Chapter 6

Ongoing Initiatives and their Major Actors[1]

It may be noted that the structure of this chapter is the same as followed for *Chapter 7* on Strategies and Actions. In other words, readers can follow the flow of each aspect of biodiversity given below, from the description of ongoing initiatives to the identification of gaps (both covered in this chapter), to the delineation of strategies and actions needed to fill the gaps and enhance ongoing initiatives (in *Chapter 7*). The section numbering is therefore also corresponding between the two chapters, e.g. *Section 6.2.1.1* corresponds to *Section 7.2.1.1*.

Each section below, with the exception of the first one, is structured in the following manner:

i. A brief description of the topic being dealt with;
ii. Details of ongoing initiatives regarding this topic (not meant to be exhaustive); and;
iii. A list of the key gaps in these initiatives.

6.0 Ongoing Initiatives on Overall Planning and Governance

The conservation of biodiversity and use of biological resources is dependent on the overall structure of planning and governance in India. A substantial part of the country's biodiversity is on lands (and in waters) that are state-owned (for a discussion on the history of state take-over of resources, *see Section 5.2*). But there are also significant parts that are in the hands of communities and individuals. Generally, decisions regarding the conservation, use and distribution of biodiversity and biological resources are currently within the broader framework of India's political decision-making process. This process has emphasized representative democracy, in which elected representatives from village-to national-level take decisions and cause them to be implemented. The process has also stressed that planning and management be done by specialized agencies, e.g. the Forest Department for forests (and 'forest lands', a legal category which could also include non-forest ecosystems). Over the last few years, greater focus is being put on decentralized governance of resources and other aspects of village and city life.

Gaps*:* There are a number of crucial gaps in the current planning and governance of biodiversity:

1. More than half a century after Independence, India still does not have a comprehensive national land and water use plan. In the absence of such a long-term vision, much of the planning of land/water uses remains ad hoc and short-term. The consequences are not only a serious lack of coordination, but more seriously, contradictions in the plans and programmes of different agencies and sectors. Biodiversity, and those whose livelihoods are based on biological resources, are often the worst affected, e.g. when ecologically rich areas are taken up for industrial or commercial development.

2. Governance of biodiversity (and natural resources in general), remains highly centralised, and in the control of government agencies. Recent policy and legal moves towards decentralisation are encouraging, but the actual changes are very slow. 'Representative' democracy has shown up serious failures and weaknesses, especially in bringing the voice of the underprivileged sections of society into decision-making. Moves towards 'participatory' democracy, which could provide a platform for such sections, are slow and hesitant.

6.1 Ongoing Initiatives for Wild Biodiversity

6.1.1 Wild Biodiversity: Increasing Understanding and Information

6.1.1.1 Overall Concept

Despite several decades of research by various government organizations and university departments, our understanding of the multitude of India's natural ecosystems, their biodiversity and the constraints in their sustainability still remain fragmented and localized. Even something as basic as an inventory of faunal and floral elements is neither geographically continuous nor comprehensive. The situation is not much better with respect to sustainable utilization and management. These lacunae have been recognized and several initiatives, both governmental and non-governmental, are already in place. This section reviews some of the major ongoing initiatives towards understanding India's biodiversity.

6.1.1.2 Current and Past Initiatives

Central Government

Ministry of Environment and Forests (MoEF)

a. The Botanical Survey of India (BSI) was formally constituted in 1890 with the purpose of maintaining the efficiency and standards of botanical studies in the country. The Survey is based in Kolkata, from where it coordinates its 9 regional centres, which carry out botanical explorations. The primary objectives of the BSI include survey of plant resources of the country; taxonomic studies of all the flora; enlisting endangered species; undertaking measures for effective conservation; and collecting and maintaining germplasm and gene banks of endangered and vulnerable species. Another objective is to prepare databases of the flora of India and its States/Union Territories. BSI undertakes the collection and preservation of specimens of economically beneficial plants. It also aims at the preparation of a National Database of herbarium collections (http://envfor.nic.in).

b. The Zoological Survey of India (ZSI) was set up in 1916 to promote survey, exploration and research on the various aspects of wild fauna. The primary objectives of the ZSI include the 'Exploration, Survey, Inventorisation and Monitoring of Faunal Resources; Taxonomic Studies; Status Survey of Endangered Species; Publication of Results through Departmental Journals; Preparation and Publication of Red Data Book, Fauna of India and Fauna of States; Bio-ecological studies on some important communities/species; Preparation of Database for recorded species of the country; Maintenance and Development of National Zoological Collections; Training, Capacity Building and Human Resource Development; and Central Referral, Information, Advisory and Library Services.' It has 16 regional centres. The ZSI also maintains museums at Headquarters and Regional Stations and conducts Environmental Impact Studies when specifically requested for by the Ministry of Environment & Forests. It is also involved in development of ENVIS (*see Box 6.10 and Table 6.6*) and CITES centres, granting Research Fellowships, Associateships and Emeritus Scientists Programmes, undertaking collaborative research programmes on biodiversity, GIS and remote sensing studies for recorded animal diversity, and chromosomal mapping as well as DNA fingerprinting. (http://envfor.nic.in; Alfred 2002)

   Both BSI and ZSI are increasingly becoming involved in surveys of coastal and marine biodiversity.

c. The Forest Survey of India (FSI) was set up in 1981 at Dehradun. The purpose was to periodically (10-year cycle) monitor the changes in land/forest resources and accordingly present data for national planning. Every two years, the FSI prepares a comprehensive State of Forest Report, which includes a National Forest Vegetation Map (NVM). Through the use of remote sensing data the FSI also prepares various thematic maps with minimum essential ground truth verification. It aims at creating a computer-based National Basic Forest Inventory System (NBFIS) to collect, store and retrieve necessary forestry and forestry related data for national and state-level planning. FSI also undertakes the design of methodologies relating to forest surveys and subsequently updates them. It prepares forest inventories in selected states and UTs as and when required.

Other activities include training in modern forest survey techniques; advice to States/UTs on design and development of regional components of NBFIS; and support and oversee technique/inventory work undertaken by State/UT Forest Departments (http://envfor.nic.in/fsi/fsi.html).

d. The MoEF has launched the All-India Coordinated Project on Capacity Building in Taxonomy (AICOPTAX) in 1999-2000 (*see Section 6.1.6.2*). So far, 11 centres for research have been established. For each centre, an experienced taxonomic expert has been identified as the coordinator, who in turn has identified 4-5 collaborators across the country. The coordinators of the centres together with the collaborators are required to undertake the following activities through training of two research scholars each:

- Survey, collection, identification and preservation
- Maintain collections and taxonomic databanks
- Develop identification manuals
- Train college teachers and students and local communities in para-taxonomy (MoEF 2001a).

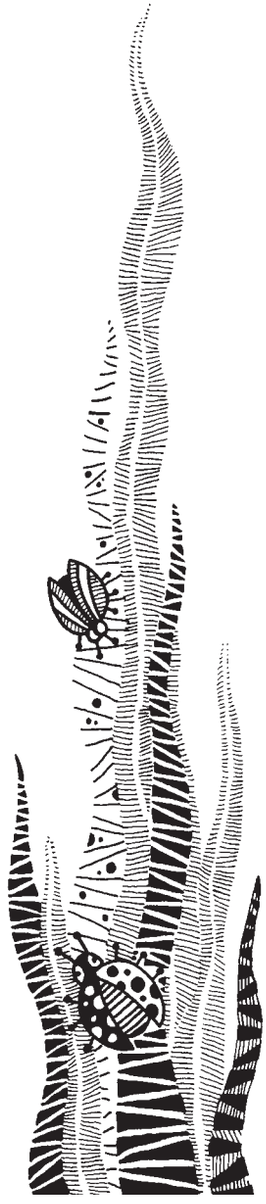
e. An All-India Coordinated Research Project on Ethnobiology (AICRPE), initiated by the MoEF in 1982, documented the use of biological resources by ethnic communities in India. The documentation is limited to the knowledge of tribal communities and does not include other local uses and practices (MoEF 1999b).

f. The Environment Research Programme of the Ministry of Environment and Forests (MoEF) specifically deals with problems related to pollution; chemical, biochemical and engineering investigations; technology development for waste minimization; waste recycling; resource recovery; effluent treatment and other environmental studies related to pollution control; development of instruments for pollution measuring and control; development of eco-friendly and cleaner technologies, etc. (MoEF 2001a).

g. The Ecosystem Research Scheme of the MoEF is an inter-disciplinary programme of research, which emphasises an ecological approach for studying all the relationships between humans and environment. Subjects of research have included ecosystem approach, the ecology of important rare, endangered animal species like South Indian primates, monitor lizards, germplasm collection, propagation and improvement of forest plants of the Thar desert, sea-level rise, methane measurements in the country, insect plant interrelationships in forestry ecosystems, vertebrate diversity on the Great Nicobar Biosphere Reserve, human-wildlife interactions in protected areas, rare endemic avifauna of Andaman and Nicobar Islands, non-human primates of India, human-nature interactions in and around National Parks, ethnobiology, etc. (MoEF 2001a).

h. The Eastern and Western Ghats Research Programme addresses itself to location-specific problems of resource management in the Eastern and Western Ghats regions of the country. This scheme supports research projects on soil and water management, impact of mining and environment, conservation of biodiversity, impact of human activities and industrialization on local river ecosystems, sacred groves, effect of plantation crops and soil erosion, rehabilitation of degraded areas, grasslands, tropical montane flora of Eastern and Western Ghats, etc. (MoEF 2001a).

i. Indian Council of Forestry Research and Education (ICFRE), Dehradun, (*see Section 6.1.10.2*) has been created to formulate, organise, direct, and manage forestry research; transfer the technologies developed to states and other user agencies; and impart forestry education. The council has 8 research institutes and 3 advanced centres to cater to the research needs of different bio-geographical regions of the country. These are Forestry Research Institute, Dehradun; Himalayan Forest Research Institute, Shimla; Centre for Social Forestry and Eco Rehabilitation, Allahabad; Institute of Forest Productivity, Ranchi; Institute of Rain and Moist Deciduous Forest Research, Jorhat; Tropical Forest Research Institute, Jabalpur; Centre for Forestry Research and Human Resource Development, Chhindwara; Arid Forest Research Institute, Jodhpur; Forest Research Centre, Hyderabad; Institute of Wood Science and Technology, Bangalore; and Institute of Forest Genetics and Tree Breeding, Coimbatore (http://www.icfre.org/).



j. All-India Coordinated Project on Coastal and Marine Biodiversity: This project of the MoEF aims to complete inventories of coastal and marine biodiversity. Subsidiary objectives include capacity-building in taxonomy, creation of databases, networking and website hosting on biodiversity-related themes, promotion of participatory monitoring and management etc. (MoEF 2002a).

k. Indian Coral Reef Monitoring Network (ICRMN): The tasks of the network include continuous monitoring of the health of the coral reef ecosystems through biophysical and environmental surveys, and development of the appropriate infrastructure and humanpower capacity needed for this purpose (MoEF 2002a).

l. National Natural Resource Management System (NNRMS) identifies remote sensing application projects addressing key environmental and ecological issues such as management of forests, grasslands, faunal resources, wetlands, coastal areas, land degradation, river pollution etc. (MoEF 2002a).

m. Coastal Zone Management Plans (CZMP): As directed under the CRZ Notification, 1991, all coastal states & Union Territories were directed to prepare Coastal Zone Management Plans (CZMPs) within one year from the date of the notification (*see Section 6.1.8.2*). On 18th April 1996 the Supreme Court [WP (Civil) 664 of 1993] directed all states to file their complete CZMPs by 30 June 1996. The Central Government was to finalise and approve the said plans with or without modifications within three months thereafter. The MoEF had reiterated this through its letter dated 27 September 1996 to the Chief Secretaries of all coastal states, calling for certain modifications and conditions to be incorporated into the revised CZMPs. The present CZMPs of all the states are only conditionally approved documents, and the MoEF still awaits their finalisation.

n. The Central Pollution Control Board (CPCB) was constituted in 1974. The main functions of CPCB are indicated in The Water (Prevention and Control of Pollution) Act, 1974, and The Air (Prevention and Control of Pollution) Act, 1981 (see Section 6.1.8.2). These are to 'promote cleanliness of streams and wells in different areas through prevention, control and abatement of water pollution; and to improve the quality of air and to prevent, control or abate air pollution in the country.' The CPCB has in collaboration with the State Pollution Control Boards (SPCBs) established a National Ambient Air Quality Monitoring (NAMP) network. There are 290 stations in 92 cities/towns. The purpose is to collect, compile and disseminate information on air quality (http://envfor.nic.in).

Box 6.1 Environment Impact Assessment (EIA)

(*also see Box 6.41*)

In 1994, the Environment Impact Assessment (EIA) Notification (under the Environment Protection Act, 1986) made it legally mandatory for 29 (later increased to 30) industrial and developmental activities to get environmental clearance from the centre. Each of these activities needs to follow a specified procedure – for instance, the preparation of a detailed EIA report and its evaluation by an Impact Assessment Agency. In 1997, the notification was amended to include, as mandatory, a public hearing to be conducted before a project is considered for clearance.

EIAs are a progressive tool in the direction of sustainable development planning. EIAs are supposed to give a full understanding of the impact of a proposed project on nature and people, and help assess whether the project should or should not be built. They also form the base of mitigatory plans if the project is approved.

However, EIAs as currently practiced raise concerns which need to be addressed. One of these is the preparation of inappropriate and inadequate EIA reports. There are several reasons for such a situation. Many of the guidelines for EIAs need to be updated. Expertise to carry out professional EIAs is either limited, or not easily available. Most serious, however, is the fact that EIAs are usually funded by those who are proposing the project, thereby making independent studies very difficult. The lack of public involvement in the preparation of the EIA report is another critical problem. Another significant concern has been the amendments (including removing projects from the purview of the notification/public hearings etc) to the EIA notifications, which have gone against the very spirit with which this notification came into being.

The EIA notification could be one of the most effective means of conserving biodiversity by checking destructive industrial development. However, the above problems need to be tackled to make this happen. Most important, EIAs need to be commissioned with funding independent of the project proponents, and be carried out by agencies with a clear track record of integrity. Public involvement needs to be built in centrally, at all stages of the process. Without such changes, these essential tools will remain ineffective. It is hoped that the provisions for EIAs of projects that could affect biodiversity in the Biological Diversity Act 2002 will greatly enhance the scope and efficiency of current EIA processes (Kohli and Kothari 2001).

Ministry of Science and Technology

a. The National Bioresource Development Board (NBDB) under the Department of Biotechnology (DBT), was established in December 1999. The basic objectives of the Board (also relevant to *Section 7.1.10.2*) are to decide the broad policy framework for effective application of biotechnological and related scientific approaches for research & development and sustainable utilisation of bioresources, especially for the development of new products and processes; to develop a scientific plan of action for contributing to the economic prosperity of the nation through accelerated research & development using the modern tools of biosciences; to evolve effective *ex situ* conservation strategies for bioresources of potential scientific and economic value; to develop predictive groupings of biological resources through well-established molecular lineages; to construct gene maps of bioresources that can be used for locating useful genes; to promote the use of biological software in the management of agricultural pests and pathogens; to promote value addition to bioresources; to train human resource for the achievement of the above objectives; to strengthen bioinformatics vis-à-vis bioresources.

   Some of the Resource Based Projects are Digital Inventorisation, Prospecting for Natural Dyes from Bioresources, and research on Botanical Pesticides. There is also a programme on the inventory of the existing microbial resources, to be followed up by exploitation of these resources. There are several region-specific projects including for coastal areas, Himachal Pradesh and Manipur (MoST 2002). DBT is also running a project involving several institutions in the country on microbial diversity and bioprospecting.

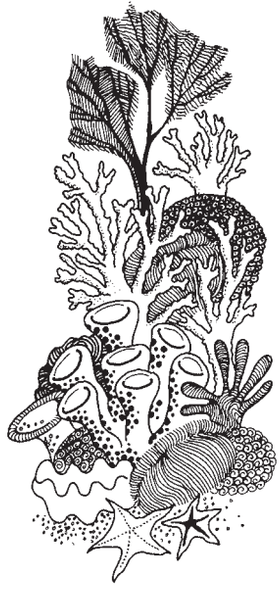
b. Department of Ocean Development (DOD) (*see Section 6.1.6.2 and 6.1.9.2*)

   i. Global Ocean Observing System (GOOS): The DOD, as the nodal agency, is expected to initiate long-term monitoring of the coastal and oceanic waters for changes in properties leading to biodiversity changes. Observations for biological and chemical properties in the coastal and oceanic components are also planned. Data collection by telemetry on oceanic properties and network observations of the origin and fate of pollutants in coastal waters (COMAPS, see below) are two such examples of long-term monitoring initiated by DOD.

   ii. Basic research programmes of DOD: DOD funds ongoing initiatives in several disciplines of marine science. Notable among them are the following:

- Assessment of marine living resources
- Fisheries resources along continental slopes
- Deep scattering layer
- Toxic algal blooms
- Benthic productivity studies
- Deep sea fishing resources
- Harvest technology for deep sea fishes

   iii. Integrated Coastal and Marine Area Management (*also relevant to Section 6.1.6.2*): This project aims to collect data on all oceanographic and biological properties, and socio-economic profiles of selected coastal marine ecosystems, so as to develop Geographic Information System (GIS)-based management action plans for their maintenance. This project includes the objectives of developing criteria for identifying sensitive and critical habitats.

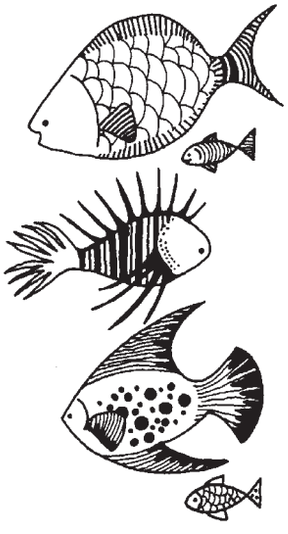


iv. EIA studies (see MoEF schemes above and *Box 6.1*): By incorporating EIA studies with technology development (examples are deep-sea mining, and Ocean Thermal Energy Conversion), DOD endeavors to minimize impacts on biodiversity. For example, even before the technology for manganese nodule mining has been decided upon, the DOD has initiated studies on the effects of discharge of mine tailings on water column biodiversity and biological processes. Similarly, even the pilot-scale operation of the Ocean Thermal Energy Conversion (OTEC) power generation plant in the Gulf of Mannar was attempted only after a theoretical assessment of the impacts of cold water on biota of pelagic waters.

v. Ocean Biodiversity Resource Groups: The DOD has formulated groups to study different faunal and floral groups of the marine realm and suggest ways for their conservation and sustainable use.

vi. Drugs from the Sea: This project aims at inventorying marine organisms with bioactive potential, and using this knowledge for the benefit of humankind.

vii. Coastal Ocean Monitoring and Prediction System (COMAPS): The DOD is running this programme since 1989 to monitor pollutants along the Indian coasts. A large number of stations were used for regular sampling of physical, chemical and biological parameters. As a result of this programme 'Hotspots' (high degree of environmental impacts from pollution) have been identified (http://dod.nic.in/ayr94-95/ar_coa52.htm).



c. Department of Science and Technology (DST), established in May 1971, has the objective of promoting new areas of Science and Technology and playing a key role towards organising, coordinating and promoting science and technology activities in the country. The Science and Engineering Research Council (SERC) of the Department supports research projects in areas such as chemical sciences, physical sciences, life sciences, engineering sciences, earth system sciences and atmospheric sciences (Shresth and Kamath 2002).

d. The Council of Scientific and Industrial Research (CSIR)
   i. CSIR has brought out *The Wealth of India Series*, a dictionary of Indian raw materials and industrial products covering plant species, animals, animal products and minerals. This describes the prevalent usage of various plants and other elements of bio-resources among the local people (MoEF 1999b). It is also bringing out several relevant journals.
   ii. The National Botanical Research Institute (NBRI) of the CSIR has initiated the preparation of digital taxonomy, molecular taxonomy, virtual herbarium etc. It has launched web-based international network programmes including that on the digital treatment of legume diversity in South Asia. NBRI is presently in the process of developing a database of all higher plants of India, including that on medicinal plants (*see Section 6.1.6.2*). The institute has also initiated the digitization of herbarium species in 7 biological labs of the CSIR (Pushpangadan 2002).

Ministry of Agriculture

a. The Central Marine Fisheries Research Institute (CMFRI) is engaged in the survey and assessment of potential of exploitable fisheries along the Indian coasts. CMFRI has an ongoing programme of cataloguing the biodiversity profiles of the coastal waters and selected ecosystem groups. This is an initiative continuing since the 1960s.

   Since the last 40-50 years, the CMFRI has been coordinating data collection on the species composition and quantity of marine fish caught, from numerous landing centres all along the coasts of India. This is probably the most intensive network of monitoring marine biodiversity exploitation. In the last few years, it has been decentralised to state levels, but the structure of data collection and the centers covered remain the same.

b. The Fisheries Survey of India (FSI), based in Mumbai, conducts exploratory surveys in offshore waters to identify harvestable non-conventional fish stocks, so as to relieve the pressure on the coastal habitats.

c. The National Bureau of Plant Genetic Resources (NBPGR) (*see Section 6.2.1.2*), established in 1976 by the Indian Council for Agricultural Research (ICAR) has the responsibility to plan, undertake and coordinate activ-

ities and services related to plant genetic resources including collection, exchange, quarantine, evaluation, documentation, conservation and utilisation. Its mandate includes planning, organising, conducting and coordinating plant exploration for collection of genetic diversity. This is with particular reference to native and naturalised crops and their wild varieties in India and (in specific cases) abroad. It also undertakes introduction, distribution and exchange of plant germplasm for research purposes (Shresth and Kamath 2002).

d. The National Bureau of Fish Genetic Resources (NBFGR), established in 1983 and based at Lucknow, has the responsibility of establishing genetic inventories of fish resources in the country (*see Section 6.1.2.2*).

e. Institutes of the Council of Scientific and Industrial Research (CSIR), such as Central Drug Research Institute (CDRI) and Central Institute of Medicinal and Aromatic Plants (CIMAP), have taken a lead role in assessing the herbal and other therapeutic properties of plants and microorganisms (Johri 2002).

Ministry of Health and Family Welfare

The Department of Indian Systems of Medicine and Homeopathy has set up a National Medicinal Plant Board (NMPB) under the chairpersonship of the Minister of Health and Family Welfare. The functions include coordination with Ministries/Departments/Organisations/State/UT Governments for development of medicinal plants in general, and specifically in terms of assessments and database development; advice on policy matters; guidance in the formulation of proposals and schemes related to collection, storage and transportation; identification, inventorisation and quantification; promotion of *ex situ/in situ* cultivation and conservation of medicinal plants; promotion of cooperative efforts among collectors and growers; matters relating to import/export of raw material, as well as value-added products either as medicine, food supplements or as herbal cosmetics including adoption of better techniques, and marketing of products to increase their reputation for quality and reliability in the country/abroad; undertaking and awarding scientific, technological research and cost-effectiveness studies; development of protocols for cultivation and quality control; and encouraging the Protection of Patent Rights and Intellectual Property Rights. The Board has undertaken several projects to achieve its mandate (Department of Indian Systems of Medicine and Homeopathy 2000).

Box 6.2 Traditional Knowledge Digital Library

The Department of Indian System of Medicine & Homeopathy (ISMH) entrusted CSIR the task of preparing an easily navigable electronic computerised database of documented traditional knowledge relating to use of medicinal and other plants.

It has initiated the preparation of a Traditional Knowledge Digital Library (TKDL) covering 35,000 *Ayurvedic* formulations involving medicinal plants. The TKDL will include details of international patent classification and traditional knowledge resource classification, key words on plants and formulations, synonyms, dictionary of equivalent for *Ayurvedic* terminology, concepts and definitions, and references to documents as well as *shlokas* in digital form. TKDL would be created in English, German, French and Japanese. This database will be sent to patent offices of the US, EU, Japan and other countries to enable them to search and examine any prevalent use/prior art, and thereby prevent biopiracy (MoEF 2002a).

The National Institute of Science Communication and Information Resources (NISCAIR) is focusing on documented knowledge systems (*Ayurveda*, *Siddha*, etc.), while the National Botanical Research Institute (NBRI) is focusing on oral traditional knowledge with the following objectives:

a. Establishment of digitised database on oral traditional knowledge of tribal communities of the country from the data already collected under the All-India Coordinated Research Project on Ethnobiology (AICRPE) sponsored by MoEF.
b. Inventory collection and digitisation of hitherto undocumented oral traditional folk remedies/dietary practices of the rural/village communities of the country.
c. Survey of major herbaria to collect ethnobotanical information and incorporate the same in a digitised database.
d. A critical evaluation of traditional knowledge and identification of potential information having IPR value (Pushpangadan 2002).

Concerns have been raised about the lack of community involvement in the above, especially in decision-making regarding the digitisation of oral knowledge.

Department of Space

Space Application Center (SAC), Ahmedabad, and National Remote Sensing Agency (NRSA), Hyderabad, are involved in application of remote sensing for monitoring changes in habitats, covering both terrestrial and marine types.

The Indian Institute of Remote Sensing (IIRS), Dehradun (*see Section 6.1.10.2*), has been working on a project entitled 'Biodiversity Characterisation at Landscape Level', which discusses the habitat fragmentation/ loss/destruction and its consequences in terms of the loss of phytodiversity. Data has been produced on North-East India, Western Ghats, Western Himalaya and Andaman and Nicobar Islands (Roy 2003).

Box 6.3 Biodiversity Information System

The **Indian Institute of Remote Sensing functions under its parent body, the National Remote Sensing Agency** (NRSA), Department of Space, Government of India. The prime objectives of the Institute are training, education, research and consultancy in remote sensing and GIS applications (http://www.isro.org/iirs-training.htm).

One of the programmes with reference to biodiversity is the preparation of a map atlas and specific database of Bioprospecting and Molecular Taxonomy. This was released at the 90th Indian Science Congress, Bangalore. They are available for scientific users on reproduction cost-basis. The database is also put on the website (www.biospec.org). All information is available on the website in static form as printed or downloadable material. The dynamic maps and specific database can be accessed through a password authorization.

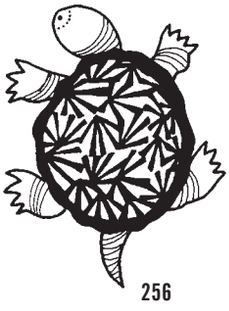
This is a component of the Biodiversity Information System (BIS) which is under development, and will contain a set of information systems including vegetation type, fragmentation, disturbance regime and biological richness maps of Western Ghats, North-Eastern India, Western Himalaya, and Andaman & Nicobar Islands. It will also include a *Species Information System* (SIS,) using ground ecological data of species biodiversity sites (so far, 5100 sample points in the above regions have been covered); *Forest Resource Information System* (FRIS) which contains available information on forest cover, population (human) density, cattle population, fire risk, climatic regions of India, and bioclimatic region maps of India; *Spatial Decision Support System* (SDSS) which enables downloading of a subset of data and assigning locale-specific criteria for prioritizing sites for conservation, or to build up scenario by altering the criteria. BIS has a strong bias towards higher plant diversity and habitats. However, it is open-ended, to accommodate other life forms as well (Roy 2003).

Autonomous Institutions

i. As an autonomous institute of the Ministry of Environment and Forests, the G. B. Pant Institute of Himalayan Environment and Development (GBPIHED) was set up in 1988, at Kosi-Katarmal, Almora. The Institute is 'a focal agency, to advance scientific knowledge, to evolve integrated management strategies, demonstrate their efficacy for conservation of natural resources and to ensure environmentally sound development in the entire Indian Himalayan Region (IHR).' The institute has linkages with national and international organizations committed to environment and development-linked issues in the mountain regions. GBPIHED undertakes research and technology development (http://envfor.nic.in).

ii. Salim Ali Centre for Ornithology & Natural History (SACON) was established in 1990. The main objectives include research and extension activities relating to natural history. A number of biodiversity-related projects are underway (http://envfor.nic.in).

iii. Wildlife Institute of India (WII) was established at Dehradun in 1982. Since 1986 it has been functioning as an autonomous institution of the MoEF. Some of the objectives of WII include the establishment of a body of scientific knowledge on wildlife resources, training on conservation and management of wildlife resources, research on wildlife management, and linkages with other relevant national and international organizations. WII has a ENVIS center (*see Box 6.10 and Table 6.6*) on Wildlife and Protected Areas since 1997, with the objective to collect, collate and disseminate information related to the topic (http://wii.gov.in).



iv. The Centre for Ecological Sciences (CES) was established at the Indian Institute of Science, Bangalore, in 1982. Since then the Centre has undertaken several research programmes in Basic and Applied Ecology. The focus areas are Biological Diversity, Social Behaviour, Human Ecology, Ecodevelopment, Climate Change and Tropical Forests, Plant-Animal Interactions, Animal Communication etc. CES is the first Centre of Excellence supported by the MoEF. It also has an ENVIS center (*see Box 6.10 and Table 6.6*) with the objective of creating a Biodiversity Information System on the Western Ghats (http://ces.iisc.ernet.in).

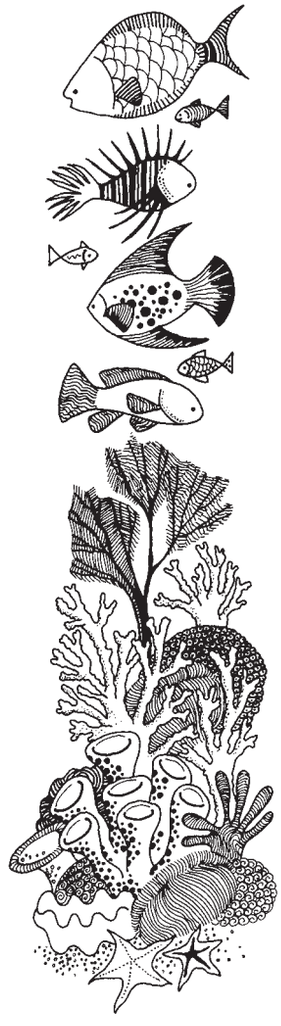
v. Indian Institute of Forest Management was set up in 1982 at Bhopal. This autonomous educational institute of the MoEF undertakes teaching and research programmes on forest management and related topics in India and South Asia. IIFM also undertakes consultancies for national and international clients from the government, industry and other allied sectors (http://www.iifm.org/).

vi. The National Institute of Oceanography (NIO) based in Goa has initiated a project for establishment of a gene library for marine organisms. Under the Indian Coral Reef Monitoring Network, the NIO has begun regular monitoring of coral reefs of Lakshadweep since 1999. Parameters observed as of now are only the percentage coral cover. More parameters, especially biological diversity profiles, are to be added soon.

vii. The National Institute of Ocean Technology, Chennai, has installed telemetric buoys at some coastal and oceanic locations for continuous records of sea surface temperature and sea state parameters. These buoys are in operation for the last several years.

viii. The Centre for Ecology Research & Training (CERT) was set up in 1983 at the Indian Institute of Science, Bangalore. The primary focus is the ecology and environment of the Western Ghats. CERT has carried out various research activities such as studies of past climatic changes in Southern India, conservation of wild relative of cultivated plants in the Western Ghats, environmentally sound planning of hydro-electric projects, alternatives to large dams etc.

ix. The C.P.R. Environmental Education Centre (CPREEC) (see Section 6.12.2 and.6.1.6.2) has been conducting water quality monitoring, ambient air quality monitoring, soil analysis and noise level surveys in different cities, towns and ecologically fragile areas in the states of Andhra Pradesh, Karnataka, Kerala, Pondicherry and Tamil Nadu. The centre has been carrying out research and training activities in the Nilgiri Biosphere Reserve and the Andaman and Nicobar Islands (Krishna 2002).



State Government

a. Forest Deparments (FD): State Forest Departments have a Research Wing that carries out biodiversity-related work.
b. State-level Departments of Environment undertake several activities and research related to biodiversity.
c. Fisheries Departments: Many state level fisheries departments also undertake research activities related to biodiversity.
d. Several State Councils for Science and Technology have undertaken research on biodiversity.

Box 6.4 Urban Forestry Plans

- Pimpri-Chinchwad is a twin city of Pune and lies in the same district. The Pimpri-Chinchwad Municipal Corporation has prepared a manual for urban forestry in the area. This manual provides clear information on low-cost techniques for improving environmental conditions along water bodies, in green zones and urban settlements. It specifically addresses issues such as *nullah* and stream maintenance, riverbank stabilisation, flood level buffer restoration, aquatic habitat, and incorporation of roadside and hill area afforestation. It is hoped that this will result in improved municipal planning and management as well as a better and accurate public consciousness regarding the value of healthy waterbodies, and increased support for environmental improvement that will sustain and accelerate local economic devel-

opment (Bhushan 2000).

- The main emphasis of the Greening Chandigarh Action Plan 2001-2002 is on a judicious blend of exotic and indigenous tree species in urban forestry. The plan advises against monoculture plantations. The entire Action Plan revolves round the concept of biodiversity in urban forestry as well as in natural forest areas.. This Action Plan is a joint effort of all the greening agencies/departments of the Union Territory of Chandigarh (*Chandigarh State BSAP*).

NGOs

Some key NGOs with a research focus are as follows:

a. Worldwide Fund for Nature – India (*see Section 6.1.2.2*) has carried out several research studies and put together information related to various aspects of wildlife conservation. (There is a reference to WWF-India's work subsequently in this section as well as in later sections.)

Box 6.5 Biodiversity Conservation Prioritisation Project

The Biodiversity Conservation Prioritisation Project (BCPP) has been India's most comprehensive exercise to prioritise sites, species and strategies for biodiversity conservation. This process was carried out through several community groups and over 40 NGOs, educational and scientific institutions and government agencies, coordinated by WWF-India. BCPP attempted to develop a participatory methodology for prioritisation and subsequently applied this methodology to arrive at a set of conservation priorities. Sites were prioritised from among Deserts, Rangelands, Wetlands, Coasts, Oceans, Forests, Islands, Mountains, Biosphere Reserves, Sacred groves, National Parks and Sanctuaries. Prioritisation was also carried out between species of medicinal plants and animals, wild relatives of cultivated and domesticated plants and animals, and other wild plants and animals. Strategies were prioritised at both micro and macro levels. The project was partially supported by the Biodiversity Support Programme (BSP) – a consortium of World Wildlife Fund, Nature Conservancy, and World Resources Institute, funded by the United States Agency for International Development (USAID) Global Bureau (Singh et. al., 2000).

b. The Bombay Natural History Society was set up in 1883. BNHS has been carrying out wildlife research crucial for conservation of India's floral and faunal biodiversity for the past several decades. It is especially known for its contribution to ornithological work. Systematic wildlife research has also been carried out, especially on endangered species (Asian Elephant, Great Indian Bustard etc), ecosystems (Chilika in Orissa, Sacred Groves in Maharashtra etc.) and Protected Areas (Keoladeo Ghana, Point Calimere etc.) (http://www.bnhs.org/).

Box 6.6 The Important Bird Areas Programme (IBA)

The IBA Programme aims to identify, document and advocate the protection and management of a network of sites that are important for the long-term viability of naturally occurring bird populations across the geographic range of those bird species for which a site-based approach is appropriate. This programme of BirdLife International is a worldwide initiative aimed at identifying and protecting a network of critical sites for the conservation of birds. The IBA Programme in India is coordinated by the Bombay Natural History Society (BNHS), the BirdLife Partner-designate in India, and is coordinated through the **Indian Bird Conservation Network** (IBCN).

This programme is a site-based approach, which identifies sites of international importance for the conservation of birds and other biodiversity. It also has the objective of collating and disseminating information.

The BNHS has organised 9 regional workshops to identify IBAs for every state and union territory of India. With the exception of Daman and Diu & Chandigarh, IBAs have been identified for all the states and union territories of India (*Important Bird Areas Sub-thematic Review; see also Annexure 12 for a list of IBAs*)

c. The India Ecodevelopment Project, according to the World Bank Staff Appraisal Report (1996), laid down an elaborate protocol for monitoring of the project. In 1998 the Indira Gandhi Conservation Monitoring Centre (IGCMC) (*see Box 6.10*) of WWF-India, prepared, for the Project Tiger office, a Conceptual Framework for the Ecodevelopment Project Performance Monitoring. In the year 2000 another protocol for monitoring ecodevelopment projects was prepared. It is not clear how much of this monitoring has actually taken place.

d. Documenting of Community Based Conservation Efforts: Many organizations/individuals are studying and documenting community-based conservation and natural resource management efforts, ranging from those initiated by communities themselves to those started by government agencies. The Society for Promotion of Wastelands Development has done this in the case of Joint Forest Management. Kalpavriksh – Environmental Action Group is putting together an All-India Directory of Community Conserved Areas.

e. Conservation Assessment and Management Plan Workshops (CAMPS) are a part of a process that helps in rapid threat assessment of endangered species of plants and animals. They adopt criteria developed by the World Conservation Union (WCU). CAMPS have been pioneered in India by the Conservation Breeding Specialist Group (CBSG), and have so far produced peer-reviewed status lists of mammals, reptiles etc. The Zoo Outreach Organisation based in Coimbatore has conducted CAMP workshops for mammals, reptiles, amphibians, freshwater fishes, chiroptera and primates.

   Threat assessment for medicinal plants of peninsular India based on CAMP workshops has been coordinated by FRLHT, Bangalore, with effective contributions from reputed botanists, local community experts and foresters from the region.

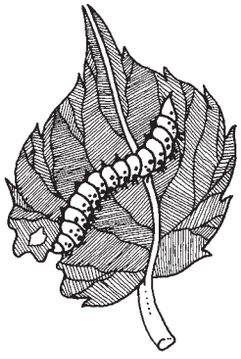
f. The Wildlife Protection Society of India (WPSI) was formed in 1994. WPSI aims to provide additional support and information required to combat escalating illegal wildlife trade. One of its prime focus is on saving the tiger. It has also worked on the banning of the *Shahtoosh* trade. The organization runs a Sea Turtle Protection Programme, conducts enforcement workshops and supports Elephant and Rhino conservation programmes etc. (http://www.wpsi-india.org).

g. Ashoka Trust for Research in Ecology and the Environment (ATREE) with offices in Bangalore, Bagdogra and Delhi, has undertaken research and action programmes on topics related to conservation and livelihoods, land use change, mapping and conservation planning, agro-biodiversity as well as forest genetic resources (http://www.atree.org).

h. The Foundation for Revitalisation of Local Health Traditions (FRLHT) in Bangalore was established in 1993. It has been recognised by the MoEF as a 'Centre of Excellence' for medicinal plant conservation and traditional knowledge. FRLHT has created a multi-disciplinary database on medicinal plants, which covers their inventory, distribution, trade, threat status and traditional knowledge. It has also initiated a herbarium and raw drug repository of the medicinal plants of India (http://www.frlht.org).

i. The Wildlife Trust of India (WTI) was established in 1998. Its primary focus is wildlife conservation in the country. Among its many other programmes WTI has also undertaken elephant- and rhino-related research projects such as compilation of elephant mortality records and study of trade in ivory and elephant poaching pressures in the country (http://www.wildlifetrustofindia.org).

j. The Indian Academy of Sciences is presently carrying out Project LIFESCAPE. The purpose is to prepare illustrated accounts of important plants and animals found in the country, to encourage the use of first-hand field observations in the teaching of biology, and to encourage the participation of undergraduate and post-graduate students and teachers in documenting and monitoring of India's biodiversity (http://www.ias.ac.in).



k. Centre for Environment Education (South) is involved with an Environmental Quality Monitoring Programme with 20 colleges in nine districts of Karnataka. The process includes monitoring of biomass and soil (http://envfor.nic.in/cee/cee.html).

l. Environmental Quality Monitoring Group (EQMG) of the Peoples' Science Institute, Dehradun (*see Section 6.1.10.2*), has developed a fully-equipped pollution monitoring laboratory to conduct scientific investigations on pollution problems. They have two water quality monitoring kits, one for domestic water quality testing and the other for general water quality monitoring. EQMG also conducts awareness campaigns and runs training programmes on pollution monitoring (EIAWatch Listserve, 27 August, 2002). The Centre for Science and Environment has a Pollution Monitoring Laboratory, which undertakes research and analysis to determine pesticide residues and water quality, and monitor ambient air quality (http://www.cseindia.org/ html/ eyou/programmes.htm).

m. The (previously Tata) Energy Research Institute, an organisation based in New Delhi, has undertaken extensive research related to aspects of bioresources and biotechnology.

n. Herbaria, Museums, Insect Collections and other Databases: There are several initiatives all over the country (both by the Government and NGOs) to maintain repositories of fauna and flora. Examples of these have been mentioned in the case of BSI, ZSI, and FRLHT in this section. Also see *Section 6.1.6.2* for NMNH, IGRMS, *Section 6.1.3.2* for Chennai Crocodile Park and *Section 6.1.1.2* for NBRI initiatives. Apart from these there are several other initiatives like those by the BNHS and other organisations/individuals.

Box 6.7 Research Activities by NGOs at a State/Union Territory Level

Every state has diverse government and non-government organisations, which are working on issues related to biodiversity and biodiversity conservation at the state level. These activities also include extensive research. For instance, the **Gujarat Ecological, Education and Research Foundation** (GEER) as part of its major objectives focuses on generating ecological baseline information of different Protected Areas of Gujarat. Some important surveys in Kachchh include the Wild Ass Sanctuary in the Little Rann of Kachchh; mangroves; Sarus Cranes, etc. (*Kachchh Sub-state Site BSAP*). GEER is recognised under CSIR as a Research Institution (Sharma 2002).

The **Rhino Foundation for Nature in NE India**, established in 1994, has supplemented governmental efforts in some of the key protected areas by providing infrastructural support and is also engaged in survey and documentation. The Manipur Association for Science and Society (MASS) has published scientifically documented books on Medicinal Plants, Manipur Hill rice Cultivars, Fish fauna of Manipur etc. (Ranjan 2003).

Many initiatives have been taken in urban areas as well; for instance, the Vidarbha Nature Conservation Society (VNCS) is presently involved an eco-planning project for Nagpur city in Maharashtra. The vision is to make Nagpur an Ecocity, i.e. a city where both economic and ecological development can be ensured in a balanced way on a sustainable bases without putting pressure on the hinterland. A Bird Watcher's group in Kolkata, Prakriti Samsad, has been monitoring the bird population in the city. In Delhi NGOs like Delhi Bird Group have been carrying out bird studies and counts in various parts of the city. Students from Pune University are documenting the biodiversity of their campus as also of the nearby wetland at Pashan, as well as the National Defence Academy (NDA) campus forests nearby (www.ranwa.org/nda.htm). In Pune, the Ecological Society and Research and Action in Natural Wealth Administration (RANWA) have published an assessment of species diversity of various zones of the city, and one of the country's first detailed reports on the range of urban biodiversity from plants and invertebrates to birds and mammals (www.ranwa.org/punealive).

This is just a glimpse of the range and variety of work which is taking place in different states.

Box 6.8 NCL's Center for Biodiversity Informatics

National Chemical Laboratory (NCL), Pune, initiated work in the area of biodiversity informatics in the year 2000.

The Mission of NCL's Centre for Biodiversity Informatics (NCBI) is 'to develop tools and standards, and to help improve infrastructure and capacity building to accelerate national progress in collection, collation, analysis, prediction and dissemination of knowledge about Indian biotic resources and its environ to make their sustainable use.'

NCBI has developed the following products and tools:

- Web Portal (http://www.ncbi.org.in) – Prototype for clearing-house mechanism.
- Electronic Catalogue of Known Faunal Species of India – http://www.ncbi.org.in/biota/fauna/
- SAMPADA – Taxon independent software for Biological Collections Digitization & Management (http://www.ncbi.org.in/sampada/)
- BCML – Biological Collections Markup Language (http://www.ncbi.org.in/bcml/)
- Database on Sacred Groves of India (http://www.ncbi.org.in/sacredgrooves/)
- Database on Conservation sites in India – Currently this database has cursory information about national parks, wildlife sanctuaries, biosphere reserves, tiger reserves, Ramsar sites and botanical and zoological gardens in India.
- Database on Biological Collections in South Asia – It currently holds data on herbariums and a few zoological and microbial collections from the South Asian region.
- Database on Biological Organizations within India.

Contributed by Vishwas Chavan, Scientist, Information Division, National Chemical Laboratory, Pune

Box 6.9 Herbaria, Museum, Insect Collections and other Databases

There are several initiatives in the country to maintain repositories of fauna and flora. Examples of these have been mentioned for BSI, ZSI, and FRLHT in this section. Also see *Section 6.1.6.2* for NMNH, IGRMS, *Section 6.1.3.2* for Chennai Crocodile Park and *Section 6.1.1.2* for NBRI initiatives. Apart from these there are several other initiatives like those by the BNHS and other organisations/individuals.

Box 6.10 Existing Information Resources

In India there are several agencies which maintain information on various components of biodiversity. Some of these are:

- Environmental Information System (ENVIS) (*see Section 6.1.6.2*) set up by the Ministry of Environment to provide environmental information on subjects relevant to decision-makers, using existing institutes and agencies as distributed subject-oriented centres. These agencies are responsible for collecting, collating, storing, retrieving and disseminating the information on the allotted themes.
- The MoEF is also the Regional Service Centre (RSC) of UNEP's INFOTERRA for the countries in South Asia.
- The Planning Commission has set up the National Natural Resource Management System (NNRMS) in the early 1980s for the management and development of natural resources of the country.
- The Global Mangrove Information System (GLOMIS), a web-based database and information system, has been developed by the International Society for Mangrove Ecosystem (ISME), in Chennai. The M.S. Swaminathan Research Foundation (MSSRF) hosts the Centre. The Mangrove Ecosystem Information Service (MEIS) is a collection of databases developed by MSSRF (*see Sections 6.1.2.2*, *6..4.2*, *and 6.2.2.2*). It caters to the GLOMIS database and information system.
- The Indira Gandhi Conservation Monitoring Centre (IGCMC), part of WWF-India has been involved in activities which include developing Geographic Information Systems (GIS)-based databases for protected areas, species distribution, wetlands, degraded forests and other important ecosystems.

Source: Integrated Biodiversity Information System Sub-thematic Review

Communities

Communities have their own 'informal' methods of studying, analysing and transmitting biodiversity and related phenomena. This is based on observations while dealing with nature, village-level discussions to further the understanding gained from such observations, and assessment of this understanding based on diverse folk worldviews and epistemological systems. Unfortunately, other than some anthropological and sociological work, and more recently the work of NGOs in documenting traditional knowledge and practices, the 'formal' world of biodiversity experts understands little of these systems. This lack of understanding is compounded by the fact that traditional communities do not make neat distinctions between research, knowledge, practice and day-to-day living – all these merge into one another.

The brevity of this section is therefore more a reflection of our inability to understand and describe community modes of understanding, rather than a result of lack of such initiatives.

Some examples of community research and monitoring, include the following:

a. In an interesting 'formalisation' of the village *chauk* or *chabutra* (square) process of discussions, the villagers of Mendha (Lekha) in Gadchiroli District, Maharashtra, have set up *abhyas gats* (study circles). These groups discuss and study issues of natural resource management (NTFP collection and sustainability, forest fires and their impacts, honey collection, *nistar* or forest produce rights, laws and policies relevant to them, bird diversity, etc.), and, when required, call upon outside NGOs and academics to help them understand these issues. Armed with the understanding generated by these groups, the *gram sabha* of the village is able to take more informed decisions (Pathak and Gour-Broome 2001).

b. The National Institute of Oceanography (NIO), as part of formulating the Management Plan of the Lakshadweep Coral Reefs, has set in place a system of participatory monitoring for the area for the years 1999-2000, along with the local community in the area. Monitoring this area requires scuba diving skills and also the ability to recognise coral forms and impacts on them. To enable this to happen, diving equipment has been made available to the team. Local community members from three islands have been trained to be members of these teams. The teams consist of scientists, technical officers, trained local youth and high-ranking officers. All islanders have been taught to record the status of corals, and their reporting skills are cross-checked with those of the divers from NIO. The all-islander survey team has so far completed surveys in all the ten inhabited islands and two uninhabited islands. This approach has led to increased awareness among the islanders. Training on biodiversity inventories and environmental quality measurements is now planned to be imparted to the islanders.

Box 6.11 Community-Based Monitoring at Biligiri Rangaswamy Temple (BRT) Wildlife Sanctuary

Many donor projects have developed monitoring and evaluation mechanisms. The **Biodiversity Conservation Network** (BCN), a USAID-funded project which operated in the Asia Pacific region (1993-1999), was established to promote biodiversity conservation at specific project sites to evaluate an enterprise-based approach to conservation. There was an emphasis on natural resource monitoring and evaluation, and 30% of the project funds were spent in developing appropriate monitoring mechanisms. The capacity of local communities to take forward the M&E agenda was also developed.

At the confluence of the Western and Eastern Ghats in southern India lies the BRT Wildlife Sanctuary. Within this 540 sq km forest sanctuary also lives a tribal community, the Soligas, comprising about 4,500 members. The core of this project here was to increase the economic stake of the Soligas in the biotic resources of the sanctuary, by generating additional income through the processing and sale of a few non-timber forest products. The project also aimed at establishing a community-based monitoring system to ensure the long-term sustainability of these resources. The project focus was on a honey-processing and a food-processing unit. There were two main reasons for setting up a community-based monitoring system here. The first was to ensure that the enterprise in question was not unsustainable and it was not negatively affecting the overall biodiversity of the site. The second was to see if this kind of M&E was viable; if so, then the condition of the ecosys-

tem should improve after setting up of the enterprise. Biological monitoring was envisaged at two levels: a simple community-based system and a more complex one set up with the help of ecologists. A rapid assessment of traditional knowledge was carried out before setting the formal M&E in motion. The assessment revealed that the Soligas had an intricate knowledge of the ecosystem. This survey also revealed the limitations of the so-called 'scientific' biological monitoring programmes. The *Soligas*, for example felt very strongly that fire was an integral part of the ecosystem. The Forest Department, on the other hand, has been suppressing fire in the area. Monitoring focused on the harvesting of the fruits *nelli* (*Phyllanthus emblica*), and soapnut (*Acacia sapindus emarginata*), The participatory resource monitoring continues to be undertaken by harvesters themselves. The records of quantities available and extracted are maintained by the harvesters as well as the staff of the enterprises. Manuals on participatory resource monitoring have also been prepared. There is some evidence that participatory resource monitoring has been effective. In case of *nelli*, for example, harvesters often cut branches or hack small trees while collecting fruits. In areas where there has been participatory resource monitoring, however, the number of cut stems is much lower than in areas in which such monitoring has not been practiced. It has also been observed that the communities that practice resource monitoring are more aware of the importance of regeneration of the species in question than the communities that do not have a monitoring system in place. Community-based monitoring in BRTWLS, however, has several limitations. This monitoring does not include the overall monitoring of biodiversity because the community is only interested in the resources it uses. Even for resource monitoring, the *Soligas* showed little interest in monitoring regeneration levels without incentives. Also, the Forest Department is yet to show interest in community monitoring systems.

Source: Community Based Monitoring Sub-thematic Review

c. Since 1998, Indian Institute of Biosocial Research and Development (IBRAD) has done pioneering work on village-based vegetation monitoring. This work has been carried out in several Forest Protection Committees (FPCs) located in Midnapore and Bankura districts. It started as a process to involve local people in forest management. It is now being used to answer specific management questions and resolve disputes regarding resource use. After initial discussions with IBRAD researchers, local people carry on with data recording and analysis. It is now recognized that, besides being familiar with the local vegetation, communities also have comprehensive knowledge about the ecology and impact of various forestry practices on the ecosystem. There are several recorded cases where successful monitoring has been undertaken by scientists and local people, mainly for answering management questions. 'In the village of Bandhgaba, the issue of the detrimental impacts of the peeling of tree bark for tying headloads was resolved through vegetation monitoring. Through simple sampling methods, it was found that roughly 70% of trees in their forest had their bark peeled off which was likely to lead to high mortality rates in the near future. This piece of information galvanised the local people into action who then found alternative materials for tying of head-loads. In the village of Ghugimura, vegetation studies were carried out to study the effects of closing forest areas to cattle-grazing' (*Ecological Impacts of NTFP Extraction Sub-thematic Review*)

d. A step in the direction of documenting traditional knowledge are the Biodiversity Registers (*see Section 6.2.1.2*). However, as operationalised at present, this is a one-time documentation of community knowledge. To evolve a community-based monitoring system, biodiversity registers can be used as baseline information.

Box 6.12 Participatory Mapping as part of BCPP

(*see also Box 6. 5*)

The Strategies Group of the Biodiversity Conservation Prioritization Programme (BCPP) attempted to demonstrate a participatory sketch mapping technique by selecting sample sites in seven ecosystems to prioritize people's strategies for conservation. Participatory mapping was carried out in four of these ecosystems. Two groups of villages were selected in the desert ecosystem from the state of Rajasthan. Other ecosystems chosen were: the wetlands around Chilika lake in the state of Orissa, Palamau Tiger Reserve of the state of Bihar to represent the Gangetic plain ecosystem, and South Andaman and Little Andaman to represent island ecosystem. At each site, historical mapping was done along with a group of villagers to understand reasons for conflict in natural resource management. Mapping also provided an opportunity to document local eco-

logical knowledge. The mapping exercise also brought forth information on threats and pressures to particular ecosystems/habitats in the region. The main objective of the mapping remained the transfer of people's information to maps having proper coordinates and scale, so that they could be used in GIS functions. Each ecosystem was taken up for mapping some specific issue relevant to it. This is an important tool for participatory monitoring and evaluation (Sankaran *et. al*., 2000).

Others

Nationwide surveys on Protected Areas (*see Section 6.1.2.2*) have been carried out for the following aspects:

- Biogeographic aspects by Wildlife Institute of India (Rodgers and Panwar 1988; Rodgers *et. al*., 2002)
- Social and management aspects by Indian Institute of Public Administration (Kothari *et. al*., 1989)
- Gaps in coverage and prioritisation of PAs by the Biodiversity Conservation Prioritisation Project coordinated by WWF India (Mehta 2000)

The first two of these are being updated as of 2003.

Academic Institutions

A number of organisations including the National Environmental Engineering Research Institute (NEERI), Center for Interdisciplinary Studies of Mountain and Hill Environments (CISMHE), Institute of Economic Growth (IEG), Tata Energy Research Institute (TERI), Centre for Atmospheric Sciences, Indian Institute of Public Administration (IIPA), Kalpavriksh, Operations Research Group (ORG) and WWF-India carried out a study of the value of natural resources in the Yamuna River Basin. The study was based on a combination of randomly sampled field studies, primary and secondary literature sources and the analysis of remotely sensed data. CISMHE has also carried out a study on the loss of carbon sequestration from destruction of forest areas of the National Capital Region of Delhi since the 1940s. This has helped to ascertain the value of a terrestrial ecosystem in the event of its loss.

There are several case studies on economic value of natural resources, which have been carried by institutions such as G.B.Pant Intitute of Himalayan Environment and Development, CISMHE, Indian Institute of Economic Growth, Research and Information System for the Non-Aligned and Other Developing Countries, Indira Gandhi Institute of Development Research etc. (*see Table 4.48 and Section 4.2.5*)

Box 6.13 Research within the NBSAP

The NBSAP process had not originally envisaged any fresh fieldwork or data collection, as it was supposed to only collate, analyse and work on existing information. But, interestingly, despite the limited budget allocations, several sites took on fresh data collection activities:

The Aravallis Ecoregional Working Group collected data (based on a questionnaire) from over 100 villages, covering the states of Rajasthan, Gujarat and Haryana. This was done with the help of the State Forest Departments, NGOs and students. The Punjab nodal agency did an analysis of the information in biodiversity- related Ph D and M Phil theses available in the state's academic institutions.

In the states of Mizoram, Meghalaya, and Tripura, the nodal agency conducted village-level public hearings across several districts, generating information and ideas about biodiversity issues.

In Karnataka, several students conducted mapping and data collection exercises associated with the state BSAP process.

The Rajasthan State nodal agency developed an intersectoral integrating matrix as an attempt to understand the impact of activities of various government departments on biodiversity. This was followed by a few consultations with the representatives of the government departments, in order to get a holistic view and understanding of the issue.

In Uttara Kannada district, the Agriculture Department carried out surveys of crop diversity still being used by farmers in the district.

The Economics and Valuation of Biodiversity thematic group prepared questionnaires on the valuation of various aspects of biodiversity, and put together a detailed document on the current state of knowledge relating to this subject.

The nodal agency for Assam constituted a state-level network, called the Assam Science Society Biodiversity Network (ASSBN), for collecting biodiversity-related information from various ethnic communities. The ASSBN which includes members of the Assam Science Society and local NGOs/experts is expected to function even after the state-level BSAP process is over. A few members of the core committee of the state BSAP travelled all over the state to record information first-hand.

This list is only indicative and not exhaustive. Details on these and activities of other sites can be gleaned from local, state, thematic and ecoregional BSAPs.

6.1.1.3 Major Gaps

Major gaps, including those identified in the National Policy and Macro Level Action Strategy on Biodiversity (MoEF 1999b), are:

i. *Inventory and Status Surveys*
- Baseline data on species and genetic diversity, particularly intra-specific genetic diversity and their micro and macro habitats is inadequate.
- The areas that are still poorly surveyed include the inaccessible Himalayan areas, the Andaman and Nicobar Islands and the marine areas in the Exclusive Economic Zone.
- Certain groups of invertebrates amongst the fauna, namely nematodes, mites, insects, some lower groups of plants (such as algae, fungi, bryophytes, and lichens) and micro-organisms are poorly understood taxa.
- The process of preparation of red data books is presently slow and is not validated using the internationally recognised revised guidelines.
- Development of a digital database of herbarium specimens and zoological specimens is inadequate.
- There are very few studies on wildlife diseases in the wild.
- There are very few documents/reports relating to biodiversity, which are more user-friendly and less technical.
- Serious gaps in knowledge exist with relation to marine biodiversity and resources. These include:
  - Reliable and updated stock estimates (and population trends) of various marine resources;
  - Impacts of human activities on marine biodiversity;
  - Precise estimates of the number of fisherfolk engaged in various kinds of activities, or the level of investments made in marine fisheries;
  - Precise estimates of the amount of fish and other marine resources extracted every year;
  - Estimates of the trans-border trade, illegal extraction and trade in marine resources;
  - Traditional and current property rights and resource partitioning strategies of fishing communities (Sebastian 2000).

ii. *Ecological Relationships and Dynamics*
- Inadequate research activities have been undertaken in protected areas, and, where undertaken, such activities usually do not address the functional properties of ecosystems.
- Identification of indicator species, which serve as early warning systems of habitat change, is lacking. Consequently there are gaps in information on several biological and managerial parameters.
- There is very little understanding of the links between wild and agricultural biodiversity.

iii. *Impact Assessment and Monitoring* (*includes both human activity and management initiatives*)
- In the natural ecosystems, which are under the jurisdiction of the State or Central Government, some M&E (usually census operations) takes place as part of the overall management of the area. However, M&E is

by and large not made an important part of any project/programme that is launched within the system. Existing legislation and policies dealing with natural ecosystems and wild taxa do not stress on the need for M&E.

- Very little monitoring of wildlife populations takes place as an explicit part of the management. There are regular attempts at estimating the population (in the form of wildlife census) of a few charismatic species that are invariably large mammals or birds. However, the estimate that is presented is often treated with a lot of skepticism due to the lack of transparency and doubts regarding how the number was arrived at.
- In the State Forest Departments, at present there is no adequate system of monitoring and evaluation. The National Forestry Action Plan-India (MoEF 1999a) states that in the past the Forest Departments did have an elaborate system consisting of control registers, reporting requirements and inspections. Chronological records of all important happenings in the administrative unit such as fire etc., and major undertakings such as plantations and compartment histories etc. were maintained. All periodic reports were compiled into an annual publication. Working Plans were closely monitored and each new plan made an evaluation of the previous Plan. Plans were made according to guidelines, specifications and prescriptions. This system eroded over time. However there has been a revival of Working Plans and elaborate parameters are now being laid down for these plans.
- For marine areas as well, there are no long-term, regular monitoring parameters.
- There is a lack of studies relating to biodiversity impacts of the range of human activities, including of wildlife management practices themselves.
- There is almost no monitoring of the impacts that activities in one sector have on the other.
- Development of community-based M&E methodologies (and building capacity to use these) is weak.
- Dissemination of results of monitoring rarely takes place. This information is seldom shared with local communities.

iv. *Traditional modes of understanding/research*

- There is limited understanding of research initiatives taken up by communities, and of traditional forms of research and documentation.
- Many cultures have helped to sustain nature and natural resources, but there is little systematic understanding and documentation of the diverse ways in which this relationship has existed and continues.

v. *Value of biodiversity and its uses*

- Some of the significant areas where there are major gaps in R&D are exploration and collection of biological material for various uses, molecular characterization, and upgradation of appropriate technologies.
- There is lack of understanding and valuation of ecosystem benefits of biodiversity.

vi. *Institutional gaps*

- There is inadequate trained scientific personnel for research and M&E.
- There is limited availability of literature, particularly old data, in accessible form.
- The participation of industry and private sector in R&D is not yet substantial.
- There is lack of involvement of communities in formal research.
- There is inadequate coordination of the various agencies undertaking research and monitoring. This has led to duplication, and sometimes even contradictions.

6.1.2 Wild Biodiversity: *In Situ* Conservation

6.1.2.1 Overall Concept

Conservation *in situ* is 'the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings' (UNEP 1992). This is an effective means of conservation. It not only ensures the continuation of the full range of conditions needed for ecosystems and species to thrive, but also provides for the elements of evolution to continue. India has taken several critical steps towards *in situ* conservation, some of which are highlighted below.

6.1.2.2 Current and Past Initiatives

- **Protected Areas (including Biosphere Reserves)**

Government

a. The establishment of National Parks and Sanctuaries (called protected areas or PAs, as a convenient abbreviation) has been one of India's most important measures to conserve wildlife and biodiversity. Several such areas have been declared using the Wild Life (Protection) Act, 1972 (WLPA) (see Section 6.1.8.2), in both marine and terrestrial ecosystems in the country (see Annexure 8 for list). Though several PAs were set up in the period before 1970, it was only after the promulgation of the WLPA that the move gained significant momentum. There were a total of 65 PAs in the country up to 1970. The number went up to 101 between 1971 and 1975. The number rose up to 854 by 2000, with proposals for 288 more areas (Rodgers et. al., 2000). There are today 89 National Parks and 500 Wildlife Sanctuaries (589 PAs) occupying 156,000 sq kms of the country's geographical area (MoEF 2003). Some of the country's last remaining habitat types, and the last populations of severely threatened species, are conserved in these PAs. The legal protection given to PAs has also in many cases helped to stave off major threats from 'developmental' and commercial pressures. The state-wise and biogeographic distribution of 582 PAs is presented below.

