



Chapter – 9

*Centers
of
Excellence*

Centres of Excellence

Introduction and Objectives

The Ministry started the scheme in 1983 to strengthen awareness, research and training in priority areas of Environmental science and management.

Nine Centres of Excellence have been set up so far by the Ministry with a view to strengthening awareness, research and training in priority area of environmental science and management are as under:

- Centre for Environment Education (CEE), Ahmedabad
- CPR Environmental Education Center (CPREEC), Chennai
- Centre for Ecological Sciences (CES), Bangalore
- Centre of Mining Environment (CME), Dhanbad
- Salim Ali Centre for Ornithology and Natural History (SACON), Coimbatore
- Centre for Environment Management of Degraded Ecosystem (CEMDE), Delhi
- Centre of Excellence in Environmental Economics at Madras School of Economics, Chennai
- Foundation for Revitalization of Local Health Traditions (FRLHT), Bangalore.
- The Tropical Botanic Garden and Research Institute (TBGRI), Thiruvananthapuram

Centre for Environment Education

Introduction and Objectives

CEE was established in 1984 as a Centre of Excellence in Environmental Education, supported by the Ministry in recognition of the importance of environmental education in

India's overall environment and development strategy. CEE develops innovative programmes and educational material, and builds capacity in the field of education for sustainable development (ESD). To test the validity and effectiveness of its programmes and material, CEE undertakes demonstration projects in education, communication and development that endorse attitudes, strategies and technologies, which are environmentally sustainable

Progress of Activities Undertaken

4th International Conference on Environmental Education

CEE hosted the 4th ICEE, organised by Government of India and co-sponsored by UNESCO and UNEP, from 24 to 28 November, 2007 at Ahmedabad. A particular significance was attached to this Conference in light of it being held in the third year of the on-going United Nations Decade of Education for Sustainable Development (DESD 2005-2014). Towards this, the Conference was organized with the objectives to review the status of EE in the context of DESD, reformulate EE to support Education for Sustainable Development (ESD) and help bridge gaps, share good practices and experiences in ESD, and develop strategies for progressing ESD in the world. The Conference had over 1500 participants, of which about 650 were women and 150 were youth, from 97 countries across the globe.

Strengthening Environment Education in School System

CEE continued facilitating in implementation of the curriculum of existing Environmental Education syllabi and textbooks, orienting text book writers, developing text books and teaching-learning materials, and teacher training under the Ministry initiated project

Strengthening Environment Education in School System (StrEESS). A national level directory, "Status Report of EE in India" was also compiled and launched during the 4th ICEE, not only to obtain an overview of EE implementation in the country but also as a strategy document to help define an action plan for India.

National Green Corps

CEE has been the Resource Agency (RA) in 15 states and two UTs and covers around 40,000 schools through this countrywide awareness programme initiated and funded by Ministry. NGC aims at spreading environmental awareness among school children through eco-club activities, and through children in society at large. Various activities including training of master trainers, developing and distributing educational material, observing environment days, conducting workshops and celebrating events like Eco-Balmela and Mowgli Utsav were undertaken.

Youth and WASH in India

A collaborative programme of UNICEF, Nehru Yuva Kendra (NYK), National Service Scheme (NSS) and CEE, the objective of Youth and WASH is to engage college youth in education and awareness campaigns as part of their NSS work. The programme is focused on Water, Sanitation and Hygiene (WASH) related awareness programmes in villages of five selected states—Chattisgarh, Gujarat, Maharashtra, Rajasthan and Tamil Nadu. To facilitate infusion of WASH concepts in NSS programmes, a national workshop was held to develop appropriate NSS camp modules and assessment formats. The module and the assessment format were translated and adapted at the state level and camps in three states—Chattisgarh, Maharashtra and Rajasthan were completed during the year.

Sundarvan

Sundarvan, a Nature Discovery Centre located at an independent site in Ahmedabad, is an associated activity of CEE. During the year, Sundarvan organized 217 snake shows and received 79,258 visitors. Fifty Nature Education Camps were organised in different ecosystems around Gujarat in which 2212 persons participated.

EE through Interpretation

Over the years CEE has done interpretation programmes, using a range of media and technologies, for protected areas, heritage sites, museums, zoos and other important places that attract numerous visitors. Interpretation projects were carried out during the year which included upgradation of Kanha National Park Interpretation Programme, Bandhavgarh Interpretation Programme, Interactive Forest Map for Forest Survey of India and Nandankanan Zoo Aquarium Project.

Initiative with CAPART

CEE was selected as Nodal NGO (NN) for the Council for Advancement of People's Action and Rural Technology (CAPART) initiative in Gujarat. CAPART also sanctioned two more projects, viz. Project on Rain Water Harvesting Structure (RWHS) and Rural Sanitation Programme (RSP), to CEE. Till December 2007 more than 115 RWHS and 130 sanitation blocks were constructed.

Gram Shilpi

Samvardhan, an education, drinking water and sustainable livelihood initiative, benefits 4000 families in 24 tribal villages of South Gujarat. As part of this initiative, Gram Shilpi, a two-year programme was launched for the post graduate students of Gujarat Vidyapeeth, Ahmedabad. The main objective of the

programme is to train a cadre of youth for competencies required to reconstruct rural villages of Gujarat for 21st century with regard to ESD and Gandhian philosophy. The 30 modules of training are content, method and skill based, as a part of which the youth will stay and work in villages to implement the classroom learnings.

