

Final Technical Reports

Linking Disaster Risk Reduction (DRR), Climate Change Adaptation (CCA) and sustainable landscape development goals in the Eastern Himalaya

ATREE-EH Eastern Himalaya Regional Office Gangtok and Darjeeling 2014

Supported by





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List of Acronyms

ATREE	Ashoka Trust for Research in Ecology and the Environment
CCA	Climate Change Adaptation
DLR-P	Darjeeling Ladenla Road Prerna
DM	District Magistrate
DRR	Disaster Risk Reduction
EH	Eastern Himalaya
EHCAF	Eastern Himalaya Climate Awareness Forum
FV	Forest Village
GTA	Gorkha Territorial Administration
HWC	Human-Wildlife Conflict
ICS	Improved Cook Stoves
IMI	Indian Meteorological Institute
KTCA	Kanchenjunga Trans-boundary Conservation Area
LI-BIRD	Local Initiatives for Biodiversity, Research and Development
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
PM	Particulate Matter
RV	Revenue Village
SNP	Singhalila National Park
SWLS	Senchal Wildlife Sanctuary
TCA	Trans-boundary Conservation Area

Linking Disaster Risk Reduction (DRR), Climate Change Adaptation (CCA) and sustainable landscape development goals in the Eastern Himalaya

SUMMARY: The START/CDKN-funded project *Linking Disaster Risk Reduction (DRR), Climate Change Adaptation (CCA) and sustainable landscape development goals in the Eastern Himalaya* ran from July, 2012 to June, 2014. The project was supported by the CDKN-START *Disaster Risk Reduction and Climate Change Adaptation in South Asia* program and implemented by Ashoka Trust for Research in Ecology and the Environment (ATREE-EH), India, in partnership with Local Initiatives for Biodiversity, Research and Development (LI-BIRD), Nepal. The objective of the project was to explore strategies for strengthening the climate resilience of socio-ecological systems in the Eastern Himalaya, and in the longer term to pilot a regional model for the integration of climate change information into risk reduction planning, and—more broadly—into rural development planning at the landscape scale. The project was implemented in rural districts of Darjeeling and Sikkim on the Indian side of the border, and in adjacent Ilam district on the Nepal side. It also supported significant networking among NGOs, government agencies, community leaders and other stakeholders in Nepal and India.

In this **Final Report** we describe:

- 1. The background and site of the research;
- 2. The range of completed and ongoing research project components and products on the theme of CCA and DRR in South Asia which were initiated partially or entirely with the support of the CDKN-START funding;
- 3. Education and training-related impacts of the CDKN-START funding;
- 4. Public/stakeholder communications, networking and policy efforts on the theme of climate change in South Asia that were facilitated by CDKN-START funding and form an essential part of building climate resilience in our study area; and
- 5. Further research funding opportunities in the area of climate adaptation and livelihood security for which ATREE was able to leverage the CDKN-START grant.

The text-based products of the research are attached separately as Appendices 1-12.

The START-CDKN research program culminated in a meeting in Delhi in February of 2014, at which leading members of the six funded projects presented outcomes and discussed challenges encountered during the course of their research. These discussions are currently being consolidated and presented in an analytical context for publication in the *Asian Journal of Environment and Disaster Management*. This effort is being spearheaded by members of START, ATREE and others.

1. BACKGROUND: The Eastern Himalaya mountain range is a globally significant center of bio-cultural diversity. Biologically, the region is a global center of evolutionary novelty and species endemism. Culturally, it has been a crossroads for cultural diffusion between all parts of Asia. In terms of critical ecosystem services, the Himalayan system is a primary source of fresh water for as much as 25% of the world's population. At the same time, climate change is

expected to have rapid and severe consequences for biodiversity, agriculture and livelihoods in the Eastern Himalayan mid-montane. Among the known risks in the region are water scarcity during dry winters, food insecurity from increased soil erosion and unstable market conditions, earthquakes, landslides and floods during the monsoon. Despite the extraordinary environmental, cultural, and socio-economic importance of the Himalayan landscapes, and despite the special geological and cultural vulnerability of the region to climate change, we lack information about the magnitude, rate, and impact of such change. Even less is known about the vulnerabilities of communities, or about the present adaptive capacities of institutions to counter the effects of climate change.

The ATREE program addressed mid- to high-altitude areas of Darjeeling district (of West Bengal), North Sikkim district, and Ilam district in Eastern Nepal. Together these regions constitute the Kanchenjunga-Singalila Landscape Complex, extending from the Kanchenjunga Conservation Area in Nepal across the border through Khanchendzonga National Park in Sikkim, south to Singalila National Park in Darjeeling, and east to Barsey Rhododendron Sanctuary in Sikkim.

