

annual report

2012 - 2013



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Ecology and the Environment**

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mission statement

"To promote socially just environmental conservation and sustainable development by generating rigorous interdisciplinary knowledge that engages actively with academia, policy makers, practitioners, activists, students and wider public audiences."

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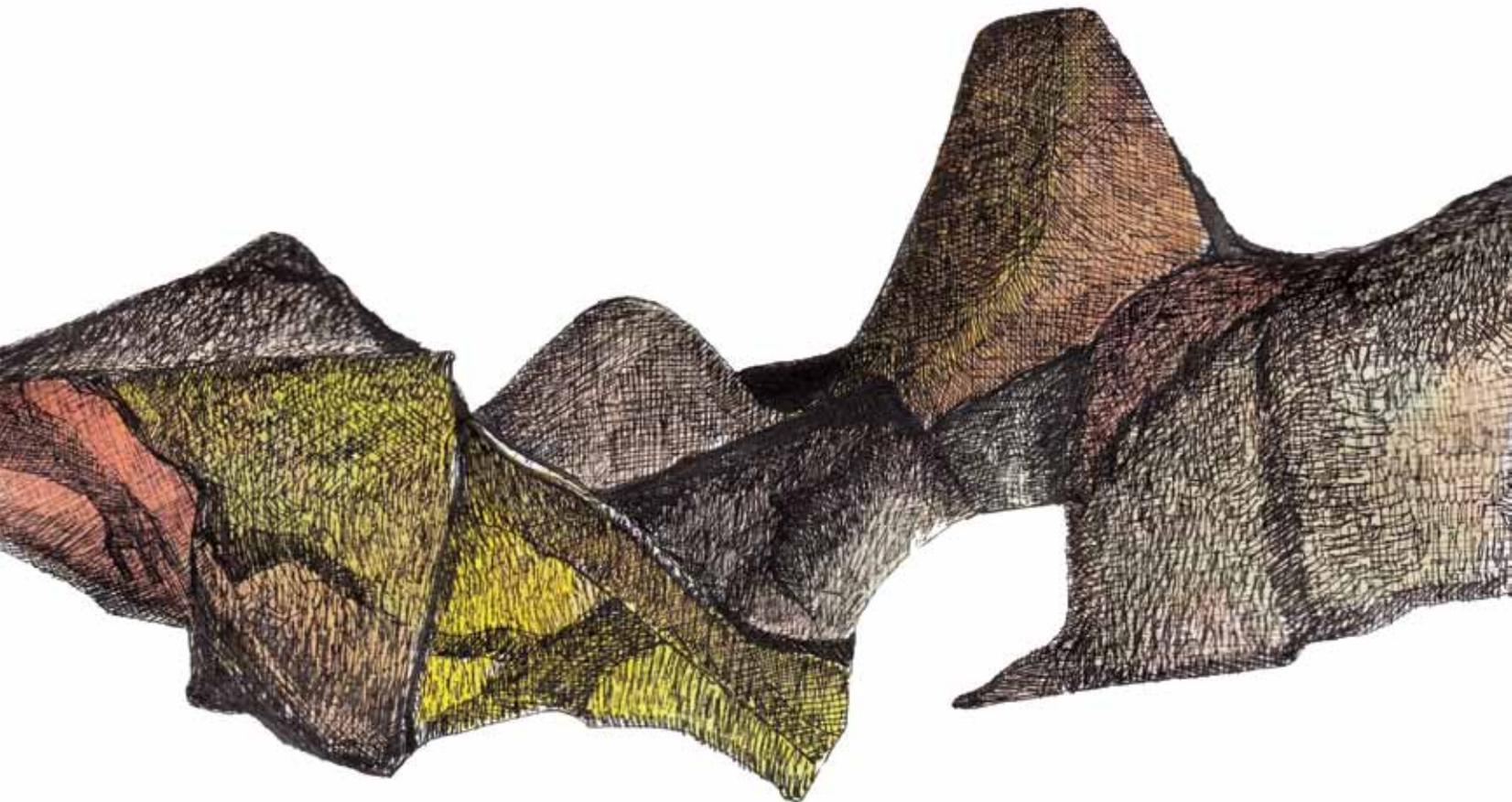
contents



ATREE: Consolidation and Growth	04
ATREE Milestones	06
Research Highlights	09
Centre for Environment and Development	09
Suri Sehgal Centre for Biodiversity and Conservation	19
Education	27
PhD programme	27
Community-based Conservation Centres	29
Outreach	33
Action research in the Eastern Himalayas	33
Policy	38
Citizen science	39
Small grants in the Eastern Himalayas	39
CEPF	40
Khoshoo	40
Workshops	41

Publications	43
Books	43
Book chapters	43
Peer reviewed articles	43
Discussion papers	45
Reports	46
Popular press	46
Awards and Recognitions	47
People	49
Partners	53
Financial Statement	58

Director's/ President's Message



Toward ATREE's Twentieth Anniversary

Consolidation and Growth

Problems arising at the interface of environment and socio-economic development are complex, and their resolution requires both ingenuity and time. In this context, sixteen years represent a relatively short period. ATREE was established only in 1996 (starting operations in 1997), yet in its short history the organization has already made a good start in addressing some of our most pressing environmental challenges. ATREE has earned a number of distinctions, including being ranked #19 globally and #1 in Asia among environmental think-tanks. In this report we note not only this particular milestone, but also several other important stages in the organization's development.

Even as ATREE continues to address a host of perennial problems – biodiversity loss, water scarcity, and poor environmental governance among them – new environmental pressures are emerging. Climate change is one, in particular its associated extreme climatic events. The devastating June cloudburst in Uttarakhand and October's cyclone Phailin in the Bay of Bengal, each, remind us once again of the precarious balance between nature and society. These events demonstrate our increasing need for effective environmental monitoring and for better understanding of the interactions between environment and humanity.

ATREE has been a leader in pressing the Ministry of Environment of Forests of the Government of India to initiate comprehensive monitoring of the health of our ecosystems. Indeed, ATREE researchers have been monitoring ecosystem structure and process in several

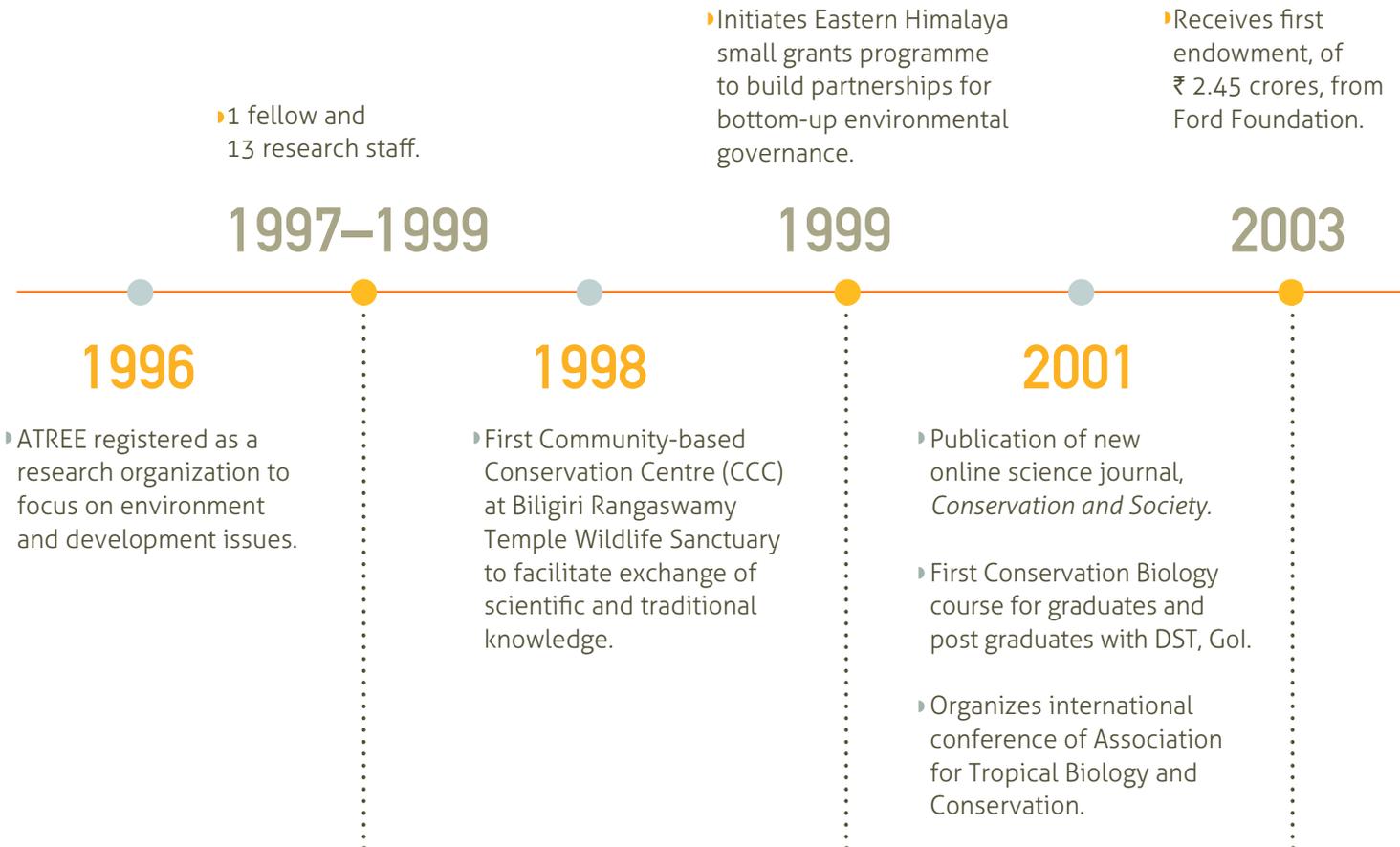
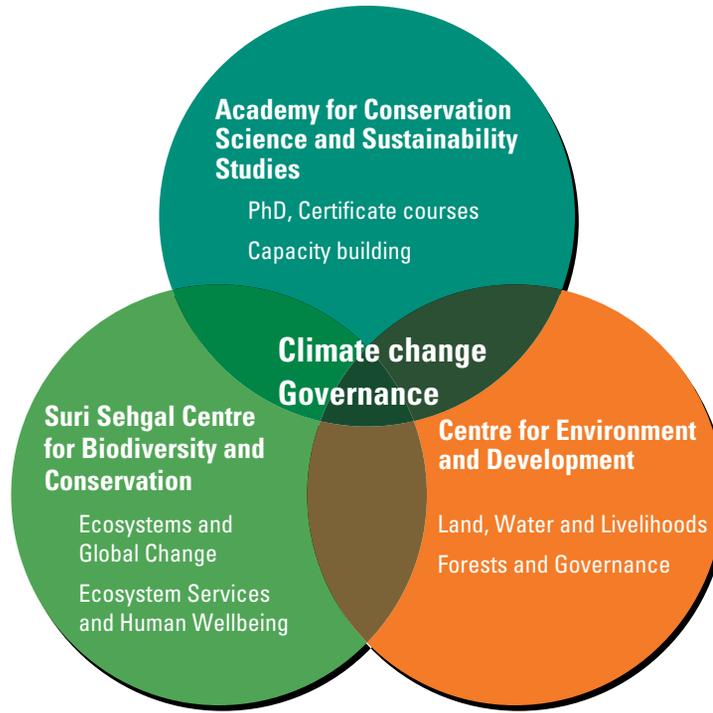
south Asian landscapes. And there are new proposals to expand these programmes, particularly in the Eastern Himalaya.

Climate change is an active and growing research area at ATREE. Aided by strong supporters such as the Oak Foundation, the Government of Norway, and Ms. Rohini Nilekani, our future plans call for the consolidation of our diverse climate-related activities into a unified interdisciplinary programme on Climate Change.

Strengthening human resources to meet the country's environmental challenges also remains a top priority with ATREE. With thirty six doctoral students currently enrolled in ATREE's PhD programme, and with new cohorts of students obtaining their degrees every year, ATREE is establishing itself as a premier institute of higher learning in conservation and sustainability studies. ATREE is particularly proud of its eight doctoral students from the northeastern region of the country – an area with extraordinary biocultural diversity and acute environmental challenges, but with limited human resources.

As always, we are most grateful to our many friends and donors for their encouragement and support. We particularly appreciate the resources provided by Tata Trusts, the Sehgal Family Foundation, the Institute of Rural Research and Advancement, the Norwegian Government, IDRC, Ms. Rohini Nilekani, and Ms. Kumari Shibulal. We welcome comments on our work and suggestions on ways to improve it.

Organisation Structure



ATREE milestones

Pics: Ovee Thorat



Head office, Bengaluru.

- ▶ Establishes Academy for Conservation Science and Sustainability Studies. Doctoral programme has three students.
- ▶ CISED* merges with ATREE. ATREE reorganizes to facilitate interdisciplinary work under four programmes.**
- ▶ Move into new green building, headquarters in Bengaluru.
- ▶ Hosts the International Canopy Conference.
- ▶ Hosts SCB conference, Asia chapter, Biodiversity Asia 2012
- ▶ Three doctorates awarded.
- ▶ Begins work on the Karnataka Biodiversity Atlas.

2006

2009

2012

2004

- ▶ Establishes the Ecoinformatics Centre, for application of geospatial technologies in research.

2008

- ▶ Launches the India Biodiversity Portal, an open access platform for online species- and habitat-related information.

2011

- ▶ ATREE's first doctoral student graduates.
- ▶ University of Pennsylvania survey ranks ATREE 1st among environmental think-tanks in Asia.

2013

- ▶ ATREE has 36 PhD students, 18 faculty, 5 offices and 5 CCCs. 12 more PhD students join the ranks in August 2013, taking student strength to 48.
- ▶ Endowments now at ₹ 31 crores.

* Centre for Interdisciplinary Studies in Environment and Development.

** Land, Water and Livelihoods; Forests and Governance; Ecosystems and Global Change; Ecosystem Services and Human Wellbeing



3 Research Highlights

- Centre for Environment and Development
- Suri Sehgal Centre for Biodiversity and Conservation

Centre for Environment and Development

Human use of earth's natural resources is placing unmatched pressure on the capacities of local and global ecosystems. In south Asia, the subsistence needs of a large rural population and the demands of a growing industrial sector and consumer class on forests, water resources and agricultural lands are leading to resource degradation and conflict. At the same time, the conventional development paradigm of rapid industrialization and urbanization, which is expected to lead to poverty alleviation, is generating air, water and solid waste pollution and affecting human lives and ecosystem health at multiple scales.

