



REPORT 2005–2007

ASHOKA TRUST FOR RESEARCH IN ECOLOGY AND THE ENVIRONMENT

CONSERVING BIODIVERSITY AND SUSTAINING OUR FUTURE

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Acknowledgements: ATREE would like to acknowledge and thank its staff who have contributed text and photographs to this report.

FOREWORD

The Ashoka Trust for Research in Ecology and the Environment (ATREE) was established in 1996. During its ten years of existence, ATREE has emerged as one of India's premier conservation organizations. As described in the pages of this report, we have launched a number of programs and our work is having an impact on conservation. While we celebrate our successes, a decade of existence should provide a pause for reflection and time to think about future priorities.

Although organizations such as ATREE are generating new and relevant knowledge, building human resources, and bringing stakeholders together for conservation action, a number of challenges remain. Rapid economic growth, inequitable development, and poor governance continue to extract a heavy toll from the environment. Climate change further threatens to exacerbate environmental degradation and losses of biodiversity. At the same time polarization about such issues as the Forest Dwellers Rights Act, 2006 is preventing the society to reach a consensus on the best ways to conserve and manage biodiversity.

ATREE is developing its strategic plan to confront our most pressing environmental challenges. Improvements in policies and environmental governance, climate change, harmonization of the provisions of the Forest Rights Act and conservation goals are likely to be the key components of the new plan. ATREE will also anchor a multi-institutional India Biodiversity Portal, sponsored by the National Knowledge Commission. The portal will advance knowledge about all aspects of biodiversity, provide a forum to scientists and citizens alike to enrich biodiversity databases, and disseminate information about biodiversity.

Central to ATREE's future is our concept of an Academy for Conservation Science and Sustainability Studies that will encompass almost all our research and capacity building programs. An innovative, interdisciplinary doctoral program in conservation science and courses and certificate programs for professionals from non-government organizations and government organizations as well as college and university teachers will constitute the core academic programs of the Academy. Five community conservation centers will serve as the field extensions of the Academy, facilitating the combination of theory and practice, integration of different knowledge systems and the two-way flow of ideas and information between the classroom and the field.

ATREE would need support and advice from our friends and well wishers as we move forward to implement a range of new programs. Thus we welcome comments and inputs from the readers of this report.

ATREE continues to receive support from many sources, but we are particularly grateful to the Arghyam Foundation, Ford Foundation, Suri Sehgal Foundation, Sir Dorabji Tata Trust and an anonymous donor for their generous unrestricted support.

Kamaljit S. Bawa
President

INTRODUCTION

Globally, we are going through a period of far-reaching environmental and economic transformation. The three key elements of environmental change are land-use change, biodiversity change and climate change. Underlying these changes are population growth combined with increasing consumption levels, and policies associated with development, economic growth and international trade. Globalisation – the movement of goods, services, and ideas through international trade and information technologies – is also accelerating economic and environmental changes. All these changes have significant consequences for sustainability and human well-being.



Our understanding of the complex web of these changes and of how best to manage them is fairly limited. For example, chronic rural poverty and environmental degradation are causally linked

and mutually reinforcing; they can be resolved only if they are addressed simultaneously. Yet possible solutions are necessarily complex, multi-level and multi-variable, and involve people, policy, livelihood, conservation and governance, at the very least. They also need to be implemented over the long-term and at large enough scales for them to reverse these negative trends.

In South Asia, many ecosystems are largely modified by human presence, extraction of biomass and appropriation of ecosystem services. One of the most challenging issues is the maintenance of biodiversity and ecosystem services under these conditions, and especially identifying the scale and intensity of human use that is compatible with continued maintenance of biodiversity and ecosystem services. Our understanding of economic and environmental change, the forces underlying these changes and the impact of changes on biodiversity and humanity are still not very clear.

The degradation of natural capital – biodiversity and natural ecosystems – is of particular concern for several reasons. First, changes are rapid and when associated with loss of species or ecosystems, irreversible. Second, the loss of natural ecosystems results in loss of ecosystem services such as clean water from watersheds, retention of soil and soil fertility, sequestration of carbon and provision of pollinators and natural predators of pests. Value of these ecosystems services often exceeds the annual gross domestic product of countries. Third, in a country like India, millions of people rely on products from natural ecosystems to sustain their livelihoods. Fourth, our understanding of biodiversity in natural ecosystems both in terms of the amounts and function remains so woefully inadequate that we are unable to fully comprehend the consequences of its loss. Fifth, with impending climate change and increasing spread of invasive species, biodiversity crisis is likely to get worse with far reaching impacts on human societies. Sixth, developments in science, sampling and decision science have not yet played a key-role in the management of complex ecosystems. Finally, with impending climate change and increasing spread of invasive species, the degradation is likely to worsen, with far-reaching impacts on human societies.

ATREE STATEMENT

Mission statement: 'To integrate rigorous natural and social sciences with policy, education and socially responsible conservation action.'

The Ashoka Trust for Research in Ecology and the Environment (ATREE) was established in 1996 to contribute to efforts to curtail the rapid loss of India's diverse biological resources and natural ecosystems and to address the environmental, social and economic dimensions of this decline. ATREE's goals are:

To conserve biological diversity and promote sustainable development.

To improve the institutional and policy framework for protection of the environment.

To strengthen the knowledge base and the capacity of government and non-governmental organisations to use the best knowledge and data to evolve solutions to environmental problems.

We seek to accomplish these goals by generating new knowledge, improving policy and governance related to management of biodiversity, and developing social and human capital to address our most pressing environmental challenges.

Over the last decade ATREE has grown and established itself as a leading national institution working in the area of biodiversity conservation. Our staff strength has grown from six individuals to a current strength of over 140 individuals with expertise in diversified disciplines spread over three offices and a number of project sites. ATREE has been recognised as a Scientific and Industrial Research Organisation by the Ministry of Science and Technology, Government of India.

The activities at ATREE are organised under three centres: Centre for Conservation Science, Centre for Eco-Informatics, and Centre for Conservation Governance and Policy. The Centre for Conservation Science brings together our core strengths in various sub disciplines of conservation such as ecology, genetics, landscape ecology, taxonomy, hydrology and environmental economics. The Centre generates knowledge about the structure and function of biodiversity and human impacts on biodiversity. The Centre for Eco-Informatics assembles, organises and disseminates data on biodiversity and various other environmental parameters, develops new tools to analyse and disseminate information, model ecosystem processes, and build human capacity in environmental, particularly, biodiversity informatics. The Centre for Conservation Governance and Policy works primarily on the role of rural communities and civil society in conservation and management of biodiversity and addresses issues related to governance and policy. Educational and outreach activities cut across all the three Centres.

The geographical focus of our work includes two of India's global biodiversity hotspots, the Eastern Himalayas and the Western Ghats, as well as areas of wetland conservation and coastal and marine conservation. We are based in Bangalore, with offices in Delhi, Kalimpong and field offices that facilitate implementation of research, education

and outreach programmes. Our field offices and Community-Based Conservation Centres (CCCs) are enabling the development of community-based programmes, emerging as spaces for collaborative research and local conservation and livelihoods interventions.

Our sources of funding are uniquely diverse. Activities are supported by private foundations (The Sehgal Family Foundation, Ford Foundation, Blue Moon Fund), public trusts (Sir Dorabji Tata Trust), international organisations (Conservation International, National Geographic Society), multilateral (World Bank, United Nations Development Programme (UNDP)), United Nations Environment Programme (UNEP), bilateral (Department of International Environment and Development Studies (NORAGRIC), Norwegian University of Life Sciences, Ås, Norway, British High Commission) and government agencies like the Department of Biotechnology and the Ministry of Environment and Forests (MoEF), Government of India.

The last two years have been significant in many ways. ATREE was awarded the 'Dr APJ Abdul Kalam Rajya Parisara Prashashti' for its contribution to environmental conservation and management. ATREE has also been involved in providing inputs for national level initiatives like the National Capacity Needs Self Assessment (NCSA), the Social and Environmental Assessment components of the World Bank supported Biodiversity Conservation and Rural Livelihood Improvement Project (BCRLIP) of the National Tiger Conservation Authority, the Critical Ecosystem Partnership Fund (CEPF) initiative in the Eastern Himalayas Hotspot, the 'Definition of forests' initiative of the MoEF and some other high profile projects. ATREE along with the Nature Conservation Foundation (NCF), Mysore and Citizen Consumer and Civic Action Group (CAG), Chennai is executing the environmental assessments component of the UNDP Post-Tsunami Recovery Framework that is focused on the environmental and ecological aspects of the coastal areas in the tsunami-affected regions in mainland India. During this period we have also embarked on establishing five CCCs in the Western Ghats and initiated the wetlands conservation programme in Vembanad backwaters in Kerala.

This report summarises the work of ATREE over the period 2005–2007.

RESEARCH CENTRES

ATREE is built on a strong academic foundation and actively pursues investigations in the natural and social sciences, which form the basis for ongoing projects that are dedicated to outreach and education. Action-oriented research is critical to laying the groundwork of knowledge necessary for protecting India's biodiversity. Thus, our research programmes are emblematic of ways in which basic knowledge can be applied to conservation imperatives. ATREE's research comprises programmes in three principal multidisciplinary areas housed in the three different centres – Centre for Conservation Science, Centre for Eco-Informatics and Centre for Conservation Governance and Policy.

The multiple research projects at ATREE strive towards increasing the depth of our understanding of India's biodiversity, which is critical for conserving and restoring our ecosystems. The body of knowledge generated by each centre informs and complements the work of the other centres. This cross-disciplinary approach enables ATREE to maximise its efforts at tackling key conservation issues that are essential for preserving our environment. In addition, the overlapping activities of these three centres guide outreach projects and generate new ideas in a synergistic process of learning and action.

Centre for Conservation Science

The Suri Seghal Centre for Conservation Science at ATREE has a charter to build a critical body of knowledge about India's biodiversity. Understanding biodiversity is crucial to galvanising conservation awareness. Recognising the structure, function and value of biodiversity enables us to prioritise outreach activities and natural resource management initiatives. The Centre has three focal areas of research and action:

- Structure and function of biodiversity and ecosystem services
- Human impacts on biodiversity and ecosystem services
- Responses to changes in biodiversity and ecosystem services

Ecosystems are composed of multiple interacting species and communities. These interactions are complex and many-layered, and sustain the living web that keeps ecosystems functioning and generates ecosystem services for communities and society at local to global scales. Researchers at ATREE are engaged in studies of forest, coastal and wetland ecosystems. We seek answers to the following key questions: What is the multiplicity of species that comprise the biodiversity we see in India today, and which of those species could face extinction? How do species interact and what is their role in maintaining ecosystem function? More importantly, given that many of our ecosystems have been degraded by injudicious use, what is the effect of degradation on ecosystem function and ecosystem services? And finally, despite fragmentation or loss of ecosystem components, that we have already experienced, are our forests still alive with the vital interactions that are required for their persistence? Taxonomic identification is critical to ascertaining species richness. ATREE researchers are conducting rigorous taxonomic research focused on deciphering and describing the complexity and levels of organisation among groups of flora and fauna. Our extensive and expanding herbarium and insect collections help to focus and organise our taxonomic pursuits.

The current rate of growth today has its downside: there is intense pressure on natural resources with significant impacts on biological diversity. Our ecological systems are unlikely to continue to sustain us if the current use trends continue. Many of our research projects are dedicated to assessing the impacts of the manifold human uses of natural resources on ecosystems, and where possible, seeking ways to mitigate these impacts.



ATREE conservation scientists are researching the regeneration of forest systems that have experienced different intensities of disturbance in forests in the Western Ghats. These disturbances range from logging in the Kalakad–Mundanthurai Tiger Reserve (KMTR) to managing forests for non-timber forest products (NTFP) in the Biligiri Rangaswamy Temple (BRT) Wildlife Sanctuary. Results from KMTR indicate that although overall species numbers tend to be similar in logged and intact forests, logging has significantly altered relative abundance of various tree species. Regeneration of intact forest dominants (such as *Palaquium ellipticum*) is rare in logged forests. On the other hand, secondary species such as *Litsea wightiana* and *Acronychia pedunculata* tend to be abundant in managed forests. In the BRT Wildlife Sanctuary, natural resource management is the joint effort of forest managers and the indigenous community that depends on forest resources, principally non-timber forest products, for their



livelihood. In BRT, *nelli* or amla (*Phyllanthus emblica* and *P. indofischeri*) and myrobalans (*Terminalia bellirica* and *Terminalia chebula*) populations have been monitored, as they are important resources for the indigenous communities who live in these forests. In the case of amla, for example, studies indicate that amla populations, in one of the two forest types where it occurs, have very few young individuals, which could be a result of frequent fires, and may result in future population bottlenecks in the absence of appropriate management interventions.

Similarly, there is ongoing research into the impacts of fire on forest regeneration in deciduous forests. One study area is Sadhukonda reserve forest, a dry deciduous-scrub forest in

Andhra Pradesh, which serves as an important source of fodder and fuel for surrounding villages. Both the local communities and the Foundation for Ecological Security (FES) have been involved in concerted efforts to minimise annual fires over the past three or four years. Although there is now visibly higher biomass in unburnt stands, this is largely due to more grass growth, and only some trees regenerating from old root stock. There is very little new regeneration of trees. These findings indicate that protection from fire, alone, may be insufficient to restore these degraded landscapes, and highlight the need for active interventions, such as replenishing the soil seed bank or planting tree seedlings, to jumpstart the restoration process. Researchers are also working out the dynamics and linkages between fire and invasive species in tropical forest systems. *Lantana camara*, a common invasive, seems to have an advantage over native species in colonising burnt forest patches. Once established, lantana appears to fuel fires, in what could be seen as a self-perpetuating fire-lantana cycle.

These long-term efforts aim to understand how and why tropical forests and their functions change. This effort is revealing new information on how key drivers such as human use and climate change are changing ecosystems and affecting ecosystem services.