A regional framework is necessary because these countries share biodiversity, watersheds, and traditional knowledge and practices. Policies in one area have impacts on natural processes, resources and people in others.

2. PROJECT COMPONENTS

This work represents a core building-block in our organization's development of an integrated approach to studying regional climate change dynamics and climate change vulnerability in the Eastern Himalaya. We present work in four thematic areas (for the individual products, see **Appendix**):

2.1 Stakeholder perceptions assessments and regional CCA/DRR case studies

2.1.1 Appendix 1: T. Ingty & R. Seidler: *Traditional high-mountain communities and climate change: Documented adaptive strategies in North Sikkim, Eastern Himalaya*

Based on **Tenzing Ingty's** field work for his PhD at University of Massachusetts Boston, this paper documents a range of adaptive strategies to ongoing climate and economic changes observed among traditional pastoral-agricultural groups in a high-altitude watershed of North Sikkim. (The paper is in final preparation to be submitted to *Ecology & Society*.)

2.1.2 Appendix 2: T. Ingty: Adaptations to Climate Changes in Dzongu, a Tribal Reserve of North Sikkim, India

Working in Dzongu, the hilly Lepcha tribal reserve located in central North Sikkim district, Tenzing Ingty documented the responses of indigenous communities to the effects of ongoing climate change and of cyclone Aila.

2.1.3 Appendix 3: T. Ingty & K. Bawa PPT: *Reconciling local knowledge on climate change with scientific data: A case study from Lachen valley, Eastern Himalayas*

This is a PPT presentation given by Tenzing Ingty (with Dr Kamal Bawa) at a regional conference in Bhutan, including original photography and graphics related to his work in Sikkim.

2.1.4 Appendix 4: A. Gazmer: Questionnaire study on responses of socio-ecological systems to climate change in the buffer villages of Singalila National Park (SNP): Preliminary analysis, findings and results

2.1.5 Appendix 5: A. Gazmer: CCA awareness and divergent risk perceptions among community stakeholders, Singalila National Park (SNP)

Anand Gazmer, PhD student at ATREE-Bangalore, is researching phenological changes and human perceptions of climate changes among mid- and high-altitude communities in Singalila National Park. In these two documents he presents preliminary results of his survey of community perceptions comparing higher and lower altitude groups.

2.1.6 Appendix 6: LI-BIRD (P. Chaudhary et al.): *Final Technical Report, LI-BIRD subproject, Ilam, Nepal*

ATREE partner **LI-BIRD** (NGO based in Pokhara, Nepal, but active in Ilam district as well) presents results of an extensive survey of high-altitude community climate perceptions in Ilam district, which shares a porous international border, language and cultural affinities with Darjeeling district of West Bengal. The analysis is based in part on field work performed by a sponsored Master's student.

2.1.7 R. Seidler et al.: *Case studies on divergent risk perceptions and regional responses to Aila 2009 and Sikkim Earthquake 2011* (in process)

The experience of two large-scale landslide-related disasters in the last five years has focused the minds of authorities on the problems of infrastructure, development and climate change in this climate-vulnerable mountain region. Information on what happened, what worked well and what didn't – beyond the information distributed by government agencies and the anecdotal observations of individuals – has proven surprisingly difficult to glean. The paper is in process.

2.1.8 Seidler, Dietrich, Schweizer, Bawa et al.: *Convergence of Climate Change Adaptation* & Disaster Risk Reduction in South Asia: lessons from six research (in process)

2.2 Knowledge synthesis (including preliminary climate modeling)

2.2.1 Appendix 7: U. B. Shrestha: *Preliminary analysis of temperature and precipitation trends in the Eastern Himalayas*

Uttam Shrestha began this modeling work, with support from the USAID-CCRD grant, as a doctoral student at University of Massachusetts Boston. He received his degree in 2013 and took up a post-doc position in Australia, so it has been difficult for him to advance on this front. Here we present his preliminary analysis of temperature and precipitation trends, showing possible anomalies in the regional temperature trajectory of the Eastern Himalaya as compared either with the Western Himalaya or with the mountain range as a whole. These data need to be compared in detail with other data, to determine whether the trends are robust or whether they are artifacts of sparse underlying data. In particular, number and placement of weather stations during the first several decades of the time series need to be ascertained. The raw data were obtained from the Indian Meteorological Institute (IMI).

