

ANNUAL REPORT 2016–17



**ASHOKA TRUST FOR RESEARCH IN ECOLOGY
AND THE ENVIRONMENT**

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Eurasian griffons, a winter visitor in the dry grasslands of the Thar Desert. © Chetan Mishra.

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President's Message

Building Leadership for Safeguarding the Environment

Among the highlights of the 20th-anniversary celebrations of ATREE's establishment were the seminars by ATREE's doctoral students, dispersed among the talks by international experts. Short, crisp and informative, the three-minute speed talks conveyed the essence of their story—the societal importance of their work, the soundness of their approach, and the significance of their findings.

ATREE's Academy for doctoral students was established in 2009. Designed to encourage interdisciplinary work to help resolve our most pressing environmental challenges, the Academy was intended to attract the raw talent to build a new generation of environmental leaders. Our intention was not necessarily to recruit students with high grades but to search for people who had a passion for the environment and the potential to excel.

This potential was amply demonstrated when two years ago, I attended a doctoral thesis defence at ATREE. I will always remember what M. Parmesha said as he concluded his presentation: "When I joined ATREE's doctoral programme, I did not know how to write and I had not stepped out of Karnataka. Today, as I defend my thesis, I am happy to say that I have published five papers in peer-reviewed journals and have travelled to six countries."

I am proud of the work that doctoral students have done. They have worked with people in Spiti on free-ranging dogs and Meghalaya on forest-agriculture transition. They have investigated the effects on

ecosystem services of urbanisation in Bangalore and the response of indigenous communities to climate change in North Sikkim. The range of themes and geographies is amazing.

The extraordinary talent and the dedicated work of ATREE's doctoral students have been recognised through many national and international awards. Noteworthy, this year, has been the award of the New India Foundation Fellowship to Nachiket Kelkar, who was chosen among nine leading scholars out of 400 nationwide applicants.

In my 50 years of professional life, nothing has brought me more joy and satisfaction than the work of ATREE's Academy, the work made possible by the students and a dedicated and able faculty.

Many donors and friends continue to support the Academy and encourage us to explore uncharted waters. Specifically, Rohini Nilekani, the Shibulal Family, the Sehgal Family, the International Development Research Center (Canada), the Royal Norwegian Society, and the Tata Trusts remain our great champions. We are grateful to all.

Kamaljit S. Bawa
President and Distinguished Professor of Biology
University of Massachusetts, Boston



Director's Desk

ATREE turned 20 last year, which marks a coming of age of sorts. ATREE has now established itself as one of the leading think-tanks in Asia, an academic institution of repute with an increasingly appealing interdisciplinary PhD programme, and as an organisation committed to environmental and social justice, through its work on livelihoods with local communities and grassroots organisation.

A series of events were held through the year to mark the occasion. ATREE helped organise the annual conference of the Indian Society for Ecological Economics and hosted a panel discussion. A felicitation event was conducted for K.N. Ganeshiah, one of ATREE's founders, after his retirement from the University of Agricultural Sciences, with a keynote address by Kathleen Morrison, Professor of Anthropology, University of Pennsylvania School of Arts and Sciences.

The major event was an international conference on Conservation Science and Sustainable Development in January 2017. The event was held at the JN Tata Auditorium in the Indian Institute of Science and attracted over 500 participants, including many youngsters from colleges in the city. The programme included keynote presentations by Georgina Mace, Gunter Pauli, Esther Mwangi and Upmanu Lall and invited talks and sessions on Biodiversity and Ecosystem Services, Forests and Livelihoods, Climate Change and Water. The TN Khoshoo Memorial Event was also held with a panel discussion on the interlinking of rivers in India. The 2016 award was presented to KJ Joy, an activist and researcher in the development sector for over 30 years.

The highlight of the event for me was a series of three-minute talks by ATREE's students and researchers. In the age of short attention spans (symbolised in this country at least by the invasion of T20 cricket), speed talks have become the fashion in many international conferences. The three-minute

thesis has now become a popular competitive event in Australia, Canada and other countries. Coached by a few of our eternally energetic and irrepressibly enthusiastic faculty, the students demonstrated the diversity of their work in a series of pithy talks (now on our YouTube channel).

During the year, ATREE was also awarded the prestigious Distinguished Service Award by the Society for Conservation Biology. Having taken a moment to savour our accomplishments and take pride in how far ATREE has come, it is perhaps best to lock the laurels away and look to the future. At a time when both national and global politics seem less than conducive to environmental and social concerns, ATREE has a particular role to play in providing thought leadership for the present as well as in creating leaders of the future.

Never has it been truer that knowledge is power. But the path forward to environmental sustainability and social equity lies in the democratisation of that knowledge. The very nature of ATREE's research – interdisciplinary, participatory and inclusive – is central to its purpose, namely to break the shackles of current development paradigms and create a new world of environmental empowerment.

To mark our 20th year, ATREE published an edited volume on its work across various sectors. However, rather than a typically dry scientific collection of papers, ATREE's fellows decided to put together a collection of short easily accessible articles with evocative illustrations and images. We already know that we can do the science; it's time to make it do work in society.

But the most creative science and solutions come from freedom, to think, act, and be inspired. This is essential to achieve one of our main goals, to create future environmental scholars and leaders. The issues that we work on are no laughing matter, but there is no reason that we should not have fun while figuring out how to fix them! ATREE therefore aims to be an organisation that abhors straight lines. In our research and our culture, we aim not just to follow in the footsteps of the best, but to blaze (winding) trails that they can follow.

Kartik Shanker
Director, ATREE

Recognitions and Achievements

2016–17

ATREE was ranked as the 19th top environment policy think tank in the world by the University of Pennsylvania's 2016 Global Go To Think Tank Index Report released by the Think Tanks and Civil Societies Program (TTCSP) of the University of Pennsylvania, Philadelphia, USA.

ATREE was awarded with Distinguished Service Award by the Society for Conservation Biology, Asia Section.

The United Nations Framework Convention on Climate Change (UNFCCC) Secretariat provisionally admitted ATREE as an Observer NGO.

Dr. Kamaljit S. Bawa, President of ATREE, received the Jose Cuatrecasas Medal for Excellence in Tropical Botany from the Natural History Museum, Smithsonian Institution.

Recognising ATREE's Governing Board member Ms. Rohini Nilekani's philanthropic work, the American Academy of Arts and Sciences elected her as a Foreign Honorary Member.

The International Consortium of Environmental History Organizations (ICEHO) appointed Dr. Siddhartha Krishnan, Fellow, ATREE, as a board member.

The Indian Society for Ecological Economics (INSEE) elected Dr. Bejoy K. Thomas, Fellow, ATREE, as an Executive Committee Member. He was also a visiting scholar at the University of British Columbia in spring 2017.

The Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India, appointed Dr. Sharachandra Lele, Senior Fellow, ATREE, as a member of the Expert Appraisal Committee on Thermal Power Projects and Coal Mining and the Committee on Sustainable Low Carbon Growth. The journal Sustainability Science, published by Springer, also elected him to the editorial board.

International Association of Hydrologic Sciences invited Dr. Veena Srinivasan to serve on its Scientific Advisory Committee for the Scientific decade 2013–2022, entitled "PantaRhei".

The Ministry of Social Welfare, Government of Karnataka, nominated ATREE's researcher Dr. C. Madegowda as a member of the Karnataka Adivasi Abhivrudhi Mandali.

Research scholar Nachiket Kelkar was awarded the New India Foundation Fellowship for 2017. The International Whaling Commission also inducted him as an external scientific contributor to their Annual Scientific Committee Meeting in Slovenia.

Research scholar Vikram Aditya received the Wildlife Conservation Trust – WCT Small Grant to study hunting practices and impacts on wildlife in the northern Eastern Ghats.



Research Highlights

ATREE's research spans across two centres, each housing three programmes



Centre for Environment and Development

WATER, LAND AND SOCIETY

The programme's aim is to generate valuable insights that can help identify social, technological and governance solutions to India's water problems.

FACULTY: Dr. Veena Srinivasan (Programme Leader), Dr. Bejoy Thomas, Dr. Durba Biswas, Dr. Priyanka Jamwal, Dr. Shrinivas Badiger and Dr. Sharachandra Lele.

FORESTS AND GOVERNANCE

This programme aims to influence the forest policy debate by incorporating the changing socio-economic contexts of local communities, the importance of historically-situated and locally nuanced forest rights arrangements, and the need for institutional arrangements that fairly link local and global stakeholders.

FACULTY: Dr. Siddappa Setty (Programme Leader), Dr. Sharachandra Lele.

CLIMATE CHANGE MITIGATION AND DEVELOPMENT

This programme aims to find approaches of decoupling economic growth and greenhouse gas emissions and harness co-benefits for the local environment, health, and energy security.

FACULTY: Dr. Sharachandra Lele (Programme Leader), Ms. Ulka Kelkar, Dr. Shikha Lakhanpal and Dr. Megha Shenoy (Adjunct Faculty).



Centre for Biodiversity and Conservation

BIODIVERSITY MONITORING AND CONSERVATION PLANNING

This programme aims to describe, assess and monitor biodiversity across scales, taxa, and landscapes, apply broad interdisciplinary approaches to conservation planning, and catalyse adaptive management practices to further ecological sustainability.

FACULTY: Dr. R. Ganesan (Programme Leader), Dr. Priyadarsanan Dharma Rajan, Dr. G. Ravikanth and Dr. N.A. Aravind.

LANDSCAPES, LIVELIHOODS AND CONSERVATION

This programme aims to examine the contrasting and synergistic strengths of natural and social drivers of environmental change at the landscape level and find solutions that enhance both conservation and livelihoods.

FACULTY: Dr. T. Ganesh (Programme Leader), Dr. Ankila Hiremath, Dr. Abi Tamim Vanak and Dr. Nitin Rai.

ECOSYSTEM SERVICES AND HUMAN WELLBEING

This programme aims to understand the various dimensions of ecosystem services and introduce it into ongoing and new societal and policy discussions.

FACULTY: Dr. Jagdish Krishnawamy (Programme Leader), Dr. Soubadra Devy and Dr. Siddhartha Krishnan.



Centre for Environment and Development
Water, Land and Society

This programme’s faculty members have been engaged in several large research projects. Two major interdisciplinary research projects in urbanising watersheds are nearing completion and have already resulted in several peer-reviewed publications, discussion papers and conference papers. These projects involved training dozens of young researchers who worked as research associates and interns.



ADAPTING TO CLIMATE CHANGE IN URBANIZING WATERSHEDS (ACCUWA)

This four-year interdisciplinary research study focusing on two rapidly urbanising watersheds in southern India — the Arkavathy sub-basin in Karnataka and the Noyyal sub-basin in Tamil Nadu — reached its conclusion. This study, supported by International Development Research Centre (IDRC) Canada, highlighted how water quality and availability is changing with increasing urbanisation, industrialisation, climate change, and high rates of urban consumption.

Over the course of the study, a team of more than 50 researchers, including faculty, students, research staff, interns, and collaborators, explored each of the links in the conceptual framework through extensive primary and secondary research. The project has already resulted in 30 publications and reports, with more to come. It finally culminated in three dissemination workshops — one national and one in each sub-basin — and revealed several policy salient insights.

Significant findings of the Project:

Groundwater over-abstraction and eucalyptus plantations have resulted in the drying of streams.

When faced with groundwater depletion, state agencies tend to invest in artificial recharge via check dams. But artificial recharge does not create ‘new’ water. Any water that recharges groundwater does not flow downstream if groundwater over extraction continues unabated.

Treating groundwater and surface water as a single interconnected resource will require participatory water budgeting that is simultaneously bottom up (village scale, aggregating upwards) and top down (basin scale, apportioning downwards)

Climate related actions should not be planned by separate climate cells in the government. Instead, mainstream policies should allow flexibility to address climate related uncertainties.



Left: The frothing waters of the Byramangala reservoir, in Karnataka, used to irrigate mulberry crop. © IDRC / Atul Loke.

Top: Flow measurements being taken at the outlet of the Jakkur lake wetland using a velocity meter. © IDRC / Atul Loke.