Table 6.1 State-wise Distribution of PAs

		Existing Protected Area Status					
State & Union Territory	**Area km²**	**No. of NPs**	**Area km²**	**% of state Area**	**No. of WLS**	**Area km²**	**% of state Area**
Andhra Pradesh	275068	4	373.23	0.14	22	12600.09	4.58
Arunachal Pradesh	83743	2	2290.82	2.74	11	7606.37	9.08
Assam	78438	5	1968.6	2.51	15	883.16	1.13
Bihar	94163	1	335.65	0.36	11	2949.17	3.13
Chhattisgarh	135194	3	2929.5	2.17	10	3419.46	2.53
Goa	3702	1	107	2.89	6	647.96	17.5
Gujarat	196024	4	479.67	0.24	21	16422.72	8.38
Haryana	44212	1	1.43	0	9	279.92	0.63
Himachal Pradesh	55673	2	1429.4	2.57	32	5770.85	10.37
Jammu & Kashmir	222235	4	4680.25	2.11	15	10312.25	4.64
Jharkhand	79714	1	231.67	0.29	10	1862.72	2.34
Karnataka	191791	5	2435.14	1.27	21	3888.22	2.03
Kerala	38863	3	536.52	1.38	12	2143.36	5.52
Madhya Pradesh	308252	9	3656.36	1.19	25	7158.4	2.32
Maharashtra	307690	5	955.93	0.31	35	14376.66	4.67
Manipur	22327	1	40	0.18	3	393.3	1.76
Meghalaya	22429	2	267.48	1.19	3	34.2	0.15
Mizoram	21081	2	250	1.19	4	771	3.66
Nagaland	16579	1	202.02	1.22	3	20.34	0.12
Orissa	155707	2	990.7	0.64	18	6969.15	4.48
Punjab	50362	0	0	0	10	316.73	0.63
Rajasthan	342239	4	3856.53	1.13	24	5712.83	1.67
Sikkim	7096	1	1784	25.14	5	265.1	3.74
Tamil Nadu	130058	5	307.84	0.24	19	2539.82	1.95
Tripura	10486	0	0	0	4	603.62	5.76
Uttaranchal	53485	6	4077	7.62	6	2413.76	4.51
Uttar Pradesh	240926	1	490	0.2	23	5222.47	2.17

State & Union Territory	Area km²	Existing Protected Area Status					
		No. of NPs	Area km²	% of state Area	No. of WLS	Area km²	% of state Area
West Bengal	88752	5	1693.25	1.91	15	1203.28	1.36
Andaman & Nicobar	8249	9	1156.91	14	96	389.39	4.72
Chandigarh	114	0	0	0	1	25.42	22.3
Dadra & Nagar Haveli	491	0	0	0	1	92.16	18.77
Lakshadweep	32	0	0	0	1	0.01	0.03
Pondicherry	493	0	0	0	0	0	0
Daman & Diu	112	0	0	0	1	2.18	1.95
Delhi	1483	0	0	0	1	13.2	0.89
India	**3287263**	**89**	**37526.9**	**1.14**	**493**	**117309.27**	**3.57**

Source: Wildlife Institute of India 2003

Table 6.2 Biogeographic Region-wise distribution

Zone	Province	Size Km²	Existing Protected Area Status								
			No. of Parks	Area Km²	%	No. of WLS	Area Km²	%	Total PA	Area Km²	%
Trans Himalaya	Ladakh Mountains	109754	2	4775.00	4.35	1	5000.00	4.56	3	9775	8.91
	Tibetan Plateau	75069	1	1784.00	2.38	3	5443.50	7.25	4	7227.5	9.63
Total		**184823**	**3**	**6559.00**	**3.55**	**4**	**10443.50**	**5.65**	**7**	**17002.5**	**9.20**
Himalaya	North West Himalaya	69401	4	1334.65	1.92	25	2846.62	4.1	29	4181.27	6.02
	West Himalaya	52072	4	2736.20	5.25	14	3312.65	6.36	18	6048.85	11.62
	Central Himalaya	5457	2	166.60	3.05	6	261.02	4.78	8	427.62	7.84
	East Himalaya	83743	2	2290.82	2.74	11	7606.37	9.08	13	9897.19	11.82
Total		**210673**	**12**	**6528.27**	**3.1**	**56**	**14026.66**	**6.66**	**68**	**20554.93**	**9.76**
Desert	Thar	178296	1	3162	1.77	1	7.9	0	2	3169.9	1.78
Desert	Kachchh	35718.00	0	0	0	4	12906.19	36.13	4	12906.19	36.13
Total		**214014**	**1**	**3162**	**1.48**	**5**	**12914.09**	**6.03**	**6**	**16076.09**	**7.51**
Semi Arid	Punjab Plains	122903	2	30.16	0.02	32	2275.21	1.85	34	2305.37	1.88
Semi Arid	Gujarat-Rajputana	416576	6	1338.26	0.32	50	11852.32	2.85	56	13190.58	3.17
Total		**539479**	**8**	**1368.42**	**0.25**	**82**	**14127.53**	**2.62**	**90**	**15495.95**	**2.87**
Western Ghats	Malabar Plains	66633	3	674.23	1.01	11	1323.52	1.99	14	1997.75	3

			Existing Protected Area Status								
Zone	**Province**	**Size Km²**	**No. of Parks**	**Area Km²**	**%**	**No. of WLS**	**Area Km²**	**%**	**Total PA**	**Area Km²**	**%**
Western Ghats	Western Ghats Mountains	65546	10	2709.9	4.13	32	8618.52	13.15	42	11328.42	17.28
Total		**132179**	**13**	**3384.13**	**2.56**	**43**	**9942.04**	**7.52**	**56**	**13326.17**	**10.08**
Deccan Peninsula	Central Highlands	241310	9	5109.1	2.12	27	8824.77	3.66	36	13933.87	5.77
Deccan Peninsula	Chhota Nagpur	178095	2	1077.37	0.6	25	7500.89	4.21	27	8578.26	4.82
Deccan Peninsula	Eastern Highlands	208150	2	1458.37	0.7	12	3071.19	1.48	14	4529.56	2.18
Deccan Peninsula	Central Plateau	410041	6	527.3	0.13	32	19863.45	4.84	38	20390.75	4.97
Deccan Peninsula	Deccan South	342743	3	460.71	0.13	24	4077.44	1.19	27	4538.15	1.32
Total		**1380339**	**22**	**8632.85**	**0.63**	**120**	**43337.74**	**3.14**	**142**	**51970.59**	**3.77**
Gangetic Plain	Upper Gangetic Plain	206687	3	1830.8	0.89	17	4067.55	1.97	20	5898.35	2.85
Gangetic Plain	Lower Gangetic Plain	148161	3	532.2	0.36	15	1376.58	0.93	18	1908.78	1.29
Total		**354848**	**6**	**2363**	**0.67**	**32**	**5444.13**	**1.53**	**38**	**7807.13**	**2.2**
Coasts	West Coast	29509	1	162.89	0.55	4	328.11	1.11	5	491	1.66
Coasts	East Coast	61778	3	1481.33	2.4	17	3558.29	5.76	20	5039.62	8.16
Coasts	Laksha-dweep	32	0	0	0	2	92.17	288.03	2	92.17	288.03
Total		**91319**	**4**	**1644.22**	**1.8**	**23**	**3978.57**	**4.36**	**27**	**5622.79**	**6.16**
North East	Brahma-putra Valley	66290	5	1968.6	2.97	15	883.16	1.33	20	2851.76	4.3
North East	North East Hills	105050	6	759.5	0.72	17	1822.46	1.73	23	2581.96	2.46
Total		**171340**	**11**	**2728.1**	**1.59**	**32**	**2705.62**	**1.58**	**43**	**5433.72**	**3.17**
Islands	Andamans	6196	8	1046.91	16.9	92	358.77	5.79	100	1405.68	22.69
Islands	Nicobars	2053	1	110	5.36	4	30.62	1.49	5	140.62	6.85
Total		**8249**	**9**	**1156.91**	**14.02**	**96**	**389.39**	**4.72**	**105**	**1546.3**	**18.75**
Grand Total		**3287263**	**89**	**37526.9**	**1.14**	**493**	**117309.27**	**3.57**	**582**	**154817.93**	**4.71**

Source: Wildlife Institute of India 2003

Box 6.14 India's Protected Areas: Some Interesting Titbits

- The oldest PA is Corbett National Park in Uttaranchal, notified on 8th March 1936; and the youngest are the Madei and Netravali Wildlife Sanctuaries, Goa, notified on 4th June 1999.
- The largest national park is Hemis in Jammu and Kashmir, with an area of 3500 sq km, while the smallest is South Button Island in Andaman and Nicobar Islands, with an area of 0.03 sq km.
- The largest wildlife sanctuary is Great Indian Bustard in Maharashtra, with an area of 8496.64 sq km, and the smallest are Goose Island and Rowe Island in Andaman and Nicobar Islands, with an area of 0.01 sq km each.
- The largest biosphere reserve is Gulf of Mannar off Tamil Nadu, with an area of 10,500 sq km.
- The largest tiger reserve is Nagarjunasagar Srisailam in Andhra Pradesh, with an area of 3,568 sq km.
- Andaman and Nicobar Islands has the highest number of PAs (105), while three union territories – Dadra and Nagar Haveli, Lakshadweep, and Pondicherry – do not have any PAs.
- Chandigarh has the highest proportion of land under PAs (22.81%), while Haryana has the lowest (0.51%).
- Gujarat has the largest area of land under PAs (17,224 sq km), while Daman and Diu has the smallest (2.18 sq km)

Source: Kutty and Kothari 2001

b. Ecodevelopment Scheme: A centrally-sponsored scheme was launched by the Government of India in 1991-92. This scheme was entitled 'Eco-development around National Parks and Sanctuaries including Tiger Reserves'. The basic objective of this programme is to reduce biotic pressure from grazing, fuelwood, fodder and collection of various non-timber forest products in the PAs, by providing alternatives to the villagers.

   The scheme is implemented by the Wildlife Wings of the State Forest Departments. Unfortunately, there is to date little systematic information on the results of this programme. The Government of India has initiated a systematic evaluation of this programme in selected PAs (*see Section 6.1.5.2*).

Box 6.15 India Ecodevelopment Project

The **India Ecodevelopment Project** was initiated on the basis of an Indicative Plan prepared by the Indian Institute of Public Administration on behalf of the Government of India. This was in 1994.

The project is partially funded by the Global Environment Facility Trust Fund through its implementing agency, the World Bank, as a grant to the Government of India. The Project has been implemented in seven sites in seven different States – *Palamau* in Jharkhand, *Buxa* in West Bengal, *Nagarhole* in Karnataka, *Periyar* in Kerala, *Pench* in Madhya Pradesh, *Gir* in Gujarat and *Ranthambhore* in Rajasthan.

The main objective of the project is to conserve biodiversity and to improve Protected Area Management and Ecodevelopment Support. The project also envisages preparation of future biodiversity projects covering a larger number of Protected Areas.

Since the early 1980s the ecodevelopment approach has been seriously debated, and the very design of this approach has raised many issues and concerns. The role of different institutions in the design and implementation of this strategy has been questioned, as has been its long-term viability (Singh and Sharma, in press). Most serious however, is the criticism that the project only reinforces an 'exclusionary' vision of conservation, in that the prime focus is on providing alternatives to people rather than integrating them into PA management.

Box 6.16 Ecodevelopment in the Kalakad-Mundanthurai and Periyar Tiger Reserves

The Kalakad Mundanthurai Tiger Reserve (KMTR) is located on the southern tip of the Western Ghats. It comprises Kalakad and Mundanthurai, two adjacent sanctuaries. The Mundanthurai Wildlife Sanctuary was established in 1962 and the Kalakad WLS in 1976. A large number of people living in and around the forests depended on the area for both food and income. The World Bank- assisted FREEP project was launched in KMTR in November 1994, as a five-year project. KMTR was selected as a pilot site for ecodevelopment in Southern India.

This project has brought about a perceptible change in the lives of local people. Some positive impacts are:

- Over 2000 woodcutters who were dependent on the forests for their livelihood have opted for alternate livelihoods.
- Approximately 3700 families have been provided with alternate energy sources, such as biogas, kerosene, LPG, husk *chulhas* etc. This has also led to less pressure on the forests.
- Local communities have taken up some plantation activities, adding to biomass sources.
- Grazing within KMTR has been reduced by over 50%.
- There is now a greater awareness among target villages about the significance of this forest belt and the need for its conservation.
- There has been a reduction in wildlife offences.

In the Periyar Tiger Reserve in Kerala, the ecodevelopment initiative has focused on a series of innovative community-based ecotourism ventures. These have helped convert poachers to become conservers of the area's wildlife, provided meaningful employment to villages, helped establish village-level institutions and a Reserve-level federation of such institutions, and improve park-people relations. The status of wildlife protection has also visibly improved as villagers take active (and often voluntary) part in patrolling, anti-poaching, fire control measures (Kothari and Pathak in press)

The success of the ecodevelopment model in KMTR and PTR has been due to several reasons. There was from the beginning a committed team of forest officials, NGOs and village members who lent the required support. The planning process was dynamic enough to allow for change as the project progressed. The planning process was made as participatory as possible (John Joseph *et. al*., 2002).

While ecodevelopment seems to be proving a good strategy in addressing PA cost-benefit imbalance at a good number of places, it however continues to be project-driven, thereby putting a question mark over its long-term sustainability. Some inherent weaknesses of ecodevelopment have been:

- Under the present legislation, the definition of ecodevelopment allows for limited local people's participation in the management of national parks and wildlife sanctuaries.
- The approach has not been able to influence changes in land tenure legislation and agrarian reforms. These could potentially provide incentive to invest in land improvement and conservation.
- Ecodevelopment has not been able to control land use on the fringes of the PAs. Proliferation of tourist resorts on the periphery of the Periyar Tiger Reserve and the mushrooming of cement factories on the fringes of the Gir Lion Sanctuary are two examples.

The Village Ecodevelopment Committees at places do not adequately represent poor and marginalized people and, if represented, they are not empowered adequately to influence the decision-making process.

c. Creation of Biosphere Reserves (BRs) in the representative ecosystems was proposed by UNESCO in 1972, through its Man and Biosphere Reserve Programme. The concept behind these areas was to deal with the issue of conservation of biodiversity and its sustainable use, with the emphasis on human beings as an integral part of the ecosystem and the need to involve them in conservation activities of the area. In India 13 BRs

Table 6.3 Present Status of Preservation Plots in India

State	No. of Plots		
	Conservation (Reserve) Forests	Production (Protected) Forests	Total
Andhra Pradesh	11	–	11
Arunachal Pradesh	1	–	1
Assam	9	1	10
Bihar	9	–	9
Gujarat	18	–	18
Haryana	–	–	0
Himachal Pradesh	6	6	12
Jammu & Kashmir	3	–	3
Karnataka	11	–	11
Kerala	8	43	51
Madhya Pradesh	25	–	25
Maharashtra	11	–	11
Manipur	–	–	0
Meghalaya	2	–	2
Nagaland	–	–	0
Orissa	6	–	6
Punjab	–	–	0
Rajasthan	3	–	3
Tamil Nadu	2	67	69
Union Territories	–	–	0
Uttar Pradesh	32	–	32
West Bengal	27	5	32
Total	**184**	**122**	**306**

Sources: Khullar 1992; Gupta & Totey 1994; Biswas 1999; Natural Terrestrial Ecosystems Thematic BSAP

have been declared by the Government of India. Three of these (Nilgiris, Nandadevi and Sundarbans) Biosphere Reserves are registered with UNESCO. However, BRs have no legal protection in India. In many cases BRs do contain national parks and/or sanctuaries (Kutty and Kothari 2001) (*see Annexure 9*).

Box 6.17 Regeneration and Restoration of Ecosystems and Reintroduction of Species

- Since 1986, the Ecological Society in Pune has been carrying out restoration of forests (on barren slopes at an altitude of 620 metres, 45 kms from Pune city) in the Panshet Dam catchment area. The land now harbours 21 tree species, 24 grass species and a variety of bushes as well as climbers. It also provides 10 tons of fodder and about a tonne of fuelwood to the local communities in the area. The organization has also been working on the creation of a wetland-forest complex since 1996. The project, which was initiated in a stone quarry, has today restored a variety of terrestrial and aquatic flora/fauna. Since 2001, 40 acres of denuded land in a semi-arid zone near Phaltan District, Satara, have also been brought under restoration efforts. Apart from the restoration of flora and fauna, this effort has also allowed for local graziers to access the regenerated grasses on a controlled basis (Prakash Gole, personal communication 2003).
- WII (*see Section 6.1.1.2)* has been surveying potential sites for reintroduction of the Asiatic Lion (*Panthera leo persica*) (http://wii.gov.in/pageresearch.html). The proposed site for this reintroduction is Kuno Palpur Sanctuary in Madhya Pradesh (http://www.teriin.org/biodiv/issue.htm).
- The one-horned rhino (*Rhinoceros sondaicus*), was found in the forests of Dudhwa located in the Terai region of Uttar Pradesh, more than a century ago. Poaching and game hunting wiped out the population here in the late 19th Century.

In 1984, through a systematic effort, captive-bred rhinos were reintroduced into Dudhwa. Suitable habitats were earmarked prior to their reintroduction. About 27 sq km of grasslands and open forests with perennial source of water were identified as the rhino-reintroduction areas. Two monitoring stations were also established (http://www.teriin.org/biodiv/issue.htm). As of February 2003, there were 16 Rhinos (Tariq Aziz, personal communication 2003)

- The GBPIHED has taken up intensive investigations on propagation and *in situ* reintroduction of plant species such as *Swertia chirayita* (Jammu and Kashmir and Kumaun Himalaya), *Taxus baccata* (Kumaun Himalaya), *Picrorhiza kurrooa* (Kumaun Himalaya) (Uppeandra Dhar, personal communication 2002).
- Considerable regeneration efforts have been taken up under Joint Forest Management (*see Section 6.14.2 and 6.1.5.2*).
- Local civil society organizations in Kerala, with support from the Intermediate Technology Development Group, are working with fishing communities to restore aquatic biodiversity in their fishing grounds. This is being done through the construction of simple artificial reefs, primarily in response to loss of fishing grounds due to destructive trawling activities. These reefs were constructed with the use of local material ranging from rocks, coconut palm stumps, tyres, concrete well rings and triangular ferro-concrete units cast on the beach. The result has been the restoration of fish breeding sites and provision of inshore fishing locations. The initiative has also created a sense of ownership and stewardship amongst the fisherfolk (ITDG 2002)

d. Preservation Plots: Indian Council of Forestry Research and Education (ICFRE) (see Section 6.1.1.2) has identified '309 forest preservation plots of representative forest types, for conservation of viable and representative areas of biodiversity. 187 of these are in natural forests and 112 in plantations, covering a total of 8500 ha' (MoEF 1999b).

- **Other Sensitive Ecosystem Conservation and General Conservation Measures**

Government

a. India is implementing a comprehensive programme since 1987 for conservation and management of wetlands of the country. The activities include preparation and implementation of management action plans for 20 identified wetlands of the country, emphasising participation of people living around these areas. Several activities such as catchment area development, including afforestation, vegetative contour bunding, construction of water harvesting structures, gully control, check dams, stream bank erosion control etc, have been undertaken in wetlands such as Chilika, Loktak, Harike, Kanjli, Wular and Bhoj (MoEF 2001a).

The Convention on Wetlands was signed in Ramsar, Iran in 1971. It is an intergovernmental treaty, which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources (http://www.ramsar.org/). India became a member of this Convention in 1982. As of November 2002, 19 wetlands have been designated as Ramsar Sites. These are Harike (Punjab), Pong Dam (Himachal Pradesh), Ashtamudi Lake, Sasthamkotta Lake and Vembanad-Kol (Kerala), Chilika Lake and Bhitarkanika mangroves (Orissa), Deepor Beel (Assam), Kolleru Lake (Andhra Pradesh), Tsomoriri and Wular Lake (Jammu and Kashmir), East Kolkata Wetlands (West Bengal), Sambhar Lake and Keoladeo National Park (Rajasthan), Ropar Lake and Kanjili Lake (Punjab), Point Calimere Wildlife and Bird Sanctuary (Tamil Nadu), Bhoj (Madhya Pradesh) and Loktak Lake (Manipur) (WWF-India/GoI 2003).

b. To focus attention on urban wetlands threatened by pollution and other anthropogenic activities, state governments were requested to identify lakes that could be included in the National Lake Conservation Plan (NLCP). The activities of the NLCP include formulation of perspective plans for conservation based on resource survey using remote sensing technology and GIS, studies on biodiversity and related ecological matters, prevention of pollution from point and non-point sources, treatment of catchment areas, desilting and weed control (MoEF 2001a).

c. State Governments have taken elaborate measures to check the growth of weeds such as water hyacinth, *Ipomea* and *Paspalum* species in wetlands such as Loktak Lake, Harike, Kanjli, Bhoj etc. One of the important

components of management action plans is conservation of endangered and threatened species. Some of the endangered species, particularly Rhinoceros and *Sangai* (Brow-Antlered Deer) have been reintroduced in the wetlands. Certain portions of Chilika, Kabar and Loktak wetlands have been declared as sanctuaries or national parks, especially for the protection and conservation of wildlife. (MoEF 2001a).

d. The MoEF has set up the National River Conservation Directorate, which acts to reduce pollution in the rivers under the National River Conservation Plan (NRCP). The Ganga Action Plan and the Yamuna Action Plan are two examples of this. Several other polluted rivers are also under active consideration of NRCP. Examples are Gomti Action Plan and Damodar Action Plan. Like the NRCP, the National Lake Conservation Plan (NLCP) works on conservation of lakes. The recent lakes taken up for conservation by NLCP are Powai in Maharashtra and Ooty and Kodaikanal in Tamil Nadu.

e. Guidelines for sustainable development and management of brackish water aquaculture have been drawn up. Some State Governments like those of Tamil Nadu and Andhra Pradesh have also developed their own aquaculture guidelines and regulatory measures in the coastal zone areas. The State Government of Orissa has formed a Task Force to look into the various aspects of prawn farming along the coastline (MoEF 2001a).

f. The National Mangrove and Coral Reef Committee has the responsibility of promoting management action plans for all mangrove and coral reef regions of the country, and promotion of R&D activities that have a direct bearing on conservation issues. A draft national action plan on strategies to ensure community participation in conservation of mangroves has been prepared. This committee is also responsible for establishment of National Mangrove Genetic Resource Centre at Bhitarkanika (Orissa) and National Coral Reef Research Institute at Port Blair. Financial assistance is being provided to all states every year for restoration of degraded mangrove habitats (MoEF 2002a).

   The Committee provides guidance for effective implementation of the management programmes, which are currently operational in 15 areas in the coastal states of the country. State-level Steering Committees have been constituted for formulation of specific Management Action Plans for each area. Nodal universities/academic institutions are being actively associated in research activities in different mangrove areas under the overall supervision of a Research Sub-Committee, which functions in the MoEF. The Ministry is undertaking a National Action Plan for protection, conservation, regeneration and afforestation of mangroves in coastal areas as a thrust area activity. (MoEF 2001a).

g. The Ministry, in consultation with various scientific institutions and experts working in the field of marine science, identifies endangered marine species to be brought under the purview of Wild Life (Protection) Act, 1972. Notable among the organisms thus protected are the Sea cow (*Dugong dugong*), the whale shark, some species of commercially exploited sharks, several species of molluscs and, recently, all coral species.

Box 6.18 Ecologically Sensitive Areas under Environment (Protection) Act, 1986

Since the late 1980s, Section 3 (2) (v) of the Environment (Protection) Act, 1986, and Section 5 (1) of the Environment (Protection) Rules have been used to declare areas in the country as Ecologically Sensitive Areas (ESAs). This has been done either in response to a threat to a sensitive ecosystem or as a preventive action to conserve certain areas. These areas include (http://envfor.nic.in):

- Doon Valley (Uttaranchal)
- Murud Janjira (Maharashtra)
- A part of the Aravallis (Rajasthan and Haryana)
- Dahanu Taluka (Maharashtra)
- Mahabaleshwar-Panchgani (Maharasthra)
- Pachmarhi (Madhya Pradesh)

- No Development Zone at Numaligarh, East of Kaziranga (Assam)
- Matheran (Maharashtra)

These sections were also used for the CRZ Notification and the recognition of sensitive coastal ecosystems, as also the notification of the Taj Trapezium Zone Pollution (Prevention and Control) Authority.

Since 2000, the process of declaring areas as ESAs has been more formalized and MoEF has prepared a comprehensive set of guidelines laying down parameters and criteria for declaring ESAs. These criteria are Species-Based (Endemism, Rarity etc), Ecosystem-Based (sacred groves, frontier forests etc) and Geomorphological feature-based (uninhabited islands, origins of rivers etc). There is also a set of auxiliary criteria along the same lines. The guidelines also include a format for submitting proposals to declare Ecologically Sensitive Areas.

h. The Convention Concerning the Protection of the World Cultural and Natural Heritage was signed in 1972. Each state that is party to this Convention recognizes the duty of ensuring the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage (http://whc.unesco.org/). Under this convention five natural heritage sites have been declared: Kaziranga National Park (Assam), Keoladeo Ghana National Park (Rajasthan), Manas Sanctuary (Assam), Nandadevi National Park (Uttaranchal) and Sundarbans National Park (West Bengal) (MoEF 1999a).

i. Biosphere Reserves (see Section on 'Protected Areas').

Box 6.19 Supreme Court Judgement on Aquaculture, 1996

The Supreme Court on December 11, 1996, ordered that 'all aquaculture industries/ shrimp culture industries/shrimp culture ponds operating/set-up in the coastal regulation zone as defined under the CRZ Notification shall be demolished and removed from the said area before March 31, 1997.' Some of the other directions given by the Court include an order that no aquaculture industry, whether intensive, semi-intensive, extensive or semi-extensive is to be permitted anywhere within Coastal Regulation Zone (CRZ) (*see Section 6.1.8.2)*. The only activity permitted by the Court was traditional and improved traditional aquaculture. Even the existing traditional/improved traditional farms within the CRZ need to seek permission from the Aquaculture Authority to continue their activities. The court directed that the persons whose farms were ecologically devastated by neighboring aquaculture farms would be compensated for the losses suffered by them. The judgement also aimed at protecting the fragile coastal ecosystems of the country (http://www.earthisland.org/take-action/actionalert_map19.html).

j. National Afforestation and Eco-development Board promotes afforestation and development of degraded forests and adjoining lands. This includes coastal shelterbelt as a thrust area. A total of 13 projects from coastal shelterbelt plantations have been sanctioned under this scheme.

k. Project Tiger was launched in 1973, following the recommendations of a special task force of the Indian Board of Wildlife. The main objectives are (http://envfor.nic.in):
   - To ensure maintenance of a viable population of tiger in India for scientific, economic, aesthetic, cultural and ecological values.
   - To preserve, for all times, the areas of such biological importance as a national heritage for the benefit, education and enjoyment of the people.

   9 Tiger Reserves were created to begin with, and presently there are 25 Tiger Reserves spreading over 14 States and covering an area of about 33,000 sq kms (*see Annexure 10*).

l. Project Elephant was launched in 1991-92 to ensure long-term survival of identified viable population of ele-

phants in their natural habitats. The main objectives include 'Ecological restoration of existing natural habitats and migratory routes of elephants; Development of scientific and planned management for conservation of elephant habitats and viable population of wild Asiatic Elephants in India; Promotion of measures for mitigation of man-elephant conflict in crucial habitats and moderating pressures of human and domestic stock activities in crucial elephant habitats; Strengthening of measures for protection of wild elephants form poachers and unnatural causes of death; Research on Project Elephant management-related issues; Public education and awareness programmes; Ecodevelopment; and Veterinary care' (http://envfor.nic.in).

m. Other species conservation projects include Project Hangul launched in 1970 in the Dachigam National Park, Jammu & Kashmir; Project Crocodile Breeding and Management was started in 1976 and is now operating in 16 sanctuaries; and the Gir Lion Sanctuary Project, started in 1972 in the Gir Forests of Gujarat (Kutty and Kothari 2001; *Gujarat State BSAP*)

Box 6.20 Special Conservation Measures for Endangered Plant Species

- **Conservation of Orchids:** In 1979-80 The Government of Arunachal Pradesh in set up an Orchid Sanctuary in Sessa in West Kameng district. The sanctuary covers the sub-tropical wet evergreen forests at elevations ranging from 1100-1800 metres. The sanctuary is situated in the Doimara Forest Reserve and covers an area of 100 sq km. More than 200 species have been recorded within the sanctuary (Asthana 2002).
- **Citrus Sanctuary in Meghalaya** (*see Section 6.2.2.2*)
- Schedule VI of the Wildlife (Protection) Act, 1972 (*see Section 6.2.8.2*) lists six plant species. These are Beddomes' cycad (*Cycas beddomei*), Blue Vanda (*Vanda coerulea*), Kuth (*Saussurea lappa*), Ladies' slipper orchids (*Paphiopedilum spp.*), Pitcher plant (*Nepenthes khasiana*) and Red Vanda (*Renanthera inschootiana*).
- The Forest Departments of Andhra Pradesh, Karnataka, Kerala, Maharashtra, and Tamil Nadu have set aside 54 forest patches as 'Medicinal Plants Conservation Areas' (MPCA) measuring 200-500 ha each (www.frlht-india.org/is.htm). These MPCAs represent all the forest types and climatic zones and harbour 93 of the 134 red-listed species of medicinal plants threatened with extinction. 14 of these species have been studied, for recovery prospects based on reproductive biology, by ATREE (*see Section 6.1.1.2*), Institute of Forest Genetics and Tree Breeding (IFGTB) and TBGRI, in coordination with FRLHT. This includes Western Ghats endemic species which are heavily traded, such as *Trichopus zeylanica*, a climber confined to southern-most Western Ghats inhabited by Kani tribes (see Box 6.48).

NGOs

a. Participatory processes are being developed with local communities for the co-management of wetlands, including Ramsar sites (*see Section 6.1.7.2*). Recently, a community-based project on Loktak Lake has been initiated by Loktak Development Authority and Wetlands International-South Asia to develop and implement participatory management processes involving local communities and NGOs. Wise use of the resources of the East Kolkata Wetlands (*see Section 6.3.2*) is being practiced by the local community. Similar approaches are under way for other wetlands including Chilika, Keoladeo National Park and Harike Wetland. An effective role has been played by several NGOs in the country to save the wetlands and help in the conservation of the threatened species. There is also the case of conservation of Sukhna Lake in Chandigarh. The Environmental Society of Chandigarh, the local people and school children have all been participating in the conservation of this lake through an environmental movement called '*Shramdan*'. Awareness building is one of the important components of the management action plans.

b. Worldwide Fund for Nature-India (WWF-I): WWF-India began in 1969 as a wildlife conservation organization. Over the years, the perspective broadened towards a more holistic approach to conservation issues in India. WWF's mission is 'The promotion of nature conservation and environmental protection as the basis for sustainable and equitable development' (www.wwfindia.org). Its work has the following broad programme components:
   - 'Promoting India's ecological security; restoring the ecological balance.

- Conserving biological diversity.
- Ensuring sustainable use of the natural resource base.
- Minimizing pollution and wasteful consumption promoting sustainable lifestyles.'

The organization carries out its conservation programmes though Field Programmes, Public Policy, Education, Communications, NGO Networking and Resource Mobilization.

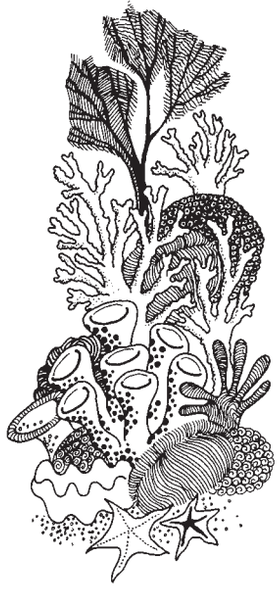
c. The Ranthambore Foundation has been working in and around the Ranthambore National Park, Rajasthan with a long-term objective of maintaining the essential ecological balance necessary for human beings to live in harmony with nature. It has also been working towards the protection of tiger habitats all over India (http://www.eaglehawksc.vic.edu.au/kla/science/5_tigers/rantham.htm).

Box 6.21 *In situ* conservation in Urban Areas

The megalopolis of Mumbai is one of the few large cities in the world having a sizeable protected area within its boundaries. Mumbai also has rich mangrove forests within its several creeks. The thorn forests of the Delhi Ridge, spread over 7700 hectares through the heart of the capital city, provide a welcome contrast to the concrete jungle around (Kalpavriksh 1991). The Cantonment areas in many Indian cities are located in biodiversity-rich areas. Chennai contains large stretches of original dry, evergreen forests protected in the Guindy National Park or in educational institutions. There have been several citizen and NGO initiatives towards *in situ* conservation in urban areas:

- Students and young professionals have long protected Chennai's turtle nesting sites through the famous 'turtle walk'.
- Thanks to a number of NGOs and the resistance against concretisation by traditional fisherfolk, Kolkata's wetlands have partially survived.
- The Ahmedabad Green Partnerships project, a collaborative effort of CEE and the Ahmedabad Municipal Corporation, is working on developing a 'green space' in the city with community involvement (CEE 2003).
- Guindy in Chennai, Van Vihar in Bhopal, Borivili in Mumbai and other such natural ecosystems are conserved as formal protected areas.
- Several NGOs in Delhi have joined to save the Ridge Forest, one of the world's largest urban green stretches.
- Sustained campaigns by several NGOs in Nagpur have saved some urban wetlands from being drained and built over.
- Many urban administrations have also responded positively, by declaring protected areas, enacting legislation like Urban Tree Acts, and integrating some biodiversity concerns while making master plans (Patwardhan *et. al*., 2001).

d. Reef Watch Marine Conservation: This Mumbai-based group is interested in conservation of some groups of marine organisms. The current initiatives are towards conserving corals and whale sharks, and may extend to include whales and sharks in the near future. The present geographical focus includes Lakshadweep, Andaman and Nicobar Islands and the Gujarat coast.



e. NGOs in North Karnataka, Goa and Maharashtra have proposed to the MoEF that a portion of the northern Western Ghats (covering parts of Karnataka, Goa and Maharashtra) be declared as the 'Sahyadri Ecologically Sensitive Area' (SESA) (see Box 6.18). The proposal. recommends that the area is kept free of industrial activities, mining (including renewal of leases), dams and reservoirs, diversification and expansion of existing industries, felling trees and agro-horticulture that might harm the ecology of the landscape. The SESA envisages the protection of an entire landscape, which would make conservation of the region holistic, as against protecting isolated patches as parks and sanctuaries (*Western Ghats Ecoregional BSAP*).

f. A project on mangrove conservation and management was initiated by the M.S. Swaminathan Research Foundation (MSSRF) (*see Sections 6.1.1.2*, *6.14.2*, and *6.2.2.2*) in 1996 at Pichavaram and Muthupet mangroves of Tamil Nadu. This was done in collaboration with the Forest Department of Tamil Nadu and other stakeholders. The following year, the project was established in the Krishna and Godavari mangroves (including

Coringa) of Andhra Pradesh. Soon after, it was initiated in the Mahanadi delta and the Devi river mouth of Orissa, and the mangroves of Sundarbans, West Bengal. The project seeks to 'enhance national capacity and national action' in the conservation and sustainable management of coastal mangrove wetlands. It aims to build the capacities of local communities, government agencies and grassroots level institutions to restore, conserve and utilize the mangrove wetlands in a sustainable manner. The project's most important output is a model for Joint Mangrove Management (JMM), to be adopted and replicated by the Forest Departments in the four states. JMM is presently being implemented in 31 demonstration villages in Tamil Nadu, Andhra Pradesh and Orissa (http://www.mssrf.org/costalsystems/coastalwetlands.html).

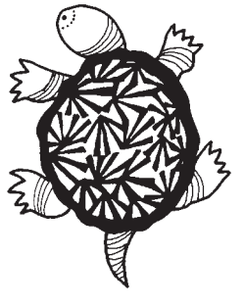
Box 6.22 Initiatives addressing Human-Wildlife Conflicts

- *Changing crop patterns*: In areas immediately around forests, growing crops that animals find undesirable may prevent raiding. Mustard, for instance, has been successfully (and profitably) grown around Ranthambore National Park.
- *Agro-forestry*: Tree plantations, which are largely immune to raiding, yield high profits to farmers. However, it takes 5-7 years for trees to reach maturity. In North-East India, several timber companies offer bankable/guaranteed returns schemes (these provide annual income plus a lump-sum payment at the end of the scheme), which allow farmers to overcome their cash-flow problems..
- *Fencing*: There are several Government/NGO support programmes for fencing.
- *Trenches around agricultural lands* are useful in preventing raids by wild boar, nilgai, and blackbuck.
- *Safer corrals and pens for livestock*: In Ladakh, a secure design for sheep and goat enclosures has been used by the Snow Leopard Conservancy. This design uses community knowledge and participation, and has considerably brought down predation within the corrals by snow leopards (Jackson and Wangchuk 2001).
- Some traditional methods of crop protection include use of firecrackers; night-patrolling; beating drums; use of trained dogs; lighting fires along field boundaries; tying threads to crops along boundaries; placing a scarecrow/statue in the field (*Human-Wildlife Conflicts Sub-thematic Review*)
- There are many compensation schemes by both government and non-governmental organisations. Two of the NGO initiatives include:
  - The **Wildlife Trust of India**, as a part of its **Van Rakshak Project** has launched a scheme of supplementary accident insurance of PA staff from March 30, 2001. This scheme brings the entire field staff of the forest departments, working on wildlife duties in protected areas, under a single insurance scheme. The scheme covers Forest Department Employees of the rank of Range Forest Officer and below on field wildlife duties. Even temporary employees, who have been on the rolls for at least three years and are on field wildlife duties, are eligible. For the scheme to be made applicable in a state, the state government's approval is required and in addition the Forest Department of the state should also provide a list of eligible employees (P.C. Bhattacharjee, personal communication 2002).
  - Under the **WWF Tiger Conservation Programme** (TCP) a cattle compensation scheme was introduced in some states in 1998. This complemented the existing government schemes. The compensation scheme was introduced because villagers were poisoning their cattle, so that the tigers which ate them would in turn get poisoned. This was being done by the villagers as a reaction to the increasing killing of cattle by tigers (http://www.panda.org).

g. The Foundation for Revitalisation of Local Health Traditions (FRLHT), in collaboration with five State Forest Departments and local communities of Kerala. Karnataka, Tamil Nadu, Maharashtra and Andhra Pradesh, has established a network of 54 *in situ* Medicinal Plant Conservation Areas (MPCAs) to conserve intra-specific medicinal plant diversity of peninsular India (*see Annexure 14*).

h. The struggle to save Silent Valley began in the 1970s, as a reaction to the proposal for the building of a dam across the river Kunthipuzha that would generate 120 MW of power. This would have submerged some of the finest tropical evergreen forest of the country. This evoked protest from all parts of the country and the movement gained support at national and international levels. The Silent Valley Samrakshana Samithi was formed by activists opposing the dam. The movement involved people from all walks of life, ranging from

students to politicians. The Central Government stalled the project. Silent Valley was subsequently declared a National Park.



i. C.P.R. Environmental Education Centre (CPREEC) (*see Sections 6.1.1.2 and 6.1.6.2*) has been involved in the conservation and restoration of the endangered or near-extinct sacred groves in the states of Andhra Pradesh, Karnataka and Tamil Nadu. The Centre has surveyed 398 sites and restored 37 sacred groves in these states and Pondicherry (Krishna 2002).

j. Since the last decade, the Sanjay Gandhi National Park (SGNP) has been visited by more than 200,000 visitors during the one-day festival of Mahashivratri (in March). The combination of uncontrolled crowd, lack of adequate coordination between concerned agencies and inadequate staff used to lead to a large amount of garbage being generated in the area. It was noticed that forest fires had also been frequent. Since 1998, various governmental and non-governmental agencies – including the Police, the Archaeological Survey of India, the Bombay Municipal Corporation (Hydraulic and Security Departments), BEST (which arranges the buses), and NGOs such as BNHS, WWF, BEAG etc. – have been trying to address this issue. Volunteer inputs, press releases on 'dos and don'ts' have been some of the methodologies used, along with regular coordination meetings prior to the festival day. All inflammable material, cigarettes, *bidis*, matches, lighters etc. are banned, and confiscated at the main gate, as are plastic bags. All commercial activities are also strictly banned. Entry of private vehicles is also strictly regulated on this day. All these measures have resulted in the number of visitors dropping to about 30,000 during Mahashivratri, and there was also not a single forest fire within the SGNP in March 2003 (Debi Goenka, personal communication 2003).

Box 6.23 Some Initiatives at State/Union Territory level

This is a glimpse of the range of conservation activities which have been taken up at state and union territory levels.

- The **Andaman and Nicobar Islands Environmental Team** (ANET), a division of the Madras Crocodile Bank Trust (*see Section 6.1.3.2*), Centre for Herpetology works with the primary aim to help ensure the long-term survival of biodiversity of Andaman & Nicobar Islands while recognising the needs of the human inhabitants. Since its formation in 1989, the Team has been working on several different, though complementary, fields, including that of research, environmental education and applied conservation-related activities.
- **Operation Kachhapa** was initiated in 1998 for the conservation of Olive Ridley sea turtles in Orissa. It is coordinated by the Wildlife Protection Society of India (New Delhi) and involves the Orissa Forest Department, Orissa Fisheries Department and the Wildlife Society of Orissa. The Wildlife Institute of India, Dehradun and Project Swarajya, Cuttack, are also associated with the initiative. (CEE 2003)
- The **Bhoreli** (**Anglers**) **Association** based in Tezpur, Assam, is working for the conservation of fishes, especially the *Mahaseer*.
- **Wild Orissa** has been involved in an exercise to prevent poaching of migratory and endemic waterfowl, as well as prevent poaching of waterfowl nests and eggs in the Chilika Lake in the state of Orissa. The initiative had involved participation of the local villagers and more specifically, the poachers/hunters themselves. This programmes is being carried out in association with the Chilika Development Authority (*see Box 6.57*), the Wildlife Wing of the Orissa Forest Department, Bombay Natural History Society etc. (*see Section 6.1.2.1*).
- **Nature's Beckon** had earlier been working extensively on conservation issues in Dhubri district western Assam. It has now extended its activities to upper Assam and the conservation of rain forest ecosystems. The organisation has substantially contributed to the conservation of biodiversity in Chakrashila, covering parts of the districts of Dhubri and Kokrajhar, which was declared a sanctuary in 1994 (*Assam State BSAP*).
- The Nature Conservation Society, Amravati, works on conservation issues (including anti-poaching) in the Melghat Tiger Reserve and surrounding forests. Some of their activities include attempts to restore corridors that connect the protected forests in the Satpura Range (habitats between Melghat and Pench, and Pench and Kanha), preventing the illegal encroachments and so on (http://www.sanctuaryasia.com).

Communities

As briefly mentioned in *Section 3.3.2*, rural communities in India have an ancient tradition of conservation of natural ecosystems and species. Though considerably eroded in the last few decades, many of these practices still survive, and are of late being complemented by new conservation initiatives by, or involving, communities. The range of community-based efforts at *in situ* conservation includes:

a. Sacred Sites (*see also Section 3.3.3*): In India a number of communities practice different forms of nature worship. A significant tradition is that of providing protection to patches of forest (sacred groves), water bodies (sacred ponds, lakes etc.) and entire landscapes (e.g. the Rathong Chu Valley in Sikkim), for cultural and/or religious reasons. One of the many forms of nature worship in India is the tradition of consecrating certain forest habitats to a deity or ancestral spirits. Harvesting of any living matter is generally prohibited within these patches of forest. The customary protection of the habitat over centuries has resulted in conservation of a range of rare and endangered species in the sacred groves. At least 13,720 sacred groves are reported in India. There also exist several sacred ponds/lakes, but these have received scant attention as compared with sacred groves. The Kecheopalri Lake in Sikkim is one such sacred lake. The concept of a sacred landscape takes forward the philosophy of sacred sites. Perhaps one of the best-known examples of sacred landscape is that represented all along the course of the sacred river Ganga. The sacred landscape in this case covers the land all along the course of the river, the human habitation and the land-based activities, the ancient temples, and the sacred cities, representing a set of inter-connected ecosystem types, bound together by the sacred river itself. In Sikkim (which is as a whole considered sacred by the Sikkimese Buddhists), the area below Mountain Khangchendzonga in West Sikkim referred to as '*Demojong*' is most sacred to the people, being the abode of Sikkimese deities (*Culture and Biodiversity Thematic BSAP*).

b. Community-Conserved Areas: There are perhaps thousands of areas and species that are under community protection across the country. Community Conserved Areas (CCAs) are of diverse kinds:
   - In Bongaigaon district (Assam), the villagers of Shankar Ghola are protecting a few square kilometres of forest, which contain a group of the highly threatened Golden langur. Another initiative with the same species as a key indicator was triggered by the work of the NGO Nature's Beckon, in the protection of the Chakrashila forests (now Sanctuary) by surrounding villages.
   - The villagers of Jardhargaon and Nahin Kalan in Uttaranchal state have successfully conserved large forest areas containing sub-Himalayan tract biodiversity.
   - Several thousand villages in Orissa have initiated forest conservation and regeneration on their own, or in conjunction with official programmes (*see Box 6.24*).
   - With help from the NGO, Tarun Bharat Sangh (TBS), several dozen villages in Alwar district (Rajasthan), have reconstructed the water regime, regenerated forests, and in one case (Bhaonta-Kolyala), even declared a 'public wildlife sanctuary'.
   - Youth clubs from the villages around the Loktak Lake (Manipur), have formed a Sangai Protection Forum to protect the greatly endangered Brow-antlered deer, which is found only in this wetland. They take part in the management of the Keibul Lamjao National Park, which forms the core of the lake.
   - In 1800 hectares of deciduous forest, villagers of Mendha (Lekha), Gadchiroli district (Maharashtra), have warded off a paper mill from destroying the bamboo stocks, stopped the practice of lighting forest fires, and moved towards sustainable extraction of non-timber produce.
   - Many traditional practices of sustainable use have helped in wildlife conservation. For instance, pastoral communities in Ladakh, Rajasthan, Gujarat and many other states had strict rules regarding the amount and frequency of grazing on specified grasslands. Ornithologists have recorded that these helped to maintain viable habitats for threatened species like bustards.
   - At Khichan village (Rajasthan), villagers provide safety and food to the wintering Demoiselle cranes, which flock there in huge numbers of up to 10,000. Hundreds of thousands of rupees are spent by the residents on this, without a grudge or grumble.
   - At Kokkare Bellur (Karnataka), and many other sites where large waterbirds are surviving on village tanks and private trees, villagers offer protection against hunting and untoward disturbance. In Mukalmuwa (Nalbari district, Assam) and Puran Gudam (Nagaon district, Assam), individuals have taken up activities

for the conservation of trees such as *Simul* (*Bombax ceiba*) for regular nesting of adjutant storks. There are two undisturbed breeding colonies of Greater adjutant stork in Khutikatia and north Hoibargaon area of Nagaon district maintained by the local people (*Assam State BSAP*). Many ornithologists are coming around to the view that for species like the Greater adjutant stork and the Spotbilled pelican, community protection may be the most effective means.

- In Goa and Kerala, important nesting sites for sea turtles such as Morjim and Galgibag beaches respectively, have been protected through the action of local fisherfolk, with help from NGOs and the Forest Department.
- The Bishnoi community of Rajasthan follows the 29 tenets laid down by Swami Jambeshwar Maharaj. These tenets focus on protection of nature and ban on killing of animals, felling of trees etc. Blackbuck thrive around Bishnoi settlements and one site (Abohar) in Punjab is even declared as a wildlife sanctuary.
- Villagers have declared their traditional community forest as the Ghosu Bird Sanctuary in a part of Zunheboto district in Nagaland. Khonoma village (Nagaland) near Kohima has declared a large area of about 70 sq km as Khonoma Nature Conservation and Tragopan Sanctuary.
- Chusan Pir island, in Jamnagar district (Gujarat), which is also a part of a Marine National Park, is a unique example of a conservation effort by the Badela, Sanghar and Vadher communities. The communities continue to conserve 300 year old mangrove vegetation on the island. (*CCAs in Gujarat Sub-thematic Review*)

It is to be noted that many of these areas and species are conserved through customary, community evolved laws or tenets (*see Section 6.1.8.2*)

Box 6.24 Community Forest Management in Orissa

According to available estimates, over 5,000 out of 12,000 villages (Manoj Patnaik, personal communication 2003) within or near forests (out of a total of approximately 51,000 villages in Orissa) are actively protecting and managing state-owned forest lands in their vicinity. While some villages have been protecting their forests for as long as 60 to 70 years, the majority started protection in the late 1970s or early 1980s. The management unit ranges from a group of households to a settlement or hamlet to a cluster of villages, and the area under protection varies from a few hectares to 1000 hectares. Various forms of community organizations evolve within villages and hamlets or between villages. These include Forest Protection Committees with an executive committee selected/elected by the village general body (usually excluding women). Other organizations include Councils of Elders, Youth Clubs or, occasionally, *Mahila Samitis* (women's organisations).

CFM develops and enforces rules for restricting access to forests, regulating use and penalizing offenders. Protection systems vary between *thengapalli* (voluntary patrolling in rotation) and paid watchmen. CFM groups often have elaborate rules for penalties for those from within the community and outside of it. In the absence of formal legal authority, enforcement of these rules is done through social sanctions. These arrangements are dynamic, adaptive and flexible (Singh 2001).

As corroborated by several earlier studies (Kant *et. al.*, 1991; Jonsson and Rai 1994; Singh & Kumar 1993 & 1994; Singh 1995; Vasundhara 1997 & 1999; Sarin & Rai 1998; Conroy *et. al.*, 2000), the presence of village institutions, and their prior experience with managing common property resources, was a major factor contributing to the emergence of CFM. Although most of the commons have been appropriated by the state, collective community-based arrangements still exist for management of water bodies and village *haats* (markets), celebrating cultural and religious events,[2] and managing conflicts. Weak presence of Panchayati Raj Institutions for local governance – due to infrequent elections till 1993 – also contributed to the development of informal village institutions (Singh 2001).

CFM has had dramatic, positive impacts on forest quality, as well as on enhancing the capacity of local institutions to deal with issues relating to villagers' lives and livelihoods, including management of other common pool resources

Many CFM villages in Orissa also use their income from forests (mostly from occasional cleaning and thinning operations) for building village assets.

Box 6.24 provides just a mere sample of the numerous efforts of communities conserving natural resources all over the country. Also significant are various people's struggles and movements to secure their rights to resources and conserve the biodiversity of their region against destructive commercial and developmental threats (*see Box 6.25*).

Box 6.25 Some People's Movements Leading to Conservation

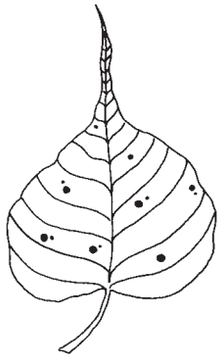
- Nearly 150,000 people of the Torpa and Tamar areas in Jharkhand have been resisting the construction of the Rs 23,000 million. **Koel Karo** Hydro Electric Project since it was first planned by the Bihar government in 1973. The submergence area has valuable forests. Also in central India, two mega dams, Bhopalpatnam and Inchampalli, have been stalled by determined *adivasi* resistance since the 1970s. The dams would have wiped out wildlife rich areas (including a part of Indravati National Park) and displaced thousands of *adivasi* families (http://www.infochangeindia.org/EnvironmentIstory.jsp?recordno= 130&section_idv=6).
- **Chipko** (*hug the trees*) **Andolan** (movement) began in the early 1970s, in the Garhwal and Kumaun Himalayas of Uttaranchal. This was in response to the increasing threat to the felling and auctioning of natural forests in the region. It was also to protest against the State Forest Policy and the complete neglect of the relationship between the hill people and their forest resources. The movement got its name from the symbolic protest by many villagers (especially women) who pledged to hug trees to save them from felling (Mahajan and Kohli 2002). In Karnataka, the Appiko movement was initiated drawing inspiration from the Chipko Andolan, to save forests from being felled in Uttara Kannada district of the Western Ghats.
- A 30-megawatt project on the **Rathong Chu River** in Sikkim was stopped by the efforts of the residents of the area in 1998. Besides being a biodiversity hotspot the area is also considered a sacred landscape. The project was to have been located close to the Khangchendzonga National Park, an important habitat for several endangered animal species, including the Sikkimese Shapu, barking deer, civets, bears, the red panda, the blue sheep and a variety of jungle and mountain cats. This was a result of a sustained campaign led by the Concerned Citizens of Sikkim (CCS). The role of the resident Bhutia tribals was also crucial in this struggle. The project was withdrawn despite the fact that the government money had already been paid out for land acquisition. The campaign also had the support of the Chagpori Tibetan Medical Research Institute, Darjeeling, that identified hundreds of rare medicinal plant species in the project area (www.kewa.org/a2.html).
- The **National Fishworkers' Forum** was formed in 1979 as an attempt towards organized and collective action against the growing commercialization of the fisheries sector. Through concerted action over a long period of time, the NFF has been able influence marine fishing regulations in almost all states. They have carried out sustained campaigns against mechanized boats, night trawling and other activities, which prove detrimental to the biodiversity and livelihoods of the marine and coastal environment.
- In 1992, the Government of Orissa had leased more than 400 hectares of **Chilika Lake** to a private company for shrimp farming. A strong people's movement ultimately induced the Orissa High Court to direct the Orissa government to modify the lease policy in favour of safeguarding the interests of the local fisherfolk. Although the private company had to be moved out, other large operators subsequently moved into the area. Local fisherfolk are a strong force behind the Chilika Development Authority's move to deal with the situation (*see Section 6.1.7.2*).

Others

a. Armed Forces: Several operational areas of the armed forces such as INS Shivaji in Lonavala, College of Military Engineering, Pune and Navy Nagar, Goa, have been declared as *plastic free zones* to protect water bodies and aquatic life etc. Ecological Task Forces have taken up the herculean task of rehabilitating some of the most ecologically fragile areas (like Shiwaliks and outer Himalayas). Several of the vast areas under the control of the armed forces, especially in ecologically fragile areas along India's borders, harbour significant biodiversity, and the armed forces have gradually become more sensitive towards conserving them, though much more work is needed on such sensitisation.

b. One example of the involvement of religious organizations in educating people is that of the Badrivan

Restoration Programme of G.B. Pant Institute of Himalayan Environment and Development. For the revival of Badrivan (the ancient sacred forest of Badrinath shrine, Chamoli, Uttaranchal), seedlings of various high altitude trees were distributed to pilgrims, *pandas*, army personnel and local people in the form of *Brikshya Prasad*. This resulted in the survival of more than 15,000 saplings of various trees/shrubs in and around Badrinath shrine (*Natural Terrestrial Ecosystems and Culture and Biodiversity Thematic BSAPs*).



c. Religious Bodies: There are several temple groves across India where forest patches are conserved with various degrees of strictness. The Bhimashanker temple grove in Maharashtra, for instance, is believed to be relatively untouched for hundred of years. In other areas, NGOs and religious authorities have initiated conservation and ecological regeneration projects. For instance, as an effort to strengthen the links between religion and conservation, in 1991 WWF India started to work with the people of Vrindavan in what was called the Vrindavan Forest Revival Project (VFRP). The focus was on greening the 11-km sacred pilgrimage route called the *parikrama*. Walking around a holy place, or performing the *parikrama*, as it is called, is one way of honouring the place and offering one's tribute. Over 2000 traditional trees and flowering bushes have been planted and cared for. 15,000 sacred plants used in daily worship such as *tulsi*, Indian rose and marigold have been raised and distributed among the local community. The community also requested for tree groves to be developed within the city and on the *parikrama*. For the first time in the town's history, the authorities and religious heads joined hands to form the VFRP Advisory Group to help and advise WWF-India's project staff.

   In Gujarat there are several examples of religious bodies which have undertaken conservation of habitats around temples, such as Rajarajeswari Mandir-Dharmata, Balaram Mahadev Mandir, Kedarnath Mandir, Balundra etc. (*CCAs in Gujarat Sub-thematic Review*).

Box 6.26 Ecological Parks in Indian Oil Refineries

Indian Oil owns and operates seven giant oil refineries, each occupying an average area of over 1000 acres, at Panipat (Haryana), Mathura (U.P.), (Baroda (Gujarat), Haldia (West Bengal), Barauni (Bihar), Guwahati (Assam) and Digboi (Assam). These refineries have in the past caused serious pollution and social disruption, but have of late tried to become ecologically more responsible. This is not only through treatment and re-use of wastewater generated in the plants, but also through extensive greening and wetland creation.

All refineries have done extensive tree plantation in and around the refinery, ranging from hundred thousand to three hundred thousand trees. Besides serving as a pollution sink, this green cover also enhances the aesthetic look, and attracts birds, both migratory and non-migratory, in large numbers to the water bodies. Ecological parks have been developed extensively around the polishing ponds. These areas are not frequented even by the employees, and hence offer perfect solitude to birds.

Mathura Refinery has seen nesting of waterbirds from 1992 onwards, including night herons, egrets, cormorants, purple and grey herons, darters and white ibis. Mathura Refinery is unique as this was the first ecological park that has been developed in an area of 4.45 acres in the vicinity of the Effluent Treatment Plant. Birds thrive on treated effluent which has fish, turtles and other aquatic life. The polishing ponds and other water bodies in the refineries have been used by the birds basically for resting in the daytime while on migration, and for communal roosting in the night. During a visit to the Mathura refinery in December 2002, nearly 50 nests of Painted Storks (with about 92 adult and young Painted Storks), 75 odd nests of cormorants and other waterbirds like Spotbill (60), Shovellers (70), Coots (30) and Common Pochards (30) were observed.

At the 100 acres of wetlands at the Panipat Refinery, more than 7,000 ducks, including 4 Great Crested Grebes have been recorded by birdwatchers (Suresh Sharma on http://new-lists.princeton.edu/listserv/nathistory-india.html, 17.2.2002).

This shows that it is prudent for any big industrial setup to develop its own secure place for the thousands migratory birds that come into India. Enough land should be provided/made compulsory for all future industrial belts to demarcate space for water bodies of other natural or semi-natural ecosystems.

Adapted from a contribution by N. Shiva Kumar

Box 6.27 *In situ* Conservation Efforts as part of the NBSAP Process

One of the unanticipated impacts of the NBSAP process has been the occurrence of *in situ* conservation efforts in some associated sites. For instance:

- In the Chedema Sub-state Site in Nagaland, the villagers have declared they will stop hunting, and replace chemical farming with organic agriculture.
- A village in Vidarbha region of Maharashtra has taken steps to protect a heronry (nesting) site, after participating in the NBSAP planning process for the region (*Vidarbha Sub-state Site BSAP*).

At the Rathong Chu valley, a local site for NBSAP, local citizens and NGOs that participated in the planning exercise have moved to evict illegal settlers from outside, who were destroying the environment, and have lobbied to include biodiversity-related issues in the manifesto of the *panchayat* elections. Two local NBSAP committee participants even contested local elections and one of them was elected (*Rathong Chu Sub-state Site BSAP*).

This list is not exhaustive and there are perhaps several other such efforts, with the NBSAP process being a facilitator.

d. Corporate and Business Houses: Godrej Trust Pvt. Ltd. owns and has attempted to conserve 1750 ha of mangrove vegetation in Vikhroli, Mumbai. The Trust maintains a nursery which provides saplings for afforestation. Two observation towers have been erected in this area. The Trust has also established an interpretation centre with the purpose of creating awareness about mangroves and the need to conserve them (http://www.bcpp-india.org/chapter9a.htm).

In the heart of Pondicherry city, the campus of the Swadeshi Cotton Mill harbours about 184 species of plants, covering 60 families, in which 61 species are trees, 37 shrubs, 4 lianas, 28 climbers and 58 herbs. The campus has about 16 *Adansonia digitata*, which are supposed to be approximately around 300 years old. Unfortunately, construction of a court premises has seriously threatened this campus since 2002 (*Pondicherry State BSAP*).

6.1.2.3 Major Gaps

Major gaps in *in situ* conservation efforts (including those adapted from the National Policy and Macro Level Strategy on Biodiversity (MoEF, 1999b)) include:

1. The current PA network does not adequately cover many biotic provinces over states and biogeographic regions. For example, Ladakh, South Deccan, Gangetic Plains, Assam Hills and Nicobar Islands have less than 1% of their total area covered by the PA network, despite the fact that these are some of the most biodiversity-rich areas in the country. According to a comprehensive survey by WII there are 18 biomes which have inadequate PA coverage. Major proposals have been made for all except three, which are Orissa Semi-evergreen forests, Tropical swamp forest and sub-tropical dry evergreen forests (Rodgers *et. al*., 2002).

   In situ conservation is seriously lacking in marine/coastal areas and the necessary special measures have not been evolved for wetlands.

   The Biodiversity Conservation Prioritisation Project (see Box 6.3) found that, of the 22 biogeographic provinces identified by Rodgers and Panwar (1988), only 8 had PAs covering 4.6% or more of the province (4.6% being the national coverage by PAs). There was very poor (less than 2%) coverage in the following biogeographic provinces: Thar, Punjab, Malabar Plains and Lower Gangetic Plains (Mehta 1998).

2. Many PAs have yet to complete legal procedures prescribed under the Wildlife (Protection) Act, 1972 (*see Section 6.1.8.2*). The settlement of rights is yet to be resolved in many areas. This has prevented adequate management of these areas.

3. Many areas lack professional staff, essential equipment, maps and other infrastructure.

4. Measures taken for the tackling of threats to PAs are inadequate. As a result, they continue to be impacted by activities such as poaching. There have also been very few initiatives/measures towards tackling the problem of exotics and invasives.

5. Little attention has been paid to the conservation of plants in general and lower groups of plants and animals in particular.

6. Programmes for conservation for threatened and endemic species (flora and fauna) are inadequate. Outside PAs and CCAs, such species receive very little protection, especially against the destruction of their habitats.

7. India has 26 centers of endemic species. Only three of these centers fall within the PA network (MoEF 1999b). Outside PAs and CCAs, such species receive very little protection especially against the destruction of their habitats.

8. The current PA network does not adequately cover a representative proportion all the wild species in the country. Preliminary analysis points out that even mammals and lower vertebrates may be poorly covered. Also, large populations of several threatened species occur outside the official PA network (*Wild Animal Diversity Thematic BSAP*).

9. Conservation policies and programmes (both government and non-government) have alienated local people and have not recognized the potential of community-based conservation. Many PAs have created a situation of serious displacement and resource deprivation for local communities; with several million people affected – though it is also true that in several cases the protection offered by the Wildlife (Protection) Act, 1972 (*see Section 6.1.8.2*), has staved off commercial and developmental projects, which could have destroyed communities. The experience and sense of deprivation, however, is stronger than the sense of benefit, and PAs have therefore created intense hostility, conflict and waning public support (Kothari *et. al*., 1996). In addition CCAs remain a neglected part of the conservation landscape (*see Section 7.1.2.2* regarding the recent provision on Community Reserves) There is also inadequate legal backup for communities to be able to enforce their customary or unwritten rules.

10. In some cases CCAs have not succeeded in fulfilling their mandate towards *in situ conservation*, and there are several instances where communities have been responsible for the loss of biodiversity in and around their villages. Even sacred sites in many places have been eroded as the sentiment of 'sacredness' has weakened.

11. There is a serious absence of an overall land/water use plan demarcating ecologically important areas where large-scale development and commercial projects will not be allowed.

12. *In situ* conservation outside PAs and CCAs, except in some special ecosystems, is very inadequate, often absent.

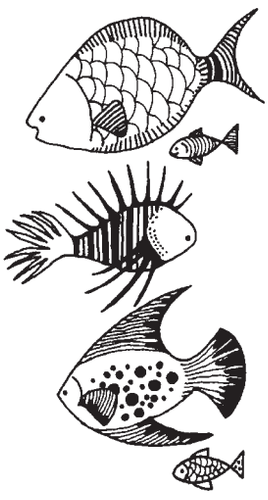
13. Biodiversity conservation in forestry, fisheries and grassland management programmes is weakly integrated.

14. The armed forces, corporate sector, religious institutions, and so on are inadequately sensitised and involved.

15. There are many inequities in the management of PAs. Some PAs, which are relatively high-profile, tend to get more attention than those which are comparatively low-profile. This is irrespective of the latter's biodiversity richness, representativeness, uniqueness and endemicity (Uppeandra Dhar personal communication 2002).

16. In many cases, state-level priorities for *in situ* conservation efforts are not reflected in the national level priorities.

17. Issues relating to human-wildlife conflict are not being adequately addressed (*see Box 5.5*).



6.1.3 Wild Biodiversity: *Ex Situ* Conservation

6.1.3.1 Overall Concept

Given the sad but undeniable reality that there simply are not enough spaces left for the full range of *in situ* conservation initiatives to be put into place, and that at least for the foreseeable future natural habitats are going to continue being under threat, there is an urgent need for conservation initiatives outside natural habitats also. Such *ex situ* conservation includes zoological parks (for animals), botanical gardens (for plants), and culture collections (for micro-organisms). This section describes the range of initiatives being taken in India for such conservation.

6.1.3.2 Current and Past Initiatives

Central Government

a. Zoological Parks and Aquaria: The Central Zoo Authority was created in 1992 with the objective of ensuring better management of zoos in the country. After the establishment of the Authority, it is mandatory for all zoos to seek recognition from CZA for their functioning. To facilitate the objectives of the CZA, the GoI adopted the National Zoo Policy in 1998 (*see Section 6.1.8.2*).

   The total number of recognized zoos in India as of July 2003 is 165. As of 31 March 2003, there were 10182 animals belonging to Schedule I and Schedule II of the Wild Life Protection Act, 1972 (*see Section 6.1.8.2*), in 58 major zoos. Some of the zoos and aquaria where captive breeding or other conservation-oriented activities have been prominent include:

   - Padmaja Naidu Himalayan Zoological Park, Darjeeling (Conservation breeding of Red Panda and Snow Leopard);
   - National Zoological Park, Delhi (Conservation breeding of *Sangai*, Swamp Deer and Red Jungle Fowl);
   - Sanjay Gandhi Biological Park, Patna (Conservation Breeding of Rhino);
   - Alipore Zoological Park, Kolkata (Conservation breeding of Bhutan Grey Peacock Pheasant and *Sangai*);
   - Arignar Anna Zoo, Vandalur, Chennai (Conservation Breeding of Lion- Tailed Macaque and Nilgiri Langur);
   - Sephaijhala Zoo, Agartala (Conservation Breeding of Leopard Cat); and;
   - Kanpur Zoo (Conservation breeding of Indian Rhino); (Bipul Chakraborty, personal communication 2003)

   There are many aquaria registered with the CZA, though there does not seem to be any consolidated information on the exact numbers. The Taraporevala Aquarium (Mumbai) and the one in Bhopal are the largest. There are also some well-established ones like in Lakshadweep and Port Blair (Andaman and Nicobar Islands) and the CMFRI has maintained two at their Vizhinjam and Calicut centres (B.F. Chhapgar, personal communication 2003).

Box 6.28 Red Panda Rehabilitation

The Darjeeling Zoo and the Central Zoo Authority have taken up a rehabilitation effort for the highly endangered Red Pandas (*Ailurus fulgens*) found in the forests of North-East India. The purpose is to increase the number of Red Pandas in the wild. Permission has been obtained from the State Government and from the West Bengal Forest Department, and the captive-bred Pandas will be released in the 78.60 sq km Singalila National Park in Darjeeling. This national park is also the natural home of this endangered species.

The rehabilitation programme was scheduled to begin in November 2002. Two selected female Red Pandas are proposed to be released in May 2003. Prior to the release there will be a two-phase rehabilitation. In the first phase, the Pandas will be released in the open enclosure of the zoo for three months. The second phase would be in the form of partial release into the wild with radio collars, so that the movement and territorial changes can be monitored (Arunayan Sharma at http://new-lists.princeton.edu/listserv/nathistory-india.htmlon 31.10. 2002).

b. Botanic Gardens: There are 33 Botanic Gardens in the country (MoEF, 1999b). Perhaps one of the most important is the one in Kolkata, where the floral varieties are well classified and categorized. The 250 year-old Banyan tree with circumference of around 400 meters, one of the largest, holds a special appeal for the visitors.

In Southern Bangalore lies the 240 acres Lal Bagh Garden. The Lal Bagh rock in this garden is one of the oldest rock formations in India, believed to be 3000 million years old. The garden also houses a rare and valuable collection of tropical plants (http://travel.indiamart.com).

A National Botanic Garden is being set up at NOIDA-Delhi in association with the BSI. This initiative has been undertaken as part of the 'Green Channel' project under the National Jan Vigyan Science & Technology Mission of the Ministry of Science & Technology (MoEF 2002a).

c. Conservation of Orchids: A number of orchid sanctuaries and orchidariums have been established in orchid-rich habitats like the foot-hills of the Himalayas, the Western Ghats, the western coastal region and the southern hill stations (http://www.escapetoindia.com/Wildlife/bio_diversity_india.htm).

One of India's largest orchidariums is located at Tippi in Arunachal Pradesh. It was established in 1972. It has approximately 50,000 orchids under cultivation, of which 315 are classified as exotic. The orchidarium has identified over 29 orchid species that are now considered endangered. Another orchidarium in Arunachal is located is Dirang and houses a 5-hectare nursery for orchids. The local community is actively involved in looking after the nursery.

A project titled 'Conservation through micropropagation of rare and exquisite orchids of the Western Ghats' was sponsored by the MoEF at the Tropical Botanic Garden and Research Institute, Trivandrum. Through this project, rare orchids like the 'Blue Vanda' and 'Ladies Slipper' orchid have been preserved in *in vitro* cultures (IIPA 1996).

d. The Central Council for Research in Ayurveda and Siddha (CCRAS), established in 1978 has promoted the cultivation of medicinal plants at five herbal gardens across the country covering an area of 135 acres. Some important plants being cultivated are *gugglu* (*Commiphora wightii*), saffron (*Crocus sativus*), *ashwagandha* (*Withania somnifera*), *tagar* (*Valeriana jatamansi*), *sarpagandha* (*Rauvolfia serpentina*), *kalmegha* (*Andrographis paniculata*), *kumari* (*Aloe barbadensis*) and *daruharidra* (*Berberis aristata*).

e. The Pygmy Hog (*Sus salvanius*) is the smallest and the rarest wild *suid* (pig) in the world. Only a few isolated and small populations survive in the wild, and today it is on the brink of extinction. Presently, the only viable population of the species exists in the Manas Tiger Reserve. The Pygmy Hog Conservation Programme (PHCP) is a collaborative programme with the IUCN/SSC Pigs, Peccaries and Hippos' Specialists Group, Jersey Wildlife Preservation Trust, Forest Department, Government of Assam and the MoEF. The PHCP is a broad-based research and conservation programme and is based in Basistha, Guwahati. This programme is funded by the European Union and the Jersey Wildlife Preservation Trust. One of the main objectives of the Programme is to establish a well-structured conservation breeding project for pygmy hogs, to guard against the possible extinction of the species in the wild as a source of animals for future reintroduction (Narayan 2002). Eventually it is hoped that reintroduction of the captive bred pygmy hogs will take place (Goutam Narayan, personal communication 2003).

f. National Bureau of Fish Genetic Resources (NBFGR) (*see Section 6.1.1.2*) has a mandate that also includes maintenance and conservation of fish germplasm in collaboration with other centers. Some of the major programmes include the genetic characterization of endangered germplasm and commercially important fish species as well as development of gene banking technology (*also relevant to Section 6.1.10.2*) (http://dare.nic.in/nbfgr.htm).

g. There are very few *ex situ* conservation attempts for marine organisms. The few that exist include establishment of aquariums and tissue culture initiatives mainly with some macro-algal and mangrove species, by some national laboratories and university departments.