This project will be pursued as soon as we have hired a new ATREE Fellow to coordinate the various climate change-related activities. The search to fill this position is ongoing.

2.2.2 Appendix 8: A. Fritz: Preliminary Report Assessing the Role of Improved Cook Stoves in Indoor Air Pollution Reduction and Health Improvement in Darjeeling, West Bengal

2.2.3 Appendix 9: C. Rai: A Test of the Fuel Efficiency of the Tamang-style ICS in Darjeeling district

2.2.4 Appendix 10: P. Chaudhary & K. Bawa: *Patterns and determinants of domestic energy use in Kanchenjunga Himalaya*

Alison Fritz, a talented intern from Yale University School of Forestry and the Environment, was able to document some very encouraging reductions in carbon monoxide emissions from the Nepali *Tamang*-style improved cook stove over its traditional counterpart. It appears that ICS are emitting only about a third as much CO into the living space as do the traditional stoves. And this large reduction in CO already appears to be correlated with a reduction in respiratory distress among women and children of between 15% and 30%. Samples for testing for particulate matter (PM) are presently at the laboratory at Harvard and should be available shortly.

The main structural difference between the traditional and improved models is that the latter has a chimney leading outdoors, but that's not the only difference. **Chirag Rai** has been working on a series of comparative tests to determine relative fuel efficiency of the ICS, and again preliminary results are very encouraging.

Pashupati Chaudhary was some years ago a Visiting Fellow at ATREE-EH. The research on fuel wood usage in his paper with Kamal Bawa was done during that time; the USAID-CCRD funding supported the analysis and preparation of the paper. This is a near-final stage, still needing to be cleaned for journal submission.

2.2.4 Appendix 11: S. Thomas: *Human-wildlife conflict (HWC) in the Darjeeling Hills: History and research needs*

Another of ATREE's main concerns in rural Darjeeling has been an apparent increase, over 10-15 years, in crop raiding by small and medium-sized mammals. **Samuel Thomas**, Communications Manager and Programme Associate, has made a strong start on an analysis and history of HWC in Darjeeling, including a global review of current research literature. His preliminary draft will be expanded for submission in November 2014 to a major journal, perhaps *Human Ecology*. Rinchen Lama, a native of Darjeeling town who has been working for social and environmental NGOs in Delhi, was hired just toward the end of the USAID-CCRD grant to begin a large scale survey of community experiences with HWC in some 30 villages. Her orientation and exploratory field visits were facilitated by USAID-CCRD funding.

2.2.5 Appendix 12: A. Wilson: Establishing a monitoring system for community fuelwood extraction impacts in Singalila National Park and Senchal Wildlife Sanctuary, Darjeeling

Another UMass Boston PhD student, **Alexa Wilson**, has now spent two summers in Darjeeling, setting up permanent forest research plots in the periphery of several villages in SNP. These plots will be repeatedly censused for changes in vegetation due to fuel wood extraction, to enable a fuller and more precise estimate of the value of ecosystem services in the rural hills economy. Despite a general strike and political agitation which prevented any movement in or around Darjeeling town for some weeks of July and August 2013, her account of progress to date shows that the basic infrastructure for her research is in place and is already producing interesting data.

3. EDUCATION AND TRAINING

3.1 Building capacity of local CBOs, NGOs and civil society

Workshops were held in several locations in Sikkim and in Darjeeling, bringing together local NGOs with interests in disaster risk and response issues and in climate change. In the two-day conference in Darjeeling, there were also several members of the incoming district administration, the Gorkhaland Territorial Administration, as well as representatives of Nepali NGOs and Ilam district outreach officer. Although it is sometimes painfully slow, we are making progress in building the important personal relationships with administrators and officials that will allow ATREE to participate more fully in decision-making about environmental management and risk management. In particular, Samuel Thomas (Communications Manager) has been put in charge of investigating the process for selecting projects under the MGNREGS social employment program. This program has become one of the main influences on rural infrastructure siting, construction and maintenance, yet the administrative channels by which projects are chosen and organized in Darjeeling has become murky and irregular. Indeed, there are some indications based on information to date that the process may have become so corrupted that ATREE may not be able to get involved without major ethical compromise. However, we are still hoping this is not the case.

3.2 Village Disaster Preparedness Training

A Disaster Preparedness Training session was conducted by local NGO Anugyalaya in Rampuria in August, 2012. Prakash Tamang, ATREE field staff, has been using the same module to conduct community awareness generation programmes in all our field areas in SWLS.

In November, 2013, Prakash Tamang also attended the CPR (Cardio Pulmonary Rescue) First Aid Training conducted by St. Johns Ambulance Society, Siliguri.