The brunt of both resource degradation and pollution is most heavily felt by the urban and rural poor. How the process of development – economic, technological, socio-cultural and political – can lead to sustainable and equitable use of natural resources and containment of the pollution burden, and how sustainable resource management can contribute to poverty alleviation and human wellbeing are the broad questions that drive the work of the Centre for Environment and Development.

Forests and Governance

The goal of the Forests and Governance programme is to understand what combinations of governance regimes, economic policies, cultural changes and biophysical measures will lead to better forest governance in south Asia. This means more sustainable, equitable and livelihood-enhancing outcomes, and strong democratic processes. The focus is on rights, institutions and governance mechanisms, ecological and sustainable use of natural resources, and economic and cultural dependence.

The flow and distribution of forest benefits

Forests generate multiple products and services for multiple stakeholders at different scales, and different ways of managing the forest are likely to create different trade-offs between these stakes and stakeholders. But there is limited empirical information on the nature and magnitude of these tradeoffs under different situations. ATREE, in collaboration with the University of East Anglia and Vasundhara, has been conducting a study of how the magnitude and distribution of forest ecosystem services accruing to different stakeholders are affected by forest governance regimes. Sites in Nayagarh and Khorda districts of Odisha state, representing three different



NTFP for livelihoods: bundling tendu leaves in Baisipalli, Odisha.



NTFP for subsistence: button mushrooms.



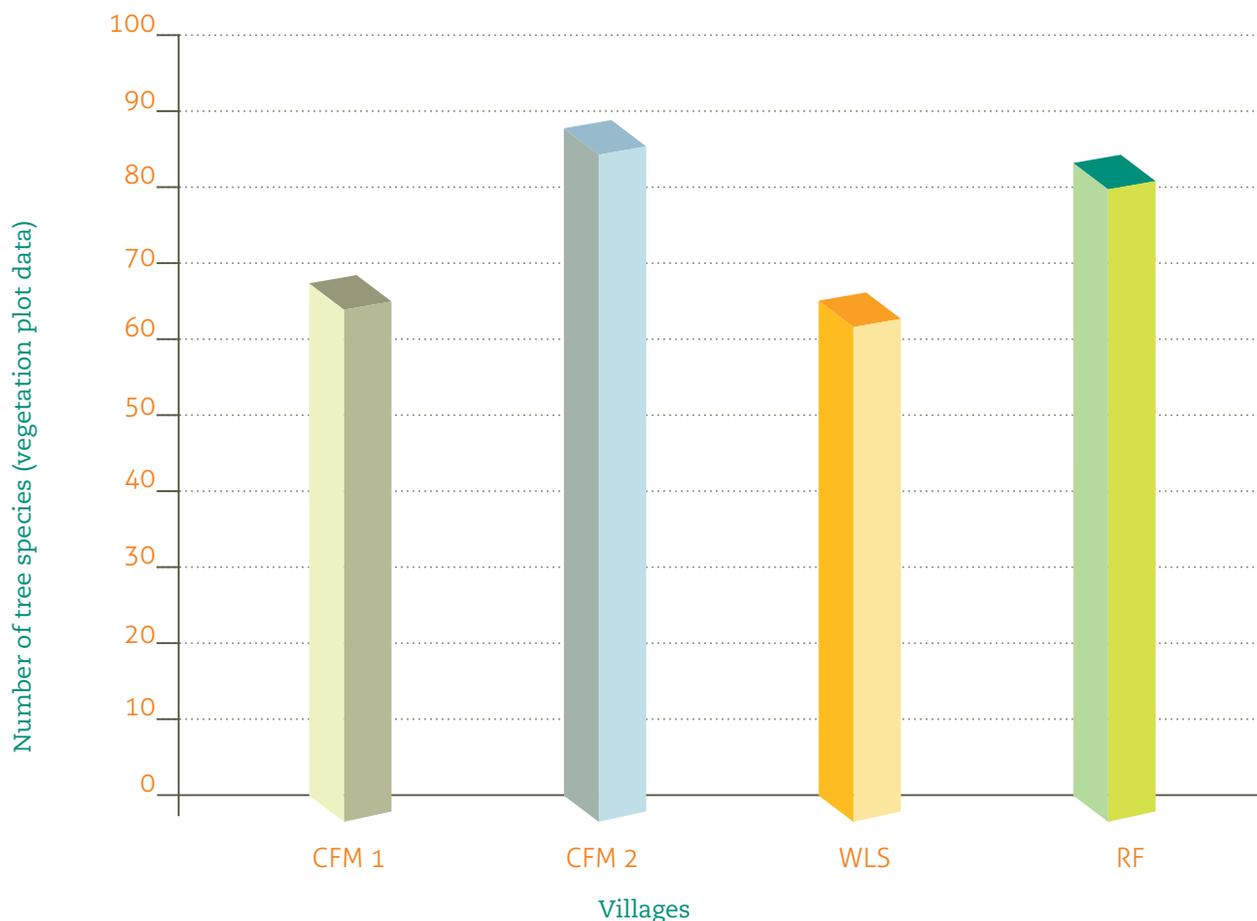
The Dengajhari agro-ecological landscape is the beneficiary of ecosystem services provided by adjacent forests – pollination and hydrology regulation.

governance regimes, viz. (informal) Community Forest Management (CFM), state-controlled Wild Life Sanctuary (WLS) and Reserve Forest (RF), have been studied. The study covers key products, regulatory services, cultural values (including rarity and endemism), and also 'dis-services'.

Preliminary findings from the study indicate that in the case of cultural values, community forestry sites match the sanctuary and reserve forest sites on overall tree species richness (see figure below), whereas certain specialized taxa may be better represented in the sanctuary or state-controlled sites. In the case of products, flows of firewood and fodder are much higher (per unit area) in community forestry sites, because they have smaller resource catchments available to them. Finally, dis-services such as crop damage by wild boars are quite significant in all sites.

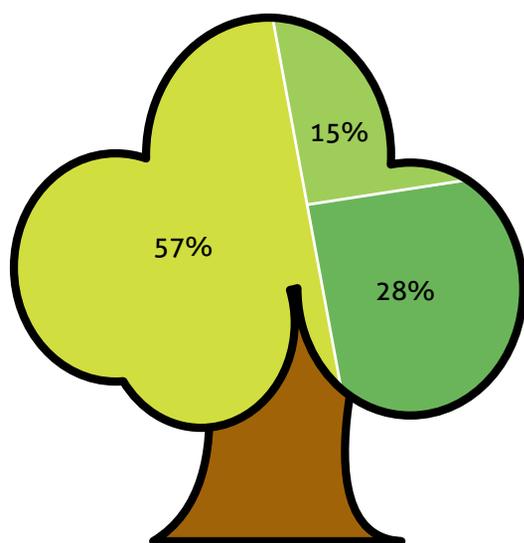
In all cases, the socio-economic and institutional context plays a major role. The use of certain products depends upon the presence of certain communities skilled in their use and is culturally associated with them. Firewood consumption fluctuates with access to other fuels, and collection of non-timber forest product depends upon access to markets, not just the presence of the plant. Harvesting rules and willingness of the community to impose them on insiders determine whether timber flows are low but sustainable, or high and unsustainable.

Institutions, both formal and deeply embedded ones, such as the caste and class system, also strongly influence the distribution of benefits. For instance, in one CFM site, relatively recent immigrants have not been able to access the community forest, and dalit craftsmen also get left out because the community does not allow sale of bamboo. Across all sites, dalit households had



Tree species richness in sample plots across governance regimes: Richness in CFM sites is similar to that in non-CFM sites.

lesser access to certain forest benefits, even compared to adivasi households. At the same time, appropriation of products by powerful outsiders in violation of community or government rules continues in many areas, such as a timber mafia in the RF site, a firewood collector group in a CFM site, or absentee livestock owners in another CFM site (see figure below). This phenomenon highlights the necessity for conducting context-specific analysis of ecosystem value rather than extrapolating from elsewhere, as is commonly done in the ecosystem valuation literature.



- grazers from within village
- grazers from neighbouring villages
- absentee livestock owners

Distribution of grazing benefits in a CFM site: absentee owners and outsiders capture most of the benefits.

Final conclusions are yet to emerge from this ongoing study, but it is clear that the forest ecosystems generate both services and dis-services for different stakeholders, and their magnitude and distribution are strongly influenced by the socio-economic context and governance system in complex ways.

NTFP-based livelihoods: the case of *tendu* leaf policy

Forest-dwellers in central India derive substantial income from extraction and sale of non-timber forest products (NTFPs). Foremost amongst these products is *tendu patta* (leaf of *Diospyros melanoxylon*), used in the rolling of *bidis* (Indian cigarettes), with aggregate annual sale value exceeding Rs 2,000 crores. What share of this value do the forest-dwellers (mostly Scheduled Tribes) actually get, and how do state policies influence this share and the absolute value derived by them? What should state policy regarding this hitherto state-controlled product be in the light of the Forest Rights Act 2006 (FRA) and other legislation that grants ownership of such products to forest-dwellers? A study by ATREE, conducted with the help of villagers, activists and non-governmental organizations in the states of Madhya Pradesh (MP), Maharashtra, Odisha and Rajasthan, identifies major areas where policy changes are required.

The four states present significant contrasts in their *tendu* leaf policies: Rajasthan and Odisha make no concession to the fact that *tendu* leaf is actually the property of tribal forest-dwellers, and continue to extract royalties as before. In contrast, MP in 1998 and Maharashtra in 2005 recognized the passage of the Panchayat Raj (Extension to Scheduled Areas) Act 1996 (PESA) and, although they have not actually handed over rights to tribal communities, and have continued to treat them as wage earners, they have decided to return most of the royalties or profits earned from the sale of *tendu* leaves back to the *tendu* pluckers through a 'bonus' or 'incentive wages'. MP, in addition, has created a so-called cooperative structure where all harvest and sale is carried out by pluckers' cooperatives.

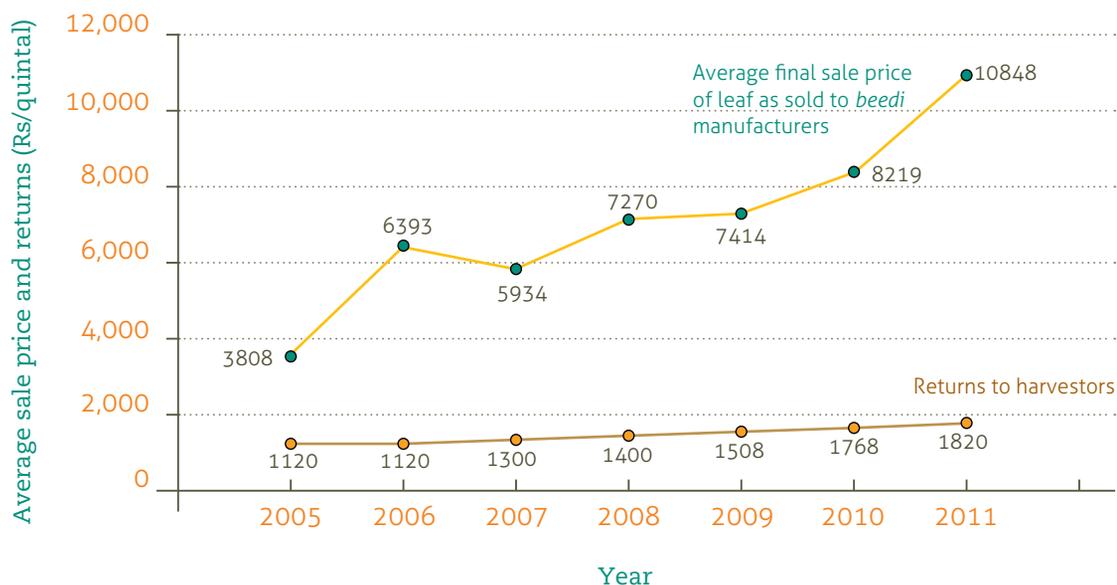
The cross-state studies show mixed results. In Odisha, data shows that the share of the *tendu* pluckers in the final price of processed leaf obtained has been abysmally low (only 17%) (see Figure on page 14). This is despite the fact that Odisha sells processed leaves (i.e., sorted, graded, bagged), and gets better prices relative to the other states.

Meanwhile, MP pays approximately 46% of the final price of processed leaf to the pluckers and Maharashtra, 68%. Our study of the MP cooperatives also shows that these are cooperatives only in name: pluckers have no control over activities of the organization, everything being controlled by the state-controlled Minor Forest Produce Federation. Efforts of civil society in Rajasthan



A useful NTFP: Aristolochia indica is used in traditional medicine.

Pic: Prasad Dash



Low share of harvesters in final sale price of *tendu* leaf sold by Odisha government

to capture additional margins by forming collectors' cooperatives and participating in the processing of *tendu* leaves have not yielded significant gains to pluckers, as the business of processing and selling *tendu* leaves requires large working capital and understanding of the market. However, these initiatives have helped the cooperatives capture *tendu* leaf contractor profits as collective benefits for pluckers.

When both the PESA and the FRA confer full ownership of NTFPs on tribal/forest-dwelling collectors, it is untenable that states should continue the colonial practice of extracting royalties from these products. And neither superficially autonomous cooperatives (as in MP) nor simply de-controlling *tendu* leaf trade (as attempted recently in parts of Odisha) nor jumping into processing without first capturing all the margins from just sale of unprocessed leaves (as in the Rajasthan civil society cases) is the solution. While abolishing royalties completely is the obvious first step for states such as Odisha and Rajasthan, all states must then move in a graduated but concerted manner to building genuine cooperatives at the local level, supporting them with

working capital and skill-building required to tackle the challenging *tendu* leaf market.

Land, water and livelihoods

The goal of this programme is to understand the trends and drivers of change in land and water stressed regions, and urban-rural interfaces with respect to water availability, water quality, land degradation, food security and provisioning of environmental services by agro-ecosystems. It seeks to identify appropriate practical and policy strategies that promote environmental sustainability and human wellbeing.

Cities, climate and water

How do urbanization and climate change impact availability, quality and distribution of water for different users? How do communities adapt? Three projects are addressing these questions in peri-urban districts around Bengaluru and Coimbatore to create a picture of the impacts of urbanization on watersheds.