Above: The Vrishabhavathi river carrying Bengaluru’s sewage flowing through densely populated neighbourhoods. © IDRC / Atul Loke.

AGRARIAN, ENVIRONMENTAL CHANGE AND URBANISATION

This five-year research project, funded by the Tata Trusts, focused on the Vrishabhavathi and Suvarnamukhi catchments, both of which originate in the Greater Bengaluru region. The project aimed to understand the socio-economic and environmental implications of urbanisation, specifically wastewater pollution, in peri-urban areas and villages that lie close to expanding cities. The research found that heavy metals contaminated water downstream of Bengaluru, and when used to irrigate farms downstream of the city, heavy metals enter the food chain.

Researchers attributed these problems to a combination of poorly designed standards, inadequate monitoring and weak enforcement. They also examined the techno-economic feasibility of decentralised wastewater treatment.

Significant findings of the Project:

Direct use of wastewater from urban streams introduce heavy metals into the food chain, which pose a risk to human health.

The current surface water quality regulatory standards for various applications are not comprehensive. For example, surface water (rivers and lakes) is exposed to both industrial (toxic contaminants and heavy metals) and domestic pollution (organic contaminants) but are regulated only for organic contamination i.e. Biological Oxygen Demand (BOD) and faecal coliform.

Urban and peri-urban farmers use wastewater flows from urban rivers for irrigation purposes, thereby increasing the risk of food contamination.

Currently, water quality data from the spot/ grab samples are used to assess the pollution levels of the surface water bodies. But these spot samples do not reflect the extent of contamination as most of the wastewater discharges occur during the early hours of the day. Therefore, there is an urgent need to introduce passive water quality monitoring devices which will help pollution control boards to manage the surface water quality better.

The study highlighted the need for catchment-based management solutions for improving/ maintaining the desired quality of water in our rivers and lakes.

2035 VISION FOR SUSTAINABLE, EQUITABLE WATER AND WASTEWATER MANAGEMENT IN BENGALURU

The goal of the project is to evaluate a range of options for sustainable and equitable water and wastewater management in Bengaluru for the Year 2035. In particular, the project analyses Bengaluru's ability to sustain itself using local sources (wastewater, storm water, groundwater, and efficiency improvement) without the need for expensive inter-basin projects. The project has focused on lakes as the central component of Bengaluru's water system and undertook intensive monitoring and modeling efforts.

Policy Outreach:

This research has fed directly into the policy process. Collaborative work with the Bangalore Water Supply and Sewerage Board (BWSSB) on sewage monitoring is currently underway. These efforts have also led to the inclusion of ATREE's Senior Fellow, Sharachandra Lele in the Bellandur Lake Rejuvenation Committee in May 2016, and later in the Bellandur Lake Monitoring Committee.

ENHANCING WATER LITERACY IN INDIA

The WLS programme conducted a Training Programme on Water Conflicts for 25 journalists, scholars and practitioners. Programme faculty gave over 25 public talks and published four opinion editorials. Two widely watched short films also helped disseminate the findings of the research, as did many dissemination workshops conducted both in rural areas, through the Water Literacy campaign, and in the city via an apartment-level meeting on decentralised wastewater treatment.

Below: A farmer in Doddaballapur region, north of Bengaluru, monitoring the depth of his borewell. © IDRC / Atul Loke.

Bottom: A farmer tends to his freshly planted rows of baby corn which is irrigated by the Byramangala reservoir. © IDRC / Atul Loke.





Centre for Environment and Development
Forests and Governance

The Forests and Governance programme analyses the performance of local forest institutions, empowers communities to claim rights under the Forest Rights Act (2006) and studies the influence of forest governance regimes on the distribution of ecosystem benefits. The programme also conducts action-research on the enterprise-linked conservation of Non-Timber Forest Products (NTFP) and studies the long-term ecological dynamics of NTFPs.



Above: Forest based livelihoods. © Kalyan Varma.

Facing Page: Honey processing in MM Hills. © Paramesh M.

MANAGING FORESTS FOR BIODIVERSITY AND HUMAN WELLBEING IN THE FACE OF GLOBAL CHANGE

This project, funded by the United States Agency for International Development (USAID), aims at the sustainable use of Non-Timber Forest Products (NTFPs), helping forest-dwelling communities add value to NTFPs with improved processing and marketing strategies, and improving incomes of agricultural communities with the use of new products and techniques. With project sites located in the Eastern Himalaya and the Western Ghats, research load is shared by ATREE's Forests and Governance programme (which works on the Western Ghats component) and ATREE's Northeast India Initiative (which works on the Eastern Himalaya component). In the Western Ghats, the project has been implemented in the Malai Mahadeshwara (MM) Hills, Biligiriranga Hills, and the Cauvery Wildlife Sanctuary.

Outcomes of the Project:

Enterprise based conservation has been encouraged among the indigenous Soliga community to secure their livelihoods. This, in turn, would increase the community's stake in the conservation as the income generated will incentivise them to conserve and monitor the resources.

With active community participation, three decentralised processing units have been established to add value to honey, gooseberry, soapnut, soapberry and wild mango. These processing units have now started generating income.

Participatory resource monitoring conducted in 35 villages elicited the participation of 700 individuals, who were trained on the sustainable use of forest resources. Through such monitoring activities, harvesters estimated the percentage of bee colonies before and after harvest and noted the amount of forest resource collected.

IMPROVING FOREST GOVERNANCE IN INDIA

Forest Rights Act 2006 was a landmark policy which gave forest-dwellers rights over their land. The Forests and Governance programme at ATREE has been working fastidiously towards addressing roadblocks that hinder the Act's implementation, implementing provisions of this Act, creating community forest management plans, and raising awareness about the Act among communities that have historically depended on forests for their livelihoods and sustenance. The programme has worked extensively in south India to monitor the long-term dynamics of NTFPs and enhance their market value through community-level enterprises. In helping communities acquire their rights under the FRA (2006), the programme has been actively reconciling community rights and livelihood needs with conservation goals in protected areas. In central India, this programme is now engaged in helping identify sustainable, viable and equitable approaches for Community Forest Resource management under the FRA.



Contributions towards forest governance in India:

The F&G programme contributed to a state-level update on FRA implementation in Karnataka, and to the national-level report 'Promise and Performance' published by the Community Forest Rights Learning and Advocacy (CFR-LA) network.

The programme also submitted contributions for the Compensatory Afforestation bill to Member of Parliament, Mr. Jairam Ramesh.

The programme provided inputs on the proposal for setting up community-based conservation plans in protected areas to Dr. Amita Prasad, Additional Secretary to Government of India, Ministry of Environment, Forests and Climate Change.

The programme co-organised a workshop for local communities from Biligiri Rangaswamy Temple Tiger Reserve with the Soliga Abhivridhhi Sangha in September 2016 to discuss a proposed relocation programme.

Following the official recognition of Community Forest Rights of 39 villages in Biligiri Rangaswamy Temple Tiger Reserve, Malai Mahadeswara Wildlife Sanctuary and Cauvery Wildlife Sanctuary in December 2016, a workshop was organised in ATREE in March 2017 with Soliga community representatives from these villages on the next steps in implementing community-level forest management under the FRA.



Centre for Environment and Development
Climate Change Mitigation and Development

The Climate Change Mitigation and Development (CCMD) programme aims to understand how social, institutional and behavioural factors enable or impede sustainable, equitable and low-carbon development pathways. The programme studied decentralised renewable energy generation, conflicts between renewable energy, conservation, urban solid waste management, and conspicuous consumption behaviour.

ROOFTOP SOLAR ENERGY GENERATION IN RAMANAGARA TOWN, KARNATAKA

The project, funded by the Royal Norwegian Embassy in India and the Environmental Management and Policy Research Institute (EMPRI), Department of Forest, Ecology and Environment, Government of Karnataka, investigated the factors determining household behaviour regarding the adoption of renewable energy and energy efficiency in Ramanagara, a small city in Karnataka. The study revealed the role of regulatory uncertainty, information barriers, and cultural factors in the low adoption of rooftop solar photovoltaic technology by urban households. Using insights from behavioural economics, the study recommended bundling solar PV loans with housing loans and piloting incremental payment schemes for renewable energy.

Dissemination of Study:
 Findings of the study were presented at conferences organised by the International Education for Sustainable Development Alliance (INTESDA), Hiroshima; Tata Institute of Social Sciences (TISS), Mumbai; and the Oslo Centre for Interdisciplinary Environmental and Social Research (CIENS), Norway.

CONFLICT BETWEEN RENEWABLE ENERGY AND BIODIVERSITY PROTECTION

This study analyses conflicts between renewable energy projects and biodiversity protection. Cases of wind energy projects in Maharashtra and mini-hydro projects in Himachal Pradesh and Karnataka show that the same conflict is manifested either as an environment versus environment or as an environment versus development conflict, contingent upon the scale of analysis and how the political process prioritises different interests. This research highlights the social and political consequences of renewable energy development and the potential trade-offs between biodiversity, livelihoods and renewable energy.

POLICY DRIVERS OF RENEWABLE ENERGY EXPANSION IN INDIA

This ongoing study, in collaboration with Indian School of Business, investigates the exponential rise in wind



Solar farms in biodiverse grasslands impinge on ecosystems. © Prashant MB

installed capacity across Indian states from 2001–2010 and shows that it is a function of the interaction between the international Clean Development Mechanism and two domestic policy instruments. The findings highlight how multi-scalar policy pathways enable renewable energy outcomes.

SOLID WASTE MANAGEMENT (SWM) INNOVATION IN BENGALURU

Solid waste constitutes a significant environmental problem in a rapidly urbanising India. This study, a collaborative work with Sichuan University, China, investigated Bengaluru’s decentralised waste management policies and practices. A combination of citizen activism and judicial intervention contributed to the formulation of a decentralised solid waste management policy in 2012.

Significant findings of the project:
 The project revealed that recycling of dry waste and on-site composting of wet waste could potentially generate revenue.
 —
 Incineration of sanitary waste involves a significant cost and requires support from the municipal body
 —
 A workshop held in March 2017 communicated the findings of this study to a cross-section of officials, judiciary, activists and private companies. The local press widely covered this workshop.
 —



Top: Waste Management in Bengaluru. © Megha Shenoy.
 Above: Workshop to disseminate findings on urban solid waste management innovations in Bengaluru. © Ravi Kumar D.

DRIVERS OF CONSUMPTION DECISIONS

Rising per-capita consumption is a major driver of environmental degradation. This study analysed the data from the India Human Development Survey to identify socio-cultural correlations of conspicuous consumption behaviour in India, after controlling for income. The multivariate analysis suggests that exposure to mass media and social networking are positive drivers of consumption whereas education seems to mitigate their effects.

ENGAGING WITH THE ENVIRONMENTAL CLEARANCE PROCESS

Participation in the Expert Appraisal Committee for Coal Mining and Thermal Power Projects constituted by the Ministry of Environment, Forests and Climate Change enabled our faculty to understand and contribute to the statutory processes for environmental clearances, including scrutiny of environmental impact assessments, public hearing proceedings, and environmental management plans. The objective of this engagement is to improve the rigour and scope of these assessments by incorporating better hydrological models, cumulative impact assessments, and greenhouse gas emissions.



Centre for Biodiversity and Conservation

Biodiversity Monitoring and Conservation Planning

The Biodiversity Monitoring and Conservation Planning programme generates knowledge through applied research and outreach activities by using integrative taxonomy and monitoring biodiversity and ecosystem changes. The programme aims to improve the management of biodiversity and ecosystems through a variety of outputs that could potentially influence existing policies and conservation planning.