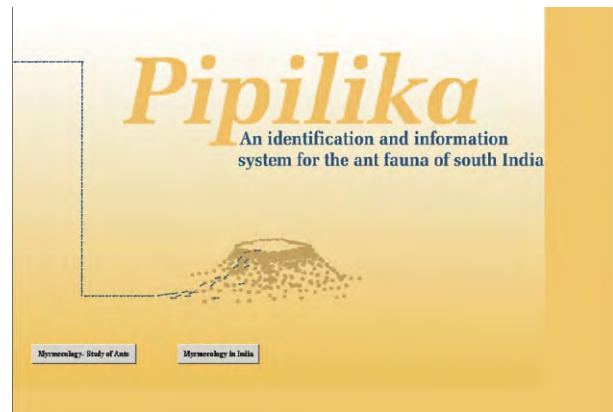
Preliminary results indicate that not all trees flower and fruit annually; some only flower once in 10 years. Also, the species-level mass flowering and fruiting by dominant species is critical for dependent animal species, especially bees and bats. We are also part of a large international collaboration with the Centre for Tropical Forest Science's pan-tropical network of long-term forest dynamics plots.

In the Bandipur National Park and BRT Wildlife Sanctuary, data from instrumented catchments and soil sampling has revealed the long-term impacts of cattle grazing, cattle dung export and biomass extraction on forest hydrologic response and soil properties. Streams have become flashier because of a greater component of overland flow, and soils have reduced organic matter, have lost clay due to selective erosion, have higher bulk-density, and have reduced cation exchange capacity.

Similarly work at the landscape scale using time-series of remotely sensed data has revealed that dry forests are very dynamic with high inter-annual variability, a quasi-cyclic oscillation in the beginning of dry season foliar biomass, which is linked to rainfall and subject to frequent disturbances such as fire. The analysis also reveals a declining trend in foliar biomass from 1986 to 1996 across sites in the seasonally dry forested landscape in the Upper Cauvery basin. This decade was preceded by the devastating 1982 drought and had a few more dry years soon after. We are studying the dynamics of these forests with respect to climate change, land-use change, human demands on biomass and ecological resilience.

It is increasingly evident that measurement and continuous monitoring of biodiversity for large landscapes is simply not feasible if it is to be done in the field. Carefully calibrated and tested remotely sensed surrogates for some components of biodiversity can be developed and have the advantage of being repeated and being replicable and consistent. Of course its testing with ground measurements and data is absolutely essential.

We have used multi-date remotely sensed data to develop indices of eco-climatic distance that replaces conventional discrete forest type classification and mapping with a single continuous measure. This combines information on tree-density, canopy cover and degree of deciduousness within a single index. It has been shown to be correlated with species richness and can capture a significant component of species compositional turn-over from site to site, especially at moderate to coarse spatial scales.



An inventory of lesser known taxa that are functionally important for the Western Ghats is nearing completion. A digital computer-aided key to the ants of the Western Ghats has been developed as a beta-version. The focus of this group is to highlight the ecological role played by insects in various ecosystems, from agriculture to forest landscapes. The insect collection at ATREE is growing into an educational and research resource for the entire region.

Studies have also identified genetic hotspots for various forest tree species and proposed a framework for *in situ* conservation action. Work is ongoing on some of the endemic, rare and critically endangered tree species such as *Semecarpus katbalekanensis*, *Hubbardia heptaneuron* and *Ceropegia fantastica*. An on-ground species recovery programme with emphasis on genetic enrichment is being carried out in the Western Ghats. Ongoing work with several medicinally important plant species is revealing surprising results on constraints. For *Nothapodytes nimmoniana*, for instance, there appears to be no clear regenerative or reproductive

constraint for widespread populations in the Western Ghats. However, a very rare climbing medicinal plant, *Embelia ribes*, shows very poor fruit set and seedling recruitment. Systematic approaches to ascertain constraints will help prioritise species and develop methods for conservation.



Our researchers are carrying out some pioneering work on forest canopies. One of the efforts has been to examine and monitor epiphytes and their associated fauna. Epiphytes, particularly, can be very sensitive to climate change and altered air quality, therefore the effect is to investigate response of epiphytes and associated fauna to disturbances, including simulated climate change. Research is also underway to understand the role of canopy structure and avian community in the wet forests of the Western Ghats. Last year ATREE also hosted an international workshop in collaboration with the Global Canopy Programme to discuss climate change impacts on forests and to promote the sustainable use of forest canopies. Delegates from Brazil, Ghana, Madagascar, Malaysia, China and India discussed the sustainable use of forest canopy biodiversity and how this can add value to national park systems, by supporting local livelihoods through environmentally sustainable canopy based enterprise development. The meeting discussed the social and economic values of forest canopy ecosystem services to



humanity and how countries could be compensated financially for reducing deforestation rates. ATREE is the country partner in a larger United Nations Environment Programme (UNEP) project to establish a global network of 'Whole Forest Observatories', to monitor canopy biodiversity and global climate change, one of which will be located in India's Western Ghats.

The Eastern Himalayas office is undertaking a study on the status of the red panda (*Ailurus fulgens*) in the Neora Valley National Park, Darjeeling district. During the reconnaissance work in 2006, detailed information on vegetation and local settlements has been collected and transects have been laid. Systematic data collection

of the red panda in the park is being carried on since October 2006 and the aim is to prepare an assessment of threats and develop a draft conservation plan for the red panda. A survey in collaboration with the West Bengal Forest Department has also authentically confirmed presence of the globally threatened rufous-necked hornbill (*Aceros nepalensis*) and the endangered great pied hornbill (*Buceros bicornis*) in the Neora Valley National Park in Darjeeling district. The higher relative abundance of rufous-necked hornbill (81 per cent) is a fair indication of habitat and diverse food resources. An effort also has been made to study the socio-economic profile of seven villages surrounding the park. Another effort is in exploring the feasibility of a biological corridor between Singalila National Park and Senchel Wildlife Sanctuary in the Darjeeling hills. The feasibility studies between Singalila National Park and Senchel Wildlife Sanctuary have been conducted separately in three different forest corridors by Centre for Studies in Rural Economy, Appropriate Technology and Environment (CREATE), ATREE and Federation of Societies for Environment Protection (FOSEP). The project aims at working with farmers in these areas to raise awareness, build capacity and skills for improved agriculture and enable marketing of their goods.

The Eastern Himalayas office is also developing a strategy for participatory conservation of medicinal plants in the Darjeeling and Sikkim Himalayas. An inventory of four of the eight targeted species has been developed (part of the first interim report available at www.plantlife.org.uk). These are *Aconitum palmatum*, *Panax pseudoginseng*, *Picrorhiza kurroa* and *Nardostachys jatamansi*. A nursery has been set up of the four species in Upper Chatakpur forest village (7892 ft) in Senchel Wildlife Sanctuary, Darjeeling district. ATREE has held consultation meetings with Forest Departments of Sikkim and West Bengal, the Sikkim State Medicinal Plants Board and the Department of Home, Sikkim. Potential sites have been identified from study of herbarium sheets at Botanical Survey of India, Himalayan Circle (Gangtok), Llyod Botanical Garden (Darjeeling) and North Bengal University. Extensive reconnaissance surveys were conducted along with interviews of knowledgeable villagers to determine the presence of the species and the status of populations in addition to secondary information. The project plans to develop a conservation action plan at the end of the research period.

The Critical Ecosystem Partnership Fund (CEPF) grants programme for the Eastern Himalayas is being coordinated by ATREE. Under this programme, ATREE will be coordinating funds for conservation of biodiversity in the Eastern Himalayas. A total of nearly \$1.5 million will be disbursed to civil society organisations for conservation work. Non-governmental organisations (NGOs), academicians and universities are eligible to apply for funds. A first call for funds was announced by ATREE in the second half of 2006. A total of 36 civil society organisations had applied, out of which eight have been short-listed by a regional committee comprising various eminent persons representing the government as well as universities and NGOs. Under the CEPF programme, ATREE will be disbursing grants to nearly 25 to 30 NGOs. Grants will be in the form of large as well as small funds. The programme is designed to enhance the capacity of civil society organisations by making available funds for conservation work and research.

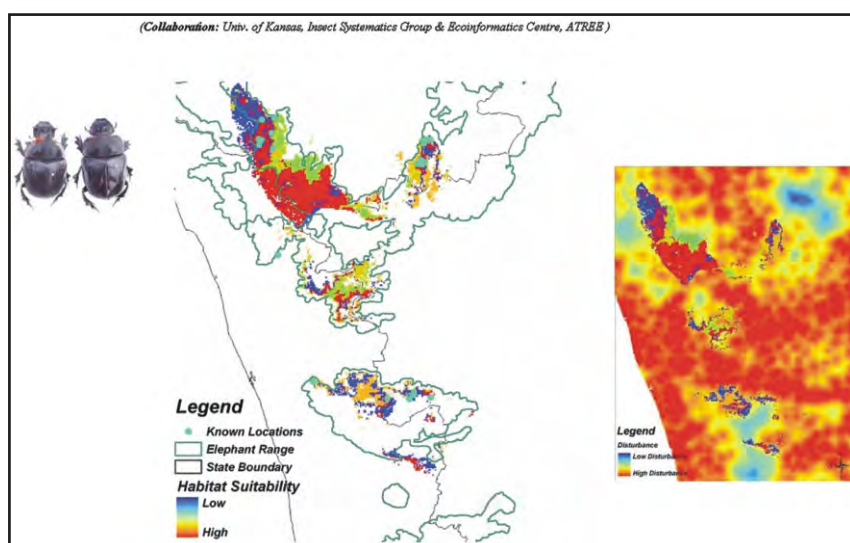
This centre will be intensively involved soon in collaborative research and training with the Stockholm Resilience Centre on ecosystem services and ecological resilience in protected areas, sacred groves and production landscapes.

Centre for Eco-Informatics

The Centre for Eco-Informatics at ATREE, established in 2004 and officially inaugurated in May 2005, was initiated with the vision of enhancing co-operation and exchange of information for biodiversity conservation. Specifically, the centre focused on assembling, organising and disseminating biodiversity data in the public domain for various stakeholders; promoting research and development tools and software including modelling; and capacity building activities for environmental professionals in handling large datasets and modelling tools. Its mission is to be a web-enabled, publicly accessible resource for integrated and value-added information on ecology and the environment and to actively promote collaboration in applied research and capacity building in eco-informatics.

The Centre offers access to biological, ecological and socio-economic information with special emphasis on the globally recognised biodiversity hotspot within the country—the Western Ghats. Information on bio-physical factors relevant to conservation and natural resource management, such as climate, topography, soil and hydrology parameters are made available through the website. Value added published maps that have resulted from almost a decade of ecological and environmental research at ATREE and its partner agencies are being compiled currently.

The Eco-Informatics Centre at ATREE is the first of its kind in the country to offer an interactive, query-based WebGIS (Geographical



Information System) service through its website www.ecoinfoindia.org. Through this portal users can visualise, analyse, integrate and map various types of spatial data for natural resource management and conservation according to their specific need. The goal is to eventually provide access to GIS data related to conservation and natural resource management for the entire country. The easy access to relevant information thus provided will be of benefit to stakeholders ranging from policy makers especially within the Ministry of Environment and Forests, Government of India, to resource managers, researchers, students and educators.

The Centre has a powerful online modelling tool called OpenModeller that allows the user to predict/model probable species distribution. The WebGIS module has also been refurbished with improved user interface and functionality with a lot more data on species locations in the Western Ghats. We have also uploaded about 30 programming tools/scripts for the use of user community free of cost that offers special functionality for the use of GIS and Remote Sensing technology. In addition, the Centre has produced five peer reviewed articles that are being developed as manuscripts to be submitted to relevant journals.

Database dissemination and software tools

A total of 169 raster datasets of various climatic, terrain and land-cover parameters of 1 km to 10 km resolution covering the entire country have been developed and uploaded in the web portal. The Centre has also developed and uploaded species databases of plants of India, grasshopper, butterfly (progressing) and ants (progressing), database archive for 1,391 vector datasets covering administrative, natural and bio-geographic features, 30 scripts in three languages developed to batch process, standardise and ease handling of large datasets, both raster and vector and, implemented a comprehensive WebGIS based online data

analysis system on the portal. Free Google map technology has been incorporated on the eco-informatics portal to develop an interactive online interface for listing conservation projects.



Research and development

The Centre has completed several projects on niche modelling of threatened endemic species and insects. In addition, gap analysis in the Western Ghats and modelling of land-use and land-cover changes were also investigated. Our team has published papers in peer reviewed journals, presented papers in international conferences and participated in study tours and faculty exchange programmes. A Memorandum of Understanding with National Chemical Laboratory Centre for Biodiversity Information was signed and we are currently collaborating with the World Conservation Union (IUCN) Invasive Species Specialist Group to launch the Invasive Species Information System called ISIS.

Capacity building

The Centre has conducted workshops including the International Workshop on Ecological Niche Modelling in November 2006 in Bangalore along with the Global Biodiversity Information Facility (GBIF). Eight interns have also been trained in database development to spatial modelling and software design and implementation.