For the Adaptation to Climate Change in Urbanizing Watersheds (ACCUWa) project, the premise is that stressors like demographic change, land use and climate variability will affect marginalized groups more than others and by tracing the processes that aggravate already existing vulnerabilities, it would be possible to arrive at an understanding of the effects of urbanization and climate change. The project compares two watersheds: the Arkavathy watershed in Karnataka, which flows through peri-urban Bengaluru; and the Noyyal watershed in Tamil Nadu, which includes Tiruppur and Coimbatore. An analysis of the current situation in the Arkavathy watershed has been published as the first Discussion Paper of the Centre for Environment and Development at ATREE – *Arkavathy water management: A situation analysis*.

In the initial phase of this three-year project, the ACCUWa team has identified gaps in information essential for water governance. For instance, the pattern and extent of domestic water scarcity is unclear: existing data from the government reflects installed capacity, not actual deliveries. No estimates exist on agricultural, commercial and industrial water use, and there are no guidelines regarding 'fair' allocation across these sectors, or between upstream and downstream users. The processes governing water contamination are not

well understood and although surface water flows in the Arkavathy have been declining, there is no scientific consensus on why this is happening. This research, funded by the International Development Research Centre (IDRC), Canada, will integrate interactions with local experts, water managers, and users with understanding of the biophysical processes, socio-technical infrastructure and institutional mechanisms through which climate change impacts will be felt by water users.

A parallel study, funded by the Tata Social Welfare Trust, (TSWT), focuses on urbanization impacts in agrarian landscapes outside Bengaluru city. The ACCUWa and TSWT projects share understanding of the hydro-geology of the larger basin and water quality issues in Vrishabhavathi catchment, as the TSWT study sites – the Vrishabhavathi and Suvarnamukhi catchments – form a subset of the larger Arkavathy basin. The Vrishabhavathi originates inside Bengaluru city and carries much of the waste from the city, while the Suvarnamukhi originates in Bannerghatta forest and is less affected by urbanization and change. The TSWT project compares the two catchments for urbanization, livelihoods transitions and crop/land use change, using a bottom-up approach involving the communities in the study area.



Pic: Praveen Urs



Collecting samples for water quality tests in the Vrishabhavathy

The third study, funded by the Department of Science and Technology (DST) and IDRC, has supported the setting up of a state-of-the-art water quality lab at ATREE. Samples of water quality from the Arkavathy basin are being analysed to trace how human and industrial waste impact human and ecosystem health. Initial analysis of the water quality suggests that the water is indeed highly contaminated with nitrates and faecal coliform. Future work will also look at processes of contamination taking place within piped supply networks.

ATREE expects that an integrated treatment of the issue and the region will help improve decision making and policy on water governance.

Agrarian crisis in peninsular India: groundwater depletion, land-use change, climate and markets

The increasing dependence on groundwater for agriculture has led to a serious crisis of groundwater depletion in peninsular India. From being the second-most important source of irrigation during the 1980s, it now contributes to more than 65% of net irrigated area. It plays a critical role in household and regional food security, in improving livelihoods of rural agrarian populations and, at a larger scale, in national food production and rural development goals. With increasing dependence from just the farming sector, the source is depleting at an alarming rate due to over-exploitation, posing huge challenges to small and medium land holders. Changing farming practices,

Pic: Shrinivas Badiger



Small and medium farmers use a small part of their land to cultivate cash crops such as vegetables to ensure some income.

Research Highlights

failing borewells, fluctuating markets for cash crops and misplaced water and agricultural policies also add to the agrarian stress in these regions.

The AICHA – Adaptation of Irrigated Agriculture to Climate Change – project aims to study this picture of agrarian and environmental crisis in a groundwater-dependent catchment in Kabini sub-basin of the Cauvery basin. The research aims to develop a comprehensive analytical framework to understand the role of agronomic and water management, under the changing forces of climate, markets and agricultural policies. The research will anchor the framework on farmers' behaviour and strategies by integrating the role of social–economic hierarchies and biophysical asymmetries of resource

availability within the watershed, spatially and temporally; and test alternative policy scenarios to achieve sustainable outcomes at the household-level, at regional agricultural production level, and to achieve sustainable environmental outcomes.

This three-year AICHA project is supported by the Indo-French Centre for the Promotion of Advanced Research (CEFIPRA), and includes researchers from the Indo-French Cell on Water Science (IFCWS), Indian Institute of Science, ATREE and the French National Institute for Agricultural Research (INRA).







Suri Sehgal Centre for Biodiversity and Conservation

This centre aims to build a critical body of knowledge about India's biodiversity, ecosystem functioning and services provided by natural and managed ecosystems in the context of global, regional and local change. We believe that understanding the role of biodiversity and ecosystem functioning in sustaining human welfare is crucial to galvanizing conservation awareness and eliciting civil society support for conservation. Recognizing the structure, function, and value of biodiversity will enable us to prioritize outreach activities and natural resource management initiatives.

Ecosystems and global change

The goal of the programme on Ecosystems and Global Change is to understand the dynamics of complex socio-ecological systems, fill critical knowledge gaps, and to actively engage with civil society and government to better deal with the uncertainty associated with ecosystems under global change. It is organized under four working groups: Systematic Biology and Conservation Genetics, Monitoring and Habitat Management, Wetlands, and Invasive Species. A cross-cutting theme across these working groups is Conservation Planning and Society.

Grassland, wasteland, any land

For grasslands, nomenclature is everything. Dubbed 'wasteland', they tend to get put to more 'productive' use through the agency of various stakeholders in development and urbanization. This miscellaneous use takes place in the grassland, scrub and thorn forest biomes that support critically endangered species such as the great Indian bustard, lesser florican and other endangered and endemic species such as Indian wolf, Indian fox and blackbuck. These grasslands are a wilderness-human matrix that have supported the livelihoods of local and nomadic pastoralists for centuries.

ATREE is hosting a two-year project to produce country-wide maps of dry grassland biomes using available satellite imagery, with finer-scale maps at district level for Andhra Pradesh, Karnataka, Madhya Pradesh and Maharashtra. This will be a crucial first step to charting out areas that require urgent conservation action and developing landscape management plans for the protection and sustainable use of grassland habitats with local communities.

For the district scale maps of the four states, the team has combined classification of coarse (250m), fine (30m) and very high (5.8m) resolution satellite imageries

Pics: Abi Tamim Vanak



Part of familiar but much overlooked Indian landscape, the Indian savanna. Shown here, grasslands of Mhaswad in Maharashtra. Bottom right shows a bund being dug, which will change the biodiversity health of this landscape forever.

to create a map of grassland areas. It then created land cover maps with land cover categories such as grasslands, scrub, plantations, fallow, cropland, bare rock, and bare soil to refine the initial classification and create high accuracy maps of land cover type. The team also charted presence of grassland-associated species through preliminary presence data from carnivore scat, track impressions, herbivore pellets, opportunistic sightings and local information.

In the next phase of the project, species-presence data from field surveys and camera-traps will be used to create species occupancy maps across the four states. This will be combined with land cover maps, vegetation composition maps and human-wildlife conflict maps to derive a conservation prioritization ranking that factors in species presence, threats, disturbance and costs, using conservation planning software.

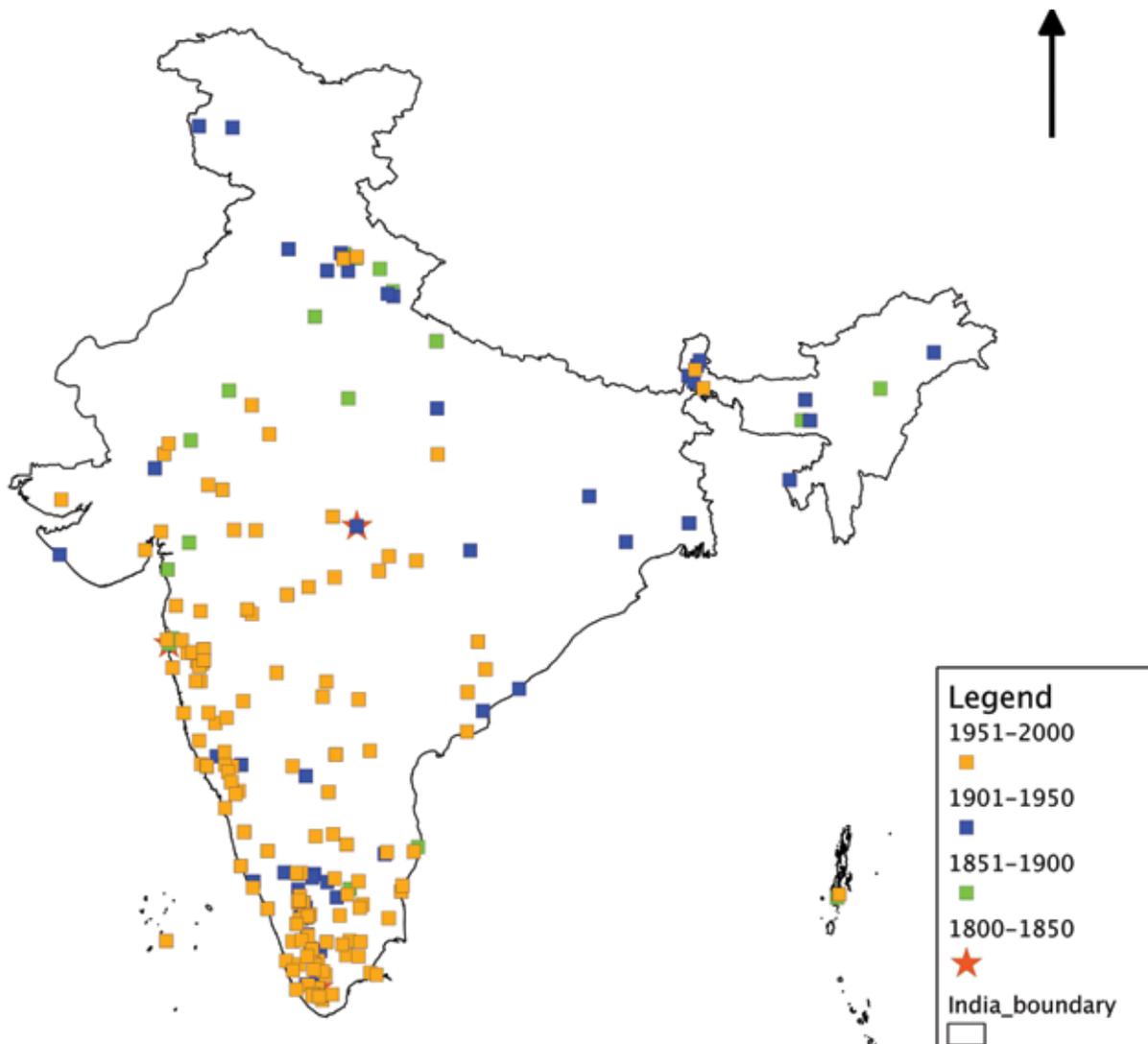
Based on the rankings obtained from the software, the team will chalk out areas of conservation of high priority grasslands, and develop a plan based on an inclusive, adaptive management framework. The team will share the results of these analyses and conservation prioritization ranking with local stakeholders and on online databases such as India Biodiversity Portal, with high resolution, district level maps.



Understanding spread and management of Invasive Alien Species

Throughout human history, wherever people have travelled, other species also have travelled with them – many intentionally, some inadvertently. Some of these species have become dominant in their new environments, competing with the native biota, altering ecosystem structure and functioning, and causing ecological and economic damage. These 'invasive alien species' are increasingly regarded as a significant driver of global change. Over the past decade, faculty and doctoral students have focused on different aspects of the study of invasive species.

Tracing historical patterns is useful in understanding the drivers contributing to the spread of invasive species. ATREE has reconstructed the historical introduction and spread of one of the most ubiquitous invasive plants in India, *Lantana camara*. Archival information suggests that lantana was transported to Europe from the Caribbean region in the late 17th century and was then exported to colonies of Europe, including India, as an ornamental plant during the early 19th century. The human-aided dispersal of lantana across the country most likely facilitated its spread, providing it a platform from which to escape into the wild and proliferate.



Lantana spread across India based on herbarium records from 1800 to 2000

The earliest record of lantana in India in the *Hortus Bengalensis* is from 1807, when it was introduced to the Calcutta Botanical Garden. Thereafter, lantana appears to have been introduced widely across the country over a relatively short period, for use as a hedge plant. The oldest recorded herbarium specimen of lantana is from 1814, from near Panchmarhi, in Central India, and the first from the Western Ghats, dates to 1835 in Courtallam. For the period 1800–1850 there are only three herbarium records for lantana. By 2000 this number had increased more than 100-fold to 340 herbarium records.

At a smaller spatial and temporal scale, the change in lantana distribution over a decade in the Biligiri Rangaswamy Temple Tiger Reserve (BRT), a protected area of the Western Ghats, provides insights into more localized drivers of spread. Our work indicates that historical disturbance (sites of old forest plantations) may partly underlie the present-day distribution of lantana. Surprisingly, our work suggests that the cessation of a historical disturbance – anthropogenic fires – may also underlie the pattern of lantana spread. Both ecological and ethnographic data point to the possible role of annual dry season fires in curbing the spread of lantana in these forests. This fire management, practiced by the local Soliga community was disallowed when BRT became a protected area.

Another aspect of invasive species research, of particular importance in their management, is to map and monitor their distributions. This potentially provides the tools to predictively model invasive species spread, and could help identify habitats most vulnerable to invasion. Ongoing work on invasive species mapping focuses on a mollusc, the African giant snail (*Achatina fulica*), and two plants, *Lantana camara* and *Chromolaena odorata*. The African giant snail was introduced into India in 1847, at Calcutta. It has now spread across the country, and causes damage to agricultural and horticultural crops. ATREE is developing a database to assess the distribution of giant snails in India and is also modelling their spatial and temporal spread using ecological niche modelling.

In addition, we are using advanced rapid assessment technology such as remotely sensed satellite data and Geographical Information Systems to map and monitor understory invasive plant species, *Lantana camara* and *Chromolaena odorata* in the Western Ghats. While

remotely sensed data have been extensively used elsewhere for mapping invasive plant species, their utility in mapping tropical forest ecosystems where alien plant species have invaded the understory has not been widely researched. ATREE research involves ground measurements of known locations of the two invasive plants, in conjunction with very high-resolution satellite data, to develop techniques for mapping the spread of these species over extensive areas. We are also testing the ability of this technique to detect and map species at different phases of establishment, in two protected areas in the Western Ghats – the BRT (Karnataka) and Netravali Wildlife Sanctuary (Goa).