Village	Month	Year	Resourced by	No. of Participants		No. of Participants		No. of Participants		Total	Institution building
				Male	Female						
Rampuria FV	April	2014	Prakash Tamang, ATREE Field Staff	11	20	31	Disaster Management Committee				
Lalung	May	2014	Prakash Tamang, ATREE Field Staff	18	12	30					
Rambi FV	May	2014	Prakash Tamang, ATREE Field Staff	17	8	25					
Paschim Permanent FV	May	2014	Prakash Tamang, ATREE Field Staff	5	7	12					
Chatakpur FV	June	2014	Prakash Tamang, ATREE Field Staff	10	2	12					
Total beneficiaries: 110											
Total hours training: 10-15											
Total person-hours: 1100-1650											

Each training is a one day training of 2-3 hrs.

3.3 Eastern Himalaya Climate Awareness Forum (EHCAF)

At the START-CDKN project regional workshop in March 2014, ATREE-EH founded and agreed to host the Eastern Himalaya Climate Awareness Forum (EHCAF), a regional stakeholder-network to include NGOs and agencies across the monsoon-affected Himalaya, including several Indian montane states as well as Eastern Nepal and Western Bhutan. Key EHCAF goals are knowledge-exchange and collaboration to set the stage for climate adaptation and disaster risk reduction. The main challenges for EHCAF will be

- securing regional consensus on priorities, and
- bringing that consensus persuasively to the attention of decision-makers.

These challenges are particularly complex in India, given hierarchical bureaucracies. A stakeholder's forum for discussion and mutual learning will be essential to strengthening the voice of civil society, and to forging a unified message about the importance of building climate awareness. ATREE-EH Communications Manager Samuel Thomas is currently working on an independent website, and we are building membership in Nepal and Bhutan as well as across Indian East Himalaya. See section **4.2.1** below for details on planned learning-and-sharing events under EHCAF.

3.4 Short video: Climate Change in the Eastern Himalaya: Ancient risks, future threats

Although it was not included in our original proposal and the bulk of the necessary funding came from another source, nevertheless we will acknowledge START-CDKN support for the following project as well. We are currently in the editing stages of producing a short video entitled *Climate Change in the Eastern Himalaya: Ancient risks, future threats,* working with award-winning videographer and photographer Sandesh Kadur (www.sandeshkadur.com/). The video features short interviews (mostly in Nepali with English subtitles) with farmers, mountain pastoralists (yak herders), and rural women discussing their perceptions and interpretations of recent changes in climate. The interviews are interspersed with beautiful footage of natural and human landscapes and wildlife of the Darjeeling Hills and North Sikkim, as well as landslide scars, crumbling roads and the construction of vast hydropower projects.

4. PUBLIC/STAKEHOLDER COMMUNICATIONS, NETWORKING AND POLICY EFFORTS

4.1 Conferences and presentations of research materials collected partly or entirely with START-CDKN support:

Tenzing Ingty

- 1. *Reconciling local knowledge on climate change with scientific data: A case study from Lachen Valley, Eastern Himalayas*.14th Congress of the International Society of Ethnobiology (Bhutan), 2014
- 2. Climate change in Sikkim: Synthesizing available knowledge and reconciling local knowledge with scientific data – a case study from Lachen Valley. International Conference on the Eastern Himalaya: Climate Change, Livelihoods and Poverty. Centre for North East Studies and Policy Research. Jamia Millia Islamia. Delhi. 2013

- 3. Response of agro-pastoral indigenous communities to the cascading effects of climate change – studies from Sikkim, Eastern Himalayas, India. International Conference on Climate Change Impacts and Adaptation for Food and Environmental Security. SEARCA, Los Baños, Laguna, Philippines, 2012
- 4. Impacts of climate change on patterns of natural resource use by agro-pastoral communities in the Eastern Himalayas. 3rd National Research Conference on Climate Change. Indian Institute of Science, Bangalore 2012
- 5. *Impacts of climate change on patterns of natural resource use by agro-pastoral communities in the Eastern Himalayas*. Society of Conservation Biology (SCB) Asia conference in 2012

Dr Reinmar Seidler

- 1. *Disaster risk reduction, climate change adaptation and governance in a climatevulnerable Himalayan region.* Global Land Project (GLP) Open Science Meeting 2014: *Land transformations: between global challenges and local realities*, March 19-21, 2014, Berlin.
- Can Ecosystem Services be leveraged to link social and environmental goals in dynamic Eastern Himalayan mixed-use landscapes? International Society for Ecological Economics (ISEE) Bi-annual Conference 2014: Well-being and Equity within Planetary Boundaries, August 13-15, 2014, Reykjavik.