Digitised inventory of plant resources of India

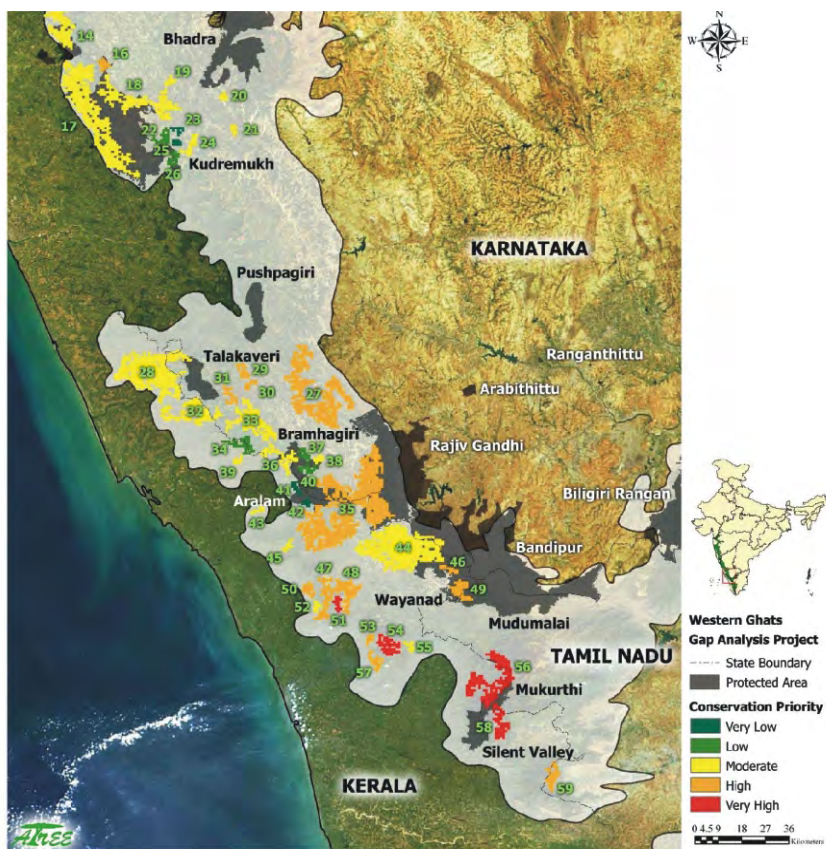
This is one of the major and significant ongoing projects at ATREE in collaboration with University of Agricultural Sciences, Bangalore. We have one of the biggest digital databases on plant resources of India with the names of plants, taxonomy and distribution details (along with probable species distribution recovery maps for each species) that have been collated from more than 280 published floras, reports and other sources of literature all over the country. The database consists of about 48,584 species names, 25,877 synonyms, 100,000 common names and 400,000 distribution records. Further, we have completed the data inputting from about 25 flora pertaining to northeastern Himalayas.

We are developing a checklist of Indian plant resources and so far we have completed a checklist for 140 important families out of about 257 plant families in India. In addition, a checklist for south Indian plant families is completed and both of these can be found on the website <http://221.135.191.194/plantsindia/index.php>.

The entire database is being posted to the eco-informatics website under a unified query-based structure that would be a single repository of information including the first ever checklist of Indian plants. We are also working on streamlining the search and query system of the databases to make them user friendly and efficient to enable easy updation in the future. This is likely to serve as the foundation for the use and propagation of the science of plant systematics and use of correct/un-ambiguous terminology ratified by the foremost experts on plant species nomenclature in the world.

Further, we have the digital database of about 35,000 herbarium specimen images belonging to 8,000 species that have been scanned and collated from within and outside the country. Of these, 3,000 are medicinal plant specimens. For easy management of specimens, we have developed indigenous software named as Taxon Image Manager. Further, we have 7,000 photographs and 5,000 line diagrams in this digital database and an image archiving facility is being developed for storing these images.

Digital keys for *Crotalaria* and *Sesbania* species have been developed for easy identification of species from these genera. The 'Cyber Taxonomy Module' for easily accessing the original taxonomic nomenclature and tracing the nomenclature changes over the years has been developed in the form of Decision Support System for Taxonomies (DSSTn). We have developed more than 50 species fliers for easy identification of plant species from Western Ghats. In addition, the project has released two CDs, *Sasya Sahyadri* (Plant Resources of Western Ghats) and *Sasya Bharathi-Dakshina* (Plant Resources of South India) for public use.



The Eco-Informatics Centre is currently offering a course in landscape ecology to be taught as part of the new MSc programme in Wildlife Biology that was started by Wildlife Conservation Society-India Programme and partners (<http://www.wcsindia.org/wnew.htm>). This module is taught in two parts—introductory and advanced—each extending over a month. The introduction to landscape ecology also covers some basic Remote Sensing and GIS concepts as well as mapping and analytical tools that are relevant to landscape ecology and natural resource management. The advanced module in landscape ecology focuses on modelling and geostatistical tools that can be applied to landscape ecological research and requires the development and implementation of individual research projects.

Centre for Conservation Governance and Policy

The Centre for Conservation Governance and Policy focuses on action-research projects and policy issues in the area of natural resource management. The thematic areas of the Centre's work encompass a wide range of issues like integrated and inclusive approaches to policies and institutions; fiscal measures and economic instruments; and socio-economic and policy drivers of sustainable land-use. In the Western Ghats and Eastern Himalayas, the Centre's activities focus on reconciling conservation with viable livelihood options for rural communities that help sustain biodiversity. In addition, the Centre undertakes review of environmental policies and provides policy and management inputs based on research findings. It also aims to foster interdisciplinary research and action in conservation planning and management of natural resources, and to strengthen community and civil society involvement in conservation.

Conservation and Livelihoods Programme

The Conservation and Livelihoods Programme at ATREE is based on the premise that local communities are integral to any conservation effort, and that it is possible to evolve participatory and inclusive approaches to conservation that reconcile conservation of biodiversity and the livelihoods of local communities dependent on the ecosystems around them. We suggest that understanding social conditions (social hierarchy and inequity) and allowing greater access and security of tenure are central to achieving socio-economic well-being and ecological sustainability. The vagaries of markets—global, regional and local—have a big impact on local livelihoods. The exploration of forest product use regimes is incomplete without an analysis of the political economy of forest use at local, regional and global scales. Finally, we argue that there is a need for democratic local institutions that will enable communities (especially weaker sections within communities), to negotiate arrangements for equitable access rights and local control.

The Conservation and Livelihoods Programme works in five sites: Biligiri Rangaswamy Temple (BRT) Wildlife Sanctuary, Natham, Kalakad–Mundanthurai Tiger Reserve (KMTR), Kanakapura and Male Mahadeswara (MM) hills. Each of these sites has its own set of issues in terms of people and their resource landscape. Two of them are protected areas, the rest are reserve forest areas. Over the last two years, the Conservation and Livelihoods Programme has attempted to understand the socio-economic conditions of these forest dependent communities, their resource landscape and their interactions with the landscape. This was done through Participatory Rural Appraisals in each of the sites, detailed socio-economic surveys and ecological monitoring of the forest. The interdisciplinary approach and the demands of implementation have presented some foreseen challenges. Gathering multi-disciplinary data in a participatory manner has taken time but this has been time well spent as we have slowly come to develop a better understanding of the contexts at each site.

We carried out institutional mapping at each site to identify appropriate community institutions and partner organisations. We are exploring the potential role of formal and informal local institutions in managing resources and conserving biodiversity, and assessing ways in which conservation and livelihood interests can be reconciled. We are working with a range of institutions—Panchayats, civil society organisations, traditional institutions, women's groups and medicinal plant collector groups. For instance, in the BRT Wildlife Sanctuary we are examining such traditional indigenous systems as *kula* (clan-based) institutions which have the potential for decentralised conservation effort. We are also engaging with local institutions for the dissemination of policy instruments that provide legal space for decentralised forest governance.

Conservation by substitution in the Western Ghats

Lantana camara is one of the ten most invasive weeds in the world. It is hard to control, but in MM hills this weed is being ingeniously converted to furniture by the *Soligas* (an indigenous tribal community) and is significantly contributing to their livelihoods. Four Lantana Craft Centres (LCC) have been set up and these centres impart training and encourage *Soligas* to take up lantana crafts. Forty families earn their income from this enterprise and are meeting their livelihood demand only out of lantana craft. So far lantana products worth Rs 3.5 lakhs have been marketed in Bangalore, Mysore and MM hills. LCC artisans also participated in several regional level and national exhibitions at Mysore, Mandya and Bangalore. LCC secured the best stall award in Krishimela-2005 and 2006. Besides this, ATREE has formed 50 Jyothis or self-help groups (SHGs) to enhance livelihoods and alleviate poverty of the local *Soligas* through micro-finance. The federation of these SHGs is called Divyajyothi. To create a larger awareness of lantana craft and to initiate a dialogue on the problems and prospects among the artisans, ATREE and the *Soligas* at MM hills organised a one-day 'Confluence on Lantana' on April 2, 2005 and on June 16, 2006.



Expanding Conservation and Livelihoods Programme in Darjeeling hills

Our efforts to conserve biodiversity and enhance livelihoods of rural communities in Darjeeling hills have brought in due recognition from a wide range of institutions in the region. The Kurseong Forest Division of the West Bengal Forest Department has sought our expertise to conduct conservation and livelihoods activities in four villages under its jurisdiction. Socio-economic surveys and Participatory Rural Appraisals have already been undertaken in the selected villages and possible interventions sketched out. Major focus will be laid on enhancing the already existing practices of the village communities (agriculture and animal husbandry) through desired technical trainings as well as awareness-raising for community conservation.



Engaging markets to sustain livelihoods and advance conservation

This project works with households across 19 villages in Darjeeling hills through SHGs marketing organic products and handicrafts. ATREE works with small and marginal farmers, organising households into viable business associations, helping them explore suitable niche markets for their organic produce, facilitating shared produce processing and packaging and post-harvest collection and marketing, and enabling linkages with financial institutions and service providers. The project has also led to greater local awareness regarding organic certification and fair trade. The Forest Department and a local NGO have picked up the ATREE approach. The project has also succeeded in establishing a network with the government agency District Rural Development Authority and local NGOs for up-scaling the project. This project is also

looking at invasive species and their potential role in improving rural livelihoods while also having an overall positive feedback on the ecosystem. In the village clusters around Senchel Wildlife Sanctuary (Darjeeling hills), the intervention seeks to introduce a positive feedback on the aggressive *mallingo* (*Yusbiana maling*) by promoting its profitable extraction from the wild. The intervention is seen as an opportunity to improve the livelihoods of local communities, who weave baskets from *mallingo* stems, by linking them to potential buyers, in this case, the tea estates in the area. The Eastern Himalayas office hopes to scale up the intervention and take some of the positive learning through area extension into parts of Sikkim and Meghalaya.

Sustaining critical natural resources through improved agricultural productivity

The project has sought to optimise returns from agricultural lands with benefit of biotechnology in ATREE's target villages in Senchel and Mahananda Wildlife Sanctuaries and bring livelihood options more in sync to meet broader conservation priorities. As a major component, ATREE has supported local farmers with technology transfer and training to cultivate high yielding varieties of large cardamom (*Amomum subulatum*), pepper (*Pepper nigrum*), turmeric (*Curcuma domestica*) and ginger (*Zingiber officinale*). Technical trainings have also been provided to farmers for production and use of biofertilisers (vegetative and vermi composting) to complement and enhance agricultural productivity. Polyhouse technology as established to be the best practice in high altitude organic farming under an earlier project of ATREE is being innovated and upscaled. All interventions have been planned and implemented through and in consultation with village institutions and SHGs. Overall, the project has sought to build on ATREE's ongoing conservation and livelihoods component of the Eastern Himalaya office.



Conservation through livelihood enhancement and awareness

The project has contributed to virtually stopping charcoal business (by 98%) in two villages of Senchel Wildlife Sanctuary in Darjeeling district. Each household is now harvesting one backload (30 kg) of fuelwood to last them for at least three days as compared to 45 backloads in the beginning of the project period. Income from the charcoal business has been replaced by Square Metre Vegetable Garden (SMVG) activities as well as other additional small scale activities like eco-tourism and cardamom nursery. Ownership by communities of the project process has graduated from information sharing and participatory planning towards community gaining control of the processes. SHGs today are linked with a broad range of stakeholders, from government departments to NGOs. The main component of the project was raising awareness among the communities and inculcating in them, a sense of responsibility. Along with this various technical trainings were provided. The project's approach was to motivate and mobilise the communities to identify possible alternative livelihood activities that would be successful in their villages. SHGs of community members were formed to undertake these activities. The communities participated by contributing their share of labour and sometimes even resources like cash, to implement activities. The project experimented with a diversity of alternative livelihood options and has taken time to decide with the community in finalising the appropriate activities. One of the lessons from the project was to work with the communities with an open agenda. The success of SMVG was based on trial and error. Communities have been empowered to continue innovation of this technology. The UNDP-Global Environment Facility (GEF) Small Grants Programme Project is being sustained through grants provided by Department of Biotechnology, India, and the Blue Moon Fund, USA.

While the Department of Biotechnology grant is strengthening the GEF initiated activities, the Blue Moon Fund is supporting villages to market their products from the SMVGs. The Eastern Himalaya office plans to upscale the pilot project by a medium sized project proposal in 2007.

Responsible eco-tourism in Darjeeling and Sikkim

This was a part of the larger eco-tourism project and in the Eastern Himalayas the project strategy involved reviewing existing eco-tourism models, their strengths and weaknesses, degree of community involvement and setting up user friendly criteria for their self-monitoring and evaluation, after relevant gaps were identified. The findings were shared through two consultation workshops on eco-tourism policies, one in Kalimpong (Darjeeling district) and the other in Gangtok (Sikkim) for Darjeeling and Sikkim eco-tourism followed by a national workshop in Gangtok. A follow-up strategy on the project will be to build capacities to monitor eco-tourism models in Darjeeling and Sikkim Himalayas and strengthen the human capital for social, financial and ecological equity in this popular enterprise of the region.

Wetland Conservation Programme

Wetlands are considered as one of the most productive ecosystems on earth harbouring high levels of biodiversity. But, unfortunately most of the wetlands are facing grave threats from various human activities. We have recently initiated a community-based Wetland Conservation Programme around the Vembanad wetland, Kerala.

Vembanad wetland, a Ramsar site, is the largest humid tropical, wetland ecosystem of the southwest coast of India. A transitional ecotone between sea and land, Vembanad lake is a highly productive environment, providing feeding, spawning and rearing areas for a very large population of fish and shellfish. It supports the third largest wintering waterfowl population of the country and also harbours rich fishery resources. A large proportion of the 1.6 million people living on the banks of the wetland are directly or indirectly dependent on this ecosystem for their livelihood.



The environmental conditions of the lake is in a steady decline due to severe anthropogenic pressures and all these activities are to various degrees in decline because of socio-economic and ecological changes happening in the region. The commercial nature of these activities leads to uncontrolled resource use which poses grave threats to the ecosystem. ATREE is trying to address some of these issues through its Community Environmental Resource Centre (CERC), established at Alappuzha, by bringing together local communities and institutions to strengthen participatory integrated management of the Vembanad backwaters.