Table 6.4 State-wise List of Crocodile Rearing and Releasing Sites in India

States	Rearing Centres	Releasing Sites
Andaman Island	Haddo Mini Zoo, Port Blair	Lohabarack Crocodile Sanctuary
Andhra Pradesh	Vishakhapatnam; Warangal; Hyderabad; Nagarjunasagar-Srisailam	Sivaram WLS; Manjira WLS; Pakhal WLS Kinnerasani WLS; Nagarjunasagar-Srisailam WLS
Bihar	Hazaribagh	(Damodar Valley Corporation
Gujarat	Gandhinagar; Sasan Gir	Ranjit Sagar Lake; Sasan Gir WLS Ajawa Sarovar; Karjan Dam; Narmada Dam
Kerala	Neyyar Dam, Perruvanmoozhy	Neyyar WLS; Parambikulam WLS
Madhya Pradesh	Deori (Morena Dist.)	National Chambal WLS; Sivpuri NP Son WLS; Ken WLS; Vanvihar NP (Bhopal)
Maharashtra	Sanjay Gandhi; Tadoba	Gugamal WLS; Melghat TR
Orissa	Satkosia; Nandankanan Dangmal (Bhitarkanika) Ramatirtha (Simlipal)	Satkosia WLS; Baisipalli WLS; Hadgarh WLS; Bhitarkanika WLS; Simlipal TR; Chandaka WLS
Rajasthan	Kota	National Chambal WLS; Vanvihar WLS Ranthambhor TR; Jawahar Sagar WLS
Tamil Nadu	Hoganekkal; Amaravati ; Sathanur Mudumalai; Chennai	Krishnagiri Reservoir; Hoganekkal Falls; Sathanur Reservoir; Amaravati Reservoir; Mudumalai WLS; Kalakad-Mundanthurai WLS (Papanasam); Annamalai WLS
Uttar Pradesh	Katarniyaghat; Lucknow	Ganga River; Corbett NP; Dudhwa NP; Sarda River; Katerniyaghat WLS; Rapti River; Gharga River; National Chambal WLS; Batwa River; Pinahat Ghat
West Bengal	Bhagabatpur	Sundarban TR; Sajnakhali WLS; Gorumara NP

Source: Singh 1999b

WLL - Wildlife Sanctuary; NP - National Park; TR - Tiger Reserve

Box 6.29 Germplasm Facilities

Recognising the need for sophisticated facilities for research and development and providing services, the following germplasm facilities have been set up:

- The National Facility for Microbial Type Culture Collection at the Institute of Microbial Technology, Chandigarh, with over 1,600 cultures in its stock.
- The National Facility on Blue Green Algal Collection at the Indian Agriculture Research Institute, with over 500 strains and several pure cultures as well as soil-based cultures, which have been supplied to farmers for production of biofertilisers.
- The National Facility for Marine Cyanobacteria at the Bharatidasan University, Tiruchirapalli, which is coordinating extensive surveys on the southern coast.
- The National Facility for Plant Tissue Culture Repository at NBPGR (National Bureau of Plant Genetic Resources), New Delhi, which has undertaken *in vitro* conservation of germplasm (seed, pollen *in vitro* culture) over the medium- and long-term, particularly for those species for which conventional methods are inadequate. It has 650 accessions of crop species and employs molecular methods of characterisation and classification.
- The National Facility for Laboratory Animals at the Central Drug Research Institute, Lucknow, and the National Institute of Nutrition, Hyderabad, which have made available quality animals for biomedical research and industry in the country.
- The National Facility for Animal Tissue and Cell Culture, Pune, an autonomous institution under Department of Biotechnology (DBT) with 1127 stock cultures comprising 594 different cell strains. The facility has supplied 401 culture

consignments to 84 institutions throughout the country. It also has 50 vectors, plasmids and genomic libraries.

- Three National Gene Banks for Medicinal and Aromatic Plants at the Central Institute of Medicinal and Aromatic Plants, Lucknow, and the NBPGR, New Delhi, both for the northern region; and the Tropical Botanical Garden and Research Institute, Trivandrum, for peninsular India; to conserve important species of proven medicinal value, which are categorised as endangered, threatened or rare, are used extensively in traditional systems of medicine, are difficult to propagate, have significance for R&D for the future, and are of commercial value. India is the regional coordinator for Asia and also the overall coordinator for the establishment of Gene Banks of Medicinal and Aromatic Plants among G-15 countries.
- The Centre for Cellular and Molecular Biology, undertaking the development and maintenance of DNA profiles (MoEF 2001a).

In addition to the above-mentioned major centers, some other institutes with microbial collections are: Department of Microbiology, Bose Research Institute, Calcutta; Collection of Insect pathogens, Department of Entomology, North Marathwada University, Jalgaon; Division of Standardization, Indian Veterinary Research Institute, Izatnagar; Defence Research and Development Organization, Kanpur; Mycology Herbarium, Department of Botany, Delhi University, Delhi; Forest Research Institute, Dehradun; Department of Microbiology, Mahatma Phule Agricultural University, Pune; National Dairy Research Institute, Karnal; Microbial and Cell Biology Laboratory, Indian Institute of Science, Bangalore; Department of Chemical Technology, University of Bombay, Matunga, Mumbai; Vallabh Bhai Patel Chest Institute, Delhi; Central Food Technology Research Institute, Mysore; Hindustan Antibiotics Ltd., Pune; Indian Drugs and Pharmaceuticals Ltd.; ICRISAT, Hyderabad; Indian Institute of Technology, Delhi; Department of Microbiology, University of Delhi, South Campus; Department of Microbiology, G.B. Pant University of Agriculture and Technology, Pantnagar; Central Research Institute, Kasauli; Tata Energy Research Institute, New Delhi; Department of Biotechnology, Thapar Institute of Engineering and Technology, Patiala.; and industrial houses like Biocon, Sarabhai, Sandoz, Thermis Wockhardt, Spic and Hoechst.

h. The Government of India started the Crocodile Breeding and Management project in 1976 to save the three endangered crocodilian species, the freshwater crocodile, saltwater crocodile and the *gharial* (*see Section 6.1.2.2*) (MoEF 2001a). Apart from the breeding of a large number of crocodiles, the project has made several other significant contributions such as creation of important wetland sanctuaries, with crocodilians as flag species; and management of species other than the crocodilians, including mangrove flora, marine turtles, freshwater turtles, monitor lizards, Gangetic dolphins, otters and some other reptilian fauna.

NGOs:

a. The Madras Crocodile Bank (MCBT) is a non-profit registered trust formed in 1976. It was the first crocodile breeding centre in Asia. Over the years, over 1500 crocodiles and several hundred eggs have been supplied to various State Forest Departments for stocking programmes, and setting-up of breeding facilities. The Trust facilitates many activities related to herpetofauna research and conservation. The campus near Chennai houses over 3,000 reptiles and this serves the purpose of a large outdoor laboratory. The Crocodile Bank functioned as the regional source of status information for the World Conservation Monitoring Center. The

Box 6.30 Indian Crocodile Action Plans

The Centre for Herpetology, Madras Crocodile Bank has been centrally involved in the preparation of two **Indian Crocodile Action Plans**, in coordination with the IUCN **Crocodile Specialist Group** and Indian crocodile researchers. The main purpose of the first of these action plans is: to carry out research on the priority areas identified in the action plan; publicity and awareness on the usefulness of crocodiles, especially with people living in and around crocodile habitats; skill development and training of the forest department and wildlife cadre; regional interaction on crocodile conservation and fund raising.

Another action plan highlights the need for the revival of the MoEF technical committee for crocodiles, initiation of countrywide surveys, establishment of commercial captive breeding with a portion of the revenue going for crocodile conservation; review of the laws on making two species of crocodile available for trade; commencement of commercial farming and ranching; development of an industry and marketing system; initiation of international cooperation with Nepal and Bangladesh for crocodile management; maintenance of select groups of captive genetic stock and the encouragement of additional expertise (MCBT and CSG 1993).

Bank centre has hosted many national and international meetings related to reptile research and conservation. The MCBT also brings out *Hamadryad*, the Journal of the Centre for Herpetology. Research carried out within the MCBT has resulted in over 100 publications. In 1992, a new division of MCBT, the Andaman and Nicobar Islands Environmental Team (ANET), was constituted. This division was set up in South Andamans to carry out herpetological and other ecological studies in the islands (ANET 1993).

b. The Chennai Snake Park (Madras Snake Park) was set up in 1972, and received statutory recognition from the Central Zoo Authority in 1995. The Snake Park houses 31 species of Indian snakes, all three species of Indian crocodiles, four species of exotic crocodiles, three species of Indian turtles/tortoise and five species of lizards. The Park has a museum of preserved specimens of reptiles and amphibians, as also an information library on reptiles. The aims and objectives of the Park Trust are to 'maintain and display a captive collection of snakes and other reptiles as a means of education to the public; undertake captive breeding of vulnerable species; promote knowledge on snakes, other reptiles and amphibians to dispel the erroneous beliefs about them; aid and assist research; maintain a museum of collections to provide facilities for identification and classification; maintain a library of books and other related literature; publish scientific and semi-scientific literature; undertake a survey on the distribution and status; provide consultancy services; and provide a common forum for interaction among amateur scientists and friends of reptiles and amphibians' (http://www.tamilnaduscientists.com/SnakePark/snakepark1.html).

c. Eighteen NGOs from southern India coordinated by FRLHT (*see Section 6.1.1.2*) (www.frlht-india.org/es.htm) have established 18 Medicinal Plants Conservation Parks (MPCP), scattered over Karnataka, Kerala and Tamil Nadu states. Altogether, they have raised 1438 medicinal plant species including 78 red-listed species, and have raised and distributed over 2,000,000 saplings of over 350 species. Majority of these comprised 15-20 important plants for domestic health care, which were distributed at cost basis to nearby households (along with training for simple home remedies using these plants) for use in Kitchen Health Gardens (KHG). This programme initially did not include several red-listed species raised in MPCPs as above, as many of these are trees and require large space and gestation period. However, recently the KHG programme is beginning to include a few red-listed herbs, shrubs and climber species such as serpentine (*Rauvolfia serpentina*) and Glory lily (*Gloriosa superba*) (Ghate 2002).

Several Universities and other institutions also maintain botanical gardens all over the country. The Punjabi University, for example, has a botanical garden attached to the Department of Botany, which is spread over 12 hectares of land. The garden includes 450 species of trees, shrubs, and climbers from various parts of the country. The garden also has several houses with succulents, ferns and other shade-loving plants. There is also a rosarium and a desert garden (http://www.universitypunjabi.org/pages/teaching/teaching3.html#Anchor-BOTANICAL-44867).

Communities:

a. Home gardens (*see Section 4.1.4*), are mixed-farming systems comprising seasonal and perennial crops, plants and trees, and harbouring a variety of animals, all sustained in the land surrounding a house. In many regions, home gardens have traditionally been developed and sustained by farmers. This is primarily because of the fact that these were then the most beneficial forms of cultivation or land use, given the constraints and opportunities encountered by them. Many medicinal plants are grown in these gardens (*Biodiversity in Home Gardens Sub-thematic Review*).

6.1.3.3 Major Gaps

Key gaps including those identified in the National Policy and Macro Level Action Strategy on Biodiversity (MoEF 1999b) include the following:

i. Although some initiatives have been taken up by DBT and MoEF, the information about microbial diversity is highly limited and scattered with little build up of appropriate network, because of which the exploratory investigation carried out in various colleges/universities are never properly documented, and the cultures

not deposited in the culture collection. The large gene pool of various groups of micro-organisms held by such centers is lost because of the lack of support and continuity.

ii. *Ex situ* conservation of micro-organisms involves their isolation and maintenance in a germplasm collection. However, more than 90% of microorganisms remain uncultured, and therefore maintenance in germplasm also becomes a very limited exercise. The prevalence of so many uncultured species in nature clearly indicates the gaps in present understanding of the nutritional requirements and available technologies for cultivation of micro-organisms. Development of gene sequencing and molecular phylogenitors has to a large extent helped in identification of uncultured micro-organisms but it is not possible to conserve them till the appropriate methods of cultivation are developed (*also relevant to Section 6.1.2.3*).

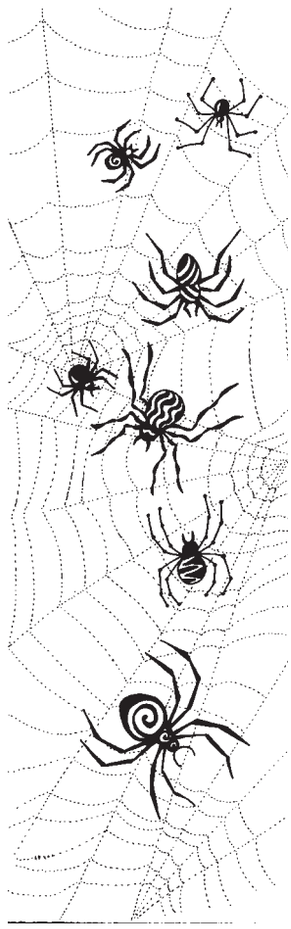
iii. Facilities for the *ex situ* conservation of biodiversity are limited and inadequate for the range of biodiversity that needs to be conserved.

iv. Many of the *ex situ* centers are involved in conservation activities in an implicit rather than explicit way. Their role has been primarily limited to recreation rather than conservation. There is a lack of overall vision and direction linking *ex situ* to *in situ* conservation including systematic planning on captive breeding for reintroduction into the wild.

v. There is a lack of a central database with full information on all zoological parks and botanical gardens, especially on pedigree lines, genealogies, exchanges etc.

vi. There is inadequate exchange of information and experiences amongst and between zoological parks and botanical gardens.

vii. Lack of financial, technical and legal support for non-governmental and community efforts handicaps the efforts.



6.1.4 Wild Biodiversity: Sustainable Use

6.1.4.1 Overall Concept

Almost all the ecosystems, and a great proportion of species in India, are under some form of human use. While in the past a number of factors including traditional restraints and customary practices, low population, and lifestyles that were not resource-intensive contributed to the sustainability of this use, today's levels of utilisation are very often well beyond the capacity of the ecosystem or species to recuperate. Reaching sustainable levels of use is therefore a critical goal.

Despite the fact that the concept of sustainability is a well-established principle of management, its practice often poses problems. At one level, the question is simple: will the ecosystem or species being used be able to remain in or return to its original form or numbers, after use? At a deeper level, the question is more complicated: will the ecosystem or species not only return to its original form and numbers, but will it also retain the internal diversity and the relations with the rest of nature, after use? Will all the other elements of diversity that are dependent on the ecosystem or species in question, be able to continue meeting these needs from this resource?

The Convention on Biological Diversity defines sustainable use as 'the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations.'

In the absence of a clear national understanding on this issue, what is used below are thumb-rule measures such as whether the overall coverage of an ecosystem remains, or whether the overall numbers of a species remain at a viable level. It is quite clear that even using these somewhat simplistic parameters, resource uses in India are often well above sustainable levels.

Many of the initiatives described in *Sections 6.1.1.2* and *6.1.2.2* are closely associated with sustainable use of biological resources. A few others are mentioned below.

6.1.4.2 Current and Past Initiatives

Government

a. Joint Forest Management (JFM) (*see Section 6.1.5.2*): Beginning in the 1980s as scattered initiatives by some forest officials, and since 1990 transformed into a national programme, Joint Forest Management (JFM) is an ambitious government attempt at regenerating and sustainably using forests. It was launched by MoEF's circular of June 1, 1990 to all states and union territories providing guidelines for the '*Involvement of Village Communities and Voluntary Agencies in the Regeneration of Degraded Forests*' (GoI, 1990). Almost all the JFM orders in various states allow a 100% share for members of the Forest Protection Committees in the flow of usufructs (NTFP and fuelwood and small timber except reserved items) from the protected forest areas. NTFP flow thus provides a significant incentive to communities for the protection of their respective forest areas. Though the initial thrust of JFM was towards timber production, both communities and forest officials are realising that NTFP use is far more sustainable and beneficial. However it must be realised that inappropriate harvesting practices will eventually destroy the resource base. Regular monitoring and surveys are required to ensure sustainable extraction. The February 2000 Guidelines (*see Section 6.1.5.2*) therefore asked states to shift the focus from timber to NTFP. It also suggested that JFM be extended to standing or well-stocked forests, not only to degraded areas as was the case till now. It therefore opens up the potential for sustainable, participatory management of all forests other than PAs.

   As part of the JFM initiatives, states like Gujarat, Haryana and Punjab have banned grazing completely; other

Table 6.5: Status of JFM (as on March 1, 2002)

S. No.	States	Area under JFM (sq km)	No of Forest Protection Committees
1.	Andhra Pradesh	17,675.70	6,816
2.	Arunachal Pradesh	58.1	13
3.	Assam	69.7	245
4.	Bihar	741.4	296
5.	Chhattisgarh	28,382.55	6,412
6.	Goa	130	26
7.	Gujarat	1,775.00	1,340
8.	Haryana	658.52	471
9.	Himachal Pradesh	1,112.47	914
10.	Jammu & Kashmir	795.46	1,895
11.	Jharkhand	4,304.63	1,379
12.	Karnataka	1,850.00	2,620
13.	Kerala	49.95	32
14.	Madhya Pradesh	43,000.00	10,443
15.	Maharashtra	6,866.88	2,153
16.	Manipur	5,072.92	82
17.	Mizoram	127.4	129
18.	Nagaland	1,500.00	55
19.	Orissa	7,834.67	12,317
20.	Punjab	735.6	184
21.	Rajasthan	3,093.36	3,042
22.	Sikkim	6	158
23.	Tamil Nadu	3,733.89	999

S. No.	States	Area under JFM (sq km)	No of Forest Protection Committees
24.	Tripura	319.89	180
25.	Uttar Pradesh	507.03	540
26.	Uttaranchal	6,066.08	7,435
27.	West Bengal	4,880.95	3,545
	Total	**142,334.45**	**63,721**

(Source: RUPFOR 2002, Sharma,. 2002)

Box 6.31 Positive Impacts of JFM

There have been several impacts of the JFM programme, some of which are:

1. Improved condition of Forests: The successful implementation of JFM has contributed to the increased overall forest cover by 3,896 sq kms and dense forest cover by 10,098 sq km. In many areas under JFM there has been a decline in incidents of illicit felling. In Rajasthan, contrary to past experience, people have not resorted to tree felling in JFM areas even during droughts. An Andhra Pradesh Forest Department study shows that between 1996 and 1999, the dense and open forest covers increased by 18 and 22 percent respectively. This increase is primarily attributed to the introduction of JFM.
2. Increase in Income: The income of many participating JFM communities has increased during the course of this programme, as a result of employment through micro-planning, sale of non-timber forest products, share in the final harvest etc. As stated in RUPFOR (2002), 'Income generation through JFM:
   - 21.58 million person days of employment were generated in just six states in 2000-01; 40 million persondays of employment were created through JFM under the Andhra Pradesh Forestry project (1994-2000)
   - Rs 1 million (US $ 21,000) was spent on each micro-plan under the Maharashtra Forestry Project
   - Irrigation facilities developed under JFM in Harda, Madhya Pradesh, have increased crop yields by two to five times
   - Milk production up from 40,000 to 200,000 litres per year in Nisana village, Vyara, Gujarat, due to better fodder availability after initiation of JFM
   - In four states, FPCs received around Rs 62.59 million (US $ 13 million) through benefit-sharing mechanisms during 2000-01. In West Bengal, it is estimated that on an average each FPC has received about Rs 70,000 (US $ 1,500) as share in timber revenue.
   - At the end of 2000-2001, total community funds under JFM were Rs 557.09 million (US $ 11.6 million) in seven states.'
3. Reduction in Encroachments: In several places, illegal encroachment has been curbed due to the introduction of JFM. In Andhra Pradesh, for example, almost 12% of encroached forest land (38,158 ha) has reportedly been freed with the initiation of the JFM programme.
4. Involvement of NGOs: There has been an increase in the number of NGOs involved in the forestry sector, with the initiation of JFM. A survey of six states reveals that 1,061 NGOs are actively engaged in JFM-related activities.
5. Change in Attitude: One of the most positive outcomes of JFM has been the change in attitude of local communities and forest officials towards each other. Many traditional forest practices have been revived. The large number of training and orientation programmes carried out throughout the country have been instrumental in brining about this change in attitude (RUPFOR 2002).

A National Support Group (NSG) of JFM was also set up by the Society for Promotion of Wastelands Development (SPWD) to facilitate the collection of information related to JFM in different parts of the country. The NSG in turn formed four sub-networks to deliberate on the issues of: a) Gender, b) Equity, c) Training, and d) Ecology and Economics. The sub-networks consisted of several NGOs, research and academic organizations (Ravindranath *et. al*., 2000).

(see also Section 6.1.5.2.)

States have allowed for rotational grazing. These practices have helped the regeneration and survival of vegetation in forests, and in increasing supply of fodder grasses (http://envfor.delhi.nic.in/divisions/ for-prt/jfm/html/eval.htm).

b. Greening India (Centrally Sponsored Scheme): The scheme 'Greening India' has been launched with a view to achieving the goal of bringing 33% of the country's land area under forest/tree cover, as set out in the National Forest Policy (NFP) 1988. Towards this, it is intended to institutionalize mass production of good quality planting material (QPM) that would meet the economic and environmental requirements. State Forest departments (SFDs) would set up hi-tech nurseries, to serve as source of quality genetic material for satellite nurseries which shall be set up in each district. A network of satellite nurseries capable of producing large quantities of planting material, spread throughout the length and breadth of the country, is considered necessary to cover 25-30 million ha of non-forest land in the next 15 years.

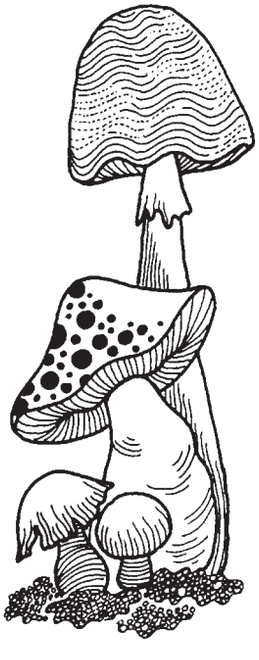
c. The National Medicinal Plants Board seeks to support short-term result oriented project proposals in designated areas (Shreshth and Kamath 2002). These include:

I. Promotional schemes:

- Research & Development in medicinal plants sector including drug-testing labs for validation and certification of farmers produce:
- *In situ* conservation and *ex situ* cultivation of medicinal plants for restricted sustainable harvesting
- Production of quality planting material
- Extension activities
- Marketing information service on medicinal plants to the domestic and global market

II. Commercial schemes:

- Ensure supply of quality planting material in bulk to the farmers by way of appropriate technology, viz. vegetative propagation, tissue culture etc
- Production of medicinal plants in bulk as per demand and supply position of most-preferred species.
- Area expansion for selected species in the specific agro-climatic zones
- Develop proper harvesting techniques
- Semi-processing of produces viz. collection, grading, drying, packing etc.
- Develop innovative marketing mechanism



III. Other activities:

- Promoting cooperative efforts among growers and collectors of medicinal plants through NGOs, Federations, Pharmaceuticals, and Cooperatives Societies etc.
- Improving availability of medicinal plants by establishing herbal gardens as demonstration plots. Plantation of trees and other species of medicinal plants with long gestation period.
- Securing better economic returns to the growers of medicinal plants through market interventions.
- Value addition of products by encouraging small, medium and large-scale industries utilising medicinal plants.
- Gathering information and developing multimedia database related to medicinal plants.
- Undertaking, assisting or encouraging scientific technological and economic research.
- Value addition, semi processing of produce of medicinal plants cultivated under Vanaspati Van schemes and other agencies.

The Board has sanctioned 145 projects during 2001-2002 for overall development of medicinal plants, which include 59 for *in situ* and *ex situ* conservation, 25 extension activities, 36 research and development initiatives and 17 demonstration/herbal gardens.

The projects are planned to be entrusted to State Medicinal Plants Boards (SMPBs), ICAR, ICFRE, CSIR institutes, State Governments, Agriculture and other Universities, public and quasi-public, Development

Corporations and other organisations.

d. National Afforestation and Eco-Development Board (NAEB) (see Section 6.1.1.2): NAEB's Scheme on Non-Timber Forest Produce including Medicinal Plants, is a Centrally-Sponsored Scheme started in 1988-89 (Seventh Plan). The scheme provides 100% central assistance to the States for Cultivation of medicinal plants to augment the rising demand for plant-based drugs and to offset the scarcity because of unscientific exploitation.

e. People's Protected Areas: An initiative in the states of Madhya Pradesh and Chhattisgarh, this focuses on sustainable harvesting of NTFPs from biodiverse reserve forests and corresponding support to tribal and rural livelihoods. The programme also has an *ex situ* component that envisages raising of multi-layered plantations with cultivation of medicinal herbs as intercrops. There is a strong focus on processing and marketing of medicinal plants. The programme lays emphasis on baseline documentation and regular monitoring of biodiversity, including the sustainability of the NTFP harvest from the forest area included in the PPA. Poverty alleviation, through a framework of converting forest produce into assets for poor people, is one key aspect of PPAs (*Chhatisgarh State BSAP*). There are 32 PPAs in Chhattisgarh (R.C. Sharma, personal communication 2003) and 12 in Madhya Pradesh (BMS Rathore, personal communication 2003)

f. The Chhattisgarh Forest Department has undertaken an initiative for certification of Non-Wood Forest Produce, with the prerequisites of community controlled resources, organic production, traceability/chain of custody, benefit sharing mechanisms, non-destructive harvesting, value addition, socio-cultural matrix, green marketing, and quality control mechanisms (Chhattisgarh Forest Department 2003b).

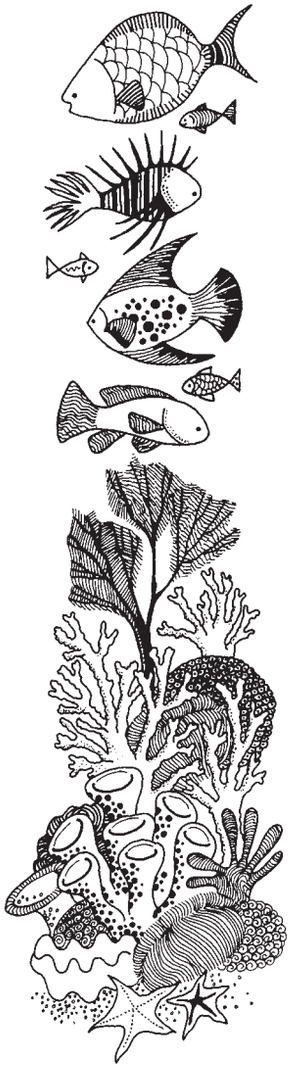
g. The Lok Vaniki scheme in Madhya Pradesh proposes that private woodlots of the thousands of farmers in the state (which have practically become a liability to the owner), degrading rapidly due to lack of any incentive or a proper system of management, are properly managed in accordance with a working plan prepared on scientific lines. The major thrust is not only on 'handing back' to the people the management of their own forests, for economic and environmental benefits, by 'unlocking' the neglected and degrading forests on private holdings but also to promote a 'culture of tree cultivation' as a regular source of earning for land owners.

   In order to facilitate preparation of management plans a new profession of 'Chartered Foresters' has been conceived. Similarly to cope with technical and market-related problems of private forestry, farmers have been encouraged to organize themselves under '*Lok Vaniki Kisan Sangh*'. A suitable policy and legal framework to facilitate scientific management of private forests has been provided by enacting the Lok Vaniki Act, 2000, and the Lok Vaniki Rules, 2002. The Government is also supporting a capacity-building programme by financing various study tours, workshops and training programmes for farmers as well as foresters. Arrangement for supply of improved planting stock on demand has also been made, from high-tech nurseries of the forest department.

h. The Tribal Cooperative Marketing Development Federation (TRIFED) was set up in 1987 by the Government of India as a cooperative society. The objectives of TRIFED include full utilization of natural products from tribal areas by marketing; securing higher earnings and generating employment opportunities for tribal people; creating of awareness of the interplay of market forces among tribals to enable them to optimise their incomes; providing assured markets and remunerative prices for tribal produce and also to undertake price support operations wherever and whenever required; lending marketing and financial support to state-level tribal and forest organisations; quality upgradation of tribal products with a view to maximise unit value realization; export of tribal products and providing a full range of services, including organised collection of tribal produce, scientific exploitation of forest products, storage, transportation, marketing and exports. TRIFED has a number of commercial operations for tribal produce: procurement/purchase, storage, preliminary processing and processing, sales and retail sales through tribal shops, packaging, transportation, insurance, maintenance of quality, training, research and consultancy (http://www.trifed.co.in).

i. Mesh sizes, trawl regulations: Government of India has taken some steps towards ensuring sustainable management of coastal resources. These include introduction of fishing holiday, mesh size regulation, CRZ notification (*see Section 6.1.8.2*), restriction of the capacity (HP) of the mechanized trawlers etc.

The Marine Fishing Regulation Act (MFRA), 1978 states that 3-6 nautical miles from the coastline should be reserved for the operation of traditional fishing. It is only beyond this zone that mechanized fishing should be carried out. The Act prohibits fishing by deep-sea fishing vessels within the terrestrial waters of India. It also directs measures for conservation and sustainable development of marine fisheries within terrestrial waters. This is essentially by restricting the type of fishing, fishing gear or craft, period of fishing, mesh size etc.



In Kerala the Kerala Marine Fisheries Regulation Act, 1980 (and subsequent amendments), puts a number of restrictions on fishing activity. These include a ban on fishing from June-August, limiting the number of trawlers and boats fishing within the state; regulation of mesh size to about 35 mm for cod-end of a trawl net and a ban on trawling during the monsoon months. Similar stipulations are found in some other states (*West Coast Ecoregional BSAP*).

NGOs

a. The M.S. Swaminathan Research Foundation (MSSRF) has ongoing projects on sustainable livelihood options for coastal communities (*see Section 6.1.2.2*). The Bio-Village Programme of the MSSRF was set up in 1991 with support from the United Nations Development Programme (UNDP). This was initiated in 19 villages in Pondicherry to work towards livelihood security of the poor through use of local resources. Income generation activities included mushroom cultivation, cultivation of fodder grass, dairying, vermiculture and aquaculture. A micro-credit system in all villages, managed primarily by women, provides sustainability to the programme. MSSRF has been helping towards capacity building for these enterprises. It has established a bio-centre to provide training and disseminate relevant information to the villagers. This bio-centre is managed by the villagers themselves (Krishnakumar 2000).

b. Ecotourism initiatives: Simply stated, ecotourism is 'environmentally responsible tourism', which must be: i) environmentally, socially, culturally and economically sustainable; ii) educational, and, iii) locally participatory.

The Biodiversity Conservation Network (*see Section 6.1.1.2*) (BCN), (a USAID-funded project) carried out an ecotourism project in Sikkim from 1995 to 1998. The project attempted to strengthen community-based ecotourism opportunities at two sites – the Yuksam-Dzongri Trekking trail which lies in the buffer zone of the Khangchendzonga National Park; and the Lethang and Cho-jo settlements around Khecheopalri Lake. The project at the Khecheopalri Lake (which has great cultural and religious significance for the Sikkimese Buddhists and is a popular tourist destination), attempted to work with the two settlements around the lake to clean up the area and generate awareness among tourists. It also had a scientific component to monitor the pollution levels in the lake and find ways of mitigating it. The community, has with the help of the project developed a detailed plan outlining the vision for the lake. The initiative at the Yuksam-Dzongri Trekking trail focused on developing local capacity and has given enterprise and conservation training to over 200 people in seven professions associated with ecotourism, ranging from cooks, porters, tour operators and guides to lodge owners. The project also assisted stake-holders in developing and endorsing a Code of Conduct for Ecotourism in Sikkim. An interesting fall-out of this project has been the emergence of a community-based organization called the Khangchendzonga Conservation Committee (KCC), an initiative by the local community. KCC has also coordinated the formulation of the BSAP for the Rathong Chu Sub-state Site of the NBSAP (*Rathong Chu Sub-state Site BSAP*).

The Corbett-Binsar-Nainital (CBN) ecotourism initiative is an effort in landscape-level planning for ecotourism. The CBN Ecotourism Initiative focuses on the Corbett National Park, Binsar Wildlife Sanctuary and Nainital Hill Station, all in the state of Uttaranchal, covering an area of around 8,000 sq kms. This is a joint venture between several organizations ranging from LEAD Fellows, the Wildlife Institute of India, The Mountain Institute, The Corbett Foundation, Rainbow Friends of Nature and Environment to Wildrift and Mahila Haat.

The initiative was designed to develop a framework for conservation and tourism by making use of multi-stakeholder and participatory processes. The CBN circuit, once developed as an ecotourism destination, could become a hub for ecotourism in Uttaranchal and stimulate ecotourism development in other parts of the province. The objective was to develop a framework for conservation and tourism in the Corbett-Binsar-Nainital region. Additionally, there are plans to develop 4 villages that can serve as models for community-based tourism. The process was initiated with a week-long workshop to develop planning skills, identify partners and seek commitments for various activities. Subsequently, a consultation methodology was designed with inputs from partners. The consultation methodology was used to conduct 21 one-day consultations with various stakeholder groups. These included villagers, officials of the Forest and the Tourism Department, tourism businesses (resort owners, tour operators, nature guides, Boat Association, taxi drivers etc.), NGOs, local institutions and townships. The consultations lead to the identification of assets, vision/objectives, limitations/obstacles and broad strategies and groups of activities. Representatives from the consultations were invited to a multi-stakeholder workshop. A planning session with partners has been held to develop the framework and research activities were conducted to obtain visitor viewpoint and additional information (Rajiv Bhartari, personal communication 2003).

c. In the Biligiri Rangaswamy Temple Sanctuary (*see Box 6.11*), the BCN project focused on the sustainable extraction and local processing of three forest products – *Amla* or Gooseberry (*Emblica officinalis*), wild honey and some Ayurvedic preparations from select medicinal plants – through processing and improved marketing. The project has raised the income levels of the *Soligas* as also provided them an economic incentive to conserve the region's biodiversity. The biological sustainability of each of these products has been examined and data pertaining to sustainable harvest rates for amla and some of the other NTFP has been generated.

d. EcoCraft was an experiment in environment education, carried out in a few schools in Mulshi taluka, Pune district and Kashele village, Raigad district, in Maharashtra. It was taken up by Centre for Environment Education, in association with the Academy of Development Sciences and the Bharati Vidyapeeth Institute of Environment Education and Research. Working with their teachers, students identified specific crafts and artifacts in their area, which depend on local natural resources as raw material. The students worked with local artisans to understand how the artifact is made. They were encouraged to themselves learn the processes and skills involved in the craft, and to make small models of the artifact they studied. They also explored to some extent the raw materials used, the status of these resources, and whether the artisans had anything to say about the supply of raw material over the last few years. In sum, the teachers and the students used local craft traditions as a learning resource. Some of the artifacts that students studied in Kashele included the plough, the *irla* (raincoat made of bamboo and teak leaves), and mot (a leather pouch to draw water from a well) (CEE 2003).

e. The Himalayan Environmental Studies and Conservation Organisation (HESCO) in Uttaranchal was formed in 1980-81 and registered in 1983. The organisation's main aim is to develop technologies to benefit common people. One major thrust is biomass utilisation. A key species of focus is *Lantana camara*, a weed which has overrun the lower Himalayan mountain slopes. HESCO decided to try and find uses for this weed. It was found that its branches were strong enough for furniture, the leaves could be used as fodder for goats, and the flowers and leaves could be used to make incense sticks and scented candles. Youth and women are now trained at HESCO in the manufacture of items made out of *Lantana*. The organization also helps them market these products. As a result of HESCO's efforts in starting varied developmental programmes, particularly for women, the Union Department of Science and Technology has established one of the country's four Women Technology Parks under HESCO at village Mehuwala. This center, besides working with at least 35 species of fibre-yielding plants, also offers training programmes in local food processing. The organisation proposes to focus work on the *gharat* (traditional watermills) used to grind grain. According to the founder of HESCO, "With technological upgradation, they can add 2,500 MW to the national power grid at no cost and each power-generating *gharat* can provide employment to four persons each in 500 thousand families' (Pushkarna 2002).

f. At the request of the National Wastelands Development Board, the National Dairy Development Board (NDDB) set up the Tree Growers Cooperative Pilot Project in 1986. The National Tree Growers Cooperative

Federation (NTGCF), was registered as an apex national-level multi-state cooperative society in 1988. NTGCF's mandate was to work with tree growers' cooperatives. However over the years the need to work with multiple institutions was felt. Keeping this in mind, the Foundation for Ecological Security (FES) was formed in March 2001, while NTGCF continued to work with cooperatives. The work of FES includes providing technical and financial assistance to village institutions like Tree Growers Cooperatives, Watershed Committees, Van Panchayats, *Gramya Jungle* Committees, Joint Forest Management Committees and Sub-Committees of village Panchayats in different states. It also facilitates the strengthening of village institutions and assists local communities to take up soil and water conservation activities, as well as work on revegetation and protection measures (http://www.nddb.org/institutions/fes.html).

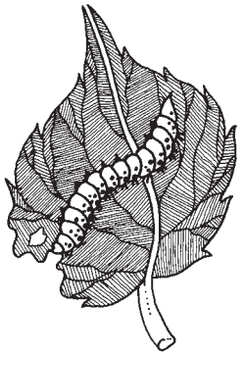
g. Covenant Centre for Development (CCD), a Madurai-based NGO has promoted a Community Enterprise Forum of India (CEFI, www30.brinkster.com/cefi) in collaboration with over 90 NGOs and Community-Based Organisations (CBOs) in India, including Ekta Parishad of Madhya Pradesh, with the support of ATREE (www.atree.org).

Box 6.32 Tassar Silk and Honey in Garhwal Himalayas

A Biodiversity Conservation Network (*see Section 6.1.1.2*) project on silk and honey was supported in the Garhwal Himalaya in the state of Uttaranchal. It focused its work on three catchments. The project area lies in what is known as the 'oak belt', which is extremely important, and also under severe threat throughout the Western Himalayan Range. This project is designed to promote an enterprise-based approach to conservation. The enterprises focused on oak tassar-based sericulture and village-based bee keeping/honey production. The silk worms are reared on oak leaves, which are sustainably harvested from surrounding oak forests. A company called Chamoli Tassar Udyog Pvt. Ltd has been set up to coordinate sericulture operations, facilitate sale of silk and ensure equitable distribution of returns from the enterprise. By 1998 Chamoli Tassar Pvt. Ltd. had been able to achieve complete self-sufficiency in silkworm seeds (eggs). The surplus is utilized for spinning and reeling into yarn. Silk spinning was initiated for the first time in 1998. Training in reeling also began at the same time. Many families are involved in this exercise now. The Tassar silk from oak is being woven and sold to the retail market. For honey production, a company called Dev Bhumi Madhu Udyog Pvt Ltd was established. By 1998 test marketing of honey was carried out on the major pilgrim routes. The locally processed honey has acquired 'Agmark' certification and is sold in the market under its own brand name – Dev Bhumi Madhu. A processing unit has since been leased for the processing of honey (Bhatt 1998).

Communities:

a. Many communities have traditionally had customary rules and practices for ensuring sustainability of resource uses. Gadgil and Guha (1992) list the following prescriptions:
   - Provide complete protection to certain habitat patches which represent different ecosystems so that resource populations are always maintained above a certain threshold.
   - Provide complete protection to certain selected species so that community-level interactions are minimally disrupted.
   - Protect such life history stages as appear critical to the maintenance of resource population.
   - Provide complete protection to resource populations at certain times of the year.
   - Organise resource use in such a way that only relatively small groups of people control or have access to a particular resource population.



b. In more recent initiatives, several communities have attempted to explicitly address the issue of sustainability. For instance:
   - The Panikka community who live on the borders of Madhya Pradesh and Orissa provide 'traditional *aal* (*Morinda tinctoria*)-dyed *gamchas*, waist-cloths and *sarees* to the different tribal communities of Bastar, Jagdalpur and of Orissa itself. The bark of the secondary roots of the tree is extracted by the Indrawati forest dwellers, bought from them and sold to the local dyeing community by local dalit traders, a fine example of the cooperative chains of interactions between forest harvesters, traders and users, that have

through judicious usage been the beneficiaries as well as guardians of the local forests' (*Natural Dyes Sub-thematic Review*).

- The villagers of Mendha (Lekha) in Maharashtra have been collecting honey through a 'non-violent' methodology. The idea is to extract honey without destroying the honeycomb. Prior to practical use of this methodology, a *Madhumakhi Abhyas Gat* (Honey Bee Study Circle) was established and members were given special gear to wear at the time of extraction. Behavioural studies on the bees were undertaken. The villagers decided that extraction would be done only in the dark, when the bees are least active. Also only the part of the comb containing honey would be extracted. Following this exercise, the villagers noticed that bees could restore the honey quickly as the entire comb was not destroyed. The number of combs found in the area also significantly increased. With the help of a NGO from Wardha called *Dharamitra*, the honey is being marketed as *Ahimsak* (non-violent) honey, and has generated substantial economic benefit. The villagers are now trying to spread this effort to other interested villages around them (Pathak and Gour-Broome 2001; *Vidarbha Sub-state Site BSAP*).
- A community-owned enterprise 'Gram Mooligai Company Limited' (GMCL), with marginal farmers and women self-help groups as shareholders, has been initiated in Tamil Nadu, Karnataka and Maharashtra to promote livelihoods based on the sustainable use of medicinal plants which are collected and cultivated by them. GMCL (www.village-herbs.com) markets about 15-20 species of medicinal plants highly valued in the Madurai market. These plants are collected by Village Women Sanghas from non-forest areas such as agricultural fallow lands, wastelands, roadside etc., from over 50 villages spread over 4 districts in Tamil Nadu. These women are being consulted by GMCL and FRLHT (*see Sections 6.1.1.2 and 6.1.3.2*) staff through participatory discussions about sustainable harvesting techniques. These include collecting only the ripe plants or their parts, collecting fruits only after seeding is over, leaving small portions of plant population unharvested for regeneration, minimizing wastage in harvest, transport and storage etc. (Ghate 2002). GMCL turnover was close to Rs 6 million in 2002-03, and is expected to touch Rs 10 million next year.
- As part of the Nahin Kalan BSAP process, an exercise to identify certain sustainable use principles for the area was undertaken by the villagers. Based on traditional practices and local knowledge a few simple and important principles of what not to do when out gathering fodder were put together in the local Garhwali dialect. The three principles are:
  - *Choti Na Kata* (Don't cut the tree tops): It is a strong traditional belief that the top/tip of the tree must not be cut, as this harms and may even kill the tree. Also, seeds form only on uncut branches and a shortage of seeds is one of the reasons for the lack of regeneration of trees.
  - *Mota Phanga Na Kata* (Don't cut big branches of trees): This too damages and harms the tree and can even kill them.
  - *Chhote*, *Bachhe Perh Na Kata* (Don't cut small trees): There are very few new, young trees in the forest (*Nahin Kalan Sub-state Site BSAP*)

Box 6.33 The Nanda Devi Biodiversity Conservation and Ecotourism Declaration

(October 14, 2001, Gram Sabha Lata, Chamoli, Uttaranchal)

Today on the 14th of October, 2001, in the courtyard of the temple of our revered Nanda Devi, we the people's representatives, social workers and citizens of the Niti valley, after profound deliberations on biodiversity conservation and tourism, while confirming our commitment to community based management processes dedicate ourselves to the following:

1. That we, in accordance with the resolutions adopted by the World Tourism Organisation's Manila Declaration 1997 on the Social Impact of Tourism will lay the foundation for community-based tourism development in our region.
2. That in our region we will develop a tourism industry free from monopolies and will ensure equity in the tourism business.
3. With the cessation of all forms of exploitation like the exploitation of porters and child labour in the tourism industry, we will ensure a positive impact of tourism on the biodiversity of our region and the enhancement of the quality of life of the local community.
4. That in any tourism related enterprise we will give preference to our unemployed youth and underprivileged families; we will also ensure equal opportunities for disabled persons with special provisions to avail such opportunities.

5. That we will ensure the involvement and consent of the women of our region at all levels of decision-making while developing and implementing conservation and tourism plans.
6. While developing appropriate institutions for the management of community-based conservation and ecotourism in our area we will ensure that tourism will have no negative impact on the biodiversity and culture of our region, and that any anti-social or anti-national activities will have no scope to operate in our region.
7. We will regulate and ensure quality services and safety for tourists, and by developing our own marketing network will eliminate the middlemen and endeavour to reduce the travel costs of the tourist.
8. While developing the tourism infrastructure in our region we will take care of the special needs of senior citizens and disabled persons.
9. As proud citizens of the land of the Chipko movement, we, in the name of Gaura Devi will establish a centre for socio-culture and biodiversity, for the conservation and propagation of our unique culture.
10. We will ensure the exchange and sharing of experiences with communities of other regions to develop ecotourism in accordance with the Manila Declaration of 1997 in those regions.
11. Acknowledging the spirit of Agenda 21 of the Earth Summit, Rio 1992, the Manila Declaration on the Social Impact of Tourism 1997 and the International Year of the Mountains and Ecotourism, 2002, we will strive for biodiversity conservation and an equitable economic development within the framework of the Constitution of the Republic of India.
12. Today on October 14, 2001, in front of our revered Nanda Devi, and drawing inspiration from Chipko's radiant history we dedicate ourselves to the transformation of our region into a global centre for peace, prosperity and biodiversity conservation.'

Source: Tourism and Biodiversity Sub-thematic Review

There are several community conserved areas (*see Section 6.1.2.2*) which have put together a set of rules for the sustainable management of natural resources. Some of them are:

- Restrictions on what kind of and where livestock grazing is allowed;
- Prohibition on felling of live trees, and use of only dead and fallen timber/fuelwood allowed, as followed in Kailadevi Wildlife Sanctuary in Rajasthan and Jardhargaon in Uttaranchal (Kothari *et. al*., 2000)
- Control of forest fires like in the case of Mendha (Lekha) village in Maharashtra (Pathak and Gour-Broome 2001);
- Control on the size of fish and other aquatic produce being caught (*see Box 6.34*);
- Restrictions on the amount and size of non-timber forest produce being collected as practiced in BRT Wildlife Sanctuary, Karnataka and Akash Kamini valley in Uttaranchal (Biodiversity Conservation Network 2000).

Box 6.34 Tawa Reservoir and the Tawa Matsya Sangh

The Tawa reservoir in Madhya Pradesh is a site where the local tribal communities are resisting attempts at commercialization by outsiders, as this would adversely impact their livelihoods. The local people, primarily Gonds and Korkus, were cultivators and seasonal collectors of forest produce who caught fish in order to supplement their diet. After the construction of the dam they took to fishing for survival in the face of little or no rehabilitation after the submergence. They have formed the Tawa Matsya Sangh (TMS) (a fishing cooperative), after a struggle under the leadership of the Kisan Adivasi Sangathan. The Sangh comprises 38 primary cooperatives of tribal persons whose villages were submerged following the construction of the Tawa dam on the Tawa River, a tributary of the Narmada, in 1975. For the first time in Madhya Pradesh, the TMS has attempted to provide an alternative means of livelihood to tribal persons displaced by a dam, which was built as a part of the Narmada Project (Prasad 2001).

'Members of the Tawa cooperative strictly observe the required conservation rules. To spare juvenile fish, nets below a certain mesh size are not permitted. *Catla* fish under two kilos and *Rohu* and *Mrigala* under one kilo are left alone, to ensure that every fish gets at least one opportunity to breed. A "closed season" of two months every year, beginning June 16, is rigorously observed. Teams of fishermen, in boats and jeeps, keep an eye out for any possible violations. Such violations persist in many parts of Madhya Pradesh, often with the open connivance of the police and fisheries staff. The Tawa experiment helps solve the problem of poaching. By forming one primary society in each of the villages surrounding the reservoir, every

possible poacher is offered the opportunity to participate and get a sense of ownership. Members take a collective oath to abide by the rules and to desist from poaching. They also collectively decide on the wage rates for the year; these have been raised to their highest level after making provision for government royalty, fish seed and other expenses' (Sunil 2000).

At the end of 2002, there was news that the State Government was not likely to renew the fishing lease of the Sangh or cooperative. After a stiff resistance, the lease was renewed, but with several conditions. The MP government did not accept any of the demands made by the Tawa Matsya Sangh (e.g. the renewal of the lease for 10 years, reduction in royalty, provision of infrastructural facilities, waiving of registration fee etc.), but has also changed the previous conditions and imposed many new ones (Prasad 2001). The struggle for a just resolution to this is going on.

Box 6.35 Sustainable Tourism in Kumarakom

Kumarakom is a bird sanctuary in Kottayam district, Kerala, and is home to 91 species of local and 50 species of migratory birds. The mangrove forests act as feeding and breeding grounds for many fish species. The Kumarakom *panchayat* owns five large tourist resorts. There are seven smaller resorts and 20 home-stay facilities. The *panchayat* itself earns about Rs 1.2 million per year and claims that tourism industry's revenue is over Rs 300 million. The growth in tourism initially resulted in a significant increase in income for the villagers, as many sold their land to make way for more resorts, and wages were earned through labour at construction sites. However as resorts became functional, regular employees were hired from outside. With increasing tourism pressure, villagers lost their privacy as also their access to many fishing grounds. There was degradation in the mangrove forest areas, thereby affecting fish breeding grounds. Pollution levels in the water bodies rose.

In 1995-96, EQUATIONS, a Bangalore-based NGO started working with the Kumarakom *panchayat* to help towards awareness of tourism in the region. The *panchayat*, having begun to feel the increasing ill effects of tourism, agreed to carry out regular surveys in the area. In the year 2000 EQUATIONS conducted a GIS Mapping exercise in the area. A detailed database on the biophysical and socio-economic status of the *panchayat* was also developed. A study entitled, 'Status Report on Kumarakom and maps on administrative boundary, land use pattern, assets/infrastructure, house distribution, settlement cluster, water resource, tourism infrastructure, facilities in the bird sanctuary of Kumarakom *panchayat*' was carried out and shared with the *panchayat*.

The *panchayat*, backed by the villagers, having realised the adverse impacts of tourism on Kumarakom, requested EQUATIONS for ways to mitigate these impacts. The response of EQUATIONS was to conduct a Technical Session on 29 August 2002 for the *panchayat* members on the powers and functions of the *panchayat* devolved as per the Kerala Panchayat Raj Act, under the broad mandate of the 73rd Amendment of the Constitution which can be used for the proper regulation of tourism. Motivated by the knowledge on the powers and functions of the *panchayat*, the members came up with a People's Charter and Draft Guidelines on Sustainable Tourism for Kumarakom.

The people of Kumarakom have demanded the preparation of a Master Plan for tourism development within the *panchayat*. The Charter has also made regulations on new constructions, tourism activities and utilisation of common resources. The Charter further insists that the tourism industry should ensure direct and indirect employment opportunities for the local people, and contribute to the priority projects for the well-being of the community and conservation of the environment, in the backdrop of overall socio-economic development of the region. There is a major focus on the concepts of social obligations of tourism industry and its corporate accountability. The Charter also demands the creation of an expert committee to look into the conceptualisation, planning, implementation and monitoring of tourism development within the Kumarakom *panchayat*.

The *panchayat* is now planning the creation of a Functional Committee on Tourism as per Section 163 (1) of the Kerala Panchayat Raj Act, which allows the *panchayat* to form functional committees on different subjects (Kumarakom Grama Panchayat 2002; Equations 2001).

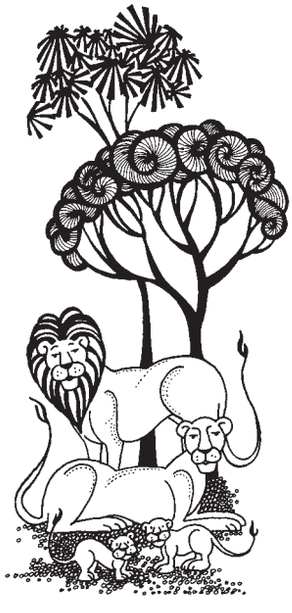
Others:

a. M/s Nanakoo Orchid, in Ziro, Lower Subansiri district, Arunachal Pradesh, is the first private enterprise to venture into orchid farming. This started as a beneficiary under WWF-sponsored project of State Forest Research Institute to cultivate orchid as an alternative source of income, and ensure rehabilitation of waste lands and *jhum* fallows. With this initial support, Nanakoo Orchid started growing *Cymbidium* orchids. With increasing demand for orchids, the company expanded further and is now one of the premier ventures in the region. They have further supported a number of women cooperatives and farmers for growing orchids and other flowers. The effort has yielded valuable results in terms of conservation and germplasm and sustainable utilization. Some of the rare orchids in the state are being grown here (Hegde 2003; Arunachal Pradesh State BSAP).

6.1.4.3 Major Gaps

Major gaps remain, including those adapted from the National Policy and Macro Level Strategy on Biodiversity (MoEF 1999b):

i. There are clear gaps in the conceptual and empirical work on the definition of sustainability.
ii. Assessment (including M&E) of the sustainability of all existing resource uses by communities, industry, urban consumers and others remains extremely weak or even absent in cases.
iii. There are inadequate assessments and feasibility studies of the population and productivity of each species, in both terrestrial and aquatic ecosystems.
iv. There is no comprehensive assessment of the extent and nature of the dependence of people's livelihoods on biological resources, the threats to these livelihoods, and the changes that are taking place.
v. There is limited acknowledgement and recognition of the fact that people dependent on biological resources have traditionally developed their own norms of sustainability. There is also limited understanding or documentation of how and why these norms are eroding.
vi. There are inadequate provisions in programmes, schemes, laws and policies to ensure sustainability in all forms of biological resource use. Integration of the sustainable use concept in all relevant economic sectors such as animal husbandry, fisheries, forestry and industry is lacking.
vii. There are few efforts to explore and promote alternate livelihoods, where existing practices have become unsustainable and/or ecologically destructive practices have been adapted by communities.
viii. There is no analysis or assessment on whether the sustainable use concept can be met through the imposition of disincentives, regulatory systems or positive incentives.
ix. Most urban and many industrial users of bioresources seem unaware of the unsustainability of their consumption.
x. There are only scattered efforts to promote sustainable biodiversity-based enterprises to enhance the livelihoods of local communities dependent on biodiversity. This applies to economically important resources, those used for domestic and survival purposes, and those which are currently undervalued. .
xi. The term 'ecotourism' is most often misinterpreted and conveniently 'misused' by the user groups. The tourism industry at present continues to promote conventional tourism under the garb of ecotourism. This is because there is a lack of a common understanding and acceptance of what the concept means. On the other hand, the potential for genuine, ecologically- and socially-sensitive tourism as a sustainable livelihood option is hardly tapped. The present tourism policy does not directly address issues related to ecotourism.



6.1.5 Wild Biodiversity: Equitable Access, Use and Sharing of Benefits

6.1.5.1 Overall Concept

As mentioned in *Section 5.2*, one of the root causes of biodiversity destruction and the loss of biodiversity-based livelihoods has been a range of inequities in access to decision-making, resource use, and sharing of benefits. This is also within the context of the growing international discussion on access and benefit-sharing (ABS). The Preamble of the Convention on Biological Diversity (CBD) states that the contracting parties recognise 'the close and traditional dependence of many indigenous and local communities embodying traditional lifestyles on biological resources and the desirability of sharing equitably benefits arising from the use of

traditional knowledge, innovations and practices relevant to the conservation of biological diversity and the sustainable use of it's components.'

Article 8 of the CBD also requires equitable sharing of benefits with the holders of traditional knowledge and practices, and this would apply as much within India as outside. There continues to be discussion on the precise definitions of these terms, in particular the term 'equitable'. For the purposes of this action plan, we use a broad concept of equitable access/use and benefit sharing. This includes:

- The right of primary stakeholders such as local communities, who depend on biodiversity, and other direct managers of natural resources to access and protect biological resources and related knowledge essential for ecosystem services and livelihood security; since such access is meaningless without reference to the lands and waters on which these resources exist, this should also include the right to access and protect land and water;
- The right of primary stakeholders, as also the country to which the resources belong, to an equitable share of the benefits being generated from access and use by others; in this case 'equitable' means that which is agreeable to all parties concerned, with special focus on the needs of underprivileged sections such as women, 'lower' castes and classes, and *adivasis*;
- The responsibility of all such stakeholders to ensure the conservation, sustainable use (and further equitable access and benefit-sharing from such use), of these resources, and the perpetuation of related knowledge;
- The need to ensure the protection of traditional/indigenous/community knowledge related to biodiversity, and in particular to ensure that intellectual property regimes respect the rights of communities and individuals within communities to control such knowledge, and their rights to an equitable share of benefits being generated from the wider use of such knowledge.

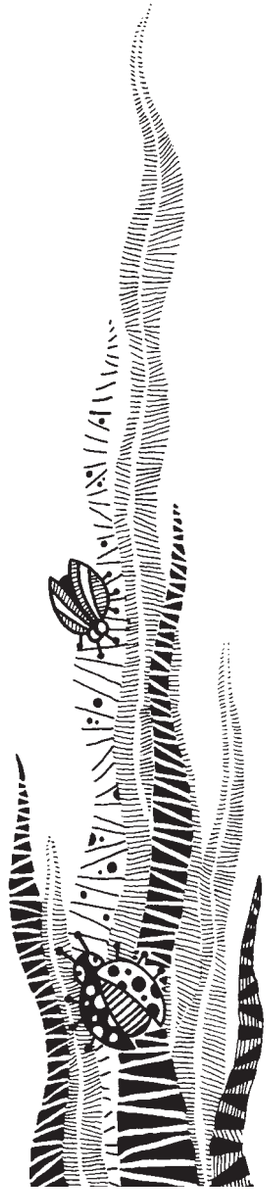
A number of initiatives in India have attempted to achieve such equity, some of which are described below.

6.1.5.2 Current and Past Initiatives

Government

i. Forest Policy of 1988: The 1988 Forest Policy, in contrast to the earlier focus on maximizing revenue and promoting forest-based industry in 'national' interest, has articulated the twin objectives of ecological stability and social justice. Highlighting the symbiotic relationship between tribals and other poor people and forests, the new policy emphasizes protection of their rights and treating local needs as 'the first charge' on forest produce (GoI 1988). Stating the need to generate 'a massive people's movement, with the involvement of women' for achieving its objectives, the 1988 Forest Policy, for the first times created space for the participation of forest-dependent women and men in the management of state-owned forest lands. Revenue generation has been clearly subordinated to conservation objectives.

ii. The 73rd and 74th Constitutional Amendments for Decentralization of Governance: The 73rd and 74th amendments to the Indian Constitution in 1992 made it mandatory for all states to introduce democratic decentralization of governance through a three-tier structure of Panchayati Raj (local self-government) Institutions (PRIs). The spirit of the constitutional amendment is to promote participatory democracy through empowering *gram sabhas* (comprising all adult voters) to have a decisive say through open and transparent decision-making at the village level instead of the concentration of decision-making powers in a few elected representatives. The 29 functions recommended for decentralization to Panchayati Raj Institutions listed in the 11th Schedule include agriculture, land reforms, land improvement and management, minor irrigation, water management, watershed development, animal husbandry, fisheries, social and farm forestry, NTFPs and maintenance of community assets. Management of state-owned forest lands is not included but may be specifically notified by individual state governments. Major water bodies continue to remain under state or central government control. Genuine devolution of authority to PRIs for the above 29 functions could create vast space for location- and ecosystem-specific, community-controlled conservation of biodiversity. This can be combined with sustainable use for enhanced livelihood and ecological security, provided the capacity and spirit of responsibility is strong enough.



The actual decentralization of governance to PRIs in different states has varied widely, as the devolution of powers, finance and functional autonomy of PRIs was left to state governments. There have also been changes in the nature and extent of devolution with changes in state governments. In general, actual devolution is far from adequate.

Box 6.36 Participatory Planning by Panchayats in Kerala

From 1997 to 2001, Kerala adopted a unique model of people's planning through PRIs with 35-40% of the state's plan funds being devolved to *panchayats*, together with the transfer of line department staff to them. Under the People's Plan campaign, 4970 resource persons (both women and men) were trained at the state level and 10,863 persons trained at the district level to assist the PRIs in various ways, from organising gram sabhas to social auditing. The trainees were committed social activists and technocrats, many of whom had been involved with the literacy movement of the late 1980s. Several guidelines and institutional mechanisms were developed for enabling marginalised groups and women to actively participate in decentralized planning, with 10% of the plan funds specifically allocated for women-centred projects. Mandatory cost-benefit analysis of each project under the peoples plans included its gender impacts. Several institutions of marginalised groups and women were developed and supported in pursuing their livelihood activities. The *gram sabha* was activated as the forum for transparent and participatory decision-making with committed non-government facilitators ensuring that the marginalised gained an equal voice. Although there seems to have been limited focus on integrating biodiversity conservation with the peoples' planning process, incorporating the preparation of people's biodiversity registers (PBRs) in the work of PRIs has been attempted.

With a change in the state government in 2001, many of the guidelines have been revised, reducing space for local participation and control, particularly the sensitivity to gender and equity concerns. Instead there is an attempt to revert control over such decisions to government functionaries (Mohan 2002).

Another innovative attempt to integrate natural resource management, which can be expanded to incorporate community-based biodiversity conservation in participatory microplanning by *gram panchayats*, has been initiated in Himachal Pradesh by the Indo-German Changar Eco-Development Project in collaboration with Navrachana, an NGO forum. In this, *gram sabhas* of *panchayat* wards undertake participatory analysis of their Natural Resource Management problems and prepare ward level plans, which are then integrated at the *panchayat* level through transparent negotiations and discussions in *gram sabha* meetings at which representatives of various line departments are also present. Funds available for different sectoral schemes are allocated in accordance with the participatory plan, with villagers supplementing shortfalls through voluntary contributions (both labour and cash), giving due emphasis to issues of equity by prioritizing the needs of the most underprivileged (IGCEDP 2001). Navrachana is also promoting biodiversity conservation with the concept of eco-income generation (*see Section 6.1.4.2*).

iii. The Panchayats (Extension to the Scheduled Areas) Act, 1996 (PESA): Enactment of the central Panchayats (Extension to the Scheduled Areas) Act (PESA) in 1996 provided a more radical constitutional and legislative mandate for devolution of local self-governance in Schedule V (tribal majority) areas. PESA makes the *gram sabha* (the body of all adult voters of a self-defined community) 'competent to safeguard and preserve the traditions and customs of the people, their cultural identity, community resources and the customary mode of dispute resolution'. (GoI 1996, Clause 4d). Every *gram sabha* is also empowered to approve the plans, programmes and projects for its social and economic development before their implementation, besides having ownership rights over minor forest produce within its area, either directly or through the *gram panchayat*. The *gram sabha* or *panchayat* at the appropriate level is also to 'be consulted before making the acquisition of land in Scheduled Areas for development projects and before resettling or rehabilitating persons affected by such projects in the Scheduled Areas'.

In states like Madhya Pradesh , the provisions of PESA have been extended to non-scheduled areas also (*vide* Order No. F-26/8/97/10-3, dated 15th May 1998).

PESA is arguably the most empowering legislation for India's tribal people supported by a Constitutional amendment. Yet, the Act is ambiguous, making it equally vulnerable to contradictory interpretations. PESA effectively mandates community-based natural resource (including forests, pastures and wetlands) management by *gram sabhas* in Schedule V areas. The MP State version of the Act, for example, provides that the *gram sabha* in Scheduled Areas will have the powers to 'manage natural resources including land, water, and forests within the area of the village in accordance with its traditions and in harmony with the provisions of the Constitution' but then adds 'and with due regard to the *spirit of other relevant laws for the time being in force*.' Tribal communities insist that their community resources include forest areas which they have traditionally used but which have been taken over by the state over past decades. Unfortunately the majority of tribals in Schedule V areas (barring areas where movements such as the *Bharat Jan Andolan* and *Humare Gaon Mein Humara Raj* have invested considerable efforts in making them aware of their rights) do not even know about PESA and its provisions (Sundar 2000).

A prime example of the problems in implementing PESA relates to the transfer of ownership of NTFPs. PESA requires state legislatures to ensure that '*Panchayats* at the appropriate level and the *Gram Sabha* are endowed specifically with the ownership of minor forest produce' (GoI 1996, Clause 4.m.ii). This has potential for impoverished collectors finally gaining the right to realise the full value of the produce collected by them. Formation of Van Dhan Samitis (Forest Wealth Committees) for collection of non-nationalised NTFPs was initiated in Bastar by a dynamic ex-Collector, using official interpretations of PESA provisions. For a couple of years the scheme enabled the collectors to get significantly higher prices, but has reportedly collapsed after the collector's transfer. The scheme did not focus on building the capacity of gatherers to develop member-driven democratic Van Dhan Samities (VDS) but treated them as 'beneficiaries' of state benevolence. Despite the majority of NTFP collectors being Scheduled Tribe (ST) women, the majority of VDS office bearers were non-ST men (Bhogal & Shankar 2000b).

Box 6.37 NTFP Transfer in Orissa

So far Orissa is one of the few states which has transferred the ownership of 67 NTFPs to *gram panchayats* (not *gram sabhas*), including 7 higher-value oilseeds. Little, however, has been done to build the capacity of *panchayats* to handle this ownership, or the capacity of the collectors to improve the returns from their labour while ensuring sustainable harvesting. Where NGOs have organised women's groups, some of them have reportedly been able to take advantage of the new policy and are getting better returns than before from a few of the transferred NTFPs. The Orissa Tribal Development Cooperative Confederation (TDCC) has helped improve the gatherers' returns through offering minimum support prices for some MFPs and increasing competition among buyers (Babu & Mishra 2002) (*see Box 5.23*).

The more valuable nationalised NTFPs such as *Kendu* leaf, however, continue to be under the government's monopoly control exclusively for generating revenue. Although Orissa's *Kendu* leaves fetch a higher price for their better quality, the wages paid to pluckers are the lowest compared to other states. While the government charges a royalty of Rs 30 per tonne on bauxite mined by industry, impoverished *Kendu* leaf pluckers are charged a royalty equivalent to a Rs 1200 per tonne (Saxena 2001a).

Box 6.38 Implementation of Minor Forest Produce (MFP) Ownership Transfer in some other States

- Madhya Pradesh's definition of MFP includes all forest produce other then timber harvestable on a non-destructible basis. Other than 4 nationalised MFPs, the rest of the MFPs are free for the *gram sabha* and its committees (*Van Samiti*) to collect, process and trade. 100% of profit, even from nationalized produce, is ploughed back to the collectors through their cooperative societies; 50% of this is to be given in cash to the NTFP collectors, 30% earmarked for infrastructure development, and 20% for regeneration of forests.
- In Gujarat 'ownership' of NTFPs has been transferred to the *zilla parishads* instead of *gram panchayats* or hamlet-

level *gram sabhas*. There is no change in the status of collectors from wage-earners to owners or change in their awareness levels.