Finally, management of invasive species poses different challenges in the varying environments where they occur. Efforts to remove invasive species and restore native species are both labour and resource intensive, and may need to be prioritized for high-conservation-value landscapes. Elsewhere, management may entail finding uses for invasive species, to offset their ecological costs. ATREE is applying learning from a lantana management-by-use model for management of *Eupatorium adenophorum* (syn. *Ageratina adenophora*), in Sikkim Himalayas, where the plant is adversely affecting cardamom-based agroforestry. ATREE is promoting the use of *Eupatorium* for dye making as an alternative to synthetic dyes in the manufacture of local crafts, fabrics, toys, etc. ATREE will also facilitate the design and development of newer products using the dye, and will help develop rural and urban market strategies and linkages for natural dyes. Two villages in south Sikkim – Lingee and Kaw – have been chosen for the pilot project.



African giant snail (*Achatina fulica*)

Pic: Aravind N. A.

Pic: Arundhati
Das



Sholas are high-elevation stunted evergreen forests that grow in folds of grassy hill slopes in the Nilgiris.

Ecosystem Services and Human Wellbeing

The overall goal of this programme is the understanding and communication of the complex bio-physical, ecological, socio-ecological, economic and political dimensions of ecosystem services with their implications for equity and sustainable management of ecosystem services. There is particular emphasis on using the ecosystem services framework for eliciting political and societal support for conservation of natural and managed ecosystems that sustain biodiversity and generate ecosystem services.

Understanding global change in the Nilgiris

That the Nilgiris have a 56% contemporary forest cover is an obfuscating statistic. The Nilgiris have witnessed large-scale transformation of grassland, wetlands and montane evergreen forests (sholas) into plantations of exotic trees, tea and agriculture over the past hundred and fifty years. The upper plateau was a grassy landscape till the mid-18th and early 19th centuries,

when it was transformed to plantation, hill-station or cantonment, depending on the demands of war and post-war development mandates, or the recreational requirements of a hill station, or training requirements of the military. Much of the Nilgiris grasslands was subject to afforestation. The north and northwestern portions, home to most Toda hamlets, were reserved for recreation and pasturage, but post-independence, these too were planted with eucalyptus, pine, wattle and Scotch broom. ATREE began research on the cultural and economic consequences of tiger depredation of Toda buffaloes in these afforested areas, as well as the cultural and ecological contexts. This study has evolved into an environmental history of landscape transformations in the 20th century Nilgiris. This history seeks to understand and contextualize utilitarian and aesthetic ideologies that underlay conservation and development policy and practice on the Nilgiri plateau. ATREE believes that prospects of any present and future development and conservation policy for restoring pastoral landscapes

or lives, would improve, or be better informed with an understanding of 20th century conservation and development history of colonial and postcolonial Nilgiris.

In the upper reaches of the Nilgiris, fragments of shola forests still exist. These high-elevation evergreen forests form stunted formations that grow in the depressions and folds of hill slopes amidst a matrix of natural grasslands. They are of particular interest from a conservation perspective as they harbour a variety of endemic plant and animal species and may be especially vulnerable to climate change, being tropical mountain-top habitats. A study in the shola-grassland matrix explores the nature of ecological communities and the processes that structure them, using the shola forests of the Nilgiris as a model ecosystem. The research investigates the environmental and biotic factors that influence the distributions and abundances of shola tree species across the landscape, especially those of endemic species.

The rapid and large-scale landscape transformation in the past hundred and fifty years – replacing grasslands over vast stretches with mono cultures of an invasive exotic tree and with tea plantations – has adversely affected the shola-grassland ecosystem. Research indicates that up to 49% of the tree community in the sholas of the Upper Nilgiris Plateau consists of endemics, some of which are frost-tolerant. Shola communities embedded in a matrix of natural grassland differ considerably from those that are embedded in a matrix of tea and wattle. The difference is in terms of overall diversity and composition, levels of regeneration and levels of occurrence of invasive species. Grassland sholas seem to have the highest levels of alpha diversity, the greatest density of young saplings and the lowest levels of invasion of alien species.

On another front, ATREE has initiated a study with a network of instrumented sites across the upper part of the Nilgiris to examine the impact of land-cover and land-use on hydrologic services and their response to extreme rain events, which are becoming more frequent. The Nilgiris are interesting from the ecosystem services trade-off perspective because of the large scale conversion of grasslands into exotic species tree-plantations, which increases evapotranspiration across the landscape, and the number of dams and reservoirs for hydropower generation and other water services. The increase in evapotranspiration has been linked to reduction in stream flow, especially in the dry-season,

and this has shown to have reduced hydro-power generation in the past. The production of timber and wood-products is thus shown to be negatively related to water services. Apart from land-cover and land-use change, there is the looming threat of climate change. The Nilgiris have always been prone to landslides but the recent increase in extreme rain events in India and prediction of higher rain intensities in the Western Ghats under some climate change scenarios may pose further challenges to the ecological and socio-economic resilience of socio-ecological systems in the Nilgiris. As rainfall intensities increase in response to climate change, and in combination with land-cover and land-use change, the trade-off between hydrologic services and other provisioning and regulating services could become more complex. The impact of the extreme rain events on shola and grassland biodiversity dynamics is unknown and needs close attention in the near future.

Ecosystem services, dis-services and resilience

Do forest fringe communities recognize ecosystem services they receive from forests? A preliminary assessment of community perceptions of ecosystem services was made under the Tata Social Welfare Trust supported project, 'Integrated approaches to adaptive resilience-based management of forests for supporting agro systems in the Sikkim-Darjeeling Himalayas'. The objective was to gain an idea about whether or not communities, living in villages fringing reserve forests and protected areas, recognized ecosystem services, and if they did, what was their perception of the services they were receiving from the surrounding forest ecosystem, their prioritization of those services, their perceptions of threats or drivers of change to the sustained or regular supply of the services they considered important, and finally, what the community perceived to be dis-services.

Initial findings are that communities do depend upon and recognize tangible benefits from forest ecosystems. Water was perceived the most important ecosystem service, followed by fuelwood, fodder and non timber forest products (NTFPs). Economically, communities were more dependent on NTFPs like mushrooms and edible water cress than on medicinal plants due to lack of demand for the medicinal plants in the villages of Senchel Wildlife Sanctuary, Singhalila National Park, Darjeeling and Dzongu, north Sikkim. The exception was

Pic: Annesha Chowdhury



Birds eye view of yak grazing pastures at Chopta valley, Lachen in north Sikkim.

Lachen valley, where the community depended more on the harvest of the economically important dwarf juniper (*Juniperus* sp.) and dwarf rhododendron (*Rhododendron anthopogon*) for incense making, and *Yarsa Gumba* or the Himalayan Viagra (*Cordyceps sinensis*) and the Noble rhubarb (*Rheum nobile*) for medicinal purposes.

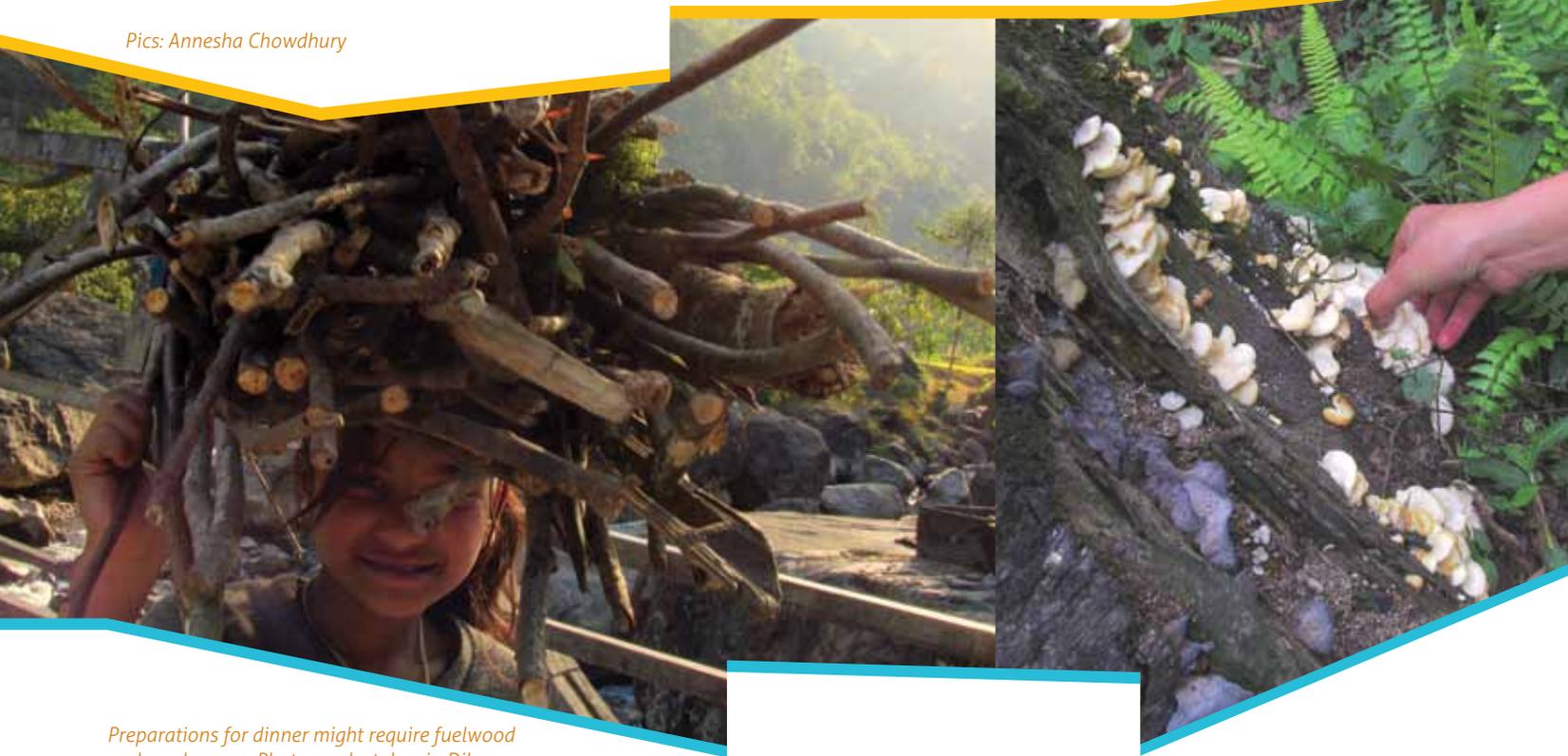
Communities perceive deforestation, unplanned plantations, water sources drying up, the spread of bamboo, rising temperatures, decreasing rainfall, deteriorating soil quality, and increased human pressure on forests as some of the major threats or drivers of change to flow of the ecosystem services they considered important.

Most communities perceive crop raids by wild boar, deer and bears to be the primary dis-service. Livestock lifting comes second to crop raids in terms of dis-services. In

instances of human–wildlife conflict, the communities do not seem to receive compensation for the loss of crops and livestock. However, in Yuksam, west Sikkim, there is a practice of collecting an endowment or premium from all community members in cases of livestock loss, a practice well known in Nepal as community-based compensation.

Preliminary surveys on the intrinsic value of biodiversity as a foundation supporting service were also made. Key bird, tree and butterfly assemblages were identified with community participation in Heegyathang in lower Dzongu, north Sikkim to serve as indicators of biodiversity richness of an area. It was found that because the Lepchas or the Rong are a community intrinsically bound to their landscape and natural surroundings, cultural services also played a major role in their lives, besides the usual tangible provisioning services of water, fuel wood, fodder and NTFPs.

Pics: Annesha Chowdhury



Preparations for dinner might require fuelwood and mushrooms. Photographs taken in Dilpa outside Singhalila National Park, and in private forests of Heegyathang, Dzongu.

A conceptual framework for assessing the status, drivers and trends of priority ecosystem services has been designed borrowing from the TEEB (The Economics of Ecosystems and Biodiversity) and MEA (Millennium Ecosystem Assessment, 2005) framework. The next set of activities will include participatory mapping of resource-rich and resource-poor areas in all study sites, based on community valuation of ecosystem services on which they depend. Standard ecological methods will be

employed to study regeneration rates, species diversity and grazing rates, as well as for vegetation and fauna (birds, butterflies and wildlife) to assess the biodiversity richness. Community tolerance towards different animals causing different types of dis-services will be assessed. This will be combined with social and archival data to develop a community-based monitoring protocol for the study sites.

4 Education

- ATREE's PhD programme
- Community-based Conservation Centres



Talks@ATREE draw speakers and audiences from varied backgrounds.

Pics: Ovee Thorat



ATREE's PhD programme

The Academy for Conservation Science and Sustainability Studies encourages an interdisciplinary approach to analysing environmental and development issues. The major focus of the academy is the interdisciplinary PhD programme, which currently consists of 36 students and 18 faculty. The course work, in conservation science and sustainable development, reflects this interdisciplinary approach.

Students enrolled in the programme are required to take courses that cover fundamental concepts in ecology, environmental sciences, economics, sociology, research methods in social and natural sciences, integrated approaches, and current perspectives in conservation and development. The programme also offers basic courses in mathematics, writing and science communication. Elective courses include systematic biology, environmental history, political ecology, GIS and remote sensing, plant–animal

interactions, and ecological economics. Readings and classroom discussions are supplemented by public talks, workshops and conferences. Students are encouraged to appear in public speaking platforms, participate in organizing events, and publish in popular media, besides academic journals. ATREE students have presented their research in conferences in India, Germany, Japan and USA. Students have published their results in a wide range of journals such as *Society and Natural Resources*, *International Journal of Geo-information* and *Journal of the Bombay Natural History Society*.

The PhD programme currently has 36 PhD students. Three students graduated in 2012–13. Students who are enrolled in the PhD programme are offered fellowships for five years. The programme will be adding 12 more students to this pool in 2013 to make it a total of 48 students.

Students who graduated this year

Chetana H.C. received a doctoral degree for his study titled '*Assessing the ecological processes in abandoned tea plantations and their implications for ecological restoration in the Western Ghats, India*', with T. Ganesh as his guide.

Savitha Swamy did her research on '*Reshaping neighbourhood parks for biodiversity and people: a study on pocket green spaces in Bengaluru, India*', under the guidance of Soubadra Devy.