2007 State of the World: Our Urban Future

The Indian reprint of the Worldwatch Institute publication *State of the World 2007: Our Urban Future* was launched in November 2007 at the 4th ICEE. The book showcases stories from cities around the world and sets example for the ways cities can be managed, built and lived in for a healthier and more peaceful urban future. CEE is developing educational and training programmes in different parts of the country to promote action by citizens, activists, professionals and managers towards a more sustainable urban future.

Awareness and Training Programmes on BMWM

The Hazardous Substances Management Division (HSMD) of the Ministry has granted CEE a project to impart awareness and training to 2400 healthcare workers from 200 HCEs in the city, through 60 training workshops starting in May 2007. The project was allotted based on CEE's survey and analyses on Biomedical Waste Management (BMWM) practices in Delhi in 2005.

Rebuilding Trust Phase II

Rebuilding Trust (RT) is the disaster rehabilitation programme of CEE following the Kashmir earthquake of 2005, which focuses on livelihood support to vulnerable families; setting up demonstration centres and provide training on non – farm based

technologies as alternative livelihood sources; disaster risk reduction campaign in earthquake affected schools of Baramulla and Kupwara districts in J&K; and conducting teacher training programmes.

Training and Capacity Building for ESD

As a component of the larger project 'EE in Teacher Education', supported by the National Council for Teacher Education (NCTE), CEE developed a set of three resource books for teacher educators. The Hindi and English versions of the books were launched during the 4th ICEE. The three units are on Environment and Development; Nature and scope of Environmental Education; and Teaching methodologies and evaluation techniques in EE.

Journal of ESD

The Journal of Education for Sustainable Development (JESD) was launched in July 2007 at the 4th World Environmental Education Conference held in Durban, South Africa. The JESD is a peer-reviewed international journal, aimed at global readership and the scope of content covers all fields of formal and non-formal ESD. The second issue was also brought out in November during the 4th ICEE.

Global Communities for Sustainability

Global Communities for Sustainability (GCS) is a joint project of CEE Australia (CEEA), the Australian Association for Environmental Education (AAEE) and CEE India. It aims at developing integrated sustainability initiatives that have local and international dimensions.

The project established communication and exchange between around 20 different Australian and Indian school communities who explored and shared sustainability issues through a guided process.

Media and Publications

- www.kidsrgreen.org: CEE developed and maintained the monthly e-magazine www.kidsrgreen.org. A series of workshops were held to introduce the KidsRgreen website in schools which were attended in all by over 1000 students, 79 teachers and 20 journalists.
- www.desd.org: CEE is the Nodal Agency for Implementation of DESD in India and as part of DESD secretariat an online platform for sharing information on and discussing ESD has been developed.
- Tbilisi to Ahmedabad - The Journey of Environmental Education: CEE developed and launched the first version of this sourcebook that follows the evolution of EE over the last four decades, on the occasion of 4th ICEE. The book is a compilation of important resolutions, declarations, strategies and recommendations that have provided the framework and guiding principles for the EE Movement.
- *Samvardhan* – Building cadres for sustainable development: This is a book describing the Samvardhan project, which has attempted to tackle the issues of drinking water, livelihoods and primary education through ESD in a rural context.
- Tales of the Tiger: This is a manual for teachers, developed both in English and Hindi with support from the Directorate of Project Tiger. It is an information and activity manual to help teachers communicate facts and issues related to tigers.

- NatureScope India - Diving into Oceans and Discovering Deserts: Diving into Oceans and Discovering Deserts are the two CEE publications developed under Exploring Ecosystems Series of NatureScope India. They explore and explain several dimensions of Oceans, marine life and threats faced by oceans and Deserts, Drylands, and Desertification respectively. These are comprehensive books with information and hand-on activities to help upper primary and secondary school teachers and students take a close look and understand the two ecosystems.

C.P.R. Environmental Education Centre (CPREEC)

Introduction and Objectives

This Centre, established in 1989 by the Ministry aims at spreading awareness and interest regarding environment among all sections of the public by organizing a variety of programmes such as training courses, seminars and workshops, research and surveys, exhibitions, eco-development, restoration of sacred groves and resource material development.

Progress of Activities Undertaken

Green School Initiative

CPREEC has devised an innovative and yet easy to implement system called 'Green School Initiative' for monitoring the environment-related activities in the schools. The 'Green School Initiative' helped the students to learn more about the environment and the community to become more environment-conscious.

The broad aims of the scheme are

- Environmental education through systematic approach.

- Improving environmental standards of schools.
- Benchmarking for environmental protection / initiatives.
- Reduction in the use and wastage of resources.
- Financial savings as a result of reduction in the use and wastage of resources.
- Knowledge enrichment through practical experience.
- Development of personal and social responsibilities for the school and its environment
- Involvement with other related projects
- Providing a vehicle for developing community involvement
- Encouraging sharing of ideas and knowledge through interaction among schools
- Providing links and support to other schemes

The Green School Initiative was implemented in certain selected schools in Chennai and Udhagamandalam in Tamilnadu, Hyderabad in Andhra Pradesh and Bangalore in Karnataka.

Training Programmes

- During the year, CPREEC focused its training programmes to the specific needs of stakeholders. Training programmes on Disaster Management were conducted for coastal community and NGOs. These programmes were conducted in the southern states of Tamilnadu, Andhra Pradesh, Karnataka and Kerala.
- Training programmes on Waste Management were organized for rural

sanitary workers and the rural and urban employees of community health centres. The main focus was on explaining composting techniques and bio medical waste management in primary health centres and hospitals.