The project aims to build multi-sectoral and multi-stakeholder partnerships at the local level, influence decision making, increase coordination between stakeholders and strengthen their capacity so that the Vembanad backwaters is restored, protected and sustainably managed.

Coastal and Marine Programme

The Coastal and Marine Programme began in 2004 and adopts an interdisciplinary approach covering ecology, policy, legal and sociological aspects into its research and conservation interventions. The outputs and dissemination also range from peer reviewed journals, news articles, reports, policy briefs, and outreach and advocacy through other networks.

Team members were requested by UNDP to write papers on coastal policies, particularly on rehabilitation efforts in Tamil Nadu and the Coastal Regulation Zone (CRZ) and review the Swaminathan Report on the CRZ. Presentations on these subjects have been submitted and made to relevant government agencies, NGO networks and so on. The programme is working on writing assignments and similar consultancies that involve environmental and coastal policy reviews.



Coastal Regulation Zone notification and post-tsunami rehabilitation

ATREE and the UNDP drafted a 'Statement on the Coastal Regulation Zone (CRZ) Notification and Post-Tsunami Rehabilitation in Tamil Nadu'. The report analysed the position of the law regarding potential rehabilitation efforts along the Tamil Nadu coast after the Indian Ocean tsunami. The position of India's principal coastal legislation, the CRZ Notification 1991, is examined here. The CRZ Notification is a specialised legal instrument for governing development activities throughout coastal stretches. The report aimed at providing government and non-government rehabilitation agencies with a clear understanding of the role and position of the CRZ Notification in any of the rehabilitation efforts that may take place in areas under the jurisdiction of this law.

Government of India–United Nations Development Programme Post-Tsunami Environment Initiative

ATREE along with the Nature Conservation Foundation, Mysore, and Citizen, Consumer and Civic Action Group (CAG) executed the Post-Tsunami Environment Initiative (PTEI) project for UNDP for executing the environmental assessments components. ATREE staff were closely involved in conceptualising and executing this project aimed at providing socio-ecological insights into resilience related factors associated with the December 2004 Indian Ocean tsunami.

Management recommendations for the Sethusamudram Ship Canal Project for the Gulf of Mannar Biosphere Reserve Trust

ATREE was commissioned to execute a study to enquire into the monitoring and mitigation efforts as management strategies for the Sethusamudram Ship Canal Project (SSCP) for the Gulf of Mannar Biosphere Reserve Trust (GoMBRT). This was executed by a team of experts from within and outside ATREE and a report titled 'Review of the Sethusamudram Ship Canal Project—Mitigation and monitoring measures as a management strategy for the Gulf of Mannar' has been produced and submitted to the GoMBRT and presentations on the same have been made.

Conservation interventions and outreach in coastal areas

The members of the coastal programme have also made several presentations at regional and national workshops on the CRZ and the implications of new legislative changes on coastal environments and communities. The programme also provided technical support and resource persons to Kalpavriksh and PANOS on 'Coastal Issues' for their media workshop series 'Media for the environment and the poor' in New Delhi. Members of the programme also facilitated stories in print and broadcast on the above theme and issues.

ATREE is an active member of the Orissa Marine Resources Conservation Consortium (OMRCC). Through its assistance this multi-stakeholder informal body has taken significant strides towards collaborative conservation approaches in Orissa. ATREE staff is on the advisory group of the OMRCC and assists in the smooth functioning of the OMRCC projects and activities in Orissa. As a means to overcome the strong impasse existing between conservationists and the fishing communities, the OMRCC has undertaken several livelihood promotion activities in the coastal villages, with the support of the Ford Foundation through the Covenant Centre for Development, Madurai. The activities under this project are being coordinated and executed through the United Artists' Association (UAA), which is based in Ganjam, Orissa. ATREE staff has facilitated key OMRCC meetings and workshops on new environmental reforms through the changes in the Environment Impact Assessment Notification (2006 Amendment) and the CRZ Notification, the proposed Special Economic Zones in Orissa, the Right to Information Act 2005 and rehabilitation policies of Orissa. 'Turtle Story' a children's educational book written by Kartik Shanker of the Coastal Programme was translated into Oriya and distributed in schools at the mass nesting sites.



Recent policy initiatives

National Capacity Needs Self-Assessment

The National Capacity Self-Assessment (NCSA) is funded by the Global Environment Facility (GEF) and is aimed at assisting countries to assess their priority national capacity needs for meeting their obligations under various Multilateral Environmental Agreements (MEAs). These MEAs include the United Nations Framework Convention for Climate Change (UNFCCC), United Nations Convention for Biodiversity (UNCBD), and United Nations Convention to Combat Land Degradation (UNCCD). The NCSA is unique in that it promotes synergy among the three MEAs. Through the self-assessment process, countries will identify capacity gaps and then come up with their own solutions to rectify these.

ATREE was chosen to lead the assessment in the 'biological diversity' thematic area. The objective of the thematic assessment was to assess the capacity strength and shortages related to biodiversity management in India with special reference to the National Biodiversity Strategic Action Plan and prepare a thematic profile that will facilitate the prioritisation of areas for GEF support to capacity building. Based on desk reviews, interviews and extensive consultations, ATREE prepared a thematic report describing the capacity situation. The information generated by the NCSA process will be used for substantive inputs into the development of future capacity development activities.

Biodiversity Conservation and Rural Livelihoods Improvement Project

ATREE was contracted by the National Tiger Conservation Authority (NTCA) of the Ministry of Environment and Forests, Government of India to undertake Social and Environmental Assessments in six landscapes selected for intervention under the World Bank funded Biodiversity Conservation and Rural Livelihoods Improvement Project. The areas include Changthang in Ladakh, Dampa in Mizoram, Askot in Uttaranchal, Rann of Kutch in Gujarat, Satpura in Madhya Pradesh and Agasthyarmalai in Kerala–Tamil Nadu. The assessments focused on mapping stakeholder interests, developing a participatory framework and suggesting social and environmental safeguards.

Defining 'forest' in the Indian context

The Ministry of Environment and Forests, Government of India has awarded a consultancy to ATREE for 'Defining forest in the Indian context'. The objective of the study was to evolve the definition(s) of forest in the Indian context keeping international commitments and different orders of the apex court into consideration and develop ecologically sound and a socially desirable definition of 'forest'. ATREE held wide-ranging discussions to arrive at a possible set of definitions and the report has been submitted to the Ministry.

Sustainable and responsible eco-tourism

ATREE undertook a project that assessed eco-tourism policies and models in four states. The study aimed at making eco-tourism enterprises environmentally sustainable, socially responsible and financially viable eventually leading to models for community owned and managed eco-tourism. The project focused on reviewing the strengths and gaps in the existing eco-tourism initiatives in the states of Kerala, Karnataka, Sikkim and West Bengal, covering the two biodiversity hotspots of Western Ghats and Eastern Himalayas. A 'white paper' on issues, regulations and best practices in eco-tourism for Darjeeling in West Bengal, Sikkim, Kerala and Karnataka was prepared based on the consultations and the assessments and submitted to the Ministry of Tourism, Government of India and the British High Commission, New Delhi.

Non-timber forest produce cess

ATREE also undertook a project to determine the feasibility and viability of re-orienting taxation policies and procedures applicable to forest products, specifically non-timber forest produce (NTFP) at various levels in order to channelise much needed additional financial resources for the conservation of NTFP resources. This project focused on tax incidence on focal NTFPs, the efficiency of institutional mechanisms and governance structures in place to manage taxation policies and use of the resultant resources and the administrative feasibility and economic viability of a cess on NTFPs at any level of the value-chain. The report was based on data from Orissa, Uttaranchal and Karnataka.

Pollination services

Kodagu is agro-climatically unique and is also where the River Cauvery originates. This coffee country depends on neighboring forests for the ecosystem services they provide, especially for pollinators of the backbone of the Coorg economy—coffee. There are changes happening in the region in terms of rights over trees and land, cultivation practices, forest degradation in the surroundings, expanding tourism and coffee prices and related policies. The project aims to calculate the perceived value of pollinators and identify appropriate management practices to facilitate sustainable production of cross pollinated crops like coffee, cardamom, orange and vegetables in the region. The economics of these services of pollinators, their perceived value to the planters and appropriate management practices are being analysed based on a primary survey across vegetation type and native tree gradients.

Land-use policies and sustainable development

This project aims to develop integrated assessment tools for sustainable development for application by scientists in developing countries. ATREE is the Indian counterpart in this 15 country, three and a half year long study. The project provides assessment procedures that enable documentation and understanding on impacts of land-use policies on sustainable development, taking into account multi-functionalities and policy options on biodiversity, climate and trade. As a part of this study, researchers have been looking at relationships that link trends in current land-use pattern especially agricultural land-use, with rainfall, irrigation, intensity of inputs, input and output prices, production, yield levels, retail and wholesale prices as well as incentives and disincentives from the government in various forms from time to time. These relationships will be useful in interpreting the trends in agriculture in Karnataka through periods of varying policy focuses and farm distress as experienced in the state. It will also help in pinpointing the specific issues of concern and important factors to be kept in mind for future policy interventions.

CONSERVATION EDUCATION PROGRAMMES

ATREE's conservation education programmes are rooted in research and field-based learning designed to promote a conservation ethic and enhance conservation capacities in civil society. Our programmes reach out to a wide range of audiences ranging from young school children to professionals. In schools, our conservation education programmes expand the range of the students' educational curricula to include applied environmental concepts and leadership skills. Our school-based programmes also create awareness about the range of potential career options in fields related to natural resource conservation. We also provide a diverse array of short courses targeted at university students and professionals. ATREE implements conservation education programmes from its offices in New Delhi and Bangalore, as well as across its field sites.

ATREE collaborates with many other institutions that share our dedication to conservation. Such collaborations have engendered high quality conservation education programmes that are affordable and are also applicable to a wide range of venues, now implemented across the country. While the high standards and the integrity of our educational initiatives are retained, the regional priorities and sensitivities of each area are integrated into each programme. Several of our educational programmes are highlighted in the following sections.

Delhi

Over the years, ATREE-New Delhi has developed and institutionalised a vibrant Conservation Education Programme (CEP) that focuses on connecting the Generation-Next, i.e. young school students with the dialogue and debate on conservation and sustainable management of natural resources. This is accomplished through a variety of approaches that include outdoor experiential learning modules, development and dissemination of high quality curriculum materials and orientation programmes for school teachers and administrators.

Two thematic modules offered by CEP namely the Mountain Programme and the Desert Programme have been a great success having attracted more than 1,500 school students to these participant financed, outdoor and residential modules. While the Mountain Programme was operated from ATREE's dedicated facility in Sirmaur district in Himachal Pradesh, the Desert Programme was operated in association with Arid Forest Research Institute, Jodhpur, Rajasthan. Both modules have been appreciated as an interesting mix of experiential learning and outdoor excitement and are handled by ATREE's seasoned cadre of instructors and programme managers involved with these modules. The programmes have been patronised by a wide variety of schools including the Kendriya Vidyalaya Sangathan.



CEP has laid special emphasis on development of quality curriculum materials to support its programmes. This includes not only material developed in-house but also creating a repository of similar materials developed by other organisations. Based on an appreciation of CEP's extensive linkages with schools in North India as well as a sophisticated level of understanding of the information needs of a young audience, ATREE was invited by the Ministry of Environment and Forests, Government of India to prepare two educational posters to commemorate

the 'International Year of Deserts and Desertification'. Both these posters were well appreciated and have been distributed all across to help create a better understanding of issues related to deserts in the country.

In recognition of the experience and expertise accumulated over the course of time in implementing high quality conservation education programmes, ATREE-Delhi was recently designated as the Regional Resource Agency for the states of New Delhi and Haryana for the prestigious Department of Biotechnology Nature Awareness (DNA) Clubs Programme being implemented by the Department of Biotechnology, Government of India at the national level. DNA clubs are intended to promote nature awareness among select schools across all the states in the country.

The Conservation Education Programme at ATREE-New Delhi is committed to developing a responsible civil society that is cognizant of the threats posed by human actions on natural systems and processes. It seeks to achieve this objective by developing its own suite of programmes and activities as well as joining hands with other organisations having similar objectives and complementing strengths.

Bangalore

The Butterfly Park at Bannerghatta National Park was inaugurated on 26 November 2006. The park is the result of a collaborative effort between the University of Agricultural Sciences, Bangalore, the Zoo Authority of Karnataka, the Karnataka Forest Department and ATREE and is funded by the Department of Biotechnology and the Karnataka Government. The Butterfly Park has an impressive walk-through glass dome, which exhibits anywhere from 10 to 15 species of butterflies. It also has a museum dedicated to butterflies and insects. The park also has a butterfly-theme gift shop.



ATREE has been organising several outreach and education workshops for primary as well as middle school children for schools in and around Bangalore. Biodiversity workshops have been conducted regularly through Delhi Public School's Butterfly Garden, Bangalore where children learn about biodiversity through structured activities. This programme is planned to help them observe, understand and realise the importance of urban biodiversity. Programmes aimed at planting butterfly host plants in various schools have helped in spreading the 'green' message and also saving urban wildlife, which people were unaware of.

A butterfly gardening kit was launched in a biodiversity exhibition in Bangalore. The kit included seedlings of larval and adult host plants, and a manual. The plants were supplied by women entrepreneurs who run small seedling nurseries linked to our conservation and livelihood programme at Kanakapura, south of Bangalore. The kits have become very popular and requests have come from as far as Delhi.

Weekend camps as part of ATREE's Outdoor Environmental Learning Initiatives (OELI) were organised for several batches of students from urban schools. These camps provide students the opportunity to understand conservation by experiencing it firsthand through our field stations and Community-based Conservation Centres.