UNDERSTANDING PAST CLIMATIC FACTORS ON BIOGEOGRAPHIC PATTERNS IN AMPHIBIANS AND FRESHWATER SNAILS

Climate can have a significant influence on the distribution of biodiversity. The Indian monsoons, which formed 7-12 million years ago, could have influenced the diversification in amphibians of the biodiverse Western Ghats. This project tested the above hypotheses using molecular data for over 150 endemic species across seven families of amphibians. The results indicated that genera *Micrixalus*, *Indosylvirana* and *Raorchestes* diversified after the Indian monsoon strengthened. These genera are either post-monsoon breeders (*Micrixalus* and *Indosylvirana*), terrestrial breeders (*Indirana*), or develop directly, bypassing tadpole phase (in the case of *Raorchestes*). Comparatively, other families had evolved early during the Miocene and post mid-Miocene optima.

The Western Ghats is also home to several species of snails including the Genus *Cremnoconchus*, a uniquely freshwater mollusc belonging to the family *Littorinidae*, which is entirely marine. The project will investigate whether sea level changes in the last 100 million years are responsible for the diversification of *Cremnoconchus* in freshwater habitats of the Western Ghats. At present, central and northern Western Ghats house 13 species of snails, with nine species restricted to central and four to the northern Western Ghats. The project used preliminary molecular studies to study how these species would have evolved.

Significant findings of the project:

A distinct clustering observed among central and northern Western Ghats species indicating that these might have evolved at two different geological time periods.

Species found in the central Western Ghats are basal to those found in the northern region of the mountain range.

The larger phylogeny with other sister species shows that the *Cremnoconchus* has evolved in parallel with the species belonging to the subfamily *Litorininae*.



Top: *Cremnoconchus* sp. in the Western Ghats. © N.A. Aravind.

ASSESSING SPECIES ADMIXTURES IN HERBAL TRADE

The global economy of the international trade of herbal products has been increasing by 15 percent annually. Southern and south-east Asian countries supply raw materials for most of the herbal products. In India, of the 8,000 species of medicinal plants harvested in the wild, around 960 species are in the active trade. However, with the increasing trade in international trade in herbal medicines, there is also a growing concern about widespread adulteration and species admixtures in raw herbal trade. The adverse consequences of such species admixtures on the health and safety of consumers are only recently beginning to be recognised and documented. In the last three years, with funding from the Department of Biotechnology, Government of India, this project has established DNA barcodes for several

medicinal plant species and assessed the extent of adulteration in southern India. This assessment revealed that over 80% of herbal products are adulterated. The project also assessed the nature and magnitude of species admixtures in raw herbal trade and the underlying drivers that might lead to such admixtures.

Project Outcomes:

Established DNA barcodes for over 150 medicinal plant species.

Designed a framework for the development of a herbal trade authentication service that can help regulate the herbal trade market.



Above: ATREE began the long-term ecological monitoring of forests in KMTR in 1990. © Kalyan Verma

Facing Page Top Left: *Onthophagus jwala*, female. © Anu Radhakrishnan.
Facing Page Top Centre: *Onthophagus pithankithae*, female dorsal. © Anu Radhakrishnan.
Facing Page Top Right: *Onthophagus tharalithae* dorsal. © Anu Radhakrishnan.

Facing Page Bottom: *Tongeia pseudozuthus*. © Seena N. Karimbunkara.

LONG TERM ECOLOGICAL MONITORING

ATREE initiated the long-term monitoring of plant phenology in the wet forests of Kalakkad Mundanthurai Tiger Reserve (KMTR) in 1990, and in the Biligiri Rangaswamy Temple (BRT) Tiger Reserve in 1995. Since then, over 750 trees belonging to 70 species have been monitored every month for the last 26 years. This project aims to decipher the phenological patterns of canopy and sub-canopy trees and understand these changes in relation to the functional traits of the species and local (microhabitat) and global changes (climate). The curation of these extensive data sets along with information on climatic variables is currently underway. Long-term vegetation monitoring plots from the evergreen forests of KMTR and dry deciduous forests of BRT Tiger Reserve were recently re-censused after a five-year interval. New data sets are being curated for analysis before integrating them into the previous census' data sets.

Significant findings of the project:

- Abundant species survive better than the less abundant species, which could perhaps explain their competitive superiority.
- Understorey species showed greater mortality rates when compared to canopy and sub-canopy tree species.
- Tree species which are restricted to the Western Ghats showed better survival rates than widely distributed species. However, the trunk growth rates between the two groups were found to be similar.
- In the dry deciduous forests of BRT Tiger Reserve, mortality rates and recruitment are largely unchanged between the five-year census intervals.



NEW DISCOVERIES, REPORTS AND DATABASES

A recent story on dung beetles in BBC Earth mentions how scarabs, which were once an Egyptian icon, have emerged to be an important part of the ecosystem. Beetles benefit the ecosystem in several ways, in particular through feeding and relocating its food resource, the dung. Contrary to popular imagination, however, these beetles don't just feed on dung. ATREE's insect laboratory has come across 12 species of dung beetles, including three recently discovered ones, which feed on other invertebrates. The three new species include *Onthophagus jwala* and *O. pithankithae* from Kerala and Karnataka respectively — which were found feeding on the carcass of a millipede — and *O. tharalithae* from Assam which was found feeding on a dead giant African snail. This team also reported the strange behaviour of a known species, *O. rudis*, which was found feeding on the body tissues of a live millipede after entering through one of its damaged body segments.



Significant findings of the project:

- Revision of the genus *Onitis* found in the Indian subcontinent
- Preparation of an inventory on the dung beetles of the Shendurney Wildlife Sanctuary, Kerala, which will add new species to the taxa.
- Three new species of drain flies (*Psychodidae*) have been described from the Western Ghats — *Horaiella pectinata*, *Gondwanoscurus jezeki*, and *Saximormia gladiator*.
G. jezeki sp. nov. and *S. gladiator* sp. nov. represent the new record and range extensions for both genera.
- Reported the occurrence of a rare butterfly the false Tibetan cupid (*Tongeia pseudozuthus* Huang) after 100 years from the Ithun Valley, in Arunachal Pradesh. (This is the only photographic record of the species which confirms its presence in India).
- After the launch of *Scarabaeinae* species pages on the India Biodiversity Portal (IBP), the Insect Lab at ATREE developed and deployed 1,174 species pages for grasshoppers as well. A checklist for the Orthopterans of India is also available on the portal. This comprehensive database on grasshoppers from India is first of its kind.



Centre for Biodiversity and Conservation

Landscapes, Livelihoods and Conservation

The work of the Landscapes, Livelihoods and Conservation programme is focused on examining ecosystem processes across different types of landscapes (ranging from arid and semi-arid grasslands to savannah and moist forests). The programme is also involved in studying the different 'natural' and 'social' drivers that feed into and affect these processes.



Above: Foxes in the the human-dominated village of Baramati in Pune district, Maharashtra. © Anjan Katna.

COEXISTENCE OF MESO-CARNIVORES IN HUMAN-DOMINATED LANDSCAPES

In collaboration with the Centre for Ecological Sciences, Indian Institute of Science, Bengaluru, the project aims to identify patterns of resource use and movement for all meso-carnivore species across a landscape mosaic using a combination of very high-resolution Earth observation data and advanced GPS telemetry. The project aims to determine the ecological parameters and behavioural strategies that enable the occurrence of the golden jackal, Indian fox and jungle cat in human-dominated systems. The data generated by the project allows researchers to model the fine-scaled movement strategies of meso-carnivores in modified landscapes, and determine the thresholds of tolerance to landscape change.

Outcomes of the project:

Eighteen Indian foxes, eight golden jackals and eight jungle cats have been fitted with GPS collars.

More than 30,000 locations for all of these species have been obtained, making it one of the largest GPS telemetry based studies in India.

Identification of key resting/denning sites, foraging areas, residency time in forage patches and pathways of use that link resource patches.



Above: Free ranging dogs in human-dominated landscapes. © Anirban Roy.

ONEHEALTH TO RABIES RESEARCH IN INDIA

This Wellcome Trust/DBT India Alliance-funded project combines animal ecology, disease ecology and human health in a 'OneHealth' framework to understand rabies dynamics in India. With study sites spread across Karnataka, Maharashtra and Haryana, this project also aims to understand how rabies spills over or back from dogs to wild carnivores.

Outcomes of the project:

Sampling more than 500 dogs across the urban-rural gradient in Maharashtra and Karnataka.

Large-scale quantification of dog population densities across the study sites in Maharashtra and Karnataka, as well as the city of Panchkula, Haryana.

GPS collaring of 20 dogs in villages around Baramati in Maharashtra, where an ongoing project also monitors the movement of meso-carnivores to understand overlap and potential contact rates.

Sampling of dogs in Bengaluru and Solapur following vaccination programmes to determine if the vaccination has resulted in sufficient immunity levels against rabies in dogs.

MIGRATING GRASSLAND RAPTORS: POPULATION CHANGE IN HARRIERS ACROSS SPACE AND TIME

Harriers are migratory raptors that roost on the ground in large numbers in tall grasslands. However, with the disappearance of grasslands in the country, the roosts of many of these birds are affected. This project, funded by the Department of Science and Technology, Government of India, attempts to identify such roosts from historical records and field visits, monitor their population in such roosts and track how the birds move at the individual and population level across the subcontinent. This information, which is expected to show how these birds use dynamic grasslands and scrub habitats in a human-dominated agriculture-grassland matrix, would have a bearing on conservation science. The project has revealed a significant decline in the population of harriers in India, more significantly in the Rollapadu Bustard Sanctuary in Andhra Pradesh, which once had the second largest roost site in India. The project also identified lacunae in the monitoring of several ecological parameters which could help in understanding the impact of pesticide, grassland transformation, agriculture intensity, and what happens in their breeding grounds apart from socio-ecological drivers of change. In addition to its findings, the project also addressed the strict regulations in allowing advanced tracking devices to be fitted on animals to study migration.

Outcomes of the project:

Reported a decline in harriers at prominent roosts sites across India based on historical and current data.

Reported a 90% loss of birds in the Rollapadu Bustard Sanctuary in Andhra Pradesh that once had the second largest roost site in India.

Organised a global and local level workshop on satellite telemetry and tagging of birds in November 2016 for the forest department staff and students at the Great Indian Bustard Sanctuary, Nannaj, Maharashtra. This workshop was conducted in collaboration with the Maharashtra Forest Department and leading experts on harrier migration from Montagu foundation and Groningen University, Netherlands.

A POLITICAL ECOLOGY OF THE GREEN ECONOMY IN THE GLOBAL SOUTH

This project investigates green governmentality in ecotourism, carbon forestry, and climate-smart agriculture in selected cases from East Africa and India. The project develops a novel conceptual approach by combining Michel Foucault's notion of 'governmentality' (understood as the techniques and tactics of government) with theories of resistance, social agency and critical institutionalism. This theoretical combination retains the potential to break new ground in environmental governance studies by combining a focus on power and authority with one on agency, rights, and institutions. The ambition is to develop an understanding of the interplay between structural power and individual agency as played out in the context of global economics and environmental change in the Global South.

This project is being conducted in collaboration with the Norwegian University of Life Sciences (NMBU). Other collaborating institutions include University of Sheffield, UK, Institute of Research for Development, France, Institute of Development Studies, UK, University of Dar es Salaam, Tanzania, University of Wisconsin-Madison, USA, and the Oslo and Akershus University College of Applied Sciences, Norway.

HUMAN-WILDLIFE INTERACTIONS IN DARJEELING-SIKKIM HIMALAYA

Human beings, in their environment, have always been interacting with wildlife. These interactions are in the form of coexistence, subsistence, and recreation, or are bio-cultural in nature. However, some of these interactions take the form of conflicts. Additionally, the growing human population has consequences on human-wildlife interactions, which calls for changes in wildlife management. It is, therefore, important to document the historical and emerging human-wildlife interactions and understand and analyse them for creating informed interventions. ATREE's Eastern Himalaya offices, through three projects, has been working on human-wildlife interactions, focusing on the conservation of focal species and sustainable development in the human-dominated landscapes of Eastern Himalayas, specifically

Darjeeling-Sikkim. The three projects in Darjeeling-Sikkim geographically cover three altitude zones comprising lowland subtropical forests, mid-hill temperate forests, and high-altitude temperate and subalpine forests. Representative species like the hornbills in the lowland forests, pangolins in the mid-hill forests, and the red panda in high altitude forests are being studied to understand the factors and dynamics influencing human-wildlife interactions in the region.