- Training programmes on Water Resources Management were organized for women and youth groups in the states of Andhra Pradesh, Tamilnadu and Karnataka. Importance of desilting of water bodies and grey water recycling were stressed in the programmes.
- Training programmes for teachers, advocates and students were organised in close coordination with the concerned education departments and law colleges in all the above states, besides Goa, Orissa, Maharashtra and Pudhucherry.

Biodiversity Conservation Education

Training programmes on biodiversity conservation was conducted for teachers, teacher trainees, students, NGOs and animators in the states of Andhra Pradesh, Karnataka, Tamilnadu and Pudhucherry. The programmes were conducted in the reserve forest area, mangroves and wetlands. Workshop on People's biodiversity Registers were organised in all the above states.

Conservation and Restoration of Sacred Groves

Sacred groves represent an ancient Indian conservation tradition, protected by the local people out of religious fear and sentiment. They are home to the local flora and fauna, a veritable gene pool and a mini biosphere reserve. Under the 'Conservation and Restoration of Sacred Groves' programme, eight sites were restored during this year. CPREEC withdrew from four earlier sites, which were handed over to the village panchayats, and four new sites were taken up for restoration.

Training programmes on conservation and restoration of sacred groves were organized for teachers, school students and the villagers.

Environmental education for eco-development

Women form the core of family system and their role is one of hardship particularly in rural India. In order to make the environment programmes more effective, women were trained on health-care and nutrition, vermicomposting techniques, construction of smokeless chulha, etc. Seeds and saplings were distributed to women's groups for developing kitchen garden. The programmes were conducted in collaboration with NGOs in the states of Andhra Pradesh, Karnataka, Tamilnadu and Pudhucherry.

Nilgiri biosphere reserve conservation

Several training programmes on environmental education were conducted for teachers, students, panchayat leaders, tribal youths and women. The Green School

Initiative launched in Ooty was a grand success. The Thambatti herbal garden was well-maintained and several school students visited the garden to understand the importance of medicinal plants and the imperative need to conserve them. An exhibition on Endangered Wildlife Photographs was organised at Ooty. Several school and college students and the public visited the exhibition.

Andaman & Nicobar Islands

Training programmes on Disaster Management were organized for teachers, students, women and animators in the islands. Environmental education programmes were also conducted for teachers, students and women. An exhibition on Green Healers – Medicinal Plants of Andaman & Nicobar Islands was organized. The flora and fauna native to the islands were highlighted. Several school students and public visited the exhibition.



Fig.67 A training programme in paper bag making, organized by CPREEC, Chennai

Exhibitions

- An exhibition of medicinal plants viz. Green Healers – Medicinal Plants of India. was organized at Chennai. The schools in Chennai, Hyderabad, Bangalore, Ooty, and Union Territories of Pudhucherry, Andaman & Nicobar Islands were requested to send entries for an exhibition on Wildlife Photographs organized by CPREEC. Several students and general public took part and sent in their photographs for display at the exhibition.
- A third exhibition on Biodiversity Conservation was also displayed at Chennai. Several schools sent their students in batches visited the above exhibitions, which received media publicity.
- Earlier exhibitions were sent to other cities and towns for creating awareness.

Resource Material Generation

CPREEC brought out four issues of the quarterly newsletter ECONeWS. The annual issue of the Indian Journal of Environmental Education was brought out. Existing publications were updated and printed for use in training programmes. The list of publications is as follows

New Publications

- Eco news – 4 issues
- Annual issue of Journal of Environmental Education
- Green Healers – Medicinal Plants of India
- Sacred Animals of India

ENVIS Newsletter

- April 2007 – September 2007, Vol. VI, No. 1
- October 2007 – March 2008, Vol. VI, No.2

Abstract Volumes

- Sacred Animals of India
- Sacred Water bodies of India

Video Films

CPREEC has a wide collection of video films for use in the regular training programmes. The existing 30 pneumatic tapes (more than 15 years) were converted into digital version. Additional copies of educational video films were made into CDs for use in training programmes. CPREEC had produced educational films and audio cassettes to spread the message of environmental conservation and protection.

Research and Surveys

Noise level survey was organized at T. Nagar, Ambattur and Mogappair, near Kilpauk Medical College covering residential, commercial, industrial and silent zones. 225 water and soil samples from various locations in Chennai city were analysed. Vermicompost samples were analysed for the Tamilnadu Forest Department. 200 water testing kits were prepared and distributed to schools. Ambient air, noise and automobile surveys in Mysore in Karnataka, Udhagamandalam in Tamilnadu and Hyderabad in Andhra Pradesh were conducted. Ground water and soil were surveyed in Madurai, Tamilnadu. At the conclusion of each survey, the results were published in the press and a dialogue was commenced with the concerned authorities, local people and NGO.

Expanding CPREEC's database on ecological heritage of India

CPREEC is expanding the existing database on various aspects of Indian ecological heritage – sacred animals, sacred gardens, sacred groves, sacred mountains, sacred rivers, sacred tanks, sacred trees and the other

ecological traditions of India – by primary as well as secondary sources. The existing database includes information on sacred gardens, sacred gardens and groves, sacred water bodies, sacred tanks, sacred trees, sacred animals, sacred mountains. ENVIS Center has also collected information on ecological traditions of India from various print media sources.

Biodiversity Conservation Through Capacity Building

CPREEC in collaboration with the British High Commission, New Delhi, implemented a project on Biodiversity Conservation through Capacity Building. Two separate workshops for NGOs and chief judicial magistrates were organized in the state of Kerala. The workshop for judicial magistrates was conducted in collaboration with the State Judicial Academy at Kochi and the NGO workshop was conducted at Thiruvananthapuram.