Kavitha B. studied the '*Microbial diversity of earthworm burrow wall*' under the guidance of D.J. Bagyaraj, former Adjunct Fellow at ATREE.

of Biome Environmental Solutions, Bengaluru; Robert D. Stevenson of University of Massachusetts Boston; Henry W. Loescher of University of Colorado, Boulder; S. Janakarajan of Madras Institute of Development Studies (MIDS), Chennai; and Bob Pressey FAA of James Cook University, Australia.

PhD scholars started an interactive talk series on work-in-progress research; seven talks have been held in this series with internal and external speakers discussing conceptual frameworks, methodologies, and questions. This series has helped presenters refine their work with feedback from faculty and students from different backgrounds and experiences. Students also initiated an '*Around the field in 15 minutes*' presentation series in which they introduce their field experiences and insights to ATREE staff. Eight episodes of this series, by students, visitors and interns have played so far to packed audiences.

ATREE has a vibrant internship programme that receives interns from across the world. In 2012–13, faculty guided 25 interns.

Academy initiatives in 2012–13

Talks@ATREE is a series of talks that are presented every Wednesday and cover a range of topics and interests. Some of the speakers of this year were Gary Martin of Global Diversity Foundation, USA; S. Vishwanath

Pic: Ovee Thorat



Soliga musical welcome for 2013 PhD batch.

Community-based Conservation Centres

Study abroad programme

ATREE, through its network of five Community Conservation Centres offers students a unique opportunity to learn basic skills of ecological field work and their application to environmental problems in southwestern India. This is a region of extraordinarily high biodiversity, where human and wild communities have coexisted for thousands of years. However, both are under increasing pressure from population growth and the rapid transformation of India's economy. A major theme of the programme is conservation biology: a multidisciplinary field that addresses challenges created when natural habitats, wildlife, and traditional cultures confront modern industrial society and human population growth. During the programme, students visit field research stations and nature preserves for periods of one to ten days. These sites include diverse habitats, representing major ecosystems of the Western Ghats of India: wet tropical rainforest, moist-deciduous and dry-deciduous forest, shola-grassland forest, montane forest, scrub forest and open grasslands. They are likely to see a variety of large mammals including wild elephants, several deer species, gaur, native wild dogs, leopards, and tigers. They also visit villages and agricultural areas to learn how human communities interact with the

surrounding forest and animal communities. A six-week study abroad programme has been designed for a group of undergraduate students from Kansas University who spent time at these field stations and at ATREE's head office in Bengaluru.

earthian Continuous Engagement Programme

Besides presenting the Khoshoo earthian trophy for the most actionable entries in the Earthian Sustainability Awards for schools and colleges, ATREE is also knowledge partner in the Wipro three-year Continuous Engagement Programme (CEP). ATREE works with the shortlisted entries to introduce them to ideas of 'sustainability'.

The first orientation programme was held in February with teachers from four earthian awardee schools of 2012. The theme was *Forests, Culture and Us*. Ideas of sustainability and resource use were discussed through contextualized field-based activities at the CCCs in BRT, MM Hills and Kanakapura.

Pic: K. S. Seshadri



Hipposideros speoris, Schneider's leaf-nosed bat.

Agasthya CCC Research

Ecological and economic benefits of anurans to paddy farming in southern India

A large number of amphibians exist in paddy fields and consume a high diversity of arthropods; this makes them important not only in a strict ecological sense but also economically as they offer ecosystem services in the form of possible pest control. The Agasthya CCC initiated a study in three villages near the CCC to empirically test if the amphibians provide any measurable ecosystem services that can be quantified in terms of the value addition to paddy cultivation.

The CCC has documented the diversity and abundance of anurans in wet paddy fields, their habitat correlates, diet composition, and linked these with their perceived economic benefit through interviews with farmers.

This study was funded by the Madras Crocodile Bank Trust/Centre for Herpetology.

Temples as critical habitats for bats in southern India: implications for conservation

It is not surprising that the dark enclaves of ancient temples on the banks of Cauvery, Vaigai and Thamiraparani are favoured by bats and birds. These

temples, which may be 500 to 1000 years old, sometimes harbour several bat species, and the temple towers and the *sanctum sanctorum*, a place usually undisturbed, are prime roosting areas. An emerging threat to resident bat colonies is the modernization of temples, in which one of the requirements is lighting up of dark spaces.

Bats adapt to and proliferate in human-dominated landscapes, and are versatile in their choice of habitats. Though they provide several important ecosystem services such as pollination, pest control, and fertilizers from droppings, these are never clear to the communities that share the landscape with bats. Instead, bats are more often villified as vermin. ATREE's Agasthya CCC initiated a project to identify temple characteristics most likely to foster bat populations, and further, how this might help in bat conservation. The team also saw this as an opportunity to engage with local communities to build awareness about bats and increase community stake in their conservation.

The team found bat populations in 31 out of 61 temples in the survey areas of Tirunelveli and Tuticorin districts of Tamil Nadu. Architecture of the temple seems to be the main factor for the presence of bats. Renovation and lighting in the temples are major habitat disturbances.



*Fulvous fruit bat,
Rousettus leschenaultii.*

Pic: K. S. Seshadri

Pics: Harisha, R. P.



L-R: Twig of makali, *D. hamiltonii*, and roots being harvested.

CCG Research in MM Hills

Issues in *in situ* conservation of *Decalepis hamiltonii*

Decalepis hamiltonii, called *makali* in the local language, is an endemic, endangered plant species found in the Western Ghats. Its leaves and fruits are medicinally important; the tuberous roots are used as a laxative, appetizer and in a health tonic. In the food industry, the roots are pickled and the root extract is used as substitute for vanillin. It is also a key ingredient in ethnomedicine – taken orally to rejuvenate the body, also considered an efficacious anti-inflammatory. The plant’s commercial and medicinal values have directly contributed to its decline in the wild. ATREE looked at the history of conservation or use-management of this plant and potential issues in the implementation of an *in situ* conservation plan to preserve viable populations of *D. hamiltonii* in their natural surroundings.

ATREE found that the plant’s decline in the wild due to unsustainable harvest has been an area of concern for the Karnataka Forest Department for more than five decades, with records showing conservation priority areas marked in MM Hills as far back as in 1954–55. In 1962–63, *makali* harvests were banned for two years, followed by further bans for a four-year period in 1964–65 in areas showing low populations. In the late seventies, through 2000, various methods were employed – rotational harvesting, protocols of

population-density assessments before harvesting, broadcasting of seeds, etc. From 2007, harvest of the plant has been completely banned in MM hills.

These measures have not helped. ATREE found that lack of community participation in decision making has meant that ‘illegal’ harvest continued. Unmindful harvesting practices affect the population and regeneration of the plant. In *D. hamiltonii*, regeneration is through rootstock resprouting and seed germination, whereas harvesters uproot entire plants to maximize collection for the market. Overharvesting of the roots before the plant achieves reproductive maturity has led to its decline in the wild. The market has driven continuous harvests, whereas the plant requires a minimum of two years for regrowth for next harvests. Harvest contracts continue to be given to middlemen. Habitat disturbance and insufficient rainfall are also responsible for decline of population in the forest.

ATREE recommends developing comprehensive conservation action plans and evaluation practices at village level; promote *ex situ* conservation to reduce pressure on natural populations; mark conservation priority areas, identified with community assistance, to share with stakeholders down the line; and factor livelihood concerns of harvestors in the conservation plan.

5 Outreach

- Action research in the Eastern Himalayas
- Policy
- Citizen science
- Small grants in the Eastern Himalayas
- CEPF
- Khoshoo
- Workshops

Pics: Tenzing Ingty



Herbivory is one of the processes that impact species density, distribution and composition. L-R: Sheep grazing along the trans-Himalayan pastures. Yak milk is used to make products for sale as well as subsistence.

Action research in the Eastern Himalayas

Impacts of climate change on alpine grasslands

ATREE has been examining the response of plant species diversity to climate change and grazing in Himalayan alpine pastures, the primary habitat used by the region's agro-pastoral communities.

Trends from data collected indicate that there is higher species richness as well as greater above ground net

primary productivity in grazed areas as compared to ungrazed areas. Clearly, grazing plays a positive role. In order to further look at impacts of climate change on species diversity in grazed areas, the researcher used an experimental design simulating warming. He used open top chambers (OTCs – see image on the next page) based on the methods developed by the International Tundra Experiment programme. The design was set up in collaboration with the National Centre for Biological Sciences (NCBS), Bengaluru. OTCs have been set up at five sites along an elevation gradient of 3000m to 5000m. Data collection for OTCs and control will start soon.



Open Top Chamber is an experimental warming design that traps heat within the chamber and raises its temperature by about 2 degree Celsius.

Pic: ATREE

World Heritage Biodiversity Project in NE concludes

The five-year World Heritage Biodiversity Project for India (WHBPI) titled *Building Partnerships to Support UNESCO's World Heritage Programme: India* concluded in August 2013. ATREE coordinated the implementation of the project in Manas and Kaziranga National Parks in Assam, with strategic support from the Ministry of Environment and Forests and the State Forest Department of Assam. The project was supported by the Ford Foundation and Sehgal Foundation, with matching funds by the UN Foundation.

Employing collaborative research and monitoring, the project produced the first detailed baseline and photographic data of species occurrence and diversity in Manas. This study contributed to the results of the all-India tiger estimation in 2010, and provided persuasive evidence in the decision to remove the 'In Danger' status of the World Heritage Site by demonstrating documented recovery of key wildlife populations in these areas.

The outreach component took into account the particular challenges of communities living in the vicinity of a protected area. The project enabled livelihood enhancing activities for about 400 households through Self-Help Groups and Eco-Development Committees. In response to community concerns, like human-wildlife conflict, it set up 40 watch towers at strategic locations on the park-village boundary. A World Heritage Biodiversity Scholarship scheme helped 180 students.

From a protected area management perspective, new anti-poaching camps and outposts were set up, forest beat camps were renovated, and modern wireless communication equipment were provided for frontline Forest Department staff. A three-phase staff training programme on wildlife crime, and scientific research on wildlife and habitat was incorporated in monitoring reports as part of capacity building of the protected area staff and management.



Gurudongmar Lake, Sikkim.

Energy use patterns and ICS

A study initiated in 2012 is looking at energy use at the household level, seasonality, choice of fuelwood species, use of alternatives and sources of fuelwood, including time allocation for collection, for rural communities in Darjeeling who do not have easy access to alternative energy sources like LPG and kerosene.

Villagers report that preferred fuelwood species, like oaks, are no longer available in the adjacent forest patches. Available evidence also suggests that indoor air pollution from biomass fuels and traditional cook stoves may pose a serious health threat, particularly to women and young children who spend considerable time near the stove.

ATREE has been promoting the use of Improved Cook Stoves (ICS) in villages in the Senchel Wildlife Sanctuary and Singhalila National Park areas. The replacement of traditional stoves by ICS improves heat transfer, which reduces the amount of fuel required and the amount of emissions. Households report that fuelwood use is nearly 40–50% less in the new stoves.



Pic: Urbashi Pradhan

Sustainable Livelihoods Programme

The conservation and livelihoods component of the Darjeeling Himalayas programme continues to work on issues of energy use, training for income generation, organizing Self-Help Groups, restoring agro-diversity and promoting ecotourism and sustainable agriculture. It has expanded to four more villages in the Senchel WLS and Singhalila National Park clusters. With this, the Sustainable Livelihoods Programme covers over 340 households in 10 villages, benefiting over 1400 people.

The people of Rampuria forest village have initiated village-based tourism. They also provide home-stay facilities to trainees, researchers, students and government staff. ATREE has helped with developing a tourism plan and the formation of a Rampuria Forest Village Homestay/Tourism Management Committee. This committee is now in the process of developing guidelines with regard to management (roles, responsibilities, internal monitoring, and tariffs), partnership roles, marketing, benefit sharing and also allocation of a percentage to the Committee Fund. Travel and tourism companies are already coordinating with the committee and including Rampuria as a destination in their itinerary.

Climate Change and Disaster Risk Reduction

Disaster events of the past – the earthquake of 2011, and Cyclone Alia in 2009 – have brought to the fore the lack of preparedness of the state and community in dealing with extreme events. With the overall objective of strengthening the climate resilience of socio-ecological systems in the Eastern Himalaya, ATREE has been organizing stakeholder consultations in project sites in Darjeeling and Sikkim, at the state, district and village levels. These have focused on gathering stakeholder perceptions on the key risks and drivers of disaster, the coping mechanisms, and the lessons learnt in disaster management and preparedness. The longer-term goal is to develop and pilot a regional model for the integration of climate change information into risk reduction planning and rural development planning. It will involve stakeholder perception assessments, knowledge synthesis, including preliminary climate modelling, capacity building of civil society, and improving the capacity of policy-makers by sharing research outputs and results on the ground.

The consultations are a part of the START-funded project on Linking Disaster Risk Reduction (DRR), Climate Change Adaptation (CCA), and Sustainable Landscape Development Goals in the Eastern Himalaya.

Policy

How to reduce human-wildlife conflicts: elephants in Karnataka

Karnataka is home to a fifth of the country’s population of elephants. Following increasing incidences of straying and human–elephant conflicts, a Karnataka Elephant Task Force was set up. S. Lele of ATREE’s Forests and Governance programme was invited to be part of this Task Force.

The recommendations of the Task Force to the Government of Karnataka follow from the objectives of long-term survival of viable populations of elephants, and reduction of conflict between elephants and people so as to relieve human suffering and promote greater acceptance and tolerance of elephants.

The Task Force has submitted a report recommending a zone-based framework for protection of elephants and their habitats, mitigation of elephant–human conflicts, strengthening of administrative structures and institutions, participation of local communities in

planning and management of conflict, ensuring the welfare of captive elephants, and scientific monitoring of elephants and conservation schemes.

Sharing the learning: focus on India’s Ramsar wetlands

One hundred and thirty two delegates, scientists and government officials met for the first time for a discussion on issues concerning Ramsar wetlands in India at the National Ramsar Sites Stakeholders Meet and Wetland Conservation Seminar. Participants ranged from farmers and fishermen, to environmentalists, naturalists, researchers, scientists, teachers, politicians, and staff from government and non-government organizations.