Kalakad–Mundanthurai Tiger Reserve

Conservation education is one of the important components in Kalakad–Mundanthurai Tiger Reserve (KMTR) targeting a few villages located at the edge of the protected area. Our long-term goal is to involve children in monitoring local biodiversity as a means of advancing conservation awareness and action. KMTR has been an important incubation centre for new methods and tools to promote a monitoring-oriented conservation education programme in our other sites. Lessons will be applicable in other biodiversity-rich sites. Students are applying these techniques in monitoring the seasonal changes of bat flight paths. They are monitoring birdlife of a few wetlands and are now working closely with ATREE and local Panachayats to develop a community wetland bird reserve. During school vacations, week-long workshops are organised where they actively participate in ATREE field station activities. Several students have volunteered as research assistants on ongoing projects at the KMTR field station. They participate annually in awareness raising campaigns for prevention of plastic in the reserve targeting tourists and pilgrims who visit the reserve during annual festivals.



Kanakapura

Here we are attempting to bring ecology and conservation education to school backyards spread across a network of 70 government schools. Backyard school ecology is promoted through a culturally relevant idea called 'Nandanavana', which is a mythical forest-garden. School yards are being enriched with locally diverse plants, and demonstrable eco-friendly technologies to provide a living backyard laboratory for conservation education. Students are involved in a hands-on learning exercise from selection of species, seeds, growing and planting to maintenance of these enriched backyards. In partnership with the teachers and others resource persons we are developing learning

resources linked to the curriculum from these enriched backyards. We envision that these Nandanavanas would become a spring board for better appreciation of local and global conservation issues.

Biligiri Rangaswamy Temple

The anti-plastics campaign lead by students from the local Vivekananda Girijana Kalyana Kendra (VGKK) school in Biligiri Rangaswamy hills aims for a plastic-free sanctuary. The pilgrims and shopkeepers have been encouraged to replace plastic carry bags with those made from cloth.

A teachers' manual titled 'Forests Alive' has been prepared for Biligiri Rangaswamy Temple (BRT) to facilitate *Soliga*



students' environmental learning by relating environmental concerns and learning of the world at large to their own surroundings, history and activities in BRT. This manual is also a classroom aid/textbook both for environmental studies for primary school students and for middle and high school (class 1–10). It comes with a kit consisting of colour posters, colouring sheets, flash cards, web of life game and nature cards. The manual has been developed as a joint initiative of ATREE, VGKK and Kalpavriksh. The Kannada version 'Vana Sanjeevana' that is in circulation has been translated by the well known environment writer Nagesh Hegde. Other environmental education activities in BR hills include local students planting native saplings and live fencing it with lantana around the Someshwara Kere and collecting non-biodegradable waste from around the temple premises. Simultaneously, an awareness campaign was carried out in the larger adult *Soliga* community.

Four-day nature camps were organised for high school students from several schools of the Kendriya Vidyalaya Sangathan. Their time was enriched with multiple activities and experiences that explored the many facets of biodiversity. Students were exposed to the work of ATREE which included sustainable agriculture and kitchen vegetable gardens.

Vembanad

A new and exciting educational programme around the Vembanad wetlands in Kerala is being planned. Vembanad lake and wetland ecosystem is a globally recognised Ramsar site and provides a rich learning resource for local schools. The curriculum-linked activity-based programme reaches 50 village schools around the wetlands. The programme envisages building a better understanding of the ecological functions of wetlands and their socio-cultural and economic significance. An essential part of this programme is to equip students with the tools and perspectives to monitor wetland health and change.

OUTREACH

The Outreach Programme at ATREE is designed to initiate and support grassroots movements that contribute towards the creation of a sustainable future that conserves India's rich biodiversity. Our Outreach Programme works with the understanding that the livelihoods of rural communities are inextricably interwoven with the natural world that surrounds them, including watersheds, forests, and associated products that meet their needs. Working within this framework, teams from ATREE offices have embarked on dynamic projects with the goal of integrating outreach and its necessary counterpart, environmental education to advance conservation and continued stewardship of local natural resources by the communities.

Individual projects within the Outreach Programme are manifold. Focused on indigenous tribal communities and other rural communities, projects within the programme extend to several areas within the Western Ghats and the Eastern Himalaya regions.

Eastern Himalaya Outreach Programme

The Darjeeling-based office of ATREE is currently working towards generating, delivering and adopting best practices of sustainable human development. Since 2005, we have expanded our programme to eight more villages in Darjeeling Himalaya.

ATREE organised households into viable rural commercial or business associations while working with forest village communities in Senchel Wildlife Sanctuary (Darjeeling Himalaya). Technical trainings, along with financial management and group dynamics trainings were provided to build local capacity. Exposure tours and continued interaction with other fellow farmers and stakeholders of the programme were organised. Mistakes from earlier efforts of ATREE's endeavours in the same villages were rectified and new inventive approaches were adopted, while retaining traditional ones. These were tested and piloted. The whole process was innovative in its participatory approach with the targeted communities. Partnerships were facilitated between local farmers, extension workers, scientific institutions and government departments.

Priority was given to engender interest and engagement of the communities and inculcate in them a sense of ownership of the programme processes. Ownership has graduated from information sharing and participatory planning towards communities gaining control of the processes. The communities are now sustaining these processes and scaling up the work. We have strengthened local institutions by making them more representative in nature, encouraged participation and consensus and developed meaningful partnerships.

ATREE has basically sought to build on existing livelihood practices for better management and conservation of biodiversity in the region. One of the major interventions has been towards enhancing agricultural productivity. The Square Metre Vegetable Garden is a technology that enables introduction and cultivation of high value vegetables that is



easily adaptable to the conditions of the forest villages and existing skills of the villagers. To add value to the local agro-ecosystems, ATREE is supporting local farmers with technology transfer and training, to cultivate high yielding varieties of large cardamom (*Ammomum sabulatum*), pepper (*Pepper nigrum*), turmeric (*Curcuma domestica*) and ginger (*Zingiber officinale*). Technical trainings have also been provided to farmers for production and use of biofertilisers (vegetative and vermi composting) to enhance and complement traditional farming practices.



ATREE has always laid special emphasis on gender through participation of all categories of society. A noteworthy influence has been of the role of women in various conservation activities. Almost 40% of women represent 13 self-sustaining SHGs in ATREE's target villages. An all women's group is preparing and selling 10 different bamboo products. Gender biased activities like growing fodder and fuelwood is saving time and energy for women. Cooking hearths have been innovated to make cooking easy for women while at the same time using fuelwood more effectively. Gender biased activities like growing of fodder and fuel wood were introduced, which are saving time and energy for women. The universal perception of rural women is changing from shy and vulnerable, to efficient managers and entrepreneurs.

The dependence on forests indicated by the use of fuelwood has been brought down by nearly three times. One of the most noteworthy outputs of ATREE's interventions has been the virtual diversion of charcoal making in one of the target villages, to more sustainable practices of livelihoods. Earlier each of the 39 households was consuming almost 45 backloads (105 kg) of fuelwood everyday to make wood charcoal. Due to creation of suitable livelihood opportunities and the high degree of awareness raised, illegal charcoal making has completely stopped. These indicators clearly provide evidence that the quality of biodiversity has been enhanced through the programme. On the contrary, communities are now involved in voluntary planting of native trees species to restore degraded forest patches adjoining the village lands.

Effective marketing is critical to drive any livelihood-based conservation programme. To meet this objective, ATREE Eastern Himalaya office's outreach programme has set up 'Products Himalaya', a permanent platform to market rural produce. Through the dedicated outlet, ATREE is helping 57 SHGs across 19 villages in Darjeeling



Himalaya, including its own target areas to explore suitable niche markets for their organic produce, facilitating shared produce processing and packaging and post-harvest collection and marketing, and enabling households to link with financial institutions and other service providers. Presently, 40 different products based on local resources and ethnic themes, of rural SHGs and one urban SHG are being sold through the outlet. A major challenge in future is to market green products, sometimes unique to the region. For this, the programme is networking with other NGOs, target farmers and concerned business organisations to build a self-sustaining model for marketing green vegetables and value-added allied products.

The profound effects of the persistent efforts by Eastern Himalaya office, often in collaboration with other organisations, are earning due recognition from neighboring villages, government departments, NGOs and other institutions in biodiversity conservation.

Finally, ATREE, Eastern Himalaya office has been exploring the potential of invasive species in improving rural livelihoods while also having an overall positive feedback on the ecosystem. In the village clusters around Senchel Wildlife Sanctuary (Darjeeling hills), we have initiated intervention on the aggressive pioneer *malingo* (*Yushiana maling*) by promoting its profitable extraction from the wild. The intervention is seen as an opportunity to improve the livelihoods of local communities, who weave baskets from *malingo* stems, by linking them to potential buyers, in this case, the tea estates in the area.

Western Ghats Outreach Programme

ATREE field sites at Kanakapura, Kalakad–Mundanthurai Tiger Reserve, Male Mahadeshwara hills, Biligiri Rangaswamy Temple and Natham have been deeply committed to outreach activities based in rural areas.

Kanakapura

Agriculture in this human-dominated forest-agriculture matrix has to respond to unreliable and low seasonal rainfall and to elephants that use this region as a north–south migratory corridor. Farmers tend to leave more land fallow due to these pressures and possibly due to migration of labour to the ever expanding city of Bangalore. ATREE's team is involved in action research that integrates agro-forestry with water and soil conservation measures on farm lands. ATREE works with several farmers in developing demonstration farms as learning resources for fellow farmers in the region. Three training programmes were organised for farmers in 2006 where these concepts and techniques were explained. We also organised an exposure visit for 15 selected farmers to BIRD-K (BAIF institute for rural development-Karnataka) to expose them to BAIF's tree-based farming methods in rainfed areas. Linked with agro-forestry outreach is participatory research in partnership with the Centre for Natural Biological Resources and Community Development to explore farmer-friendly technologies to multiply *Arbuscular mycorrhizal* (AM) fungi under field conditions. AM fungi improves the establishment success of inoculated tree seedlings, particularly under nutrient and water stressed conditions common in this region.



Kalakad–Mundanthurai Tiger Reserve

ATREE is practicing a conservation intervention programme to decrease dependency on the forests of Kalakad–Mundanthurai Tiger Reserve (KMTR) as well as simultaneously build awareness of local biodiversity. The programme intend to enrich the local biodiversity as well as creating awareness about the utilisation and management of biodiversity at local scale.

Multipurpose Home Garden Programme (MPHG) is practiced in four villages abutting the forest so that the household biomass demand will be met from their own backyard and from underutilised community space within the

village. Women collectives formed around this activity are provided capacity in raising MPHG, developing micro-enterprises and in self-governance. As part of institutionalising the efforts and build community ownership, local Panchayat institutions were facilitated to be part of the effort. This has led to the access of a common land in one of the village, in which efforts are on to raise a multipurpose biomass farm with community involvement. Similarly, working with the local Panchayat and civil society organisations ATREE facilitated the notification by the district administration banning plastics from KMTR. A major anti-plastic campaign was done to effectively implement the ban.



Male Mahadeshwara hills

ATREE has assisted in building the skills of Soliga artisans in converting lantana (*Lantana camara*) to furniture and other crafts. ATREE has been successful in establishing a robust marketing network. We are currently exploring opportunities to link the artisans with an export and urban-savvy marketing company to ensure a steady demand for the products. We are also involved in facilitating the training of local artisans in other lantana-invaded landscapes. Training on lantana craft by artisans from Male Mahadeshwara (MM) hills was provided to the community at Kumuli near the Periyar Tiger Reserve in Kerala and to the *Kadukurumbas*, a local community living near Bandipur National Park in Karnataka.

Channapatna is world famous for its enamel-coated wooden toys made from *Wrightia tinctoria*, a small, deciduous tree. However, procurement of *W. tinctoria* requires high transportation costs as the trees are scattered, which means a higher production cost resulting in the toys being sold for a higher price. ATREE experimented with *Lantana camara* as an alternative for *W. tinctoria*. Lantana, an invasive weed, is

available in abundance in the region and can be collected quite easily. Its use as an alternative has meant zero investment thus keeping the production cost to the minimum and at the same time reducing pressure on *W. tinctoria*, which is a fast dwindling species. Experiments are ongoing with the artisans to improve the quality and diversify the designs of toys made from lantana.

ATREE in partnership with the Covenant Centre for Development, Madurai has over the last few years set up a federation of SHGs in MM hills. Most of the groups are linked with the local bank and are actively involved in saving and utilising loans. We are looking at mechanisms and ways to link the federation with the lantana craft business. Ninety per cent of lantana artisans are women who are also SHG members.



Biligiri Rangaswamy Temple

Most of the Soliga tribal community in Biligiri Rangaswamy Temple (BRT) live inside the forest area and practice traditional ‘organic’ farming for their subsistence. However, the yields from agriculture are low due to low soil fertility and high degree of soil erosion from the sloping farm lands. Farmers also have to work under the constant threat of wildlife damage to crops.



Agro-forestry work being implemented in BRT uses simple ‘organic’ technologies to increase yields, diversify the farms, and conserve soil and water. The purpose of all these interventions is to improve the well being of the people and the prospect of sustainable use of forest and land resources. All interventions aim to strengthen on-farm capacities and improve sustainable traditional technologies. We are also building on-farm capacity to improve composting systems. Introducing these technologies depends on a strategy of using on-farm trials and field-station trials. On-farm trials include the use of contour row-sowing rather than broadcast sowing, improved access to traditional varieties of seeds, planting indigenous fruit yielding seedlings along the bunds and composting practices. Field station trials include experimental plots to demonstrate line sowing, vegetable garden, composting, and grafting of selected high-yielding local crop varieties like amla (*Phyllanthus emblica* and *P. indofischeri*) and related fruit trees. On-farm trials using row cropping showed 30% increase in yields to broadcast sowing in 21 farms. Some of the farmers themselves have started adopting line sowing techniques especially in Devarahalli village.



Efforts were made to collect and preserve 151 varieties of seeds including seeds for agricultural crops and vegetables through conducting seed festivals. Activities were also undertaken to conserve indigenous varieties of banana as an *in situ* germplasm collection. Under restoration activity seedlings of indigenous varieties of economically important multipurpose species were raised in centralised and decentralised nurseries. These included several non-timber forest products (NTFP) species that were selected based on farmer preferences.