Basic Health-care in South Indian villages – revival and compilation of indigenous remedies using Common Medicinal Plants

A training programme on Medicinal Plants was organised for SHG members at Chennai on August 18, 2007. Sixty five women participated in the programme. Nearly 230 medicinal plants available at IMPCOPS, Chennai were documented. The available manuscripts on medicinal plants at the Saraswathi Mahal Library, Thanjavur were documented. Available medicinal plants in the Tropical Botanical Garden Research Institute (TBGRI), Thiruvananthapuram, Kerala and Foundation for Revitalization of Local Health Traditions (FRLHT), Bangalore, Karnataka were video documented.

National Green Corps (NGC)

Under NGC, several training programmes were organized for teachers under NGC in

the states of Andhra Pradesh, Karnataka, Kerala, Orissa, Tamilnadu, Union Territories of Pudhucherry and Andaman & Nicobar Islands. School students implemented various environmental activities towards protection of the environment. Several NGC schools actively participated in the National Environmental Awareness Campaign of the Ministry of Environment and Forests, Government of India.

Earth Day Celebrations

As part of Earth Day celebrations, training programmes were organized for Panchayat members, SHG members and NGOs in the districts of Anantapur, Medak and Prakasam in Andhra Pradesh. In Karnataka, the programme was organized for students at K. Ramapur's Hanumanbetta, one of the reserve forests.

National Seminar on Conservation of Eastern Ghats

CPREEC collaborated with Environment Protection Training and Research Institute (EPTRI), Hyderabad to organize a National Seminar on Conservation of Eastern Ghats at Chennai on December 28 and 29, 2007.

National Conference on Environment and Indian History

CPREEC and the C.P. Ramaswami Aiyar Institute of Indological Research organized a national conference on Environment and Indian History at Chennai on January 11 and 12, 2008. Several papers were presented at the conference. Publication on Sacred Animals of India was released during the conference.

CPREEC Award for Environmental Education 2007

C.P.R. Environmental Education Centre Award for Environmental Education for the year 2007

was awarded to Shri. Swaraj Kumar Kanhar, a tribal teachers and Headmaster in-charge at Ambajhari U.G.M.E. School (mainly for tribal children), Ambajhari Post, via. Baunsuni, Boudh District, Orissa. The Chairman of CPREEC gave away the award at a function organized at Chennai during the year.

Centre for Ecological Sciences (CES), Indian Institute of Science, Bangalore

Introduction and Objective

The Ministry recognized the CES, IISc. Bangalore as a Centre of Excellence in 1982-83 to conduct research and undertake educational and training activities in the broad area of ecology of Western Ghats.

Progress of Activities Undertaken

The Centre carried out 30 research projects during the year under the broad themes of Biodiversity and Conservation, Behaviour and Evolution, Climate Change and its Impact, and Eco-development. In addition, it offered several courses for PhD students, hosted visiting scientists and students from other institutions, and conducted several workshops/training programmes for stakeholders, particularly for the Forest Department. CES faculty have delivered more than 50 lectures and published around 25 popular articles as an effort towards popularization of research. A summary of the activities under the major research themes is as follows

Biodiversity and Conservation

Molecular ecology of Indian fauna

CES has initiated new programmes in the field of molecular ecology. This includes a study of the molecular phylogeny and a survey of Hanuman langur morphotypes and genetics in Karnataka. One interesting result that has emerged from these studies is that large

mammal populations in the Western Ghats show genetic differentiation across the Palghat Gap that has acted as a bio-geographic barrier.

The ecology of marine turtles in the Bay of Bengal

Olive ridley turtles were monitored during nesting and in offshore waters during the breeding season from December to April in Orissa. A programme on the biology of leatherback turtles is being initiated in the Andaman and Nicobar islands. These populations will be monitored using conventional tagging, satellite telemetry and genetic analysis.

Ecology and conservation of Asian elephants in Mudumalai Wildlife Sanctuary

Monitoring the population structure and demography of elephants in Mudumalai Wildlife Sanctuary, using standard field methods was continued. Sixty one observations of elephant herds/bulls were classified during the study period.

Fish diversity in relation to landscape and vegetation in central Western Ghats

A study was conducted in Sharavathi River of Karnataka to understand fish species composition with respect to landscape dynamics. The study, using a combination of remote-sensing data as well as field investigations, shows that the streams having their catchments with high levels of evergreen and endemic tree species of the Western Ghats were also richer in fish diversity and endemism, compared to those catchments with other kinds of vegetation.

A new frog species from the central Western Ghats

Tropical evergreen forests of Indian subcontinent, especially of the Western Ghats,





Fig.68 A new frog species from the Central and Western Ghats are known hot spots of amphibian diversity, where many new anuran species await to be identified. A new shrub-frog taxon related to the anuran family Rhacophoridae was described from the Sharavathi River basin of central Western Ghats. The new frog possesses the characteristic features of rhacophorids (dilated digit tips with differentiated pads circumscribed by a complete groove, intercalary cartilages on digits, T-shaped terminal phalanges and granular belly, the adaptive characters for arboreal life forms), but also a suite of unique features that distinguish it from all known congeners in the region.

Behaviour and Evolution

Behaviour of Social Insects

A most intriguing aspect of the societies of ants, bees and wasps is that they are feminine monarchies – there are queens but no kings and all workers are females. Males don't work. Using the Indian primitively eusocial wasp *Ropalidia marginata* and the important task of feeding larvae as an example of work, a novel attempt has recently been made to understand the secret behind the well-known laziness of the males.