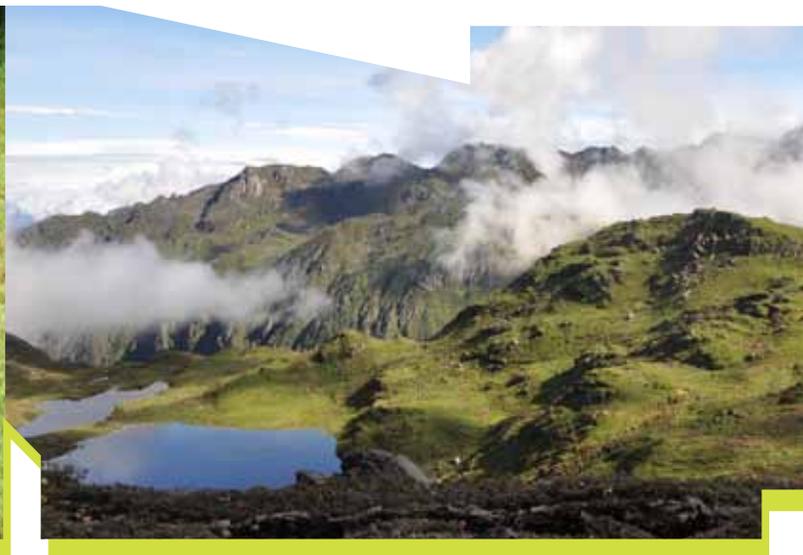
The aim of the seminar was to share conservation models and learning that could be replicated. The event was supported by the Ministry of Environment and Forests. WWF India, Department of Environment and Climate Change and Government of Kerala were event partners. The meet was held at Alappuzha, Vembanad Kol wetlands, the largest Ramsar site in India.

Pic: Sandesh Kadur



Is it just about territory? Human-elephant conflict in Karnataka.

Pic: Shweta Basnett



Alpine dwarf rhododendrons habitat, site for study of climate change impacts on phenology and plant-pollinator interactions.

Citizen science

Karnataka Biodiversity Atlas

In 2012, the Karnataka Biodiversity Board, Government of Karnataka, commissioned ATREE to develop an open source, open access web-GIS atlas on the biodiversity of Karnataka. The atlas was envisioned as a publicly accessible, web-enabled, spatial database that would allow users – academics, policy makers, nature enthusiasts – to visualize the distribution of biodiversity in Karnataka, along with associated species and habitat information. The atlas is being developed from secondary datasets contributed by government and non-government organizations, and from individual researchers.

ATREE will launch the beta version of this atlas in 2013. The Karnataka Biodiversity Atlas is being developed in collaboration with Strand Life Sciences and University of Agricultural Sciences, Gandhi Krishi Vignana Kendra.

Waterfowl census 2013

The Agasthyamalai CCC conducted its third mid-winter waterfowl census in the wetlands of Tirunelveli and Thoothukudi districts, with the help of 51 citizen volunteers and the Pearl City Nature Society. Volunteers – students, teachers, nature enthusiasts and birdwatchers carried out the survey in 63 wetlands. Preliminary results recorded the presence of more than 58,000 birds belonging to about 60 species. Waterbird numbers from about 40 wetlands that were surveyed during all the three years revealed an increase of about 9,000 birds from the first two years of survey. Deep water birds like pochards and diving birds like cormorants were in fewer numbers due to depleted water levels owing to scanty rainfall this year.

Small Grants Programme in the Eastern Himalayas

One of the key capacity building activities of ATREE, supported by Ford Foundation, is the Small Grants Programme for the Eastern Himalayas. The programme supports researchers and local organizations to conduct studies on various aspects of biodiversity in the Eastern Himalayas. Five grant agreements were signed in 2012 for work that will end by December 2013.



Pic: Rohin D'souza



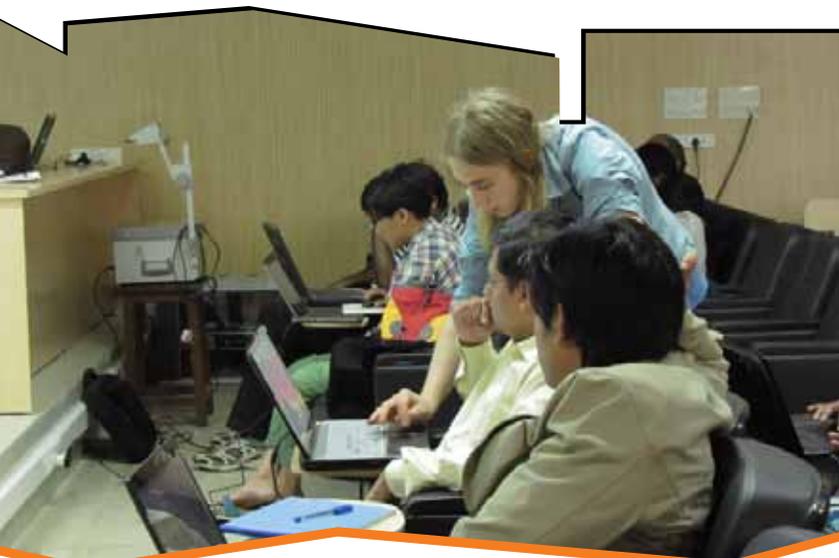
Olive-backed pipit.



Pic: Prashanth M. B.

The waterfowl census recorded more than 58,000 birds belonging to 60 species.

Pic: Ovee Thorat



Biodiversity Asia 2012 workshop.

Aaranyak has developed novel mitochondrial sequence markers to assess presence of tiger and sympatric co-predators in Garo Hills, Meghalaya. This non-invasive genetic study has confirmed the presence of leopard, marbled cat and leopard cat in the protected areas of Garo Hills.

Samrakshan Trust is promoting community-based livelihoods through eco-tourism in the Balpakram Baghmara landscape, Meghalaya, where monoculture plantations are overtaking natural landscapes.

Varun Goswami is evaluating the ecological and socio-economic drivers of human–elephant conflict in a fragmented, human-dominated landscape in Garo Hills. Data from the study shows that incidents of conflict were most frequently reported in areas adjacent to forest patches.

Karshni Naresh Chaitanya has taken up the documentation of orchids in Sikkim Himalayas, using as reference the seminal 1898 tome, *The Orchids of the Sikkim Himalayas*, by Sir George King and Robert Pantling. The work will attempt to locate all 449 species documented in the book.

Anand Gazmer, an ATREE PhD scholar, finds that global warming is influencing local climate, agro-ecosystems, surrounding biodiversity and local livelihoods in his work on the response of high altitude vegetation to climate change in Darjeeling Himalaya and its conservation and social outcomes.

Pic: Ovee Thorat



Madhav Gadgil on Western Ghats, nature, people and development at the 9th TN Khoshoo Memorial Lecture.

CEPF

The Critical Ecosystem Partnership Fund (CEPF) is one of the largest conservation investments in the Western Ghats Biodiversity Hotspot, with ATREE as its regional implementation partner since 2008. On the basis of remarkable progress by this initiative, this five-year programme extended its term by another two years beyond its scheduled April 2013 closure. On the strength of the extension, and additional funds, proposals were invited by ATREE for the fourth round in December 2012, with 95 applications received. Of these, 16 small grants and 15 large grants were selected in February 2013, by a decision making panel consisting of CEPF, ATREE Regional Implementation Team and external invited expert members, to add to the 69 grants already implemented in the landscape.

Khoshoo

The Khoshoo Memorial Awards recognize exceptional efforts in the areas of research and application in conservation, environment and development in India. They are sponsored by the Khoshoo family, ATREE, and the Institute of Rural Research and Development (an initiative of the SM Sehgal Foundation).

Vidya Athreya, Research Associate with Pune's Kaati Trust, and Centre for Wildlife Studies and Asian Nature

Pics: Sutapa Mukherjee



L-R: Evening cultural event and field activity of the Continuous Engagement Programme of the earthian sustainability awards.

Conservation Foundation, Bengaluru was recognized for her pioneering work on leopards in human-dominated spaces. Dr Madhav Gadgil gave the 9th TN Khoshoo Memorial Lecture on *Western Ghats: Nature, People and Development*.

This year's Khoshoo earthian trophy went to KK English High School, Bengaluru; Sakar English School, Ahmedabad; and Rajalakshmi Engineering College, Chennai for their practical action plans on waste management. This is part of the Khoshoo youth outreach, in partnership with the Wipro earthian. Read more about Wipro earthian's Continuous Engagement Programme on page 29.

Workshops

Conservation and environment debates in Asia

ATREE and its partners organized the 2nd Asia Regional Conference of the Society for Conservation Biology (SCB) in Bengaluru, over five days, in August 2012. The theme of the conference was Science, Policy and Governance. Natural and social scientists discussed the social, cultural, political, economic and ecological aspects of doing conservation in the human-dominated landscapes of Asia over various symposia, talks, panel discussions and workshops. 400 participants from 23 countries attended this conference.

Developing species portals requires more than technology

ATREE organized a two-day Indo-US workshop on biodiversity informatics to survey state-of-the-art biodiversity initiatives in India and the United States; propose standards for convergence and exchange of information among diverse biodiversity portals; promote integration of geospatial data with species pages; and facilitate increased citizen involvement in biodiversity informatics. The participants addressed issues of collaboration, compatibility across portals or platforms, and reliability of crowd-sourced data. They identified taxonomic overlaps and lack of collaboration as the two most critical hurdles in the creation of reliable online biodiversity information directories.





6 Publications

- Books
- Book chapters
- Peer reviewed articles
- Discussion papers
- Reports
- Popular press

Books

Bawa, K. S. and S. Kadur. 2013. *Himalaya: Mountains of Life*. Bengaluru: Ashoka Trust for Research in Ecology and the Environment.

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Priyadarsanan, D. R., S. Devy, N. A. Aravind, K. A. Subramanian and S. Narayanan. 2012. *Invertebrate diversity and conservation in the Western Ghats*. Bengaluru: Ashoka Trust for Research in Ecology and the Environment.

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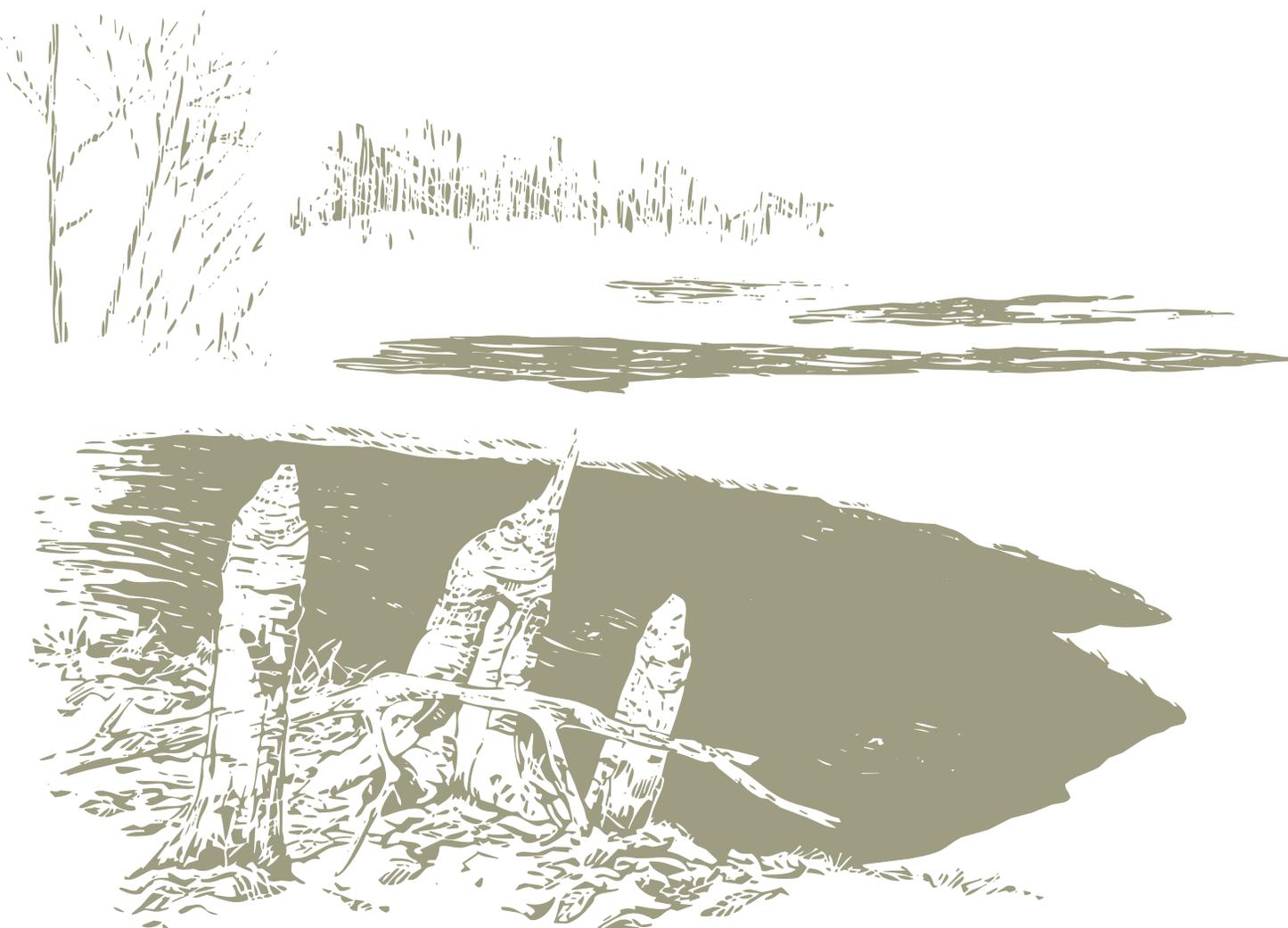
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7 Awards & recognitions

1. UNESCO's World Heritage Committee inscribed the Western Ghats into World Natural Heritage Sites in July 2012. ATREE had provided the scientific basis for selecting sites in the Government of India proposal to UNESCO in 2006. ATREE also facilitated stakeholder meets with visiting reviewers, while this proposal was being evaluated.
2. ATREE was ranked 19th in the global list of top 70 environment think tanks in the University of Pennsylvania think tanks ranking.
3. Niraj Kakati, Coordinator, Assam, was nominated to the Regional Expert Committee for undertaking *'Management Effectiveness Evaluation of the Protected Area Network in India'* by the Ministry of Environment and Forests, Government of India. The sites will include National Parks and Wildlife Sanctuaries in six states of northeast India.
4. Jagdish Krishnaswamy was nominated to the executive committee of the Indian Society for Ecological Economics (INSEE). He was also nominated as a member of the International Scientific Committee of Programme on Ecosystem Change and Society (PECS) under the International Council for Science (ICSU).
5. Sharad Lele was elected to the board of International Society for Ecological Economics.