Outcomes of the projects:

Reported 65 species of wild edible fruits from Neora Valley National Park, Darjeeling, 45 of which made dietary components of both the hornbills (three species) and local communities. Five of these wild fruits species used by the hornbills were reported to have high commercial value.

Located three nest sites of the three hornbill species, two of them outside protected area of Neora Valley National Park.

Identified key challenges to sustainable nature tourism in red panda landscapes from assessments of three protected areas in Darjeeling-Sikkim. Appropriate interventions, such as the capacity building of local nature guides and strengthening of interpretation, have been initiated in the Singhalila National Park.

Assessed eleven tea plantations and private agroforests for pangolin status, installed camera traps in three habitats comprising private agroforests, tea plantations and forests in Darjeeling.

Reported the abundance of the Pangolins, burrow use patterns, and burrow characteristics.

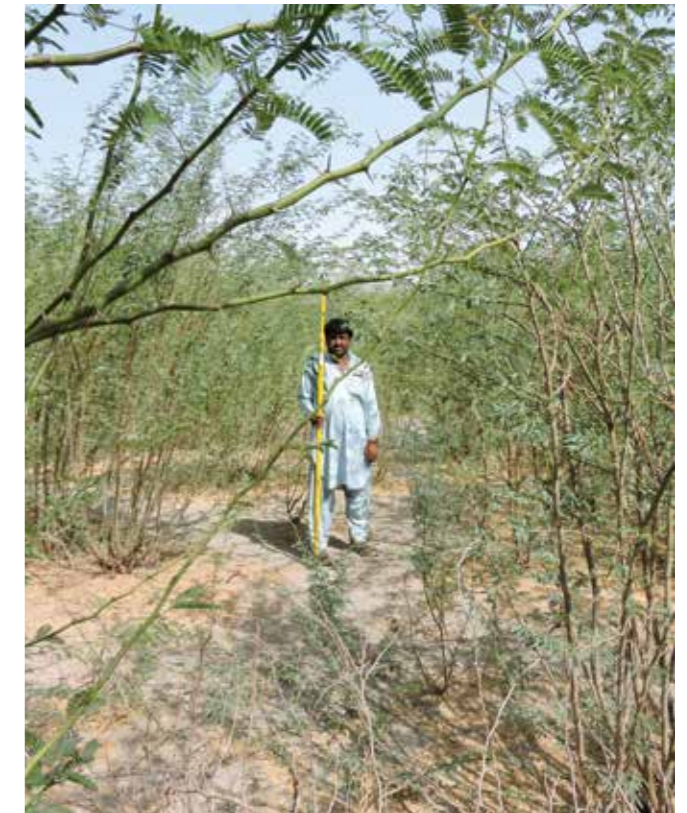
Identified key threats to pangolins including illegal trade and pocket areas for subsistence hunting and poaching.

Mobilised and trained local community members as Pangolin Guardians in tea plantations and private agroforests. These individuals monitor the species and raise awareness about conserving them in areas outside protected areas where the species do not afford legal protection.



Above Left: *Prosopis* having been lopped in a plot. © Ankila Hiremath.

Above Right: *Prosopis* regrowth within a year of lopping. © Ankila Hiremath.



THE BANNI GRASSLANDS IN A TIME OF CHANGE

The Banni grassland of Kutch has been significantly transformed in the past few decades by *Prosopis juliflora*, an introduced nitrogen-fixing tree that has invaded almost half of the Banni. To some, this exemplifies successful 'wasteland reclamation.' But *Prosopis* has replaced native trees and grassland, altered habitats for birds and animals, and reduced grazing areas for livestock. *Prosopis* has also spawned a parallel charcoal economy, profoundly affecting pastoralists' livelihoods and cultures. In the process, it has created tradeoffs between charcoal-based livelihoods and pastoralist livelihoods, between carbon converted to charcoal and carbon sequestered, and between livestock and wildlife.

This project, funded by USAID's Partnership for Enhanced Engagement in Research (PEER) Programme, aims to develop a predictive understanding of the *Prosopis* spread with climate change and evaluate the extent to which it is possible to remove *Prosopis* and restore Banni's grasslands. The project addresses questions such as whether it is ecologically feasible to restore

these grasslands or has *Prosopis* transformed them irreversibly; also, whether it is socio-economically feasible to completely restore grasslands, or are charcoal-based livelihoods here to stay?

To this end, the project is also developing a systems dynamics model of the Banni that could serve as a decision support tool to share with stakeholders to evaluate alternative management options and their implications for the ecological and socioeconomic resilience of Banni.

DELINEATING LINKAGES BETWEEN ECOSYSTEM SERVICES AND LIVELIHOODS

The vast rolling plains stretching east all the way to the Bay of Bengal from the foothills of the Western Ghats in Tamil Nadu's Tirunelveli district comprises hot and arid grasslands. Over the years, this landscape has shrunk because it is considered a wasteland, thereby easing its conversion into residential plots, industrial areas, tree plantations and paddy farms. There is growing evidence of how valuable grasslands are for local communities and how it supports biodiversity that provides ecosystem services, which in turn supports local livelihood.



The districts of Tirunelveli and Thoothukudi are home to a community of traditional herders, Edaiyars— who now calls themselves Konars. They straddle between the two districts in search of pasture. This migration is significant for farmlands in the landscape too, since during the day while sheep graze, their urine and pellets enrich the soil in fallow lands and reduce the usage of chemical fertilisers for cultivation. Farmers also pay for penning the sheep herds in their fields during nights.

Moreover, these grasslands house an astonishing diversity of plants that are typical to the semi-arid landscapes of southern India, and several large and small mammal species. These dry lands also support about 100 bird species, of which 65 are dependent on grasslands including several rare and migratory birds. Additionally, they also support several species of reptiles

including the scaly gecko, which ATREE researchers rediscovered in the area after 115 years, and the fan throated lizard, a new species restricted to the dry lands south of Tamiraparani.

The fallow field, dry farmland and grassland complex in the districts of Tirunelveli and Thoothukudi comprises a shrinking area of land that supports the livelihoods of grazing communities whose livestock depend on the grasslands for pasture. It also supports a significant biodiversity that is unique to grasslands. These grasslands can be conserved by strengthening local communities to protect their grazing areas with governmental support. It is critical that these grasslands are notified as *Meichal peramboke*/ grazing lands and people are made aware of their legal rights over these areas.



Facing Page: Migration of local pastoralists.
© Prashant MB.

Above: Blackbucks in the Rollapadu grasslands.
© Prashant MB.

Outcomes of the projects:

A 40% decrease in the extent of grasslands in Tiruchendur, Thoothukudi, and over 20% decrease in Radhapuram and Sathankulam taluks, in Tirunelveli and Thoothukudi respectively. The drastic reduction of grasslands in some taluks of Tirunelveli and Thoothukudi is due to agricultural expansion, invasion of the exotic weed *Prosopis juliflora*, and urbanisation.

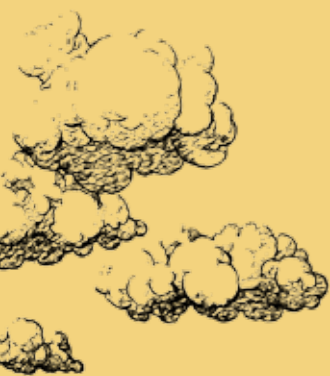
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In the Naguneri and Srivaikundam taluks, however, there is a slight increase in grasslands which could be due to large expanses of land being converted to unoccupied housing plots by clearing *Prosopis juliflora* and other bushes. Large expanses are also fenced off and not available for grazing by the Konars. It also prevents free movement of wildlife across the fenced off areas.

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There is not only a reduction in grassland area, but they have also become small and patchy. Most grasslands are now between 1 to 2 hectares (ha). There are very few large patches (> 10 ha) of grasslands left in the district.

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Centre for Biodiversity and Conservation
Ecosystem Services and Human Wellbeing

This programme conducts projects across several states in India, especially the Northeast and South India, on varied topics such as climate change adaptation, distribution of and access to ecosystem services, and eco-hydrology. This programme aims to benefit communities dependent on forests and affected by changing weather patterns (especially extreme rainfall events), as well as policy makers.



HYDROLOGIC AND CARBON SERVICES IN THE WESTERN GHATS

Extreme rain events are occurring with greater frequency, which is likely to increase in the future. There is a pressing need to bridge the gap in the knowledge of how these events are distributed over space and time, and their influence over hydrology and carbon dynamics in large landscapes with different land cover and land use patterns. This project aims to understand the nature of extreme rainfall events and the hydrologic and carbon regulatory effects of forest degradation and reforestation in the Western Ghats. Supported by the Ministry of Earth Sciences (MoES), Government of India, and the National Environment Research Council (NERC), UK, to strengthen inter-governmental partnership on climate change research, this project is part of the MoES-NERC's Changing Water Cycle Programme.

The project has led to some critical research and data outputs, methodological breakthroughs, the establishment of long-term monitoring sites, and has helped enhance the capacity for hydrologic and water resources monitoring among the civil society. The project trained over a hundred students, NGOs and government staff in the fields of hydrologic science and monitoring.

Outputs of the project:

Explored the changing roles of El Niño-Southern Oscillation (ENSO) and the Indian Ocean Dipole (IOD) in governing the long-term dynamics of the Indian monsoons.

Conducted a carbon dynamics study, one of the first in India integrated with hydro-meteorology, which generated data on stem respiration and soil respiration. This study suggests that future changes in temperature are likely to affect soil carbon cycling more than changes in soil moisture.

Generated a near-complete carbon budget for the wet forests of Sirsi, Karnataka, making it one of the most comprehensive quantifications of its kind for any forest ecosystem in the Indian sub-continent.

Used novel methods to identify changing dynamics of rainfall directly from meteorological and hydrological times-series (from existing government stations and new experimental catchments) that are capable of observing change above uncertainties in the techniques used.



Above: Trade of mandarin oranges in Sikkim. © Urbashi.

Facing Page: The changing roles of climatic drivers are leading to extreme rainfall events and droughts. © Susan Varghese.

SUSTAINABLE USE OF BIORESOURCES IN THE EASTERN HIMALAYA

This project, supported by the Department of Biotechnology, Government of India, provides technical innovations and ecological research for the sustainable use of bioresources in the Eastern Himalayas. The project has brought together the unique strengths of researchers at the National Centre for Biological Research (NCBS) and ATREE. Sikkim, as part of the Eastern Himalayas, is in the forefront of climate change. Its bioresources, both natural and agricultural, will face the brunt of global change drivers in the near future, which will affect vegetation health and productivity. This project has paved the way for establishing long-term monitoring sites for bioresources and ecosystem services, which will emerge as pioneers in the entire Himalayas for a comprehensive understanding of how ecosystems respond to global change. These early-warning sites will also help detect emerging trends and, in combination with improved regional climate change outputs, help forecast the availability of bioresource and critical ecosystem services under future scenarios of climate change.

Outcomes of the project:

Generation of extensive datasets on the richness, composition and spatial distribution of biodiversity, as well as detailed information on the ecology, demography and genetics, of key taxa across the Sikkim landscape.

Establishment and development of programmes to quantify current patterns and evaluate temporal trends in the provisioning of ecosystem services (pollination and hydrological services) to humans across the Sikkim landscape.

Initiation of long-term experiments to understand and quantify the impacts of future climate change, in particular, the effects of global warming on community and ecosystem-level processes in the high-altitude grasslands of the Sikkim Himalaya.

Development and strengthening of linkages with regional institutions and communities to understand the socio-ecological dimensions of bioresource use in the Sikkim Himalaya.

Building local capacity in Sikkim through the scientific training and development of a cadre of young researchers from Sikkim.