Dr Kamal Bawa

- 1. INVITED SPEAKER, Ecosystem Services in Mountains Synthesis Workshop. Global Change and Ecosystem Services in the Himalaya: Sponsored by Mountain Research Institute, Bern, Switzerland, 11-14 September, 2012.
- INVITED SPEAKER and CO-ORGANISER, Biodiversity Informatics Workshop, Sponsored by the Indo–US Science and Technology Cooperative Program, Bangalore, India, 21-23 January, 2013.
- 3-7. At least 5 presentations about the book *HIMALAYA: MOUNTAINS OF LIFE* to various professional societies and groups:
 - ATREE Bangalore (January 28, 2013)
 - India International Center (February 16, 2014)
 - Bombay Natural History Society (January 29, 2014)
 - University of Massachusetts, Boston (March, 2014)
 - Village Forward, Sudbury, Massachusetts (October 2, 2014)
- 8. Harvard University, Sackler Museum: *Himalaya: Environmental Change, Biodiversity, People.* October 1, 2014. The talk, sponsored by six academic units of Harvard University and attended by over 250 persons, was featured in *Harvard Gazette* and *Harvard Crimson*:

http://news.harvard.edu/gazette/story/2013/10/the-himalayas-amazing-biodiversity/ http://www.thecrimson.com/article/2013/10/2/himalaya-book-art-photography/

9. INVITED PARTICIPATION IN Green Growth Summit, G3 (invited by the Government of Denmark), Copenhagen, October 21-23, 2014.

- 10. INVITED EVENT A conversation with Jane Alexander, actress, about Conservation of the Himalaya. Oct. 30, 2014, Rubin Museum of Asian Art, New York.
- 11. COMMENCEMENT ADDRESS, University of Alberta, June 10, 2014.
- 12. INVITED TALK: Reconciling local knowledge on climate change with scientific data: A case study from Lachen valley, Eastern Himalayas (with Tenzing Ingty), International Society of Ethnobiology Congress, Bhutan, June 1-7, 2014.
- 13. KEYNOTE ADDRESS: Indo-US. Workshop on Conservation and Sustainable Use of Biodiversity in the Western Himalaya. June 28-29, 2014. Dehradun, India.
- 14. *Global Change, Human Well Being and Biodiversity: Perspectives from the Himalaya.* Invited talk at the United Nations University, Tokyo.

4.2 Policy advocacy:

4.2.1 EHCAF cross-visits: The first major undertaking for the new EHCAF will take place in the fourth quarter of 2014, and proceeds from the March Darjeeling workshop in which three guest speakers came from Ilam, Nepal, to describe district and municipal-level disaster risk reduction strategies, some supported by the central government and others more community-based. GTA officials present were very intrigued and were eager to make a visit to several villages in Ilam to observe the very different and better-organized approach to disaster awareness and prevention that has been built up in Nepal over the last decade. Now that the monsoon season is over, these visits are being organized and will take place soon. (The funding for these events, of course, comes from another source, but since the impetus for this outreach came from workshops supported partly by START-CDKN funds, it is important to flag it here as well.)

4.2.2 GTA contacts

See section **3.1** above for details on our ongoing efforts to work with GTA and other districtlevel officials (especially with the Land Department of the Darjeeling District Magistrate (DM) office, as well as MGNREGS.)

5. FURTHER RESEARCH FUNDING OPPORTUNITIES LEVERAGED

5.1 USAID-India, InFoRM program, \$1.2 mill.: *Managing India's Forests for Biodiversity and Human Well-being in the Face of Global Environmental Change*. This grant is in many ways a direct follow-up to the USAID-CCRD funding, but expanded to scale up several components of our research-action program in climate-aware development strategies (notably the household energy/ fuel wood/ ICS work). We are also taking a more explicitly comparative approach by using the larger grant to fund new initiatives in the high hill landscapes of the Western Ghats, Southern India.

5.2 CDKN-CIRF (pending): *Moving Science into Policy: Exploring Improved Environmental Governance Opportunities in Transitional Landscapes of the Darjeeling Hills.* This proposal is also a direct outcome of the governance-related work under the Climber-Scientist program. If successful, this will fund the participation of a specialist in political ecology to both study and influence the ongoing administrative transition in environmental governance.

5.3 Barr Foundation (pending): support for endowment of new ATREE Fellow(s) to expand the energy program in the Darjeeling-Gangtok office.