Plant-animal interactions

The two main thrusts of investigation in these areas are on chemical ecology and visual

ecology. The main model systems being used are ant-plants especially the semi-myrmecophytic understorey tree *Humboldtia brunonis* (Fabaceae), figs and associated fig wasps and nematodes (*Ficus:Moraceae*), ant-mimicking spiders (Salticidae), crab spiders (Thomisidae), and nocturnal carpenter bees (*Xylocopa*). The topics being investigated involve species interactions, particularly pollination mutualisms (e.g. fig and fig wasps, carpenter bees), parasitism (parasites of the fig-fig wasp mutualism), and mimicry (ant mimicry in salticid spiders and floral mimicry in crab spiders).

Acoustic communication in crickets

Methods to estimate foliage density in the understorey of an evergreen forest as a step towards characterizing habitat structure in the forests of Kudremukh National Park have been standardized during past one year.

Climate Change and its impact

Climate change and forest sector in India

Global assessments have shown that future climate change is likely to significantly impact forest ecosystems. The study assessed the impact of projected climate change on forest ecosystems in India. A shift towards wetter forest types in the northeastern region and drier forest types in the northwestern region in the absence of human influence is projected.

Climate and the dynamics of a tropical dry forest at Mudumalai, southern India

The structure and stability of tropical forests and their role in the carbon cycle are being investigated, especially in the context of future climate change.

Human Ecology and Ecodevelopment

Joint Forest Management in Uttara Kannada district

Studies on six villages selected under the Joint Forest Management (JFM) Programme in Uttara Kananda for assessing the implications of community protection of JFM plantations over last five years indicated decrease in tree density, loss of 9% of species and increase in shrub species density. Decrease in stem density of exotic planted species reflects the demand for fuelwood in the village.

Participatory Natural Resources monitoring in selected villages in Uttara Kannada district

Natural resources such as soil, water, forest, cropland and livestock are critical for sustainable food production and livelihoods, but subjected to degradation and loss. Monitoring of natural resources over time helps in understanding changes that have occurred and taking corrective action. Studies conducted in four villages of Uttara Kannada district in the Western Ghats have shown that there could be both positive and negative impact of changes that have occurred in the village ecosystems.

Support to Government Policy

CES faculty have provided significant inputs to a number of government committees including the Expert Panel on Climate Change, National Tiger Conservation Authority, Planning Commission subgroups on Biodiversity, Wildlife Conservation and Climate Change, and governing bodies of institutions such as SACON.

Centre of Mining Environment, Indian School of Mines University, Dhanbad

Introduction and Objective

The Ministry set up CME as a Centre of Excellence in Mining Environment in 1987 in the Indian School of Mines University, Dhanbad. Since inception, the Centre has been carrying out Academic and Advance

Research Activities in Environmental Science and Engineering with special emphasis on Mining Environment.

Progress and Activities Undertaken

- The Centre completed the following research and development projects during the year:
 - An assessment of overburden dump rehabilitation technologies adopted in CCL, NCL, MCL and SECL mines.
 - Investigations into the Air Quality Status and its Impacts on Social Spectrum of some Coal Mining Areas of Korba Industrial belt of Chhattisgarh.
 - Impact of mining on the pattern of Land Use Change in Mines and their neighbourhood in selected Mining Areas of Jharkhand.
- The ongoing projects sponsored by Department of Atomic Energy, "Baseline Studies of Bagjata and Banduburang sites of UCIL" was carried out by the Centre for the following objectives:
 - Air quality & Micro-meteorology
 - Surface & Ground Water Quality
 - Soil Quality



Fig.69 Slope stabilization in MCL

- Status of Aquatic Biota
- Natural Vegetation
- Dietary Components (Milk , Egg , Fruits, Common vegetables, Pulses, Cereals, Kendu, Meat & fish samples)
- During the year, as a part of academic activities, the centre organized the following:
 - “1st International Conference on Managing the Social and Environmental Consequences of Coal Mining in India”, 19-21 November, 2007, in New Delhi in association with University of New South Wales and Australian National University.
 - Sit and Draw competition for about 200 students from Nursery to Std. X on World Environment Day at CME, Dhanbad.
 - Tree Plantation for eco-development activities in the campus
 - Prof. S.K.Bose Memorial Lecture on “Environmental Concerns of Coal Mining –Broad View In Indian Context” on January 29, 2007 in CMI.
 - One Day Workshop on “Life Skills and Solid Waste Management” for school students (January 31, 2007).
 - Two Unit Based Training Programs on Environmental Management in Mining Areas for over 100 Executives of Gujarat Mineral Development Corporation Ltd (GMDC) at Panandhro, Rajparadi Mines and Ahmedabad during Feb. 21-28, 2007 & October 23-30, 2007.
 - Training Programs on Environmental Management in Mining Areas for 25 Executives of National Mineral

Development Corporation Ltd (NMDC) at Hyderabad during November 27-29, 2007.

- A Training Workshop on Environmental Impact Assessment for about 50 executives of BCCL on January 17, 2007.
- Environmental Awareness Workshop for the teachers of local Schools and Colleges in association with CPCB (Eastern Zone), SPCB, CIMFR, etc. at ISMU, September 13, 2007.

Salim Ali Centre for Ornithology and Natural History (SACON), Coimbatore

Introduction and Objectives

The SACON was established by the Ministry in 1990 with the mission “to help conserve India’s biodiversity and its sustainable use through research, education and people’s participation, with birds at the centre stage”. The management of the centre is vested in a Governing Council chaired by the Secretary (E&F).

Progress of Activities Undertaken

The research projects undertaken during the year deals with a variety of topics related with species-specific studies and studies relating to ecosystems / community ecology, impact assessment, and environmental contamination. SACON also continued with the Environmental Information system (ENVIS) programme on wetlands, and pursued its nature education programme intensively during the year.