ADAPTATION AT SCALE IN SEMI-ARID REGIONS (ASSAR)

This project supported by the Department for International Development (DFID) and Canada's International Development Research Centre (IDRC), aims to enhance the understanding of climate vulnerability and adaptation in semi-arid regions of India and Africa. This year, the project brought together researchers from three project sites in Africa and India for a land-use and land-cover training and capacity building workshop, in Bengaluru, that focused on linking GIS and Remote Sensing to dynamics of ecosystem services in semi-arid regions. This south-south research initiative (encompassing key regions of the global south) will extend to assessing climate influences on vegetation in semi-arid regions of India and Africa in the future.



Above: Groundwater irrigated farms in the arid Bhavani. © Anjan Katna.

Facing Page: Boatman in Aghanashini, one of the only remaining undamed river. © Vidyadhar Atkore.

Significant findings of the project:

Revealed greening and browning trends in the mixed agricultural and forested landscape in semi-arid parts of the Moyar-Bhavani basin.

Led to the establishment of a network of vegetation plots to assess spread of *Prosopis juliflora*, an invasive species, in Tamil Nadu.

Initiated the development of a citizen-science initiative for an invasive species atlas.

Identified possible shifts in monsoon regimes.

Conducted the first ever study of blackbuck antelope occupancy in Moyar Valley.

INTEGRATED APPROACHES FOR ADAPTIVE RESILIENCE-BASED MANAGEMENT OF FORESTS

This Tata Trusts-funded project is the first socio-ecological assessment of conservation and wellbeing in the eastern Himalayas that rigorously combines ecosystem functioning and human functioning and capabilities. The freedoms that forest dwellers and dependents have in carrying out their day to day activities hold much conservation significance.

This project demonstrates how and why wellbeing assessments in and around protected ecosystems can go beyond livelihood approaches that narrowly and singularly reduce forest dependence to income. This interdisciplinary study has been accommodated as a full panel in the Human Development and Capabilities Association (HDCA) conference, Cape Town, 2017.

CHANSE: COUPLED HUMAN AND NATURAL SYSTEMS ENVIRONMENT FOR WATER MANAGEMENT UNDER UNCERTAINTY IN THE INDO-GANGETIC PLAIN

Managing water resources in the Indo-Gangetic Plain (IGP) is a tremendous challenge because of the basin's uniqueness in scale, biophysical complexity and the dynamics of its institutional and socio-economic characteristics. Considering expected population growth and impacts of climate change, achieving water security in India, and especially in the IGP, is a growing challenge that requires interdisciplinary collaboration across sectors, local communities, institutions and academia. This project brings together researchers from leading institutions in the UK (Imperial College London, University of Exeter and British Geological Survey) and India (ATREE, Indian Institute of Science Bangalore, Indian Institute of Technology Bombay, Indian Institute of Tropical Meteorology Pune), international organisations (UNESCO) and local NGOs, to support water management in the IGP.

Outcomes of the project:

The project conducted its first ever multi-disciplinary study on ecological flows in relation to the management of the Gandak barrage in the Gandaki River, a tributary of the Ganges, with linkages to water demand and supply in agriculture and other uses.

ASSESSING ECOSYSTEM RESPONSES AND SOCIO-ECONOMIC IMPACTS OF ALTERED AND FREE-FLOWING RIVERS

This Royal Norwegian Embassy-funded project continued ATREE's work in the Aghnashini, Son and the Bedthi basins. The project, which is also supported by the Government of Madhya Pradesh and the Ministry of Earth Sciences, Government of India, aims to estimate the ecological flows in the Son Gharial Sanctuary (Son basin), Madhya Pradesh. The project will evaluate the effects of hydropower projects on fish population and conduct hydrological and water quality monitoring in the Aghnashini basin.

The project conducted a pioneering study on the recovery of fish species below hydrologic barriers in the Western Ghats. This is the first study of ecosystem services and the responses of fishes in estuarine and river ecosystems to upstream flows of freshwater in the Aghanashini basin.



Bonnet macaque at forest shrine. © Anirban Roy.

Community Conservation Centres



The Community Conservation Centres (CCC) facilitate a two-way flow of knowledge between local stakeholders and researchers at ATREE. They act not only as field bases for doctoral research, but also provide a space for monitoring socio-ecological systems. The CCCs have been instrumental in reaching out to and building capacities of local community, community institutions, forest officials, environmental journalists and visiting students, including those participating in study-abroad programmes.

The four Community Conservation Centres form an integral part of ATREE and conduct a host of activities with community participation, which include research, outreach, livelihood enhancing programmes, capacity building, education and building awareness. The CCCs have also been instrumental in providing policy-level interventions.

AGASTHYAMALAI COMMUNITY CONSERVATION CENTRE

ATREE established the Agasthyamalai Community Conservation Centre (ACCC) in 2001 at the foothills of Agasthyamalai in Tamil Nadu. The ACCC informs the local stakeholders about the importance of the region's forests, wetlands and grasslands through research and outreach in Kalakkad Mundanthurai Tiger Reserve (KMTR) and the surrounding districts of Tirunelveli and Thoothukudi. Since its inception, the ACCC has addressed several important conservation issues in the region, documented bird diversity in the wetland, and brought about the conservation of an heronry through community participation.

Securing traditional pastoral livelihoods:

The ACCC and ATREE staff anchored a project on the 'Shrinking pastoral lands of Konars: Delineating linkages between ecosystem services and livelihoods,' which addresses conservation and livelihood issues in the neglected semi-arid grasslands of southern India. The project focuses on the Konars, a community of pastoralists who graze an indigenous variety sheep (well adapted to hardy and semi-arid conditions) across the districts of Tirunelveli and Thoothukudi. Regarded as wastelands, these arid grasslands that once stretched across vast areas in southern and eastern India have shrunk in recent years. ACCC conducted a participatory workshop for the herder community that



Wintering birds in Agasthyamalai Wetlands. © Prashant MB.

explored options to secure common arid lands and augment management practices so as to safeguard their livelihoods, while also addressing biodiversity and ecosystem concerns. The CCC also organised a two-day in-house research seminar to align research and outreach approaches with that of ACCC's goal.

Annual Water Fowl Count 2017:

For seven years, ATREE has been facilitating an Annual Water Fowl Count in Tirunelveli and Thoothukudi with the participation of individuals and organisations such as the Pearl City Nature Society and Nellai Nature Club. The survey revealed that not many birds visited the parched wetlands this year. With an estimated count of 8,000, the population of birds in these wetlands is at an all-time low. However, the effort gave an opportunity for local communities to learn about the influence of rainfall pattern and its linkages with the arrival of the water birds. Print and visual media highlighted the importance of Water Fowl Count 2017 in securing the wetlands as well as the ecosystem services that these birds and their wetlands habitats provide.

Conservation Education:

As part of its Conservation Education Programmes, the ACCC facilitated the training of 50 field staff of the Kalakad Mundanthurai Tiger Reserve in GIS-RS platforms, so as to help them monitor and map biodiversity with cutting-edge tools. ACCC, in collaboration with the Azim Premji Foundation, also



Waterbird Census participants. © Prashant MB.

conducted a certificate course to train 25 secondary school teachers from Pondicherry in experiential learning methods for teaching biodiversity science. This exercise also led to the development of a teaching manual by ATREE, with the support of Earthian-WIPRO grants. This manual integrates biodiversity conservation with other humanities-based sciences to reflect the realities of saving biodiversity in human-dominated landscapes. On yet another occasion, the wildlife week celebration, ACCC facilitated a two-day experiential learning exercise on exploring biodiversity for 20 school students.

Conservation Award:

Bell Pins, a leading entrepreneur from the region, and ATREE jointly instituted a Conservation Leadership Award in 2016 to recognise the services of individuals who contribute to the conservation of the region's biodiversity and biological resources. In its first event, ten individuals including a farmer, herder, folk artist, teacher, and home maker were recognised for their contributions towards conservation. Bell Pins and ATREE also jointly established an endowment to conduct the award programme annually.

Green Pilgrimage:

Agasthyamalai is home to several pilgrimage sites including the Sorimuthayan temple, which holds a ten-day festival at the heart of the Kalakad Mundanthurai Tiger Reserve. ACCC has been working for over ten years to initiate the development of a multi-stakeholder

programme to institutionalise 'green pilgrimage' efforts in the tiger reserve. ACCC liaised with the Forest Department, District Administration, and civil societies to develop participatory approaches to regulate issues such as solid waste management, water management, noise pollution and intrusion into wildlife habitat. To ensure that the festival doesn't adversely impact the tiger reserve, the CCC worked closely with the local Kalathimadam community and prepared them to celebrate the festival in a way that is least detrimental to the region's ecology. ACCC provided a refresher workshop to the tiger reserve staff and NGOs associated with green pilgrimage efforts and shared its expertise with other green pilgrimage initiatives.

BILIGIRI AND MALAI MAHADESHWARA HILLS COMMUNITY CONSERVATION CENTRES

ATREE's first Community Conservation Centre (CCC) was established in the Biligiriranga Hills in 1992 by Prof. Kamaljit S. Bawa, a founding trustee of ATREE. One of the first projects in the region was the monitoring of Non-Timber Forest Products (NTFPs), an area of study

that continues to be one of the mainstays of the Biligiri CCC (BCCC). Research on NTFPs and other forest fruits also led to a project in the Malai Mahadeshwara Hills, following which the Malai Mahadeshwara CCC (MMCCC) was established. Both these centres serve as forums for learning about the environment, which in turn enables the sustainable use of forest resources locally. The CCCs also conduct classes on alternate livelihood sources that can help in financially securing forest-dwelling communities. Other services offered by these CCCs include facilitating the implementation of the Forest Rights Act (2006), restoring critical wildlife corridors, and providing scholarships to local students.

Lantana Craft Center (LCC):

The MMCCC established Lantana Craft Centres (LCC) as a response to the growing invasion of *Lantana camara*. The LCC trained artisans from the forest-dwelling Soliga and Lingayat communities in using the processed bark of *Lantana* to craft furniture. Lantana craft training has now been introduced in other forest areas in south India. In 2016, LCC organised five training sessions for 115



Lantana obstructing the movement of deer in BR Hills. © Anirban.



Using processed *Lantana* bark for making furniture.



Community meeting in BRT CCC. © Jadeswamy.



Vembanad plastic cleaning campaign. © Jojo T.D.

people in collaboration with the forest department and the local NGOs. The LCC has been instrumental in linking about 350 artisans with the Tribal Cooperative Marketing Development Federation of India (TRIFED), thus providing them with ID cards and insurance coverage. This association has also led to an exemption of commercial tax on lantana products.

Implementation of Forest Rights Act:

MMCCC team facilitated the implementation of provisions of the Forest Rights Act (FRA) 2006 by organising workshops and creating awareness. Through these efforts, the CCC facilitated the acquisition of around 700 individual's rights and 25 Community Forest Rights. The individual and community forest rights were approved by a district-level committee in 2016. The team is now working with the community to develop a community management plan. The BCCC also facilitated the implementation of FRA with the help of Soliga institutions, whereby 312 families received land rights and 39 Gramasabhas got community rights over three protected areas in the Chamarajanagara district (approved by a district-level committee). Tribal groups from Sathimangala, Tamil Nadu, Gundale Pete, Karnataka, and the Action Aid Team from Orissa visited Biligiri Rangaswamy Tiger Reserve (BRT) to learn about

the Forest Rights Act and its implementation in BRT. Around 40 Soliga tribal leaders participated in this meeting.

Ban on Plastics:

An anti-plastic campaign conducted for three days with the support of the Asian Religious Conservation Project, temple authorities and Mysore Resettlement and Development Agency (MYRADA) resulted in the ban of plastic use in MM Hills and the initiation of other environmentally friendly programmes.

Awareness Generation and Education:

The MMCCC has been playing an important role in building awareness and serving as a learning centre for students, researchers and the general public. This CCC has disseminated knowledge on lantana crafts, wild medicine, wild food plants, and rainwater management. Under the 'managing forests for biodiversity and human wellbeing in the face of global change' project, Non-Timber Forest Products (NTFP) resources are being monitored and sustainable resource management strategies are being developed.