In the temple area of BRT and MM hills a project was initiated to create awareness about utilising local/traditional crops for food and temple offering (*prasad*), build capacity of women in preparation of these items, and generate supplementary incomes through the sale of these items in the temple area and beyond. We worked with 56 SHGs in 20 hamlets at MM hills and 12 hamlets in BRT. These groups were formed as part of our ongoing intervention in the area to address conservation and livelihood issues and we have worked with these groups to initiate and sustain this project. Groups located close to the temple precincts in both the



areas were engaged in preparing the *prasad* kits. The kit consists of 50 or 100 ml bottles of locally harvested honey, laddus made out of *Amaranthus* and bengal gram/finger millet, seedlings of sacred tree species, all of which were packaged in cloth/paper bags.

Natham

The Community-based Conservation Centre (CCC) at Natham is actively used by local communities to explore and further their livelihood options in a sustainable manner. Covenant Centre for Development (CCD), an NGO, in partnership with ATREE facilitates these activities. Several training workshops and meetings have been organised to promote sustainable harvests of medicinal plants, organic cultivation, and better marketing processes. CCD champions the concept of using local resources and traditional skills to sustain livelihoods. Local people are empowered through the involvement in robust microfinance federations organised by CCD and through active exposure to relevant government policies and acts.

ACADEMIC PROGRAMME AND PARTNERSHIPS

The Doctoral Research Programme

At ATREE we have initiated a doctoral programme in Conservation Science with the goal to impart training in the natural and social sciences to research scholars, policy-makers, and managers to use integrated approaches to conserve biodiversity. The programme is designed to promote interdisciplinary research by integrating tools and approaches from the disciplines of ecology, economics, sociology and climate science to address local and regional issues of conservation, development and sustainable use of natural resources.

Doctoral students will benefit from the many areas of research already being conducted at ATREE. These include landscape ecology, ecosystem hydrology, tropical forest ecology, plant and insect taxonomy and systematics, restoration ecology, conservation genetics, ecological economics, environmental sociology and environmental policy. We have stressed on the need to perform action-oriented research, which integrates principles from multiple disciplines and generates the knowledge and tools required for conservation planning and implementation.

The philosophy inspiring our research programme is that sustainable economic development is possible only if ecological and social perspectives are properly integrated in planning. Economic development in the past has given only limited consideration to ecological factors that influence environmental health and biodiversity and has largely ignored the concerns of people whose livelihoods are directly dependent on natural resources. The ecological goods and services that ecosystems provide have not been properly accounted in planning and implementing development projects, resulting in the decline of forest cover, loss of biodiversity, soil erosion and land degradation. On the other hand, top-down biodiversity conservation plans that exclude forest-dependent people have had negative impacts on the cultural and economic structures of their societies and alienated them from the goals of conservation. We believe that proper accounting of environmental and social costs, genuine efforts to promote the sustainable use of natural resources, and integration of livelihoods with biodiversity conservation, would lead to radically different approaches to economic development than is being implemented today. The ATREE graduate programme in Conservation Science would aim to develop and contribute toward this emerging new paradigm in conservation and development.

To prepare the students to undertake high quality research, we have designed rigorous coursework which will train them in a) the foundations of natural and social sciences, b) integrated approaches to biodiversity conservation, c) research design and methods in the natural and social sciences, and d) a choice of specialised and advanced elective courses that focus on frontline research and action. After the completion of mandatory coursework requirements, students will be required to appear in a comprehensive exam and present a research proposal that will form the basis of their doctoral research. Doctoral degrees will be awarded



through Manipal University (formerly Manipal Academy of Higher Education), which has recognised ATREE as a centre for doctoral studies.

ATREE–Department of International Environment and Development Studies, Norwegian University of Life Sciences, Ås, Norway

A three-year collaborative academic and research partnership was launched between ATREE and the Department of International Environment and Development Studies (NORAGRIC), Norwegian University of Life Sciences, Ås, Norway, in January 2007. This partnership is supported by the Royal Norwegian Embassy, New Delhi. The ATREE–NORAGRIC partnership is commencing with ‘Conservation of biological diversity and sustainable use of natural resources: Capacity building for interdisciplinary research and application’ an initiative whose overall goal is to establish a robust academic exchange programme integrating research and education.

The project envisions an exchange programme between faculty of NORAGRIC and ATREE to conduct joint research and develop core interdisciplinary courses for ATREE's Ph.D. programme in Conservation Science. The research will address effects of climate change on tropical biodiversity in two prominent regions where biodiversity is under threat: 1) tropical forest-agricultural landscapes and 2) the 'interface' zones of tropical mountain tops and forest canopies. Specific activities for tropical mountain-top habitats include documenting and monitoring species distributions, abundance and status, gathering data on climate variables in the Western Ghats, and using these data to assess vulnerabilities of species to global climate change scenarios. Tropical forest-agricultural landscapes offer numerous possibilities for conserving biodiversity in natural habitats as well as in biodiversity-rich farming. However, failures in agriculture precipitated by changing climates could lead to destruction of forest. We therefore need to assess land-use intensity and farming outcomes under different scenarios, test novel farm practices and conduct feasibility and cost–benefit analyses of these. The aim would be to build-in resilience in farming systems to changing climates as well as integrate elements of biodiversity to promote biodiversity-rich farming.

Research teams will strive to integrate new knowledge on forest biodiversity, ecological processes and functional dynamics in these complex landscapes. Reciprocal effects of ecosystem resilience and socio-economic resilience will be tested, and reciprocal impacts of land-use changes and climate change will be analysed and modelled. Cost–benefit analyses will assess the effects of changes in agro-biodiversity on economic trends, and local ecological–economic systems will be modelled under medium-term climate change scenarios. The results will be integrated to develop practical, immediately implementable actions, to help modify local agriculture practice, livelihoods and policy. Outreach activities will be developed, including community-based monitoring systems, educational programmes and integration of traditional knowledge with scientific approaches.

FELLOWS: PERSONAL AND RESEARCH STATEMENTS

The personal and research statements of the Faculty who have joined ATREE in the Financial Year 2005–2007 are given below.

Dr. P. A. Sinu

Personal statement



When I completed my Ph.D. in May 2006, many of my well-wishers wanted me to pursue my post-doctoral studies abroad, preferably in North America. Although I was not inclined to move abroad leaving ATREE or my second home in Sringeri, where I wanted to build-up a programme, I gradually started thinking of moving for a while to work with a well established research team abroad. However, I was particular about the institute I would like to associate with rather than the country itself. This resulted in my sending a mail to Prof. Taja Tschardtke of University of Gottingen in Germany, whom I had met and interacted with while attending a symposium in Sussex University, United Kingdom in 2005. The mail was fruitful, and I received an invitation from him and his colleague Dr. Alexandra M. Klein to visit their laboratory for an interaction. I visited the prestigious Agro-ecology Department, which produces an average of 35 scientific papers every year in highly esteemed journals like *Science* and *Nature*. Although I conducted some preliminary field work in and

around Gottingen, my mind was exploring the research possibilities in Sringeri. Why can't I test those entire hypotheses in Sringeri? Why can't I associate with them to write a collaborative research proposal and go back to Sringeri and work! That was a critical time for me as I was waiting for the verdict on my proposal submitted to the National Geographic Society. Fortunately both my research proposals, Department of Science and Technology-Young Scientist Programme and National Geographic Society's Research and Exploration Grant, were approved for funding.

Two places, ATREE and Sringeri, provided me lots of opportunities and room to think freely, formulate and initiate new programmes. I gradually started thinking beyond simply enumerating number of insects and diversity estimation, to find answers for many of the questions that kept popping in my mind while doing the last segment of my field-work during the Ph.D. programme. My association with Prof. K. R. Shivanna opened the world of pollination systems and the possibilities to explore more of that aspect.

Research statement

Evaluating the ecological impacts and sustainability of leaf litter harvesting in community-managed Soppinabetta forests of Western Ghats.

Team: P. A. Sinu, Giby Kuriakose, Gladwin Joseph, K. R. Shivanna

Being a trained insect ecologist and systematist, my passion has always been insects. However, my research interest aims to understand the ecosystem functions insects contribute at insect–plant–human interface. Human influenced habitats and secondary growing forests are the focal places of my studies. Seed dispersal and predation are two major factors that affect tree recruitment in tropical climates, where insects play crucial roles as pre-dispersal and post-dispersal predators. I have initiated a study to assess how the periodical leaf-litter harvesting would affect the regeneration dynamics of tree community of Soppinabetta forests of Sringeri. In collaboration with Giby Kuriakose, I have initiated detailed vegetation survey and phenology studies of Soppinabetta tree and liana community of Sringeri.



In a separate study, in association with Prof. K. R. Shivanna, I have initiated the work to look into the role of forest matrix in maintaining the pollinators particularly the stingless and solitary bees of agro-ecosystems that form a part of the matrix.

Regional orchidarium in Sringeri

Team: P. A. Sinu, Kruthik Chandrashekar and Giby Kuriakose

The genuine interest in collecting and maintaining wild epiphytic orchids by Kruthik, a young local farmer of Sringeri prompted me to encourage him to apply for a small grant from ATREE to conduct a systematic survey of orchids of Sringeri taluk. In a one-year survey through various land-use types, we have collected and planted nearly 60 species of wild orchids in the Soppinabetta that belong to Kruthik. Now this regional orchidarium functions as a live repository for pursuing more studies related to pollination modes of orchids.

Krishikoota—A gathering of farmers for conservation of Soppinabetta forests of Sringeri

Team: P. A. Sinu, Kruthik Chandrashekar and farmers

Soppinabetta of Sringeri functions as the hub of my current and some of my past research work. During the course of my research I have noticed quite a few serious threats these forests face, and I could expect many more in the near future. I felt that there was a need to have a formal gathering of farmers and like-minded researchers to work towards preserving Soppinabetta forests of Sringeri from further degradation as farmers are the 'real' custodians of these forests. *Krishikoota*, the proposed gathering will work positively for a better functioning of these forests.

Dr. Robert J. Chandran

Personal statement



I have always been fascinated by how complex ecological systems such as tropical rainforests work. Tropical forests and coral reefs are unique among the world's ecosystems because they harbour very large numbers of species. In fact most of the world's biodiversity is present in tropical forests. Conventional ecological theories, such as those based on competitive interactions, are inadequate to explain species diversity and community assembly of these systems. Decades of diligent work on the natural history and patterns of species distributions have led to the formulation of theories that explain the origin and maintenance of

species diversity in tropical forests. Although many theoretical explanations have been offered, field data to test these hypotheses are scanty and difficult to obtain. One effort to obtain such large-scale data is the global network of forest dynamics plots governed by the Centre for Tropical Forest Science, United States of America. The network facilitated the establishment of over 17 large permanent tropical forest plots in 14 countries, one of which is in Mudumalai, southern India. My graduate dissertation work at Mudumalai gave me the opportunity to participate in this global effort to understand tropical forests.

My research in the past has focused on understanding the factors that influence tree diversity in tropical forests. I have worked on tropical ecosystems that range from relatively species-poor tropical dry deciduous forest in Mudumalai, southern India, to a moister and species-rich forest in Barro Colorado Island, Panama, a high-elevation species-rich forest in La Planada, Colombia, and a super-rich lowland forest in Yasuni, Ecuador. While the Mudumalai forest has about 25 species in 1 ha, the Yasuni forest has over 650 species in a single hectare! Specifically, I have been investigating whether biotic interactions (such as Janzen–Connell effects) and habitat specialisation (mediated through soil nutrients) can influence species richness, species distributions and demography in these vastly different forests. Currently, I am involved in expanding this work with my collaborators to a global network of forest study plots in several other countries in Asia (Sri Lanka, Thailand and Malaysia) and a site in Africa (Cameroon). Potential outcomes of this research include an improved understanding of community structure, dynamics, and assembly of some of the most diverse tropical forests of the world.

Research statement

The focus of my work at ATREE over the last year has been divided between developing my research programme and coordinating ATREE's new doctoral research programme in Conservation Science. As it turned out I spent the larger part of my time working on the Ph.D. programme.

My current research interests have expanded from working on fundamental questions related to tropical forest structure and function to more applied issues on forest management, forest recovery and restoration. In particular I am interested in developing a framework that will permit the evaluation of management options for landscapes with substantial forest cover. Forest restoration, fire management, natural resource use, agricultural needs and livelihoods of forest dependent communities need to be addressed at the landscape scale. This is because development planning is typically done at the landscape scale and changes in one component of the landscape typically influence the others. Ideally, we will need to determine land-use and land-cover change over time (decadal scales) and also identify the factors that drive these changes, in order to understand the future evolution of these systems to formulate development and management plans. Fortunately, time-series of remotely sensed data are becoming increasingly available for a quantification of these processes and parameters. I am currently developing these ideas into a grant proposal, first for a pilot (feasibility) study for a landscape in the Nilgiris district in Tamil Nadu, and then based on the outcome of the pilot study, a full proposal. On this I plan and hope to involve colleagues at ATREE and scientists from other institutions.

Another study that I am developing is a meta-analysis/documentation and review of reforestation efforts in the Western Ghats. There are numerous efforts in India at reforesting degraded areas of forestland under government and private ownership. State Forest Departments have, over the years, undertaken reforestation in hundreds or even thousands of acres of land. Many are typically plantations involving a few species, but their goals have been more than just production forestry. I have consulted with Dr. S. N. Rai, a former senior forester about the feasibility of such a study. He has alerted me to the availability of a wealth of data from numerous permanent plots that could also be used for this study. The need for such a study arises mainly because the numerous reforestation efforts have not been documented in ways that make it easily accessible to other practitioners of reforestation. These efforts at reforestation constitute 'experiments' that would yield valuable data and experience to inform similar efforts elsewhere in the country. Where some time-series data on the recovering tree populations and communities are available, quantitative analyses on the process of recovery for the given management practices can be undertaken. When such data are not available, even a one-time sampling of recovering communities and comparing such data with 'reference communities' would also be useful. Potentially, this approach to studying the process of recovery can be extended to other communities such as insects, birds and other vertebrates. Testing the covariation of the recovery process is important to assess the rate of recovery of the ecosystem.