8 People

Senior management

Ganesan Balachander
Director

Sridhar Ramaswamy Iyengar
Deputy Director – Finance & Administration

Sarala Khaling
Regional Director, Gangtok

Gladwin Joseph
Senior Fellow, Academy Convenor till March 2013
and Director till August 2012

Nitin Rai
Fellow and Academy Convenor from April 2013

Jagdish Krishnaswamy
Senior Fellow and Centre Convenor, Suri Sehgal Centre
for Biodiversity and Conservation

Sharachandra Lele
Senior Fellow and Centre Convenor, Centre for
Environment and Development

Faculty

Centre for Environment & Development

Land, Water and Livelihoods

Shrinivas Badiger
Fellow and Programme Leader

Bejoy Thomas
Fellow

Priyanka Jamwal
Fellow

Seema Purushothaman
Fellow, till October 2012

Sumit Sen
Fellow till July 2012

Forests and Governance

Sharachandra Lele
Senior Fellow and Programme Leader

Nitin Rai
Fellow and Academy Convenor

Siddappa Setty
Fellow

Swati Shresth
Fellow

Suri Sehgal Centre for Biodiversity and Conservation

Ecosystems and Global Change

Ankila Hiremath

Fellow and Programme Leader

Priyadarsanan Dharma Rajan

Senior Fellow and Programme Leader

Abi Tamim Vanak

Fellow

Aravind N. A.

Fellow

Harini Nagendra

Ramanujam Fellow

Ravikanth G.

Fellow

R. Ganesan

Fellow

T. Ganesh

Senior Fellow

Ecosystem Services and Human Wellbeing

Jagdish Krishnaswamy

Senior Fellow and Programme Leader

Siddhartha Krishnan

Fellow

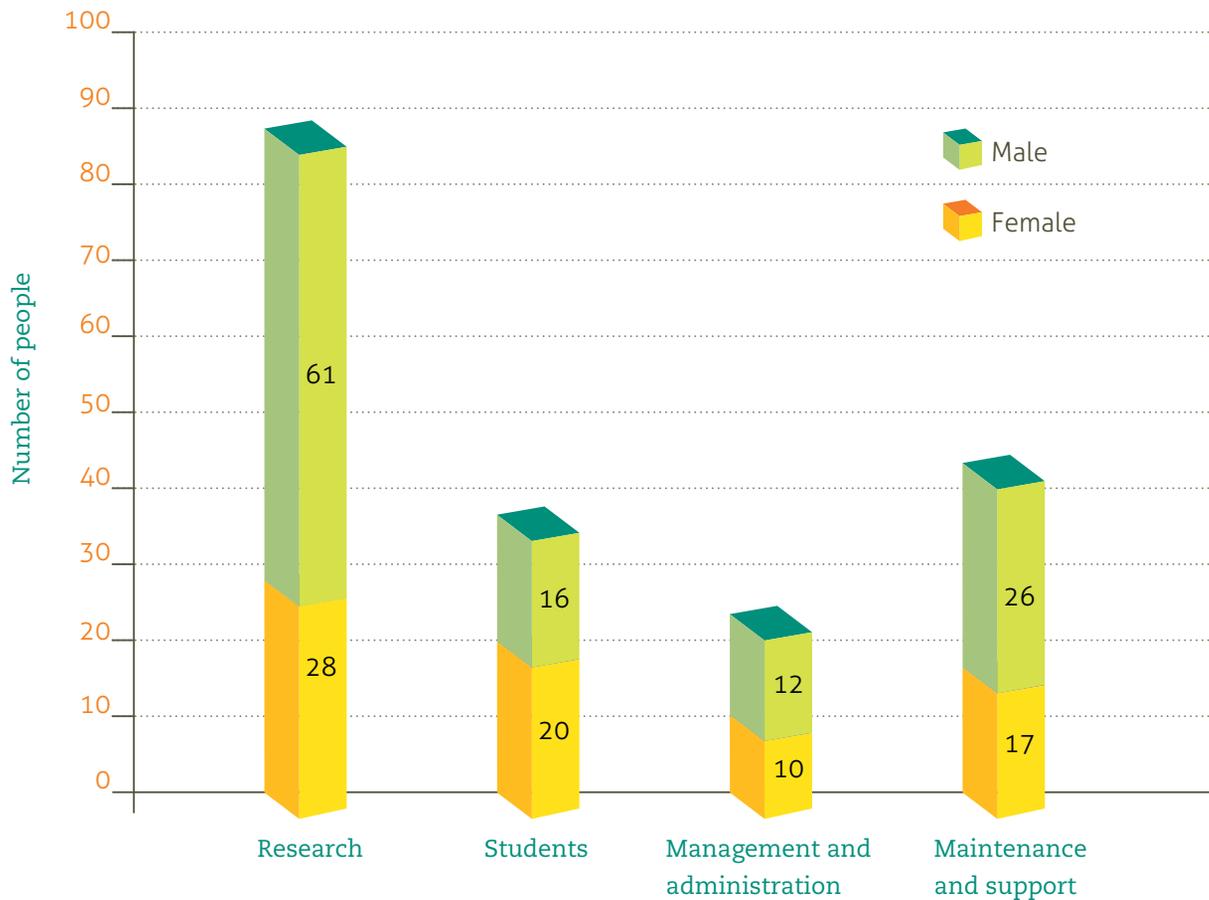
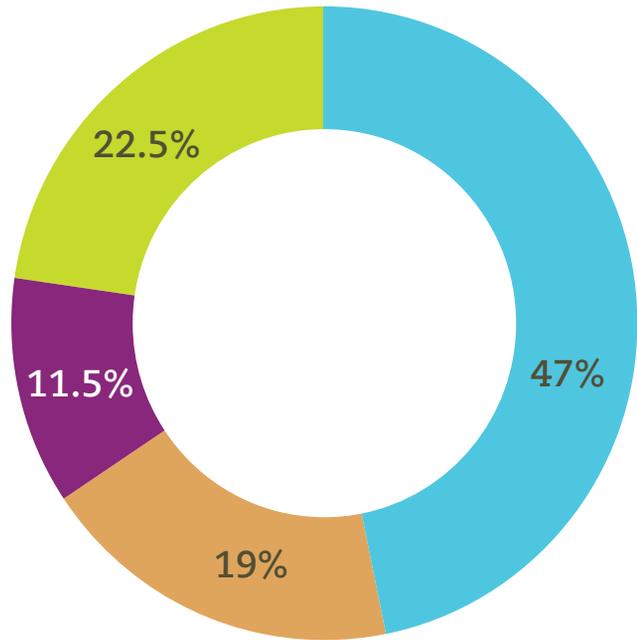
Soubadra Devy

Fellow

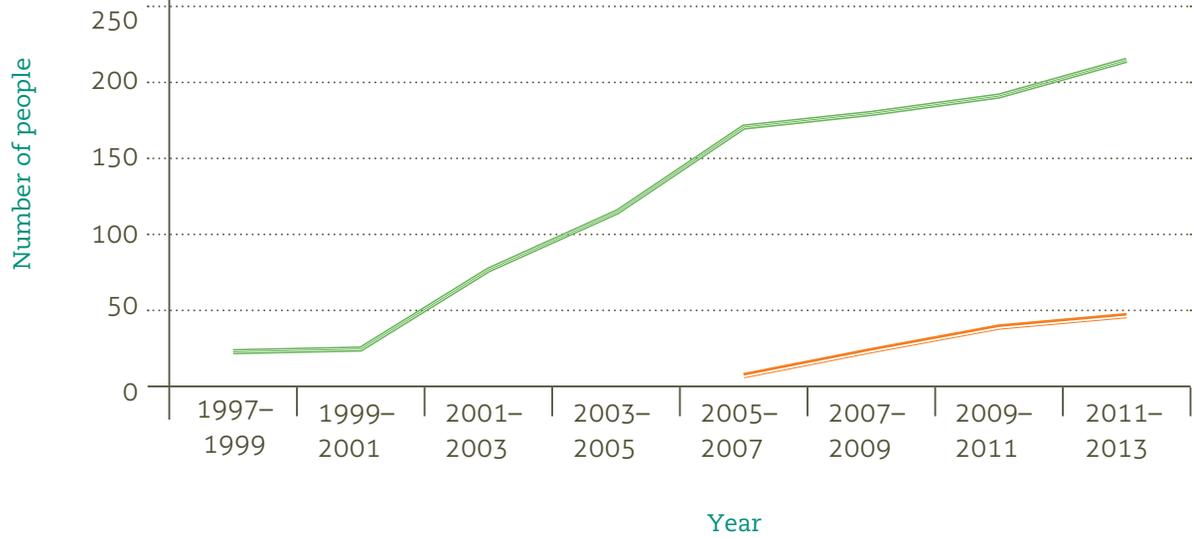
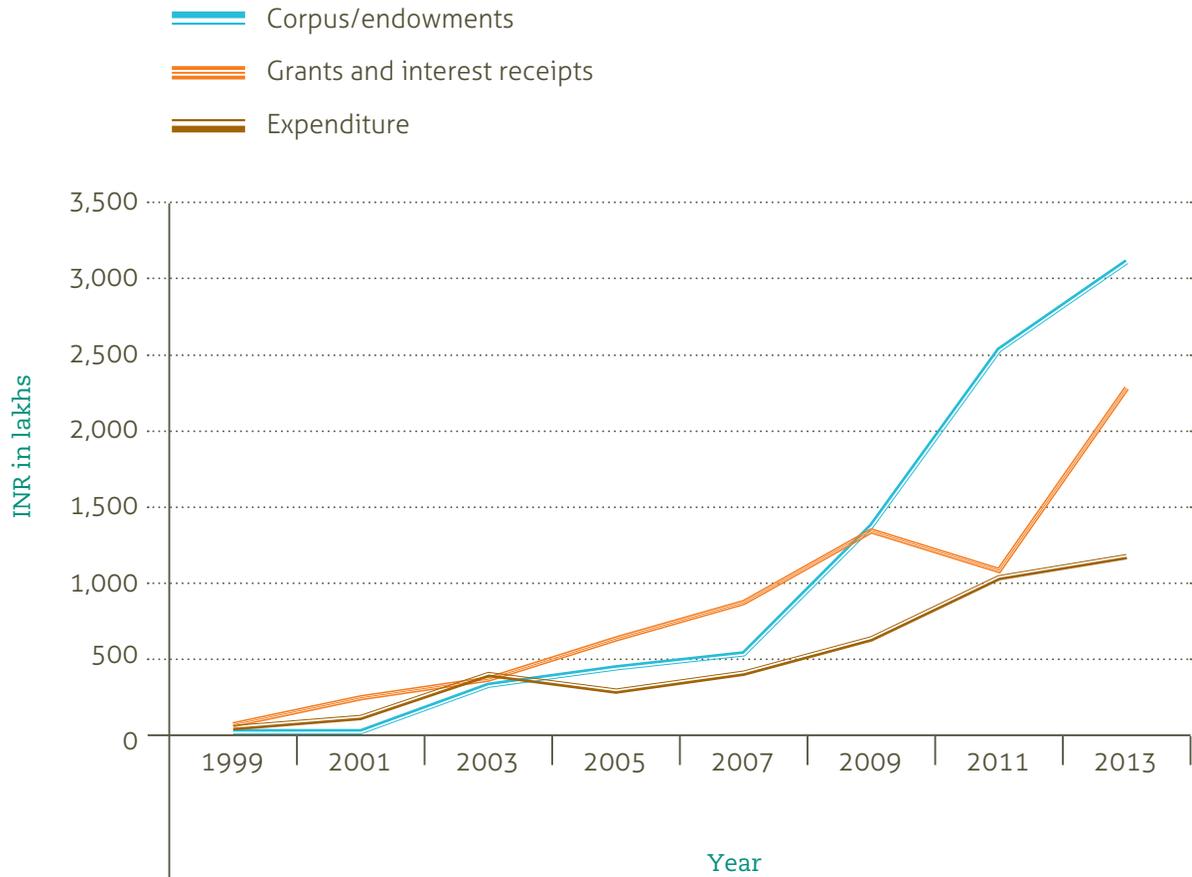


Staff strength

- Research
- Students
- Management and administration
- Maintenance and support



People



- ▬▬▬ Staff strength
- ▬▬▬ Students

9 Partners

Research

Ambedkar University, New Delhi
Aaranyak, Guwahati, Assam
Abasaheb Garware College, Pune
Andhra Pradesh Forest Department, Hyderabad
Centre for Ecological Sciences, Indian Institute of Science, Bengaluru
Centre for Wildlife Studies, Bengaluru
Chicago Botanical Garden, USA
College of Forestry, Ponnampet, S. Kodagu
College of Forestry, University of Agricultural Sciences Dharwad, Sirsi, Karnataka
College of Horticulture and Forestry, Pasighat, Arunachal Pradesh
Concordia University, Montreal, Canada
Consiglio Nazionale delle Ricerche – Istituto di Studi sui Sistemi Intelligenti per l'Automazione (CNR-ISSIA), Bari, Italy
Department of Biotechnology, Government of India
Department of Environment and Forests, Government of Assam
Department of Environmental Science, Rhodes University, south Africa
Department of Forests, Environment and Wildlife, Sikkim
DLR Prerna, Darjeeling
Dolphin Foundation, Guwahati, Assam
ETH Zurich, Zurich, Switzerland
FERAL
Foundation for Ecological Research, Advocacy and Learning, Puducherry
French National Institute for Agricultural Research, France
Goa Forest Department
Gubbi Labs, Gubbi, Karnataka
Indian Institute of Integrative Medicine, CSIR, Jammu
Indian Institute of Science, Bengaluru, Karnataka
Indian Society for Ecological Economics
Indo-French Cell on Water Science, Bengaluru, Karnataka
Kerala Forest Research Institute, Peechi, Kerala
Ministry of Earth Sciences
Ministry of Environment and Forests
National Centre for Biological Sciences, Bengaluru, Karnataka
National Institute of Hydrology, Hard Rock Regional Centre, Belgaum, Karnataka
Natural Remedies Limited, Bengaluru
Nature Conservation Foundation, Mysore, Karnataka
Office of the Director, Kaziranga National Park, Bokakhat, Assam
Office of the Field Director, Manas Tiger Project, Assam
Rubber Research Institute, Kottayam, Kerala
Sahjeevan, Bhuj, Gujarat
School of Geography and Environmental Science, Monash University, Australia
Stockholm Resilience Centre
Tropical Botanical Garden and Research Institute, Thiruvananthapuram
University of Agricultural Sciences, Bengaluru, Karnataka
University of Cambridge, Cambridge, UK
University of Dundee
University of East Anglia, Norwich, UK