Major activities during the year include the following

- The avian species specific studies undertaken include a ‘study to identify and map Lesser Frilican breeding sites to

develop a fodder-producing grassland network in western India', 'Ecology and Conservation of the Spot-billed Pelican in Andhra Pradesh', and 'study of Ecology of Indian Grey Hornbill (*Ocyrceros birostris*) with special reference to its role in southern Eastern Ghats'.

- In the Andaman & Nicobar Islands, SACON continued the project on "in-situ and ex-situ Conservation of the Edible-nest Swiftlet *Collocalia fuciphaga*. Extension of Phase II". This programme intend to develop scientifically managed nest harvesting as a means of providing sustainable livelihoods for nest collectors, farmers, and poorer sections of the community as well as forming an important source of revenue for the



Fig.70 *Egretta gularis* - an Western reef egret

islands.

- A study was undertaken on "Pollination and seed dispersal by animals in the dry

deciduous forests of Southern Eastern Ghats" funded by Tamil Nadu Forest Department (Research wing) to suggest plants that can attract "keystone mutualists" and suggest native plant species for afforestation programs is in progress. A similar study to explore "Plant-bird interactions with special reference to identification of bird-dispersed plants in Attapady hills, Kerala" is at the verge of completion.

- An impact assessment study on Mumbai trans-harbor sea link project focusing on Flamingos and migratory birds, started in 2006 is being completed in 2007. The study focuses on a stretch of about 5 km over Sewri and Nhava including the mudflats that have been identified as an Important Bird Area (IBA) by the Indian Bird Conservation Network. The area harbors a large population of small waders and 2-15% of the entire south Asian population of the Lesser Flamingo (*Pheonicopterus minor*) which is a Near Threatened species.
- The research project to 'inventory the Biodiversity of Attappady with GIS Aid' is being completed in December 2007. The Attappady area lying in the foothills of Nilgiris in the Mannarghat forest division in Kerala is classified under the "restoration zone" in the Nilgiri Biosphere Reserve and needs habitat improvement. The Attapady Hill Area Development Society (AHADS) has been working in this region for the improvement and restoration of the habitats and the upliftment of the tribes. An 'evaluation of butterfly communities as bio-indicators in Western Ghats', initiated in July 2006 is on the verge of completion and the final report is in advanced stage. One thirty three species of butterflies belonging to five families were recorded which included

- nine species endemic to the Western Ghats.
- SACON has initiated a three-year program “strengthening community conservation efforts in Nagaland; a programme to impart technical support on biodiversity conservation and livelihood options to communities’.
 - A three years study on the herpetofaunal Communities of the Upper Vaigai Plateau, Western Ghats, India, funded by the Eastern and Western Ghats Programme of MoEF and initiated in 2006 is in progress. Another study on ‘the Ecology of the Endangered Indian Rock Python (*Python molurus*)’ is undertaken in Keoladeo National Park (Bharatpur) with funding from the Ministry has been initiated during this year.
 - The study on ‘structural and functional attributes of the wetlands of Indo-Gangetic plains with reference to Uttar Pradesh’ in collaboration with Indian Institute of Remote Sensing (IIRS) was continued. The study is expected to be completed shortly. An ‘Evaluation of Global Data Sets from GIAM (Disaggregated and aggregated) using National Inventory Database in India’ in collaboration with Department of Forests, Irrigation, Command Area Development, I & CAD, Govt. of Andhra Pradesh have also been undertaken.
 - A study on ‘adaptation and tolerance of birds to urbanization – a critical evaluation with emphasis on life strategy’ funded by the International Foundation for Science (IFS, Sweden) looks at the bird species, nest success and abundance along an urban gradient and the underlying ecological principles and behavioural adaptation of species. A similar study focussing on sparrow in view of the urbanization and environmental transition is in progress in Coimbatore. The study also examines the population changes of the species with special reference to Electro Magnetic Radiation (EMR).
 - A study has also undertaken on ‘the status, habitat and development of EMP for Blewitt’s owl in Araku Valley’. The study funded by the Andhra Pradesh Mineral Development Corporation is on the verge of completion.
 - A study on the ‘Impact of agricultural pesticides on the population status and breeding success of select species of fish-eating birds in Tamil Nadu’ has been undertaken. A study on the ‘use of biomarkers in evaluation of heavy metal contaminants in marine fishes’ is completed.
 - As part of nature education program the “People’s Biodiversity Register through School Children” has been completed. Nature education programme was continued more intensively and some of the scheduled programs are
 - nature camps for students of Coimbatore,
 - ‘wildlife week celebrations,
 - Salim Ali trophy nature awareness competitions and awards,
 - Salim Ali birth anniversary celebrations,
 - student research programmes,
 - Salim Ali naturalist forum,
 - world wetlands day celebrations, and teachers training programme etc.

Centre for Environmental Management of Degraded Ecosystems (CEMDE), University of Delhi

Introduction and Objectives

The CEMDE under the aegis of School of Environmental Sciences, University of Delhi, has been functioning as a Centre of Excellence of the Mining since 1997 for the environmental management of degraded ecosystems.

Progress of Activities Undertaken

Restoration of Mined out Areas

The grassland developed at the Fine Ore Dump (Deposit 5, 10, 11A) of the Bailadilla Iron Ore Project of the National Mineral Development Corporation at Bachelu has 90% grass cover and the substrate is enriched with litter and organic matter and microbial activity. The grassland developed has not only enhanced the biological productivity but also processed the habitat. The grassland also harbours plantlets of woody species such as *Alstonia scholaris*, *Macaranga*, *Trema*, wild *Mangifera*, *Woodfordia* and *Atylosia* – the early successional species of native moist semi evergreen forest.