Although I have been working on the foregoing research agenda, I have also devoted considerable time to developing the new doctoral research programme at ATREE. Students will register with Manipal University, which is the institution that will award the Ph.D. degree, but the entire programme will be run by ATREE in Bangalore. Doctoral students will first undergo rigorous coursework, which will train them in fundamental concepts in ecology, economics, sociology, and then in advanced concepts in research methods and conservation science. I have been actively involved in developing the course structure and course syllabuses for the programme.

Several aspects of the doctoral programme need to be developed much further and consolidated, a process that will take a few if not several years. There are challenging aspects to developing courses, particularly courses that discuss new and rapidly evolving interdisciplinary approaches in the conservation of biodiversity, natural resource management and development. We plan to develop several elective courses that are designed to prepare the student to address these current challenges. We also need to develop partnerships with other institutions, that will bring in financial and human resources to strengthen this programme in both teaching and research.

On a different note, I have been working on contributing to the conservation education programme at ATREE. For a start we are focusing on schools in the urban sector. We have started by reviewing environmental education sections of school textbooks for grades 5–10. We plan to then develop activities that will nicely complement and add value to these existing curricula. ATREE has already developed components (e.g. kit for butterfly gardens in schools), which can be integrated with new components to educate and sensitise school students to a variety of environmental issues. The conservation education programme is a large team effort.

Dr. T. O. Sasidharan

Personal statement



I developed my interest in insect pathology from the time I started my career in sericulture research in the Central Silk Board in the early eighties. The frequent silkworm crop losses encountered by farmers due to rampant outbreaks of microbial infections further fostered my interests in the field. During my research career in the Central Silk Board, I was continuously involved in research projects on microbial diseases of silkworm, with the major objective of developing appropriate disease control technologies for enhancing silkworm crop production. It was very satisfying that during the period, we could develop certain very effective, viable and easy to adopt technologies for silkworm disease

management at field level, one of which has now been patented in India. Though the core area of research was silkworm disease control, I gradually developed interest in the broader areas of insect pathology. Insect–pathogen interactions and the potential of several microbial agents to regulate natural populations of insects too, fascinated me often. Soon, I came to realise that while insect pathogenic microbes are unwelcome and pose continuous problems in an agro-industry like sericulture, they find a perfect place in insect bio-control, if exploited judiciously. My association during the earlier part of my career with the scientists at the Institute of Biological Control in Kyushu University, helped me broaden my knowledge and pursue my interests in insect bio-control, especially using insect specific Microsporidia with their inherent characteristics to qualify as potential bio-control agents. Microsporidia are a unique and diverse group of eukaryotic organisms that infect almost all animal phyla from protists to humans and a large number of them are reported from insects. Insect–pathogen interactions in nature present some of the excellent examples of co-evolution and there are several interesting findings on modification of immune mechanisms by insects, when continuously challenged by pathogens and a concurrent development of more potent invasive mechanisms by the pathogens.

In the present day, bio-control methods using entomo-pathogenic microbes are increasingly being appreciated and advocated. Biological control, in a way, supports conservation of species, because, the organisms exploited are generally target specific and operate in tandem with the principles of population dynamics. Managing, and not eliminating, a potentially noxious pest species below the Economic Injury Level is the ultimate objective of any bio-control programme. They could, therefore, be the right choice for pest management in the interest of preserving the rich biodiversity of our ecosystems since the candidate organisms for the purpose are chosen carefully, laying emphasis on their target specificity. Bio-control, hence, has always conservation embedded in it and should be promoted in the interest of sustainable ecosystem management.

Taking lessons from my experience in the field of microbial disease control, I am currently pursuing studies under two research projects on insect bio-control, one funded by the Department of Biotechnology (DBT) and the other by the Department of Science and Technology (DST). One of the projects envisages development of a mycoinsecticide based on *Metarhizium*, a potential entomopathogenic fungal organism capable of causing natural epizootics among insect populations. The other aims to look at entomopathogenic microsporidia occurring in forest insects to identify potential candidate organisms suitable for developing bio-pesticides.

Research statement

Developing eco-friendly bio-control technologies for management of insect pests in forestry.

Project: Development, augmentation of efficacy and improvement of dissemination systems of *Metarhizium* based mycoinsecticide for the management of major pests in forest plantations and nurseries.

Project: Investigations on Microsporidia affecting forest Lepidoptera of South India and their prospects as bio-control agents

Team: Dr. T.O. Sasidharan, Dr. Priyadarsanan Dharma Rajan, Ms. R. Usharani, Ms. A. Anitharani

Collaborator: Dr. O.K. Remadevi, Institute of Wood Science and Technology, Bangalore



During the nineteenth century, the insect pest populations became increasingly resistant to different insecticides such as organochlorines and organophosphates. Increased concentrations and new classes of pesticides are being required today to kill the insects resistant to the already available chemicals. Consequently, from this stand point, there is tremendous pressure today, on populations of beneficial insects and several other non-target species. An accumulating body of evidence on resurgence of the target organisms, emergence of secondary pests to pest status, impact on the non-target organisms including humans, environmental pollution through accumulation of pesticides in soil, water and air and residues on the agricultural products and animals has further multiplied our concerns. These facts have necessitated the development of alternative and more selective methods for addressing the pest problems. Notwithstanding the potential hazards involved in their use, chemical insecticides are still the first and immediate choice for pest control even today. Another serious demerit associated with the technology is the broad spectrum activity of such chemicals. The concept of biological control took root and gained popularity under these circumstances. It has now come to stay as one of the very prominent and wise strategies for insect pest management and has already proved its merit especially in the agricultural sector. Attempts to extend the application of these technologies to other sectors like forestry, public health and urban households have also started receiving appreciable attention. The recognition of the benefits and long term dividends of this approach has been the foremost reason for the increasing acceptance of this technology in recent times. Most of these methods employ natural enemies, botanicals and microbes for pest management. Among them, application of microbes has almost established its place in the current day integrated pest management. Insect pathogenic fungi are perhaps the first few ones used by agricultural technologists for control of insect pests of agriculture crops. The present day scenario witness diverse groups of organisms including bacteria, viruses, protozoa and even nematodes being employed for insect pest control. In this kind of approach, a native organism which is capable of causing natural epizootics in a pest population is generally exploited. In fact, we have now ushered in an era of employing even engineered organisms which have provided a cutting edge to this kind of a technology, though to the anguish and deep concern expressed from some quarters of the scientific community against these techniques.

In this backdrop, under one of the projects funded by DBT, we are trying to examine the possibility of using native isolates of *Metarhizium* fungus for control of potentially dangerous insect pests of forest plantations and nurseries. Our team has been successful in isolating a few strains of the fungus, from the field with promising effects against certain defoliator pests of selected timber yielding trees. Under the other project funded by DST, we are trying to look for insect specific Microsporidia which can induce gross pathological effects in the target insects for possibly exploiting them for pest control. An interesting achievement of the study has been the isolation of a Microsporidian parasite for the first time, from the defoliator pest of teak, *Hyblaea puera*. We hope to come out with more interesting observations in due course, which could strengthen our cause towards developing eco-friendly technologies for preserving the environment.

Dr. Ramanatha Rao

Personal statement

Although I was elected as Adjunct Senior Fellow, ATREE in November 2006, my actual association with it started in September/October 2006 after I returned to India and settled down in Bangalore. Since I am new to most of the ATREE community, it may be appropriate to provide first some background information about me [although we had worked together on bamboo and rattan since almost the beginning of ATREE and later on developing a proposal to Global Environment Facility (GEF) on conservation and utilisation of fruit genetic diversity].



I am trained in plant genetics and plant breeding, however, since 1975 I have been working on conservation and utilisation of plant genetic resources, in particular, crop genetic resources. In fact, this association started in 1970 when I was looking at plant architecture and its effect on biomass production in sorghum. Although I worked for a while in Andhra Pradesh Agricultural University and Indian Council of Agricultural Research, my real career started with as Botanist (Groundnut), Genetic Resources Unit, International Crop Research Institute for the Semi Arid Tropics (ICRISAT), Patancheru, Andhra Pradesh, India. While at ICRISAT, my major interests were collecting (in over 23 countries in Asia, Africa and Latin America) and assembly of *Arachis* genetic resources from national and international sources; classification and documentation; maintenance and evaluation of groundnut germplasm and identification of desirable traits. I established the first *ex situ* World Collection of over 10,000 groundnut accessions before I left ICRISAT. During this phase, I also spent a one-year sabbatical as Consultant with Inter-American Institute for Cooperation on Agriculture (IICA)/Empresa Brasileira de Pesquisa Agropecuaria (EMBRAPA), as a Specialist in Taxonomy and Genetic Resources at the Centro Nacional de Recursos Geneticos (CENARGEN)/EMBRAPA, Brazil. Among other things, I provided the framework for improving the work on genetic resources at CENARGEN and for a National Programme on Groundnut for Brazil.

I joined the International Board for Plant Genetic Resources (IBPGR) [which became the International Plant Genetic Resources Institute (IPGRI) and now the Biodiversity International] in July 1989 as the Genetic Diversity Officer in the Research Programme of the Organisation at its Headquarters in Rome, Italy. The duties included: identification and placement of contracts in centres of excellence for research on patterns of variation in gene pools including genetics, taxonomy and cytology; liaise with IBPGR field projects to assist in scientific aspects of planning and transfer of methodology and techniques; planning and identification of priority research on genetic diversity and liaise with relevant scientific organisations concerning taxonomy and population genetics. I moved to the newly opened Regional Office for Asia the Pacific and Oceania (APO) in Singapore as Senior Scientist (Genetic diversity and conservation). This office moved to Serdang, Malaysia at the end of 1996. With changes in organisation, I became Senior Scientist (Understanding and Managing Diversity), Bioversity International and the Coordinator of its global project on Utilisation of Genetic Diversity.

In all these years, genetic diversity, the central theme of plant genetic resources (in fact this notion can be extended to all biodiversity), has remained my major interest, although I have dabbled in a number of other areas. As an adjunct, training of national partners and younger enthusiasts to better understand the extent and distribution of genetic diversity and its utilisation has been the other major interests.

Research statement

From the foregoing, it is clear that my major contribution will not be on researching a particular issue but on transfer of the knowledge gained over the years to others and to contribute to niche areas in ATREE research portfolio that focuses on plant genetic resources and agro-biodiversity. Since I strongly believe that, in our haste to better the less endowed, we have lost track of the diversity that is available in nature that could be put to use to better their lot, i.e. making everyone eat rice (or maize in Africa or wheat in Latin America). This trend could be reversed by expanding the food basket and at the same time make the life of many more interesting and colourful.



I plan to get involved more and more on tropical fruit work. These are food crops and perennial species and are good for marginal lands. Thus, any improvement in increased use of the diversity available in fruit species not only contributes to increased food and nutrition security but also to environmental health. The current issues in agro-biodiversity conservation and utilisation are genetic diversity status and trends including genetic erosion, rationalisation of collections, utilisation of conserved genetic resources including crop wild relatives, access, intellectual property rights, seed supply systems and bio-safety. The issues related to genetic diversity and utilisation are technical issues that require base line information and tools to enhance use to better benefit from investments made on conserving millions of genetic resource accessions around the globe. The access issues are farmers' access to genetic resources, researchers' access to genetic resources to enrich the adapted gene pool and breeders' access to the adapted gene pool to breed new varieties. The outcomes of such efforts focusing on tropical fruit tree genetic resources could include diversity of tropical fruit tree genetic resources conserved *in situ* and on-farm through improved knowledge of its value, use and sustainable management practices; benefits to rural communities using methodologies and good practices for the management and conservation of tropical fruit tree species and intra-specific diversity and increased capacity of stakeholders to apply good practices for managing tropical fruit tree genetic resources diversity and livelihood options.

As I mentioned earlier, I would be very much interested in education and training activities so that the knowledge that has accumulated within ATREE and in other collaborating centres of excellence can be used to improve the understanding and knowledge of younger workers in agro-biodiversity field. Currently, I am working with a regional consortium of government and non-governmental organisations of four Asian countries—India, Indonesia, Malaysia and Thailand—participating in the Tropical Fruit Tree Genetic Resources (TFTGR) Project funded by the GEF entitled 'Conservation and sustainable use of cultivated and wild tropical fruit diversity: Promoting sustainable livelihood, food security and ecosystem services' that has been established to contribute to the improvement of livelihoods and food security of target beneficiaries through the conservation and use of tropical fruit tree genetic resources. ATREE is one of collaborating partners of the project and on behalf of all partners in TFTGR Project (India, Indonesia and Thailand) is requesting the Nuffic [Netherlands Organisation for International Cooperation in Higher Education (www.nuffic.nl)] to support the tailor made training programme for the year 2008. As coordinator, it will host and coordinate the organisation of the training, which should bring about a positive change in the field of conservation of tropical fruit tree species diversity.

In the area of training and education, I would be working toward establishing a course on Conservation Genetics. I believe the substantial knowledge that exists with ATREE and its collaborators could be put to good use in developing such a course to be offered/organised by ATREE. I have vast experience in organising training at international level and have good contacts regionally and globally, which can be a good asset in getting this conceived and practised.