Marketing Forest Resources:

BCCC established decentralised NTFP processing units

to add value to community-harvested forest resources, which are marketed locally and in other parts of the state. The CCC also conducted participatory resources monitoring (PRM) activities for honey and gooseberry by involving local Soliga settlements. These monitoring teams organised 12 value-addition committee meetings to build the capacity of NTFP processing units.

Collaborating with Dr. Arshiya Bose, founder of Black Baza coffee, the BCCC also organised several meetings to discuss the coffee cultivation and coffee seed purchases. These meetings led to a proposal to incorporate coffee as well as other agricultural and forest products under a 'Farmers' Produce Company.'

Enhancing Learning Outcomes:

The BCCC facilitated study abroad programmes with the Kansas University and organised an interaction meeting with the Soliga leaders and college students. Additionally, Soliga community institutions — Vivekananda Girijan Kalyana Kendra (VGKK), BR Hills, and Samatva Trust, Bengaluru — organised a two-day motivational workshop for Soliga college students and distributed scholarships to 83 of them.

VEMBANAD COMMUNITY ENVIRONMENTAL RESOURCE CENTRE

Vembanad Wetland Conservation Programme was initiated by ATREE in the year 2007 and led to the establishment of the Community Environmental Resource Centre (CERC) at Alappuzha, Kerala. Since its inception, CERC has identified and developed the capacity needs and institutional networks for participatory integrated management of heavily used landscapes. This centre instils democratic principles into the conservation of the Vembanad wetland system through a multi-stakeholder, interdisciplinary approach. ATREE's conservation-oriented field interventions aim to mitigate pressures from unsustainable use of resources, invasive species, and climate change.

In 2016, CERC set up different inclusive institutional models, ensuring the participation of government departments, village panchayats, research institutions, user groups and civil society organisations for implementing rural development projects. The year 2017 marks the 10th year of this CCC.

Addressing the Drinking Water Crisis:

CERC established 24 community-based institutions, which installed 24 Reverse Osmosis (RO) plants in five



Fish sanctuaries like these are run by locals to sustain future harvests. © Mathew George.



Ranching in Vembanad. © Ashish George.

panchayats of Kuttanad – a region in the wetland system that is known as the rice bowl of Kerala. This activity has created awareness about water issues and wetland conservation.

Enhancing Fishery Resource:

The CERC, along with state governmental organisations, local panchayats and cooperatives, and the Samyuktha Kayal Samarakshna Samithi (Federation of Lake Protection Forums) implemented a project to secure baby clams and ensure their sustainability. The project entailed relocating baby clams from the northern part of the wetland to southern areas. The centre also facilitated local panchayats to establish fish sanctuaries, funded by Directorate of Climate Change, Government of Kerala.

Scaling up Jalapaadom:

CERC began a new project, with the support of WIPRO, on habitat learning in 10 schools in the Vembanad region. This programme facilitates ‘learning about the environment, through the environment and for the environment’.

Master’s Course on Environmental Governance:

CERC is co-organising a course on ‘State and civil societies in development and environmental governance in Vembanad, Kerala, India’ for the post-graduate students of Department of International Environment and Development Studies (Noragric), Norwegian University of Life Sciences (NMBU).

Environmentally Conscious Tourism:

Recognising the Vembanad communities’ efforts in lake and resource conservation, the National Geographic Society (NGS) initiated responsible and inclusive tour packages in collaboration with the Samyuktha Kayal Samarakshna Samathy. A share of the profits generated through this venture will be directed towards conservation of the area.

Awareness Generation:

To commemorate the World Fish Migration Day (WFMD)-2016 and the 20th anniversary of ATREE, the CERC organised a national consultation and panel discussion on ‘Linking rivers, barrages and fish migration’ on 21 May 2016. CERC also organised the 9th annual Vembanad fish count from 22-23 May 2016, in which about 120 fishery scientists, students, and volunteers participated. The centre also celebrated the World Wetland Day with a photo exhibition and public meeting on 2 Feb 2017 at Alappuzha, jointly with Kerala State Directorate of Environment and Climate Change.



Training teachers for conservation.



Mimi village (Indo-Myanmar border), Kiphrie, Nagaland. © Rohit George.

ATREE Eastern Himalaya / Northeast India Initiative



FACULTY: Dr. Sarala Khaling (Regional Director), Dr. Sunita Pradhan

To help the region of Eastern Himalaya/ Northeast India develop multi-functional landscapes where biodiversity is protected, ecosystem integrity is maintained and the wellbeing of its people is promoted.

Goals of the Eastern Himalaya/ Northeast India Initiative:

Assess and monitor regional biodiversity and ecosystem services

Support the development of sustainable landscape management systems by understanding the complex relationships between regional economic activity, forest resources, agriculture and climate change.

Enhance the regional science-policy interface by bringing stakeholders together to strengthen governance and institutions for coping with environmental change, including climate-induced disaster risks.

Build regional human capacity to meet the challenges of environmental change.

Strengthen existing knowledge and action networks among civil society organisations, government agencies, and local communities to build resilience to environmental change.

MANAGING INDIA'S FORESTS FOR BIODIVERSITY AND HUMAN WELLBEING IN THE FACE OF GLOBAL CHANGE

The Eastern Himalaya component of this project, funded by the US Agency for International Development, focuses on managing forest ecosystems and societal interactions with the forest in the face of global, environmental and economic change. The project focuses on two protected areas the Darjeeling hills, the Singalila National Park (SNP) and Senchel Wildlife Sanctuary (SWLS). The villages of the Eastern Himalayas are both forest villages (land

entitlements with the Forest Department) as well as revenue villages (privately owned land) dependent on forests for resources and livelihood. These villages bear an impact on forest conditions, which is further exacerbated by issues such as global warming, increasing fuelwood extraction, deterioration of soil owing to an increased focus on agricultural productivity, human-wildlife conflicts, and a dearth of diverse livelihood opportunities for locals. Therefore, there is an immediate need to not only adopt more climate and environment-friendly agricultural techniques but also diversify livelihood options to help locals better adapt to fluctuations in climate that can affect traditional agriculture-based livelihoods. To this end, the project has helped in reducing fuel wood dependency, promoted climate smart agriculture, explored off-farm livelihoods for locals and is actively addressing crop-raids by wildlife.

Outcomes of this Project:

Installed 182 Improved cooking stoves (ICS) this year, bringing the total number of ICSs installed to 632. This has reduced fuelwood consumption by an average of 43%.

Aided the establishment of two ICS microenterprises.

Augmented forest cover that was lost due to fuel-wood harvest by planting over 3,375 saplings of local species over five acres of land.

Organised training sessions on climate smart agriculture to enhance terrace management and bio-composting efforts, including soil enrichment by the use of indigenous micro-organisms.

13.42 hectares of land has been terraced to avoid soil erosion, and 154 vermi compost pits have been prepared which produce 20,788 kgs of compost.

Supported 43 units of locally made pesticides and established 84 soil microorganism units.

Compiled information on damage rates and the spatial distribution of damages caused by wildlife in 16 villages.

Selected plot villages for the work on mitigating human-wildlife conflicts and initiated meetings with community members and members of the Forest Protection Committee and Eco Development Committee.

Re-erected barbed wire fencing which were further strengthened by natural fencing methods, involving planting shrubs like Asare (*Viburnum*), Chutro Kesari (*Berberis nepalensis*), and Ghurpis (*Leucosceptrum canum*).

Held community meetings in four villages to inform and educate communities about activities under Mahatma Gandhi National Rural Employment Guarantee Act, 2005 (MGNREGA) that they can undertake.

Facilitated the formation of committees to oversee and promote community-based tourism, which was introduced in two villages to diversify livelihood opportunities.

Promoted poly-houses which yielded an average income of Rs. 2,542 in Singalila National Park (SNP) and Rs. 3,191 in Senchel Wildlife Sanctuary (SWLS) per household.

190 households have been supported with 25 bee-boxes since the project's inception in 2014. These bee-boxes yield an average annual income of Rs. 1,257 and Rs. 2,031 from Singalila National Park and Senchel Wildlife Sanctuary respectively. The project also led to workshops on climate change for 25 self-help groups, two CSPs, and members of the Forest Protection Committee and Eco Development Committee from Singalila and Senchel.

INTEGRATED APPROACHES TO ENHANCE LIVELIHOODS SUSTAINABILITY OF COMMUNITIES IN THE FRINGE AREAS OF MANAS TIGER RESERVE (MTR), ASSAM

The project, funded by Karl Kubel Stiftung, is a step towards conserving the rich biodiversity of Manas, Assam, through positive community interactions



SRI Training in Katajhar. © Amal Deka.

and sustainable development. The project aims to enhance livelihood sustainability of local communities dependent on the resources of Manas through institutional development, climate-smart sustainable agriculture practices, and mitigation of human-wildlife conflicts. The project team has collaborated with universities, training institutions, government departments, local councils like Village Council Development Committee (VCDC), environmental organisations, local and regional NGOs, resource persons, and experts to work towards the sustainable development of local communities and conservation of Manas' rich biodiversity. Various local institutions like Eco Development Committees (EDC), Self Help Groups (SHG), Farmer's Groups (FG) and local NGOs have been formed and/or strengthened by the project. These institutions provide local communities with a platform to plan and execute development and conservation interventions. The project has paved the way for the introduction of sustainable and climate-friendly agricultural practices and the mitigation of crop depredation by wildlife, which leads to economic loss and food insecurity. The project also supports alternative livelihoods, such as horticulture (especially fruits), apiculture, mushroom cultivation and medicinal plants cultivation, for communities in areas with intense crop depredation by wildlife.

Outcomes of this Project:

Formed and strengthened eight Eco-Development Committees (EDC) that helped Manas National Park's administration materialise eco-development activities in the fringe villages of the protected area.

With EDCs bringing villagers, Forest Departments and other allied institutions together in efforts to conserve and sustainably develop Manas, incidents of poaching in forest areas has seldom been reported. Moreover, relations between local communities and the park authority have strengthened.

Supported the construction of 11 watch towers along a seven-km stretch of the forest-village boundary in the park's Bansbari Range. These watch towers allow villagers to monitor incoming wildlife from a safe distance and serve as a resting space for frontline forest staff during their patrols along the forest boundary.

Supported local communities in developing citrus and sijou (*Euphorbia splendens*) plantations along the park's boundary to create a bio-fence.

Supported the formation of community-based monitoring and redressal groups in the villages to monitor and pilot community-based strategies for addressing the damage caused by wildlife. These groups also advocate for timely compensations to those affected by wildlife raids.



Mushroom training in Palsiguri. © Beauty Nazary.



One horned Rhino at the Manas tiger Reserve, Assam. © Beauty Nazary.



Jungle Fowl at the Manas Tiger Reserve. © Beauty Nazary.



A Mithun family in Tale Wildlife Sanctuary, Ziro, Arunachal Pradesh. © Rohit George.



Participants at the third Northeast Butterfly Meet in Tale Wildlife Sanctuary, Ziro, Arunachal Pradesh. © Rohit George.

INTEGRATED APPROACHES FOR ADAPTIVE RESILIENCE-BASED MANAGEMENT OF FORESTS FOR SUPPORTING AGRO-SYSTEMS IN SIKKIM-DARJEELING HIMALAYA

This project aims to understand how Eastern Himalayan social-ecological systems can be managed and governed to generate a sustained supply of ecosystem services and support-associated livelihoods without impairing key ecosystem attributes and functions (such as nutrient cycling, groundwater recharge, and biodiversity). Past surveys have revealed how communities living in the proximity of reserved forests and protected areas such as the Singalila National Park and Senchel Wildlife Sanctuary are highly dependent on these forests for fuelwood, fodder, clean drinking water and other intangible benefits.

To generate knowledge on sustaining ecosystem services without impairing key social or ecological functions, the project's framework includes the measurement of the condition of forests — in terms of desirable ecosystem functioning to understand how ecosystem services support or constrain functions of human wellbeing, such as bodily health, aspirations and concern for other species — and analyses of whether households can achieve a minimum level of these capabilities. It also considers whether the achievement of wellbeing ensures a continued flow of ecosystem services. The research highlights some of the key social attributes and functions such as adaptive governance, transformability, learning and capabilities that are necessary for maintaining resilience in the face of changes such as land-use, climate and uncertainties in the form of shocks and disturbances.