- In Chhattisgarh, although no mechanisms for transferring NTFP ownership to *gram sabhas* have been announced, the new state's Vision 2020 envisages earning a revenue of Rs 10,000 million from NTFPs by developing it as a herbal state.
- In Maharashtra, only 33 NTFPs have been included in the list of 'MFPs', which have been transferred to *gram panchayats* (and not *Gram Sabhas* as required by PESA). The more valuable NTFPs like bamboo, *tendu* and *amla* have been excluded from the 'MFP' list.
- In Andhra Pradesh, no change has been made in the list of 'reserved' NTFPs on which the government, through the Girijan Cooperative Confederation (GCC), has monopoly rights of sale. Only Forest Protection Communities participating in JFM, and not *panchayats* or *gram sabhas* under PESA, have been entitled to 50% of the net income from nationalized *tendu* leaf.
- Although Kerala does not have any tribal areas scheduled under Schedule V, the state Forest Department has issued an order, which entitles *adivasis* to collection, use and marketing rights to all NTFPs from areas from which they have traditionally collected them. This represents a conceptual shift, recognizing resource use landscape by NTFP gatherers larger than the village or *panchayat* boundary as the basis of resource entitlements, and is closer to the spirit of PESA than the orders of other states.

iv. Joint Forest Management (JFM) (*see section 6.1.4.2*): JFM is a major initiative of the MoEF and State Forest Departments, for translating the 1988 Forest Policy's participatory objectives into practice.
   - More than a decade of JFM implementation has generated a wealth of learning and experience. In many areas, JFM has generally helped improve the traditionally adversarial relationship between forest-based communities and FD staff. JFM has also helped improve forest cover in many areas.
   - A large number of villagers participating in JFM have also derived direct or indirect benefits from it, either of short-term wage employment from donor-funded projects, improved availability of biomass or shares of income from regenerated produce where it has been harvested. In many areas they have also gained a greater voice in planning and decision-making relating to forests.

   The February 2000 MoEF revised guidelines for JFM specified women's representation in JFM groups (minimum 33% in executive committees and 50% in the general body). It also specified that JFM microplans must conform to the silvicultural prescriptions in the working plans. While suggesting that all village organisations participating in JFM be registered as societies to provide them an independent legal identity, the new guidelines also recommended their being called 'JFM committees' across the entire country (MoEF 2000a), irrespective of their diverse histories, legal status and institutional structures,[3] or the diversity of ecosystems within which they fall and the livelihood systems and cultural diversity they harbour.

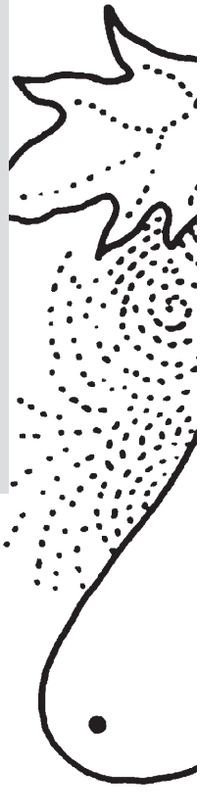
   There are wide variations in the provisions of state JFM orders. These include the legal status of the land to which JFM may be extended and the organisational structure, autonomy and entitlements of village institutions participating in JFM. Some states have restricted JFM to legally-notified degraded forest lands, whereas others, including Orissa and Uttar Pradesh, have also extended it to revenue/forest lands under Revenue Department jurisdiction. The JFM orders of Rajasthan and Karnataka have brought even village grazing and other common lands under the ambit of JFM. In Uttaranchal, JFM has attempted to bring the only autonomously managed community forests (Van Panchayats) with legal standing under joint management with the Forest Department. The undivided Madhya Pradesh was one of the first States to have extended JFM to well-stocked forest, back in 1995 (GoMP 1995).

Box 6.39 How Equitable are JFM Committees: The case of VFC Bagadari, District Narsinghpur, MP

A team of professionals visiting Bagadari in Narsinghpur wanted to know who the 10 most needy families (poorest among the poor) were in the village. It took them a couple of hours to get these 10 names through various triangulations. A meet-

ing of the general body of the Village Forest Committee (VFC) was then convened to understand the functioning of the committee. VFC Bagadari was constituted in 1998 by a forester as per the state guidelines on JFM. A village of 145 households, it has considerable ethnic heterogeneity, comprising 40 Scheduled Castes, 35 Scheduled Tribes, 66 Other Backward Castes and 4 general category households in. The team was obviously curious to know how the Committee has dealt with those 10 families, and whether their problems found focus in the VFC agenda. The VFC's support to all 10 families was listed, be it providing loans from the VFC account, engaging them for regeneration work or processing of herbs, tubers and other NTFPs for self-use and marketing. For the team it was heartening to discover this focus in committee working.

The VFC feels proud of its achievement of having resurrected some 300 ha of degraded forest, a fact that was also noticed by the State Government when it decided to award Amrita Bishnoi Award for achieving excellence in conservation. More important, the VFC has divided the forest into 10 blocks of equal areas. The regeneration work is taken up in one block each year out of the money made available to the VFC by the Department. Discussions with the villagers brought out the need for species-specific silviculture, prescriptions that will meet people's multiple objectives for multiple products from their forest. Soon thereafter, the villagers will be drawing up the micro-plan along with the FD field staff to ensure that they are able to systematically harvest the forest produce each year. The committee also identifies the challenges before it, the first one being the urgent need to address the problem of a small group of households who used to dig out fine plastering earth from the forest, locally called *Chhui Mitti*. Being a forest area the committee has banned digging of *Chhui Mitti*, and it is now negotiating the options with the group in order to ensure sustenance of their livelihoods. Yet another area, where the committee feels it has a long way to go, is that of effective participation by women in decision-making (Rathore 2002).



v. NAEB's National Afforestation Programme (NAP): The scheme titled National Afforestation Programme (NAP) (*see Section 6.1.1.2*) has been formulated by merger of four 9th Plan centrally-sponsored afforestation schemes of the MoEF – Integrated Afforestation and Eco-Development Projects Scheme (IAEPS), Area Oriented Fuelwood and Fodder Projects Scheme (AOFFPS), Conservation and Development of Non-Timber Forest Produce including Medicinal Plants Scheme (NTFP), and Association of Scheduled Tribes and Rural Poor in Regeneration of Degraded Forests (ASTRP). This is with a view to reducing multiplicity of schemes with similar objectives, ensuring uniformity in funding pattern and implementation mechanism, avoiding delays in availability of funds to the field level and institutionalising peoples participation in project formulation and its implementation. The scheme is operated by the National Afforestation and Eco-Development Board, Ministry of Environment and Forests, as a 100% Central Sector/Centrally-Sponsored Scheme (except for the AOFFP component).

   The scheme lists both short- and long-term objectives. The short-term objectives include:
   - Regeneration and eco-development of degraded forests and adjoining areas on a watershed basis.
   - Augmentation of the availability of fuelwood, fodder and grasses from the regenerated areas.
   - Securing people's participation in planning and regeneration efforts.
   - Promoting agroforestry and development of Common Property Resources.
   - Conservation and improvement of non-timber forest produce such as bamboo, cane and medicinal plants.
   - Raising coastal shelterbelts to mitigate the adverse impacts of cyclonic winds.
   - Developing water resources through plantation and water harvesting programmes;
   - Development and extension of improved technologies such as clonal propagation, and use of root trainers for raising seedlings, mycorrhizal inoculation, etc.
   - Rehabilitation of special problem lands like saline/alkaline soils, ravines, desert areas, coastal areas, mined areas, Himalayas, Aravallis and Western Ghats.
   - Employment generation for the disadvantaged sections of society inhabiting the forests and adjoining areas.

   The long-term objectives include:
   - Conservation of natural resources and biodiversity through active involvement of the people.

- Evolving village level people's organisations, which can manage the natural resources in and around villages in a sustainable manner, to fulfil broader objectives of productivity, equity, and sustainability for the general good of the people.
- Improving quality of life and self-sustenance aspect of people living in and around forest areas.

During the 10th Plan period, the scheme is to be implemented by the two-tier set up of Forest Development Agencies (FDAs) and Joint Forest Management Committees (JFMCs). FDAs will be constituted at the territorial/ wildlife forest division level and registered as societies under the Societies' Registration Act. At the grass-roots level, the JFMCs will be the implementing agency, each JFMC catering to a village. The JFMCs will be registered with the respective Territorial/Wildlife Conservator of Forests (although MoEF's own revised JFM guidelines of February 2000 require JFM groups to be registered as societies under the Societies' Registration Act).

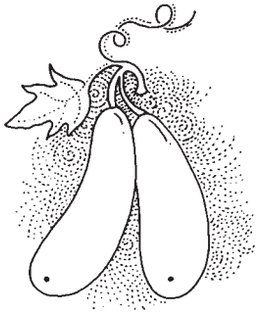
Box 6.40 Task Force on Conservation, Cultivation, Sustainable Use and Legal Protection for Medicinal Plants

A Task Force on Conservation, Cultivation, Sustainable Use and Legal Protection for Medicinal Plants has been set up by the Planning Commission for consolidation of information on the botanical and the medicinal use of plants referred to in ancient texts. The objective is to place this in the public domain as a pre-requisite to prevent patenting of plant-based medicinal plants.

A format has been devised which can be used for establishing a Traditional Knowledge Digital Library (TKDL) (*see Box 6.2*). Initially TKDL for *Ayurveda* is being developed, and following this the TKDL for *Siddha* and *Unani* described in ancient texts would be prepared. The objective of the TKDL is to ensure that knowledge in public domain is available in patent-compatible and easily retrievable form, which would help prevent claims of patent on non-original inventions.

vi. Watershed Development Programmes (*see Section 6.3.2*): The revised GoI common guidelines for watershed development projects require that implementation be done by *gram panchayats*, in contrast to the earlier focus on making sectoral departments and NGOs project implementing agencies (PIAs). However, no guidelines for ensuring that participatory watershed micro-planning is sensitive to biodiversity and ecosystem conservation have been included. The budgetary allocations for physical works provide maximum subsidies (90%) to private land owners with no provision for ensuring equitable entitlements to the benefits of increased biomass and water harvesting.

vii. Biodiversity and wildlife related laws and action plans: The National Wildlife Action Plan and the proposed Wild Life Protection (Amendment) Act considerably enhance the role of local communities in the management of PAs and other conservation areas, provide backing to CCAs (though only on community lands), and mandate some sharing of benefits. Both, however, stop well short of equitable decision-making, joint management and equitable benefit sharing. Greater potential for such equity exists in the Biological Diversity Act, 2002, with provisions for local communities to have a say in decisions regarding their resources and knowledge for protection of traditional knowledge and for benefit sharing (*see Section 6.1.8.2*).



viii. The Draft Kerala Fisheries Policy has been put together with the objective of providing security and protecting the rights of traditional fisherpeople and allied workers, particularly those who are backward among them. The policy states that in order to sustain and develop inland fisheries, all waterbodies and the nearby mangroves would be declared as Protected Fisheries Areas, while maintaining the right to fish to the traditional fisherpeople. It also highlights that in order to free the traditional fisherpeople from the clutches of the middlemen, the 'right for first sale will be legislated and this will be done through fisherpeople's cooperatives' (Thomas Kocherry, personal communication 2003).

Box 6.41 Public Hearings under the Environment Impact Assessment Notification, 1994

The Public Hearing (*also see Box 6.1*) is emerging as one forum being used by NGOs, concerned individuals and local community groups to voice their concerns regarding developmental projects. They were added to the Environment Impact Assessment (EIA) Notification, 1994 (issued under the Environment Protection Act, 1986), in the year 1997. As per the Notification 30 identified categories of industries specified within the Notification need to mandatorily conduct public hearing, as part of the process of obtaining environmental clearance for the project. In certain states like Karnataka, Gujarat and Tamil Nadu, public hearings have proved to be a strong tool for local groups to claim their space in developmental planning and decision-making. The involvement of direct stakeholders in such a process brings forth discussions and debates on the impacts of the project on aspects of culture, lifestyles, health and long-term survival of the people of the region, some of which are totally neglected in the development planning process taken up by the state.

Such a step in the decision making process also makes it compulsory for project-related information to be disseminated to all interested parties. This has been a major shift from earlier times when such information was made available only to government agencies and project planners. With experience in the use of public hearings growing among people, there is also a continuous learning in rightfully demanding the relevant information regarding projects like cost-benefit analysis, environmental impact analysis, disaster management plan etc.

While public hearings have been used as a forum to highlight the lacunae and loopholes in the existing EIAs, it is not mandatory that the recommendations that emerge be incorporated in the final environmental clearance of a developmental project. Sometimes, despite serious objections by residents and NGOs, along with evidence of negative impacts, projects have been granted clearance.

Though this process has its own set of discrepancies, it clearly provides a legitimate space for people to participate in developmental planning. Today, environmental public hearings are conducted only for the limited number of industries/operations identified in Schedule I of the EIA notification, and for those with a specified minimum investment. However, they could be conducted for any kind of developmental planning, and bring together diverse agencies, interest groups and individuals. Opinions or grievances could be articulated in a structured manner, and these could then be inputed into the decision-making process. Procedures in the public hearing could be used to facilitate exchange of information, consideration of differing viewpoints and assessment of the proposed project in terms of 'all' costs and benefits, and not just those visible to the project proponents.

Contributed by Manju Menon, Kalpavriksh

NGOs and Communities

As described earlier, there is a wide diversity of community-based conservation initiatives. In many of these, equity is a central concern. Communities are also increasingly forming informal or formal alliances through federations to negotiate with the government for policy changes in accordance with their priorities. The following section looks at some of these community and NGO initiatives.

a. Community assertion of rights over forest resources: Where villagers have got organised, they have shown the capacity to manage their forest. For example, in Chanagaon (Nagari, Raipur district, Chhattisgarh), the villagers have been mobilised by the Bharat Jan Andolan (BJA) and are fully aware of their rights to manage their forests under PESA. They had initiated community forest protection on their own. A proposal of the Forest Department (FD) to start a Village Forest Committee (VFC) for JFM was rejected by the villagers on the grounds that the 30% share of timber being offered by the FD was unacceptable when they were entitled to 100% under PESA. They decided it was better to continue with their customary system under which people could ask the *gram sabha's* permission for timber when they needed it (Sundar 2000).

   In Mendha (Lekha), Maharashtra, in contrast, the villagers, after more than a decade of protecting surrounding forests and asserting tribal self-rule, agitated to get their village included in the JFM scheme. They felt that

the scheme would benefit them and that they were well organised to withstand attempts, if any, at state control (Pathak and Gour-Broome 2001).

Box 6.42 Diversity of CFM in Uttaranchal

Democratic and autonomous community management of legally demarcated village forests by elected forest councils, or Van Panchayats, has existed in Uttaranchal for over 70 years. Unofficial community management, with diverse institutional arrangements on all legal categories of forest lands, has co-existed with (and, in fact, pre-dates) formally constituted Van Panchayats.

Both the Van Panchayats and unofficial CFM systems are, however, facing challenges from some new systems introduced in the state. With funding from the World Bank, the Uttaranchal Forest Department has promoted Village Forest Joint Management (VFJM) with Van Panchayats on village forest land. This is in contrast to JFM on degraded Reserve and Protected forests under Forest Department jurisdiction in other states. This policy may encourage the opposite of devolution, with greater governmental take-over of village forests managed autonomously by communities, instead of creating space for villagers to participate in management of Reserve Forests under departmental jurisdiction. The decision-making autonomy of Van Panchayats participating in VJFM is '*subject to the supervision*, *direction*, *control and concurrence of the Divisional Forest Officer*' (FDUP 1997: 3.1). A functionary of the Forest Department has been made the joint account holder and the member secretary of all Van Panchayats (VP), by recent revision of the 1976 Van Panchayat Rules (GoU 2001), despite 7 decades of reasonably good independent management by the communities.

Given Uttaranchal's long history of community struggles for forest rights, the villagers see the new rules as an encroachment on their long-standing and legally demarcated community forests. They have formed a Van Panchayat Sangharsh Morcha (VPSM), which has been lobbying against the Uttaranchal Van Panchayat Rules, 2001. Experienced VP *sarpanches* with long experience of building consensus for CFM feel that instead of addressing the VPs genuine problems, the Forest Department has used the revised rules to regain control over community forests. They have asserted their claim for effective management of their forest. The Van Panchayat Sangharsh Morcha in Uttaranchal has designed its own, alternative institutional structure and rules for community controlled forest management through broad-based consultations with VP representatives. They feel that the Forest Department should provide technical support or arbitration on demand. Due to the villagers lobbying with different party candidates during their electoral campaigns, the present ruling party had included restoration of community forest rights in its election manifesto. After assuming power, the ruling party has constituted a committee, which reportedly includes a representative of the VPSM, to look into the matter in greater depth. The committee has submitted its report to the state government.

(Extracted from documentation of the VPSM by Madhu Sarin)

In Orissa, 4,000 to 5,000 villages practicing CFM have collectively been demanding replacement of JFM with a CFM policy, which acknowledges and builds upon community initiatives (Singh 2000; Singh 2001b). Similarly, in Madhya Pradesh, mass tribal organisations argue that meaningful community participation in forest management should include land reforms and resolving the issues of people's land rights.

b. Moving Towards Genuine Community Forestry: In Karnataka a group of NGOs has proposed a new concept of participatory forest management for the state. NGOs and academicians have launched a campaign called Jana Aranya Vedike (People's Forest Forum) aimed at bringing about fundamental policy changes to the ongoing process of the Joint Forest Planning and Management (JFPM) in the state (*see Box 6.43*). Workshops and meetings are also being conducted in Karnataka and other states to work out further details regarding the policy changes (PFF 2002).

Box 6.43 Taking JFM Forward: the Karnataka People's Model

The Karnataka People's Forest Forum, consisting of several community and non-governmental organisations, issued a statement in 2002, urging the adoption of the following principles and steps:

- Participatory forest management is a system of governance of natural resources, not a short-term project or programme.
- Participatory forest management is a basic right of all communities that derive direct or indirect benefits from forests and public lands. This right must be given by law and must be available everywhere in the state; it must not depend upon government organisations or project funds.
- Moving to participatory forest management requires changing the allocation of rights and responsibilities between local institutions, off-site stakeholders and governmental agencies. This does not require large-scale funds. Hence, no loans should be taken by the government to implement projects in the name of forest development or JFPM; unspent amounts from loans already taken should be returned immediately.
- Participatory management must cover all public lands that villagers use and are willing to manage, regardless of their physical condition or legal status, not just 'degraded forests'.
- Participatory management must extend to protected areas, with appropriate safeguards and compensatory benefits.
- Within these lands, the villagers must have rights to harvest, consume and sell the surplus of all products that are permitted to be harvested under the sustainability norm. Payment to government should be only for support services provided by government agencies. All contracts given to private contractors for harvest of dead-and-fallen trees or NTFPs must be cancelled immediately.
- Individual rights and privileges in public lands, such as *soppinabettas*, *kumkis*, and *baanes* must be brought into the ambit of participatory management, but clear mechanisms for balancing or removing intra-village inequities created by these rights must be set up. Customary rights of nomadic communities must also be protected.
- The unit of participatory management may be as small as an individual hamlet within a revenue village, if desired by the local community.
- The village or hamlet-level institutions must be given the responsibility of stopping all further encroachments on public lands and of evicting current encroachers other than the absolutely poor or landless. It must also have statutory powers to set rules for resource use and to penalise offenders within and outside its boundary.
- The village or hamlet-level institution must be answerable to all adult members living within its boundary, and it must have full autonomy in day-to-day management. Hence, there should not be any government officials in the management committee of the village-level institution, except as non-voting invitees, if desired by the community.
- Resource Management Norms for ensuring environmental benefits and long-term sustainability must be evolved in a participatory manner and then enforced by the Forest Department (FD) in a transparent manner. In addition, the FD must provide help in protection when demanded by the villagers.
- A statutory multi-stakeholder body at the district-level should have the powers to adjudicate disputes between villages, between villages and the FD, and between villages and off-site beneficiaries.
- The process of setting up Forest Development Agencies must be suspended immediately, until a truly participatory system of management is put in place, and until the structure of the FDA is debated publicly and modified accordingly.

Contributed by Naveen Thomas for Karnataka People's Forest Forum.

c. Achieving Intra-Community Equity through Community Forestry: In several initiatives of participatory forest management, inequities within communities have been consciously or inadvertently reduced. An example is Saigata village in Maharashtra (*see Box 6.44*).

Box 6.44 Saigata Village Initiative

The village Saigata is situated in Bramhapuri Taluka, Gadchiroli District, Maharashtra. The village community consists of multi-caste, multi-religious, tribal/non tribal people such as Buddhists, Gonds, Govari, Mana, Mali, Lohar, Dhivar and Kunbis.

In the past the village was surrounded by thick forests. However the period between 1955 to 1975 saw large-scale

destruction and the forests were all but wiped out. Many villagers had themselves started selling fuelwood in the market. In 1973, under the leadership of an enterprising *dalit*, Suryabhan Khobragade, a Krishak Charcha Mandal (Agriculturists' Discussion Group) was set up with the intention of holding periodical group discussions on the problems of agricultural development of the village.

In 1979, the *Mandal* called a *gram sabha* meeting to discuss the issue of the deteriorating forests. Khobragade emphasized the need to protect the forests and the *gram sabha* unanimously decided to undertake the work of regenerating the forests. Those villagers who grazed their goats and sheep in the forest voluntarily sold their flock. The 40 villagers who earned their livelihood through selling fuelwood were gradually convinced to look for alternative sources of employment.

In time, the measures adopted by the villagers started yielding results. The vigilance of the villagers against reckless grazing and pilferage of timber and fuelwood resulted in gradual regeneration of the forest. The denuded areas were covered with a lush growth of grass. The villagers had to battle with the forest authorities for the right to use this grass that had grown because of their efforts.

Today the forest area of about 270 ha in the vicinity of the village has regenerated considerably. Many species of birds and animals, including leopards, are now reported here. Since 1993, the village has become a part of the official Joint Forest Management Programme of the State Government.

Contributed by Neeraj Vagholikar, Kalpavriksh

d. In the Chipko movement (see Box 6.25) areas of Uttaranchal, women have not only led the struggle but also gained greater respect and a voice in local decision-making, relating to other aspects of village life.

e. Gaining a Foothold for Small Scale Fisherfolk: Movements such as those led by the National Fishwokers' Forum and the South Indian Federation of Fishermen Societies, have helped small-scale artisanal fisherfolk assert their rights to marine and coastal resources. Powerful trawling and aquaculture interests have been resisted and in many places driven away. In some inland waters too, such as the Tawa Reservoir (*see Box 6.34*), Madhya Pradesh, small-scale fisherfolk have been able to organise into collective forums to gain an equitable say in decision-making.

Box 6.45 Community-Based Systems in Fisheries

Communities along the coast have also developed various systems designed to, among other things, ensure equitable access to resources and to resolve conflicts. For example, Kurien and Vijayan (1995) describe the *karanila* system practiced in the districts of Allepey and Ernakulam in Kerala. This is an income-spreading mechanism prevalent in the canoe and encircling net fishery. This system has been practiced for about half a century. It dictates that the permanent and semi-permanent crew (as well as temporary crew) will have a custom-bound claim to income even if they do not perform any productive work activity on that particular fishing trip. Bavink (2001) describes another type of system along the Coromandel coast in the state of Tamil Nadu. In this system, marine fisherfolk, through traditional fisher councils at the hamlet level connected by kinship-based networks, regulate fishing effort in inshore waters. Mathew (1991) describes the *padu* system followed in parts of the Pulicat Lake in Andhra Pradesh. This traditional system entails granting entitlements to eligible members of a particular community for undertaking specified fishing activities in certain designated fishing grounds in the lake. Through its rules, it provides compatible fishing rights to prevent conflict. It is significant that while conservation of resources may not have been the explicit objective, it has often been a consequence of such systems.

Contributed by Chandrika Sharma

e. Samridhi Mahila Cooperative Society began with the support provided by the Indo-German Changar Eco-Development Project (*see Section 6.1.5.2)* in 1995-96. Operating from Thakurdwara near Palampur in Kangra district, this is the first women's cooperative of Himachal Pradesh. In collaboration with the Changar project two voluntary organization, New Hope of Kangra and Himalaya Bachao Samiti of Chamba helped in this endeavor. Samridhi is now a federation of village-based women's production groups. The objective of the project is value addition to locally available fruits, in order to make it a viable income-generating activity for the women of the region. The production involves manual labour and uses processes derived from the traditional skills of sun-drying and natural preservation. Some of the products include *chutneys* of *amla* and mango and pickles of mango, garlic, green chillies, *amla* and sweet lime. The group also produces candies made out of amla, citrus and ginger, apart from *amla* preservatives. Stringent quality control is maintained and the products are marketed under the brand name Changar. Medicinal Plants is another important area for income generation. Samridhi has helped another organization named Lok Vigyan Kendra, to promote cultivation of medicinal plants on degraded land (Prashar 2002).

Box 6.46 Benefit Sharing from the Mahuda Tree in Dhandasan

Bhiloda is a tribal taluka of Sabarkantha district in North Gujarat, a third of which is covered by forests. The tribals are highly dependent on the forests as a source of their livelihood for fuelwood, fodder, medicines, leaves, flowers etc. The Dhandhasan village *panchayat* has 500 Mahuda (*Madhuca indica*) trees grown on 75 hectares of village land. For the last 35 years, people of this village have been traditionally following the practice of collecting the flowers of Mahuda on a community basis. The flowers are used for various purposes, after drying. Mahuda tree is supposed to be a good source of timber. The wood is used for various purposes including agricultural implements.

Earlier, people had the privilege to use the Mahuda trees according to their respective needs. Nobody in the village objected to it. But as time passed, with increasing demands of households, the resource started becoming inadequate to fulfill everybody's demand. Altercations and conflicts soon became common. Looking at the state of affairs, the then *sarpanch* of Dhandasan village felt that there was a need to evolve norms for regulating the access. It was soon decided that every household would get an equal share of flowers every year. Thus from 1965 onwards, this traditional practice is being maintained with a lot of enthusiasm. The practice has more or less ended the conflict among the villagers and seems to have inculcated a feeling of interdependence among them.

All the members of the village participate in the operation of flower collection. Only one person can participate from each household. No other person except the village members is allowed to take part in the collection of flowers, nor are they entitled to any share. A membership fee of Rs 10 is fixed. If a household lives separately, then to include themselves as members, each individual has to provide fresh application with a fee of Rs 10 to the *panchayat*.

Source: Community Conserved Areas in Gujarat Sub-thematic Review

Box 6.47 Supreme Court Judgement on Settlement of Rights

Most Protected Areas (PAs) in India have human populations living inside them, or in adjacent areas, dependent on the PA resources. In most cases, the settlement of rights of these people, as is supposed to be done under the Wild Life (Protection) Act, 1972 (WLPA), has not been fully carried out. In 1996, WWF-India filed a case in the Supreme Court asking for directions to all state governments to fulfill their responsibilities under the WLPA. As part of this, in late 1997, the Court directed all states to complete their procedures for settling people's rights within one year (i.e. by late 1998). It is under these directions that District Collectors have been required to initiate settlement procedures. The procedure entails issuing a notice to all villagers to claim rights, if any. Apart from this, the Collector (or designated officer) is himself/herself supposed to go into these rights. Once all claims are in, the officer ascertains which rights are valid and which are not, and then decides whether to (a) acquire the rights by paying compensation or some other alternative; (b) allow rights to continue within the PA (in case of sanctuaries only, this

is not permissible for national parks); or (c) recommend the deletion of those parts of the PA which are encumbered with rights. In many states, Collectors are known to have decided on course (c) and areas have been denotified even if at times important for conservation. Apart from the denotification issue, the settlement process has thrown up other serious concerns as well. The process itself is riddled with problems, given that there are no national- or state-level guidelines on how to carry it out. Many villagers never get the initial notice, or cannot read it; putting submissions to the Collector can be a daunting task; villagers rarely hear back about the decisions taken by the Collector, or why such a decision was taken, what criteria were used to determine whether rights were viable, and so on . Unrecorded rights (e.g. honey collection from the forest, or the forest rights of landless people) are often not taken into consideration. On the other hand, vested interests within and outside these communities take advantage of the situation by demanding the right to continue unsustainable exploitation (Kalpavriksh 1999). As of late 2002, nearly 5 years after the Court's order, most states appeared not to have completed their settlement process.

Others:

a. Equitable sharing from use of traditional knowledge: Though there has been increasing recognition of the need to recognise, reward and equitably share benefits from the wider use of traditional knowledge, there are very few actual examples of such initiatives. One of the pioneering ones is the sharing of benefits arising from the sale of a herbal drug resulting from the knowledge of the *Kani* tribe in Kerala (*see Box 6.48*). The National Innovations Foundation has developed a detailed protocol for access and benefit sharing having to be used while registering any local innovation for wider use (http://www.nifindia.org/benefit.htm).

Box 6.48 The Kani-TBGRI Model

In 1987, a team of scientists from the Tropical Botanic Garden and Research Institute (TBGRI) went on an ethno-botanical field trip in the Agasthya Hills in the Southern Western Ghats. The team was accompanied by some members of the Kani tribe, a community inhabiting this region. While on the expedition, the scientists noticed that the Kanis frequently ate a certain fruit that seemed to give them a lot of energy.

After the assurance that the information will not be misused, the tribals revealed that this wild plant was locally called Arogyapacha (meaning 'greener of health'). TBGRI conducted detailed studies of the leaves of the plant, which revealed it had anti-stress, anti-hepatotoxic and immunodilatory/immunorestorative properties. They also isolated 12 active compounds from the plant and filed patent applications on the product developed. The drug Jeevani was formulated by TBGRI with Arogyapacha and three other medicinal plants as ingredients. A license to manufacture Jeevani was given to Arya Vaidya Pharmacy (Coimbatore) Ltd in 1995, for a period of seven years, for a fee of Rs 1 million. TBGRI decided that the Kani tribals would receive 50% of the license fee, as well as 50% of the royalty obtained by TBGRI on sale of the drug.

In 1997, the tribals, with help from the TBGRI, registered a trust called Kerala Kani Samudaya Kshema Trust. 50% of the license fee received by TBGRI has been transferred to the trust. The three tribal informants of TBGRI received monetary rewards from the Trust fund. Besides this, the amount in the Trust fund is intended to be used for the benefit of the Kani community as a whole. One of the key objectives of the Trust is to establish a biodiversity register to document the knowledge base of the Kanis. However, there is no unity of views among the Kanis, some of whom (including the healers among the Kanis called the Plathis), have objected to the manner in which the 'arrangement' with TBGRI evolved. Some activists have also alleged that patent claims were unwarranted and that the Kanis actually got a poor deal. This trust has now almost 70-75% of the Kani population as members and thus acts as a forum to interact with outsiders.

The manufacture of Jeevani and subsequently flow of royalties ran into problems for several reasons. This is primarily because the Kanis live in and around the Reserve Forests of the region and require permission of the Forest Department for harvesting the plant. This permission has so far been denied because of the fear that commercialization will lead to overharvesting and thereby endanger the conservation of the plant. This has also been compounded by incidents of pilferage of the plant by non-tribals.

TBGRI and AVP however believe that there are means to sustainably harvest the plant in the forest area. AVP's proposal that it would pay the Kanis initial seed money for the cultivation of the plant and enter into a buy-back arrangement with the Kanis to buy the leaves harvested from the cultivated plants was rejected by the Forest Department. There has been some recent progress on the matter, in that the Government of Kerala has reportedly taken the view that Kanis should be allowed to cultivate Arogyapacha in the forest area. The actual modalities of cultivation are yet to be worked out with the Forest Department however.

There have been many stumbling blocks in executing such a benefit sharing arrangement, primarily because this was initiated at a time (1987-1990) when there was no national/international law or policy governing such mechanisms. The Convention on Biological Diversity (CBD) came into being on 29th December, 1993, and the Government of India ratified it in February 1994.

The TBGRI-Kani benefit sharing arrangement was given an award at the World Summit on Sustainable Development, Johannesburg, in September 2002, for being a model benefit sharing arrangement (Anuradha 2000; Gupta 2000; Interview with Dr Pushpangadan, Former Director, TBGRI, in October 2002)

Adapted from contributions by R.V. Anuradha and P. Pushpangadan (2002)

b. The Kerala Institute for Research, Training and Development Studies of Scheduled Castes and Scheduled Tribes (KIRTADS) initiated the Kerala Tribal Intellectual Property Rights Bill. The Bill focused on the constitution of specific authorities for documenting the knowledge of tribal peoples and negotiating terms for access to it. Between 1996 and 1998, several workshops were organized by KIRTADS for a larger discussion on the Bill. The workshop participants included representatives of tribal communities, NGOs, lawyers, journalists and different government ministries.

   The Bill suggested that authorities set up under it would have a joint responsibility along with communities, to negotiate terms with outsiders in relation to the intellectual property of such communities. While the need for such a Bill was welcomed in principle, there were concerns regarding issues like the tribal communities not always being organized, not always having secure access to or ownership over the resources used etc. (Anuradha *et. al*. 2001). There is reportedly a legislation being proposed on this in Kerala though it is not clear to what extent the KIRTADS draft is part of it.

c. GMCL (*see Section 6.1.4.2*) has been successful in making profits and distributing those as dividends amongst village women gatherers' *sanghas* i.e. Self Help Groups (SHGs) – who are the shareholders (Ghate 2002).

Box 6.49 NBSAP Initiatives Towards Equity

- At various levels of the planning process, efforts were taken to reach out to women, *dalits* and other underprivileged sections. While some BSAPs like that of the Deccan Area Sub-state Site drew largely from the knowledge of *dalit* women farmers, there were also several meetings and public hearings during the NBSAP process in various sites to reach out to special groups such as snake charmers, traditional healers etc. Some of these attempts yielded tangible results. For instance, as part of the North Coastal Andhra Sub-state site process, it was observed that by the end of the planning process, women were more vocal in expressing their concerns than they were in the beginning.
- As part of the NBSAP process, various guidelines for gender, people's participation and equity were circulated amongst the executing agencies so that these concerns are incorporated during the BSAP formulation. A special note on conducting public hearings was also prepared. All these concepts were reiterated at the national workshops and deliberated upon in detail in the regional workshops.
- A workshop with the theme of *adivasi*/Indigenous Peoples and Biodiversity was organized, and representatives from communities from all over the country attended the meeting. The deliberations culminated in a statement and a set of recommendations for the national action plan of the NBSAP.
- At many sites, special meetings were held with children to understand their perspective vis-à-vis biodiversity. This served

a two-way process of both generating awareness amongst children and also integrating their concerns into the various regional BSAPs.

- At the national level, meetings were also conducted with specially-abled children in different parts of the country. This also fed into the preparation of a sub-thematic review on Environmental Education and People with Disabilities, the recommendations of which have been incorporated in the national plan.

6.1.5.3 Major Gaps

i. A range of inequities continue in the control and the use of biodiversity in marine, coastal, forest, wetland, grassland and desert ecosystems. Centralised state control over large areas is compounded by the inequities within and between communities. Successful official and non-official attempts to remove these inequities are inspiring, but are not being adequately upscaled, replicated or adopted.

ii. Many community initiatives have remained bound within (or actually increased) traditional inequities. For instance, community-led forestry initiatives have often left out the landless or women from decision-making and benefit sharing, and sometimes further deprived them from access to CPRs (Sarin *et. al*. 1998b; *Munsiari Sub-state Site BSAP*).

iii. The new policy requirement that forest-based industry meet its raw material needs from private lands instead of its earlier privileged access to nationalized forests is a major equity enhancing provision. However, the significant redistribution of resource access, enabling impoverished biodiversity- dependent communities to regain a stake, has often not taken place. This has been due to several factors:
   - No clear legal or institutional mechanism has been put in place to secure improved common property resource access for tribal and other forest dwellers (excepting to some extent through JFM);
   - Concerns for biodiversity conservation in managed forests, as well as the importance given to NTFPs has remained rather weak in the existing working plans;
   - Slow progress towards making PA-management more participatory (as recommended by several government committees), combined with the Supreme Court judgements requiring early settlement of rights in PAs (*see Box 6.47*) and banning the collection of NTFPs from PAs in some states;
   - Lack of an effective mechanism to resolve long standing issues related to the land rights of forest dwellers resulting from inadequacies of the processes by which common lands were declared state-owned forests, particularly after independence (*see Section 5.2.2*) (Rangachari & Mukherji 2000; Saxena 1995a; Saxena1999; Saxena 2001a; GoAP 2002).

iv. Even in states where land reforms were relatively successful, certain sections of the population remained disprivileged. For instance, the land reform movement in Kerala has unfortunately not dealt adequately with the serious problem of land alienation of *adivasis*. Many erstwhile *adivasi* lands have been taken over by more dominant groups, leading to a continuing conflict between *adivasi* groups and the state. A tragic manifestation of this is the clash between *adivasis* and the state over the occupation of land in Wynad Sanctuary, Kerala, in which a still-unknown number of *adivasis* were killed and injured. The *adivasis* had forcibly occupied the land in protest against the state government's inability to deliver on long-standing promises to provide land tenure to them, in return for the historical alienation from their ancestral lands that these tribals have faced (http://www.himalmag.com/2003/march/perspective.htm).

v. Natural grasslands and pastures often get classified as 'forests' and thus get subsumed by timber management prescriptions, instead of being treated as natural ecosystems.

vi. In most states, the commitment to promoting 'Gram Swaraj' through *gram sabha* empowerment has progressed very slowly. On top of this, the state government has divested the *panchayats* of their control over common grazing lands for distribution among the landless (Verma 2002), which may be considered beneficial from an equity point of view, but will have long term adverse impacts on biodiversity, local livelihoods

and decentralised decision-making. Further reduction in already shrunken grazing lands will increase grazing pressure on surrounding forests and negatively impact the livelihoods of resource-poor livestock rearers. Nomadic pastoralists, some of whom continue to maintain threatened indigenous breeds of livestock, may be the most negatively impacted.

vii. There continue to be cases of government agencies retaining control over funds and management of natural resources falling in the domain of PRIs. In many states such as Haryana, leases to village water ponds are being auctioned to the highest bidders for fish farming in accordance with Fisheries Department guidelines, instead of the decision being left to *gram sabhas*. In Madhya Pradesh, only a campaign against transfer of control of local water bodies to commercial interests led to the government recognizing the rights of local fisherfolk (*see Box 6.34*).

viii. The implementation of PESA has been weak, and the enabling state legislations have several limitations. In fact, in some corresponding state acts, many provisions of PESA have been totally ignored. Instead, ownership of NTFPs is being made subject to existing laws, e.g. the Maharashtra Forest Produce Act, 1997.

ix. In most states, marketable NTFPs have been treated as state property and the gatherers paid at best unskilled labour wages. There are however exceptions to this, as in Madhya Pradesh, where for the bulk of NTFPs, the collectors have the freedom to use as they wish.

x. At present, tribals and other forest dwellers are exploited by middlemen when it comes to the marketing of MFP/NTFPs. This very often deprives the collectors of the profit which is due to them (Chhattisgarh Forest Department 2003a).

xi. Very few practical initiatives acknowledge, value and protect the indigenous knowledge of NTFP-gatherers (exceptions include the *Kani* tribal case and a few other examples discussed earlier).

xii. The JFM programme has the following gaps:
- The revised JFM guidelines do not mention decentralization of governance and the role of PRIs. PESA's potential, especially in Schedule V areas in terms of transferring management control over community forest resources to *gram sabhas*, remains unutilised, or at best somewhat weakly used. The Madhya Pradesh resolution of October 2001, however, makes it mandatory to have a *gram sabha* meeting for constitution of the new Van Samiti, and in case of old ones, they have to seek a fresh mandate of the *gram sabha*.
- Few comprehensive studies and monitoring have been done to assess JFM's impacts on socio-economic and gender equity.
- Some of the contentious equity-related issues, which have surfaced with the expansion of JFM, include the following:
  - *Contested claims over 'forest' land and desirable land use*: The process of reservation of forests has not been adequate at places. There are cases where some of the legitimate claims have not been dealt with. Some such areas have also been brought under JFM, and plantation done on these areas, thereby accentuating the conflict.
  - *Mutual Transparency and Accountability*: In only a few states has JFM moved towards a village representative being the head, and having clear systems of transparency and accountability. While some individual officers have taken commendable initiatives in this regard, the same has not taken institutional roots. Transfer of such officers often results in rapid reversion to earlier practices, non-fulfilment of commitments, and in some cases misuse of community funds (Vasundhara 1998; Sarin and Rai 1998; Sarin 1996; Samata-CRYnet 2001; Sundar 2000; Bhogal & Bhogal 2000; Diwan *et. al*., 2001, Sarin 2001a).
  - *Villagers' customary and legal forest rights versus 'benefit sharing' under JFM*: In the case of Uttaranchal's Van Panchayats, the legal forest rights are not only over forest produce, but include the right to *manage* community forests by councils elected by village *gram sabhas* for the benefit of community members. JFM has in places replaced such rights with a standardized share-cropping formula, often leaving them with reduced access than before (Ahmad 1994; Sarin 2001a; Sarin 2001b; West Himalaya

Ecoregional BSAP). Notwithstanding the fact that the rights regime defined under JFM has resulted in recovery of forests and the biodiversity thereon, nomadic and settled pastoralists and goat rearers have been among the worst sufferers on account of reduced access (Chakravartyi-Kaul 2002; Anthra 2001; Deshingkar 2002; *Nomadic Pastoralism Sub-thematic Review*).

- Weakening horizontal inter- & intra-community support structures: In Andhra Pradesh, many goat rearers are unwilling to become Van Suraksha Samiti (VSS) or Forest Protection Committee members, as the Forest Department requires grazing to be stopped by VSSs. This has deprived impoverished graziers not only of their traditional grazing access but also of other legal forest rights, as only VSS members are entitled to shares of benefit under JFM (Ramdas 2000; Deshingkar 2002).
- Inadequate space for community participation in defining parameters: As one would expect, the rights regime defined under JFM did lead to inter-community and intra-community conflicts. The continuing primary focus on improving the condition of the forest resource, in accordance with departmental criteria of resource quality, sometimes tends to leave out specific livelihood uses (especially relating to specific NTFPs), leading to inequitable outcomes for already vulnerable socio-economic groups at both inter- and intra-community levels. These uniform prescriptions also may not be in the best interest of maintaining ecosystem integrity and conserving both floral and faunal diversity. For instance, in Mendha (Lekha), Maharashtra, villagers had to repeatedly assert that, contrary to silvicultural prescriptions as laid down in the working plan, lianas and vines in the forest should not be cut as they were critical to the forests' integrity (Pathak and Gour-Broome 2001). However, a focus on NTFP management and concerns for biodiversity conservation even in the managed forests is now being articulated to varying degrees in the new generation of working plans, and has been stressed in MoEFs' February 2000 circular on JFM to all states, as well as in the JFM guidelines.

xiii. Biodiversity conservation *per se* does not find any mention in the 11th schedule of the constitution. Several Panchayati Raj Institutions (PRIs) are unlikely to take this into consideration while carrying out their activities. This could also lead to situations such as in the case of distribution of grazing lands to the landless where the objective of equity starts undermining the objective of conservation.

xiv. Not enough attention has been given to the protection of indigenous knowledge and equitable sharing of benefits from its wider use.

xv. There is no organised system for the marketing of community-managed or developed resources or efforts to ensure equitable sharing of benefits from the use.

6.1.6 Wild Biodiversity: Capacity of Actors in Each Sector

6.1.6.1 Overall Concept

All sections of society need to be involved in the colossal tasks of conservation, sustainable use, and ensuring equity. Yet different sections have different skills and knowledge, and each has major gaps in the capability to handle the required tasks. Identifying these gaps, and what is needed to plug them, is a major challenge.

India has one of the world's largest pools of biodiversity knowledge, including an immense range of traditional/indigenous knowledge and a huge modern scientific base. Given below are some of the key initiatives in increasing the biodiversity-related capacities of various sectors.

6.1.6.2 Current and Past Initiatives

Government

Central Government

a. Several professional bodies have been set up under the MoEF. These include Indian Council for Forest Research and Education (ICFRE), Wildlife Institute of India (WII), Indira Gandhi National Forest Academy

(IGNFA), Indian Institute of Forest Management (IIFM), Botanical Survey of India (BSI), Zoological Survey of India (ZSI)), Forest Survey of India (FSI), National Museum of Natural History (NMNH), Centre for Environment Education (CEE), CPR Environmental Education Center, G B Pant Institute of Himalayan Environment and Development, and Salim Ali Centre for Ornithology and Natural History (SACON). These are actively engaged in awareness, education, research and training activities on various facets of biodiversity. These institutions target various actors, including government agencies, NGOs, industry, armed forces, media and the academic community to fulfill their mandate. The courses range from Post Graduate (PG) degrees/ diplomas to seminars and workshops.

b. The WII (*see Section 6.1.1.2*) regularly conducts PG diploma courses for officers from various States/Union Territories as well as specialized modules on Wildlife Management, Biodiversity Conservation, Ecotourism Planning and Management and Wetland Conservation and Management in the Protected Areas.

c. MoEF also undertakes capacity-building programmes in the areas of environmental clearance of projects, development of manuals and guides for preparation of Environmental Impact Assessment (EIA)/ Environmental Management Plan (EMP) and environmental economics.

d. Lal Bahadur Shastri National Administration Academy (LBSNAA), Mussoorie, Indian Institute of Public Administration (IIPA), New Delhi, and Yeshwantrao Academy of Development Administration (YASHADA), Pune, organise workshops and training programs with significant environmental content for civil servants.

e. ENVIS Centers (*see Box 6.10*): The Environmental Information System (ENVIS) network of the MoEF, established in 1982, is responsible for the collection, collation, storage, retrieval and dissemination of environment related information. The ENVIS network focal point is at the MoEF and 25 centers have been set up in different organisations/establishments in the country in selected areas of environment. These Centres have been set up in the areas of pollution control, toxic chemicals, central and offshore ecology, environmentally sound and appropriate technology, biodegradation of wastes environment management, etc.

Table 6.6: List of ENVIS Centres

S.No.	ENVIS Centre	Subject
1.	Central Pollution Control Board (CPCB), New Delhi	Control of Pollution (Water, Air, and Noise)
2.	Industrial Toxicological Research Centre (ITRC), Lucknow	Toxic Chemicals
3.	Development Alternatives, New Delhi	Environmentally Sound and Appropriate Technologies
4.	Centre for Environmental Studies (CES), Chennai	Biodegradation of Wastes and Environmental Impact Assessment
5.	Tata Energy Research Institute (TERI), New Delhi	Renewable Energy and Environment
6.	Centre for Ecological Sciences (CES), Bangalore	Biodegradation of Wastes & Environmental Impact Assessment
7.	World Wide Fund for Nature (WWF) – India, New Delhi	NGOs, Parliament & Media
8.	National Institute of Occupational Health (NIOH), Ahmedabad	Occupational Health
9.	Central Arid Zone Research Institute (CAZRI), Jodhpur	Desertification
10.	Centre of Advanced Study in Marine Biology Annamalai University, Parangipettai	Estuaries, Mangroves, Coral Reefs & Lagoons
11.	Centre for Environment Education, Ahmedabad	Environmental Education
12.	Zoological Survey of India (ZSI), Kolkata	Faunal Biodiversity

S.No.	ENVIS Centre	Subject
13.	Centre of Mining Environment, Dhanbad	Environmental problems of mining
14.	National Environmental Engineering Research Institute (NEERI), Nagpur	Solid Wastes including Hazardous Waste
15.	G.B. Pant Institute of Himalayan Environment & Development, Kosi-Katarmal, Almora	Himalayan Ecology
16.	School of Planning and Architecture (SPA), New Delhi	Human Settlement
17.	School of Environmental Sciences, New Delhi	Biogeochemistry
18.	Botanical Survey of India, Kolkata	Floral Biodiversity
19.	Environmental Protection Training and Research Institute (EPTRI), Hyderabad	Eastern Ghats Ecology
20.	Bombay Natural History Society (BNHS), Mumbai	Avian Ecology and Inland Wetlands
21.	Forest Research Institute (FRI), Indian Council of Forestry Research Education (ICFRE) Dehradun	Forestry
22.	Wildlife Management and Conservation Education Wildlife Institute of India (WII), Dehradun	Wildlife & Protected Areas
23.	Indian Environmental Society, Delhi	Panchayati Raj and Environment
24.	Centre for Media Studies (CMS), Delhi	Media and Environment
25.	State Council of Science and Technology, Sikkim	Ecotourism

(Source: http://envfor.nic.in/envis/centres.html)

f. The Paryavaran Vahini scheme was launched by the MoEF during 1992-93 to enhance environmental awareness and encourage active participation of people. It encourages people to report illegal acts pertaining to forests, wildlife, pollution and environmental degradation. One Paryavaran Vahini is constituted for every identified district (MoEF 2001a).

g. MoEF in 1999-2000 initiated an All-India Coordinated Project on Capacity-Building in Taxonomy (*see Section 6.1.1.2*). Two centers for training have been established. The project plans to establish centers of research on the basis of prioritized gaps like virus, and bacteria. It also hopes to strengthen BSI and ZSI as coordinating units in the fields of taxonomy, education and training (TERI 2002).

h. MoEF has initiated the National Green Corps programme, which targets school-going children for building a nation-wide campaign on environment and biodiversity issues. The programme aims at setting up of eco clubs in 100 schools of each district, in order to build environmental awareness in the young schoolgoing students. Each such school needs to identify a teacher to coordinate the eco-club activities. The identified nodal agency for the state facilitates training of master trainers for the district, who in turn spread the programme in their respective district. A grant of Rs 1000 per year per school is provided to support the programme.

i. The National Environment and Awareness Campaigns (by the MoEF) are organised annually, under which NGOs, schools, colleges, research institutions, women and youth organisations are supported to organise a variety of activities aimed at creating awareness on environmental issues among different target groups.

j. The National Zoological Park (NZP), New Delhi aims at creating awareness amongst visitors regarding nature conservation. The NZP offers a wide range of activities to achieve the same (http://envfor.nic.in).

k. National Museum of Natural History (NMNH) has been working towards promoting awareness on the natural heritage of the country. The key objectives are to develop national and regional museums aimed at environmental education; to develop museum-based formal and non-formal educational projects; and to develop audio-visual aids, interactive exhibits etc. (http://www.nmnh.org/Asp/vision.asp).

l. The National Bioresources Development Board (*see Sections 6.1.1.2 and 6.1.10.2*) has initiated a Vacation Training Programme on Bioresources for school children (Johri 2003).

m. National Botanic Research Institute (NBRI) (*see Section 6.1.1.2*) is currently finalising and establishing the Indian Botanic Garden Network. Apart from networking and maintaining a website on practical conservation of rare and endangered plants species, the project also envisages capacity building and in-country training of personnel, eco-education and information management (Pushpangadan 2002).

n. Ministry of Human Resource Development supports NGOs to take up innovative projects, which may generate locale-specific resource material to support the nation-wide campaign. A variety of material on different aspects of biodiversity has been produced under the Scheme for Environmental Orientation to School Education (EOSE), such as bird books in several different languages (CEE 2003).

o. The Department of Ocean Development (*see Sections 6.1.1.2 and 6.1.9.2*) has been organizing and participating in exhibitions and fairs at various levels with the objective of promoting awareness among citizens and school children. It also organizes workshops and seminars for exchange of information and capacity-building. As part of its Integrated Coastal and Marine Area Management project (*see Section 6.1.1.2*), the Department has undertaken several activities with the purpose of capacity-building and the development of infrastructure for R&D training (DOD 2003).

State Government

A good number of training and research institutions set up under the State Governments cater to training requirements of field personnel in the Forest Department.

a. There are over 40 forestry training institutes in India. The Bandhavgarh Training School in Madhya Pradesh and Kalagarh Training School at Corbett in Uttaranchal are two key institutions mandated to build capacities of field staff in biodiversity conservation.

   Institutions like Kerala Forestry Research Institute (KFRI) at Peechi, Kerala, State Forest Research Institute (SFRI) Jabalpur, Madhya Pradesh, State Forest Research Institute, Itanagar, Arunachal Pradesh, and Science and Technology institutions set up by different State Governments have supported research and training in the state, focusing on different aspects of biodiversity. Forestry training institutions, catering to training needs of in-service field staff, organise skill upgradation training at regular intervals.

b. In addition to the research and the training institutions set up by the state agencies, the field units of the Forest Department carry out a number of training programmes at the field level. Regular training programs are also organised jointly by the Wildlife Wing of the Forest Department and the Territorial Wing, on population estimations of large mammals.

c. The State Forest Departments and their numerous field units undertake awareness programmes on wildlife conservation as part of event celebrations like Wildlife Week, Van Mahotasava, World Forestry Day, and World Environment Day. Interpretation centers set up in various wildlife tourism areas, and eco-centers set up in forestry divisions (Madhya Pradesh & Chhattisgarh) have proved useful in sharing information related to biodiversity conservation. The Interpretation Center at Kanha set up in collaboration with CEE as well as the locally designed low-cost center at Melghat are some innovative examples. In Gujarat the State Forest Research Centre focuses on forestry research, communication and training. The Department has also set up a Forest Research and Training Institute in Gandhinagar. Each district also has Van Chetna Kendras where education programmes are regularly being organised (Sharma 2002).

   Interpretive programmes and facilities have been installed by CEE at Kanha and Madhav National Parks and at Chilika. The interpretive programmes aim at providing recreation and an understanding of how nature functions and conservation works. The Kanha interpretive programme, started in 1991, has 4 visitor centers, which

house interactive exhibits, signage, wayside exhibits and a variety of publications. In Chilika, the interpretive programme, which has been commissioned by the Chilika Development Authority, has in-boat interpretation, nature trails and school and community programmes focusing on natural resource management (CEE 2003).

Box 6.50 Integrating Biodiversity Education in 10 Shiksha Mission Schools

The Shram Niketan Sanstha, in Shahdol, Madhya Pradesh, took up a small project to help children understand biodiversity in 10 Shiksha Mission schools. The objective of this Apna School scheme of the MP Government Rajiv Gandhi Shiksha Mission has been to integrate real-life experiences of children in schooling. This is done with the objective of developing a scientific temper among children, inculcating democratic values in them, and as helping children understand their own environment better.

Several discussion and orientation sessions were organized, with the aim of taking schoolteachers step-by-step through classroom discussions, project work and village *melas*. These sessions were used to enhance the understanding of biodiversity and its interlinkages.

At the same time, the local community was exposed to biodiversity-related information and issues, through the interest generated by students in their homes. This was also done by organizing *bal melas*. A storybook in Hindi about biodiversity was also put together.

Source: Education, Awareness and Training Thematic BSAP

Box 6.51 Yatras/Boat Rallies as part of the NBSAP process

- As part of the Madhya Pradesh (MP) State BSAP process, an interesting *yatra* was initiated by the Forest Department and the Department of Biodiversity and Biotechnology in the state in January/February 2002. The team drew representation from foresters, bureaucrats, NGOs, scientists and community organisers. It had the twin objectives of creating awareness about the rich biological and cultural diversity of Satpuranchal (the Satpura area), as well as understanding the intricate relations of this rich biodiversity with the livelihood security of the rural population, specially the tribals. Covering an area of about 85,430 sq kms, the *yatra* traversed 13 districts of the Satpura uplands. Spread over 15 days, the *yatra* involved about 8,000 persons including community members, school children, government officials, media and NGO representatives (*Madhya Pradesh State BSAP*).
- The East Coast Ecoregion coordinating agency, along with the fisherfolk of Parangipettai, organized a boat race and cultural festival. The programme started with a rousing boat race, in which 20 country boats driven by 2 fishermen each, rowed up the estuary towards the mouth into the sea. The event did not in itself have a biodiversity component, but was a strategy to get the community interested and gathered for the subsequent events. Finally, there was a cultural programme put together by students. The highlight was a ecologically-centred version of the traditional Tamil drama form Willu Patta (Song of the Bow), in which a person with a simple bow instrument engages in a humorous question-answer session with others in the troupe.
- The Simlipal Sub-state Site nodal agency organised an event captioned LIFE 2001 in Mayurbhanj district Orissa. LIFE indicates Livelihood security, Indigenous knowledge protection, Forest and natural resource conservation and Equity. The main objective of these activities was to create awareness and build institutional strength for biodiversity conservation and management of natural resources. As part of the programme the following activities were undertaken: i) Cycle rally ii) Lok Shiksha Sibir (Community Education Camp) iii) *adivasi* drama iv) Forest festival.

This list is only indicative. Details on these and other such activities of other sites can be gathered from local, state and ecoregional BSAPs.

d. An interesting initiative towards understanding and spreading awareness on sacred groves has been taken up by the Indira Gandhi Rashtriya Manav Sangrahalaya (IGRMS) (National Museum of Mankind) in collaboration with World Wide Fund for Nature-India (WWF-India) and other governmental and non-governmental agencies.

Under the initiative, the museum has replicated some of the sacred groves of Kerala, Tamil Nadu, Rajasthan, Madhya Pradesh, Bengal, Maharashtra and Meghalaya as outdoor exhibits. Along with this there have also been celebrations with communities, their associated rituals and festivals. The goal is to raise awareness on the role of sacred groves in conservation of nature (http://sdnp.delhi.nic.in/resources/biodiv/articles/wwf-sacred.htm).

NGOs:

a. Professional institutions set up in the NGO sector like Bombay Natural History Society (BNHS), WWF-India and many others support wildlife-related training, research and extension activities (*see section 6.1.1.2*).

b. Ashoka Trust for Research in Ecology and Environment (ATREE), Wildlife Institute of India and the Centre for Environment Education in association with Department of Biotechnology have initiated certificate courses in Biodiversity and Bioresources for X standard students as part of summer schooling.

c. Nature's Beckon, Aranyak, Assam Science Society, The Rhino Foundation for Nature in NE India, Nature's Foster and a few other NGOs in Assam along with the Manipur Association for Science and Society (MASS) have been spreading conservation message education programs. Similar activities are being undertaken by NGOs in almost all states in the country.

d. The Center for Science and Environment (CSE), New Delhi, has come out with a series of publications that help create awareness among students, citizens groups etc. It brings out a fortnightly magazine, *Down to Earth*, on environmental issues, and a children's magazine, *Gobar Times*.

Box 6.52 Environment Education and People with Disabilities

- Vidyasagar is an organisation that works with people with disabilities in Chennai. Since 1997, children from their school project, many of whom have a neurological disability and use wheelchairs, have joined in Chennai's annual turtle walks. These walks are organised during the turtle nesting season every year by the Students' Sea Turtle Conservation Network, as an attempt to protect the nesting sites and eggs of the endangered Olive Ridley sea turtle. On every trip four children who use wheelchairs are a part of the group from Vidyasagar. Interestingly, some of the children have become regulars on these walks, and two students continue this involvement even though they are now no longer on Vidyasagar's rolls.
- The students of Spastics Society of Northern India (SSNI) lent their support to the Narmada Project-affected people in a small way. They had been exposed to the issues around large dams as part of a classroom project.
- Jana Pada Seva Trust, which is based in Melkote, a temple town in Mandya district in Karnataka, has been running an integrated school for several years. A number of children with disability from surrounding villages study in the school, which offers residential facilities. The trust also has a large farm where a number of crops and fruit trees are grown organically. Children with disabilities were included in many of the activities on the farm, an activity that they hugely enjoyed.
- In Bhopal the efforts of a group, Arushi, have been significant. They networked with officials of the Regional Museum of Natural History to make the Museum disabled-friendly. To make information regarding the center available to the visually impaired, they transcribed brochures and other information regarding the center into Braille. In collaboration with the Regional Museum of Natural History, Arushi also organized one day workshops on Accessibility for the staff of all museums, parks and zoos of Bhopal (*Environmental Education and Persons with Disabilities Sub-thematic Review*).
- CSIR/NBRI (*see Section 6.1.1.2*) has designed and developed a 'Touch and Smell Garden' for physically and visually challenged persons. 36 plant species with pleasant and different textures like smooth, coracious leaves are being planted in the garden, with legends written in Braille system explaining the plant world and its importance in maintaining life on earth (http://www.nbri-lko.org/ecoeducation.htm; Pushpangadan 2002).
- The C.P. Ramaswami Aiyar Foundation is running the 'Saraswathi Kendra Learning Centre for Children (SKCL)' an alternative centre for slow learners and children with learning disabilities. The SKCL has been conducting environmental awareness campaigns, including a project called 'Green Chennai-Clean Chennai' involving school children (Krishna 2002).

e. Sristi, an Ahmedabad-based NGO, conducts programs on biodiversity-related issues for students from rural and semi-urban areas.

f. The Ecological Society, Pune, runs certificate training courses on ecology that cater not only to students but also to professionals, housewives, business persons, who are given theoretical and practical training.

g. Kalpavriksh, based in Delhi and Pune, has produced manuals for schoolteachers of the Andaman and Nicobar Islands and Lakshadweep, oriented to learning about the biodiversity and communities of these union territories, with the help of locally available resources. It also coordinates number of articles and books on biodiversity and environment in national newspapers and websites.

Box 6.53 Kids for Tigers

'Kids for Tigers' is a Sanctuary-Britannia collaborative environmental education programme in schools across India. The purpose of the programme is to highlight the crucial link between the survival of the tiger and ecological health. It seeks to create awareness among children about India's biodiversity with the help of workshops, 'tiger feasts', nature walks, film shows and tiger information kits. As part of the initiative children with a substantial interest in saving tigers are individually recognized, get free gift subscriptions to *Cub* magazine, merit certificates, tiger scholarships, and participate in nature walks with expert naturalists etc. As part of this programme, teacher's workshops are also being conducted in various parts of the country on activities such as nature clubs, slide shows and lesson plans, which can be incorporated in the regular teaching, schedule (http://www.kidsfortigers.org).

h. *Sanctuary Asia*, a bi-monthly magazine, is published from Mumbai. The magazine deals with wildlife-related issues. The same group also simultaneously publishes a children's magazine called Cub. Several other environment-related journals and newsletters are brought out in India.

i. Centre for Environmental Law, (CEL) WWF-India, New Delhi; Centre for Environment Education, Research and Advocacy (CEERA), National Law School of India University (NLSIU), Bangalore; Environment Support Group (ESG), Bangalore; and the National University of Juridical Science, Kolkata have been imparting awareness and training on environmental law. Both CEL and NLS have diploma courses in environmental law.

j. There are many initiatives towards school-based environmental education. These include those of the Kerala Shastra Sahitya Parishad, Uttarakhand Seva Nidhi, the Bharati Vidyapeeth Institute of Environment Education and Research, the Hoshangabad Science Teaching Programme, and CEE's National Environmental Education Programmes in Schools. These initiatives range from 'integrating environmental concerns into curricula and textbooks, to extra- or co-curricular activities to development of locale-specific materials and teacher orientation' (*Education, Awareness and Training Thematic BSAP*).

k. WWF-India (*see Section 6.1.1.1 and 6.1.1.2*) has been involved in awareness and capacity-building for environmental protection and conservation. It was given a sharper focus with the launch of the Nature Clubs of India movement in 1976, and since then there have been several activities in the form of nature workshops, campaigns etc. that have been taken up. This is with the aim to strengthen both human and institutional capacity of various sectors (http://www.wwfindia.org/programs/edu/index.jsp?prm=21).

l. CPREEC (C.P. Ramaswamy Environment Education Centre) has put together a lot of information on topics such as water, land, energy, animal welfare, biodiversity with an objective to reach out to readers of different age and academic backgrounds. (http://cpreec.org/)

m. Some conservation NGOs such as Wildlife Trust of India and the Wildlife Protection Society of India (*see Section 6.1.1.2*) have been involved in producing material and holding orientation sessions for customs officers, forest guards, police and other officials on wildlife trade.

n. A large number of groups like Kerala Sastra Sahitya Parishad, People's Science Movement, Eklavya, NISTADS, NISCOM and others are involved in Jan Vigyan Jathas, in which environment is a key topic.

o. Jan Vachan Andolan: As part of a Campaign for Literacy and Libraries, the Bharat Gyan Vigyan Samiti has published about 2000 titles in 14 languages which deal with stories, pictures, songs, case-studies, articles about natural resource management, women's issues, school activities, science and so on. These have been prepared after discussions with people, followed by the documentation of their experiences as well as folk songs and stories (*Education*, *Awareness and Training Thematic BSAP*).

Communities:

a. The rural and tribal communities in the country have intricate linkages with biodiversity. These communities have their own ways of learning and imparting knowledge. Transfer of knowledge in some of these communities is through customary institutions, e.g. Dhumkuria (in Phari Korbas of Chhattisgarh & Jharkhand). Similarly, the Bhomakas (priests and herbalists) among the Korkus and Bharia of Central India pass on their knowledge, about myriad herbs and their application, to their successors in most animated manner. Oral transmission in daily life, 'resource' walks by children with parents, and other methods, are ways of learning and sharing information in these communities which are as critical to these communities as the formal system of learning to the urban community.

   The Vivekananda Girijan Kalyana Kendra in B.R. Hills, Karnataka, is one of the few organisations attempting to continue the tribal traditions of learning along with introducing formal education. There are unfortunately very few other initiatives to continue these largely oral means of training and education.

b. *Gram sabhas* and *gram panchayats* across the country have been constitutionally mandated to have a greater control of natural resources at the village level. Mendha (Lekha) village *gram sabha* in Gadchiroli district, Maharashtra, Van Panchayats and Jardhargaon Van Suraksha Samiti in Uttaranchal, Karonda Munda Van Samiti in Sarguja, etc. represent some of the brighter examples wherein grassroot-level action has not only resulted in *in situ* conservation of biodiversity, but has also helped in building a great deal of conservation awareness.

Box 6.54 Learning from Experience in Nahin Kalan Village, Uttaranchal

Awareness, sensitization and mobilization programmes have made a huge difference and led to local attitudinal change about fires. Social attitudes have changed to the extent that forest fires are being seen as a destructive and negative activity. This is evident amongst all sections of the local population, especially of the main village. The children particularly are exceptionally sensitized.

Successful Methods used as part of the planning processes (BCPP and NBSAP) in Nahin Kalan include:

- Wall writings of couplets, slogans and poems which are evocative, communicative, and direct, in Hindi and Garhwali, to make people think and act responsibly.
- Composing songs, slogans, and poems together. Some very creative poetry emerged out of this process.
- Posters: An artist made some exceptionally communicative and inspiring posters. These directly and indirectly inspired local youth and children to take up other ideas and initiatives.
- Creative activities, stories, and art with children. Lots of anti-forest fire and nature-sensitizing art emerged from this.
- Village and group meetings to discuss, share perceptions about the problem and determine contextually effective actions.
- Motivating and mobilizing people to come out and control fires.

