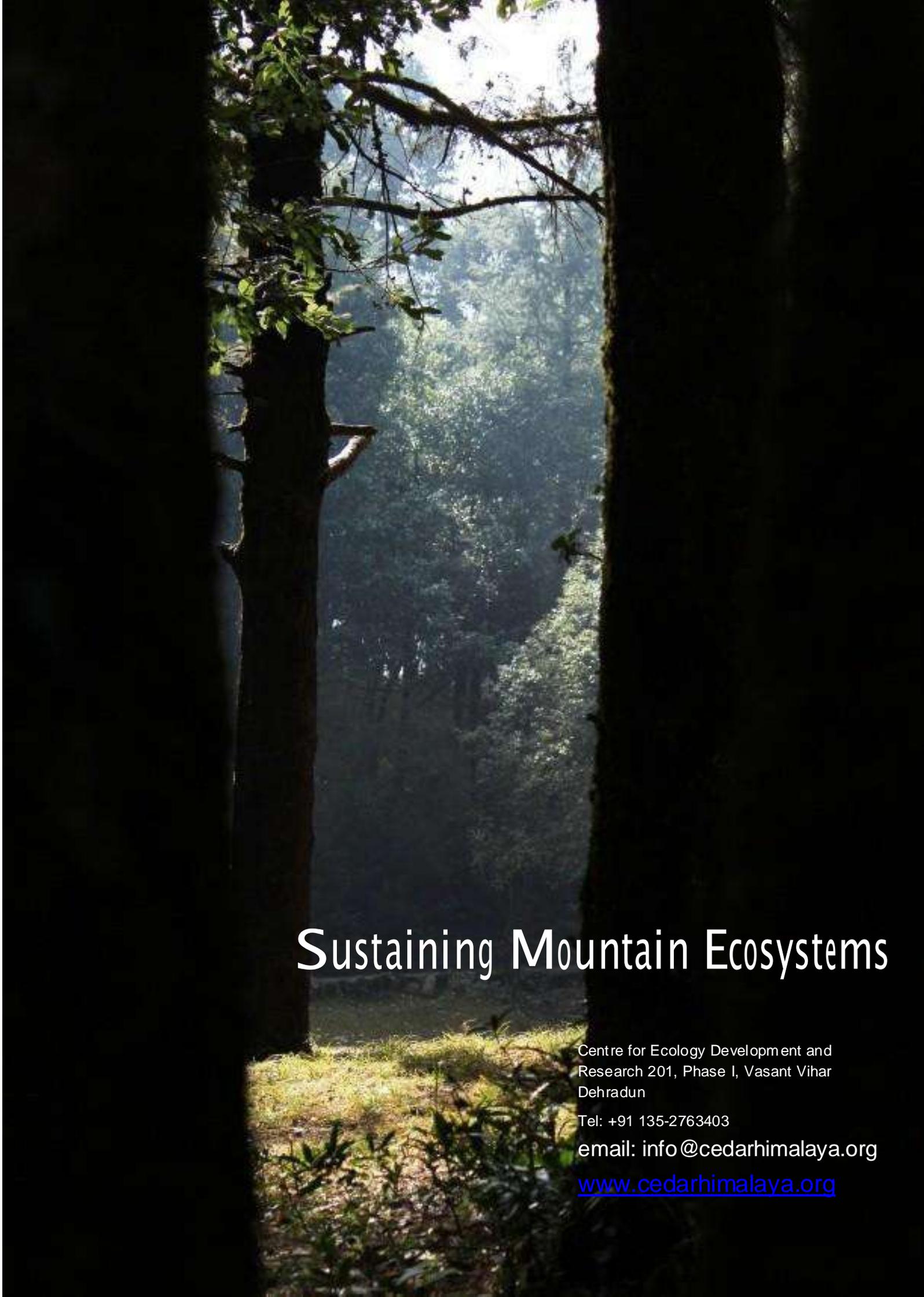
*Mr. Amit Sah*

*Mr. Sanjay Bora*

*Mr. Sindhu Gangola*

*Mr. Sumit Bhakuni*

*CEDAR Team*



# Sustaining Mountain Ecosystems

Centre for Ecology Development and  
Research 201, Phase I, Vasant Vihar  
Dehradun

Tel: +91 135-2763403

email: [info@cedarhimalaya.org](mailto:info@cedarhimalaya.org)

[www.cedarhimalaya.org](http://www.cedarhimalaya.org)