Significant findings of the Project:

Land use and land cover change analysis observed a change in forest condition since 1992, when Singalila and Senchel were declared protected areas. As a result restrictions were imposed on people's ability to access forest ecosystem services. This was also the year when a massive forest fire further deteriorated conditions of forest around Singalila, which was eventually followed by the colonisation of forest floor by *Yushania maling*.

Surveys and interactions with the communities suggest that a portion of residents in the village face water scarcity.

Data on water flow indicates a huge scope for storage, management and redistribution of available water resources among locals. Despite water quality analysis suggesting the presence of fecal coliform in most water sources, villagers perceive the waters as clean.

Assessment of human-wildlife conflicts revealed that while people recognise it as the major ecosystem disservice from the forest, they are still compassionate towards the conservation of wildlife.

Wild boar was identified as the most damaging crop raider, followed by the barking deer, macaque and Indian hare. Leopards were identified as being most damaging to livestock.

The project pegged the losses due to crop raids in two villages at Rs 233,938 and Rs 42,592 during 2013–2014.

Based on the more intolerant attitude of female members of the community towards human-wildlife conflict, the project suggested a greater involvement of women in farming and agricultural activities.

The project revealed that converting the forest ecosystem services into functions of human wellbeing requires a proper disbursement of the facilities by the government departments. However, in the hilly regions of Darjeeling, this process has been adversely affected since there has been no panchayat election since 2001.

The results of the study were shared with the stakeholders in two stakeholder meetings. One was conducted with academics and government officials, and the other with the selected villagers.

CAPACITY BUILDING AND CITIZEN SCIENCE INITIATIVES:

Despite Northeast India Initiative being a refuge for a large number of rare species that are now under serious threat and a hotspot for biological diversity and endemism, the region is poorly represented on the India Biodiversity Portal (IBP). To try and overcome this situation, Northeast India Biodiversity Portal (NEIBP) conducted a meeting and workshop at the North Eastern Hill University in Shillong in September 2015. Participants, who included students, academics, researchers, nature enthusiasts and other stakeholders from across the Northeast, expressed an interest in holding similar workshops in their respective areas so that more data can be collected and aggregated. To this end, ATREE conducted NEIBP workshops across 12 areas in the Northeast to popularise the portal and supplement the data available on IBP from the region. Attended by over 350 individuals, each workshop was conducted with assistance and on-ground support from local partner organisations and individuals.

To encourage citizen involvement in ecosystem and biodiversity conservation, ATREE partially supported the Northeast Butterfly Meet in Ziro, Arunachal Pradesh, for amateur butterfly enthusiasts, conducted workshops for nature guides in Manas National Park and Buxa Tiger Reserve, canopy and ground bioblitz for tea garden rangers and school students in Makaibari Tea Estate, and trainings for grass-root organisations.

Nectar measurement of *Rhododendron campanulatum* in subalpine forests of Kyongnosla Alpine Sanctuary, Sikkim. © Sonam Bhutia.



Academy for Conservation Science and Sustainability Studies



ATREE's Academy for Conservation Science and Sustainability Studies conducts a doctoral programme, which is recognised by Manipal University (MU), Karnataka. The Academy aims to generate interdisciplinary knowledge that addresses the concerns of the environment in a sustainable and socially just manner.

40 – PhD Students

19 – Faculty

03 – PhD Degrees Awarded

19 – Public Talks

07 – Internal Talks

56 – Interns

The doctoral programme integrates natural and social sciences in its teachings and provides a platform for innovative research which bridges links between the environment and society. The programme fosters critical thinking and leadership through a multidisciplinary coursework coupled with field studies.

Research conducted by the PhD scholars at the Academy is diverse. Their research themes include identifying priority areas of conservation, analysing the responses of socio-ecological systems to climate change, understanding

interactions between forests, soil and water in various ecosystems, the role of ecosystem services in livelihoods and human wellbeing, and analyses of conservation policies such as the REDD+ programme and India's Forest Rights Act (2006).

ATREE's PhD scholars have their field sites spread across the country, covering the grasslands of Gujarat, river systems of Bihar, coastal regions of Odisha, Trans-Himalayan landscapes and the Deccan Plateau. Additionally, ATREE's four Community Conservation Centres and the Eastern Himalayan Initiative, along with Ramble (Research and Monitoring in the Banni Landscape), a field station in Kutch, Gujarat, also anchor research conducted by the PhD Scholars. The Academy's scholars have received several awards, merits, and fellowships and have published numerous peer-reviewed and popular articles.

Coursework and Training

Coursework at the Academy spans three semesters and includes courses that are structured to instill a sound understanding of various natural and social science disciplines. ATREE's multidisciplinary fellows mentor the Academy's PhD scholars, and together, they have made significant contributions in the fields of conservation science and sustainable development.

PhD Scholars

ATREE's PhD scholars have an academic grounding in a range of disciplines including, climate science,



A PhD scholar measuring the dry weight of leaves. © Karuna Gurung.

economics, sociology, wildlife science, and ecology. The academy grants its PhD scholars a five-year fellowship.

Awards and Recognitions

Nachiket Kelkar, PhD batch 2011, was awarded the prestigious New India Foundation Fellowship for 2017. Instituted in 2004, the Fellowship aims to promote research in post-independence India. Nachiket's proposal "Dark Reflections: Field notes on people and ecology in Bihar's Gangetic floodplains" was one of nine selected from more than 400 entries.

Nachiket was also invited by the International Whaling Commission to contribute as an external scientific contributor to their Annual Scientific Committee Meeting, in Slovenia, in June 2016. He also reviewed a session on threatened small cetaceans during the meeting.

Vikram Aditya, PhD batch 2009, received the Wildlife Conservation Trust - WCT Small Grant to study hunting practices and impacts on wildlife in the northern Eastern Ghats. His research focuses on the population status of the endangered Indian Pangolin in the region.



The following students received their PhD degrees from the academy this year:

	<p>Hita Unnikrishnan (batch 2011) Thesis: The changing nature of ecological and social vulnerabilities within the context of an urban lake social- ecological system in Bangalore.</p>
	<p>Madhushree Munsri (batch 2011) Thesis: To prioritise freshwater habitats for conservation of biodiversity in India.</p>
	<p>Madhura Niphadkar (batch 2009) Thesis: Mapping invasive species <i>Lantana camara</i> in the high-diversity tropical ecosystem of Western Ghats, India.</p>



Top: Field work in KMTR.
 Above Left: A PhD scholar installing camera traps in Papikonda National Park, Andhra Pradesh. © Babu Rao.



Above Right: A PhD scholar measuring tree heights in Sikkim using laser rangefinder. © Andrew Chettri.

Talks@ATREE

The Academy conducts weekly talks where presentations are given by invited speakers to exchange ideas and engage with people from diverse areas of expertise. The Academy organised 19 public talks and seven internal talks. The Academy also hosted book discussions, a theatre session and a film screening.

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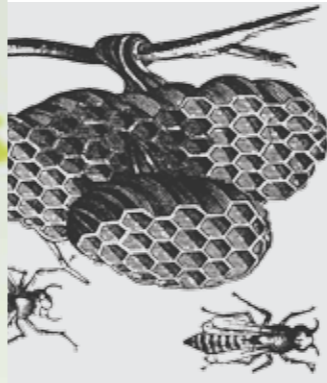
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The book *Transcending Boundaries*, published by ATREE, was released at the conference. © Rathnavel Pandian.



Conference on
Conservation Science and Sustainable Development

The Conference on Conservation Science and Sustainable Development celebrated 20 years of ATREE's interdisciplinary knowledge generation in the fields of conservation science and sustainable development. This conference aimed to further discussions and debates on biodiversity, ecosystem services, livelihoods, forest governance, climate change mitigation, sustainable development and water management.

- 33** — Invited Speakers
- 04** — Keynote Speakers
- 15** — Invited Talks
- 03** — Panel Discussions
- 600** + Participants
- 08** — Student Speed talks
- 11** — Press Coverage

In 2016, ATREE completed 20 years of research in the areas of biodiversity conservation and sustainable development. In these two decades, ATREE expanded from a small group of biologists to a 200+ strong team of interdisciplinary scientists working across India. During this period, it also instituted a PhD programme, established several field stations and contributed extensively to policy and community-level outreach. In celebrating two decades of ATREE's work, a two-day 'Conference on Conservation Science and Sustainable Development' was organised to call attention to current environmental challenges. With more than 600 participants from 10 countries, the conference witnessed a mix of students, academics, government officials, donors, and journalists attending sessions on



A 3-D model of river flow in regulated rivers. © Rathnavel Pandian.

biodiversity, climate change, forest and livelihoods, and water and society.

The conference was inaugurated by His Excellency, Nils Ragnar Kamsvåg, Norwegian Ambassador, Ms. Rohini Nilekani, founder of Araghyam, and Dr. Kamaljit S. Bawa, President of ATREE, during which they released the book: *Transcending Boundaries: Reflecting on Twenty years of Action and Research at ATREE*. This book aims to communicate academic insights from some of ATREE's key research areas to a wide audience.

Keynote addresses discussed topics such as valuing nature in a human-dominated world, inclusive business models that could shape the future of water, agriculture, food and energy, inequality in forest resource governance, and the exploitation of natural resources such as water. Panel discussion on conservation in

the anthropocene and how conservation challenges local populations drew attention to the intrinsic links between society and biodiversity and the need for interdisciplinary conservation strategies that take local people and livelihoods into account.

The conference also featured speed-talks by ATREE's young scholars, where they presented their research and the issues they address in under three minutes. These scholars were lauded not only for their short and concise presentations, but also for their diverse research topics, such as the impact of free-ranging dogs in the upper Himalayas, possible impact of climate change on Himalayan frogs, why marine protected areas fail in highly human-dominated areas with mobile species like turtles, why bees are disappearing even from an organic pesticide-free state like Sikkim, the regulatory mechanism for urban water pollution in Bengaluru, etc.



Keynote speaker Esther Mwangi spoke about inequality in forest resource governance at the conference. © Rathnavel Pandian.



ATREE's PhD student Aniruddha Marathe presenting a short talk at the conference. © Rathnavel Pandian



Dr. K J Joy received the T.N. Khoshoo award at the conference. © Rathnavel Pandian.