Source: Nahin Kalan Sub-state Site BSAP

Others:

Academic Institutions

a. A major national study of environmental content in textbooks has been completed by the Bharati Vidyapeeth Institute for Environment Education and Research (BVIEER) under the Environmental Education in the School System (EESS) sub-component of the World Bank-supported India Environment Management Capacity Building Project (IEMCB). The extent of biodiversity coverage in the curricula (of all related subjects) has been assessed. Phase II of this project (2001-2003) will cover: development of state wise programmes and materials including syllabi, course books and plans and pilot implementation (in 100 schools in 8 selected states of Andhra Pradesh, Maharashtra, Goa, Assam, Orissa, Punjab, Jammu and Kashmir, Uttaranchal) of the programmes and their continuous evaluation. BVIEER has also been involving its M.Sc. (Environmental Science) students in field studies and dissertations related to biodiversity monitoring and use, and biodiversity education (*Education, Awareness and Training Thematic BSAP*). BVIEER also runs a one-year Diploma in Environment Education, the contact classes for which are held during the school vacations. Participants are required to carry out a dissertation during the academic year with their own students (CEE 2003).

b. A Supreme Court ruling of 1991 (Supreme Court of India, Original Jurisdiction, Writ Petition (Civil) No. 860/1991 – MC Mehta v/s Union of India and Others) directed all colleges to introduce a course on environment in all undergraduate courses. A large number of colleges have initiated biodiversity-related studies.

c. About 60 colleges and universities offer degree courses in environment/ wildlife/forestry sciences (Rahul and Rao 1995). At one time 14 universities offered forestry courses. The research projects being taken up at these universities are no less significant. The Centre for Ecological Sciences of the Indian Institute of Science, Bangalore, has been a front-runner in supporting field-based research and learning in the field of biodiversity.

d. The National Law School of India University holds regular workshops on biodiversity-related litigation. Some of the universities have taken a proactive lead in disseminating research information related to various facets of biodiversity.

   In-service training programmes for science teachers on biodiversity have been initiated by Academic Staff Colleges (MoEF 2001a).

e. Courses on Environment Education: Over 25 universities in the country offer courses on Environment Education as part of the B.Ed. (Bachelor of Education) course. CEE has developed a course (including course material and teaching methodologies) on Environment Education for B.Ed. students. With support from the Department of State Education Research and Training, teachers in all B.Ed. colleges in Karnataka have been trained to teach the course.

Armed Forces

The Wildlife Institute of India has conducted a conservation awareness course for army officers. The course has been internalized as a training package, and is now conducted by army personnel totally on their own (Ravi Chellam, personal communication 2002). The ecological cell of the Army is also devising environmental courses and sensitization programmes for their personnel.

Box 6.55 Initiatives Towards Awareness as Part of NBSAP

A primary purpose of the communication strategy under NBSAP was to generate as great a participation in the process as possible. But there was also an unstated second objective: to spread awareness about biodiversity issues widely . Underlying both of these was the ultimate purpose: to generate support for conservation of biodiversity, sustainable use of bio-

resources, and equity in decision-making processes and benefit-sharing related to biodiversity. Despite certain weaknesses, these efforts helped in attracting the participation of tens of thousands of people and spreading awareness about biodiversity. Some of the methodologies used were:

- Publishing a pamphlet for inputs (*Call for Participation*) in about 20 languages, with several thousand pamphlets being distributed through mail and at workshops, fairs and festivals, and other appropriate occasions that could be used.
- Utilising the mass media in as many ways as possible; e.g. 13 radio stations in Karnataka simultaneously broadcast a special programme on the BSAP process in the State. The NBSAP process was also discussed on national television channels like Doordarshan and Star News.
- Utilising a range of folk media methods like street theater and dance drama.
- Utilising special traditional communication means, such as a mobile seed display mounted on bullock carts going through 65 villages in the state of Andhra Pradesh, ending in the preparation of a local action plan focused on agro-biodiversity.
- Organising special mass participation events, such as boat rallies on the East Coast, a *yatra* (pilgrimage) through the central Indian Satpura highlands, a cycle rally in the east Indian state of Orissa, marches in many parts of the country including north-east Indian states etc.
- Initiating a revival of publicly visible links between culture and biodiversity, through 'biodiversity festivals' in several parts of the country (consisting of seed and traditional recipe displays, rituals and cultural programmes linked to biodiversity, exchange of genetic material amongst farmers, poster and photo exhibits, and other means).
- A bi-monthly NBSAP Newsletter, going out to over a thousand persons.
- Encouraging regular and in-depth media coverage, and involving publication of several hundred articles in newspapers and magazines; organising press briefings in various parts of the country; commissioning four senior Media Fellows to travel around to NBSAP process sites and write in national dailies; coordinating special supplements in mass circulation dailies such as *The Hindu* (with about 700,000 people receiving the supplement on biodiversity), and *Chandamama* (a children's magazine brought out in 12 languages).
- Managing a website (http://sdnp.delhi.nic.in/nbsap), where all documents are uploaded for free access; seeking hyperlinks with websites of related institutions and processes.
- Integrating audio-visual presentations on NBSAP into several dozen workshops and meetings held on related topics.
- Organising two workshops to sensitise media on NBSAP and biodiversity-related issues at New Delhi.
- Holding biodiversity-related workshops with specially-abled children in New Delhi and Chennai.

Attempting special outreach for children and youth, through science fairs, outdoor exercises, poster-making and art competitions, involvement in biodiversity information collection and other methods.

Media

The media can play a significant role in creating awareness about biodiversity as well as help mobilise people's participation in the conservation of biodiversity.

Box 6.56 A Media Campaign Saves a Sanctuary

The Narayan Sarovar Sanctuary in Kachchh District, Gujarat, represents the unique desert ecosystem and is particularly important for protection of Chinkara (*Gazella gazella*). It was notified as a sanctuary in 1981. However, in 1993, it was denotified, cancelling the earlier notification, which resulted in the reduction of the sanctuary area from 765.79 sq kms to 94.87 sq kms. Soon after the denotification order, a lease was granted to a cement company to carry out open cast mining in 2000 hectares of land inside the sanctuary. The impacts of this mining would have been disastrous for the sanctuary. The denotification was prevented by a timely intervention of the Center for Environment Education (CEE), which brought this into public focus by publishing an article in a leading newspaper. The article highlighted the impact mining would have on the biodiversity within and around the sanctuary. It also focused on the fact that the denotification was objectionable under Section 26A of the Wildlife (Protection) Act, 1972, which does not permit the alteration to a protected area boundary without legal sanction. A petition was subsequently filed on this basis. CEE followed up with a press campaign, which helped garner public support against denotification. As the case progressed the campaign highlighted the legal issues. In March 1995, the Gujarat High Court order cancelled the denotification on the ground that it ignored the Wild Life (Protection) Act, 1972, which requires the approval of

the state legislature before the boundaries of a Sanctuary can be altered. However, on 27 July 1995, the State Government approached the Legislative Assembly for passing the denotification order. The State Government pushed the denotification process through the Assembly. However the land area that now remained protected as sanctuary area was 444 sq km, which was considerably more than the 94 sq km area that the original denotification would have left (CEE and MoEF 2002).

Coverage of biodiversity issues in the media has certainly grown over the years and several periodicals and TV channels provide special slots/space to it. However, in comparison with other subjects like politics, sports and even fashion, this coverage remains meagre. A comparison of biodiversity coverage in five newspapers (*The Times of India*, *Deccan Chronicle*, *The Hindu*, *Eenadu* and *Navbharat Times*). from January 2001 to June 2001, shows that very limited space was given to a aspects related to biodiversity. For instance, in the case of *Times of India*, a total of 610.5 column inches were devoted to biodiversity- or environment-related issues in the six months, with greatest emphasis on wildlife followed by water-related issues. In the case of *Navbharat Times*, the coverage was as little as 137.5 column inches. Newspapers like *The Hindu* and *Eenadu* gave far more coverage than the other three newspapers monitored during this period, though a lot of emphasis was on water-related issues (*Media and Biodiversity Sub-thematic Review*).

Table 6.7 Comparison of time given (in minutes) to various issues on prime-time newscasts
(from Jun to Sep 2001)

	Channel				
Category	**DD Eng**	**DD Hindi**	**ETV**	**Zee News**	**STAR News**
News time (in minutes and seconds)	660.24	612.57	641.35	588.55	621.10
Politics	55:54 (8.41%)	46:39 (7.57%)	125:29 (19.54%)	67:73 (11.51%)	64:59 (10.40%)
International	97:39 (14.75%)	104:33 (17.03%)	41:29 (6.44%)	32:47 (5.52%)	32:34 (5.21%)
Sports	34:50 (5.23%)	35:40 (5.78%)	22:02 (3.43%)	74:41 (12.64%)	50:22 (8.09%)
Entertainment	14 (2.12%)	12:78 (2.09%)	11:92 (1.86%)	25:39 (4.31%)	12:32 (1.98%)
Business	20:12 (3.05%)	9:07 (1.48%)	36:19 (5.64%)	53:25 (9.05%)	26:33 (4.24%)
Development	16:41 (2.49%)	16:41 (2.68%)	1:59 (0.25%)	5:33 (0.91%)	14:36 (2.31%)
Biodiversity	3:40 (0.52%)	3:40 (0.56%)	0	0	1:45 (0.23%)

Source: Media and Biodiversity Sub-thematic Review

A few television serials have helped to bring environmental issues to a mass audience, e.g. NDTV's Living on the Edge, and Bhoomi on Doordarshan.

There are also several websites dedicated to environment/biodiversity, which serve as important sources of information. Many of them serve as discussion forums and tools for campaigning and advocacy.

Corporate Sector

Eco-rating by ITC Group of Hotels: Welcomenviron is the green arm of ITC Hotels and it endeavours to help the hotels develop an environmentally-conscious philosophy. This branch of the company has developed an eco-rating system for schools for the Delhi Government, which has been used in over 1200 schools. The rating is a voluntary initiative for schools to help them build an attitude of conservation. This is done through a simple questionnaire. It is hoped that a questionnaire of this nature will assist schools in questioning/addressing their current practices and enable them to work towards becoming eco-responsible. ITC has also developed a similar eco-rating for Residents' Welfare Associations that exist in many residential colonies of Delhi, with a view to involving citizens across the city (Niranjan Khatri, personal communication 2002).

6.1.6.3 Major Gaps

a. The decline in taxonomic expertise is a major gap that needs to be addressed. There is also need for networking amongst taxonomists. Majority of the capacity-building programs focus on terrestrial biodiversity. There is scope to extend these to fresh water and marine habitats. Another serious taxonomic gap is in the area of micro-organisms. Lack of availability of trained humanpower is another major problem in continuing explorations, characterization and conservation of microbial biodiversity, since extensive use of molecular tools is now being employed in identification of microbes rather than phenotypic characters.

b. There is serious lack of ecological orientation for special sectors like lawyers, judges, economists, financial experts, custom officials and government departments other than environment/forests.

c. The institutions set up by the MoEF usually look at specific dimensions of biodiversity. Given the inadequate inter-institutional coordination, the holistic approach and coverage of biodiversity gets neglected. This is reflected, for instance, in the weakly-developed EIA sector or in the continued failure to positively link natural and agricultural ecosystem management.

d. There is inadequate capacity in current biodiversity-related institutions to deal with new situations and challenges, e.g. participatory and joint management systems, socio-economic issues, climate change, decentralization, intersectoral integration and so on.

e. The training institutions set up by the State Forest Departments in many states usually suffer from lack of motivated trainers. The curriculum in both the national level institutions as well as those in the states, needs re-assessment in terms of coverage of biodiversity issues.

f. Although a large number of organisations are working on various aspects of biodiversity, information remains very scattered. This makes the retrieval and dissemination of information difficult.

g. While the event celebrations like Van Mahotsava, Wildlife Week etc. are taken up by the government departments and NGOs, they often remain 'one-off' efforts towards creating awareness. There is a need for concerted and continued efforts in this regard.

h. Wildlife tourism as a means of creating awareness predominately caters to the urban population. The current focus of wildlife tourism is on large mammals. This needs orientation towards a holistic view of biodiversity.

i. Schools are presently not drawing upon the best available Environmental Education (EE) experiences in the country.

j. Most colleges have not introduced environmental courses. Integration of environment in general and biodiversity in particular is especially weak.

k. The biodiversity component in various courses offered by the universities and the academic institutions is not holistic. It often tends to be technical, ignoring the practical and social aspects of conservation, sustainable use, and equity; even where the syllabus is adequate, the necessary expertise to teach it is limited.

l. There is very limited educational material on biodiversity which is locale-specific, in local languages, and in different media, for different sectors of society (CEE 2003).

m. Serious erosion of non-formal and community forms of knowledge transmission, education, and training is taking place; everywhere in the country these means of education have been 'devalued', considered irrelevant or primitive. Such being the case, the traditional institutions of learning are fast fading out.

n. The urban community is strongly moving towards a global culture of consumerism, which further removes it from nature and ecological consciousness. Simultaneously, the changing socio-cultural and economic milieu in the rural areas is generally accompanied by lack of awareness and appreciation of the full range of biodiversity values and the need for their conservation. Therefore the planning efforts at the Panchayati Raj Institutions (PRI) (both at the District as well as at *panchayats/gram sabha*)-level and municipal level often remain indifferent to biodiversity concerns.

o. Inadequate capacity in villages and PRIs to use new opportunity created by participatory schemes like JFM and decentralization laws and policies like PESA.

p. The capacity-building programmes conducted by national/state level institutions on biodiversity remain sectoral and specialised, thereby reducing chances for a holistic approach. The situation gets further compounded due to weak inter-institutional linkages.

q. There is no systematic orientation of armed forces on biodiversity issues, especially on reducing impact on biodiversity in the area of their operation.

r. The Media and Biodiversity study done as part of the NBSAP process concluded that the issue of biodiversity has a low priority in the Indian media, though, the print media gives the subject substantially greater attention than television channels.

s. There is little or no integration of the concept of sustainability into the formal education system (CEE 2003).

t. There is limited use of folk media to strengthen non-formal education on biodiversity.

6.1.7 Wild Biodiversity: Inter-sectoral Coordination

6.1.7.1 Overall Concept

As discussed in *Chapters 4* and *5*, biodiversity is affected by myriad human activities. Such activities are the domain of a variety of official and non-official 'sectors': ministries, departments, academic and other institutions, NGOs, and communities themselves. While rural communities often tend to integrate different aspects of their life in somewhat seamless ways (or at least did so traditionally) the state and formal academic institutions are more fragmented and compartmentalised. Water, land, forests, air, minerals, and the human agencies and facilities necessary to deal with these natural resources are each the subject of a different department, or a different academic discipline. This results in twin problems: (a) the lack of coordination amongst all these sectors, and, (b) the lack of integration of biodiversity into the non-environment sectors.

The realisation that this non-integration is one of the major causes of biodiversity loss (and more generally of the failure to achieve sustainable and equitable development and welfare) has prompted a number of initiatives to achieve inter- and cross-sectoral integration. Some of the key initiatives are described below.

6.1.7.2 Currrent and Past Initiatives

Government

a. At larger landscape levels, there are a few examples that can be learnt from. In the late 1980s and early 1990s, an enterprising CEO of a district that included the Melghat Tiger Reserve, Maharashtra, was able to pool the resources of all development departments under him (Pardeshi 1996). He developed a common programme oriented towards the conservation of the Reserve's forests and wildlife, including through provision of alternative biomass and livelihood options through rural development programmes. At Harda, Madhya Pradesh, a forest officer managed something similar (Rathore 1996). Unfortunately, both these initiatives were short-lived, as they were dependent on innovative individuals and did not have much in the form of an institutionalised process to sustain their initiatives after they left.

b. In order to develop interconnectivity between rural development, forest conservation and employment generation in the forest-fringing villages, an umbrella scheme is being implemented on a pilot basis through a decentralised set-up. This programme is being implemented by Forest Development Agencies (FDAs) consisting of village forest committees, forest officials and other officials from departments like agriculture, animal husbandry, soil conservation, tribal welfare, public health, education etc. The FDAs institutionalise monitoring activities and have greater flexibility in project formulation, identification of funding sources, thereby meeting local requirements effectively. Forest Development Agencies (FDAs) are being seen as major implementation agencies for JFM under NAEB's National Afforestation Programme, the Greening India Scheme (see point 'h' below), and for programmes recommended by the Working Group on Forestry for the Tenth Five-Year Plan. Substantial funds are proposed to be routed through FDAs during the coming years. This new institutional structure is stated to be a form of financial decentralisation as also a means to better coordinate the activities of individual JFM committees on a larger scale.

   FDAs are registered as federations of all Joint Forest Management Committees (JFMCs) within territorial/wildlife forest divisions under the Societies' Registration Act. They comprise senior forest officials, presidents of JFM committees, one non-official member, ground forest staff, line department representatives (as non-voting members) and district officials. In the FDA's general body, out of 50 JFMC representatives, 20 have to be women, whereas in the Executive Body, there have to be 7 women out of a total of 15 JFMC representatives. The FDA concept has significant potential to help coordinate clusters of villages, move towards inter-sectoral coordination, and reduce financial delays at state government levels. But there are a number of concerns relating to their functioning (see *Major Gaps* below).

Box 6.57 Chilika Development Authority

Another landscape-level process that could provide key lessons is at Chilika Lake, one of Asia's largest brackish waterbodies, and a Ramsar site with biodiversity of international importance. In 1992, the Orissa state government placed this wetland under a legally notified Chilika Development Authority (CDA). With the Chief Minister as its Chair, the CDA consists of the state's Chief Secretary, representatives of relevant departments, NGOs, scientists, the local Member of Parliament and Member of the Legislative Assembly, and others. Formal links exist with community-level institutions such as women's self-help groups, bird protection committees and watershed committees. A new fisheries regulation has attempted to resolve conflicts between the area's traditional fisherfolk and more powerful aquaculture or commercial fishery interests from outside.

Some of the aims and objectives of CDA are:
- To protect the lake ecosystem with all its genetic diversity.
- To suvey, plan and prepare the project proposal for Integrated Resource Management
- To execute various multi-dimensional and multi-disciplinary development activities
- To cooperate and collaborate with other institutions for all-round development of the Lake and its surroundings.
- To conduct Environmental Impact Assessment studies from time to time
  (Ajit Pattnaik, personal communication 2002).

The CDA was awarded the Ramsar Wetlands Award in 2002.

c. Similar attempts have been made for several of the country's Biosphere Reserves (BRs) (*see Section 6.1.2.2*), including an initiative towards coordination across three states for the Nilgiri Biosphere Reserve in southern India. BR administration is supposed to be undertaken jointly by several relevant departments of the government, with the involvement of NGOs and independent experts.

d. To some extent, the lessons from examples like this have been built into the more recent ecodevelopment programmes around PAs. Guidelines for the Centrally-Sponsored Scheme on Ecodevelopment suggest the creation of district-level coordination committees under the District Collector or Magistrate, with the

Protected Area Director as the member-secretary. Such committees should include *gram panchayat* leaders and NGO representatives. Under a Global Environment Fund-funded project in the second half of the 1990s, there was an explicit provision that the Forest Department should coordinate conservation and development efforts with all government departments that operate in and around a PA (World Bank 1996). It is not clear how much of this actually happened, though. Indeed, some critics pointed out that the funds available with rural development agencies were much more than the funds accessed from GEF, and therefore there was little need for outside funding (Kothari 1998). Others argue that such funds can be important as catalysts (Rizvi 1999).

e. The Environment/Forests Department (and Ministry at the Centre) have the mandate to assess ecological concerns in development projects (*see Box 6.1*), and determine whether such projects should go ahead or not. At the Centre, the MoEF has several expert committees that advise on whether a particular development project should be cleared, and, if yes, under what conditions. This provides a platform for intersectoral integration.

Box 6.58 Coastal Zone Management Authorities

The CRZ Notification, 1991, laid out a detailed set of restrictions on development activities along the coast of the country. To monitor and implement its provisions, the Ministry of Environment and Forests (MoEF) constituted 13 State Coastal Zone Management Authorities (SCZMAs) for each of the coastal States and Union Territories, and one National Coastal Zone Management Authority (NCZMA), though this was finally done only in the year 1998 and 1999 respectively. The term of the SCZMAs has recently been extended to three years. This is a three-tier system to monitor the coast, with the MoEF at the top, followed by the NCZMA and then the SCZMA.

The constitution of the SCZMAs varies across the states but their duties and responsibilities are identical. They comprise various representatives of Government Departments – Forests & Environment, Revenue, Town and Country Planning, Tourism, Industries, Urban Development, Commerce, Pollution Control Boards, Fisheries, Public Works Department etc. There is also representation from several government technical and research organizations, such as the Department of Ocean Development, various academic institutions, Space Application Centre, and the National Institute of Oceanography. The SCZMAs are mandated to identify ecologically-sensitive and economically-important areas, create integrated management plans, and, most importantly, to act as **the immediate authority empowered to implement all provisions of the CRZ Notification**, including recommending projects for clearance to the government. These State-level authorities have a great deal of potential in terms of adopting creative and innovative steps to manage and conserve coastal biodiversity. However, some of the key concerns with CZMAs are:

- Despite the rich inter-sectoral composition, the mandate of the SCZMAs and the NCZMA is primarily that of policing the coast, guided by the rules of the CRZ notification, which are limited in its scope vis-à-vis conservation.
- Neither the CRZ Notification nor the CZMAs **explicitly** refers to a participatory process of coastal management. *But what has been omitted is not necessarily prohibited*. This interpretation has not been exercised by the CZMAs. Contributory factors could be the fact that these bodies were not provided with ample funds to function in an independent manner, and were administratively controlled by the State Departments of Environment.
- The composition of the CZMA is itself skewed in favour of large Government-aided/ recognized institutions and heavily dominated by Government officials. NGO representation is present only in Goa.

Contributed by Aarthi Sridhar, Karnataka

f. At district and municipal area levels, the 73rd and 74th Amendments to the Constitution have provided the possibility of sectoral integration. The District Planning Committees have the mandate of responsible use of natural resources in the development of the area. But there is no explicit provision for integrating biodiversity, and there is little information on whether even the more general provisions regarding natural resources have actually been used. A beginning has been made in some districts like Seoni (Madhya Pradesh). An interdisciplinary team undertook an interesting Satpuranchal *yatra* (*see Box 6.51*) with a view to understand the rich biodiversity of the area, and its intricate linkages with people's livelihoods. The lessons from the *yatra*

were discussed in the subsequent meeting of the District Planning Committee (DPC). The DPC resolved that biodiversity conservation concerns will be mainstreamed in the sectoral plans under the district planning process. A district biodiversity core group was set up under the chairmanship of the District Collector, with representation from different line agencies, NGOs, community representatives etc. (B.M.S. Rathore, personal communication 2002).

Upscaling this, as part of the follow-up to the NBSAP, the MP government has issued a circular to all District Collectors to ensure biodiversity integration into the planning process.

g. Guidelines for Watershed Development (Revised 2001): The Government of India's revised guidelines for watershed development appear to hold great promise. 'In a paradigm that is at once ecofriendly, gender sensitive, participatory and holistic, these guidelines, evolved on the basis of the recommendations of the Prof. Hanumantha Rao Committee are proving to be effective in addressing issues relating to production, productivity and the management of precious natural resources in various parts of the country. The guidelines have redefined the role of Government Departments in this area and provided an institutionalised mechanism for community empowerment.' (MoRD 2001). Among other components, these guidelines encompass development of forest lands in watershed areas. They also recommend that a State Watershed Development Committee be constituted to ensure coordination among various government departments/institutions and voluntary agencies

Box 6.59 Special Region Development Programmes

- **Hill Area Development Programme**: This Government of India programme is in operation in Jammu & Kashmir, Himachal Pradesh, Sikkim, Manipur, Meghalaya, Tripura, Arunachal Pradesh, Nagaland, Mizoram, Assam, Darjeeling District of West Bengal, Nilgiri District of Tamil Nadu, and Uttaranchal and Western Ghats areas. The project has been launched to overcome the problems of deforestation, soil erosion, drying up of water sources and flash floods, and the resultant problems of poverty and food shortage .
- **Western Ghats Development Programme** (WGDP): The WGDP initiated by the Planning Commission in the year 1974-75, is being implemented in 159 talukas in five States – Maharashtra (62 talukas), Karnataka (40 talukas), Kerala (29 talukas), Tamil Nadu (25 talukas) and Goa (3 talukas). The main objective of this programme has been the development of the ecoregion, keeping in mind the conservation of its fragile ecosystem and livelihood concerns of the people of the area (http://www.planningcommission.nic.in/plans/annualplan/anplsf.htm).
  However, an analysis of the actual schemes that are being funded under these two programmes does not indicate that biodiversity (or biodiversity-based livelihoods) is a critical component of the planning process. The schemes being proposed under these programmes for the 10th Five-Year Plan period (2002-2007), for instance, are more along the lines of conventional rural development programmes that have so far ignored biodiversity (Kothari 2001b).
- **Desert Development Programme** (DDP): This was initiated by the Ministry of Rural Development in 20 districts in the year 1977-78 to cover the desert region of Gujarat, Rajasthan and Haryana, besides the cold deserts of Jammu and Kashmir and Himachal Pradesh. As of September 2001, DDP was being implemented in 227 blocks of 40 districts in 7 States (MoEF 2001b). The objective of the programme is to control desertification, mitigate the effects of drought and restore ecological balance in the affected areas through land development, water resources development, afforestation, sand dune stabilization and shelterbelt creation. Largely it has been the watershed approach, which has been used in the implementation of this programme. In 1982, a Task Force on DDP reiterated and laid emphasis on ecologically sustainable development as the objective of this programme (MoEF 2001a).
- A new thrust towards river basin planning has highlighted the need to consider the ecological aspects of the entire basin, and the impacts of development in one part of the basin on other parts. However, even in such initiatives, there is very little *actual*, *on the ground* re-orientation of the various welfare and development sectors towards biodiversity concerns.

Communities and NGOs:

a. At the level of villages, *panchayat* institutions or *gram sabhas* do sometimes attempt to build biodiversity and environmental concerns into their decisions. More often than not, however, this is due to the initiatives taken by village leaders or an external agent, rather than something that is built into the formal *panchayat* system. At Mendha (Lekha) village, Maharashtra, residents have empowered themselves through the acquisition of information about laws, policies, and schemes, and insisted that all relevant government agencies pool their resources and coordinate with each other and the village council in deciding about development, welfare and conservation activities (Pathak and Gour-Broome 2001). Given their own strong thrust towards the conservation of surrounding forests, the villagers are able to ensure that biodiversity is a central concern in these activities. Increasingly, the thinking within government is also veering towards such village-level coordination and integration.

b. In the Arvari river basin in Alwar district, 15 years of successful decentralised water harvesting by villagers and a NGO, Tarun Bharat Sangh, has culminated in the formation of a Arvari Sansad (Parliament). Consisting of representatives of each of the 72 villages in the basin, this forum meets every six months to decide about matters of land, water, forests, wildlife, disputes and crimes, and other critical issues. However, involvement of government departments in this seems to be minimal so far. There is now an attempt to carry this process forward with a people's biodiversity action plan, formulated under the NBSAP process (*Arvari Sub-state Site BSAP*; *see Section 6.2.8.2*).

6.1.7.3 Major Gaps

Unfortunately, compared to the magnitude of the problem, the initiatives mentioned above are very few, and since they are not yet backed by a cohesive, comprehensive policy thrust, upscaling them or applying their lessons elsewhere has been extremely slow. Some of the key gaps are:

i. There is little emphasis on providing village institutions or urban citizens' bodies with the capacity, decision-making power, and responsibility for such integration.

ii. There is a lack of guidelines and capacity-building on this issue for local, district, and state level decision-makers.

iii. There is no institutionalised, statutorily mandated process, of integrating biodiversity into all the sectors of planning, welfare, and development. This leads to innovative approaches by officials or NGOs often being short-lived and individual-centred.

iv. There is a lack of documentation and learning from the successful formal and informal initiatives at achieving integration (such as those described above), and thereby inadequate upscaling and spreading of these initiatives;.

v. Critical conceptual or implementation gaps exist in most ongoing schemes and programmes regarding watershed, coastal areas, special regions, forest circles and so on.

vi. As a review (*Biodiversity in EIAs Sub-thematic Review*) commissioned under NBSAP has shown, the biodiversity component of the EIA procedures is weak. Nonetheless, this is an important tool for integration of biodiversity concerns.

vii. The guidelines for watershed development do not explicitly integrate biodiversity conservation issues. For instance, they do not stress the role of indigenous species of plants for afforestation or the role of traditional biodiversity-related knowledge in developing water sources.

viii. Unfortunately, there is little other indication of biodiversity integration becoming a mainstream concern in ministries and departments dealing with development and welfare, although successive five-year plans and the annual Economic Surveys have broadly spoken about ecological concerns.

ix. Forest Development Agencies (FDA): Concern has been expressed at the fact that the FDA structure is uniformly under the control of forest officers, which seems to move away from the increasing trend towards joint and participatory decision-making. Also, there seems to be some degree of incongruity between the JFM orders of different states regarding constitution and functioning of Van Samitis and the requirement for constitution of JFMC under FDA. For instance, the existing JFM orders of Haryana, Gujarat and Himachal Pradesh do not require the forest guard to be the Member Secretary and joint account holder of the village institution. In a number of States, the account is jointly held in the name of President and the Secretary, while the FDA provides that the accounts will be singly held in the name of the Secretary.

    The institutional structure of the FDAs raises some concern about the impact on existing community-led initiatives, including federations and collectivities, which are currently working well. The detailed prescriptions for the 'JFM Committees' participating in NAEB's NAP have some degree of inconsistency vis-à-vis MoEF's February 2000 revised guidelines for JFM and the diversity of provisions in different state government JFM orders. Though formed with the laudable intention of strengthening working of Van Samitis, the FDAs could in some cases inadvertently replace a diversity of tenurial and institutional arrangements by a uniform structure, which may prove contrary to the very spirit of participatory forest management.

x. A substantial amount of external aid (grants and loans) that comes to India is not sensitive to biodiversity concerns, nor does it have inbuilt mechanisms of assessing impacts on the environment or on biodiversity-based livelihoods. There is therefore a need to ensure integration of biodiversity concerns in all international relations.

6.1.8 Wild Biodiversity: Policy and Law

6.1.8.1 Overall Concept

In recent times, attempts have been made to synergise the predominantly 'environmental' laws and policies with those dealing with human rights and welfare. Efforts are also being made to reconcile the serious differences that have conventionally existed between environment-, human rights- and welfare-related laws and those dealing with commercial and 'developmental' activities.

India has one of the world's largest bodies of law and policy related to conservation, and an ancient history of customary law. Some of the key initiatives are described below.

6.1.8.2 Current and Past Initiatives (*see also Box 3.2*)

Government

a. The Constitution of India: The Constitution of India was adopted on 26th November 1949. Social, economic and political justice and the equality of status and of opportunity are among the objectives enlisted in the Preamble to the Constitution. These objectives are relevant to the conservation of biodiversity from the point of view of the equitable sharing of natural resources.

    The Seventh Schedule to the Constitution lists the subjects that the Central and State Governments are to legislate upon (in the Union, State and Concurrent Lists). Significantly, the subject of Local Government, which includes village *panchayats*, is in the State Government List. A number of items on these lists pertain to elements of biodiversity or have a bearing on the conservation of biodiversity.

    i. The Constitution and Relevant Fundamental Rights:
    Article 32 of the Constitution deals with the Right to Constitutional Remedies, and gives the people the right to move the Supreme Court by appropriate proceedings for the enforcement of the Fundamental Rights guaranteed by Part III of the Constitution. Article 226 empowers the High Courts to issue directions, orders or writs for the enforcement of Fundamental Rights, or for any other purpose.

Article 21, which guarantees the Right to Life and Personal Liberty, has been interpreted by the Supreme Court such that the right to life includes the right to a healthy environment (M.C. Mehta vs. Union of India, 1987; Bandhua Mukti Morcha vs. Union of India, 1984). Furthermore, the meaning of healthy environment has been held to encompass elements such as unpolluted water and air (B. L. Wadhera Vs. Union of India 1996; Indian Council for Enviro-legal Action Vs. Union of India 1996a; Subhash Kumar Vs. State of Bihar 1991) and protection against hazardous industries (Vellore Citizens Welfare Forum Vs. Union of India 1996). The right to life has also been held by the Supreme Court to include the right to livelihood (Olga Tellis Vs. Bombay Municipal Corporation 1986).

Article 14 guarantees the Right to Equality before law. Thus, some permissions given to set up industries granted by the government have been successfully challenged on the grounds of having been granted arbitrarily and without having taken ecological factors into consideration (State of Himachal Pradesh vs. Ganesh Wood Products; Pleasant Stay Hotel Vs. Palani Hills Conservation Council 1995).

ii. The Constitution and Directive Principles of State Policy:[4]

- Article 48A is one of the Directive Principle of State Policy and states that '*The State shall endeavour to protect and improve the environment and to safeguard the forests and wild life of the country*.'
- Article 51A deals with the fundamental duties[5] of citizens, which includes a citizen's duty to value and preserve the rich heritage of our composite culture and to protect and improve the natural environment including forests, lakes, rivers and wildlife, and to have compassion for living creatures. Articles 48A and 51A have been used by the Supreme Court on a number of occasions, to bolster 'pro-conservation' arguments.

iii. The Constitution and other aspects of case Law: Fundamental Norms:

- Some norms, which have emerged as a result of judicial interpretation, are the 'precautionary principle' and the 'polluter pays principle'. The principle of absolute liability has also been introduced as an expansion of the rule of strict liability. Absolute liability has been held to extend beyond compensating victims of pollution, to include the cost of restoring environmental degradation. Furthermore, the state has been held to be the trustee of all natural resources, which are by nature meant for public use and enjoy-

Box 6.60 Role of the State with respect to Public Lands/Waters:

From Eminent Domain to Public Trust

The current role of the state (government and all its arms) with respect to public territories is one of *eminent domain*, in which it has the right to assign these lands/waters for any purpose it deems to be in public interest. In many countries this has evolved towards the more enlightened notion of *public trust*, in which the state holds the lands in trust, ensuring that its long-term benefits to society are sustained. The Supreme Court of India has held such a notion to be applicable in India:

'The notion that public has a right to expect certain lands and natural areas to retain the natural characteristics, is finding its way into the law of the land. The ancient Roman Empire developed a legal theory known as 'the doctrine of public trust'. It was founded on the idea that certain common properties as, rivers, seashores, forests, and the air were held by the government in trusteeship for the free and unimpeded use of the general public...the public trust doctrine imposes the following restrictions...first, property subject to the trust must not only be used for a public purpose, but it must be held available for use by the general public, second, the property may not be sold, even for a fair cost equivalent, and third, the property must be maintained for particular types of uses...' (Supreme Court in *M.C. Mehta vs. Kamal Nath and others*. 1996(9) SCALE 141).

Any diversion of ecologically sensitive areas, where 'public interest' clearly needs to be defined as the protection of their critical ecological functions such as water and biodiversity, should therefore be unacceptable in such a public trust doctrine.

(Adapted from *Policies, Laws, Institutions, and Planning Thematic BSAP*)

ment. The public at large is the beneficiary of the seashore, running waters, air, forests and ecologically fragile lands. These resources cannot be converted into private ownership (M.C. Mehta vs. Kamal Nath, 1997; M.I. Builders vs. Radhey Shyam Sahu 1999).

iv. The Constitution and Marine Ecology:

- Article 297 specifies that all lands, minerals and other things of value underlying the ocean within the territorial waters, or the continental shelf, or the exclusive economic zone of India shall vest in the Union. Living resources, which fall under the category of all other resources of the exclusive economic zone of India under this article, are also said to vest in the Union. Parliament has the power to specify by or under law, the limits of these zones from time to time. Living resources would include the diversity of marine life, including the fish wealth that traditional fisherfolk depend on.

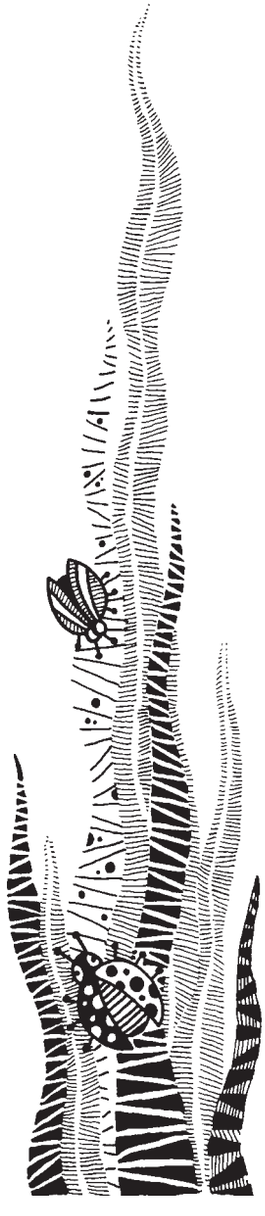
v. The Constitution and Ecosystem-dependent Traditional Communities:

Some provisions of the Constitution that pertain to the welfare of tribals and therefore have a bearing on the conservation of biodiversity are as follows:

- Article19 (5) empowers the state to impose reasonable restrictions on the fundamental rights of citizens to move freely through the territory of India and to reside and settle in any part of the territory of India. The State can impose reasonable restrictions on citizens in this context in order to protect fragile ecosystems or the interests of any Scheduled Tribe.
- It must be noted that the Supreme Court has ruled (Samatha Vs. State of Andhra Pradesh 1997) that land in Schedule V[6] areas cannot be sold to non-tribals. Article 29 (1), among other specifications, allows for giving any section of the citizens residing in the territory of India and who have a distinct culture, the right to conserve the same.
- Article 38 enjoins the State to strive to secure a social order for the promotion of the welfare of the people. This includes endeavours to be made by the State to minimise inequalities in income and to eliminate inequalities in status, facilities and opportunities, not only amongst individuals but also amongst groups of people.
- It is interesting to note that Article 39 points towards the right of citizens (men and women equally) to an adequate means of livelihood. Article 39 also indicates that the State should attempt to ensure that the ownership and control of the material resources of the community are so distributed as best to subserve the common good. In addition to this, it asserts that the operation of the economic system should not result in the concentration of wealth and means of production, to the common detriment.
- Article 40 points towards the duty of the State to organize and empower village *panchayats*. This has been carried forward through a positive measure in the form of the 73rd amendment to the Constitution, which gives more power to the *panchayat* bodies, and the subsequent Panchayats (Extension to Scheduled Areas) Act (*see Section 6.1.5.2*).
- Article 46 includes the promotion of the economic interests of Scheduled Tribes, and their protection from social injustice and all forms of exploitation.

b. The National Forest Policy, 1988 (*see Section 6.1.5.2*): In 1952, the erstwhile Ministry of Food and Agriculture enunciated a Forest Policy to be followed in the management of State Forests in the country. Forests, however, continued to be viewed as a source of revenue. Large-scale deforestation and the diversion of forest land for non-forest uses finally led to the formulation of a new Forest Policy in 1988, with a focus on conservation (Kashyap 1992).

The Policy enunciates nine basic objectives. Of these, those which focus on 'conserving the natural heritage of the country by preserving the remaining natural forests with the vast variety of flora and fauna, which represent the remarkable biological diversity and genetic resources of the country, and also meeting the requirements of fuelwood, fodder, minor forest produce and small timber of the rural and tribal populations' are the most directly linked to biodiversity and livelihood concerns.



The Forest Policy states that the derivation of direct economic benefit must be subordinated to the principal aim of environmental stability and ecological balance. It also states that 'for the conservation of total biological diversity, the network of National Parks, Sanctuaries, Biosphere Reserves and other PAs should be strengthened and extended adequately.' It then sets out a list of strategies.

c. The Indian Forest Act, 1927 (IFA) (see Section 6.1.5.2): The IFA, 1927, was intended to consolidate the law relating to forests, the transit of forest-produce and the duty leviable on timber and other forest produce. The IFA is seen as an Act related essentially to the usage of forest wealth. In this connection, three categories of forest have been provided for. The IFA empowers the State Government to constitute any forest land or waste land, which is the property of the government, or over which the government has proprietary rights, as a Reserve Forest (RF) or Protected Forest (PF). Upon having constituted a RF, the state government has the power to assign any village community the rights of Government to or over such land. This land is then to be referred to as a Village Forest.

   The IFA empowers the State Government, in certain cases, to acquire private land for public purposes under the Land Acquisition Act, 1894.

d. The Forest (Conservation) Act, 1980 (FCA): The Forest (Conservation) Act was introduced with the stated intention of checking further deforestation. The Act imposes restrictions on the de-reservation of forests and use of forest land for non-forest purposes by State Governments without the prior approval of the Central Government. It also provides for the constitution of an Advisory Committee by the Central Government to grant such approval, and to advise the Government on any other matter pertaining to the conservation of forests. In exercise of Section 4 (1) of the FCA, a set of rules – The Forest (Conservation) Rules, 1981 – have been framed by the Central Government.

e. The Joint Forest Management (JFM) Circular, 1990: In June 1990, the Central Ministry of Environment and Forests, issued a circular to the Forest Departments of States and Union Territories for the revival, restoration and development of degraded forests in the manner suggested by the circular. A number of states followed the suggestions of the JFM circular, and issued notifications for initiating of JFM in the respective states. The nature of the JFM arrangement varies from state to state. In 2000, and again in 2002, fresh guidelines on JFM were issued to all states (*see Section 6.1.5.2*).

f. The National Conservation Strategy and Policy Statement on Environment and Development was brought out by MoEF in 1992. The Statement laid down guidelines for integrating environmental considerations into India's process of development. It deals with environmental problems and actions taken. The document also points out the constraints and agenda for action and finally prioritises activities and strategies for the same. It also mandates the review of development policies from the environmental perspective.

Box 6.61 The Biological Diversity Act, 2002

Formulated after a long period of discussions and a level of public debate, the Biological Diversity Act 2002 is part of India's follow-up to the Convention on Biological Diversity. Its main provisions are:

1. It prohibits transfer of Indian genetic material outside the country, without specific approval of the Indian Government through a due process;
2. It stipulates that anyone wanting to take a patent or other intellectual property right (IPR) over such material, or over related knowledge, will have to seek permission in advance;
3. It provides for the levying of appropriate fees and royalties on such transfers and IPRs;
4. It regulates access to such material by Indian nationals as well, to stop over-exploitation (e.g. of medicinal plants), and ensure sharing of benefits to all concerned parties;
5. It provides for the sharing of benefits of various kinds, including transfer of technology, monetary returns, joint R&D, ven-

ture capital funds, and joint IPR ownership;
6. It provides for measures to conserve and sustainably use biological resources, including habitat and species protection (such as declaration of Biodiversity Heritage Sites), Environmental Impact Assessments (EIAs) of all projects which could harm biodiversity, and integration of biodiversity into all sectoral plans, programmes, and policies;
7. It gives local communities a say in the use of resources and knowledge within their jurisdiction, and the power to charge fees from parties who want to use these resources and knowledge;
8. It provides for the protection of indigenous knowledge, through appropriate legislation or administrative steps such as registration at local, state, and national levels;
9. It stipulates that risks associated with the use of genetically modified organisms will be controlled through appropriate means; and;
10. It provides for the designation of institutions as repositories of biological resources.

The Act envisages the creation of National, State, and Local Biodiversity Funds, to be used to support conservation and benefit-sharing. These funds will be generated from fees, royalties, donations, and other sources. For implementation, the Act provides for a National Biodiversity Authority (NBA), which will screen proposals for transfer of genetic resources abroad, and advise the central government regarding measures for conservation, sustainable use, and benefit-sharing. It will also oppose, where necessary, IPRs in India and abroad, which violate the Act's provisions. The NBA will consist of both government and non-government members, including members of local communities. At the state level, there will be State Biodiversity Boards (SBB), which will oversee use and conservation of biodiversity. At local government levels, there will be Biodiversity Management Committees (BMCs), which will have a voice in regulating the transfer, use, and conservation of resources and knowledge at community and individual level.

The Act omits from its purview all claims of IPRs that are made under the Protection of Plant Varieties and Farmers' Rights Act, 2002 (*see Sections 6.2.5.2 and 6.2.8.2*).

g. The Wild Life (Protection) Act, 1972 (WLPA): The WLPA provides for the creation of appropriate posts at the Central and State Government levels, an Honorary Wild Life Warden in each district, and other officers and employees as may be necessary for the purposes of the WLPA. The Act makes it mandatory for States and Union territories to constitute a Wild Life Advisory Board to advise the State Government on a range of issues related to conservation, including the selection of areas to be declared as Sanctuaries, National Parks, Closed Areas, the formulation of Schedules of species for various levels of protection, and measures to be taken for harmonising the needs of tribals and other forest-dwellers with the protection and conservation of wildlife.

   The WLPA prohibits the hunting of wild animals specified in the Schedules I-IV of the WLPA, and also states the special circumstances under which wild animals may be hunted. It also provides for the protection of plants specified in Schedule VI (six species specified at present) in any forest land and any area specified by notification by the Central Government.

   The Act deals with the declaration of Sanctuaries, National Parks and Closed Areas, and the constitution of a Central Zoo Authority. It also has provisions related to the prohibition trade or commerce in wild animals, animal articles and trophies.

   The powers of the Central and State Governments to make rules, and the rights of certain scheduled tribes to hunting are also provided for under the WLPA. The following Rules have been made under the WLPA: The Wild Life (Transactions and Taxidermy) Rules, 1973; The Wild Life (Stock Declaration) Central Rules, 1973; The Wild Life (Protection) Licensing (Additional Matters for Consideration) Rules, 1983; The Wild Life (Protection) Rules, 1995; The Wild Life (Specified Plants – Conditions for Possession by Licensee) Rules, 1995.

   In 2002, a Wildlife (Protection) Amendment Act was promulgated with provisions to strengthen conservation and move towards greater public participation.

h. The Environment (Protection) Act, 1986 (EPA): The EPA was enacted for the protection and improvement of environment and the prevention of hazards to human beings, other living creatures, plants and property. The EPA empowers the Central Government 'to take all such measures as it deems necessary or expedient for the purpose of protecting and improving the quality of the environment and preventing, controlling and abating environmental pollution.'

   The Environment (Protection) Rules, 1986, have been made in exercise of the powers conferred by Sections 6 and 25 of the EPA. Some prominent regulations that have been notified under the EPA are: The Coastal Regulation Zone (CRZ) Notification, 1991 and the Environmental Impact Assessment (EIA) Notification, 1994 (*see Section 6.1.1.2*). The CRZ notification declares Coastal Stretches[7] as Coastal Regulation Zone (CRZ), and regulates activities in the CRZ. The EIA notification directs that no new projects, which fall under categories specified by the notification, or expansion or modernization of any activity if the pollution load is to exceed the existing one be undertaken, except in accordance with the procedure specified in the EIA notification. Some of the other rules under the EPA are: Hazardous Wastes (Management and Handling) Rules, 1989; The Manufacture, Storage and import of Hazardous Chemical Rules, 1989; The Rules for the Manufacture, Use, Import, Export and Storage of Hazardous Micro-organisms, Genetically-engineered Organisms or Cells; Bio-Medical Waste (Management and Handling) Rules, 1998; Recycled Plastics Manufacture and Usage Rules 1999; The Noise Pollution (Regulation and Control) Rules 2000; Ozone Depleting Substances (Regulation and Control Rules, 2000, Municipal Solid Wastes (Management and Handling) Rules, 2000; and Batteries (Management & Handling) Rules, 2001.

i. The Ocean Policy Statement, 1982: The Ocean Policy Statement's primary focus pertains to the harnessing of resources in the Indian sea-space. It states that the 'main thrust should be on the optimal utilization of living resources...exploiting of non-living resources...and harnessing of renewable resources of ocean energy...' The Statement further points towards the use of technology for the 'utilization and preservation of the marine environment.' The Statement emphasizes the need for an 'integrated legal framework' in order to survey and conserve the marine environment (http://www.vigyan.org.in/Policy.html).

Box 6.62 Legislative Framework for Marine Fisheries and Conservation in India

Through the Territorial Waters, Continental Shelf, Exclusive Economic Zone and other Maritime Zones Act, 1976, India declared sovereign rights over a 200-nautical mile (nm) Exclusive Economic Zone (EEZ). This was keeping .in view the prospective changes in the UN Law of the Sea (UNCLOS). This Act recognises the sovereign rights to conservation and management of living resources in the Indian EEZ.

This Act made provisions for 12 nm of territorial water, 24 nm of contiguous zone, and 200 nm of EEZ, increasing India's responsibility to some 2.2-2.8 million sq km area of sea, or about two-thirds of the total area of land (Roy-Chaudhury 1997). India subsequently ratified the 1982 Law of the Sea Convention (UNCLOS) in 1995, after it came into force in 1994 (*also relevant to Section 6.1.11.2*).

Under the Seventh Schedule of the Constitution of India, inland fisheries, aquaculture, and marine fisheries in the territorial water – the marine space up to 12 nautical miles from the baseline – is on List II, or State List, which is under the jurisdiction of the State Governments. The legislature of any Indian State has exclusive power to make laws with respect to any of the matters listed under List II. It is to be noted that significant fishing activity is concentrated in territorial waters, and therefore, falls within the purview of State governments.

On the other hand fish production from the EEZ or 'deep sea' – marine space beyond the territorial sea up to 200 nm from the baseline – as well as major fishing harbours, fishing vessel industry, seafood export trade, and marine and inland research and training are on List I, and thus the responsibility of the Union Government.

The Union Government, however, does advise States on enactment of legislation for fisheries under their jurisdiction. For example, the State-level Marine Fishing Regulation Acts (MFRA) have been adapted by States from a Bill that the Union

Government had prepared and circulated in 1979. All States except the Union Territories of Andaman and Nicobar Islands, Daman and Diu, and Pondicherry, have a MFRA (*see Section 6.1.4.2*). It is also worth noting that while MFRAs exist for territorial waters (at the State level), there is no Act regulating fisheries within the larger EEZ.

Other areas related to fisheries, like the protection of wild animals, including endangered species of wild fauna and flora, like whale shark, marine turtles, several species of bivalves, mangroves and the coastal zone, marine biodiversity; and land-based sources of pollution are on List III, or Concurrent List of the Seventh Schedule, a responsibility of both the Union and the State Governments. Both the Indian Parliament and the legislature of any State have power to make laws with respect to the items in List III. The Ministry of Environment and Forests at the national level, and the Department of Forests at the State level, are responsible for the protection of wild animals and marine biodiversity.

Contributed by Chandrika Sharma

j. The Export and Import Policy is brought out under the provisions of the Foreign Trade (Development and Regulation) Act, 1992. The general policy is that export and import is free unless it is regulated by the ITC (HS) – Harmonised System of India Trade Classification – Classification of Export and Import items, or any provisions of the Export and Import policy, or any other law for the time being in force. The Director General of Foreign Trade (DGFT) also specifies through a Public Notice such terms and conditions under which goods may be exported or imported. Regulation of export or import is done by 'prohibiting' international trade by inclusion in the Negative List of Exports or Negative Lists of Import or by declaring it a 'restricted' item (Ritwick Dutta, personal communication 2003).

Box 6.63 Some Legal and Policy Measures Related to the Mining Sector

(Note: There are policies and laws for sectors such as mining, industries etc., which have a direct bearing on biodiversity. There are provisions in these legislations which can be contradictory to biodiversity conservation; but with modifications, these legislations can also facilitate the same.)

National Mineral Policy, **1993**: Some of the basic objectives of the National Mineral Policy are 'to minimise adverse effects of mineral development on environment and ecology through appropriate protective measures and to ensure conduct of mining operations with due regard to safety and health of all concerned.' The Policy makes it clear that conservation of minerals is to be interpreted to mean 'improvement in mining methods... recovery of associated minerals, reduction in the requirements of mineral per unit of material output', and not an abstinence from consumption, which is described as a restrictive interpretation of conservation.

The Policy further states that from the point of view of protecting the environment, the land chosen for mining activities should be identified, 'keeping in view the needs of development as well as needs of protecting the forests, environment and ecology.'

The **Mines and Minerals (Development and Regulation) Act, 1957** (MMDRA): The MMDRA is stated to be an 'Act to provide for the development and regulation of mines and minerals under the control of the Union.' Under the Act, 'minerals' include all minerals, except mineral oils including natural gas and petroleum.

Rules made under the MMDRA include the Mineral Concession Rules, 1960 are the Mineral Conservation and Development Rules, 1988, and the Granite Conservation and Development Rules, 1999.

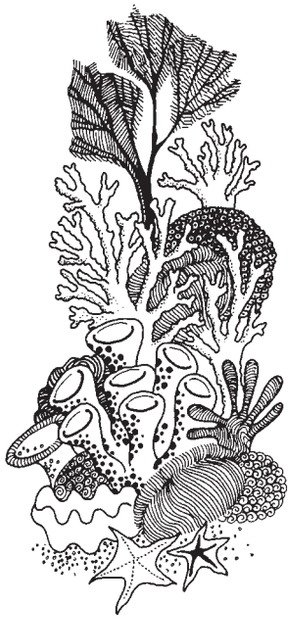
k. The National Zoo Policy (*see Section 6.1.3.2*), adopted in 1998, emphasizes the need for appropriate financial and technical resources required for the effective functioning of zoos in the country. The policy stresses on the coordination between existing zoos and eminent research/educational institutions in various aspects of

management of zoos. Under this policy, zoos are mandated to plan for collecting and displaying animals and breeding of endangered species. It also focuses on the development of interpretation material for educational and capacity-building programmes.

l. The Government of India has formulated the Science and Technology Policy, 2003, keeping in mind the changing context of scientific enterprise and to address national needs within the perspective of globalisation. The Policy addresses the following objectives: to ensure that the message of science is disseminated to every citizen of India and science and technology is integrated into all spheres of activities to ensure the security of food, agriculture, nutrition, environment, water, health and energy to the people on a sustainable level; to use scientific technology with the support of the traditional knowledge base, to help alleviate poverty, enhance livelihood security, remove hunger and malnutrition, reduce drudgery and generate more rural and urban employment; to enhance scientific research in universities and other academic institutions; to work towards the empowerment of women in the field of science and technology; to afford the necessary autonomy and independence to the functioning of academic and R&D institutions; to use modern science and technology for the protection, evaluation and use of traditional knowledge; use technology to accomplish national strategic objectives; to promote research and innovation in areas which would help the economy and society; to strengthen enabling mechanisms for the development, evaluation, absorption, and upgradation of technology; to establish an Intellectual Property Rights (IPR) Regime which would in particular maximize incentives for the generation and protection of intellectual property by all kinds of investors; to ensure that technology is enhanced to enable access to all types of information at affordable prices; to support technology for better forecasting, prevention and mitigation of natural hazards; to promote cooperation with international science and technology institutions; and to ensure the involvement of scientists and technologists in national governance (MoST 2003).

m. The National Policy for Indian Systems of Medicine and Homeopathy was approved by the Union Cabinet in October 2002. The main thrust of the policy would be to upgrade the education and research facilities in the sector, and integrate it into the national health delivery system. It was also proposed that a law be enacted to regulate education and practice in yoga and naturopathy, and to provide statutory status to the Medicinal Plants Board and tighten the quality control measures (Anon 2002b).

n. The Water (Prevention and Control of Pollution) Act, 1974, came into being... 'to provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water.' The Act makes it mandatory for the Central Government and State Governments to constitute a Central Board..



The Act empowers State Governments to restrict the application of the Act to certain areas. State Boards are also given certain powers to take samples of effluents. The Act prohibits the use of a stream or well for the disposal of polluting matter, and places restrictions on outlets and discharges of sewage or effluents. It specifies the conditions under which the State Board may give its consent for such activities.

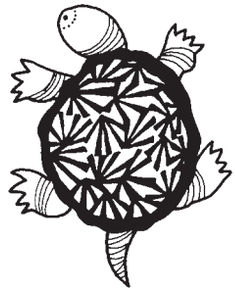
o. The Air (Prevention and Control of Pollution) Act, 1981, was framed 'for the prevention, control and abatement of air pollution'. It was under this Act that the Central and State Pollution Control Boards were set up to achieve the purpose of both the Water and Air Acts. Since then these Boards have had an important role to play in monitoring of compliance with the conditions under which industrial and developmental activities take place, and other related tasks which have direct relevance to biodiversity.

The Act also lays down rules for certain industrial plants, including emission standards etc. It gives power of entry and inspection to the Pollution Control Boards in order to ensure that the restrictions and standards are being maintained.

NGOs:

a. The Foundation for Ecological Security, in collaboration with Legal Action For Wildlife and Environment, has compiled a set of 'Proposed Amendments to the Constitution of India for Ensuring Environment Protection

and Nature Conservation', 2001. This is for the consideration of 'The National Commission to Review the Working of the Constitution.' Specific recommendations have been made on the Directive Principles of State Policy (Article 48A), Fundamental Duties (Article 51-A), Seventh Schedule (Article 246), Part IX & IX A, (i.e. *panchayats* & Municipalities), payment of compensation in writ jurisdiction, development of environmental jurisprudence through judicial intervention and interpretation of Article 21.



One important recommendation is that 'it has become necessary to recognise and incorporate Environmental Rights as separate and independent Fundamental Rights in the Constitution of India' (FES 2001)

b. People's movements and NGOs have raised concerns regarding the often contradictory nature of a number of Indian laws and have also proactively suggested alternatives. For instance, concerns about the centralised nature of the Indian Forest Act, 1927, have been the motivation behind a strong people's movement in the 1980s, which resulted in an alternative People's Forest Bill (Fernandes 1996). Strong mobilization by NGOs and activist organizations has been the trigger for a number of legislative measures and amendments. The Panchayats (Extension to Scheduled Areas) Act, 1996, is an example. NGOs have also been proactive participants in framing of a number of laws, e.g. the Biological Diversity Act 2002 and Wild Life (Protection) Amendment Act 2002.

c. Several NGOs have taken to legal action through the courts, as a method to ensure the conservation of biodiversity and livelihoods. There are many initiatives in Public Interest Litigation (PIL). Some of these include the cases against the construction of the Tehri Dam (Tehri Bandh Virodhi Sangharsh Samiti vs. State of Uttar Pradesh, 1992 SUP (1) SCC 44) and Narmada Dams (Narmada Bachao Andolan vs. Union of India AIR 1999 SC 3345); T. N Godavarman Thirumulpad vs. Union of India, 2000 SC 1636; Tarun Bharat Sangh, Alwar vs. Union of India 1992 SC 514, 516; Rural Litigation and Entitlement Kendra, Dehradun vs. State of Uttar Pradesh, 1985 SC 652; Samatha vs. State of Andhra Pradesh, 1997 (*see Section 6.1.5.2*); Ivory Traders Case, AIR 1997 Del 267; G.R. Simon vs. Union of India, AIR 1997 Del 301; Bihar vs. Murad Ali Khan, AIR 1989 SC 1; WWF-India vs. State of Orissa, AIR 1999 Orissa 15; Indian Council for Enviro-Legal Action vs. Union of India, 1996(3) SCALE: 579; Jacob Vadakan Cherry vs. State of Kerala (1998 AIHC 1688) and Institute of Social Welfare vs. State, 1996 (1) KLT 718; Prof. Sergio Carvalho vs. The State of Goa and Others, 1989 (1) GLT 276); Goa Foundation and Ors. vs. North Goa Planning and Development Authority and Ors. 1995(1) GLT 181. The judgements in these and other cases have set important precedents and directions for the further development of policy, law and practice.

d. A Draft National Policy on Conservation of Sacred Groves was put together by CPREEC (*see Section 6.1.1.2*) as an outcome of the discussions at the National Conference on Conservation of Sacred Groves and Ecological Heritage Sites in Chennai in 1998. This policy, which deals with the need to protect and conserve sacred groves in India, has been forwarded to the MoEF (Krishna 2002).

Communities:

Forest-dwelling, fishing, pastoral and agricultural communities all over India have over millennia built up a massive body of customary laws. These are usually unwritten and for most part not sanctified in India's formal or statutory law, but have traditionally been followed with rigour (and in many cases continue to be so followed). Many such customary laws relate to the management of biodiversity, including use of forests, grazing, hunting, fishing, sacred species and spaces, and myriad other aspects of human relationships with nature.

Some interesting examples from the North-East India (*Customary Laws and Biodiversity in North-east India Subthematic Review*) include:

i. Amongst the Adis and also the Monpas of Arunachal Pradesh, rivers are under family or community ownership. Fishing rights can be sold on stretches of the river within the community. Stringent rules apply to fishing with respect to use of fish traps. Among the Monpas, fishing is strictly prohibited on certain stretches of certain rivers, and it is believed that anyone violating this norm would die.

ii. The Asha Van concept of the Jamatia tribe in Tripura has its origin in the resource needs of the local people.

Traditionally, each Jamatia village maintained a surrounding forest as a protective barrier from enemies. Gradually, this forest began to be used to meet the requirements of fuelwood, small house construction, etc; which added to the pressure on forest areas. The local community then framed certain rules to regulate extraction from the forest for sustainable use of the resources.

iii. Village Safety and Supply Reserves of the Mizos in Mizoram: The concept of Safety and Supply Reserves in Mizoram dates back to as early as 1872 when they were maintained to protect the water source of the village. As no extraction is allowed from these forests, these forests are rich in floral and faunal diversity. 'A supply reserve forest is maintained to meet the personal bona fide needs of the community members. Approximately 2648 sq km of forests are under village safety and supply reserves.'

North-east India presents a great complexity in legal situations: It 'is a legal pluralist region. Indigenous communities inhabit this region and indigenous folk law governs different spheres of their lives within the society. At the same time, formal law enacted both at the centre and the state level in the country is also extended to the region; and in addition, with the Sixth Schedule states creating the Autonomous District Councils, which have been empowered[8] to enact laws for the region within their jurisdiction, there is a third set of laws enforced within the same region. The laws made by the Autonomous councils are closer to customary laws and social practices of local communities and are applicable in cases where both the parties in a dispute are tribal' (*Customary Laws and Biodiversity in North-east India Sub-thematic Review*; *see Section 6.1.5.2*).

Examples from other parts of India include:

iv. The Hindu fishing community in northern Kerala follows a traditional institution called Kadakkodi or the sea court, which is closely associated with temples located on the beach. It is constituted by a set of village elders and other persons who implement the decisions. All the 'fishermen' discuss issues related to access, conservation and conflict resolution related to the sea, and the elders make the final decision. The responsibility to monitor the implementation of these decisions is that of the entire community. Since the early 1980s this

Box 6.64 Bhaonta-Kolyala Village, Rajasthan: Community Conservation of Biodiversity

In the mid-1980s, the villagers of Bhaonta-Kolyala in Rajasthan mobilised by the NGO Tarun Bharat Sangh formed a functional body as *gram sabha* (Lok Samiti), with the agenda of village forest and water resource management for drinking and irrigation. The *gram sabha* is used as a platform for addressing common concerns through collective action. It has an open membership, with a quorum of 22 adults who by and large represent each hamlet in the two villages. The President (*adhyaksha*) of the *gram sabha* is responsible for conducting monthly meetings. It has formulated the following regulations and rules for forest and wildlife conservation:

- No shepherd will go into the forest with an axe.
- If a shepherd is caught cutting a tree, he/she will be fined Rs 11. Any person, who having witnessed such an activity fails to report it to the *gram sabha*, shall be fined Rs 21.
- No man or woman shall use an axe for collection of fuel. They will only collect dry wood.
- If wood is required for building a house or for a wedding, the person will collect it only with the permission of the *gram sabha*.
- The *gram sabha* will meet every month on *amavasya* (new moon day). In the meetings, any issue relevant to the village community will be discussed.

The *gram sabha* has the right to make changes in the regulations and enforce penalties. The body, however, is not recognised by the State Government and has no formal authority, since a formal *gram panchayat* exists, although it is not functional.

The *gram sabha* has established a village fund, to which each household contributes five kg grain after the harvest for sustaining the resource development activities. The *gram sabha* has declared the village-regenerated forest as Bhairon Dev Lok Van Abhayaranya (a public sanctuary) in October 1998. This is one of many unique examples of a local community's successful effort at conservation of biodiversity (Arvari Basin Sub-state Site BSAP).

institution is under considerable pressure, partly due to 'government promoted organizational forms such as cooperatives and new political divisions among fishing communities.' However, the institution continues to play an important role in many villages (Kurien 2002).

v. The fishing community along the Coromandel coast has been resolving problems through hamlet councils (Bavink 1997).

vi. In a number of traditional or new Community Conservation Areas (*see Section 6.1.2.2*), customary rules have been revised or modified to suit new conditions (e.g. *see Box 6.66*).

In a few states such as the north-eastern ones, statutory law recognises the validity of customary laws. More recently the Panchayats (Extension to Scheduled Areas) Act, 1996 (*see Section 6.1.5.2*), has also given such validity in the case of adivasi areas in some states.

6.1.8.3 Major Gaps

Some broad and major gaps are mentioned below. More details on these points are given in Section 5.2.7.

i. Several of the existing laws and policies in the country are not oriented towards biodiversity concerns, and have a weak integration of these concerns.

ii. There are a few sectors like wetlands, marine areas, and land/water use, which have inadequate or no legal and policy backing.

Box 6.65 Amendments to the CRZ Notification, 1991

The introduction of the CRZ Notification in 1991 provided the much-needed legal backing to check the depletion of biodiversity and environmental resources resulting from indiscriminate development activities in the coastal areas of the country, and to safeguard the interests of local fishing communities and other traditional coastal communities from land and natural resource alienation by powerful industrial and development forces. However, there have been several amendments to the notification, which go against the spirit with which it came into being.

- The first change was in August 1994, [S.O.595 (E)]. Some of the provisions were overwritten by order of the Supreme Court of India, in WP (Civil) 664 of 1993 dated 19th April 1996. Thereafter several changes followed, allowing activities related to industrial development, exploration of oil and gas, port development, storage of hazardous substances, petroleum products, real estate development, construction of resorts, sand mining, rare earth mining, activities of the Department of Atomic Energy etc. The reduction of the distance of the CRZ along rivers, creeks & tidal water bodies has also been the subject of two amendments.
- Five amendments relate to permission for sand mining in the Andaman & Nicobar Islands.
- While the original notification did have certain complications and ambiguities, these have increased with each new amendment. The latest admission of Special Economic Zones in the coastal belt and the waiver of several environmental considerations for units in these SEZs have created a formidable challenge to preserving coastal biodiversity. Terms such as 'service industries' and 'non-polluting industries' etc. have been included the notification.
- Only for three amendments were public opinion and objections invited. The rest have been introduced by corrigendum or under Rule 5(4) of the Environment (Protection) Rules, 1986, that allows the Central Government to dispense with the requirement of inviting public opinion when it is in public interest to do so.

In all instances there has been strong opposition to the amendments by academics, researchers, fishworker communities, environmental groups and civil society members across the country. They have raised concerns with reference to the cost of the survival of communities and their environments. These groups have suggested a simplification of the notification, clarifications of its grey areas and an upgradation of the notification, keeping in mind the environmentally sustainable development of the traditional communities.