Lantana Eradication and Restoration of Weed Free Landscapes

- In the 10 acre Lantana infested forest plot selected in the Beed of Vidya Bhavan Society (Udaipur range of Aravallis), a



Fig.71 Two year old restored site at Corbett Tiger Reserve after eradication of *Lantana*

grassland with native species has been developed after the successful eradication of *Lantana* by cut rootstock method. Saplings of a number of tropical dry deciduous forest community species such as *Acacia*, *Dispyros*, *Cassia*, *Albizia* and *Dalbergia* have already colonized the habitat. Similarly, the *Lantana* infested 10 acre plot in moist deciduous forest community of the Satpura Tiger Reserve is being ecologically rehabilitated. *Lantana* has been successfully eradicated from the plot. A grassland has been developed with native grass species to process the habitat and promote ecosystem development. The 10 acre *Lantana* infested plot in the Kalesar National Park has also been developed into a grassland after the successful eradication of *Lantana* by cut rootstock method. The grass cover is more than 75%.

- At Corbett Tiger Reserve, all the three plots of 10 acres each have been transformed into luxuriant grasslands which have been visited by 400-600 herbivores, wild bores, large number of grassland birds and rich insect fauna. The frequency of wildlife sightings has increased and the recreational value of the sites has been increased. The Park Management has eradicated 1000 hectares of *Lantana* infested areas in the Park by cut rootstock method. These areas are also being developed into grasslands. Four Nurseries for grasses and legumes have been developed by the Park Management in consultation with the Centre.

Taxonomy, Biology and Ecology of *Lantana*

Information on taxonomy, biology

and ecology information of Lantana is critical for its management in forest ecosystems, including Protected Areas because of the diversity in attributes that make it aggressive invasive weed classified as one of the top 10 world's worst weeds. At least 6 to 7 species of Lantana belonging to Lantana sect. Lantana are involved in the Lantana complex that is threatening native biodiversity and changing the trophic structure of biological communities in the forest ecosystems studied in India. Hybridization and polyploidy have contributed to the enormous variability in phenotypic traits that are associated with its invasiveness. The growth habit, reproductive strategies and mutualistic interactions with seed dispersal agents and Arbuscular Mycorrhizal Fungi (AMF) are contributing to its successful invasiveness. For example, surveyed all the species populations of Lantana are mycotrophic and harbour as many as 30 spore types belonging to 28 species in its rhizosphere. The management of grasslands and the control of Mikania – an invasive weed of wet tropical forest ecosystems – are also being investigated.

Madras School of Economics (MSE), Chennai

Introduction and Objectives

The Centre was set up by the Ministry in 2002 as a Centre of Excellence for carrying out studies and other projects related to the area of environmental economics. The following subject areas have been identified for collaboration between the Ministry and the Centre

- Development of Economic Instruments
- Trade and Environment
- Cost benefit analysis
- Applied aspects of Environmental Economics for the Ministry's policy

decision making; and

- Development and maintenance of website on issues related to environmental schemes.

Progress of Activities Undertaken

Supported Projects

The following projects supported by the Ministry were undertaken:

- “Utilization of Fly-ash by brick manufacturers – Environmental Costs vs. Benefits”
- “Economic Analysis of EIA in India: Costs of Delays, Impacts and Mitigation Measures”

Research Projects supported by other funding agencies

The Centre also undertook the following studies funded by other agencies

- “Environmental Sustainability and Human Development in Tamil Nadu”, sponsored by Tamil Nadu State Planning Commission.
- “Economics of Municipal Solid Waste Management: A State level study”, sponsored by the Central Pollution Control Board
- “Natural Resources Accounting for Land and Water Resources in Tamil Nadu” sponsored by the Central Statistical Organization.
- “Climate Change Impacts on Indian Agriculture: Role of Information Diffusion, Technological Development and Multiple Stresses”, sponsored by SANDEE.

Environmental Economics Website

The Centre's website <http://coe.mse.ac.in> is regularly updated in terms of research studies in the field of environmental economics, particularly in the Indian context. It has served as a major instrument for dissemination. During the last 5 years and earlier during the World Bank Capacity Building Project, MSE has built up a very good collection which serves as a point of reference for researches in South India. Research reports, dissemination papers, news briefs, useful links and newsletter etc have also been uploaded in the website.

Workshops

- A workshop on economics of solid waste management was organized by the Centre during the year as part of the ongoing project.
- Result dissemination workshop was organized in the year by the Centre as part of the ongoing project, 'Greening Incentives for Electricity', funded by Indo-Canada Environment Facility.

ENVIS Centre

MSE has also been designated as an ENVIS Centre under the Environmental Information System (ENVIS) scheme of the Ministry. The ENVIS Centre has been conducting a resurvey of academic institutions involved in teaching and research in environmental economics.