The conference concluded with the annual T.N. Khoshoo Memorial Award, which was awarded to Mr. K.J. Joy, Founder of the Society for Promoting Participative Ecosystem Management (SOPPECOM). The TN Khoshoo Memorial Award celebrates the work of world-renowned environmental scientist, Dr. Triloki Nath Khoshoo. The award is given to a practitioner or an academician whose work has had an impact in the area of environment, conservation, or development. Since 2004, this award has allowed ATREE to recognise and promote outstanding contributions in the fields of ecology and environment in India. The awards also present an opportunity for discussions about environmentally sound development and socially just conservation through guest lectures or panel discussions. This year, with the awards centred around the theme of water, a roundtable discussion on the Indian government's plan of interlinking rivers provided a space for discussing

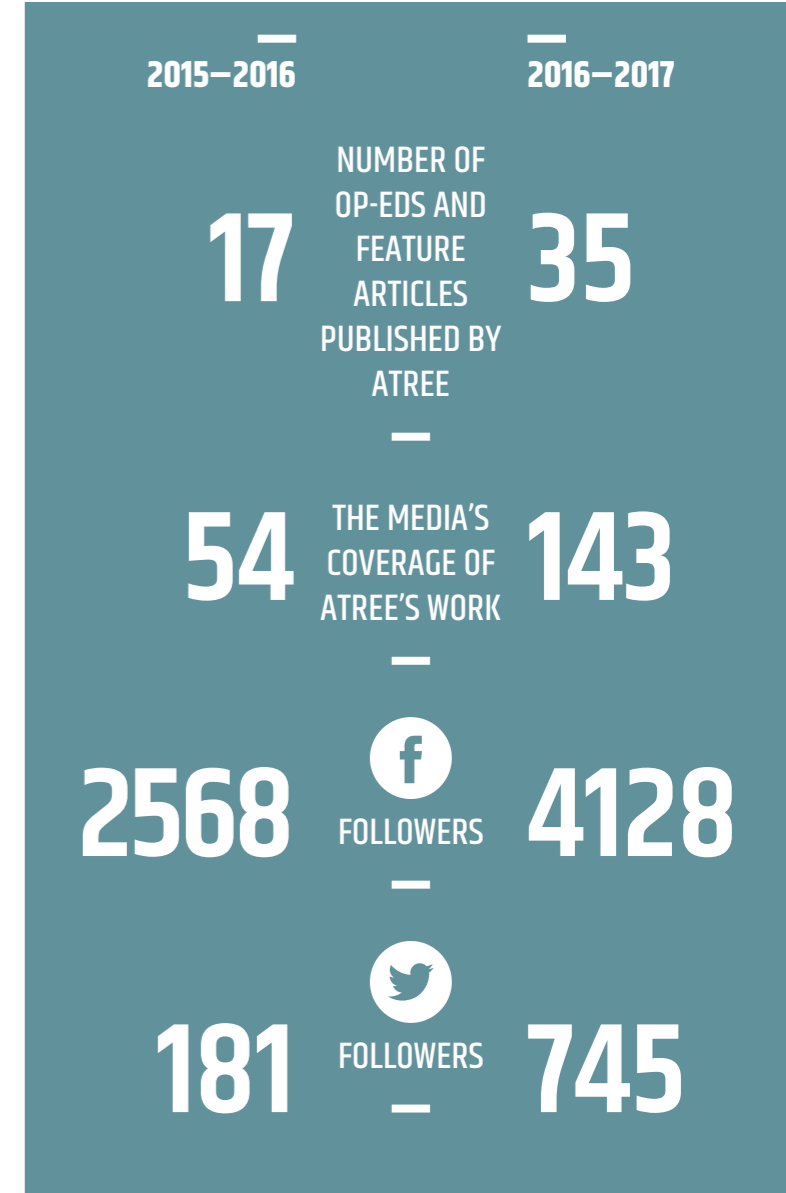
whether the plan could solve India's water woes or is a setback to the environment.

In addition to talks, plenaries and panel discussions, the conference featured poster presentations by ATREE's researchers, a photo-exhibition on 20 years of ATREE, and an installation depicting ATREE's thematic research areas complete with posters, interactive 3-D models, games and other exhibits.

The two-day conference's aim of disseminating nuanced academic insights to a wider audience was bolstered by regional and national media coverage. The conference was also broadcast live, which appealed to our rapidly growing base of social media followers.



2016-17 saw a sharp increase in ATREE's presence in the media. The year not only witnessed a greater influx of ATREE-researchers' opinions and commentaries on current affairs, and a wider coverage of their work across print, electronic and digital media, but it also saw ATREE gain a strong foothold in social media.

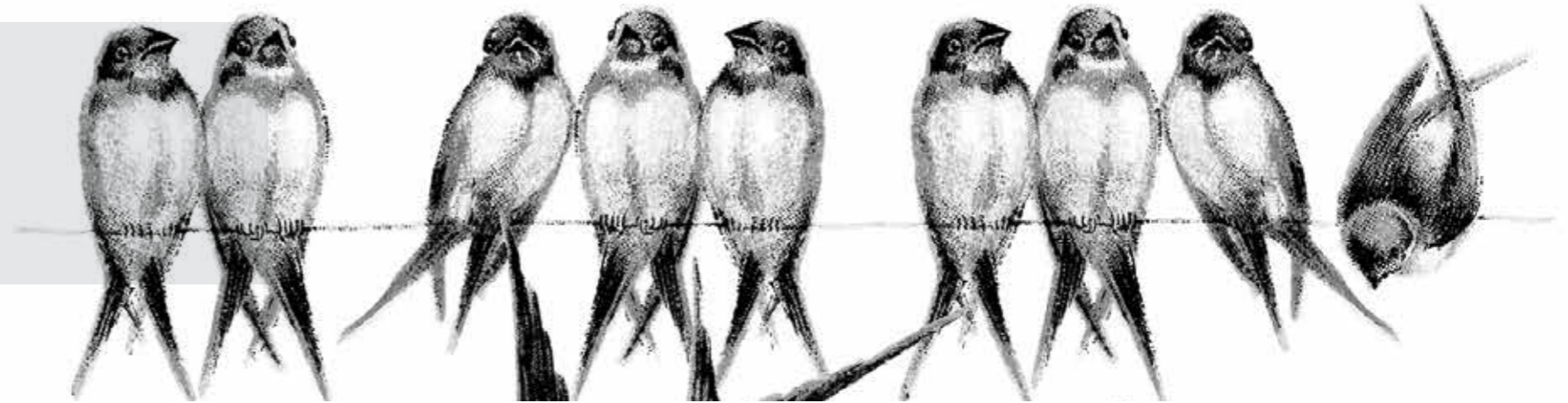


FEJI-ATREE Media Fellowship

The Forum of Environmental Journalists in India (FEJI), along with ATREE, has been conducting a media fellowship programme every year since 2014. With the goal of increasing the quality and quantity of environmental stories covered by the media, these fellowships have been awarded to 11 journalists from print, electronic and digital media. This year, four fellowships were awarded, which resulted in 28 print, TV, and online stories, covering issues as diverse as adaptation to climate change, monitoring long-term ecological changes, human-wildlife conflicts, adoption of rooftop solar power, developmental conflicts, etc. The fellowship entailed orientation and training by ATREE, upon which they were sent on field visits to some of ATREE's research areas.

Our Team

Our passionate and committed team strives to make a difference.



Faculty Affiliations

BIODIVERSITY MONITORING AND CONSERVATION PLANNING

- Dr. R. Ganesan (Programme Leader)
- Dr. Priyadarsanan Dharma Rajan
- Dr. N. A. Aravind
- Dr. G. Ravikanth

LANDSCAPES, LIVELIHOODS AND CONSERVATION

- Dr. T. Ganesh (Programme Leader)
- Dr. Ankila Hiremath
- Dr. Nitin Rai
- Dr. Abi Tamim Vanak

ECOSYSTEM SERVICES AND HUMAN WELLBEING

- Dr. Jagdish Krishnaswamy (Programme Leader)
- Dr. Soubadra Devy
- Dr. Siddhartha Krishnan

WATER, LAND, AND SOCIETY

- Dr. Veena Srinivasan (Programme Leader)
- Dr. Shrinivas Badiger
- Dr. Bejoy Thomas
- Dr. Priyanka Jamwal
- Dr. Durba Biswas

FORESTS AND GOVERNANCE

- Dr. Siddappa Setty (Programme Leader)

CLIMATE CHANGE MITIGATION AND DEVELOPMENT

- Dr. Sharachandra Lele (Programme Leader)
- Ulka Kelkar
- Dr. Shikha Lakhanpal

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- Dr. Deepak Malghan
- Dr. Megha Shenoy

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- Sridhar Ramaswamy Iyengar, Deputy Director, Finance and Administration
- Dr. Sarala Khaling, Regional Director, Northeast India Initiatives

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- Madhavi Latha

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- Rajat C.

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- Ajay Singh
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- Karma Dorjee
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- Madha
- Nanje Gowda S.
- Narayanan
- Rajanna D.
- Renukha
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- Mathivanan
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- Seena Narayanan



Pine tree covered in frost at Sandakphu, Singalila National Park, Darjeeling, West Bengal. © Rohit George.

Funding Partners

We appreciate our donors and partners for their unwavering support. strives to make a difference.



Endowments

- Rohini Nilekani
- The Ford Foundation
- ATREE Belmont and Sehgal Family Foundation
- Sarojini Damodaran Foundation
- Bawa Family, USA
- SDTT-ATREE CF
- Oak Foundation
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- BARR Foundation
- Centre for Interdisciplinary Studies in Environment & Development
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- TVS Motor Company
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- Karl Kübel Stiftung für Kind und Familie
- Ministry of Earth Sciences
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- Wipro Limited
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- Xu Lianggen

Research Grants

- Alliance of Religions and Conservation
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- Department of Science and Technology-Science & Engineering Research Board
- Dr. Jörg Müller
- Environmental Management and Policy Research Institute

FINANCIALS

Ashoka Trust for Research in Ecology and the Environment
(ATREE)

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BALANCE SHEET AS ON 31ST MARCH 2015		(INR IN LACS)	
SOURCES OF FUNDS	31st March 2016	31st March 2015	
Corpus Fund	4,465.05	4,305.00	
General Fund	128.4	98.35	
UTILISED RESERVES			
• Project Assets	1,075.64	1,001.85	
• Other Assets	15.78	20.26	
• Land and Building	696.84	623.22	
Project Fund	1,447.48	1,579.30	
TOTAL	7,829.19	7,627.98	
APPLICATION OF FUNDS			
FIXED ASSETS			
• Project Assets	1,075.64	1,001.85	
• Other Assets	15.78	20.26	
• Land and Buildings	696.84	623.22	

INVESTMENTS			
Corpus Investments		4,277.34	4,305.26
Other Investments		1,446.68	1,447.60
CURRENT ASSETS AND LIABILITIES			
Advances	24.30		18.38
Other Current Assets	12.17		12.60
Cash and Bank	288.10		205.29
Gross Current Assets	324.57		236.27
Less: Current Liabilities	7.66		6.48
Net Current Assets		316.91	229.79
TOTAL		7,829.19	7,627.98

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2016		(INR IN LACS)	
PARTICULARS	31st March 2016	31st March 2015	
INCOME			
Project income	1,661.25	1,547.75	
Interest Income	69.04	48.34	
Other Income	6.59	3.73	
TOTAL	1,736.88	1,599.82	

EXPENDITURE				
Staff Cost and Welfare		999.83		945.37
Travel		95.04		117.84
Operating and Programme Expenses		610.76		510.25
Depreciation		16.78		15.6
TOTAL		1,722.41		1,589.06
Surplus/Deficit		14.47		10.76

PAYMENTS				
Fixed Assets		159.71		300.71
Staff Cost and Welfare	1,003.64		1,002.79	
Travel	112.33		110.93	
Operating and Programme Expenses	614.65	1,730.62	483.35	1,597.07
Closing Balances				
(Cash and Cash equivalents)		6,012.25		5,985.21
TOTAL		7,902.58		7,882.99

RECEIPTS AND PAYMENTS ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2016				(INR IN LACS)
PARTICULARS		31st March 2016		31st March 2015
RECEIPTS				
Opening Balances				
(Cash and Cash equivalents)		5,958.14		5,697.96
Project Grants		1,182.61		1,311.98
Corpus/Endowments		250.00		392.38
Interest and other income		511.83		480.67
TOTAL		7,902.58		7,882.99



Ashoka Trust for Research in Ecology and the Environment (ATREE) is a research institution in the areas of biodiversity conservation and sustainable development. We focus on applied science through research, education and action that influence policy and practice on conservation of nature, management of natural resources, and sustainable development.

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

ATREE is registered with the sub registrar, Bengaluru North Taluk as a Public Charitable Trust and with the ministry of home affairs, Government of India under section 6(1) of the Foreign Contribution (Regulation) Act 1976.

ATREE is registered as a wholly Charitable Trust under Section 12(A)(a) of the Indian Income Tax Act 1961 and donations to it are eligible for 175% / 100% tax exemption under Section 35(1)(ii) / Section 80GGA(2)(a) of the Indian Income Tax Act 1961.

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visit www.atree.org to know more about us

Mission Statement

To generate rigorous interdisciplinary knowledge for achieving environmental conservation and sustainable development in a socially just manner, to enable the use of this knowledge by policy makers and society, and to train the next generation of scholars and leaders.



ASHOKA TRUST FOR RESEARCH IN ECOLOGY AND THE ENVIRONMENT

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Pastoralists herding their livestock in the Banni grasslands. © Kalyan Varma.
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