Contributed by Aarthi Sridhar, Sirsi, Karnataka

iii. In many cases laws and policies of different sectors are in contradiction with each other.

iv. There are contradictions between (a) development and biodiversity-related laws, (b) decentralisation and biodiversity-related laws, and, (c) central and state laws.

v. There is weak implementation of many relevant laws, which includes the lack of public empowerment and inadequate facilities/capacities of official agencies.

vi. There is inadequate recognition and encouragement given to customary laws.

vii. The Science and Technology (S&T) Policy, 2003 contains some serious flaws in orientation that could undermine the search for a meaningful relationship between S&T and society. It implicitly separates S&T from indigenous knowledge, and seems to view the latter from a mere instrumentalist point of view, for the benefit of formal sectors of society. It provides no role for indigenous knowledge holders or communities in general in the development and dissemination of S&T, and provides for participation only by formal sector scientists, industrialists, and academics. It does not promote alternative, collective knowledge protection systems. Finally, it does not provide for full transparency and the public's right to information relating to new developments in S&T, including those of public concern such as genetic engineering and nuclear technologies.

Box 6.66 Conflicting Policy, Legal and Institutional Frameworks for Participatory Forest Management (PFM) in Himachal Pradesh

In Himachal Pradesh, the existing policy frameworks for land use, forestry, agriculture and water do not encourage an integrated, multidisciplinary, and multi-stakeholder PFM strategy. The State Forest Policy does not encourage ownership and granting tenurial rights to the communities. The Indian Forest Act does not recognize degraded forest classification for implementing PFM. In the National Forest Policy, 1988, provisions on rights of communities over degraded forestlands (Section 4.2.4) and NTFPs (Sections 3.5) appear to be in conflict with provisions of the Forest Conservation Act, 1980 and the Wild Life (Protection) Act, 1972 (Section 17).

The legal framework of the State is contained in 23 Forest Acts, 16 Forest Settlements, 44 land related Acts and various Government Notifications. These legal instruments were introduced to strengthen the State's control on forests and regulate communities' access to forest resources. NTFPs are governed under Forest Settlements, and no uniform NTFP Act exists. Existing legal provisions place several restrictions on felling of trees (plantations and naturally-grown) by the people on private lands and those raised under PFM, granting of Tree *pattas* to the people, PFM activities on certain categories of degraded forestlands, resin extraction from private lands.

All Government Departments are mandated to elicit people's participation involving or creating community institutions to implement their programmes. The process of forming these CBOs differs greatly in scope and extent and has resulted in multiple institutions in the same villages. Agriculture and Rural Development Departments are setting up self-help groups, user groups, watershed associations and watershed committees. *Panchayats* constitute their own development committees. The Forest Department is constituting Village Forest Development Societies. None of these community institutions are sustainable, as their lifespan coincides with the duration of the programme. Consequently, conflicts are seen between the CBOs of different Departments and within the CBOs of a Department. The conflicts are seen in the use and distribution of resources and assets, and control of finances.

Amendments in The Himachal Pradesh (Sale of Timber) Act 1968, The HP Village Common Lands Vesting and Utilization Act 1974, Forest Produce Transit (Land Rules) Rule 1978, Land Preservation Act, 1978, HP Resin & Resin Products (Regulation of Trade) Act, 1981, The HP Forest Produce (Regulation of Trade) Act 1982 and Forest Conservation Act 1980 are required to make the legal framework supportive of PFM.

Contributed by A.K. Gulati, Chief Conservator of Forests, Himachal Pradesh

viii. Inclusion in the Negative List of Exports (in the Export and Import Policy) has economic implications for the exporter. Although, most if not all CITES species are included, many of the derivatives and products obtained from such species are generally excluded from the purview of the EXIM policy. This is most obvious in the case of medicinal and other CITES-listed plants. Unfortunately, the exclusion of the derivatives and products is contrary to the whole purpose of CITES and the restriction on the export of such species. Most often it is vested trade interest which leads to the exclusion of some species or exclusion of derivatives and products made therefrom (Ritwick Dutta, personal communication 2003).

ix. There is serious lack of coordination amongst various maritime states of India, e.g. in the case of seasonal restrictions and bans, restrictions on kinds of gear, inter-state movement of fisherfolk etc. The different roles of the Central and State governments, as determined by the Constitution having placed marine fisheries into both the Central and State lists, also lead to confusion and lack of cohesion. Secondly, none of the laws relating to marine areas – Territorial Waters, Continental Shelf, Exclusive Economic Zone and other Maritime Zones Act, 1976; Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act, 1981 (and rules therein, 1982); Marine Products Export Development Authority Act, 1972; and Marine Fishing Regulation Acts of Maritime States – have focused on conservation of ecosystems and species, or sustainable management of marine resources. Some general provisions for this do exist in these laws, but these have never been implemented through specific rules or guidelines (Sebastian 2000).

x. A survey of over 40 central laws carried out in the mid-1990s revealed that there was weak or no coverage of the following aspects of biodiversity: i) *ex situ* conservation of any element of biodiversity, with the exception of wild animals; (ii) regulatory provisions for ensuring sustainability in the use of bio-resources; (iii) introduction and release of alien or other invasive species with the exception of certain elements such as fish; and (iv) indigenous/traditional knowledge relating to biodiversity (Kothari and Singh 1994).

6.1.9 Wild Biodiversity: Existing Financial Measures

6.1.9.1 Overall Concept

Policy and programmatic changes, especially the integration of biodiversity into sectoral plans and programmes, and the reorientation of budgets towards greater ecological sensitivity, are the most important measures for conserving biodiversity. However there is also a requirement of extra funds for a series of actions. There has been a consistent demand by environmentalists and others for increasing the amounts available for biodiversity-related actions. Reviewed below are the ongoing initiatives in this regard.

6.1.9.2 Current and Past Activities

Government

There are three kinds of government funding with respect to biodiversity:

- Direct funding for biodiversity (e.g. wildlife and biodiversity budgets of MoEF);
- Indirect funding for biodiversity (e.g. budgets for pollution control, or for measures such as subsidies to non-conventional or renewable energy sources); and;
- Direct funding for development by re-orientation of development and welfare budgets such that they facilitate conservation, sustainable use, and equity (e.g. if subsidies to fertilisers and pesticides were to be put into subsidising organic manure and farming).

Ministry of Environment and Forests

a. Government resource allocation for biodiversity conservation
(*This section is largely adapted from the Economics and Valuation of Biodiversity Thematic BSAP.*)

In the Central and State government budgets, there are no exclusive financial resource allocations under the heading 'biodiversity'. However, several budgetary allocations are made which have indirect, and to some

extent direct, bearings upon biodiversity. The Ministry of Environment and Forests (MoEF) uses the following major heads, which can be considered as relevant:

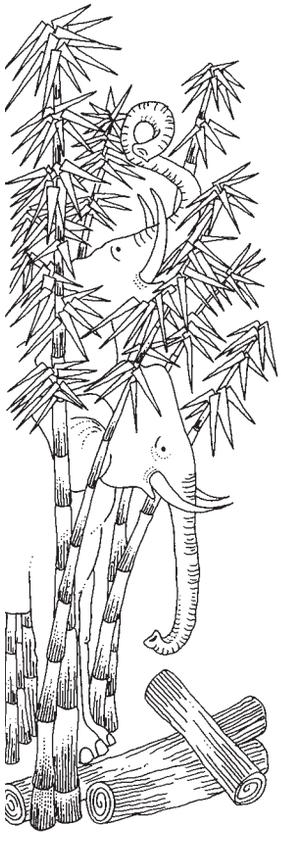
- Ecology and Environment
- Forestry and Wildlife
- Grand total for MoEF

Each of the broad headings has been further disaggregated into several sub-headings. *Annexure 15* (*Table 2*) gives details of these budget allocations under various sub-headings from 1986-87 to 2003-04. In order to make meaningful comparison over time, the actual budget allocations have been converted in to constant 1993-94 prices. The same table also shows the aggregate Gross Domestic Product (GDP) of India for each of those years. In the most recent year of 2002-03 for which data is analysed (leaving out the estimates for 2003-04), the allocation for Ecology and Environment was Rs 3956 million, and for Forestry and Wildlife Rs 2200 million (at 1993-94 prices).

At present budget allocations for conservation of biodiversity are being made both at the Central and State government levels. The consolidated budget allocations from Indian states are analyzed for the period 1986-87 to 1998-99 (*Annexure 15*, *Table 3*).

The fact that the role of the state in the management of biodiversity resources has been affected by the economic reforms process is evident from the macro-budgetary analysis. The objectives of the states in the past has been, by and large, revenue from natural resources. Other than minerals (including crude oil and gas), one of the best revenue-raising resources at the state level has been forests. Most of the forest-rich states have used this as an economic instrument for raising revenues. States such as Andhra Pradesh, Arunachal Pradesh, Kerala, Madhya Pradesh, Orissa and Punjab continue to raise far more revenue from forests than they invest in that sector.

b. The MoEF launched a scheme on Conservation and Management of Mangroves in 1986. This took into consideration the ecological and economic significance of mangroves and threats faced by them due to various anthropogenic activities. As part of this scheme grants have been released to the respective State Governments/Union Territories for the conservation and management of 32 identified mangrove areas. Several initiatives including preparation of management plans, a draft national action plan, launching of websites and establishment of database networks have been undertaken. The budget estimate for this programme (including wetland conservation) for the year 2002-03 is Rs 80 million (http://indiabudget.nic.in/ub2002-03/vol.2htm).



c. The MoEF grants several fellowships and awards for biodiversity conservation activities and research related to the same. Some of these include, Indira Gandhi Paryavaran Puraskar (IGPP), Indira Priyadarshini Vrikshamitra Award (IPVM), Mahavriksha Puraskar, Pitambar Pant National Environment Fellowship Award, B.P. Pal National Environment Fellowship Award for Biodiversity, Dr. Salim Ali and Dr. Sankhala Fellowship, Rajiv Gandhi National Wildlife Conservation Award, and Amrita Devi Wildlife Protection Award (Shreshth and Kamath 2002).

d. Financial assistance is also provided under the 'Grants-in-Aid to Professional Societies' scheme to professional societies and appropriate institutions, museums and science centres. This is to support activities and projects in the field of environment, as well as to develop exhibition galleries and educational programmes relevant to ecology, environment and wildlife. (Shreshth and Kamath 2002)

e. The Water (Prevention and Control of Pollution) Cess Act was legislated by the Parliament of India in 1977. The objective of the Act was to provide for levy and collection of a cess on water consumed by persons carrying on certain industries and by local authorities, with a view to augment the resources of the Central and State Pollution Control Boards. Cess would be levied on the basis of water consumed by industry or local authority, as per rates that the Central Government may from time to time specify. Where any person or local authority, liable to pay cess under the Act, installs any plant for treatment of sewage or trade effluent, he/she/the Authority is provided with an incentive by way of rebate of 25% of the cess payable.

The general experience of the working of the water cess shows that it has achieved reduction in water consumption in respect of chemical industries. The growing trend of installation of effluent treatment systems in the country could also have been given an impetus by the desire to earn rebates from water cess. To this extent, the water cess has contributed to achieving its incidental goal of water and biodiversity habitat conservation.

Ministry of Rural Development (MoRD)

India has several economic incentives, which have a bearing on utilisation of biological resources. These include taxes, cesses, royalties, grazing fees, seigniorages, lease rents on forest and non-forest lands and Forest Development Tax. The National Afforestation Fund instituted by the National Wasteland Development Board of the Ministry of Rural Development is an example.

MoRD also has Investment Promotional Schemes (IPS), which were launched in 1994-95 to facilitate involvement of Corporate Sector/Financial Institutions to pool in resources for development of non-forest wasteland. The primary objectives of the Schemes include:

- To facilitate/attract/channelise/mobilise resources from financial institutions, banks, corporate bodies including user industries and other entrepreneurs for development of wastelands in non-forest areas belonging to Central and State Governments, *panchayats*, village communities, private farmers etc.; and;
- To facilitate production and flow of additional biomass including farm-forestry products used as raw material inputs for different types of industries and horticultural/commercial plantations.

Ministry of Health and Family Welfare

a. Department of Indian Systems of Medicine & Homoeopathy (ISMH):
   - The scheme for Providing Central Assistance for Development and Cultivation of Medicinal Plants was started in the year 1990-91. The objective of the scheme is to augment the production of crude drugs of plant origin, which are in greater demand and mainly used in preparation of drugs of ISM & Homoeopathy, by providing central assistance for cultivation and development of medicinal plants for this purpose.
   - Scheme for Providing Central Assistance for Development of Agro Techniques and Cultivation of Medicinal Plants Used in Ayurveda, Siddha, Unani and Homoeopathy. The scheme was started in 1997-98 and the department is implementing projects for developing agro-techniques of about 122 medicinal plants through 33 organisations. Under this scheme, central assistance is provided to specialized scientific institutions in government/semi-government sector like Agriculture Universities, Horticulture Universities, Scientific Institutions etc.

b. The National Medicinal Plants Board has a number of financial schemes for conservation, use, research and development, etc. related to medicinal plants (*see Section 6.1.4.2*). Designated areas for financial support include research & development in medicinal plants sector, including drug-testing labs for validation and certification of farmers produce; *in situ* conservation and *ex situ* cultivation of medicinal plants for restricted sustainable harvesting; production of quality planting material; extension activities including training/seminars/workshops, visit of growers to demonstration spots and research institutes, extension material on agro-techniques; marketing information service on medicinal plants for domestic as well as global market; survey and inventorisation of medicinal plants. The Board has sanctioned a three-year project 'Biodiversity characterisation, conservation and bio-prospecting of four economically important medicinal plant species of Bay Islands' to the Central Agriculture Research Institute, Port Blair, Andaman and Nicobar Islands.

Ministry of Science and Technology

a. The Department of Biotechnology provides technological and financial assistance for biodiversity-based programmes, especially for Scheduled Castes, Scheduled Tribes, and women. NGOs, Krishi Vigyan Kendras and other academic institutions have been involved in the implementation and monitoring of these programmes along with the expert task forces. Some of the projects that have been supported include cultivation of aromatic and medicinal plants, cultivation of mushroom and *spirulina*, biological control of pests and diseases, vermiculture and vermicomposting, biofertilisers, aquaculture, floriculture, poultry farming, human

healthcare, food and nutrition, etc. (Shreshth and Kamath 2002).

b. Among its other mandates, the Department of Science and Technology (DST) also aims to support minimum infrastructural facilities for testing and instrumentation and science and technology entrepreneurship development. The department has a special programme, the Young Scientists Programme, to encourage young scientists to pursue a career in research and development. It provides fellowships and other support for the same. Under the Tribal Sub-Plan Scheme, location-specific and need-based projects were supported for socio-economic upliftment of tribal communities, including integrated rural development, enterprise development, technology inputs etc. DST also has a similar scheme like the DBT for young scientists (Shreshth and Kamath 2002).

c. The Department of Ocean Development (DOD) (*see Sections 6.1.1.2 and 6.1.6.2*) is supporting 87 research and development projects in the area of Marine Sciences and Technology. This includes projects under the Marine Manpower Development Programme and also as part of the Ocean Science and Technology Cell, on prioritized project areas such as marine microbiology, ocean engineering, underwater robotics etc. (DOD 2003).

Box 6.67 Innovative Funding

- The Government of Tamil Nadu, with support from UNDP/GEF has set up an independent Statutory Trust Fund for the Gulf of Mannar Marine Biosphere Reserve. This is to ensure effective inter-sectoral cooperation in sustainable conservation and resource utilisation in the Biosphere Reserve. It aims to be able to leverage existing funds available and provide effective coordination between various agencies/departments (www.undp.org.in/news/press/ress239.htm).
- The Tropical Botanical Garden and Research Institute has helped the Kani tribe to set up a Trust, into which royalties and fees relating to the development of the drug *Jeevani* (based on Kani knowledge) are placed (*see Box 6.48*).
- Funds are to be set up at local, state, and national levels under the Biological Diversity Act 2002 and the Plant Varieties and Farmers' Rights Act 2001. These will be constituted of fees, royalties, donations, and other sources.

NGOs:

a. Dastkar, an NGO in Andhra Pradesh, has been working on establishing an institutional framework for artisanal natural dyeing through building up networks, linkages and resource centers, as well as by the dissemination and sharing of information. Channels are developed for exchange of market information leading to market linkages with buyers, both within the country and abroad (*Natural Dyes and Biodiversity Sub-thematic Review*).

b. The Centre for Science and Environment (*see Section 6.1.1.1*) has developed a Green Rating Scale for Environmental Auditing for industries in India. For a sector such as Paper and Pulp, they have arrived at Green Ratings for a large number of companies. According to CSE, only three companies are just about above average rating (*Economic Valuation of Biodiversity Thematic BSAP*).

c. Foundation for Ecological Security (*see Section 6.1.4.2*).

Communities:

a. Namsang-Borduria Trust Fund: In 1948, the chiefs of the Nocte tribe in Borduria and Namsang villages in Arunachal Pradesh entered into an agreement with the government to manage community-owned forests on a scientific basis. 'Today, these villages generate net revenue of Rs 20 million annually, besides conserving the biodiversity of the area. The Namsang-Borduria Trust Fund, which was formed as result of the income from the above two forests has a corpus of Rs 100 millon. This fund supports two educational institutions, one nursing school and a referral hospital.

The Arunachal state government has tried to replicate the model throughout the state through the enactment of the Arunachal Pradesh Anchal Forest Reserve (Constitution and Maintenance) Act, 1975, and Arunachal Pradesh Village Forest Reserve (Constitution and Maintenance) Act, 1981. Subsequently, 12 village Forest Reserves were constituted in 4 districts and 11 Anchal Forest Reserve in 8 districts, covering an area of

279.26 sq km and 325.12 sq km, respectively. These biodiverse forest reserves generate substantial revenue both for the state exchequer and for community development (*Arunachal Pradesh State BSAP*).

b. In Bhaonta-Kolyala (*see Box 6.64*) villages of Rajasthan, a *gram kosh* (village fund) has been created. This has been built up with a contribution of five kilos of grain by each household. Some of this is retained by the village as a reserve for its own needs and the rest could be sold to build a monetary fund to address common community needs (Kothari et al 2000).

c. In Mendha (Lekha) (*see Sections 6.1.1.2, 6.1.2.2 and 6.1.4.2*) village of Maharashtra the villagers have started savings schemes, which focus on reserving benefits for the future. The village institutions such as the *gram sabha*, Mahila Dals and Van Suraksha Samitis have their own bank accounts managed by the villagers themselves (Kothari *et. al*., 2000).

Others:

Projects with International Aid

There are three types of external agencies providing assistance: multilateral donors, bilateral donors and foundation assistance. The types of assistance being provided include market-rate loans, various concessional loans, and grants.

'The Compendium On Donor-Assisted Projects In The Environment Sector' takes stock of the nature and type of external assistance to India in all areas related to the environment. It covers the period 1995-2000, around 400 different activities totaling nearly $10 billion in donor assistance underway in the general areas of:

1. Agriculture & Natural Resources Management
2. Industry & Energy
3. Urban Infrastructure
4. Environmental Health & Education, Environmental Policy Reform
5. Capacity-building and Environmental Assessment
6. Climate Change and Montreal Protocol (ozone-depleting substances)

As of 1999, 19 externally-aided projects were under implementation in 13 states of the country, with total approved assistance of Rs 42278 million. The annual assistance ranges from Rs 4500 to 5000 million. The main donor agencies are the World Bank, OECF Japan, Department for International Development (DFID), European Economic Commission (EEC), United Nations Development Programme (UNDP) and SIDA. External assistance received is allocated through the Central and State Plan Budget (MoEF 1999c).

The total volume of assistance in the environment sector has grown consistently at around 7% annually between 1995 and 2000. Among donors, the World Bank accounts for 39% of environmental assistance followed by Japan Bank for International Cooperation (JBIC) at 16% and DFID at 12%.

Agriculture and Natural Resources is the largest category of donor environmental assistance; about one-third ($1.5 billion) has gone to biodiversity projects and 31% ($1.43 billion) to watershed management projects. About 18% goes to forestry projects and another 18% to land reclamation/eco-restoration (about $795 million each). Country-wide multi-state projects get 30% of the assistance under agriculture and natural resources. Among the states, Haryana gets the maximum (11%), followed by Maharashtra (8%), Andhra Pradesh and Rajasthan (7%) each, and Karnataka (5%).

The nature of external assistance provided by multilateral, bilateral and other agencies is constantly changing to accommodate changing priorities and concerns. For example, in recent years, relatively more emphasis has been put on institutional strengthening, governance and participatory processes. Less emphasis has been placed, as compared to the 1980s, on financing large infrastructure projects in industry (especially in the power sector), large dams, irrigation canals, and urban development projects.

In the area of environment-related external assistance, many activities take the form of technical assistance. This is not surprising as environmental management is a relatively young field in many countries, including in India, and the institutions and agencies charged with this task have taken on broad new responsibilities over the past twenty years or so. Ever since the early nineties – and especially after the Rio conference in 1992 – development assistance has increasingly incorporated environmental objectives and concerns.

Environment projects are of two general types.

- Investment projects that serve environmental objectives, i.e. the protection or clean-up of water, soil or air.
- The second are technical assistance projects that typically support the regulatory function of government, and/or support local community and NGO efforts to better manage local resources.

In addition to these two types of environmental projects, a third type of environment-related activity is work on environmental assessments – often called 'due diligence' or 'safeguards' work – that is associated with non-environmental projects that may have negative impacts on the environment. Many donor agencies have policies concerning mandatory social and environmental assessments that are a condition of project clearance. Since one objective of all donor assistance projects is to 'do no harm,' social and environmental assessments are fundamental tools to ensure that goal.

Corporate Sector

a. The country's first corporate initiative to adopt and maintain some PAs has been taken up by DSP Merrill Lynch and the Piramal Group. A Wildlife Conservation Trust is proposed to be established in Mumbai as part of this initiative. This trust approached the Maharashtra state government to adopt two PAs, including the Sanjay Gandhi National Park, Borivli, Mumbai, and the Tadoba-Andhari Tiger Reserve, Chandrapur district. The trust proposes to provide various levels of support to these PAs, which includes funding for staff security, wildlife protection, working with villages where there is human wildlife conflict and promoting environmental awareness. They also intend to work towards developing ecotourism initiatives (Das 2002).

b. The Corbett Foundation was set up by the Khatau Group of Companies in 1994. The Foundation's activities are conducted under two divisions – one based in village Dhikuli and the other in Tera village of Abdasa Taluka in Kachchh. The key activities include environmental awareness, ecotourism, health extension and resolution of human wildlife conflicts (http://www.corbettfoundation.org/).

c. Tata Trusts: The Tata Group has set up several trusts which fund activities on biodiversity and related issues. For instance, the Ratan Tata Trust provides institutional grants and programme grants on rural livelihoods and communities (including land and water development), education, health, civil society and governance and so on. The Dorabji Tata Trust has promoted six pioneering institutions of national importance, including the Tata Institute of Social Sciences, Tata Memorial Centre for Cancer Research and Treatment, Tata Institute of Fundamental Research and National Centre for the Performing Arts, all in Mumbai; and the National Institute of Advanced Studies and the Sir Dorabji Tata Centre for Research in Tropical Diseases in Bangalore (http://www.tata.com/0_beyond_business/trusts/).

d. Godrej Foundations: The Pirojsha Godrej Foundation, established in 1972, has been supporting conservation initiatives. Amongst other contributions the Foundation has provided significant support to the World Wide Fund for Nature-India and the Bombay Environmental Action Group. The Soonabai Pirojsha Godrej Foundation has taken up the conservation of mangroves at Pirojshanagar (*see Section 6.1.2.2*).

e. The Times Foundation, set up by the Times Group, is a non-governmental organization, to promote equitable and sustainable social development. The Foundation works through NGOs in many fields to further social causes. This is done primarily through information dissemination, issue based mobilisation and fund raising. Information dissemination involves bringing to light key developments, reports and research findings that impact the social sector.

f. There are several private (ICICI Bank, ABN-AMRO Bank), cooperative, and public and private sector banks and finance agencies which assist, aid or fund activities related to environment, biodiversity conservation and livelihoods.

Box 6.68 The Srinivasan Services Trust (SST)

The Srinivasan Services Trust (SST), an organization initiated by Sundaram Clayton Limited and TVS-Suzuki Limited, has been involved in an effort to facilitate sustainable forest management in Tamil Nadu. The work currently focuses on Padavedu-Renugondapuram in Tiruvannamalai district and Thirukkurungudi in Tirunelveli district. SST's interventions in forest regeneration, in areas under either the JFM or ecodevelopment project, fall into three main categories: community development, alternative income generation and empowerment of women. The activities include:

- Involvement in Ecodevelopment in Thirukkurungudi in Tirunelveli district:
- Involvement in JFM in Padavedu-Renugondapuram in the Santhavasal Range in Tiruvannamalai district, situated on the fringe of the Eastern Ghats;
- Developing social fencing (Vattakulam village); and;
- Development of the agro-ecology of the village.

SST's support has been through:

- Providing professional expertise in developmental interventions to strengthen the initiatives of the Forest Department for JFM;
- Creating partnerships with various ongoing government rural development schemes/ projects on poverty reduction and environmental conservation for mobilizing resources; and;
- Liaising with local administration to execute development works.

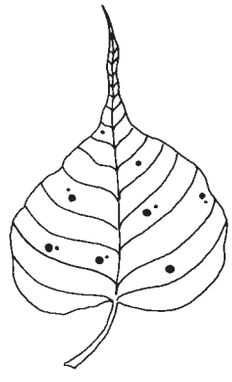
The leadership and constant interaction and intervention of the SST has gradually transformed the once divided and disintegrated village community of Padavedu-Renugondapuram into a cohesive group. This was manifested in their decision to hand over five acres of common land for fodder plantation, which had been under encroachment for years (*Economics and Valuation of Biodiversity Thematic BSAP*).

6.1.9.3 Major Gaps

a. As indicated in the *Economics and Biodiversity Thematic BSAP*, the indicators of budgetary allocations in *Annexure 15* reveal that:

- **At the national level:**
  - The allocations on *Forestry and Wildlife* have been going down, but at a much slower pace till 1995-96. They dropped very significantly from 1996-97 onwards, then started rising from 1999-2000. Allocations for *Ecology and Environment* also declined or remained static for considerable part of the 1990s, then have shown a substantial increase in the last 3-4 years (mostly in the field of control and prevention of pollution). No clear priority seems to be emerging, therefore, in the direct allocations to biodiversity conservation.

- **At the State level:**
  - The Revenue development expenditures on biodiversity-related activities (as a ratio of total revenue expenditure on all sectors taken together) have also been declining, but at a much lesser rate, from 2.99% in 1986-87 to 2.20% by 1998-99.
  - The capital development expenditures on biodiversity-related activities (as a ratio of total capital expenditures on all sectors taken together) have shown a sudden decline from 2.27% in 1986-87 to 1.81 in 1994-95, but have shown a reverse trend from 1995 onwards, rising to an average of around 2.5%.
  - Among the states, as far as revenue expenditures are concerned, except for states such as Karnataka, Kerala,



Madhya Pradesh and Orissa, all other states have registered fast declining rates of resource allocations.
- Similarly, as far as capital expenditures are concerned, most states have very low rates of allocations (except Maharashtra, Gujarat, Kerala, Tamil Nadu); besides, they have been invariably declining from year to year.

b. Environmental decision-making is yet to be merged with the mainstream economic decision-making, because environmental costs are not internalised effectively.

c. A World Bank study has estimated that environmental damages add up to 4.5% of India's GDP. TERI (1998) mentions that environmental costs in India exceed 10% of the GDP as a result of loss in agricultural productivity, loss in timber value due to degradation of forests, health costs due to polluted water and air and costs due to depleted water resources. Further the economic loss due to soil degradation resulted in an annual loss of 11-26% of the agricultural output. Thus natural resource degradation impinges on economic growth, yet economic planning and budgeting does not account for it.

d. India has a repertoire of economic incentives with a bearing on utilisation of biological resources; however, these traditional economic mechanisms are oriented more to 'revenue raising' and biomass augmentation, and are not necessarily oriented towards conservation (MoEF 2001a).

e. GNP and national income do not reflect environmental degradation or the consumption of natural resources, and are inadequate measures of productivity and social costs when environmental damage occurs. National income accounting without environmental accounting limits the information available to policymakers for gauging the impact of economic activity on the environment.

f. There is very little systematic work on the relationship between macro-economic growth measures and their precise environmental effects. What is known is that many current measures, such as subsidies to chemicals in agriculture, tax incentives to industries in 'marginal' areas (which are also usually biodiversity-rich), and rapid (including 'single-window') clearances for certain industries, are insensitive to environment concerns. They also do not enhance or protect the livelihood security of small farmers, fisherfolk, and forest-dwellers.

g. As a percentage of the total plan outlay of state and central governments, the allocation to the Environment and Forestry Sector is only around 1%. Of this, the allocation to direct biodiversity conservation through the wildlife sector is even smaller.

h. Spending as an indicator in all states shows poor progress. In the World Bank Forestry projects, during the period 1999-2000, an amount of Rs 1000 million was to be spent on the project, but the expected real spending is only a quarter of the amount.

i. The level of external assistance received has declined both in nominal and real terms: Rs 317 crores in 1997-98 but only Rs 234 crores in 1998-99, further declining to Rs 189 crores in 1999-2000. It has been observed that states having externally-aided projects are not making adequate provision of funds commensurate to the requirements of project programmes. This can have adverse implications on external assistance.

j. Continuing subsidies on government supply of wood and bamboo to industries act as a disincentive to industry to pay a remunerative price to farmers, and to value forests for their real worth.

k. An analysis done in 2002 indicates that governments (both central and states) spend about Rs 400,000 million annually on poverty alleviation programmes. These programmes do not ensure ecological security. Partly as a result of this, the contribution to the economy from agriculture and forestry has come down from 55% in the First Plan to 28% in the Ninth Plan. A Planning Commission evaluation reveals that the Rural Development Programme has failed to understand the environment-poverty link in a village. *The Food Insecurity Atlas of Rural India*, published by M.S. Swaminathan Foundation, Chennai, reveals that the

13 environmentally unsustainable states, based on key natural resources like forest land and water, are the poorest in economic terms but also amongst the most resource-rich (Mahapatra 2002).

l. There is very inadequate tapping of funds from sectors like corporate, religious and financial bodies for biodiversity.

m. There is severe undervaluation of biodiversity (*see Section 5.2.6*), leading to under-budgeting for dealing with threats.

n. There is a lack of transparency and public participation in generating, using and monitoring funds.

o. Traditional economic mechanisms, like the National Afforestation Fund are oriented more to 'revenue raising' and biomass augmentation. The potential of redesigning these instruments from a conservation point of view cannot be effected without a careful consideration of the impact of these instruments on conservation of biological resources.

p. Existing financial resources are not adequate for the various strategies and actions specified in this action plan. There is a need to generate additional resources through innovative mechanisms for biodiversity-related activities.

q. Institutions at various levels of decentralised governance are often not financially empowered. They often do not have the right to generate and control their own financial resources through the sustainable and equitable use of natural resources, the right to secure and control public funds, and the power to decide upon the priorities by which various line departments should spend their budgets in the area under their jurisdiction.

r. There is inadequate funding to promote alternate technologies. Also some of the technologies available are so expensive that they cannot be used extensively. For example:
   - The major constraints in the use of radio telemetry for wildlife research in India include high cost and the non-availability of equipment.
   - Due to inadequate R & D and incentives for ecofriendly technologies in all sectors, costs of many such technologies are still very high (especially since long-term benefits are not built into cost-benefit calculations).
   - Insufficient capital is available, especially in the small scale sector, to install new technologies.

6.1.10 Wild Biodiversity: Technology

6.1.10.1 Overall Concept

Lately there has been a growing emphasis on developing and using technologies, which do not adversely effect the environment and are more socially acceptable as compared to the conventional technologies that have been/are in use. Environment friendly technologies can be classified as:

i. Technologies that reduce environmental damage by reducing pollution through modifications in the process/products;
ii. Technologies that increase the efficiency of production process, thereby reducing the amount of bioresource raw material used, or technologies that substitute threatened bioresources with alternatives;
iii. Technologies that turn waste into products that are not harmful to the environment; and;
iv. Technologies that increase the productivity of natural resources.

Broadly, there are two kinds of industries/process that are relevant:

i. Those that use bioresources as raw materials, e.g. pharmaceutical, agro-industries, tanneries, sugar mills, seed, NTFP-based, and so on.
ii. Those that do not use bioresources but impact on biodiversity, e.g. steel plants, electronic industries, dams, mines, and so on.

6.1.10.2 Current and Past Initiatives

Government:

a. *Medicinal Plants*: The Department of Indian Systems of Medicine & Homoeopathy (ISMH) was established as a separate Department in the Ministry of Health and Family Welfare in March 1995 to bring about effective coordination in the area of traditional Indian Systems of Medicine (Ayurveda, Siddha, Unani) and Homoeopathy.

The Department has set up the Central Council for Research in Ayurveda and Siddha (CCRAS), the Central Council for Research in Unani Medicine (CCRUM) and the Central Council for Research in Homoeopathy (CCRH), which oversee R&D work in the area of traditional medicine, and also have schemes for promotion, cultivation and regeneration of medicinal plants used in these systems.

Since the herbs and medicinal plants have been traditionally obtained from forests, no systematic effort has been made in the past for developing the package of practices for cultivation of medicinal plants and herbs. The package of such practices has been worked out for some medicinal and aromatic crops by ICAR, CIMAP and others. Central assistance is provided to specialized organizations in government/semi-government sectors, for development of agro-techniques for identified medicinal plants used in Ayurveda, Unani, Siddha and Homoeopathy.

Other institutions involved in technologies related to medicinal plants include the National Medicinal Plants Board, the Department of Biotechnology (DBT), and several institutes of the Council of Scientific and Industrial Research (CSIR). The Department of Biotechnology (DBT) under the Ministry of Science & Technology (*see Section 6.1.1.2*) has been supporting R&D on medicinal and aromatic species. A major programme on conservation has been coordinated by DBT, through the establishment of gene banks (GEBMAP) among the 'Group of 15' countries under the programme of South-South Cooperation.

The application of biotechnological tools for conservation, micropropagation, production of secondary metabolites, standardization of processes for traditional herbal formulations, isolation and characterization of new therapeutic agents, and genetic enhancement of medicinal and aromatic plants have been done at various R&D institutes under DBT-sponsored programmes.

CSIR institutions which are devoted wholly or partly to research on medicinal and aromatic plants include the Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow; National Botanical Research Institute (NBRI), Lucknow; Central Drug Research Institute (CDRI); Tropical Botanical Garden and Research Institute (TBGRI), Pallode; and Regional Research Laboratories (RRLs) at Jammu, Jorhat, Bhubhaneshwar and Thiruvananthapuram.

The mandate of these institutes includes the development of agro-technologies for medicinal plants, with a focus on those plants that required in large quantities by not only in the Indian systems of medicine but also in the allopathic system of medicine.

CIMAP has developed agro-technologies for the following medicinal and aromatic plants:

Table 6.8 Agro-Technologies by CIMAP

S.No.	Name of the Plant
1.	*Mentha arvensis* (Japanese Mint)
2.	*Mentha piperita* (Peppermint)
3.	*Cymbopogon winterianus* (Java citronella)
4.	*Cymbopogon flexuosus* (Lemon grass)
5.	*Pelargonium graveolens* (Geranium)

S.No.	Name of the Plant
6.	*Matricaria chamomilla* (German Chamomile)
7.	*Dioscorea deltoidea* (Dioscorea)
8.	*Dioscorea floribunda* (Dioscorea)
9.	*Rauwolfia serpentina* (Serpent Wood)
10.	*Hyoscyamus muticus* (Egyptian Henbane)
11.	*Duboisia myoporoides* (Corkwood)
12.	*Atropa belladonna* (Belladonna)
13.	*Chrysanthemum cinerariaefolium* (Pyrethrum)
14.	*Ammi majus* (Large Bullwort/Bishop's Weed)
15.	*Catharanthus roseus* (Vinca rosea) (Periwinkle)
16.	*Claviceps purpurea* (Ergot)
17.	*Papaver somniferum* (Opium Poppy)
18.	*Artemisia annua* (Quinghaso)
19.	*Withania somnifera* (Ashwagandha)
20.	*Bacopa mannieri* (Brahmi)

Source: Export Import Bank of India 1997.

b. *Other Bioresources:* One of the initiatives of the National Bioresource Development Board (NBDB) (*see Sections 6.1.1.2 and 6.1.6.2*): includes the establishment of an Institute of Bioresources and Sustainable Development at Imphal. This institute would concentrate on sustainable use through biotechnological interventions for the socio-economic growth of the region. Training, research, demonstration and technology development would be the focus of the Institute. A large number of government agencies and institutes including ICFRE and IIFM are working on sustainable NTFP-harvesting technologies.

   The Forest Departments and Forest Development Corporations in the States and Union Territories are the nodal agencies for implementation of the scheme, and project areas are confined mainly to recorded forest land.

   During the Ninth Five Year Plan, the scheme is being operated in 25 States. The financial allocation is Rs 805 million.

c. *Energy:* In 1982, an independent Department of Non-Conventional Energy Sources (DNES) was set up in the Ministry of Energy for specific focus on this sector. To help in the commercialization and market development of these energy sources, the Indian Renewable Energy Development Agency Limited was established in 1987. In 1992 the DNES was converted into a separate Ministry of Non-Conventional Energy Sources (MNES). MNES has several programmes for Renewable Energy (*see Table 6.9*).

   The Ministry has set up three specialized institutes focusing on renewable energy. These are the Solar Energy Centre (SEC), Centre for Wind Energy Technology (C-WET) and the Sardar Swaran Singh National Institute of Renewable Energy (SSSNIRI).

   The Environment Action Programme (MoEF 1993) highlights the Integrated Rural Energy Programme (IREP) for energy development in rural areas, with funding provided through Central and State Plans. The focus is decentralized planning with a least-cost mix of various energy options, including conventional as well as renewable and non-conventional energy sources at the Block level. During the Seventh Plan around 250 Blocks were covered under the Programme.

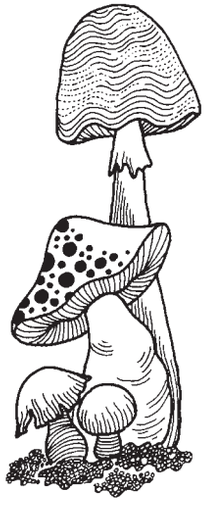
d. Indian Council of Forestry Research and Education (ICFRE), has been working on developing technologies related to wild biodiversity. Some of these include: Rehabilitation and eco-restoration of mined lands and overburden spoils, techniques for afforestation of stress sites, rain water harvesting and conservation tech-

Table 6.9: Programmes of the Ministry of Non-Conventional Energy Sources

Group	Programme
Rural Energy	Biogas
	Improved *chulha* (Cook-stove)
	Integrated Rural Energy Programme
	Special Area Demonstration Programme
	Animal Energy
Solar Energy	Solar Photo-voltaics
	Solar Water Pumping
	Wind Pumping/Hybrid Systems
	Solar Thermal
	Solar Cookers
	Solar Energy Center
Power Generation	Small Hydro Power
	Wind Power Generation
	Biomass Combustion/Cogeneration Power
	Biomass Gasifiers
	Solar Power
Energy from Urban & Industrial Wastes	Energy from Urban & Industrial Wastes
New Technologies	Chemical Sources of Energy
	Hydrogen Energy
	Geothermal Energy
	Alternative Fuel for Surface Transportation
	Tidal Energy
Planning, R&D, Technology	Non-Conventional Energy Technology Commercialization Fund
	Technology Information Forecasting, Assessment and Databank
Information Forecasting, Assessment and Databank	Planning & Coordination
	International Cooperation
	Seminars and Symposia
	Research & Development Coordination

Source: http://mnes.nic.in/

nology, improved tools for nursery practices, integrated pest management (IPM) strategies, seasoning of timber, setting up of solar and energy-efficient desiccant-based kilns (http://www.icfre.org/).



e. The National Environmental Engineering Research Institute (NEERI), Nagpur, India, has developed a sustainable eco-friendly technology with the objective of reclamation and rejuvenation of the 'soil spoils' left after open-cast mining. This technology is called the Integrated Biotechnological Approach (IBA). It involves using of diverse organic materials (industrial wastes such as press mud, a by-product of sugar mills, and treated sludge, a by-product of paper mills) to develop soil productivity. 'These organic materials nourish the depleted soil and are supplemented by the planting of saplings that contain specialized cultures of endomycorrhizal fungi and such nitrogen-fixing bacteria as *Rhizobium* and *Azotobacter*. IBA has increased the survival rate of plant species found on land that is scarred by open-cast mining to more than 80 percent. It has also boosted the species' growth rate by a factor of five' (*Environment-Friendly Technologies and Biodiversity Sub-thematic Review*).

f. The Department of Biotechnology has developed technology packages for Bioremediation of Mine Spoil Dumps through Integrated Biotechnological Approach. Some of the technologies include Ecological

Restoration of Degraded Ecosystems and Wastelands, and Technology for Mangrove Afforestation through Application of Classical and Biotechnological Tools.

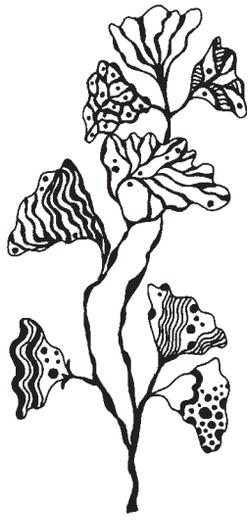
g. Establishment of Ocean Science and Technology Cells (OSTC): The Department of Ocean Development has created 9 OSTCs in various disciplines of Marine Science. Among them the cells on marine microbiology, coastal marine culture systems, marine benthos, marine biology and marine ecology are intended to promote R&D activities that would lead to conservation of biodiversity (DOD 2003).

h. Turtle Excluding Devices (TEDs): A TED fishing gear device is inserted into the trawl and functions as an escape hatch to allow turtles that are caught up in a trawl net to be released. There has been a growing international acceptance of the use of TEDs. Orissa is the first state in India to get TED technology, to reduce turtle casualty and unintended catch during fishing by trawlers. This project has been funded by the UNDP-GEF in collaboration with the State Forest Department (*Environment-Friendly Technologies and Biodiversity Sub-thematic Review*).

i. The use of remote sensing and GIS tools in biodiversity conservation is increasingly becoming a key and indispensable component all over the world. Several prominent global conservation-oriented institutions and organizations have been using these technologies in their conservation efforts. In India, these tools have been used by various agencies (government, NGOs and autonomous agencies) to analyse aspects such as forest cover, land use and so on. In some cases this has also helped in prioritising research issues and areas of intervention. Some of the agencies which have used the tools include Indian Institute of Remote Sensing (IIRS), National Remote Sensing Agency (NRSA), and Space Application Centre (SAC). Agencies such as the Forest Survey of India have also carried out mapping exercises with the help of these tools (*Remote Sensing and GIS Tools Sub-thematic Review*).

j. In order to promote the hand-made paper industry, the Government of India has proposed to set up 460 new hand-made paper units providing employment to 40,000 persons through Khadi and Village Industries under the Special Employment Programme. One registered institution at Faridabad has been identified under this programme. In addition to this, five traditional hand-made paper units have been given financial assistance for revival. Under this programme, two clusters have been financed in Rajasthan, involving 19 individual entrepreneurs.

k. National Institute of Rural Industrialisation (NIRI), Wardha, has put together a list of six activities that it will undertake, each of which has a link to biodiversity. These are Khadi and Textile Industry, Chemical Products, Bio-processing, Rural Infrastructure and Energy, Rural Crafts and Engineering, and Management and Systems. There are some common activities which have also been envisaged, which include building two-way linkages between experts and field level units; improving the quality of Khadi & Village Industry sector products and facilitating compliance with pertinent standards; building a laboratory to facilitate quality assurance and in-house research work; identifying products which can be prioritised for marketing and to prepare and upgrade the database of available technologies and experts in the field. This is part of a project of the Indian Institute of Technology, New Delhi, and Khadi and Village Industries Commission (*see Section 6.2.9.2*), the MoU for which was put together in April 2001 (http://niri-kvic.org/). The precise implications of these technologies for biodiversity conservation are not clear.



l. The Rural Technology division of Council for Advancement of People's Action and Rural Technology (CAPART) works on promoting innovative rural technologies in the village, catering especially to disadvantaged sections of society. This task is carried out through 14 Technology Resource Centres, which facilitate technology transfers and help build capacity for the same. It also supports individual innovators in developing, adapting and commercialising appropriate technologies. Some of the technologies (the biodiversity impacts of which are not clear) that CAPART is working with are Fire Proof Thatch, Rain Water Harvesting, Improved Crematorium, NADEP Composting Technology, Coconut Leaf Thatch Roofing, TARA Handloom, Random Rubble Blocks, Guna Tile Roofing, Ferrocement Roofing, Earth Resistivity Meter, Geodesic Dome, Hydram,

Single Phase Welding Transformer, Gasification, Water Mills, Vermiculture, and Lantana Utilization. Till March 2001, 1,017 technology projects had been supported (http://capart.nic.in/).

NGOs:

a. The use of radio telemetry technology in Indian wildlife research is at present in the nascent stage. Between 1983-1997, a few attempts were made to radio tag wild fauna. These included 6 crocodiles, 23 Asian elephants, 8 Asiatic lions, 1 snow leopard, 2 chital, 2 sambar, 1 nilgai, 6 Indian flying fox, 4 jackals, 7 tigers, 2 Indian wild asses, 4 otters, 3 leopards, 1 jungle cat, and 3 wolves. The technique was used to gather information on ranging patterns, home range, and habitat use of this fauna. WII (*see Section 6.1.1.2*) carried out most of this work (Goyal and Shah at http://www.npwrc.usgs.gov/resource/tools/telemtry/wildass.htm).

b. The Centre for Water Resources Development And Management (CWRDM), Kozhikode, is coordinating the Lakshadweep Island Water and Management Project, implemented in the islands by the Department of Science and Technology and Public Works Department. 'This includes the introduction of cost-effective rainwater harvesting structures, lining of ponds and utilization of subsurface flows through subsurface dykes. Demonstration tanks of 10,000-litre capacity have already been constructed at Kavaratti, Agatti, Amini and Minicoy. Ferro-cement rainwater harvesting structures will be used to reduce cost and labor. The hydro-geological sensitivity of the islands is also to be regularly monitored under this project' (*Lakshadweep State BSAP*). The project presumably has ecological benefits by helping to avoid environmentally destructive water storage and usage technologies.

c. Development Alternatives: The Eco-Building Unit of Development Alternatives, an NGO based in Delhi, has developed the Compressed Earth Block (CEB) technology. This technology offers a cost-effective, environmentally sound masonry system. In India more than 5 million Stabilised Compressed Earth Blocks have been used to build residential and community buildings in both urban and rural areas. HUDCO's network of Building Centres has appreciated and promoted this technology.

d. Decentralised Energy Systems India Pvt Ltd (DESI Power) is a collaborative effort of TARA (Development Alternatives) and DASAG India. This initiative is focused on promoting renewable energy. It works towards establishing Independent Rural Power Producers (IRPPs) with local communities and entrepreneurs. 25% of the financing is provided by Desi Power in the form of equity and the local partner puts in 25%. The remaining 50% comes from 'green' funding sources, which are willing to accept below-market return rates, or from regular commercial sources. The first Desi Power station was set up at Orcha, Madhya Pradesh (India) in April 1996, as a joint venture between FREND, a Swiss non-profit organisation that promotes renewable energy, and TARA. TARA is also a primary client of this power plant and purchases electricity to run its operations and innovations, at TARAGram (a technology village).

e. The Patriotic and People Oriented Science And Technology (PPST) Foundation which started as a movement in 1980 was registered as a trust in 1986. It has been working on exploring various aspects of indigenous sciences and technologies. It produced a journal 'PPST Bulletin' for 15 years (1980-1995) which attempted to analyse aspects of traditional Indian sciences and technologies. The Foundation has also been holding a number of state level conventions on indigenous science and technologies. Three national level congresses on traditional science and technology have also been organised by the Foundation (http://www.ciks.org/sisters.html).

f. Murugappa Chettiar Research Centre (MCRC) in Chennai works to apply science and technology to solve problems related to energy and resource conservation, essentially in rural areas. MCRC has worked on technologies for both rural applications and the industrial sector, which are ecofriendly and dovetail with local needs (http://www.ciks.org/sisters.html).

g. Centre of Science for Villages set up in 1976 in Wardha has been working on developing simple technologies

for construction and biogas, and providing training to farmers to make their own organic and herbal pesticides. The aim is to make villages self sufficient by the application of science and technology (http://www.tribuneindia.com/2002/20020403/edit.htm#7).

Communities

Communities have over centuries developed a large range of traditional technologies relating to forest produce, freshwater and marine fisheries and other aspects of wild biodiversity.

A good example of this is water harvesting. The re-establishment of the *johad* has played a central role in the environmental recovery of the Arvari river basin. A *johad* is a simple mud and rubble structure built across a water channel that holds rainwater. During the short rainy months, the rainwater was trapped by constructing these small dams and tanks, and conserved for future use. The *johads* are simple earthen structures, which act as barriers when built across the contour of a slope, to capture runoff. The process of revival of the Arvari basin was based entirely on reinstating confidence in the local tradition of water harvesting. The process of restoration began when some founder members of Tarun Bharat Sangh (TBS) began working in Gopalpura village in the region in the year 1985. After the water harvesting structures were built, there was an additional recharge of groundwater by 20%. Though the base flow to the river remained the same, there was an additional seepage of 17% of rainfall to the river in non-monsoon months. This contributed to the revival of the river and made it perennial (Kohli, In Press).

Another example is the initiative of the residents of Malgaon village, Khandwa district, Madhya Pradesh where chemical farming has been converted to green farming through recycling all kinds of biowaste generated

Box 6.69 Innovative Fishing Practices

- Fishing communities in India have traditionally been using hooks and lines to catch fish. These hooks are generally made of metal. An exceptional type of fishing gear made of bamboo is used in the districts of Barpeta, Qoalpara, Dhuburi, Bongaigaon and Koknyarb of Assam. The rice farmers and fisherfolk in these districts use this kind of fishing gear particularly to catch fish in rice fields where the depth of water ranges from 50 cm to 1.00 m. Grasshoppers are used as bait for luring the fish. The above method is generally used for catching insectivorous fishes like *koi* (*Anabas spp.*) and snake-headed fish (*Channa spp.*). At a point of time, hundreds of gears and lines are used in a rice plot. The process is continued till the water recedes.
- Tribals of Dediapada forests of Bharuch district of Gujarat use different methods to catch fish from small streams. Bamboo strips are made into fine nets. These nets are of two kinds, the first one being *bhosakiya*, for catching downward-moving fish. *Bhosakiya* is placed in the stream in such a way that water and fish enter it from the open, broad mouth. The other kind is called *molo*, which is placed in the opposite direction. Women place this net before commencing work. After 1 to 2 hours, there is enough fish for the day's meal. Since this is a self operating system, no extra labour is required. The people also make small bunds of stone, tree branches and clay to divert more water towards the bamboo net.
- In Tadadi village in Uttar Thannada district of Karnataka the extract of *Terminalia tomentosa* bark is used as preservative for fishing nets. Fishing nets are treated with the processed bark filtrate and fisherfolk say that this prevents rodents from approaching the nets. The bark filtrate also has anti-fungal and antibacterial properties.
- In Tadadi village knotted nets are made using vegetable fibre twines such as jute. Villagers found that these can withstand more strain during hauling/dragging. They also realized that durability and efficiency of these nets was much better than machine-made nets.
- In Shedikuli village in Karnataka nets are stained using Kesari colour and salt solution. Fisherfolk believe that this method increases the life of the fishing nets.

In marine areas, a large diversity of vessels, nets and other fishing gear has been developed by fisherfolk, to suit various climatic, water depth, ecosystem-specific, and species-specific conditions.

Source: http://knownetgrin.honeybee.org/

around their houses and fields. There are various methodologies adopted, which include tree plantations, use of biofertilizers, etc. Efforts are also being taken to reduce domestic waste by constructing soak pits as well as pits for the recharge of groundwater. At the same time, biomass is being converted to biogas for both cooking and electricity. The villagers have put a stop to the use of chemical fertilizers, insecticides, pesticides and hybrid seeds and have taken to the cultivation of indigenous species. This initiative is being managed by a community supported youth club and an NGO called 'Vasundhara' (*Madhya Pradesh State BSAP*).

There are several other examples of appropriate technologies that communities have developed, and are continuously innovating on. These include technologies for the extraction and use of non-timber forest produce (NTFP), medicinal plants, honey, hunting/trapping, fishing (*see Box 6.69*) and so on.

Others: Corporate Sector

- Initiatives by the *Ayurvedic* industry: More than 25 companies in the private sector are engaged in nursery development, generation of planting material and seeds, development of agricultural techniques for cultivation of medicinal plants and also initiating cultivation of medicinal plants by contracting them to farmers.
- The Confederation of Indian Industry (CII) and Government of Andhra Pradesh, with the technical support of USAID have initiated a Green Business Centre (CBC) at Hyderabad. This Centre of Excellence in Clean Energy & Environment was inaugurated in 2000. The objectives of the CBC are to promote green concepts in the private sector with a focus on clean energy, environment and climate change. Some of the services offered by the CBC include Green Process and Technology Audit, Green Process Certification, Green Building Certification, Energy Audit, Environmental Audit, Business Incubation, Technology Centres, Social Audit, and Information Centre (www.greenbusinesscentre.com).
- A number of companies are researching and marketing wood-based products. Ecoboard Industries Ltd, for instance, produces particle boards from agricultural wastes, and markets them for construction, furniture, and other uses (www.ecoboardindia.com).
- The Enviromental Information Centre is a collaborative initiative of the Federation of Indian Chambers of Commerce and Industry (FICCI), ICICI India Ltd and US Agency for International Development (USAID) under the Clean Technology Initiative (CTI) of the Trade in Environmental Services and Technologies (TEST) project. The aims of the Centre are to 'generate industry-wide awareness about the emerging challenges and opportunities on the environmental front, compile and disseminate business relevant information on global climate change, energy efficiency, clean and climate-friendly technologies and other environmental issues, provide technology intermediation and business to business match-making services to the industry in support of its environment-related initiatives, industry actions for environmental improvement and management, and facilitate adoption of cutting-edge technologies, serve as a platform for knowledge sharing on environmental issues and solutions' (http://www.cleantechindia.com/eicnew/index.htm).

6.1.10.3 Major Gaps

i. There is comparatively less promotion of technologies that use natural/biological resources. There is little or no standardization in the use of these technologies. For example, the package of agro-industry practices which have been worked out for some medicinal and aromatic crops by ICAR, CIMAP etc are not standardized.

ii. There are few technologies that are ecologically less damaging and socially acceptable. There are also few alternatives worked out for replacing technologies which are damaging to the environment:
   - The exploitation of mineral resources through open-cast or strip and underground mining has caused wide ranging environmental problems such as land degradation, loss of biological wealth, air, water and noise pollution and displacement of local communities. There has not been much work in seeking alternatives for such practices.
   - The high relative cost of Renewable Energy Technologies (RETs) is the single largest problem in its use.
   - There are weak markets and market support infrastructure for promoting RETs. This includes networks of

suppliers, dealers, credit facilitators etc. There are weak linkages between R&D at one end, and market requirements for product development, deployment and technical upgradation at the other.

iii. The dissemination of environmentally sensitive and socially acceptable technologies is very poor:
- There is very little integration of traditional and new technologies, e.g. in mapping/surveying resources in energy, in construction etc.
- There is inadequate back up support and service to technologies like biogas plants and solar heating/lighting. According to a Planning Commission (2002) report, 25% of biogas plants lie unused.

iv. Introduced technologies are rarely shared with local communities and their participation is rarely sought:
- There is inadequate collaboration between local communities and professionals in the GIS-related work.
- Resistance to change is widespread, e.g. with respect to roof top water harvesting that could make cities self-sufficient and reduce the destruction caused by dams, canals and pipelines; or with regard to full recycling technologies for industries; or ecofriendly construction.

6.1.11 Wild Biodiversity: International Fora

6.1.11.1 Overall Concept

Other countries and international institutions affect the biodiversity of India in myriad different ways. This section concentrates on some of the multilateral agreements that India is a party to, and which have an impact on India's biodiversity. Dimensions of the in-country implementation and effects of many of these agreements – which cover many aspects including all the preceding sections – are covered elsewhere in this chapter.

6.1.11.2 Current and past Initiatives

(Several treaties, conventions, agreements and organisations mentioned in this section are also relevant to *Section 6.2.11*.)

Biodiversity and Environment Agreements

a. The Convention on Biological Diversity (CBD), 1992, is a global treaty for international as well as inter-institutional cooperation on conservation of biodiversity, sustainable use of biological resources and equitable sharing of benefits arising from such uses. It came into force on 29th December 1993, and is a treaty with a Conference of Parties (COPs), the overall decision-making body. and framework annex i.e. with general mechanisms set up in accordance with procedure, set out in various parts of the Annexes (Sinha 2001).

It is the provisions of CBD that have led directly to the preparation of the NBSAP and the preparation of the Biological Diversity Act, 2002. One of the main features of the CBD is the Cartagena/Biosafety Protocol, which will enter into force on 11th September 2003 (http://www.biodiv.org/doc/press/pr-2003-06-13-bs-01-en.pdf).

The CBD recently established an Ad Hoc Technical Expert Group (AHTEG) to look at the interface of climate change and biodiversity, including the impact of climate change mitigation activities on biodiversity and the impact of climate change on biodiversity. The issue of the impact of climate change mitigation activities on biodiversity formed a large part of the discussion of the AHTEG's initial meeting.

India has been very proactive during and after the formation of the CBD, especially on matters relating to access and benefit-sharing, IPRs and biosafety. It has actively tried to use the CBD as a counter railing force to potentially detrimental provisions of some treaties like TRIPS.

b. The United Nations Convention to Combat Desertification (UNCCD), 1994, applies to countries experiencing serious drought and/or desertification and came into force on 26th December 1996. There are over 144 par-

ties to this Convention. The four regional implementation annexes to the Convention are: (i) African Annex, (ii) Asian Annex, (iii) Latin American and Caribbean Annex, and, (iv) Northern Mediterranean Annex, which mention important links between desertification and loss of biodiversity. They also focus on debt issues, unfavorable international economic trade practices, other financial and socio-economic factors, loss of traditional knowledge/know-how/practices, urbanization, wrong agricultural practices etc. (Sinha 2001).

c. The Convention on Wetlands of International Importance (Ramsar Convention) (*see Section 6.1.2.2*): The Ramsar Convention, 1971, is described as a true environmental Convention. It has evolved from being its initial narrow focus to one dealing with the biodiversity and proper use of wetlands. Numerous wetlands have already benefited from better protection as a result of being declared Ramsar sites, and there is also greater awareness of the distinct value of wetlands as a result of this Convention.

d. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) regulates international trade for an agreed list of endangered species of wild fauna and flora.India became a Party to the Convention in 1976. Since then, it has formulated a legal framework and worked out a range of regulatory mechanisms for effective enforcement of the Convention. India has consistently advocated conservation as opposed to consumption and use of wild species covered by CITES (Dutta 2002b). CITES parties have placed species in one of 3 'appendices', depending upon the degree to which they are threatened with extinction. Trade across national borders is restricted or regulated depending on the appendix in which a species is listed.

e. Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal: India has signed and ratified the Basel Convention of 1989. However, it has signed but not yet ratified the Convention Amendment, the Basel Ban, which completely bans the export of toxic wastes from developed to developing countries, even for so-called recycling purposes. In recent years, there is an attempt to work on the concept of Environmentally Sound Management (ESM) of waste as a main focus in the Convention, so that it becomes a question of ESM at the importing end rather than one of export per se. The US, Japan, Canada, New Zealand, and Australia are pushing for this, and India has joined this group. Additionally, Annex 7 to the Convention lists countries that can freely trade waste with each other. India is trying to have ESM recognised as the standard for being listed as an Annex 7 country, which is based on domestic rather than global standards. In this scenario, one of the things that saves Indian environment from large consignments of waste is that the exporting countries have very stringent regulations on export. In the past, India has resisted the inclusion of ship-breaking as a Basel topic. India has also been attempting to have some items taken off the Basel lists, e.g. PVCs, PVC-coated copper cables.

f. The Stockholm Convention on Persistent Organic Pollutants, 1997, covers the eventual ban on use of 12 chemicals, of which one is a category of chemicals rather than a chemical by itself.. Exemptions and phase-out schedules in different countries apply to all these chemicals. The Convention, however, is not only about these 12 chemicals currently listed, but specifically talks about including other chemicals on this list. India has signed this treaty but not yet ratified it. India has also asked to be exempted for Dieldrin (for emergency locust control) and DDT (for public health purposes).

g. Forest-Related Agreements/Institutions

- In 1992, negotiations among governments at the United Nations Conference on Environment and Development (UNCED) resulted in The Non-legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of all Types of Forests, also known as the 'Forest Principles', as well as Chapter 11 of Agenda 21: Combating Deforestation (http://www.un.org/esa/forests/about-history.html).

- The UN Forum on Forests (UNFF) is a successor to the Intergovernmental Panel on Forests (IPF) and Intergovernmental Forum on Forests (IFF). It has also inherited approximately 250 proposals for action on forests that were issued by the IPF and IFF. The UNFF allows countries to choose whether they

want to pursue actions under IPF or those under IFF. In January 2002 four collaborative initiatives on the 'Ecosystem Approach' were agreed upon in the context of sustainable forest management, cross-sectoral impacts, protected forest areas, and facilitating integration at the national level of NBSAPs and FAPs.

- Crottorf Consultations have been recently held on the subject of an international forest regime. The past and future of a forest regime has been under discussion. India has stressed at fora such as these that the CBD should be the defining framework for the conservation of forests.

- The International Tropical Timber Agreement (ITTA), 1983, came into force on 4th April 1985 under the auspices of United National Conference on Trade and Development (UNCTAD). It was renewed in 1994 to broaden its scope and accommodate inherent environmental concerns. The types of commitments involved relate to limits on trade in timber. The reporting and review process involves proper implementation and adequacy review and regular reporting by Parties and experts. Under this agreement, India, which was earlier categorised as a 'Timber Producing Country', is now considered to be a 'Timber Consuming Country'. Thus India is no longer under an obligation to be a net exporter of tropical timber in volume terms. ITTA is currently stressing on the need for sustainable forest management. This requires member nations to file details covering the legal and institutional framework for forest policies, areas and distribution of protected and producing forests, production levels, prices and stocks. The ITTO has also discussed the possibility of imposing conditions for labeling timber from sustainably managed forests and reducing duty on such products.

  The International Tropical Timber Council (ITTC) has launched a new action plan for the International Tropical Timber Organization for 2002-2006.

h. United Nations Framework Convention on Climate Change (UNFCCC), was formulated to combat the threat from global warming, as one of the Rio Conventions. The Kyoto Protocol was concluded in 1997, as a mechanism/framework under which the reduction in greenhouse gas emissions would take place. Part of the mechanism for this trade is the Clean Development Mechanism (CDM), which allows industrialised countries to 'buy' carbon credits by paying for carbon-reducing activities in developing countries, including emissions-reduction technologies and improved management practices for natural resources. India hosted the 2002 Conference of Parties of UNFCCC.

Other related Conventions and Agreements

i. World Trade Organisation (WTO) Group of Trade-related treaties: The General Agreement on Tariffs and Trade (GATT) was formed in 1947, primarily to encourage global economic development by limiting the use of tariffs and import restrictions. The agreement is the initial 1947 document and its periodic 'rounds of amendments', such as the 1994 final Uruguay Round of Multilateral Trade Negotiations. GATT primarily seeks to discourage or prohibit the use of import restrictions. However, it allows nations to restrict the import of products from other member nations, so long as these restrictions do not discriminate between foreign and domestic products.

  India is a Party to the 1994 GATT. This is supported by an elaborate legal instrument finalized during the Uruguay Round of Multilateral Trade Negotiations and enforced globally by WTO. GATT rules primarily facilitate free trade by going in for more trade liberalization and globalization. Its Final Act contains two agreements governing national laws on environment and/or public health – The Agreement on Technical Barriers to Trade (TBT) and The Agreement on Sanitary and Phytosanitary Measures (SPS). The TBT Agreement relates to government regulations on products. It requires that the basis for national regulations should be 'relevant international standards', 'except when such international standards or relevant parts of them would be an ineffective or inappropriate means for the fulfilment of legitimate objectives pursued.' The SPS agreement deals with government regulations and import bans regarding 'food safety and disease spreading products.' It further calls for setting international product standards. However, if a country requires it can set higher

standards than those that are part of the international norms, along with a scientific justification and carrying out a risk assessment (Sinha 2001).

The World Trade Organisation (WTO) is the administration body in Geneva, set up to implement the terms and requirements of the GATT and other trade-related treaties. One way that WTO achieves this is through dispute resolution panels where member states can reconcile conflicting interpretations of GATT's provisions. In 1994, a formal agreement under the World Trade Organization (WTO) was established to bolster and harmonize the intellectual property rights (IPR) system, including the patent legislation, in all technological fields world-wide, including biotechnology. This came to be known as Trade-Related Intellectual Property Rights (TRIPS). This has put strong pressure to harmonize national patent legislation through TRIPS in the Uruguay Round of GATT.

The WTO was also assigned a Committee on Trade and Environment (CTE) to examine trade relationships and make recommendations on appropriate modifications of the trade rules as necessary. The CTE has a two-fold mandate:

i. To identify the relationship between trade and environmental measures, in order to promote sustainable development, and,
ii. To make appropriate recommendations on whether any modification of the provisions of the multilateral trading system is required, compatible with the open, equitable and non-discriminatory nature of the system.

The Council for TRIPS (which oversees the functioning of the TRIPS Agreement), and the Committee on Trade and Environment (CTE) (which was established by the General Council in 1995 after the 1994 Marrakesh Ministerial Decision on Trade and Environment) are of major relevance to India. CTE's terms of reference required the CTE to consider the relevant provisions of TRIPS as an integral part of its work, including traditional and indigenous knowledge. In March 1998, the CTE addressed issues relevant to the theme of market access and held substantive discussions on sectors like agriculture, energy, fisheries, forestry, non-ferrous metals, textile and clothing, leather and environmental services. CTE also established a WTO environmental database on all the environment-related notifications made by members (Sinha 2001).

India has been proactive on a number of fronts at the WTO forums. In TRIPS, for instance, it took a position against universal application of patents on life forms (a stand that had been abandoned by 2003), and in favour of including requirements in patent applications for dialogue with the country of origin of the biomaterial or knowledge on which a patent application is based, proof of prior informed consent from that country and setting up benefit-sharing arrangements. On other treaties like GATT and GATS, India has opted for dual policy of opening up certain sectors and keeping others restricted. It has also advocated the lowering of hidden protectionist barriers like agricultural subsidies by the industrial countries.

j. The World Intellectual Property Organization (WIPO) administers most international conventions pertaining to the IPR since 1907, provides assistance to member states in promulgating intellectual property (IP) laws, and seeks to harmonize the national laws aiming to promote the protection of IP throughout the world. WIPO established its Global IP Issues Division in 1998. This division researches and explores various issues including new approaches to the use of IPR for new beneficiaries, biodiversity and biotechnology, protection of expressions of folklore and so on (Sinha 2001). Since the late 1990s, WIPO has been proactive in developing international instruments of standards on the protection of indigenous and traditional knowledge.