Foundation for Revitalisation of Local Health Traditions, (FRLHT) Bangalore

Introduction and objectives

In order to promote conservation and sustainable utilization of Medicinal plant resources of the country, the Ministry set up a Center of Excellence on Medicinal Plants and Traditional Knowledge at the Foundation for

Revitalization of Local Health Traditions (FRLHT) Bangalore in October 2002 to undertake the following

- Creation of a Bio-cultural repository of Medicinal plants of India
- Establishment of an ethno-medicinal demonstration garden in Bangalore
- Pharmacognostic studies on prioritized medicinal plants
- Distribution mapping using GIS and identification issues of traded Medicinal Plants
- Outreach (Training & Educational Material on Plants of Indian School of Medicines)

Progress of Activities Undertaken

Creation of a Bio-cultural repository of Medicinal plants

- Botanical surveys were carried out in different regions of the country namely Manipur, Himachal Pradesh, Rajasthan, Orissa, Tamil Nadu and Karnataka. More than 2100 plant specimen have been collected during these botanical expeditions. A total of around 200 plant species will get added to the accessions of the Herbarium after the processing and final identification of the specimen.
- One thousand quality images depicting the plant parts, habitats and parts of the plants in use etc. of medicinal plants, have been added to the available image library after scanning these at 300 dpi. A prototype module of the virtual Herbarium, in computer media, incorporating 1000 digitized herbarium sheets has been



Fig.72 *Piper nigrum* – a useful medicinal plant, needs conservation developed.

- An educational module in herbarium techniques has also been developed along with a photoguide to the prioritized medicinal plants of Karnataka.

Establishment of Ethno-Medicinal Plants Demo Garden

More than 800 Medicinal Plant species have been planted in the garden of Centre of Excellence located at the FRLHT campus. During the year 60 additional medicinal plant species have been added to this garden and the layout of the garden has been improved with the addition of four new themes which include wild edible and medicinal flowers as well as sacred medicinal plants. Suitable educational signages have been developed for these themes. Ethno-Medicinal Garden (EMG) based awareness cum educational

programmes, relating to medicinal plants, were organized for the students. Preparation of a CD on “Designing EMGs” for institutions who wish to establish EMGs of their own has been completed.

Pharmacognostic studies on prioritized medicinal plants

The lab has carried out studies relating to the botanical candidates of “Daruhaldi”. HPTLC fingerprint studies have been completed for *Berberis aristata*, *B. lycium*, *Coscinium fenestratum* and *Morinda umbellata*. Microscopy for one set of samples of these four species have also been completed. Microscopy of botanical candidates for the Ayurvedic plant drug Gokshura has also been initiated. Microscopy of one set of samples relating to four botanical candidates of Ayurvedic drug “Vidari” has also been carried out. These four species are *Adenia bondala*, *Cycas circinalis*, *Ipomoea mauritiana* & *Pueraria tuberosa*.

Distribution mapping using GIS and identification issues of traded Medicinal Plants:

- The Geo Distribution Maps have been prepared for 250 medicinal plant species and for 50 of these species Eco-Distribution maps have also been generated. The digital Geographical Distribution Atlas of Prioritized Indian Medicinal Plants has been revised and updated.
- The data relating to India’s exports and imports by commodities, compiled by Director General of Commercial Intelligence and Statistics (DGCIS) enlists the items with their Harmonized system (HS) codes along with their annual



Fig.73 *Garcinia indica* – a useful medicinal plant at FRLHT, Bangalore

quantities and values. The HS codes currently being used for these compilations lump most of the medicinal plant materials under miscellaneous categories without any indication of the specific plant entities being exported. There is a need to address this through development of an improved system of HS-coding so that the exported plant materials gets linked to the specific plant species and consequently with the sources of supply. In absence of such linkage it is not possible to assess the quantum of exported plant materials sourced from endangered plant species. A preliminary status report has been prepared for undertaking detailed assessment of the issues involved.

Outreach Training & Educational Material on Plants of Indian System of Medicine (ISM)

- This activity is focused on developing a cadre of village botanists as well as

development of educational CDs relating to plant species of ISM.

- Under the village botanists training programme the para-taxonomists have been given training relating to plant morphology, identification, nomenclature, herbarium methods etc. A website for village botanists is hosted at URL: www.villagebotanist.org. A review of this programme, along with revision of the course curriculum, has been undertaken during the year.
- Three educational CDs, namely Plants in Siddha, Homeopathy and Unani systems of medicine, have been revised based on inputs/suggestions by reviewers. A prototype of CD incorporating comprehensive inventory of plants in Ayurveda has also been prepared.

Evaluation

The Ministry reviewed the achievements of the Centre since inception till 2007 by an Expert Group specifically constituted for this purpose. The Expert Group observed that the performance of the Centre is satisfactory and recommended for further strengthening of the Centre during the 11th Plan period.

Tropical Botanic Garden and Research Institute (TBGRI) Thiruvananthapuram

Introduction and Objectives

TBGRI was recognised by the Ministry as a Centre of Excellence in 1979 for ex-situ conservation of Tropical Plants and sustainable utilisation of tropical plants. It also functions as the National Gene Bank for medicinal and aromatic plants of peninsular India.

TBGRI continued Research and Developmental activities towards achieving the goals fixed in the mandate of the institution. The conservatory Garden, which maintains a holding of over 5000 species of plants belonging to trees, palms, bamboos,

orchids, medicinal plants, ferns, cacti and succulents and rare and threatened plants, forms the largest of its kind in India. During the year, about 150 species were introduced new to the garden.

- Research work continued in 85 externally funded projects sponsored by various organizations and 13 new projects with a funding of Rs. 81 Lakhs were initiated during the year.
- Two patents were awarded and three were filed. One genus and 5 species of flowering plants and 46 species of fungi were described new to Science. Fourteen species of flowering plants were recorded new to the country. Projects on DNA fingerprinting and bar coding of endemic plants were also initiated.
- Three books and 80 research papers were published in National and International journals. Flowering plants of Kerala- a handbook, which is an exhaustive documentation of the floristic wealth of Kerala state, was released during the year.