PUBLICATIONS (2005–2007)

Articles in peer reviewed journals

- Aravind, N. A., K. P. Rajashekhar and N. A. Madhyastha. 2005. Species diversity, endemism and distribution of land snails of the Western Ghats, India. *Records of Western Australian Museum, Supplement*. 68:31–38.
- Bawa, K. S. 2006. Globally dispersed local challenges in conservation biology. *Conservation Biology*. 20:696–699.
- Chetana, H.C and T. Ganesh. 2007. Survey and activity patterns of nocturnal mammals in a fragmented dry deciduous forest of Karnataka. *Zoos' Print Journal*. 22(4):2644–2647.
- Das, A., J. Krishnaswamy, K. S. Bawa, M. C. Kiran, V. Srinivas, N. S. Kumar and K. U. Karanth. 2006. Prioritisation of conservation areas in the Western Ghats, India. *Biological Conservation*. 133:631.
- Devy, M. S. and P. Davidar. 2006. Breeding systems and pollination nodes of understory shrubs in a medium elevation wet evergreen forest, southern Western Ghats, India. *Current Science*. 90(6):838–842.
- Ganesh, T. and M. S. Devy. 2005. Non-flying mammal pollination systems: Case of *Cullenia exarillata* Robyns (Bombacaceae) a canopy tree from the wet forests of Western Ghats, India. *Current Science*. 90(12):1674–1679.
- Krishnaswamy, J., M. Bunyan, V. K. Mehta, N. Jain and K. U. Karanth. 2006. Impact of iron ore mining on suspended sediment response in a tropical catchment in Kudremukh, Western Ghats, India. *Forest Ecology and Management*. 224:187–198.
- Madhusudhan, M. D., K. Shanker, A. Kumar, C. Mishra, A. Sinha, R. Arthur, A. Datta, M. Rangarajan, R. Chellam, G. Shahabuddin, R. Sankaran, M. Singh, U. Ramakrishnan and P. D. Rajan. 2006. Science in the wilderness: The predicament of scientific research in India's wildlife reserves. *Current Science*. 91(8): 1015–1019.
- Murugan, R., K. R. Shivanna and R. R. Rao. 2006. Pollination biology of *Aristolochia tagala*, a rare species of medicinal importance. *Current Science*. 91(6):795–798.
- Nagendra, H., S. Pareeth and R. Ghate. 2006. People within parks: Forest villages and fragmentation in the Tadoba-Andhari Tiger Reserve, India. *Applied Geography*. 26(2):96–112.
- Narendran, T. C., K. Sudheer, P. A. Sinu and P. D. Rajan. 2006. A new genus of Chalcididae (Hymenoptera: Chalcidoidea) from Karnataka, India. *Journal of Ecobiology*. 18: 155–159.
- Narendran, T. C., P. G. Kumar, S. Santhosh and P. A. Sinu. 2005. On a genus and a new species of Eulophidae (Hymenoptera: Chalcidoidea) from the paddy fields of Southern India. *Zoo's Print Journal*. 20:1915–1916.
- Ostrom, E and H. Nagendra. 2006. Insights on linking forests, trees and people from the air, on the ground and in the lab. *Proceedings of the National Academy of Sciences USA*. 103: 19224–19331.
- Perrings, C., L. Jackson, K. S. Bawa, L. Brussaard, S. Brush, T. Gavin, R. Papa, U. Pascual and P. De Ruiter. 2006. Biodiversity in agricultural landscapes: Saving natural capital without losing interest. *Conservation Biology*. 20:263–264.
- Prasad, S., J. Krishnaswamy, R. Chellam and S. P. Goyal. 2006. Ruminant-mediated seed dispersal of an economically valuable tree in Indian dry forests. *Biotropica*. 38:679–682.
- Prathapan, K. D., P. D. Rajan, T. C. Narendran, C. A. Viraktamath, K. A. Subramanian, N. A. Aravind and J. Poorani. 2006. Biological Diversity Act 2002: Shadow of permit-raj over research. *Current Science*. 91(8):1006–1007.
- Saha S., H. BassiriRad and G. Joseph. 2005. Phenology and water relations of tree sprouts and seedlings in a tropical deciduous forest of South India. *Trees*. 19:322–325.
- Seema, P. 2005. Land-use strategies for tribals: A socio economic analysis. *Economic and Political Weekly*. 40:5611–5620.
- Shanker, K., A. J. Hiremath and K. S. Bawa. 2005. Linking biodiversity conservation and livelihoods in India. *PLoS Biology*. 3(11): 394.

Sinu, P. A. and K. R. Shivanna. 2007. Pollination ecology of cardamom (*Elettaria cardamomum*) in Western Ghats, India. *Journal of Tropical Ecology*. 23:14.

Sinu, P. A., M. Nasser and P. D. Rajan. 2006. Feeding ecology of two economically important tiger beetles from paddy agro-ecosystems in central Western Ghats, India. *Biotropica*. 38:500–507.

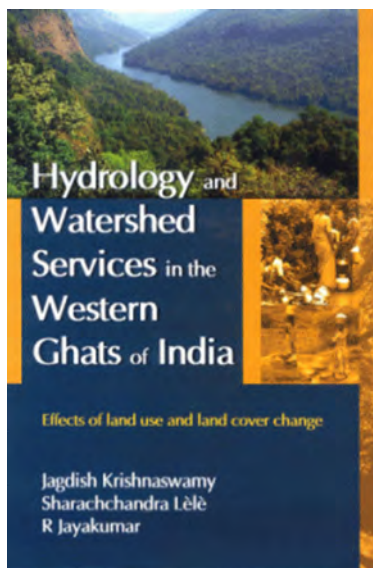
Southworth, J., H. Nagendra and K. D. Munroe. 2006. Introduction to the special issue: Are parks working? Exploring human-environment tradeoffs in protected area conservation. *Applied Geography*. 26(2):87–95.

Tandon, R., R. Chaudhury and K. R. Shivanna. 2007. Cryopreservation of oil palm pollen. *Current Science*. 92:182–183.

Tripathy, B., K. Shanker and B. C. Choudhury. 2006. The status of sea turtles and their habitats in the Lakshadweep archipelago, India. *Journal of the Bombay Natural History Society*. 103:33–44.

Books

Kadur, S. and K. S. Bawa. 2005. *Sahyadris: India's Western Ghats - A vanishing heritage*. ATREE, Bangalore, India.



Krishnaswamy, J., S. Lele and R. Jayakumar. (Editors). 2005. *Hydrology and watershed services in the Western Ghats: Effects of land-cover and land-use change*. Tata McGraw-Hill, New Delhi, India.

Popular press

Shanker, K. 2005. Lessons from Norse mythology. *Down to Earth*. November 15:50.

Shanker, K. 2005. Let's look beyond tigers. *Times of India*, December 20.

Shanker, K. 2005. Reconciliation: Lessons from marine ecology. *Down to Earth*. August 31: 49.

Shanker, K. 2005. The holy book and the sacred list. *Down to Earth*. December 31: 50.

Shanker, K. 2006. An island away. *Down to Earth*. April 30:51.

Shanker, K. 2006. Can good science help conservation? *Down to Earth*. September 15:50.

Shanker, K. 2006. For a common environmental ethic. *Down to Earth*. March 15:51.

Shanker, K. 2006. Sher Khan needs his share. *Outlook*. January 16: 66.

Shanker, K. 2006. Small empty patches are important. *Down to Earth*. June 15: 50.

Shanker, K. 2006. Taxonomic debates are important. *Down to Earth*. February 15: 49.

Shanker, K. 2006. Urban areas can support biodiversity. *Down to Earth*. October 31: 51.

Shanker, K. and M. D. Madhusudhan. 2006. Fenced out: wildlife research in India. *Down to Earth*, November 15:51.

Swamy, S. 2006. Go green. *One India One People*. 10(4): 23–24.

Swamy, S. 2006. Those fluttering beauties. *Dream Homes*. 3(11): 23–24.

Project reports

Menon, M. and A. Sridhar. 2007. An appraisal of coastal regulation law in tsunami-affected mainland India. In: *Report on ecological and social impact assessments post-tsunami in mainland India*. Submitted to UNDP. Post-Tsunami Environment Initiative. 105–149.

Sridhar, A. 2006. Environmental governance reforms, rephrasing the reform process. Draft submitted to International Institute for Environment and Development, New Delhi, 15p.

Sridhar, A. 2006. Pre and post-tsunami coastal planning and land-use-Policies and issues in India. Draft Submitted to FAO RAP, Bangkok. 30p.

Book chapters

Shanker, K. 2007. A quarter century of sea turtle conservation in India. In: *Making Conservation Work* (eds G. Shahabuddin and M. Rangarajan). Permanent Black, Delhi, India.

Seminars/workshops/conference proceedings

Rajan, P. D. 2005. Dung beetles (Scarabaeidae). Biligiri Rangan WLS, Fauna of Biligiri Rangaswamy Temple Sanctuary, Conservation Area Series No.90106. Publication of the Zoological Survey of India, Calcutta, India.

Reviews

Aravind N. A. 2006. CD review: Organic cultivation of rice. *Current Science*. 91(10):1413.

Nagendra, H. 2006. Book review: Working forests in the neotropics: Conservation through sustainable management? *Environmental Conservation*. 33: 83.

Nagendra, H., 2006. Book review: The Kuhls of Kangra: Community managed irrigation in the Western

AWARDS AND HONOURS

ATREE was awarded the prestigious 'Dr. A.P.J. Abdul Kalam Rajya Parisara Prashasthi' for Environment Conservation for the year 2006-2007. This award is given to individuals/organisations for outstanding initiatives/contributions in environmental conservation and environmental management.

Soubadra Devy was awarded the Lowell Thomas Award for 2006 in recognition of her work on the pollination of canopy trees. The Explorers Club and Rolex, United States of America (USA) Award the Lowell Thomas Award each year to honour individuals who have made unique contributions to particular fields of exploration.

C. Made Gowda was awarded the annual Vivekananda Girijana Kalyana Kendra–Swami Vivekananda Award by the President of India, Dr. A.P.J. Abdul Kalam. This award is given to outstanding tribal leaders in Karnataka.

Harini Nagendra's paper with Elinor Ostrom was awarded the Cozzarelli prize by *Proceedings of the National Academy of Sciences (PNAS), USA*. The award recognises 'recently published *PNAS* papers of outstanding scientific excellence and originality' that 'push the envelope of discovery'.

Bharath Sundaram's paper at the first meeting of the Asia–Pacific chapter of the Association of Tropical Biology and Conservation (ATBC), held at Mamallapuram, Tamil Nadu, was adjudged as the best student presentation.

The critically acclaimed '*Sabyadris: India's Western Ghats – A Vanishing Heritage*' was a finalist both in the International Mountain Book Awards under the category Mountain Image given by the Mountain Institute in Banff, Canada as well as the Independent Publisher Book Award under the category of coffee table book. This book authored by Sandesh Kadur and Kamaljit Bawa combines quality images and information about the Western Ghats in peninsular India.

Gladwin Joseph has been nominated as a member of the Indian Council of Forestry Research and Education (ICFRE) Society, Dehradun, Uttarakhand, for a period of two years with effect from April 2005. ICFRE is an autonomous society under the Ministry of Environment and Forests, Government of India.

P.A. Sinu was awarded a Ph.D. from the University of Calicut, Kerala, for his work on 'Impact of various land-use corridors on insect pests and their arthropod natural enemies in rice paddy agro-ecosystems in Sringeri, central Western Ghats, India'.

P.A. Sinu has been selected as a member of the Royal Entomological Society (RES), London, United Kingdom.

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British High Commission, New Delhi, India

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Darwin Initiative, London, UK

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Global Environment Facility-Small Grants Programme, New Delhi, India

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Institute of International Education, New York, USA

International Foundation for Science, Stockholm, Sweden

International Sea Turtle Society, California, USA

JRS Foundation, Philadelphia, USA

Keystone Foundation, Kotagiri, Tamil Nadu, India

Kodagu Model Forest Trust, Kodagu, Karnataka, India

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Rajen Chettri, Community Facilitator

Gopal Rai, Trainer

Prakash Basnet, Office Assistant

Sanchita Moktan, Marketing Coordinator

FIELD STATIONS

Biligiri Rangaswamy Hills

Programme Staff

C. Made Gowda, Research Associate

M. Paramesha, Research Associate

T. M. Mahesh Murthy, Project Associate

D. Kethe Gowda, Field Assistant

M. Kethe Gowda, Field Assistant

B. Kumbhe Gowda, Field Assistant

N. Jadeya, Field Assistant

S. Nanje Gowda, Field Assistant

R. Mahadeva, Project Assistant

Administration

Madha, Office Assistant

D. Rajanna, Caretaker

Support Staff

M. Jadeswamy, Driver

R. Madeva, Driver

C. Renukha, Cook

Male Mahadeshwara Hills

Programme Staff

B. Narayan, Senior Field Assistant

R. P. Harisha, Research Associate

M. Madesha, Field Assistant

Veerabhadra, Field Assistant

Support Staff

M C. Umesh, Driver

Kanakpura

Programme Staff

H. Manjunath, Project Assistant

G. Shivaram, Field Assistant

R. Shivrudra, Field Assistant

Kumar Nayak, Senior Field Assistant

Kalakad–Mundanthurai Tiger Reserve

Programme Staff

Kottai Muthu, Research Associate

V. Ganesan, Research Associate

Joseph Anthony Vedanayagam, Research Associate

Mathivanan, Project Assistant

Alleppey

Programme Staff

T. D. Jojo, Programme Officer

D. Deepak, Programme Officer

R. Murukesh, Research Associate

FINANCIAL STATEMENT

BALANCE SHEET AS ON 31 MARCH 2006 AND 2007		
Sources of funds	As at 31-03-06	As at 31-03-07
Corpus Fund	46,248,846	53,560,372
General Fund	21,719,512	28,603,692
Reserve for Assets (As per Contra)	16,741,634	19,624,032
Current Liabilities		
Projects in Progress	24,342,447	33,602,507
Provision for Expenses	1,983,101	703,946
Total	111,035,540	136,094,548
Application of funds		
Fixed Assets and Capital WIP		
ATREE Assets	16,310,621	26,372,564
Project Assets (As per Contra)	16,741,634	19,624,032
Investments	58,581,371	75,001,172
Current Assets		
Advances	11,471,151	1,671,793
Deposits and other		
Current Assets	2,160,548	2,249,058
Cash and Bank	5,770,214	11,175,928
Total	111,035,540	136,094,548

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31 MARCH 2006 AND 2007		
Particulars	As at 31-03-06	As at 31-03-07
INCOME		
Project Income	53,322,748	59,910,876
Corpus Fund Interest	680,041	652,721
Interest	652,379	527,704
Others	255,354	1,182,780
Total	54,910,522	62,274,081
EXPENDITURE		
Project expenses	47,219,943	53,331,220
Salaries	1,622,988	613,063
Administrative expenses	986,300	2,157,888
Excess of income over expenditure	5,081,291	6,171,910
Total	54,910,522	62,274,081



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