Human Rights Instruments

k. The United Nations Declaration on Human Rights was adopted on December 10, 1948. Member countries are expected to 'strive by teaching and education to promote respect for these rights and freedoms and by progressive measures, national and international, to secure their universal and effective recognition

and observance, both among the peoples of Member States themselves and among the peoples of territories under their jurisdiction.' Several articles under this declaration are directly or indirectly related to both biodiversity conservation and people's livelihoods. For instance, Article 3 states that 'Everyone has the right to life, liberty and security of person', and Article 22 states 'Everyone, as a member of society, has the right to social security and is entitled to realization, through national effort and international cooperation and in accordance with the organization and resources of each State, of the economic, social and cultural rights indispensable for his dignity and the free development of his personality' (http://www.un.org/Overview/rights.html).

l. The Draft Declaration on the Rights of Indigenous Peoples under the Commission on Human Rights that 'all peoples contribute to the diversity and richness of all civilizations and cultures, which constitute a common heritage of humankind.' It also recognizes 'the urgent need to respect and promote the rights and characteristics of indigenous peoples, especially their rights to their lands, territories and resources, which derive from their political, economic and social structures and from their cultures, spiritual traditions, histories and philosophies.' The Declaration has 45 articles, which by virtue of being directly related to rights of indigenous people, have a link to biodiversity (http://www.usask.ca/nativelaw/ddir.html).

m. The Convention on the Rights of the Child came into force on September 2, 1990. The preamble of the convention highlights the need to take into account the 'importance of the traditions and cultural values of each people for the protection and harmonious development of the child.' Member countries, need to follow 8 articles in which they are expected to recognize that 'every child has the inherent right to life', and 'ensure to the maximum extent possible the survival and development of the child.' It indicates that signatories to the convention would need to ensure the implementation of the rights in accordance with respective national laws and obligations to the relevant international instruments in this field' (http://www.unhchr.ch/html/menu2/6/crc/treaties/crc.htm).

Regional Fora

The South Asian Association for Regional Cooperation (SAARC), was set up by Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka through a formal Charter on December 8, 1985. It provides a platform for the peoples of this region to work together 'in a spirit of friendship, trust and understanding' towards accelerating economic and social development (http://www.saarc-sec.org/). Environmental concerns have begun to figure in the negotiations, though they are not very central.

6.1.11.3 Major Gaps

i. The working of the Intergovernmental Committee of Genetic Resources, Traditional Knowledge and Folklore under WIPO, presents an example of the influence of WTO over WIPO. This is due to the inherent conflict between the objectives of the CBD and TRIPS, which makes it difficult for WIPO to collaborate with the CBD. In its present form WIPO's influence could hinder CBD's efforts to develop non-IPR forms of protection for indigenous knowledge and resources (also *see Section 6.2.11* for more gaps relating to WTO).

ii. India's acquiescence to the WTO and its various treaties is widely seen as being a threat to biodiversity and to biodiversity-dependent communities. This could be due to indiscriminate dumping by other countries, over-exploitation for exports to the international market, dilution of environmental regulations and standards to attract foreign investment or enhance export-oriented domestic industry and agriculture, the imposition of inappropriate intellectual rights regimes affecting traditional knowledge, etc. An in-depth understanding of the precise impacts as they are being felt over the last few years since India acceded to the treaty, and as they are likely to be felt in future, is seriously lacking. Steps to counter these impacts, including through international lobbying and domestic actions, are therefore very inadequate.

iii. Having entered the WTO fold, and in particular having agreed to the TRIPS regime, India is bound to introduce regimes that allow IPRs on life forms (micro-organisms and plant varieties to start with), and patents on

products/processes that had earlier been outside the purview of patents (e.g. agricultural processes). An understanding of the precise impacts of such regimes on biodiversity, biodiversity-based livelihoods, and traditional knowledge, is severely lacking. There is little or no monitoring of such impacts, nor attempts to predict likely impacts as the regimes become tighter and more widespread. India has also lost its moral advantage in international circles, regarding the stand on 'no patents on life'. Remedial measures for all these impacts are therefore lacking.

iv. Although there is a multiplicity of laws and policies related to CITES, there is no single national legislation supporting the Convention.

v. The implementation of CITES has been affected because of domestic financial limitations, shortage of scientific personnel, shortage of administrative personnel and equipment and insufficient scientific information on the status or vulnerability of species (Dutta 2002b).

vi. The UNFCCC and other treaties do not present a definition of forests that is focused around natural, mixed forests, and keeps monocultural plantations out of this definition.

vii. While there are many flaws riddling the entire trading mechanism established under the UNFCCC, one of the most important features from the point of view of biodiversity is the inclusion of afforestation and reforestation projects, to serve as 'carbon sinks' under the CDM. This has ramification for biodiversity, as forested areas serving, as sinks are likely to be in the form of plantations, as these are fast-growing and therefore more absorptive of carbon, and it is relatively easier to calculate the carbon absorption. The biodiversity concerns get compounded when the definitions of forests accepted by the UNFCCC are taken into consideration. There are also several livelihood and equity issues related to the inclusion of carbon sinks as part of the CDM.

viii. India is yet to ratify the Convention Amendment (the Basel Ban), completely banning the export of toxic wastes from developed to developing countries. Since the ITTO's primary focus is on timber trade, it tends to over-ride considerations of either forest biodiversity conservation or the livelihoods of those dependent on forests. The negotiations of the ITTO are less open and participatory than that of the CBD.

ix. India's role in advocating conservation and sustainable use of shared resources with neighbouring countries (both water and genetic resources) at South Asian fora like SAARC is at present inadequate. This is especially in the context of cooperation on conservation, sustainable use and equity. Environment or biodiversity are yet to figure centrally in the negotiations and discussions at SAARC fora.

x. There is inadequate use of international human rights treaties and forums by India to promote the cause of biodiversity and livelihood concerns. In addition, the connections between human rights and environment/biodiversity treaties, and the potential complementarities amongst them, are under-explored and rarely utilized.

xi. The links between human rights instruments and environmental treaties, as they impact on India, have not been clearly worked out.

6.2 Ongoing Initiatives for Domesticated Biodiversity

6.2.1 Domesticated Biodiversity: Understanding and Information

6.2.1.1 Overall Concept

The lack of understanding and information about biodiversity is especially acute with respect to domesticated biodiversity. On the other hand, Green Revolution technologies, which have promoted high-yielding varieties and monoculture, and have thus been instrumental in destroying agro-biodiversity, have long been defended. It

is only in very recent years that some mention of agro-biodiversity is seen when references are made to pesticide use in agriculture and in discussions on transgenic crops. This section attempts to highlight some of the efforts towards understanding and research on agricultural and livestock diversity.

6.2.1.2 Current and Past Initiatives

Government:

a. Indian Council for Agricultural Research (ICAR) (*see Section 6.2.6.2 and 6.2.10.2*) maintains a repository of information on agriculture, horticulture, resource management, animal sciences, agricultural engineering, fisheries, agricultural extension, agricultural education, home science and agricultural communication. It also conducts agriculture related research. It facilitates linkages at national and international level. Its various institutes around the country conduct research work on their respective areas of strength (http://www.icar.org.in).

   One of the major actors in the information and documentation sector is the National Bureau of Plant Genetic Resources (NBPGR) (*see Section 6.1.1.2*). Established in 1976 by the Indian Council for Agricultural Research (ICAR), NBPGR undertakes and coordinates activities/services related to plant genetic resources, including collection, exchange, quarantine, evaluation, documentation, conservation and utilization.

   The NBPGR is in the process of developing software with a view to ensure timely access, accurate and updated information in various aspects of germplasm diversity in the country. This will also enable establishing linkages with other gene banks and dissemination of information in the form of electronic media; efforts have been underway to develop the software to meet the mandate assigned. This software includes information retrieval for passport data; accessioning of germplasm; electronic connectivity to all zonal centres and; and minimal descriptors for field crops.

   NBPGR is also in the process of developing information and database management. This system, when developed, is expected to ensure nationwide access of accurate updated information on various aspects of Plant Genetic Resources (PGR) and establish linkages with other gene banks of the world. This will also facilitate the monitoring of activities of PGR management.

b. With regard to the monitoring of agro-biodiversity, one of the normal recording procedures of the government is the revenue books kept by the Village Assistants/Village Development Officers (VDOs). VDOs maintain a seasonal record of all crops grown in every village, the lands on which they are grown and the level of production. Unfortunately, a lot of minor crops or varietal diversity within a species often do not get recorded. This is, however, the basis of all the crop statistics in the country.

c. The G B Pant University of Agriculture and Technology, Pantnagar, has a College of Forestry and Hill Agriculture at Ranichauri (Tehri Garhwal), Regional Research Station at Majhera (Nainital), Regional Research Station at Pauri and a Krishi Vigyan Kendra-cum-Research Station at Lohaghat (Pithoragarh), which carry out research activities related to mountain agricultural systems (Gautam 2002).

d. National Bureau of Animal Genetic Resources (NBAGR), Karnal, (*see Sections 6.2.2.2 and 6.2.3.2*), has been engaged in 'field surveys, physical characterisation, sustainable utilisation and conservation of indigenous livestock and poultry breeds.' Systemic field surveys have been undertaken 'to assess the population status of the breeds, socio-economic condition of the farmers, production performance and interaction of local ecology with the breeds. A systematic and scientific evaluation has been made for the local breeds of animals.' The breeds and the area where the study was undertaken is given in *Table 6.10*:

e. Several state-level agricultural universities, colleges and government-linked organizations conduct research on domesticated biodiversity.

Table 6.10: NBAGR Study Areas

Animal breed	Study area
Spiti horses	Kaja sub-division of Lahaul and Spiti districts, Hangrang tehsil
Beetal Goats	Gurdaspur, Amritsar and Ferozepur districts of Punjab
Nili-Ravi Buffaloes	Ferozepur and Amritsar districts of Punjab
Sahiwal cattle	Amritsar and Ferozepur districts of Punjab
Kodi Adu goats	Tamil Nadu
Tharparkar bulls	Suratgarh
Barbari goat	Agra, Aligarh and Etah districts
Double-humped camels	Nabhra valley, Kashmir
Jamunapari goats	By Central Institute for Research on Goats, conserved in their home tract, Mathura, U.P.

Source: Research and Development work in Agrodiversity Sub-thematic Review

NGOs:

Various NGOs that have been involved with work related to agricultural systems in their specific regions, or at national level:

a. The Deccan Development Society (DDS) has initiated the monitoring of agro-biodiversity of 75 villages of Andhra Pradesh. A Steering Committee consisting of women farmers meets every second month to discuss the situation of biodiversity on farms in the region. Members from villages map the farms in which crop diversity is being practiced. The details of each farm in terms of the crops grown, their ratio to each other and to the farm size are documented. The concept of 12 crops is one parameter to document biodiversity. Any farm that grows at least 12 crops is considered a diverse farm (*see Sections 6.2.2.2 to 6.2.2.5 and 6.2.7.2*).

b. The Navdanya movement led by the Research Foundation for Science Technology and Natural Resource Policy (RFSTE) has focused its work on facilitating seed conservation and seed exchange of traditional varieties by local groups and communities. Navdanya has been working with community biodiversity registers. It is implementing *bija yatra* – a nationwide campaign aimed at creating debate and awareness about the erosion and extinction of genetic diversity, the devastating effects of the Green Revolution, the pending threat of a WTO-promoted intellectual property rights regime and the links to diminishing food security in India (http://www.vshiva.net/navdanya.htm). Navdanya has also produced a series of useful readers on the issue.

c. Gene Campaign has undertaken work on documentation of biodiversity and biodiversity-related knowledge among three tribal populations: the Munnars in South Bihar (in the Chhota Nagpur region); the Bhils of Madhya Pradesh; and the Tharus of the Terai region. Medicinal plants and related knowledge were sought to be documented with the help of educated tribal youth. Elders in the village, medical practitioners and traditional healers were consulted in the collection and understanding of the information.

d. GREEN Foundation – Genetic Resources, Energy, Ecology and Nutrition Foundation – has been working with small and marginal farmers in conserving, promoting and reviving genetic and cultural diversity in Southern India. As part of the initiative of maintaining seed banks, the Foundation also carries out monitoring and evaluation of varieties distributed to assess the adaptability, performance, disease, yield and drought resistance (http://www.amazonlink.org/gd/diversity/green.html).

e. The Academy of Development Science and the Indian Society for Rural Gene Banks, working with farmers in Maharashtra to document their rice diversity, set up community gene banks (currently holding over 300 rice varieties from western India), and propagate selected varieties. Some of these varieties have been reported by these groups to be as high-yielding as the modern High Yielding Varieties (HYVs).

f. Anthra (*see Section 6.2.2.2 and 6.2.6.2*) is a non-governmental organization working in the field of rural animal health care in the states of Andhra Pradesh and Maharashtra. The organization believes in combining elements from traditional and contemporary knowledge systems in its work. The activities of the organization include training of animal health workers in rural areas, gender awareness (an integral part of the organization's capacity-building programs), and the documentation of indigenous knowledge in the field of animal care (http://www.vethelplineindia.com/vet/peopleorg.htm).

g. Early Birds, a group based in Guwahati, is engaged in the veterinary treatment of domesticated animals in fringe villages of protected areas in the state.

h. The Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI), an Ahmedabad-based organization has been involved in the documentation of biodiversity-related uses and innovations developed by individuals at the village level. This initiative is called the Honey Bee network (*see Section 6.2.10.2*) and has expanded considerably since the late 1980s. The network provides a platform for the conservation of biodiversity and local knowledge. Its main focus is documentation and subsequent accrual of benefits (*also relevant to 6.2.5.2*) (Anuradha *et al*, 2001).

i. For the past fifteen years, research on the Santal Hound has been carried out at Sanskriti, Hazaribagh, Jharkhand.

j. Adharshila is a small school for tribal children in western Madhya Pradesh, run by the Veer Khajiya Naik Manav

Box 6.70 Community or People's Biodiversity Registers

A document prepared by the local people listing all the life forms of their particular area, their characteristics and how they use them, is called ***Community or People's Biodiversity Register (CBR or PBR)****.*

The *CBR/PBRs* give information on

- The variety of uses of these biological resources by people in that area.
- People's Knowledge and Science, which are crucial in maintaining these biological resources.
- Community understanding of the history of land and resource use changes over time, and opinions on future strategies for the village

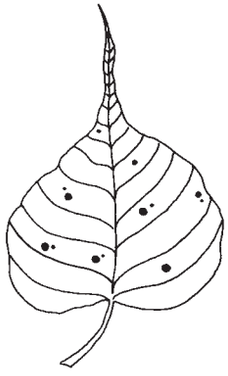
CBR/PBRs can be used:

1. To understand, monitor and evaluate biodiversity
2. To prepare guidelines for management in consultation with the communities
3. As a ready source of information on biodiversity and its uses.
4. To protect community rights over the biodiversity and their knowledge about it

There are a number of groups in India who have worked extensively on CBRs. The Centre for Ecological Studies at the Indian Institute for Science, Bangalore, has been one of the leading institutions working with CBRs. Similarly Navdanya, Gene Campaign, the Deccan Development Society and many other organisations have worked extensively on CBRs.

The Coalition in Defence of Diversity, a coalition of 140 NGOs has till date produced more than about 500 CBRs exclusively on the theme of agro-biodiversity. The Coalition has the aim of producing one CBR for each *mandal* (*taluka*) of Andhra Pradesh.

There is considerable ongoing debate on the pros and cons of CBR/PBRs. Some activists feel that these could become an easy source of information for corporations to steal, and that therefore there is an urgent need to devise legal and other means of protecting the knowledge. This may lead to further erosion of the powerful traditions of oral knowledge and oral transmission, though such erosion could perhaps be offset if some balance can be achieved between these and more formalised documented systems,. Others feel that documentation activity builds social dialogue and decisions for conservation and sustainable use and builds people's self-confidence.



Vikas Pratishthan. With help from the Adharshila teachers, students interviewed village elders, and made lists of the crops sown on their farms, marking the local seeds and the hybrid seeds separately. Students have also collected about 200 samples of 25 varieties of local seeds from 25 villages. A plot of land at the school has been reserved for propagation of these seeds. Adharshila teachers have also discussed the importance of agro-biodiversity with parents at PTA meetings, and some parents are now propagating local seeds (CEE 2003).

k. An attempt at nation-wide documentation of organic (including biodiverse) farming has been made by the Other India Press. This is in the form of a source book, which highlights the work of hundreds of innovative and pioneering organic farmers. It includes addresses of green shops, manufacturers of organic fertilisers and suppliers of earthworms and also has a history of organic farming in India and the rest of the world (http://www.makingindiagreen.org/book5.htm).

Communities:

All efforts at biodiversity information and understanding need not be very sombre and academic. In fact rural communities have often expanded their understanding of biodiversity and shared information about it in a celebratory fashion. One such recent attempt is the biodiversity festivals (*see Box 6.77*).

a. There is a vast amount of oral knowledge on agro-biodiversity available with communities, especially among women. This is not – contrary to the common perception amongst educated urban people and agro-scientists – a stagnant, outdated knowledge system. It is highly dynamic, continuously evolving and generating new insights and innovations. It is also different from formal modern knowledge on agriculture in that it is intimately linked to the socio-cultural, ethical, and other aspects of community life. Community movements and groups like Beej Bachao Andolan are also doing considerable documentation (*see Section 6.2.2.2*). The knowledge of farmers in many regions (particularly women farmers) about seed selection, preservation, storing methods, recipes etc. has been largely disregarded by formal institutions.

b. Many communities have their own specialised systems for prevention, diagnosis and cure of disease in livestock. This sometimes includes forms of immunization, such as taking the infected material from animals infected by a particular disease, processing it and then introducing it to the herd. Often these work better than better than commercial vaccines, as the virus strain is identical to the prevalent infection, e.g. sheep pox in Karnataka. In some cases no vaccines are available, as in the case of the Contagious Caprine Pleuro Pneumonia (CCPP) in Rajasthan, where indigenous cures are the only option (Ramdas and Ghotge 1995; Indo-Swiss Goat Project 1993).

Box 6.71 Gender and Seed Jatra

The agro-biodiversity in the Deccan is highly influenced by women both in the areas of conservation and wise use. Women have demonstrated extraordinary knowledge and skills in the debates around yield and production vis-à-vis diversity on lands. There are many traditional practices which celebrate the intellectual leadership provided by women in agriculture especially in the areas of crop planning, biodiversity and conservation of germplasm.

In Women's Studies' circles and among gender analysts there is a consensus that a biodiverse food production system of agriculture is women-friendly. This opinion is shared by women who spoke on behalf of the women of the Zaheerabad region in the Deccan area of Andhra Pradesh, as part of the NBSAP Sub-state action plan in the area.

The participation of women was sought in several fora:

1.	Local Advisory Committee (LAC) meeting	Total 24 – 10 were women (45%)
2.	Sarpanch's meeting	Total 60 – 14 were women (23%)
3.	Women's meeting	Total 105 – 95 were women (90.4%)
4.	Farmers' meetings	Total 95 – 20 were women (21%)

5.	NGOs' meeting	Total 52 – 17 were women (32.70%)
6.	*Jatras* (pilgrimages)	Approximately 20,000 Persons (60% women)

Since a majority of the women who attended these meetings came from disadvantaged socio-economic classes, it was difficult for them to speak up freely in front of the men in the meetings, where men from the upper castes and richer and powerful farming families, who were their employers in wage work, were present.

In spite of this disadvantage, there were several times when the women engaged in vibrant discussions with the men. They at times even challenged the notions being propagated by male landlords that women are unwilling to participate in the agricultural work when they grow traditional food crops. In some villages, women even told landlords that they would engage in a preferential participation when traditional crops are grown, will take wages only in kind and would be willing even to take 25% less wages than the wages they receive for work on cash crops.

An analysis of women's responses across 62 villages during the *jatras* highlighted some general issues (nutritional, dietary and recuperative value of traditional crops; concerns over changing trends in agriculture, economic factors affecting agriculture etc.) as well as some issues particularly relevant to women (including reproductive health). These women belong to the farming community in these villages. A few of them occupy the elected posts in local *panchayats* (*Deccan Area Sub-state Site BSAP*).

Box 6.72 NBSAP-Related Activities on Agro-biodiversity

- The Agricultural Department in Uttara Kannada district has carried out fresh fieldwork relating to agro-biodiversity as part of the BSAP preparation.
- As part of the Aravalli ecoregion plan preparation, data on domesticated diversity was collected from about 100 villages (*see Box 6.13*)
- The Nahin Kalan Sub-state Site process attempted to understand the status of agro-biodiversity in the region for which the BSAP was being prepared
- As part of the *Pastoral Nomads Sub-thematic Review*, several meetings were held to exchange livestock-related knowledge among different groups.
- The Deccan Andhra Sub-state Site process revealed the different approaches to agro-biodiversity between women and men (see Box 6.72).

This is list is only indicative and certainly not exhaustive. Details on these and activities of other sites can be gathered from local, state, and ecoregional BSAPs.

6.2.1.3 Major Gaps

i. Some of the biodiversity related information produced by NBPGR or other official institutions is not widely available.
ii. There is no monitoring in agricultural areas for tracking diversity, nor of the impacts of various agricultural policies and programmes (or of other developmental activities and cultural changes) on this diversity.
iii. 'The information available to the general population on agro-biodiversity, its critical need and role in agro-ecosystems is missing, not only from government policies and conservation circles but also from the media. Information on biodiversity in popular media is minimal. Even the specialised nature-related channels like Discovery, National Geographic that are watched by a small section of the urban middle classes rarely dwell on agro-biodiversity' (*Media and Biodiversity Sub-thematic Review*).
iv. Very few formal sector institutions or NGOs appear to be doing any vibrant work on agrodiversity. The Indian Council for Agricultural Research, ICAR, the apex body for Indian agricultural research, acknowledges the importance of biodiversity in agriculture, in its *Vision 2020*. However, implementation on the ground is limited

due to inadequate funding and policy support. There is a fear that agricultural research would concentrate more and more on biotechnology as increasing funding is coming from sources needing to carry out this research.

v. The initiatives mentioned in *Section 6.2.1.2*, while significant, are still small-scale and scattered. There are major policy and institutional hurdles to their upscaling and further spreading.
vi. Documentation of the innovative work on domesticated biodiversity is meagre. While there are a few examples of the conservation of crop biodiversity, information on livestock diversity conservation work is minimal.
vii. There is lack of a comprehensive database on domesticated biodiversity.
viii. Rural communities possess a wealth of information, knowledge and understanding about agro-biodiversity. Most of the time, this knowledge is not acknowledged, or even recognized as being valid. As a result there is a danger of losing this knowledge. In many cases, it has already been lost.
ix. There is little understanding of the links between domesticated biodiversity and culture.
x. There are no studies on the possible impacts of climate change on domesticated biodiversity.

6.2.2 Domesticated Biodiversity: *In Situ* Conservation

6.2.2.1 Overall Concept

It is only in the recent past that agricultural scientists have acknowledged what farmers and pastoralists all along knew – that the best way to conserve agro-biodiversity is to continue to grow it in the fields and raise it in pastures. In this sense, *in situ* conservation of crop and livestock diversity means its continued presence in farming and animal husbandry practices. Unfortunately, most of the formal sector agro-biodiversity initiatives have been restricted to *ex situ* conservation.

Increasingly, there is a realisation that this needs to change, and that the future of this diversity is largely in *in situ* conditions, where continued diversification can take place, and evolutionary forces can continue to play a major role. Given below are some key initiatives along these lines in India.

6.2.2.2 Current and Past Initiatives

Government

a. A citrus gene sanctuary has been established in the Garo Hills of Meghalaya. This has been set up to conserve both wild and cultivated species/varieties of citrus such as *Citrus indica* (primitive variety of citrus fruit), *Musa* (banana), *Mangifera* (mango) and other plants of economic value (Mehra and Arora 1982).

b. NBPGR (*see Section 6.2.1.2*) has collaborated with MoEF and ICFRE in the identification, establishment and monitoring of gene sanctuaries. 14 possible sanctuaries were identified (IIPA 1996), but there has not been much progress in setting them up.

NGOs

a. M.S. Swaminathan Research Foundation (MSSRF) (see Section 6.1.1.2) aims at strengthening the *in situ* on-farm conservation traditions of tribal and rural groups, due to which medicinal rice received special attention in Kerala and Orissa. A Community Agro-biodiversity Centre has been constructed by the Foundation at Kalpetta, Wyanad, Kerala. The major approaches of conservation followed by MSSRF are chronicling and revitalisation of conservation traditions, participatory plant breeding to secure a sustainable livelihood and integrated gene/grain and water management.

   In the Koli Hills, the Foundation's efforts included minor millets' seed multiplication, seed exchange, establishment of community seed banks, and local market linkages.

b. Navdanya (*see Section 6.2.1.2*) is a network of farmers, scientists and environmentalists, which aims at conserving areas rich in domesticated biodiversity. It has been working in three ecologically different areas in India, the Garhwal Himalaya, the Deccan Region and the Western Ghats.

c. In a highly eroded region of Ananthapur district, Andhra Pradesh, the Timbuktu Collective is trying out organic farming and has started a grain bank of indigenous crop varieties. Organic farming is practiced in the context of water and soil conservation work (Kalpavriksh, 1999).

d. Parisara Samrakshana Kendra (PSK), Uttara Kannada, Karnataka, and Navdanya have together worked towards conservation of cultivated crop diversity in Uttara Kannada district, Karnataka. Their *in situ* conservation effort consists of helping and motivating farmers to grow traditional varieties of paddy, arecanut, pepper, sugarcane, nutmeg and cardamom. Thirty farmers are involved in this effort to conserve the indigenous seed varieties. They are called Beej Rakshaks (seed savers). Some of the farmers grow several varieties of paddy in order to conserve varieties that have special characteristics. For example, farmers on West Coast cultivate the salinity-resistant *kegga* variety. Similarly the farmers on the flood plains cultivate *jaddu bhatta*, meaning wild rice.

   Similarly there are farmers who cultivate spice crops like nutmeg, pepper and arecanut. There are several hundred women farmers who conserve vegetable crops as well as various fruits like jackfruit (*Artocarpus heterophyllus*). They are region-specific as well as utility-specific, to be used for different purposes. PSK is networking all these farmers (Pandurang Hegde, personal communication 2002).

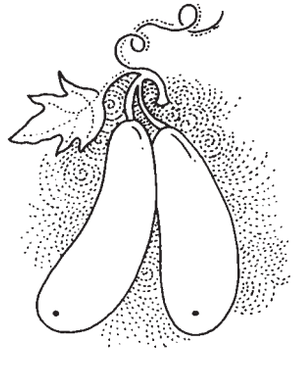
e. Based in Madurai, Tamil Nadu, the NGO Sustainable Agriculture & Environmental Voluntary Action (SEVA) has been working across the country through networking with grassroots organizations and academics. This is with the purpose of conserving local breeds of domestic animals and to work towards holistic natural resource management. At present SEVA is documenting the *toda* buffalo, *umbalacherry* and *malaimadu* cattle, *vembur* and other sheep amongst other activities (*also relevant to Section 6.2.1.1*).

f. Lokhit Pashu-Palak Sansthan (LPSS), was established in 1996 and has since then been working with the Raika camel-breeding community and other marginal groups. This is primarily with the objectives of documentation and conservation of indigenous knowledge about animal breeding and husbandry; achieving recognition for this alternative model of animal husbandry; revitalisation of indigenous institutions for managing livestock and the environment; conservation of indigenous livestock breeds; and formulating and lobbying for policies that provide a supportive environment for pastoralists. Since 2000, LPPS has been one of the key agencies, which has come together to form the Local Livestock For Empowerment of Rural People (LIFE) network. More than 100 individuals and organizations have come together to look at alternative approaches to livestock development, local feeder resources and so on (Ilse Köhler-Rollefson, personal communication 2003).

g. The Deccan Development Society works on a variety of fronts towards conservation of indigenous agro-biodiversity (*see Sections 6.2.1.2, 6.2.3.2, 6.2.4.2, 6.2.5.2* and *6.2.7.2*).

h. The Academy of Development Science is working with farmers in Maharashtra in conserving the rich rice diversity of the region (*see Section 6.2.1.1*):

i. Rupantar, based in Raipur, has been working in several villages spread across four districts of Chhattisgarh on issues related to Biodiversity (Agriculture & Forest), Food Security, Community Health, Women's Empowerment etc.



Communities:

a. In the Hemwalghati, Tehri Garhwal, Uttaranchal, farmers under the banner of the Beej Bachao Andolan (Save the Seeds Movement) have been traveling in the region collecting seeds of a large diversity of crops (Jardhari and Kothari 1996; Prasun 1996). Beej Bachao Andolan is a movement to save indigenous seeds from the onslaught of new hybrid varieties, in the Garhwal Himalayas. The movement is successfully conserving *in situ* several hundred folk varieties, 40 different crops, including cereals such as red wheat, oats, rices, *mandua*, amaranthus, buckwheat, corn; millets like *jhingora* and *koni*, beans and pulses like various *rajma* (kidney

bean) varieties, *urad*, *kulat*, *bhatt*, *chana*, *masoor* and *tor*; oilseeds like mustard varieties, sesame seed and tilphara, medicinal varieties of turmeric and ginger, *arbi* and red chillies, vegetables such as cucumbers, bitter gourd, a sweet bitter gourd, ridge gourd, bottle gourd, *jimikand*, *kadoo*, radish, fenugreek, garlic, tomatoes, peas, potatoes and coriander (http://www.bcpp-india.org).

The Beej Bachao Andolan is just one of dozens of networks and organizations (and perhaps tens of thousands of farmers) who are rediscovering the value of biologically diverse agriculture.

b. Millions of farmers and pastoralists in India, especially in rainfed or ecologically marginal areas, continue to grow a diversity of indigenous crops and/or livestock. Several nomadic and pastoral communities also retain indigenous pet breeds such as Indian hounds and Himalayan dog breeds. Traditionally, the pastoral community has played a significant role in the conservation of indigenous livestock breeds (such as one-humped camel, *Toda* buffalo, *Nari* and *Malaimadu* cattle, *Deccani* sheep). They also have a spiritual relationship with the livestock. For instance, the Raikas of Rajasthan believe that God has assigned them the duty of taking care of camels (*Livelihoods, Lifestyles and Biodiversity Thematic BSAP*).

c. Thousands of people in both urban and rural areas are trying to revive or innovate in the area of organic, biodiverse farming, including home and terrace gardens; many are documented in directories such as the Other India Bookstore's Organic Farming Sourcebook (*see Section 6.2.1.2*).

d. *Adivasi* communities of East Godavari district, Andhra Pradesh, have traditionally conserved the *Aseel* chicken breed mainly for meat. This breed is today threatened by infectious diseases, high production losses and government policies which are not conducive to the conservation of indigenous livestock. In 1996, a group of organisations (Anthra, Yakshi, Girijana Deepika, and Women's *Gottis* of East Godavari *adivasi* areas) studied the local production system in 24 villages. Following this, a number of measures to promote the conservation of this breed have been undertaken. These include promotion of local fodder crops to improve feeding; training of village animal health workers and introduction of basic health care practices such as vaccinations and regular deworming; and education of women -who are responsible for the poultry – in improved animal husbandry. These measures have led to a significant increase in the population of the *Aseel* chicken breed (ITDG 2002).

Others:

a. The International Crop Research Institute for Semi Arid Tropics, (ICRISAT), Andhra Pradesh, is a center of the Consultative Group for International Agricultural Research (CGIAR). Established in 1972, ICRISAT works with a mandate towards enhancing and maintaining genetic resources on-farm, through integrated genetic and natural resource management strategies (http://www.icrisat.org).

6.2.2.3 Major Gaps

i. Very few governmental organisations and agricultural universities have a systematic programme on *in situ* conservation. Institutions like NBPGR and NBAGR are hampered by fund and humanpower constraints.
ii. Most official and NGO-propagated agriculture and animal husbandry practices actively discourage the use of indigenous varieties and breeds.
iii. There is a serious lack of financial support for maintenance and use of indigenous varieties.
iv. Loss of a range of livestock management and use techniques, flexible enough to suit micro-situations, is taking place in most pastoral communities.
v. There is a lack of trained personnel and research in the animal husbandry departments, which can help revive indigenous diversity where it has been lost.
vi. Unfortunately, much of the *in situ* conservation efforts of communities remain unreported, undervalued and at serious risk.
vii. There is lack of information and monitoring of the impact of developmental activities on domesticated biodiversity. This hampers efforts at *in situ* conservation.
viii. Efforts towards looking at the conservation of agro-biodiversity as part of a land/waterscape are few and far between.

ix. There are very few efforts focusing on the conservation of agro-biodiversity significant areas.
x. Wild and semi-wild plants are important sources of nutrition and supplemental food for both rural and urban communities. Such foods are most often overlooked and there is no focused strategy to conserve them.
xi. A lot of domesticated biodiversity has been lost as a result of developmental projects, and the Green Revolution.

6.2.3 Domesticated Biodiversity: *Ex Situ* Conservation

6.2.3.1 Overall Concept

Given the rapid erosion of agro-biodiversity in the fields and pastures of India, there is a critical need for a back-up reservoir of indigenous crop, livestock, and pet diversity. This is, in a very limited manner, possible in *ex situ* conditions, such as gene banks and breeding centres. Such facilities can never conserve the vast diversity that is in *in situ* conditions, but could provide critical repositories of important germplasm that could be re-utilised if the *in situ* stocks diminish.

India has a strong *ex situ* conservation programme for domesticated biodiversity; indeed, almost the entire effort of the government in the case of such biodiversity has been in *ex situ* facilities. Given below are details about some such initiatives.

6.2.3.2 Current and Past Initiatives

Government:

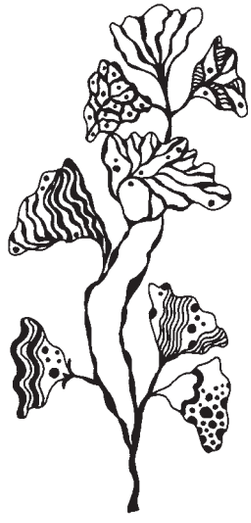
a. The Indian National Plant Genetic Resources System (IN-PGRS), spearheaded by the National Bureau of Plant Genetic Resources (NBPGR) (*see Section 6.2.1.2*) is among the most dynamic systems in the world. The NBPGR has been entrusted with the national responsibility to plan, conduct, promote, coordinate and take the lead in activities concerning germplasm collection, introduction, exchange, evaluation, documentation, conservation and sustainable management of diverse germplasm of crop plants and their wild relatives with a view to ensure their availability for use over time to breeders and other researchers. NBPGR has the authority to import and export plant germplasm for research purposes through the single window system. It is also fully equipped with very effective and efficient plant quarantine facilities. NBPGR has assisted several collaborating institutes/centres in establishing medium-term seed storage as well as computer and data documentation facilities. In addition it also imparts need-based, on-the-job training to scientists and technicians (MoEF 2001a).

   The NBPGR has a few initiatives towards the collection of wild relatives of crop plants, such as cereals, oilseeds, legumes, horticultural and ornamental crops, spices etc. from remote areas.

   The institution also collects economic plants with special emphasis on medicinal and aromatic plants from different parts of the country.

   Various special missions were executed by the NBPGR for collection of important and valuable germplasm from biodiversity areas. They include sites in the Eastern Ghats, Valley of Flowers (Chamoli district, Uttaranchal), Majuli River Island (Assam), Lohit District (Arunachal Pradesh), Kalakkad-Mundanthurai Tiger Reserve Region (Tamil Nadu and Kerala).

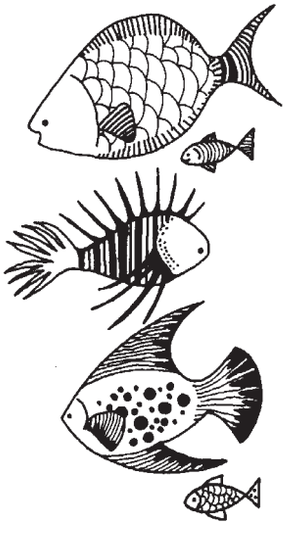
   To carry out exploration, collection and conservation of domesticated and related wild species, NBPGR operates through a network of 11 regional stations/base centres in different phyto-geographical zones of the country. The Bureau also maintains links with 40 active national germplasm sites and 131 other collaborators through which the Indian Plant Genetic Resources Management System (IPGERMS) operates. NBPGR has germplasm holdings of 2,32,814 accessions conserved in the National Gene Bank as on October 31, 2002, and 4609 in the Cryobank as on September 30, 2002. The characterisation and evaluation data has been documented in 77 catalogues. It has also taken initiatives to register important



germplasm lines having significant traits related to morphology or having tolerance to biotic and abiotic stresses. So far, 180 such important materials have been registered with NBPGR through Germplasm Registration Committees.

b. The National Bureau of Animal Genetic Resources (NBAGR) (*see Section 6.1.1.2*) and the National Institute of Animal Genetics (NIAG) were set up in 1984 at Karnal, Haryana. These organizations are responsible for the documentation, description, genetic evaluation, conservation management and utilization of all types of native breeds of livestock and poultry germplasm resources in the country (IIPA 1996).

c. The Government of India established a National Research Centre for Camel in Bikaner in 1984 under the ICAR (IIPA unpublished). Prior to that the Centre was camel-breeding farm under the aegis of college of Veterinary and Animal Science, Rajasthan Agricultural University, Bikaner. The Centre has the responsibility to conduct basic and applied research for the improvement of camel. According to ICAR, 'over the years NRCC has developed excellent laboratory facilities and infrastructure. An elite herd of Bikaneri, Jaisalmeri and Kachchhi breed of camels has been developed and maintained at the Centre. The technique of embryo transfer has been used successfully in producing two camel calves at the Centre. Extensive studies on evaluation of draught ability of camel breeds have been carried out by the Centre. The feed requirement during various stages, i.e. lactation, pregnancy, has been studied and locally available feed/fodder resources were evaluated by the Centre. The Centre has also generated useful information on double-humped camel found in Nubra Valley of Ladakh region' (http://www.icar.org.in/nrccm/home.html).



d. A National Research Centre on Mithun was established in 1988 and is based in Jharnapani, Nagaland. Its mandate is towards basic and applied research on Mithun health and production. The Centre also helps develop packages of practices to improve productivity and transfer of these packages to farmers. It acts as a repository of germplasm and information and also serves as a training centre in research methodologies (http://dare.nic.in/nrcmith.htm).

e. National Research Centre on Yak, based in Dirang district, Arunachal Pradesh. It was set up by ICAR in 1985 and formally started functioning in the year 1989. The mandate of the Centre includes surveys for genetic resources, management practices, production levels and problems associated with production; establishment of a small herd of pure yaks to carry out observations on performances under range and semi-range systems of management; conducting research on improvement of yak and its products; conducting research on nutrition, physiology, production and management aspects under semi-range and confinement; conducting research on fodder and development of pasture at mid- and high-altitude for yaks, and providing complete health coverage through proper therapeutic and prophylactic measures (http://www.icar.org.in/nrcyak/main.html).

f. National Bureau of Fish Genetic Resources (*see Sections 6.1.1.2 and 6.1.3.2*)

g. Central Arid Zone Research Institute (CAZRI) in Jodhpur, Rajasthan, has been established with fulfilling research needs of arid and desert region. Crop varieties required by the farmers of these region are different from that of other areas. The institute maintains 'the diversity in pearl millet, clusterbean, horsegram, moth bean, mustard and grasses. A large number of varieties, like Jalore, a seedless variety of pomegranate, local varieties of *bael* (*Aegle marmelos*) such as Dhara Road and Faizabadi local of bael, and Kanchan and Krishna of *anola*, have been identified and conserved by CAZRI.' The Institute has also identified Marwari and Magra breeds of sheep to be suitable for the desert tracts (*Research and Development work in Agrodiversity Sub-thematic Review*).

h. Central Institute for Cotton Research (*see Section 6.2.4.2*), Nagpur has a National Gene Bank on cotton. Here a 'rich repository of cotton germplasm with more than 9700 accessions of 4 cultivated species of cotton and over 300 accessions of perennials including 24 wild species is being maintained, evaluated and utilized. Eco-friendly, naturally coloured and organic cottons also exist in the collection' (*Research and Development work in Agrodiversity Sub-thematic Review*).

NGOs and Communities:

a. The Deccan Development Society (*see Sections 6.2.1.2*, *6.2.4.2*, *6.2.5.2 and 6.2.7.2*) works on Community Gene Fund programme with 75 dalit women's groups in 75 villages in Medak District of Andhra Pradesh. Till 2002 the Society has been able to develop 55 gene banks in 55 villages. It has retrieved over 75 varieties of landraces consisting of millets, pulses and oilseeds. Together they have banked over 16000 kg of seeds in the community banks, which are sufficient to sow over 7000 acres. A total of 2700 women are participating in this programme (http://www.ddsindia.com).

b. Other efforts at community gene banks include those by Academy of Development Science, Navdanya, Green Foundation, and M S Swaminathan Research Foundation (*see Section 6.2.1.2*).

c. Some indigenous dog breeds have been recognised and their standards laid down by kennel clubs. In 1979, the North-Eastern Kennel Club was established in Shillong, with the aim of stabilising Himalayan breeds such as the Tibetan terrier, Tibetan spaniel, Lhasa apso, Himalayan mastiff and Himalayan sheep dog. In the south, the most notable effort has been that of the Dog Breeding Unit at Madras, which was started in 1981 to promote indigenous breeds of Tamil Nadu such as the *rajapalayam* hound, *kombai, kanni*, and *chippiparai*. Some of the Himalayan breeds are doing well in Europe and America. Some, like the *kombai* (which is the nearest living relative of the practically extinct *shenkottah*, once found in Trivandrum district, South India) and the *banjara*, may be lost forever; others like the *rampur* and the *mudhol* may be revived (Baskaran 1985, Somani 1963).

   The Kennel Club of India (KCI) is trying to 'promote' Indian breeds. The most active is the Mysore Kennel Club (affiliated to the KCI), based in Bangalore, which is doing a lot to promote the Mudhol Hound. The Karnataka Government has set up a dog-breeding programme at a centre under the Animal Husbandry Department. In Pune, individuals affiliated to the KCI have taken up the breeding of Karvanis and Pashmis (Das 2002).

d. The *Beej Bachao Andolan* (BBA) (*see Section 6.2.2.2*) is spreading the idea of community or farmer level gene banks amongst several dozen villages, including in more than 100 villages through women's committees as part of the state-level Mahila Samakhya programme. BBA activists held a large number of meetings with women farmers when they were invited by Mahila Samakhya Programme for this purpose. In these meetings which continued for two years in Tehri Garhwal district. It was felt that all 'the women appreciated the message of traditional indigenous seeds. Not even at one meeting did they say that the Green Revolution seeds are better. On the other hand, the Green Revolution technology finds relatively more support among men who want to increase cash returns in the short-run. Thus the experience of this movement has been that there is a strong gender aspect in the quest for sustainable, long-term development based on environmental protection – women are likely to be more enthusiastic supporters of this' (Bharat Dogra, at http://frontierindia.scriptmania.com/F17page6.htm).

e. The Ahir community consider care of cows and animal husbandry among their main duties. Most villages in Kalyanpur taluka of Jamnagar district have an indigenous institution for community care of cows – the *gauchara system*. According to certain elders of the community, the essentials of the form in which it is practiced today date back at least three hundred years. The system is believed to have been created in response to the frequent droughts in the area and the shortages of fodder during the dry season. The *gauchar* of Tankaria village is considered small since there are about 150 cows and about 100 female calves; buffaloes and male calves are excluded from the system. The milk from the cows is retained for home consumption, and buffalo milk is converted into ghee for the market. All cow owners, regardless of their land holding or caste status, are members of the *gauchar*. The physical infrastructure includes a fenced yard of about a quarter of an acre (with a few trees providing shade), a godown for storing fodder, a bullpen and a small irrigated patch for green fodder for the bull (*Community Conserved Areas in Gujarat Sub-thematic Review*).

Others:

a. ICRISAT (*see Section 6.2.2.2*) genebank at Patancheru holds the global collection of germplasm of five mandate crops – sorghum, pearl millet, chickpea, pigeonpea and groundnut – and six small millets including finger millet, foxtail millet, barnyard millet, kodo millet, proso millet and little millet. It has a total of 113,000 accessions of these crops assembled from 130 countries (http://www.icrisat.org).

b. Many Agricultural Universities have gene banks and/or *ex situ* conservation centres. The G.B.Pant University of Agriculture and Technology, Pantnagar, has set up a 'Pantnagar Centre for Plant Genetic Resources (PCPGR)' to strengthen PGR activities including collection and conservation of local diversity, particularly from the states of Uttaranchal and Uttar Pradesh, and to import, multiply and distribute the elite planting and seed material of horticultural crops to the prospective users including farmers and private nurseries (Gautam 2002).

6.2.3.3 Major Gaps

i. Large-scale loss of genetic diversity makes it difficult to locate and use traditional livestock varieties for *ex situ* breeding purposes.
ii. There is a lack of financial, policy and infrastructural support to community gene and grain banks.
iii. There is inadequate or no repatriation of seeds back from government *ex situ* collections to farmers and pastoral communities.
iv. So far, the major emphasis was of collecting germplasm on important cultivated crops and limited to selected areas. Unfortunately, similar attention is not paid to conservation of traditional land races/breeds, particularly so in case of animals, many of which are therefore being replaced by hybrid breeds.
v. There is little official support or recognition to community gene banks.

6.2.4 Domesticated Biodiversity: Sustainable Use

6.2.4.1 Overall Concept

In the case of domesticated biodiversity, *in situ* conservation and sustainable use are more or less synonymous insofar as crop and livestock use is concerned. However, there are other aspects of agricultural sustainability, especially those related to land productivity and water use, which need to be considered. In the last few decades there has been an overall loss of agricultural productivity and sustainability. This is primarily due to soil loss, nutrient imbalance caused by excessive use of NPK fertilisers, chemicalisation and death of living matter in the soil, and waterlogging/salinisation. Attempts to offset this include changes in cropping patterns, better drainage, switch to integrated systems using less chemicals, and so on. In addition, a critical consideration is the degree of self-sufficiency of the farmer, and the country as a whole. Increasing dependence on the market and the state has reduced the institutional sustainability of agriculture.

Below are a few examples, which highlight sustainable practices with reference to domesticated biodiversity.

6.2.4.2 Current and Past Initiatives

Government:

a. The Central Institute for Cotton Research (*see Section 6.2.3.2*), Nagpur, initiated a research project in 1998 for identifying optimal practices for conserving soil moisture and for improving organic matter content of marginal soils. The results of these experiments led to a proposal to begin a long-term demonstration trial on organic cotton cultivation. It is also proposed to have comparative plots of inorganic and an integrated crop management plot, having 50% each of organic and inorganic components of inputs (PC 2001c).

b. The Agro-climatic Regional Planning Approach (ACRP) was initiated by the Planning Commission in 1988 to formulate integrated development plans for agriculture and allied sectors according to agro-climatic conditions. During the eighth five-year plan, the emphasis was on development of resources and their opti-

mum utilisation in an integrated and sustainable manner for 15 broad agro-climatic zones in the country. In 1990-91, a project under this unit was undertaken in Tumkur district of Karnataka (http://www.stem-group.org/ p43_4.html).

c. Balanced and integrated use of nutrients and promotion of biofertilizers is being advocated to control adverse effects of the use of chemical fertilizers on soil and ground water, and also for ensuring balanced nutrition to crops by employing organic manure, green manures and biological fertilizers. Field demonstrations, through a network of national and regional centres and financial assistance to state governments, agro-industries corporation and fertilizer and seed companies, constitute the strategy for popularizing biofertilizers in the country.

d. The Government of India has initiated the scheme of Integrated Pest Management (IPM) since 1985 (*see Section 6.2.10.2*). IPM focuses on pest management through a combination of agronomic, chemical and biological methods. There are 26 IPM centres spread over 22 States and 1 Union Territory in the country. This is a positive trend towards sustainable agriculture (TERI 2002), though advocates of organic and biodiverse farming point out that it still does not go far enough in eliminating harmful chemicals.

e. The Spices Board has launched schemes to assist organic spice growers by publishing national standards for organic spice production. This is to encourage traditional spice growers and to expand the spice market. This scheme has received approval from the National Standards Committee of International Federation of Organic Agriculture Movement (IFOAM) (PC 2001c).

f. The Government of India has launched the National Programme for Organic Production (NPOP) in 2001. The programme provides an institutional mechanism for implementation of national standards for organic products through a National Accreditation Policy and Programme. The programme is being implemented by Government of India, with the Ministry of Commerce and Industry as the apex body. State governments like Madhya Pradesh have announced incentive schemes for organic farming, and the North-East Council too intends to promote it in the states of the region.

g. Apna Van in Arunachal Pradesh: Some of the tribes of Arunachal Pradesh, like the Apatanis of the Ziro Plateau

Box 6.73 Nagaland Empowerment of People Through Economic Development (NEPED)

The Nagaland Empowerment of People through Economic Development (NEPED) (formerly known as Nagaland Environmental Protection and Economic Development) project was started in 1994 with the goal of sustainable management of the land base of slash and burn cultivation systems. The strategy chosen was farmer-led development, testing and demonstration of agroforestry-based intensified systems. NEPED is jointly funded by the Government of Nagaland, India-Canada Environment Facility and International Development Research Centre.

Farmers have actively participated in integrating their traditional knowledge with new concepts to bring about farmer-tested improvements. The impacts and achievements of NEPED include the following:

- It has produced major changes in agroforestry practices in Nagaland within a very short span of time, stemming from a growing awareness of the villagers of the need to save and renew forests, conserve soils, wildlife and biodiversity.
- It has also led to a greater involvement of women in decision-making as well as financially profitable activities.
- It has promoted the use of a range of local tree species to improve biodiversity in *jhum* lands, and farmers have started following the practice in their private *jhum* lands.
- It has reached down to the grassroots level, with a large share of project benefits going to the people. NEPED has served as a catalyst to the Govt. of Nagaland, helping to encourage and spread new ideas for project management and implementation. The establishment of the Project Operations Unit as a special task force to implement NEPED has facilitated this.

Source: Nagaland State BSAP

in Lower Subansiri district, have traditionally been maintaining forests for fuelwood, timber and other forest produce. Keeping such examples in mind the state government 'introduced a subsidy scheme called Apna Van in 1986-87. The Apna Van scheme notified in 1986, and subsequently revised in 1991 and 1997, envisages to raise plantations on abandoned private and community *jhum* lands of Arunachal Pradesh.' The scheme was developed as 'an alternative to shifting cultivation, under which the farmers are encouraged to plant trees along with the crop plants on their *jhum* lands so that the effect of *jhum* on the land could be minimized. The officials of the Forest Department extend technical support for the scheme and the people cultivate a variety of agri-horticultural crops with tree species as per their own requirement.' In 1997-98, approximately 16000 ha of plantations were raised under the scheme in 13 districts (*Arunachal Pradesh State BSAP*).

h. Several ministries such as the Ministry of Rural Development, as well as several state governments are putting massive resources into watershed development. The objective is land and water conservation and upgradation of land productivity. An example is the Council for Advancement of People's Action And Rural Technology (CAPART), which is a society under the Ministry of Rural Development. Its Watershed Programme is operational in drought-prone and water-scarcity areas, with the active involvement of grassroots Voluntary Organisations (VOs) and village level beneficiaries. The programme involves experienced voluntary organisations representing all the agro-ecological zones in the country. A unique scheme to train and technically assist various voluntary organisations, approved for watershed and natural resource management, has been developed for better implementation of the programme (http://capart.nic.in/).

NGOs:

NGOs and institutions in many parts of India are propagating organic sustainable agriculture and sustainable pastoralism through grazing/fodder management. The Gorakhpur Environment Action Group has been documenting and propagating this in eastern U.P. for over a decade, and publishes one of the few journals (*Vasundhara*) in Hindi on the subject. (see also examples in *Section 6.2.2.2*)

a. DDS (*see Sections 6.2.1.2, 6.2.3.2, 6.2.5.2* and *6.2.7.2*) in Andhra Pradesh has devised an alternative Public Distribution System (PDS). This has been planned to be an entirely community-managed PDS system based on coarse grains, locally produced, locally stored and locally distributed. The model focuses on the poorest of the poor among the *dalit* women. These women have been motivated to initiate and take control of the PDS system in their area. This would probably be the first-ever decentralised PDS system in the country, which will not need constant annual subsidies.

b. In the annual Nature Bazaar organized in New Delhi by an NGO, Dastkar, groups like *Beej Bachao Andolan* participate with a number of natural foods. The purpose behind this is to display and encourage the use of indigenous crop varieties in urban centers like Delhi. In turn it also develops the capacity of groups like BBA to market their products.

c. Kheti Virasat, an organization working in Punjab, was formally established in 2000. Its main objective is to propagate and publicize the concept of sustainable agriculture, water and conservation of natural resources and sustainable development. This is being done by creating awareness among farmers of Punjab about sustainable agriculture systems, organic farming, native seeds and indigenous varieties of agriculture and biodiversity, and providing them training about various systems of sustainable agriculture. Kheti Virasat also works with doctors and agricultural scientists to create awareness among the general masses about the ill effects of agro-chemicals on human health and livestock (http://www.punjabilok.com/agriculture/ kheti_virasat.htm).

Communities

Several farmers' groups and networks are advocating organic, sustainable agriculture, and thousands of individual farmers are reverting to it after having tried out chemical-dominated cultivation. In Karnataka, a farmers' network (Hittalagida) documents and spreads information on such initiatives (*see also Section 6.2.6*). In Vidarbha region of Maharashtra, organic farmers network with each other; there is even a network of organic cotton farm-

ers, some of whom get a premium export price for their 'safe' cotton (Menon, In Press) (*see also examples in Sections 6.1.2.1 and 6.1.2.2*).

A vast stretch of *moth* (*Mucuna utilis* – dry land lentil) is being cultivated in low rainfall areas such as Barmer, Churu, Sikar, Nagaur and Jhunjhunu districts of Rajasthan through organic practices. In Kerala, the traditional homestead farming system is being followed widely (PPST 1995).

Others

Box 6.74 Some Organic Farming Initiatives

- The Bombay Burmah Trading Corporation (BBTC) has attempted to convert Singampatti group of estates in Southern India to cultivate and market organic tea. This is one of the first of the few efforts towards commercial organic agriculture (PC 2001). Organic tea is also spreading in the hills of northern Bengal (*see Section 6.3.2*).
- Kalpavruksha is the name of Bhaskar Save's organic farm located in Umbargaon taluka of Gujarat. It outperforms any modern farm using chemical pesticides and fertilizers. Some of the palms yield over 500 coconuts each year, while the average is about 400. The crop of *chikoo* (*sapota*) is similarly abundant, providing an average of 300-350 kg of fruit per tree each year. Native rice, pulses, wheat and some vegetables are also grown in seasonal rotation on about two acres of land. At Kalpavruksha, so-called 'weeds' are not rooted out, since these are considered fertilizer factories of nature. Earthworms are also considered vital for the survival of this farm and there is a conscious effort to protect them (http://www.indiaorganic.org).
- Narayan Reddy is one of the well-known practicing organic farmers in Karnataka, and operates from Sorahunse near Whitefield. The farming practiced by Reddy and his family is based on a theoretical approach, as well as practical fieldwork. The Reddys experiment on their farm, keeping in mind its ecosystem. They believe, for instance, that spraying micronutrients on plants is not advisable since it creates an imbalance within the plant. The plant should be allowed to selectively absorb nutrients through its root hairs (http://www.indiaorganic.org).
- About eight kilometres from Auroville, is Annapurna, its 135-acre farm. Of the 135 acres, 25 acres are under crops or plantation. Several plots of *Casuarina equisetifolia* have been established and experiments with numerous other tree species and varieties are being carried out to see which will grow well under the difficult conditions of the land. Paddy (1.75 acres) and small quantities of other grains, pulses, legumes and fruit trees, are also grown here on trial basis. There are also twelve indigenous dairy cows. Annapurna has a seed bank with an extensive collection of indigenous varieties of several crops and paddy varieties. The seeds in the bank are periodically grown to maintain the viability of the stock. The main goal of Annapurna is to produce enough grain, pulses and oilseeds to supply the needs of Auroville, all through organic methods. A lot of work at Annapurna has been directed at improving soil and water conservation, and at trying to reduce the electrical conductivity of the soil so that the land can become more fertile (http://www.indiaorganic.org).
- Makaibari Tea Estate, West Bengal (*see Section 6.3.2*).

6.2.4.3 Major Gaps

i. The rice and wheat-based centralised Public Distribution System (PDS) has been a major factor in undermining the once biodiverse agriculture of the country. The PDS is not even appropriately linked to the nutritional requirements of people, since it has displaced or does not encourage the consumption of a number of nutritious traditional foods.

ii. Local species and varieties are not integrated into the various food-related programmes, such as Food for Work, mid-day meals, and so on. Food from locally grown and more easily available grain species is not promoted in *Balwadis*, *Anganwadis*, local hostels, etc.

iii. Public Health programmes rarely integrate traditional nutritious foods.

iv. There is inadequate realisation of the ecological, social, economic, and genetic unsustainability of conventional agriculture including the Green Revolution model. Its propagation therefore continues, with the backing of the strong vested interests tied to it.

v. There are very low incentives and very sporadic subsidies for organic farming, despite some encouraging recent programmes of the central and state governments. Marketing initiatives promoting organic agriculture are not yet widespread.

vi. There are very limited initiatives at organising seed networks and exchanges amongst small, traditional farmers.

vii. There has been severe degradation of land and water, leading to loss of agricultural sustainability, productivity, and agro-biodiversity.

viii. Very few supplementary livelihood activities have been developed for people dependent on agriculture, leading to overuse or neglect of land.

ix. Traditional culture fisheries, both inland and coastal, have been displaced and destroyed by many factors including commercial intensive aquaculture, depriving many people of their livelihoods and reducing the sustainability of the land/water.

6.2.5 Domesticated Biodiversity: Equitable Access, Use and Sharing of Benefits

6.2.5.1 Overall Concept

The broad concept of equitable access, use and sharing of benefits, as described in Section 6.1.5.1, would largely apply in the case of domesticated biodiversity as well.

6.2.5.2 Current and Past Initiatives

Government

a. The policy and legal initiatives like Panchayat legislation, Plant Varieties and Farmers Rights Protection Act, 2001 and Biological Diversity Act, 2002 have elements which directly deal which equity issues. These have been highlighted in *Sections 6.1.5.2 and 6.2.8.2*. A number of recent action plans and laws related to biodiversity have significant (though inadequate) provisions on equity. The Plant Varieties and Farmer's Rights Protection Act provides for a set of privileges and rights to farmers, and benefit-sharing arrangements between formal sector breeders and farmers from whom seed germplasm is used. Unfortunately, the act is heavily weighted in favour of formal breeders including the seed industry and the does not contain critical aspects such as prior informed consent rights to farmers (Kothari 2001a).

b. In 2000, the Department of Science and Technology established the National Innovation Foundation (NIF). The purpose was to recognise and promote grassroots innovations, which are not given their due space in mainstream science. There are two goals – wider dissemination and promotion of innovations/traditional knowledge to communities, and protection of communities from potential commercialisation. NIF has designed a system to seek consent of the innovators or traditional knowledge-holders before such sharing takes place. This is through a Prior Informed Consent Form circulated as part of the 'National Competition for scouting grassroots technological innovations and outstanding traditional knowledge.' Outstanding contributions are also rewarded as part of this process (http://www.nifindia.org/picnote.htm).

c. Land reforms have been attempted in India since soon after independence, with varying degrees of success and failure. In the strongly caste-based societies of the northern and eastern plains, for instance, the reforms largely failed. States with relative success include West Bengal (*see Box 6.75*) and Kerala.

Kerala Land Reforms Act, 1963: The Kerala Land Reforms Act, 1963, under Section 82 (1), fixed a land ceiling for individuals and joint families. With effect from first January 1970, individuals were prevented from owning, holding or possessing land in excess of the ceiling area. A similar prohibition was imposed on the leasing of land to any other individual or company in violation of these ceiling provisions. This Act resulted in the redistribution of land to agricultural labourers and dwellers. This has considerably reduced the average size of land holdings to less than 0.4 ha. with 90% holdings less than half a hectare in size. There are also no large blocks of land in private ownership that can be used by the private sector for plantation forestry. This has restricted the future access of the private sector into the forestry sector, to the use of government land (http//:kerala.gov.in).

Box 6.75 Land Reforms in West Bengal

Two important components of land reforms in West Bengal were:

– *Tenancy reforms and redistribution of land*. The tenancy reforms in the State were implemented through a campaign, popularly known as **Operation Barga**, under which all registered tenants were provided a permanent and heritable right to cultivate the leased land. 1.4 million *bargadars* were registered. Out of these, over 30% were *dalits* and over 12% were *adivasis*. Operation Barga permanently brought, about 1.1 million acres of land under the control of *bargadars* and secured their right to cultivate this land. The registration of *bargadars* also included a provision for subsidised credit, in the form of barga loans to the sharecroppers, through the state machinery.

– The second component of land reform involved *acquisition of ceiling surplus land and its redistribution* among the poor and the landless. The *kisan sabha* helped the government to identify *benami* lands. Through this process, the government was able to acquire about 1.37 million acres of land under the land reform legislation, and redistributed about 1.04 million acres among 2.5 million landless and marginal cultivator households. The land redistributed in West Bengal under land reform constitutes about 20% of the total land redistributed in India.

  The socially weaker sections of the society have greatly benefited from the redistribution of land in the state. About 55% of the land reform beneficiaries were from Scheduled Castes and Tribes. A dimension of women's empowerment in the implementation of land reform was also pioneered by the West Bengal government. This was done by giving as many as 0.5 million joint land titles and 50,000 individual land titles to women. Homestead lands (apart from the agricultural land distributed) have been given to about 0.5 million households belonging to agricultural labour, fishing and artisan households (http://pd.cpim.org/2002/june30/06302002_eco.htm).

d. Legislative attempts to provide protection to community knowledge, though late in coming, now include the Biological Diversity Act, 2002 and some proposed state laws such as in Kerala (*see Section 6.1.5.2*).

NGOs and Communities:

a. In early 1999, the Research Foundation for Science, Technology and the Ecology (RFSTE) initiated the Jaiv Panchayat: a living democracy movement in early 1999. The aim of this movement was to establish definitive sovereignty of local communities over their biodiversity resources. Member from RFSTE (*see Sections 6.2.1.2 and 6.2.2.2*) have been working with local communities in different parts of India to constitute Jaiv Panchayats, consisting of volunteers from participant villages. The *panchayats* have been focusing on recording information for community biodiversity registers (*see Box 6.70*). They are also responsible for maintaining and updating registers and developing microplans for monitoring of biodiversity (Anuradha *et. al.,* 2001).

b. The Deccan Development Society (DDS) (*see Sections 6.2.1.2 to 6.1.4.2 and Section 6.2.7.2*) in Andhra Pradesh has assisted *dalit* women farmers to work as Farming Collectives through several programmes. One of the major programmes is Land Lease, through with the women lease large pieces of farm land from big farmers and cultivate them as a collective. They share the work, expenses and the produce. Similarly, making use of the AP Scheduled Caste Corporation's Land Purchase Scheme for SC Women, the Society has organised a number of women's groups with special emphasis on single women. The land purchased through this

scheme is farmed collectively by the women. Such joint cultivation has not only given women the capacity to manage large pieces of land, but has also made farming attractive. Their focus has been on diverse crops that include millets, pulses and oilseeds, which taken together ensures them not only food security but also brings nutritional, fodder, livelihood and ecological security (P.V. Satheesh, personal communication 2003).

For instance, at Badikanne village, Medak district, 28 Hindu and Muslim women have, with the support of the above scheme, put together 24 acres of land. They are now growing about 11 crop species, some like *jowar* with several varieties. The cultivation mix and rotation is highly sophisticated, designed to maintain the fertility of the soil without having to use chemical fertilisers, to ward off pest attacks without having to use pesticides, to optimise the productivity of biomass including grains and fodder, and even to provide for distractions for the small children that the women have to bring along with them during agricultural operations. The strategy has been so successful that neighbouring farmers, some of them very large land-owners who had once converted to chemical-intensive farming, have requested the women to help them switch back to organic farming so that the natural fertility of their soils can return (Kothari 2002).

In another initiative, DDS has been working with the farmers of the area on developing 'Dalit Watersheds'. These watersheds employ the same principles as applied in conventional practice. However, the focus in this initiative is only on lands belonging to the *dalits*. Since these lands are usually situated in the upper reaches of the catchment, the project focuses its resources here. These are reclaimed and made cultivable for food crops. This is to ensure food security for *dalit* households. Besides creating a subsistence base for the *dalits*, the initiative also aims at relocating control over agricultural processes and food production in the hands of the *dalit* and other poor women of the area (http://www.ddsindia.com/).

c. The increasing move towards putting together community or people's biodiversity registers (*see Box 6.71*) is partly motivated by the desire to protect indigenous and community knowledge. Such registers could act as proof for prior art when contesting patent claims. However, there is also concern that, in many instances, the exercise is top-down; dominated by outsiders rather than led by villagers. Concern has also been expressed regarding the lack of legal protection to such documents, a gap that can hopefully be plugged through the Biodiversity Act, 2002.

Box 6.76 Prajateerpu – The Citizens' Jury

Prajateerpu – the 'citizens' jury' on food and farming futures in Andhra Pradesh – was an exercise involving marginal-livelihood citizens from all three regions of the state. It took place at the Government of India's Agricultural Science Centre (Krishi Vigyan Kendra), Algole Village, Medak District, Andhra Pradesh, from June 25-July 1, 2001. The collaborators included the Andhra Pradesh Coalition in Defence of Diversity, The University of Hyderabad, the Andhra Pradesh NBSAP team, the International Institute for Environment and Development, UK, and the Institute for Development Studies, Sussex, UK.

The central component of this exercise in deliberative democracy was a citizen's jury composed of representatives of small and marginal farmers from Andhra Pradesh, small traders and food processors and consumers. To reflect the reality of rural Andhra Pradesh, most of the jury members were small and marginal farmers and included *adivasis*. Over two-thirds of the jury members were women.

Jury members were presented with three different scenarios: the Green Revolution and biotechnology-led *Vision 2020* of the Andhra Government, a scenario with export-oriented organic farming and a scenario with more domestic-oriented organic and biodiverse farming. Each was advocated by key opinion-formers (including officials, NGOs, donors, and farmers) who attempted to show the logic behind the scenario. It was up to the jury to decide which of the three scenarios is most likely to provide them with the best opportunities to enhance their livelihoods, food security and environment twenty years later.

Each vision was presented through videos, to overcome barriers of literacy.

Jury members considered all three visions, assessing *pros* and *cons* on the basis of their own knowledge, priorities and aspirations. The different contributions of invited expert witnesses were also important for the jury's deliberations. The jury members were asked to choose a particular pre-formed vision, or to combine elements of all three futures and derive their own unique vision(s).