University of Guelph, Ontario, Canada
 University of Hawaii at Manoa, Hawaii, USA
 University of Kansas, Lawrence, USA
 University of Kent, Canterbury, UK
 University of KwaZulu-Natal, south Africa
 University of Oxford, Oxford, UK
 Uppasala University, Sweden
 Wildlife Institute of India, Dehradun
 Winrock International India, New Delhi
 World Wildlife Fund for Nature (WWF), state office, Hyderabad.
 WWF-India Program, Guwahati, Assam
 Yenepoya University, Mangalore
 Zilla Budakattu Soliga Abirudhi Sangha, Yarakaganadde, BR Hills

Education

Department of Environment Science, Kannur University, Kerala
 DePaul University, Illinois, USA – partner education
 Kansas University, USA
 Manipal University, Manipal, Karnataka
 Norwegian University of Life Sciences (UMB), Norway
 Oregon State University, USA
 Wipro earthian

Outreach

All India Radio, Thoothukudi, Tamil Nadu
 CEPF/Conservation International, USA
 EcoSystems - India, Guwahati, Assam
 Kainakary Grama Panchayath, Alappuzha, Kerala
 Kavalam Grama Panchayath, Alappuzha, Kerala
 Manas Agrang Society, Baksa, Assam
 Manas Bhuyanpara Conservation and Ecotourism Society, Baksa, Assam
 Manas Ever Welfare Society, Baksa, Assam
 Muhamma Grama Panchayath, Alappuzha, Kerala
 National Green Corps, Tirunelveli, Tamil Nadu

National Rural Health Mission, BTAD, Assam
 Natundanga Eco-Development Committee, Kaziranga National Park, Assam
 Nature Talkies, Manimutharu, Tamil Nadu
 Nature's Foster, Bongaigaon, Assam
 Panbari Manas National Park Protection and Ecotourism Society, Chirang, Assam
 Pearl City Nature Society, Thoothukudi
 Pulimkunnu Grama Panchayath, Alappuzha, Kerala
 Rhino Foundation for Nature in NE India, Guwahati
 Sri Paramakalyani College, Alwarkurchi, Tirunelveli, Tamil Nadu
 Swasam Trust, Ambasamudram, Tirunelveli, Tamil Nadu
 The Dohnavur Fellowship, Dohnavur, Tirunelveli, Tamil Nadu
 Tilak Vidyalaya Hr. Sec., School, Kallidaikurichi, Tirunelveli, Tamil Nadu
 Tribal Cooperative Marketing Development Federation of India Limited (TRIFED), South Zone
 Vanastree - The Malnad Forest Garden and Seedkeepers' Collective, Sirsi, Karnataka
 Veliyanadu Grama Panchayath, Alappuzha, Kerala
 Vembanad Nature Club, Alappuzha, Kerala
 Village Panchayats of Ayan Singampatti, south Papankulam, Veerasamuthiram Tirunelveli, Tamil Nadu
 Vivekananda Girijana Kalyana Kendra, Biligiri Rangaswamy Temple Wildlife Sanctuary, Karnataka
 Wildlife Trust of India, Guwahati, Assam
 WWF - India Program, Guwahati, Assam

Donors

Endowments

Arghyam Foundation, Bengaluru, India
 Bawa family, Belmont, USA
 Balachander family, Bengaluru, India
 Ford Foundation, New Delhi, India
 Kasturi Trust, Bengaluru, India

Shibulal family, Bengaluru, India
 Ms. Rani Dalbir Chaudhary, Punjab, India
 Ms. Rohini Nilekani, Bengaluru, India
 Sehgal family Foundation, Iowa, USA
 Sir Dorabji Tata Trust, Mumbai, India
 Smt. Mohini Khoshoo, New Delhi, India

Grants

Azim Premji Foundation for Development, Bengaluru, India
 Conservation International, Virginia, USA
 Critical Ecosystem Partnership Fund, Virginia, USA
 Department of Biotechnology, Government of India, New Delhi, India
 Department of Environment and Climate Change, Kerala, India
 Department of Science and Technology, Government of India, New Delhi, India
 Earthwatch Institute, Oxford, UK
 Ecosystems Services for Poverty Alleviation Programme, UK
 European Commission, Brussels, Belgium
 Ford Foundation, New Delhi, India
 GE Volunteers Foundation, Connecticut, USA
 Government of Kerala, India
 Greenpeace Environment Trust, Bengaluru, India
 Harp Matharu, Grange Hotels, London, UK
 Indian Statistical Institute, New Delhi, India
 Indo French Centre for the Promotion of Advanced Research, New Delhi, India
 Institute for Global Environment Strategies, Kanagawa, Japan
 International Centre for Integrated Mountain Development, Kathmandu, Nepal
 International Development Research Centre, Canada
 International Foundation for Science, Sweden
 International Union for Conservation of Nature and Natural Resources, Switzerland
 Karnataka Biodiversity Board, Bengaluru, India

MacArthur Foundation, Chicago, USA
 Madras Crocodile Bank Trust, Tamil Nadu, India
 Ministry of Earth Sciences, New Delhi, India
 Ministry of Environment and Forests, Government of India, New Delhi, India
 National Bank for Agriculture and Rural Development, Karnataka, India
 National Fish and Wildlife Foundation, Washington DC, USA
 National Geographic Society, Washington DC, USA
 Natural Environment Research Council, Swindon, UK
 Navajbai Ratan Tata Trust, Mumbai
 Rainforest Concern, London, UK
 Rufford Small Grants Foundation, London, UK
 SM Sehgal Foundation, Gurgaon, India
 Schlinger Foundation, California, USA
 South Asian Network for Developmental and Environmental Economics (SANDEE)
 Stockholm Resilience Centre, Stockholm, Sweden
 Tata Social Welfare Trust, Mumbai, India
 The International START Secretariat, Washington DC, USA
 The Mohamed Bin Zayed Species Conservation Fund, UAE
 US Agency for International Development, Washington DC, USA
 US Fish and Wildlife Service, Virginia, USA
 UN Foundation, Washington DC, USA
 United Nations Educational, Scientific and Cultural Organization, New Delhi, India
 University of Cambridge, Cambridge, UK
 Wildlife Conservation Society, New York, USA
 Wipro Cares Trust, Bengaluru, India
 Wipro Limited, Bengaluru, India
 World Bank, Washington DC, USA



Independent Auditor's Report

To the board of trustees of Ashoka
Trust for Research in Ecology and the
Environment (ATREE)

Report on the financial statements

We have audited the accompanying financial statements of ASHOKA TRUST FOR RESEARCH IN ECOLOGY AND THE ENVIRONMENT {ATREE}, Bangalore- 560 064, which comprise the Balance Sheet as at March 31, 2013, and the Income and Expenditure account, Receipts and Payments account and a summary of significant accounting policies for the year then ended.

Management's responsibility for the financial statements

Management is responsible for the preparation of these financial statements that give a true and fair view of the financial position, financial performance and cash flows of the Entity in accordance with the accounting principles generally accepted in India. This responsibility includes the design, implementation and maintenance of internal control relevant to the preparation and presentation of the financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.

Auditor's responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with the Standards on Auditing issued by the Institute of Chartered Accountants of India. Those Standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement. An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making

those risk assessments, the auditor considers internal control relevant to the Entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of the accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

- (i) In our opinion and to the best of our information and according to the explanations given to us, the financial statements of ASHOKA TRUST FOR RESEARCH IN ECOLOGY AND THE ENVIRONMENT {ATREE} for the year ended March 31, 2013 are prepared, in all material respects, in accordance with the accounting principles generally accepted in India; that proper books of accounts have been maintained by the trust, so far as appears from our examination of those books; and that the Balance Sheet, Income and Expenditure Account and Receipts and Payments account dealt with by this report are in agreement with the books of accounts.

Place: Bengaluru
Date: 5th July 2013

For G. Anantha & Co.
Chartered Accountants
FRN: 005160S

Rani N.R.
Partner
M. No.: 214318

Balance Sheet as at 31st March 2013

Rupees in lakhs*

Source of Funds	As at 31-3-2013		As at 31-3-2012	
Corpus fund		3,100.86		2,735.49
General fund		73.66		75.70
Utilized reserves				
Project assets		768.94		618.04
Other assets		33.29		38.19
Land and building		415.56		423.38
Project fund		1,743.08		1,123.84
Total		6,135.39		5,014.64
Application of Funds				
Fixed assets				
Project assets		768.94		618.04
Other assets		33.29		38.19
Land and building		415.56		423.38
Investments				
Corpus investments		3,101.28		2,740.66
Other investments		1,716.12		940.03
Current assets and liabilities				
Advances	22.29		39.16	
Other current assets	10.03		8.13	
Cash and bank	69.66		209.15	
Gross current assets	101.98		256.44	
Less: Current liabilities	1.78		2.10	
Net current assets		100.20		254.34
Total		6,135.39		5,014.64

1 lakh=1,00,000

Income and Expenditure Account for the year ended 31st March 2013

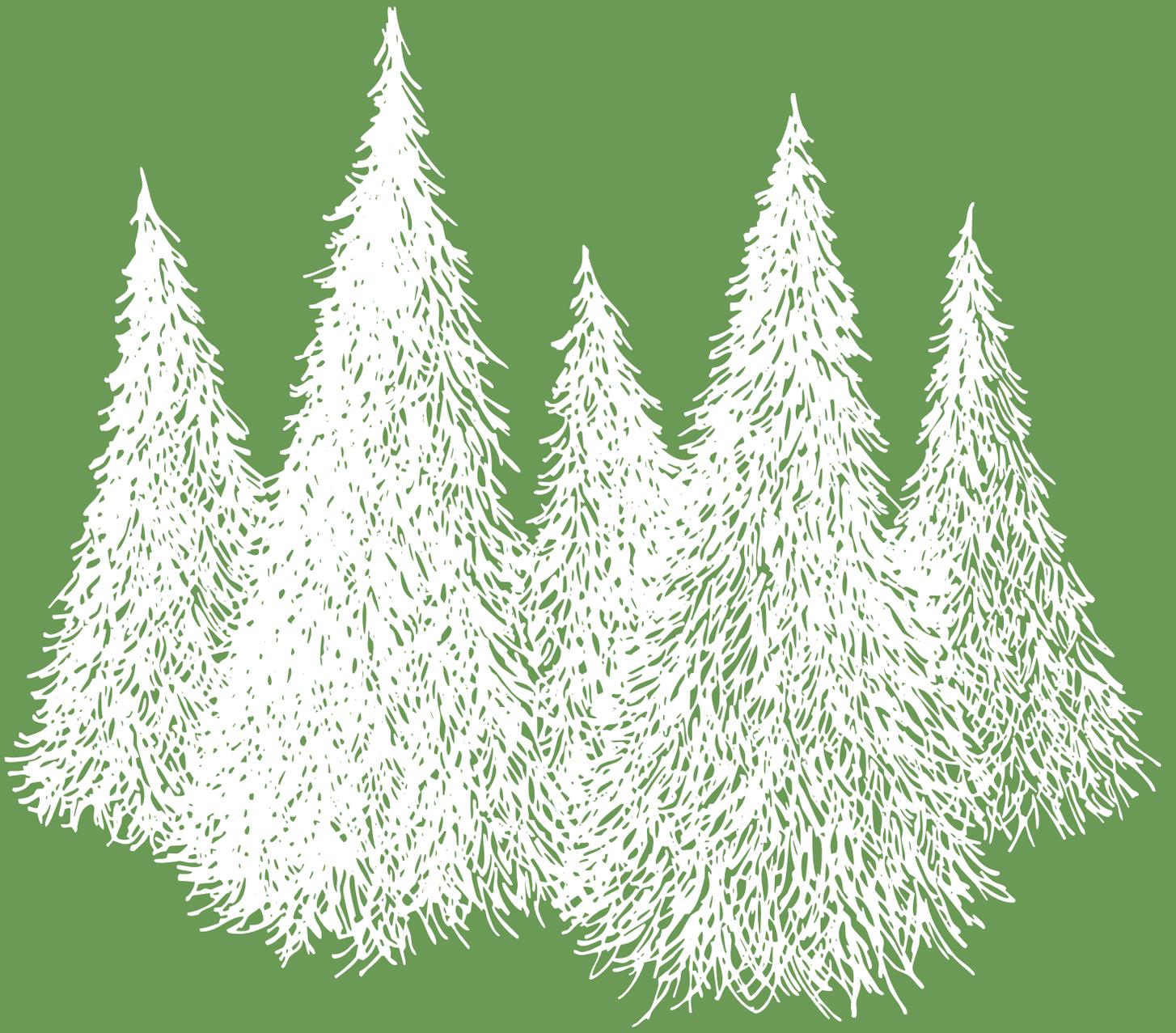
Rupees in lakhs

Particulars	For the year end 31-03-13	For the year end 31-03-12
Income		
Project income	1,121.18	1,070.30
Interest income	44.80	32.01
Other income	11.19	0.19
Total	1,177.17	1,102.50
Expenditure		
Staff cost and welfare	627.68	477.45
Travel	114.92	77.51
Operating and programme expenses	436.31	534.50
Depreciation	15.86	15.51
Total	1,194.77	1,104.97
Surplus/(deficit)	(17.60)	(2.47)

Receipts and Payments Account for the year ended 31st March 2013

Rupees in lakhs

Receipts	31 March 2013
Opening balances (Cash and cash equivalents)	3,889.84
Project grants	1,663.87
Corpus/endowments	327.04
Interest and other income	403.90
Total	6,284.65
Payments	
Fixed assets	166.50
Staff cost and welfare	608.35
Travel	114.87
Operating and programmatic expenses and advances	1,231.10
Closing balances (Cash and cash equivalents)	4,887.05
Total	6,284.65





ATREE is recognised as a Scientific and Industrial Research Organisation by the Ministry of Science and Technology, Government of India.

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