The jury/scenario workshop process was overseen by a panel, a group of external observers. They checked the videos produced and observed the whole process, to ensure that each vision was presented in a fair and unprejudiced way.

The key conclusions reached by the jury – their 'vision' – included a desire for:

- Food and farming for self-reliance and community control over resources.
- To maintain healthy soils, diverse crops, trees and livestock, and to build on our indigenous knowledge, practical skills and local institutions.

And opposition to:

- The proposed reduction (in *Vision 2020*) of those making their livelihood from the land from 70% to 40%.
- Land consolidation and displacement of rural people.
- Contract farming.
- Labour-displacing mechanization.
- GM Crops, including Vitamin A rice & Bt cotton.
- Loss of control over medicinal plants, including their export.

Source: http://www.ddsindia.com/

Others

Several companies and businesses are directly accessing organic or indigenous produce from farmers, to sell in cities, export, or convert to various products.

The Chordia agro-produce group in Pune accesses organic produce from several farmers, for their famous pickles and other products that are exported.

A number of shops in Bangalore, Mumbai, Pune, Delhi, Kolkata, and elsewhere are helping farmers get a good market.

6.2.5.3 Major Gaps

i. Measures to protect traditional knowledge and to ensure appropriate and equitable benefit-sharing from its wider use are as yet almost non-existent (*see also Section 6.2.8.2*).
ii. Land and water rights are still highly skewed, in particular due to the failure of land reforms and unchanged water ownership laws. In many parts of India this situation is getting even more iniquitous as policies begin to favour corporate entry in agriculture, a growing thrust towards non-food cash crops for urban markets and exports, etc.
iii. Women have traditionally played an important role in agricultural activities in all parts of the country. However, women's lack of independent land and resource rights has led to their disempowerment and marginalisation. This has resulted in the loss of agro-biodiversity.
iv. The role of pastoralists in conserving agro-biodiversity has not been adequately recognized. This has also led to an erosion of agro-biodiversity.

6.2.6 Domesticated Biodiversity: Capacity of Actors in Each Sector

6.2.6.1 Overall Concept

It is evident that there is an urgent need to build the capacity of various sectors towards a greater and holistic understanding of agro-biodiversity. The description in this section is an attempt to highlight some of the ongoing initiatives to fill the gaps in capacity-building.

6.2.6.2 Current and Past Initiatives

Government

a. ICAR (*see Section 6.2.1.2*) has established various research centres for agricultural research and education. It has set up 29 agricultural universities. The ICAR Krishi Vigyan Kendras (KVKs) carry out tasks of training, research and demonstration of improved technologies (http://www.icar.org.in).

b. The Small Farmers' Agri-Business Consortium of the Ministry of Agriculture focuses on training programmes in environmentally sound management practices for farmers and fisherfolk to take up economically efficient programmes of agri-business linked to agro-forestry and agriculture (MoEF 1993).

NGOs

(Also relevant to Section 6.2.4.2 and 6.2.5.2)

a. Several NGOs and institutions are creating awareness about organic biodiverse farming amongst urban and rural populations. These include awareness programmes, such as lectures and demonstrations organized by Kalpavriksh in Pune under its Signs of Hope series. Some are part of attempts to market organic food or link up producers and consumers. ECONET, created by an NGO – Institute of Cultural Research and Action, Bangalore – to supply organic products and native/tribal food items along with education for urban consumers, is an example. The Zaheerabad Consumers' Action Group, started by the Deccan Development Society, meets periodically to discuss the merits of traditional crops; workshops are held in various residential colonies to teach women a variety of recipes from traditional millets; a Millet Cookbook has been published and distributed to the group and a series of cookery videos has been prepared and are exhibited. These special cuisine shows on traditional foods are also serialised on Doordarshan. Green Foundation (*see Section 6.2.2.2*) has established a consumer's network in Bangalore, which is directly catered to by farmers.

b. Innovative methods include Biodiversity Contests by Honeybee Network (*see Section 6.2.10.2*), IIM, Ahmedabad, and contests on Kitchen Garden Diversity conducted by Hittalagida Network, University of Agricultural Sciences, Bangalore.

c. In Pune, devotees visiting Shiva temples in 2002 were given *prasad* in the form of seeds in small paper bags. This initiative by a local NGO RANWA was taken up as a method to promote greater understanding of biodiversity amongst city dwellers. This activity was undertaken in the month of *shravan* (around July-August), which is a religious month and a lot of devotees visit temples. The seeds were selected based on their suitability for growth in local conditions, potential returns, attraction to birds or butterflies, aesthetic importance and medicinal properties. Each paper bag had a pamphlet with instructions about how to sow the seeds and care for the plant. The idea was inspired by a similar project undertaken at the Balaji temple in Tirupati, where devotees were presented saplings (http://timesofindia.indiatimes.com/articleshow.asp?art_id=18902063).

d. Anthra (*see Sections 6.2.1.2 and 6.2.2.2*) is working towards enhancing awareness among school children, teachers and textbook developers about domesticated biodiversity in their surroundings, their use, and forces threatening their survival, as well as understanding the appropriateness of local breeds to their environment. Anthra is in the process of evaluating middle school textbooks in detail to assess the information about domesticated biodiversity. Based on this, educational material on different aspects of domesticated biodiversity, in the form of posters, booklets and flipcharts will be designed in colorful, attractive forms so as to generate interest in conservation of domesticated biodiversity (Anthra 2003).

e. A number of organisations including The Ecological Development Society, Pondicherry, Institute for Integrated Rural Development, Aurangabad, The Society for Equitable Voluntary Actions, West Bengal, The Indian Agency for Organic Agriculture (IAOA) and Peekay Tree Crops Development Foundation (PTCDF), Cochin, have undertaken training of their personnel in organic farming (PC 2001c).

Box 6.77 Celebratory Biodiversity Festivals and the role of the NBSAP

While biodiversity can be discussed in academic circles, scientific fora, policy-making bodies and activist groups, none of these can by themselves serve the purpose of helping people to internalise the spirit of biodiversity. This essential character of biodiversity can only be understood in a celebration of the concept.

A festive spirit characterised by celebrations and rituals has always marked a more cosmic comprehension of biodiversity, one that goes beyond material or economic values. Establishing such an understanding of biodiversity is at the centre of a Biodiversity Festival. Such events were encouraged during the NBSAP process.

- As part of formulating a local strategy and action plan for Uttara Kannada district, a *mela* (fair) was organised for the Western Ghats part of the district. The *mela* centered on the themes of agriculture and forests. Government departments (Agriculture, Horticulture, Spice Board, Fisheries, Forest, Sericulture etc.), individuals, and NGOs put up stalls. Cultural events were organised in the evening. One of the main thrusts of the *mela* was to address livelihood issues in a realistic and creative fashion. Another festival was subsequently held in the coastal parts of the district followed by a home gardens and seed networking event, which will continue well after the NBSAP process.
- In April 2001, a festival was organised at the NBSAP Sub-state Site of Rathong Chu, Sikkim. This cultural festival to celebrate *baisakhi* (spring) and the Nepali New Year also included an exhibition of indigenous foods, instruments and some crop varieties. A local skit performed as part of the festival managed to successfully incorporate the concept of NBSAP. Several other such festivals were organized as part of the Sikkim state BSAP process.
- A mobile biodiversity festival in 62 villages in the Zaheerabad region was organised in the Deccan area in Andhra Pradesh. Ten decorated bullock carts displaying agricultural biodiversity of the region traversed these villages over 35 days. Two carts displayed traditional foods that have begun to reappear in the people's daily diets. Discussions were held in each village about the agro-biodiversity in that village and plans to conserve and enhance that agro-biodiversity for sustainable use and equitable distribution. The draft BSAP was produced as a result of this. The mobile festival has become an annual affair, already held in each of the three years that the NBSAP has been underway.

Details on these and similar activities at other sites can be gathered from local, state, and ecoregional BSAPs.

f. Sahaja Samridhha, a NGO, was established in 2001 at Nunnooru, Channapatna taluka, Bangalore district, Karnataka. The organisation has been conducting meetings, workshops and trainings all over Karnataka as well as a few in Tamil Nadu with the purpose of promoting organic farming practices.

Others

- The first ever Organic Farmer's University in India was launched on 11th September 2002 in Thanjavur, Tamil Nadu. The farm-based institution will be managed by organic farmers, and facilitate knowledge transfer to farmers. (Samanvaya at http://groups.yahoo.com/group/organic_indian/ on September 24, 2002).

6.2.6.3 Major Gaps

i. There is a lack of training on agro-biodiversity issues for agricultural extension workers and other functionaries at government-run agricultural establishments like the Krishi Vigyan Kendras;
ii. There is a lack of agro-biodiversity orientation amongst NGOs and community organisations working on agricultural and related issues;
iii. Agro-biodiversity information is meagre or missing in all educational curricula and related text books.
iv. Media programmes, both by the Government (like Krishi Darshan) and by other agencies are weak in their integration of agro-biodiversity information. .
v. Consumer awareness regarding the benefits of organic, biodiverse produce is still very inadequate, especially in cities. A major hurdle in both urban and rural populations is the cultural shift towards homogenized foods (largely rice and wheat), regarding the ill effects of which there is as yet a very weak level of awareness.
vi. There are few efforts to document and revive agricultural diversity at local levels.

6.2.7 Domesticated Biodiversity: Inter-sectoral Coordination

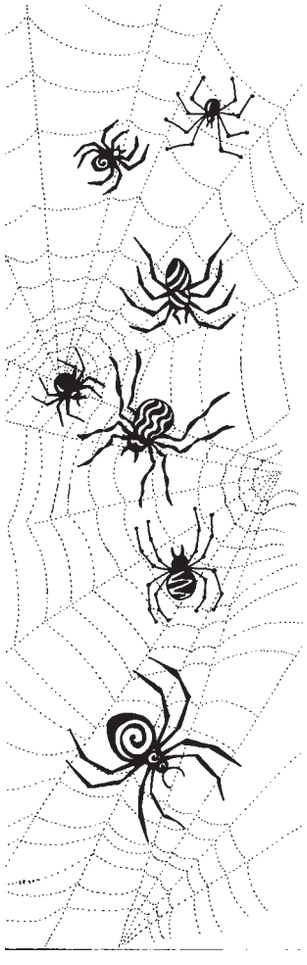
6.2.7.1 Overall Concept

The principles of intersectoral integration and the gaps with regard to this, mentioned in *Section 6.1.7.2* for natural ecosystems, are directly relevant to this section as well, and are hence not repeated here.

6.2.7.2 Current and Past Initiatives

Government

There are few government programmes explicitly oriented towards intersectoral integration with regards to domesticated biodiversity.



NGOs and Communities

The activities of some NGOs (like DDS), mentioned in earlier sections (*see Sections 6.2.1.2, 6.2.3.2, 6.2.4.2* and *6.2.5.2*) are being carried out keeping in mind intersectoral integration in agro-biodiversity conservation. This is specifically with reference to the agro-biodiversity links with the PDS, rural livelihoods, land and water management, and marketing.

6.2.7.3 Major Gaps

i. Even more than in the case of wild biodiversity, integration of agro-biodiversity into sectoral planning and processes is extremely weak, and in most cases totally absent. Ecologically positive measures like watershed development by governments, NGOs and communities do not usually build in agro-biodiversity aspects, and in most cases probably cause further loss by homogenising cropping patterns, introducing hybrids and cross-breeds and diverting or afforesting on grasslands/pastures.
ii. Horticulture programmes that are being promoted in the hill regions do not consider agro-biodiversity as an integral part of these regions and are often planned at the cost of agro-biodiversity.
iii. Agro-biodiversity is rarely integrated into international programmes such as treaties, agreements etc.

6.2.8 Domesticated Biodiversity: Policy and Law

6.2.8.1 Overall Concept

A number of existing policies and statutes in India have a bearing on the agricultural sector. Of these, the Central Government exercises its jurisdiction over a range of subjects, while some are essentially under the purview of the State Governments. This section will briefly describe existing Central Legislation and Policy, including 'judge-made' law that has a bearing on aspects of the conservation of agricultural ecosystems and domesticated taxa. Parts of the law that purport to enable the conservation of agricultural diversity will thus be described. Some policies and laws already described in *Section 6.1.8.2,* which have a bearing on domesticated biodiversity, are not repeated here

6.2.8.2 Current and Past Initiatives

Government

(Note: Policies which would be relevant to the discussion, but which are not discussed in this chapter are the state-level grazing policies, the Fertilizer policy, and district-level ground water guidelines. Acts which have not been described in this chapter, but which would be relevant to the issues dealt with in other chapters are The Fisheries Act, 1897; The Destructive Insects and Pests Act, 1914; The Essential Commodities Act, 1955; The Air (Prevention and Control of Pollution) Act, 1980; The Water (Prevention and Control of Pollution) Act, 1974, The Environment (Protection) Act, 1986; The Indian Easements Act, 1882; Various State-level Acts such as the Panchayat Raj Acts, Irrigation Acts and Drainage Acts of respective States.)

a. The Constitution of India has a number of provisions mentioned under the heading of wild diversity, which

would also apply to domesticated biodiversity. This section deals with other provisions in the Indian Constitution, which pertain specifically to domesticated flora and fauna.

Article 43, which is one of the Directive Principles of State Policy, mentions that 'The State shall endeavour to secure, by suitable legislation or economic organization or in any other way, to all workers, agricultural, industrial or otherwise, work, a living wage, conditions of work ensuring a decent standard of life and full enjoyment of leisure and social and cultural opportunities and, in particular, the State shall endeavour to promote cottage industries on an individual or cooperative basis in rural areas.' The standard of life of agricultural workers can be said to be intimately linked to crop selection by farmers, and to the use of organic inputs, access to usable water, and other such parameters.

Article 47, another Directive Principle, says 'The State shall regard the raising of the level of nutrition and the standard of living of its people and the improvement of public health as among its primary duties....' This can be said to be closely linked to sustainable agriculture, and multi-cropping, or crop diversity.

Article 48, which is also a Directive Principle, says, 'The State shall endeavour to organise agriculture and animal husbandry on modern and scientific lines and shall, in particular, take steps for preserving and improving the breeds, and prohibiting the slaughter of cows and calves and other milch and draught cattle.' This can be linked to both the conservation of indigenous breeds as also promotion of exotics and cross breeds, and thus gives contrasting signals.

Article 262 empowers Parliament to provide for the adjudication of any dispute or complaint[9] in connection with the use, distribution or control of waters of, or in, any inter-state river or river-valley. The issue of sharing waters between and among states is crucial to the pattern of agriculture in an agricultural ecosystem.

Article 323B enables the appropriate legislatures to 'provide for the adjudication or trial by tribunals of any disputes, complaints or offences' related to a number of specified matters which include: 'production, procurement, supply and distribution of foodstuffs (including edible oilseeds and oils) and such other goods as the President may, by public notification, declare to be essential goods for the purpose of this article and control of prices of such goods' and also 'land reforms by way of acquisition by the State of any estate as defined in article 31A or of any rights therein or the extinguishment or modification of any such rights or by way of ceiling on agricultural land or in any other way.' This is one of the instances of how the State is empowered under the Constitution to specifically make decisions related to crop prioritization, land use prioritization, as also land-related equity issues.

b. The National Agriculture Policy, 2001 seeks to 'actualise the vast untapped growth potential of Indian agriculture, strengthen rural infrastructure to support faster agricultural development, promote value addition, accelerate the growth of agro-business, create employment in rural areas, secure a fair standard of living for the farmers and agricultural workers and their families, discourage migration to urban areas and face the challenges arising out of economic liberalization and globalisation.'

   Over the next two decades, it aims to attain:
   - 'A growth rate in excess of 4 per cent per annum in the agriculture sector
   - Growth that is based on efficient use of resources and conserves our soil, water and biodiversity;
   - Growth with equity, i.e. growth which is widespread across regions and farmers;
   - Growth that is demand driven and caters to domestic markets and maximises benefits from exports of agricultural products in the face of the challenges arising from economic liberalization and globalisation;
   - Growth that is sustainable technologically, environmentally and economically.'

c. The National Water Policy, 2002 states, 'Planning and development and management of water resources need to be governed by national perspectives.' It further states that while doing so, the 'socio-economic aspects and need of the states concerned' are to be kept in view.

The policy points out that the quality of water is an important concern, and attaches importance to non-conventional methods of utilization of water, including traditional methods of rainwater harvesting, including harvesting rainwater from rooftops. The policy states that 'water resources planning, development and management will have to be done for a hydrological unit such as drainage basin as a whole or for a sub-basin, multi-sectorally, taking into account surface and ground water for sustainable use, incorporating quantity and quality aspects as well as environmental considerations.'

The policy calls for the promotion of watershed management and the conservation of water in catchment areas. Water-allocation has been prioritised as follows: Irrigation, Hydro-power, Ecology, Agro-industries and non-agricultural industries, Navigation and other uses.

Significantly, the policy states that 'there should be a close integration of water-use and land-use policies.'

d. The National Seeds Policy, 2002: The National Seeds Policy, 2002, along with the Seeds Act, 1966, and Seeds Control Order, 1983, form the 'basis of promotion and regulation of the Seed Industry.' It is described as a policy that will be instrumental in 'doubling food production and making India hunger free'.

   The policy describes biotechnology as a 'key factor in agricultural development in the coming decades. It further states that the creation of a facilitative climate for growth of a competitive and localised seed industry, encouragement of import of useful germplasm, and boosting of exports are core elements of the agricultural strategy of the new millennium.' However, the policy does mention that 'concerns relating to possible harm to human and animal health and biosafety, as well as interests of farmers, must be addressed.'

   The policy describes the following thrust areas: varietal development and plant variety protection; seed production; quality assurance; seed distribution and marketing; infrastructure facilities; transgenic plant varieties; import of seeds and planting material; export of seeds; promotion of domestic seed industry; strengthening of monitoring system.

e. Biosafety Regulatory Framework in India: In order to contain possible hazards to the environment from the release of Genetically Modified Organisms, the Ministry of Environment and Forests (MoEF) notified, in December 1989, the 'Rules for the manufacture, use, import, export and storage of hazardous Micro-organisms/Genetically Engineered Organisms or Cells', under the Environment (Protection) Act (EPA) 1986. These Rules are being implemented through a three-tiered mechanism:
   - Institutional Biosafety Committees (IBSCs) at the institutional level.
   - Review Committee on Genetic Manipulation (RCGM)
   - Genetic Engineering Approval Committee (GEAC)

   The Review Committee on Genetic Manipulation (RCGM) is functioning under the Department of Biotechnology. The Genetic Engineering Approval Committee (GEAC) is functioning under the Ministry of Environment and Forests to examine and issue the clearance from the viewpoint of environmental safety on a case-by-case basis.

   In addition, the Rules also provide for constitution of committees like the State Biotechnology Coordination Committee (SBCC) which is expected to monitor research as well as commercial applications of GMOs in the states and the District Level Committee (DLC) which monitors research and applications in GMOs, including accidental releases at the district level.

   The MoEF and Department of Biotechnology (DBT) seek the advice of experts in the field of genetic engineering and molecular biology who are represented in GEAC and RCGM. Besides, agency representatives like experts from ICAR, CSIR, ICMR, Drug Controller of India, Department of Atomic Energy, Ministry of Science and Technology, Ministry of Industry, Ministry of External Affairs, Ministry of Health & Family Welfare, Ministry of Food Processing & Industries, Ministry of Commerce and Industry, Department of Agriculture & Cooperation

and Central Pollution Control Board, are members of GEAC. All the proposals received by GEAC are referred to a panel of experts and their views are considered before taking a final decision. All proposals are considered on a case-by-case basis and on merit.

In order to evaluate proposals, DBT has issued the following guidelines:

- Recombinant DNA Safety Guidelines, 1990
- Recombinant DNA Safety Guidelines and Regulations, 1990
- Revised Guidelines for Safety in Biotechnology, 1994
- Revised Guidelines for Research in Transgenic Plants, 1998
- Guidelines for generating pre-clinical and clinical data for DNA vaccines, Diagnostics and other Biologicals, 1999

A Monitoring and Evaluation Committee has been set up at DBT to assess the results of large-scale field trials of transgenic crops. In addition, ICAR also evaluates the transgenic crops through its All-India Coordinated Project.

f. The Seeds Act, 1966 as amended up to 1972, was introduced as 'An Act to provide for regulating the quality of certain seeds for sale, and for matters connected therewith.' The Act makes it mandatory for the Central Government to constitute a Central Seed Committee to advise the Central Government and the State Governments, establish seed laboratories at central and state levels, for seed analysis and other functions, and take measures for seed certification. The Act places restrictions on the export and import of seeds of notified kinds or varieties.

g. The Insecticides Act, 1968, as amended up to 2000: The Insecticides Act, 1968 has been described as 'An Act to regulate the import, manufacture, sale, transport, distribution and use of insecticides with a view to prevent risk to human beings or animals, and for matters connected therewith.' It sets up a Central Insecticides Board, to advise the Government on these matters.

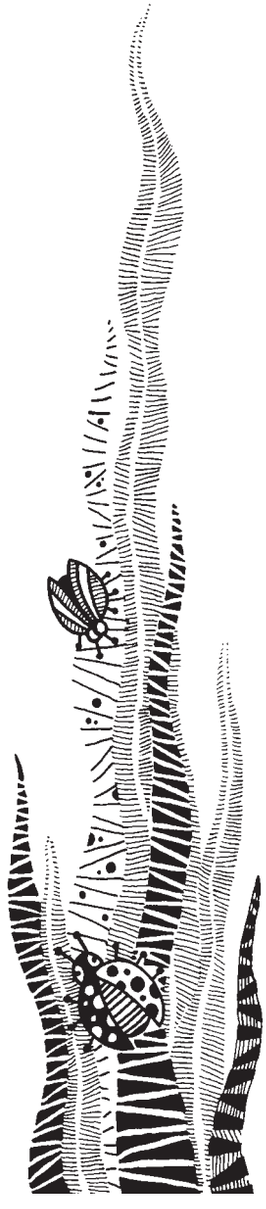
   The Act directs the Central Government to constitute a Registration Committee, which should include the Plant Protection Adviser to the Government of India, to 'register insecticides after scrutinising their formulae and verifying claims made by the importer or the manufacturer, as the case may be, as regards their efficacy and safety to human beings and animals.'

   It empowers the Central Government to establish a Central Insecticides Laboratory, and prohibits the import, manufacture, sale etc. of certain insecticides.

   The State government is also empowered to require any person or class of persons to report all occurrences of poisoning (through the use or handling of any insecticide).

h. The Protection of Plant Varieties and Farmers' Rights Act, 2001: has been introduced consequent to India's ratification of the Agreement on Trade Related Aspects of Intellectual Property Rights. The Act pertains to agricultural crop varieties, and at the outset, states that it is 'An Act to provide for the establishment of an effective system for protection of plant varieties, the rights of farmers and plant breeders and to encourage the development of new varieties of plants' (*see Section 6.2.5.2*).

i. One of the instruments of intellectual property rights introduced by the TRIPS Agreement is Geographical Indications (GIs). It consolidates elements that previously existed under 'indications of source' (of the Madrid Agreement for the Repression of False or Deceptive Indications of Source of Goods) and 'appellations of origin' (of the Lisbon Agreement for the Protection of Appellations of Origin and their Registration). Historically, traders have used a variety of marks to differentiate their goods and convey a particular geographical origin. These marks have included the depiction of local animals, landmarks, buildings and well-known personalities. Two principles form the basis for protecting GIs. First, use of an indication on products not originating in the geographical area suggested by the indication is prohibited because it would mislead or deceive con-



sumers (a consumer protection rationale). Second, use of an indication even when not deceptive or misleading (such that its true origin is conveyed through additional information, e.g. California Chablis or Champagne-like sparkling wine), is prohibited as it harms the reputation of the original and true producer (a producer protection rationale). India has introduced a *sui generis* legislation for the protection of GIs. Yet, it is conceivable that the other legal options (certification marks and court cases) might still be used by parties to assert and protect their rights. The Government of India, as of June 2003, is set to receive applications for India's geographical indications registry. The Department of Industrial Policy and Promotion (DIPP) has notified the final rules (under the Geographical Indications of Goods (Registration and Protection) Act 1999) laying down the criteria and procedure for registration of products known and distinguished by their geographical indications (http://economictimes.indiatimes.com/cms.dll/xml/uncomp/articleshow?msid=48152; Rangnekar 2003).

NGOs

The non-governmental sector in India has been contributing to the development of policies and laws on domesticated biodiversity through a variety of methods.

For example, if a Bill is introduced in Parliament, and then sent to a committee for further deliberations, the NGO sector responds to the government's call for recommendations and suggestions. In the case of what is now the Protection of Plant Varieties and Farmers' Rights Act, 2001, NGOs lobbied hard to include farmers' rights and benefit-sharing provisions (some of which did get integrated).

Second, if the government introduces a policy or legislation that the non-governmental sector is dissatisfied with, then attempts are made at lobbying for change. This could include the drafting of an alternative policy document. An example is of the Jal Biradari, comprising several NGOs and community groups like the Tarun Bharat Sangh, Rajasthan, who have reviewed the National Water Policy, 2002, and have circulated an alternative document, which is more community-centred and ecologically sensitive.

Lobbying and recommendations are also made at state level, such as that carried out by the Andhra Pradesh Coalition in Defence of Diversity, in the case of the State Government's 'Agriculture Vision 2020' (for its anti-small farmer and anti-biodiversity focus).

Communities

As discussed in *Section 6.1.8.2*, in many parts of India, customary law and usage continues to play a role in the way local communities, especially tribal communities, manage their natural resources. This includes the management of agricultural land, water and domesticated species.

a. The villagers of the Arvari Basin in Thanagazi Tehsil, Alwar District, Rajasthan, have came together to form the Arvari Sansad (Arvari Parliament) in 1998 (*see Section 6.1.7.2*). The Parliament has formed a set of rules for all the villages that are part of the Parliament. Some of the rules relevant to this section include:

– Only crops that require less water should be grown in the areas that are irrigated from the wells near the river.
– People would be penalized for growing sugarcane and rice for commercial purposes against the advice of the Arvari Sansad.
– The use of biofertilizers to avoid soil degradation and damage to lands and to help retain soil moisture would be practiced.
– Production should be prioritized for local needs. A direct relationship between the producers and buyers should be established.

6.2.8.3 Major Gaps

i. A survey of over 40 central laws carried out in the mid-1990s revealed that there was weak or non-existent coverage of domesticated biodiversity, including legislation that could regulate the displacement of indigenous crops and livestock by agricultural or industrial development

ii. There was till recently no explicit policy or legislation to protect agrodiversity; the Biological Diversity Act, 2002 can now hopefully plug one of these gaps; but a clear policy thrust related to agro-biodiversity, such as that on seeds, can neglect or even contradict agro-biodiversity conservation goals.
iii. There is an absence of agro-biodiversity industries in parameters for EIA in relevant notification and guidelines.
iv. There is a lack of recognition to customary laws that promote agro-biodiversity.
v. There is a lack of a comprehensive legal regime to prevent conversion of prime agricultural land for non-agricultural purposes, and weak implementation of state laws relating to such conversion.
vi. It is insufficient to have only legislations relating to GIs; concrete indications for each product and clear 'registration' of the protected indications are needed.
vii. All the national germplasm collection efforts have taken place without an access and benefit-sharing arrangement with the farmers and pastoralists from whom the material and related knowledge have been obtained. Such a regime is still not in place.
viii. Similarly, all ethnobiological information has been obtained without a regime to ensure the rights of the original holders of the knowledge (rights to protect the knowledge, prevent its misuse, and obtain equitable share of benefits arising from its wider use).
ix. The concept and practice of farmers' rights is weakly developed; some element of it has come into the Plant Varieties and Farmers' Rights Protection Act (2001), but here too it is weak and inadequate.

6.2.9 Domesticated Biodiversity: Existing Financial Measures

6.2.9.1 Overall Concept

In the last few decades, financing in this sector has been largely directed towards increasing yields and production. Financial incentives and schemes are almost completely oriented towards conventional, input-intensive, chemical-based farming, and hybrids in pastoralism. A few programmes that move away from such a paradigm are given below.

6.2.9.2 Current and Past Initiatives

Government

There are several schemes and programmes with a *potential* for propagating agro-biodiversity.

a. The Department of Agriculture and Cooperation (DAC), Ministry of Agriculture (*see Section 6.2.1.2*) has 182 attached/subordinate/autonomous offices under it. The Department runs 147 schemes, and its major developmental programmes/activities relate to cereals, pulses, oilseeds, commercial crops and horticulture. Subsidies and loans are provided on components such as seed and planting material, production of breeder, foundation and certified seeds, and also for distribution, apart from subsidy for transportation, front line and field demonstrations, farmers' training, subsidy on agricultural implements, micro-nutrients, and the like. In the case of horticulture, subsidy is provided for nurseries, planting materials, area expansion, workshops, seminars and publicity including irrigation devices.

   The department has a National Project on Development and Use of Biofertilizers under the Central Sector Scheme (http://agricoop.nic.in/progs.htm). The scheme was launched in March 1983.

   Under this scheme the Government provides non-recurring grants-in-aid of up to Rs 2 million for setting up biofertiliser production units of 150 MT capacity. The grant-in-aid is offered to State Departments of Agriculture/cooperatives/public sector fertilizer companies, NGOs and private agencies. This scheme is being implemented in the country with the help of a National Biofertiliser Development Centre at Ghaziabad, with six Regional Biofertiliser Development Centres each at Jabalpur, Hissar, Nagpur, Bangalore, Bhubaneshwar and Imphal. Under this scheme 74 biofertiliser production units have so far been established with central financial assistance, having an annual production capacity of 8475 tons .

b. To strengthen the Cooperative Credit Structure for meeting the credit requirement of farmers, central assis-

tance is released to state governments under the schemes for Investment in Debentures of State Land Development Banks (SLDBs).

c. Starting from the 1999-2000 *rabi* season, the Department of Agriculture and Cooperation introduced a scheme called National Agricultural Insurance Cooperation (NAIC), to insure farmers for more crops and more risks. The scheme is available to all the farmers, irrespective of the size of their land holdings. It aims at providing coverage to all food crops (cereals, millets and pulses), oilseeds and annual commercial/horticultural crops. This scheme operates on an 'Area Approach' with 'defined areas for each notified crop for widespread calamities, and on an individual basis for localised calamities such as hailstorm, landslide, cyclone and flood' (Department of Agriculture and Cooperation 2002).

d. A Kisan Credit Card scheme was introduced in 1998 to be implemented by all the rural financial institutions in the country. The purpose was to provide banking support to farmers to meet their cultivation needs. This included purchase of all inputs in a flexible and cost-effective manner (Department of Agriculture and Cooperation 2002).

e. The Khadi and Village Industries Commission (KVIC), established in 1957, provides employment, producing saleable articles and creating self-reliance amongst the poor, and building up a strong rural community spirit. It also builds a reserve of raw materials and implements to be supplied to producers, sets up common service facilities for processing of raw materials as semi-finished goods, and provides facilities for marketing of KVIC products. It also imparts training and networks to establish marketing linkages. KVIC provides financial assistance to institutions and individuals for development and operation of *khadi* and village industries, and guides them by supplying designs, prototypes and other technical information (www.kvic.org.in). In 2002, KVIC announced a plan to retail organic agricultural produce.

f. Some state governments have facilitated direct marketing by farmers – Andhra Pradesh, for instance, has initiated *rythu Bazaars*. These *bazaars* provide a platform for farmers to sell their produce directly to the consumers. Currently, there are a total of 102 *rythu bazaars* spread across the State.

g. Fund for Technology Development and Application (*see Section 6.2.10.2*)

h. Under the Plant Varieties and Farmers' Rights Act 2001, a fund is envisaged to help farmers and farming communities. This is to be generated through a variety of sources, including the sharing of benefits arising from the commercial use of their resources.

NGOs and Communities

a. Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI) has set up an internal fund to honour ten to fifteen innovators every year from its own resources supplemented by the license fee received from a company to whom three herbal veterinary drugs were transferred based on public domain traditional knowledge. A Gujarat Grassroots Innovation Augmentation Network (GIAN) was set up in 1997, as a follow up to the International Conference on Creativity and Innovation at Grassroots held at IIM, Ahmedabad, in collaboration with the Gujarat Government to scale up and commercialize grassroots innovations' (http://www.sristi.org/papers/A3.htm).

b. A total of 35,000 women's Self-Help Groups in India are reported to have credit linkages with banks through micro-credit schemes. Many of these have been initiated by NGOs through national schemes such as the Rashtriya Mahila Kosh and the Indira Mahila Yojana. Others are supported through poverty alleviation programmes of several bilateral and multilateral donors. These schemes, most of which are now being implemented under the Development of Women and Children in Rural Areas, have become the vehicle for implementation of major government programmes at the village level (http://www.un.org.in/gender/microcredit.htm).

c. A number of communities have initiated savings' schemes to help in community works as also to assist needy families in times of crisis. A substantial part of the funds are used for agricultural operations relating to land maintenance, seeds and water.

Others

Agriculture and Natural Resources is one of the largest categories of environmental donor assistance (*see Section 6.1.9.2*).

a. The National Dairy Development Board (see Section 6.1.4.2) supports the development of dairy cooperatives by providing them with financial assistance and technical expertise (http://www.nddb.org).

b. The Using Agricultural Diversity Research Award, instituted by the International Development Research Centre (IDRC) and administered by a Steering Committee comprising of NGOs, farmers, activists, and government officials of the South Asian region, has honoured community-based organizations and provides financial resources and technical support to strengthen their research capacity. The Award helps people appreciate the science behind people's actions, and the need for policy change. More than 30 awards have been given in five countries of the region, covering a range of issues including Agro-biodiversity & Community Knowledge, Uncultivated Foods, Home Gardening, Participatory Plant Breeding, Conservation, Forage and Fodder, and Folk Media (SANFEC 2002). Collectively, the work highlights the vital role of biodiversity in the development of food-secure communities, the leadership role of rural women in biodiversity conservation and the strategic role of biodiversity in building diverse and viable livelihoods and local economies.

6.2.9.3 Major Gaps

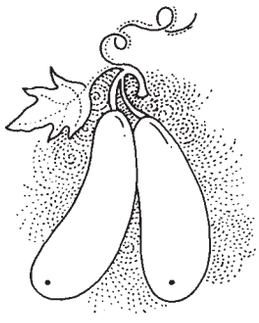
i. Central and state financial schemes to support agriculture are being implemented with limited evaluation of shortcomings or impact, especially on agro-biodiversity and on biodiversity-related traditional knowledge. Most financial support appears to have gone into programmes that encourage homogenised and high-input agriculture.
ii. Linked to the above, a series of perverse financial incentives, such as subsidies on chemical fertilisers and pesticides, are encouraging forms of agriculture that are destructive of biodiversity.
iii. Conversely, there were till recently no financial incentives for organic, biologically diverse farming *(see Section 5.2*); organic farming is beginning to attract some such incentives in a few states, but even in these there is little focus on biodiversity.
iv. There is continued undervaluation or neglect of the values of agro-biodiversity and of traditional farming/pastoral practices. Budgets do not reflect such values at all; nor are they adjusted to reflect the enormous social, economic, and ecological costs of erosion in agro-biodiversity.
v. At present there are few funds specifically earmarked for agro-biodiversity. This is hampering the promotion of the concept itself.

6.2.10 Domesticated Biodiversity: Technology

6.2.10.1 Overall Concept (*see Section 6.1.10.1*)

For centuries farmers have used biodiversity-friendly technologies, which are also in tune with productivity. There has been a trend in the last few decades towards the increased mechanization and homogenization of agriculture in India, which has unfortunately led to the loss of traditional farming practices. The major technological advances during the last three decades have been accompanied by a large increase in the consumption of artificial inputs like chemical fertilizers, pesticides, hybrids, and of late, genetically engineered organisms.

Though this trend continues to exist in policies and practice, there are several places in the country where biodiversity-friendly agricultural technologies have been kept alive by communities, or innovated by government and non-government organizations. Increasingly, the government is also responding with larger policy and programmatic support to such technology.



6.2.10.2 Current and Past Initiatives

Government

a. With growing concern about the adverse effects of the indiscriminate use of chemical fertilizers on soil fertility, productivity and environment quality, biofertilizers, including organic manures, are promising alternatives to meet the nutrient requirements of the crop on a sustainable basis (*see Section 6.2.4.2*).

The Department of Agriculture & Cooperation, Ministry of Agriculture has done some work in this area (*see Sections 6.2.1.2 and 6.2.9.2*).

The Department of Biotechnology, Ministry of Science and Technology has developed mass production technologies for biofertilisers based on *Azotobacter*, *Azospirillum*, Blue Green Algae (BGA), *Mycorrhiza* and *Rhizobium*, and transferred these to industry for production and marketing. These biofertilisers are developed for use in paddy, sugarcane, pulses, groundnut, soybean, cotton, wheat, tea and vegetables. It has been found that *Rhizobium* biofertiliser can save up to 25-30 kg chemical nitrogen in pulses and leguminous oil seeds. *Azotobacter*, *Azospirillum* and *Mycorrhiza* can make phosphate available in soluble form along with other micronutrients to most of the commercial crops. Around 10,000 demonstration programmes benefiting about 35,000 farmers have been conducted (http://dbtindia.nic.in/).

b. The potential use of biopesticides is one of the most appropriate and promising methods of management to counter the detrimental impacts of chemical-based pesticides (*see Box 5.3*) The agents employed as biopesticides, which include parasites, predators, fungi, bacteria and viruses, are the natural enemies of pests. They also target specific pests, are safe to beneficial organisms, and promote the growth of natural enemies of pests, thus reducing the need for future pesticide application.

The use of biopesticides in India is not new. There are a number of instances where biocontrol agents have been successfully employed in India in the past by communities and organisations. Some examples of these are given below:

- Sugarcane *Pyrilla* has been successfully controlled in a number of states by the introduction of its natural enemy *Epiricania melanoleuca* and *Tetrastichus pyrillae*.
- *Trichogramma*, which feeds on the eggs of sugarcane borers, has been used against borers in the states of Tamil Nadu Rajasthan, Uttar Pradesh, Bihar and Haryana.
- Similarly, *Trichogramma*, *Bracon*, *Chelonus* and *Chrysopa* spp. are being used for the control of cotton bollworms. *Trichogramma* has also been used against rice stem borer and leaf folder (*Cnaphlocrasis medinalis*).
- The sugarcane scale insect has been controlled with the help of predatory *coccinellid* beetles in Uttar Pradesh, West Bengal, Gujarat and Karnataka.

The popularity of biopesticides has increased in recent years, as extensive and systematic research has greatly enhanced their effectiveness. Also, techniques for the mass production, storage, transport and application of biopesticides have improved in recent years.

c. In 1991, the Department of Agriculture & Cooperation, Government of India, started a central sector scheme aimed at promotion of Integrated Pest Management (IPM) (*see Section 6.2.4.2*) (http://agricoop.nic.in/progs.htm).

Among other salient features of the scheme, rearing biological control agents for their field use and conservation of naturally occurring biological control agents for control of crop pests and promoting use of *neem*-based pesticides, bacillus-based biopesticides, and insect pathogens, as alternative to chemical pesticides, are important initiatives.

d. The National Agricultural Technology Project (NATP) of the Indian Council of Agricultural Research (ICAR) (*see Section 6.2.1.2*) aims to

- Revitalise the national research and technology generation, assessment, refinement and dissemination systems;
- Address location-specific production system problems for which technical solutions exist;
- Strengthen frontier areas of research to take advantage of modern tools now available;
- Conserve the natural resource base and enhance productivity of these resources;
- Strengthen management tools and procedures and development of information management systems suited to national needs; and;
- Strengthen national capacity in research and extension management , policy planning, priority setting, monitoring and evaluation to meet current and emerging needs of agricultural development.

The project has three components: the Development of the ICAR Organisation and Management Systems; Support for Agro-Ecosystems Research; and Innovations in Technology Dissemination (http://www.icar.org.in/natp.html#a3).

e. The Indian Council of Agricultural Research has launched a Mission Mode Project on collection, documentation and validation of Indigenous Technical Knowledge (ITK) so as to protect peoples' property rights and derive lessons from our heritage.

It invites voluntary disclosure from Indian organizations/groups/agencies/individuals of information pertaining to ITK on various aspects of agriculture and allied activities such as soil, water and nutrient management; pasture and fodder management; crop cultivation; plant protection; farm equipment, farm power, post-harvest preservation and management; agro-forestry; biodiversity conservation and exploitation; animal rearing and health care; animal products preservation and management; fisheries and fish preservation; ethnic foods and homestead management. The technological issues addressed include ethno-engineering & equipment, ethno-veterinary medicines, folk-agronomy, crop diversification, integrated/symbiotic farming, lands and land users, folk weather/cosmovision, multiple use species, value addition and waste utilization (http://agricoop.nic.in/annrep/fnchap11.htm).

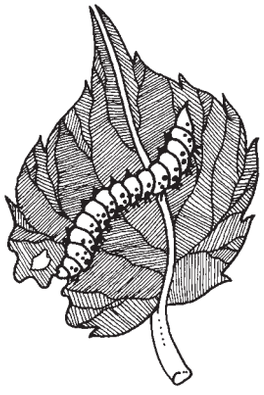
f. A National Institute of Organic Farming is proposed to be set up with 7 sub-centres to undertake extensive countrywide promotion of organic farming, under the National Project for Organic Farming outlined by the Planning Commission for the Tenth Plan period (http://www.corpwatchindia.org/news/PND.jsp?articleid=2803).

g. The Ministry of Rural Development has launched a scheme of Wasteland Development called the Technology Development Extension and Training (TDET). This Central Sector Scheme of Technology Development Extension and Training (TDET) was introduced during 1993-94. The purpose is to develop a database on wastelands, and to demonstrate cost-effective and proven technologies for the development of various categories of wastelands for sustained production of food, fuelwood, fodder etc. on pilot basis. It also includes the implementation of location-specific pilot projects/demonstration models including pisciculture, duckery, beekeeping, domesticated animals and birds etc.

The scheme is being implemented through ICAR institutions, State Agriculture Universities, District Rural Development Agencies (DRDAs), and government institutions having adequate institutional framework and organisational backup. Successful implementation of the scheme is expected to bridge the gap between the existing technologies and needs through wider application by organisations/agencies dealing with land based programme.

The Wasteland Atlas of India, covering the entire country using Remote Sensing Imageries has been brought out in collaboration with NRSA, Hyderabad (*also relevant to Section 6.2.1*).

h. 21 Jai Vigyan National Science and Technology Mission projects have been taken up by all Science Ministries and Departments. These projects are time-bound and targeted, with clear milestones and time schedules. DBT is the nodal agency for coordinating the activities of these. The projects have a focus on the impact of



science and technology on society, including the areas of food security, energy conservation, disaster management, health care and biodiversity conservation. They include development of new generation of vaccines; herbal product development; mirror site for genomic research; establishment of a National Botanical Garden for both recreation and research purposes; ocean thermal energy conservation; and biodiversity characterization in Andaman & Nicobar Islands using remote sensing techniques. A number of scientific agencies and departments would come together under these projects for implementation (http://dbtindia.nic.in/programmes/JVNS&T.html).

i. In 1996, for the purposes of the development and application of indigenous technology, the Government of India enabled placing the proceeds of an existent cess on the import of technology, called the Fund for Technology Development and Application. To administer the Fund, the Government also constituted a Technology Development Board on 1st September 1996, invoking the provisions of the Technology Development Board Act, 1995.

The Technology Development Board invests in equity capital or gives soft loans to industrial concerns and other agencies attempting development and commercial application of indigenous technology, or adapting imported technology to wider domestic application (*also relevant to Section 6.1.9.2*)

The type of projects that are considered for funding include

- Development and commercialisation of a new product/process/application through indigenous technology;
- Significant improvements in the existing product/process/application;
- Substantial quality upgradation, reduced material consumption, reduced energy consumption, cost reduction, improved competitiveness, improved ergonomics;
- Development and deployment of technology or design to satisfy existing occupational health and/or safety standards, or improve upon them;
- Development and deployment of technology or design necessary to satisfy domestic or foreign environmental requirements or standards, current or anticipated;
- Development and deployment of technology or design necessary to satisfy the requirements of domestic legislation, and/or decisions of the judiciary or product liability legislation in export markets;
- Adaptation/modification to product/process which has been imported so as to make it suitable for wider domestic application;
- Replacement of imported raw materials/components with indigenous substitutes;
- Proving the socio-commercial viability of new and/or renewable sources of energy commercially delivered to consumers;
- Development of technology to meet the medical standards and proving socio-commercial viability of bio-medical equipment and devices; and,
- Hazardous, waste recycling management.

J. The Khadi Village and Industries Commission (KVIC) has encouraged the indigenous technology industry through financial assistance, technical assistance such as introducing new equipment, new techniques, developing new varieties of paper, utilizing locally available diverse raw material, and helping the entrepreneurs in their marketing efforts.

K. Institutions like the Kumarappa National Handmade Paper Institute, Sanganer; Maharashtra State Khadi & Village Industry Board; Handmade Paper Institute, Pune; Institute of Paper Technology, Saharanpur; Central Pulp and Paper Research Institute, Saharanpur; Shankar Gramodyog Sewa Sansthan, Hapur; and the Directorate of Handmade Paper, KVIC, Mumbai have contributed to the development of the hand-made paper industry as well as to the production of recycled paper agro-wastes.

NGOs and Communities

a. The non-governmental and community initiatives described in the previous sections also present important

lessons on the appropriate technologies in agriculture. Communities and organisations have been able to carry out sustainable *in situ* and *ex situ* conservation with the help of traditional technologies.

The Sidhi tribes of Karnataka have practiced traditional agricultural practices for growing rice, mainly based upon the land topography and also administering certain effective disease and pest infestation control practices. Traditional agro-pastoral societies follow drought adjustment mechanisms for their survival in Rajasthan based on their migratory habits, livestock management and land development strategies (PPST 1995).

In Arunachal Pradesh, Monpas and other tribes inhabiting high altitudes, as also communities across the West Himalaya, where electricity is not available and diesel generators are not viable, have developed their own indigenous methods of rice milling and pounding, using the water current of streams as a source of energy to rotate the mills. These are near the fields and they are of varying capacities. They help in energy and oil conservation, and also reduce costs on power transmission lines etc. There are probably thousands of such mills across the mountains, which are built entirely using local resources (Hegde 2003).

b. The Krishi Vigyan Kendra (KVK) in Medak district, Andhra Pradesh, has been working with the local communities to promote traditional knowledge systems in agriculture and allied fields, mainly to overcome various production constraints in agriculture. KVK has developed eco-friendly, non-chemical methodologies to tackle certain agricultural pests. It has relied primarily on farmer's innovations to achieve this. The methodologies include deep summer ploughing, intercropping, trap cropping, bird perches, manual collection and destruction of larvae, cow dung and urine extract, chilli garlic extract, jaggery solution, and neem seed kernel extract. Several farmers in Basantpur and Kalbemal villages in Medak district have experimented with these practices (http://knownetgrin.honeybee.org/).

c. A farmer of Khambhisar village in Gujarat has made an innovative change in a tool called '*Khappa*', used for intercropping. The modification has benefited many farmers. The traditional *Khappa* loses its sharpness over time and has limitations when it comes to ploughing hard soil. The farmer modified the tool in such way that the blade and the pointed edge does not touch the soil directly, ensuring that the edges do not get blunted and the sharpness is retained for long. The bar in the modified tool also helps deep ploughing in hard soil (http://knownetgrin.honeybee.org/).

d. Otters, which belong to genus *Lutra*, feed on large fish, and are seen as competition by farmers and fisherfolk practicing pisciculture. Local farmers generally adopt indigenous techniques to control otters without harming them. These methods are based on the natural behaviour of otters. One of these techniques is fencing the fish tank with large meshed gill net pieces under water, all along the margin of the tank. Another method is that of placing bamboo bushes and tree branches under water. This way the fish can seek refuge within the branches and the otter cannot swim smoothly. Farmers have also found that otters do not like the smell of turmeric, and have taken to planting turmeric on the embankments of fish tanks (http://knownetgrin.honeybee.org/).

e. Bilgaon is a village in the Satpura range of the Narmada valley. On January 14, 2003, Bilgaon inaugurated the first micro-hydel project in Maharashtra built through *shramdaan* (voluntary labour). More than 2000 persondays of voluntary work went into building a 2 m high, 70 m long weir/check dam, canal, penstock and turbine. The dam taps the energy of a waterfall with a drop 9m in the Udhai river. This project is designed by two young engineers from People's School of Energy. The people of Bilgaon were supported by several people and groups in Dhule, Mumbai and Kerala, under the auspices of the Mumbai Sarvodaya Friendship Centre. The micro-hydel project of Bilgaon is planned to be able to provide at least 1 tube light to every household of every one of Bilgaon's 12 tribal hamlets spread over several kilometres. In addition, there will also be enough energy for pumping drinking water, for livelihood generation such as grinding mills, extraction of oil from *mahua* seeds, and for community agriculture such as nurseries to help afforestation, and grain bank for food security. The people of Bilgaon have created the Bilgaon Navnirman Samiti to ensure that every family benefits equally from the project (NBA 2003).

f. CHORDS, a NGO in Tuticorin district of Tamil Nadu, has trained rural women to produce compost manure and vermicompost. The Rural Agency for Social and Technological Advancement (RASTA) in Wayanad district in Kerala develops farming practices appropriate for the promotion of sustainable farming practices and compost making. The Institute of Research in Soil Biology and Biotechnology in Chennai promotes vermiculture and vermicomposting throughout Tamil Nadu through various NGOs and is also involved in organic farming. Chetana Vikas, a Tamil Nadu based NGO is promoting low-expense input and sustainable agriculture involving non-usage of chemical fertilizer and chemical pesticides using organic farming methods. Self-preparation of biopesticides by farmers and consequent reduction in farming expenses has been actively promoted by the NGO Rural Community Action Centre (RCAC) in Erode district in Tamil Nadu. The network project of APNL (Andhra Pradesh-Netherlands) on vermiculture, in Mahboobnagar and Nalgonda districts of Andhra Pradesh aims to promote vermiculture technology in dry land agriculture. Establishment of vermiculture units-cum-demonstration units in selected villages of the two districts has promoted organic farming. The Centre for Indian Medical Heritage, a NGO in Palakadu district of Kerala, are implementing a project on organic cultivation of medicinal plants and their utilization along with marketing of locally available medicinal plants (PPST 1995).

6.2.10.3 Major Gaps

i. There are insufficient incentives to encourage technological innovations at the community level.
ii. There is very limited documentation and encouragement of traditional techniques, including those which are practiced by communities even today.
iii. There is little integration and mutual synergism of traditional and modern agro-technologies, by farmer-led or participatory R&D.
iv. Lack of promotion of agro-based resource/waste utilization as an alternative to conventional technologies hampers potential incentives to sustainable agriculture.
v. There is non-availability of protocols for organic farming of crops of commercial importance, which can be monitored by farmers.
vi. Advantages of organic farming and farm inputs for the same *vis-à-vis* chemical based farming are not well documented.
vii. There is a lack of easy availability of microbial cultures that can survive in diverse climate and soil conditions. Coupled with limited facilities for mass cultures of bio-inoculants, this is affecting the availability of these farm inputs for organic farming.
viii. There is a lack of long-term assessments on the ecological, health and social impacts of GMOs and Genetic Engineering Technologies.

6.2.11 Domesticated Biodiversity: International Fora

6.2.11.1 Overall Concept

India's domesticated biodiversity and communities dependent upon it are affected by the obligations and stipulations laid down in many regional and international treaties. This includes both the treaties dealing with environment/biodiversity, as also those dealing with trade, human rights, indigenous issues, etc. This section attempts to deal with some of these issues.

6.2.11.2 Current and Past Initiatives

[Several treaties, conventions, agreements and organisations mentioned in *Section 6.1.11* would be relevant to this section as well]

a. WTO's (*see Section 6.1.11.2*) Agreement on Agriculture (AoA) was negotiated in the 1986-94 Uruguay Round. The agreement includes specific commitments by WTO member governments to improve market access and reduce trade-distorting subsidies in agriculture. Starting in 1995, these commitments are being implemented over a period of six years for developed countries and 10 years for developing ones. Participants had agreed to initiate negotiations for the reform process by the end of 1999. The 2001 Ministerial Conference in Doha, Qatar, incorporated these talks in its broader agenda for negotiation (http://www.wto.org/english/tratop_e/agric_e/agric_e.htm).

b. International Union for the Protection of New Varieties of Plants (UPOV): India has recently taken a decision to apply for membership of UPOV, an inter-governmental organization comprising 52 members (mostly from developed countries), which administers common international rules for the recognition and protection of plant varieties (PVP) to protect the interests of commercial breeders. The UPOV law is contained in two Acts of 1978 & 1991. India's recent Protection of Plant Varieties and Farmers' Rights Act 2001 (PPVFR Act), is closer to the UPOV 1978 Act, but goes beyond it in its 'farmer's privilege' provisions. On 31 May 2002, the Indian Cabinet approved the government's decision to seek accession to UPOV under the terms of UPOV's 1978 Act, which allows for greater farmers' privileges than the 1991 Act.

While UPOV 'allows' for farmers to conserve some seeds from the field for planting, this is seen as an exemption from breeders' rights rather than as a positive right of the farmer. It is feared by many experts that joining UPOV could lead to the dilution of farmers' rights as contained in the PPVFR Act. Since UPOV gives discretion on farmers' privilege to individual states, it is for farmers in countries such as India to insist with their governments that a mere mention of farmers' privileges in a UPOV-styled law does not adequately guarantee farmers' rights (http://www.upov.org/en/publications/conventions/index.html and www.grain.org).

c. International Treaty on Plant Genetic Resources (ITPGR): The International Treaty on Plant Genetic Resources for Food and Agriculture was adopted on 3 November 2001 under the auspices of the Food and Agriculture Organisation (FAO). The Treaty relates to plant genetic resources for food and agriculture. It will come into force after 40 countries have ratified it. India is one of the few countries from Asia that has ratified it.

The Treaty works through the creation of a Multilateral System (MLS) that is meant to provide for facilitated access to a negotiated list of plant genetic resources and for the fair and equitable sharing of the benefits arising from their use. The MLS is an attempt to keep the listed agricultural genetic resources in free circulation, thereby providing for their conservation and sustainable use. Developing countries rich in genetic resources are encouraged to place germplasm in the MLS, to receive in return benefit-sharing rights in the areas of information exchange, technology transfer and capacity building. *Ex situ* collections prior to the Convention on Biological Diversity, which do not come under the purview of the Convention, would now also be dealt with under the Treaty. The crops (35 food crops and 29 forage crops) to come under the MLS are listed in Annex I of the Treaty (www.grain.org/publications/it-asia-feb2002-en.cfm).

India was one of the countries insisting on the inclusion of Farmers' Rights provisions and other food security provisions in the ITPGR. The ITPGR currently leaves farmers' rights legislation to the individual parties.

c. The Consultative Group on International Agricultural Research (CGIAR) was formed in 1971 as an informal association sponsored by FAO, the World Bank, UNDP and UNEP. It supports an international network of 16 International Agricultural Research Centers (IARCs). The programmes of the IARCs fall into 6 broad categories such as productivity research; management of natural resources; improving the policy environment; institution building; germplasm conservation; and building linkages. One of the centers, ICRISAT is located in India (*see Section 6.2.1.2*).

6.2.11.3 Major Gaps

Overall, the integration of biodiversity in most of the treaties and agreements is weak. Some specific gaps are:

i. The farmers' rights and other food security provisions within ITPGR are weak and inadequate, and do not bind countries to respect the full intellectual, cultural, and material rights that local communities should enjoy.

ii. There are few safeguards in India with regard to the ecological and social impacts of increasing trade in agricultural produce, especially the dumping of subsidized produce from outside the country and the conversion of small farmer-oriented systems to capital intensive export- and market-oriented ones (*see Sections 5.1.2.3 and 5.2.1*). The focus of the AoA is on global trade, and is likely to favour farmers in developed countries, while acting to the detriment of small farmers in countries like India. At present, farmers in developed countries are very heavily subsidised and therefore able to be more than competitive in markets abroad. Therefore, despite

WTO's claim of equal treatment to all countries, existing inequities disallow for fair competition.

iii. India's proposed membership of UPOV could cause farmers' rights to be compromised, in relation to the interests of corporate and formal sector breeders. The institutionalization of plant breeders' rights is likely to make farmers' rights more vulnerable to global influences on agriculture.

6.3 Ongoing Initiatives Linking Natural and Domesticated Biodiversity

6.3.1 Overall Concept

Human societies with their various forms of domestication have traditionally co-existed with natural ecosystems and wild species, at times in conflict, at times in harmony. Unfortunately, the myriad interrelations between the two worlds has been poorly understood; much of the attention it has received has been restricted to the conflicts between wildlife and crops/livestock, or the damage caused to wilderness areas by agricultural extension and livestock.

However, it is clear that there are a range of positive linkages between the two (*see Section 3.3.3*). Pollination of crops by wild animals; cross-breeding between crops/livestock and their wild relatives; the use of semi-domesticated or semi-wild species/breeds/varieties; the use of a wide range of wild plants for manure, pest control, and other uses in agriculture; the refuge and corridor service that certain forms of traditional agriculture provide to wildlife; traditional pastoral practices (including grassland management and nomadism) that favour wildlife; the use of diverse wild foods in organic farms such as aquatic fauna in organic rice fields; etc.

In India, there have been very few explicit attempts at encouraging such links. Some of the ones that have been tried are presented below.

6.3.2 Current and Past Initiatives

Government

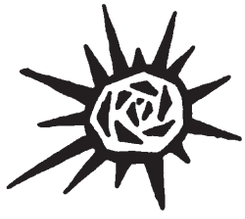
a. Planting Living Bird Perches: The National Centre for Integrated Pest Management (NCIPM) has been working on IPM modules for dryland cotton. The purpose is to help farmers by providing alternatives to chemical pesticides. Validation trials have been carried out at Barad, Nanded district, Maharashtra, in 1999. An interesting element of this module is the use of live bird perches, learning from a technique practiced traditionally in many parts of India. In this case the species *Setaria* was planted between every 9th and 10th row of cotton as a perch for predatory birds. Once the birds are lured on to these perches they feed on the bollworm larvae (*Helicoverpa*). It was found that a large population of birds ranging from mynas to finches frequented these fields and suppressed the insect pests. Birds also began to nest in the cotton fields and villagers got higher yields from their fields (NCIPM 2000).

b. Citrus Gene Sanctuary in Meghalaya for the conservation of both wild and cultivated species/varieties of citrus (*see Section 6.2.2.2*).

c. Some state governments (e.g. Kerala) are encouraging revival or adoption of mixed crop cultivation and fish culture systems, which also harbour diverse wildlife. Others are encouraging organic methods in tea, coffee and other plantations, not only helping reduce hazardous chemical use but also enhancing their wildlife value.

NGOs

a. There are many watershed development activities taken up by NGOs all over the country, in which a mix of water, agricultural and wildlife objective is a stated objective or an unstated outcome. Some examples include revival of *johads* in Alwar, Rajasthan (*see Section 6.1.10.2*), Sadguru Water and Development Foundation's activities in Gujarat etc. While agro-biodiversity remains a weak element in many of these initiatives, there are clear positive links between water harvesting, agricultural development and wildlife revival at several sites.



b. In the Amba Valley of Raigad district of Maharashtra, a watershed programme by Rural Communes (RC) is attempting to integrate biodiversity elements. A 5-year study is being carried out by Kalpavriksh to develop a baseline on key biodiversity elements, and make recommendations on what species can be incorporated into the watershed stabilisation work so that indigenous biodiversity can be enhanced. It will also help to monitor changes in species composition and ecosystems, as a result of the watershed programme. Simultaneously a detailed Community Biodiversity Register has been prepared by the community with help from Kalpavriksh, and this is expected to lead to some probable employment opportunities (Gour-Broome and Thakur 2002).

c. The WWF India Landscape Planning initiatives an exercise at large-scale ecoregional planning underway in the Terai Arc in India and Nepal and the Satpura-Maikal region in central India.. These areas harbour a sizeable portion of India's tiger population. The project aims at establishing connectivity between officially protected areas and tiger habitats outside them, through compatible agricultural and other land use practices, and in the process, conserving an entire landscape.

   The activities in the Terai region have the objective of integrating multi-species conservation (tiger, elephant, rhino etc., as key indicators of the health of the ecosystem) with the help of a Joint Forest Management approach. The programme envisages the involvement of forest fringe-dwellers, NGOs and various state Forest Departments. The aim is to conserve soil, watershed and biodiversity on a sustainable basis as well as enhance coordination between India and Nepal for Terai region restoration in the long run. In India, the initiative covers the states of Uttaranchal, UP and Bihar and includes 11 protected areas of India and Nepal (*Gangetic Plains Ecoregional BSAP*).

Communities

a. The people of the Apatani plateaus in Arunachal Pradesh are famous for the cultivation of fish and rice simultaneously in the same field. 'The water from a main stream is channelled along contours to cover maximum of the rice fields owned by different farmers. These channels are further tapped to secondary channels so that water reaches the desired plots. If the contour does not permit, they use bamboo-split conduits or timber ducts. Each of these have their own regulatory mechanisms and the water sharing is done collectively. The paddy fields are also simultaneously used for fish cultivation. If water is inadequate, two streams are connected. All the work is carried out at community level, using methods devised by the local farmers in the 1950s. They thought that this system worked better since they cultivate a wet rice variety, which provides the ideal habitat for fish, which in turn help to fertilize the rice. A diversity of birds also thrives in this mixed ecosystem (http://www.future.org/PAGES/5_INDIA/arunachal_comm_devel.html).

b. East Kolkata Wetlands: The world's largest ensemble of nearly 250 wastewater fish ponds, covering about 3,500 hectares, are situated 5 kilometers from the eastern edge of Kolkata. These fish ponds are known as *bheris*. These low-lying areas were once brackish water fish farms fed by the tides of the Bay of Bengal. However, natural processes combined with human pressures caused these to dry up. In the 1930s, in an interesting turn of events, these wetlands were rejuvenated by domestic waste water. Interestingly fish too seem to thrive in this water. This is because the wastewater was acted upon by bacteria, which actively decomposed the organic waste in the sewage before the initial stocking of fish. These bacteria combined with substantial sunlight supported the growth of other aquatic flora and fauna. This provided food for the fish and was a unique ecosystem, which served two important functions – the organic sewage was treated naturally and subsequently produced adequate food for fish. A diversity of birdlife is in turn dependent on the aquatic flora and fauna. A major share of Kolkata's fish and vegetable demand is met from this wetland system. The area is now recognized as a major wetland conservation and sustainable livelihoods effort, and has provided a model for other urban areas. Unfortunately its enormous value remains neglected in the planning of Kolkata itself, and there are periodic threats and plans for 'reclaiming' the wetlands for construction purposes (http://www.changemakers.net/journal/98october/ghosh.cfm).

   The Ramsar Bureau has declared the East Kolkata wetland a Ramsar site in 2002.

Others

a. The Makaibari Tea Estate lies in the Darjeeling district of West Bengal. The tea estate has a size of 673 hectares of which only 274 ha are cultivated with tea bushes. Approximately 400 ha are under forests, which are protected and managed by the local people. These forests are protected and managed by the local labour and staff. Unlike most tea estates in Darjeeling, which are owned by big tea manufacturing companies, the Makaibari has been part of a family business. The owner continues to live on the estate itself. Farming at Makaibari follows the biodynamic method of agriculture. No pesticides are used. This method is based on the belief that each plant contributes towards the health of its ecosystem. Thus, native plants and herbs (normally viewed as weeds) are allowed to grow along with tea on the estate. 140 plant species were identified on the Makaibari tea estate by a German scientist in 1994. The philosophy of 'Permaculture' is also practiced on the estate, as a result of which a heterogeneous array of vegetation is to be found interspersed with the tea bushes. Forests are believed to be important for fine quality tea and are therefore conserved on the estate. Makaibari has its own 'forest department' consisting of 18 local people who are responsible for patrolling the forest. These forests abound with wildlife species like barking deer, leopard and many bird species including hornbills (Dutt, In Press).

6.3.3 Major Gaps

i. There are very few attempts at systematically linking natural and domesticated biodiversity in the country, either in understanding the links or in promoting the positive ones.
ii. There is very little documentation and dissemination of information about the few initiatives, which are currently under way.
iii. The practices by communities, which often traditionally integrated the wild and domesticated biodiversity into a continuum, are neither well-known in formal sector agencies, nor encouraged by ongoing policies.
iv. Watershed programmes are not meeting their potential for integrating wild and domesticated biodiversity, due to lack of guidelines and understanding.
v. Wildlife corridor and buffer zone plans, (and PA plans as a whole), rarely consider the wild-domesticated relationship (except the conflicting ones), or provide for incentives to continue/initiate cropping and animal husbandry practices that are beneficial to wildlife.
vi. Conservation attempts relating to the wild relatives of crops and livestock are sporadic and scattered, leaving out most such species from their coverage.
vii. There is no concerted effort to promote landscape or waterscape planning in the country.

Notes

1. The initiatives described in this chapter are only indicative. There is no attempt at trying to be comprehensive, nor is each initiative described in great detail. Also, there is only brief coverage of state-level activities; these are better described in individual state BSAPs, prepared as part of the NBSAP process. Local and ecoregional activities are also described in more detail in the local and ecoregional BSAPs.
2. Marginalised sections of communities, such as lower castes, may often be socially excluded, but village-based norms exist for observing festivals together, even though these norms may be discriminatory.
3. For example, Van Panchayats of Uttaranchal were born out of peasant resistance to forest reservation that led to large areas of Reserve Forests being withdrawn from Forest Department control and restoration of community rights in them. Renaming Van Panchayats as 'JFM committees' could at a later date reduce their autonomy.
4. DIRECTIVE PRINCIPLES OF STATE POLICY: PART IV of the Constitution, Article 37: 'Application of the principles contained in this part – The provisions contained in this Part shall not be enforceable by any court, but the principles therein laid down are nevertheless fundamental in the governance of the country and it shall be the duty of the State to apply these principles in making these laws.'
5. Fundamental Duties, which fall under PART IV A of the Constitution, cannot be enforced by writs. However, they can be called into play in order to interpret the ambiguity in existing statutory law, as has been done in the some cases (Mumbai Kamgar Sabha Vs. Abdulbhai 1976; Rural Litigation and Entitlement Kendra Vs. State of Uttar Pradesh 1987)
6. Article 244. refers to the Fifth Schedule of the Constitution which provides for the administration and control of specified Scheduled Areas and Scheduled Tribes in states other than Assam, Meghalaya, Tripura and Mizoram.

7. Seas, bays, estuaries, creeks, rivers and backwaters which are influenced by tidal action (in the landward side) up to 500 metres from the High Tide Line (HTL) and the land between the Low Tide Line (LTL) and the HTL.
8. Para. 3 of the Sixth Schedule of the Indian Constitution, 1950, empowers District Councils and Regional Councils to make laws relating to certain subjects enlisted in the same para.
9. The Inter-State Water Disputes Act, 1956, has been passed under Article 262 of the Constitution.