IMPLEMENTATION OF ARTICLE 6 OF THE CONVENTION ON BIOLOGICAL DIVERSITY IN INDIA

NATIONAL REPORT

Ministry of Environment and Forests
Government of India
1998

This document has been commissioned by the Ministry of Environment and Forests, Government of India and prepared by the M. S. Swaminathan Research Foundation, Chennai.

Sources of Information : Besides the text sources cited, inputs from over 30 Indian NGOs, Institutions and individuals have been used in the preparation of this document.

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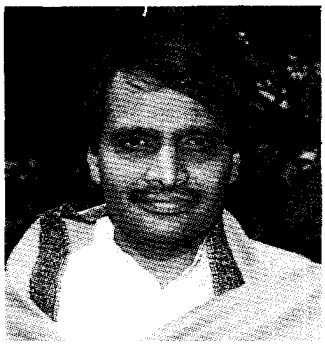


MINISTER
ENVIRONMENT AND FORESTS
INDIA

FOREWORD

It is almost five years since the Convention on Biological Diversity (CBD) came into force in December 1993. The world is now alive to biodiversity issues as never before.

The deep rooted conservation ethos of India is vividly reflected in our ancient texts which promote respect for co-existence with nature and sustainable utilisation of natural resources. The ratification of the Convention on Biological Diversity in February 1994 by India was a formal recognition of the principles offered by the Convention for forging closer international cooperation in the conservation and sustainable use of biological diversity.

It gives me immense satisfaction to release India's first National Report detailing progress made in the implementation of the CBD. This Report highlights India's policies and programmes on conservation and sustainable use of biodiversity including those on benefit sharing. The Report also elucidates efforts made towards integrating biodiversity concerns in sectoral and cross-sectoral programmes.

We are confident that the sharing of experiences through National Reports with other parties will immensely help in meeting the challenges and realising the benefits offered by the Convention for the perpetuation of evolutionary processes and maintenance of life-support systems on the earth.

20 November, 1998
New Delhi

SURESH P. PRABHU

Executive Summary

1. India is one of the 12 megadiversity countries in the world. Around 1, 27,000 species of micro-organisms, plants and animals have been described in the country till date.

2. India has had a long history of conservation and sustainable use of natural resources. National strategies and plans for the conservation, sustainable and equitable use of biological diversity are rooted in the long and rich spiritual and cultural traditions of the country.

3. Environmental protection and conservation of natural resources emerged as key national priorities in India in the wake of the 1972 Stockholm Conference on Human Environment. At this Conference, the Prime Minister of India forcefully stated that "the environment cannot be improved in conditions of poverty. Unless we are in a position to provide employment and purchasing power for the daily necessities of the tribal people and those who live in and around our jungles, we cannot prevent them from combing the forests for food and livelihood; from poaching and from despoiling the vegetation. How can we speak to those who live in villages and slums about keeping the oceans, the rivers and the air clean when their own lives are contaminated at the source?"

4. Between the Stockholm Conference and the Rio Earth Summit in June 1992, India developed an organisational structure and a legal and policy framework for the protection of environment and wildlife in the country, keeping in mind the need to simultaneously address the issues of poverty alleviation and natural resource conservation.

5. A Department of Environment was established in 1980, and was made a full fledged Ministry of Environment and Forests (MoEF) in 1985. Until 1980, the environment and forests of India were the concern of the Department of Science and Technology and the Ministry of Agriculture, respectively.

6. In June 1992, the National Conservation Strategy and Policy Statement on Environment and Development was brought out by MoEF to lay down guidelines for integrating environmental considerations into India's process of development.

7. As a follow-up of the UNCED 1992 and Agenda 21, MoEF in 1993 launched the Environment Action Programme. The Environment Action Programme aims at improving the environmental services in India and facilitating integration of environmental considerations in developmental programmes across different sectors.

8. India is one of the earliest signatories of the Convention on Biological Diversity (CBD) and became Party in early 1994. MoEF has been designated as the nodal Ministry for CBD in the country.

9. India has taken important steps in developing new strategies and further strengthening the existing strategies for effective conservation and sustainable use of its biological diversity. Various systems and approaches for the conservation and sustainable use of biological diversity have been evolved by Government, Non-Government Organisations, institutions and local communities.

10. In 1994 MoEF published a document entitled "Conservation of Biological Diversity in India: An Approach". The purpose of the document was to disseminate useful information on the subject of biological diversity and to share the Indian experience on conservation and sustainable management of biological diversity with the international community.

11. After India became Party to CBD, MoEF held wide-ranging consultations with sector-al Ministries and Departments of the Government of India, State Governments, NGOs, experts, technical institutions and other stakeholders to delineate policies and programmes for further action, in order to consolidate,

adapt and augment existing strategies for conservation and sustainable use and initiate new programmes based on a sound co-ordinated policy for future actions. The result of these consultations has been a framework National Policy and Action Strategy on Biological Diversity which is being further consolidated and pursued for finalisation. UNDP/GEF assisted project to consolidate and detail this is visualised.

12. As a result of key areas identified in the Draft National Policy and Action Strategy, in February 1997, MoEF sponsored a National Workshop on Capacity Building in taxonomy in India. As a result, an All India Co-ordinated Project on Taxonomy has been developed. Avenues for funding the project are being explored.

13. Systematic surveys of flora and fauna of the country covering all the ecosystems started with the establishment of the Botanical Survey of India in 1890 and the Zoological Survey of India in 1916. 70% of the country's land area has been surveyed and around 45,000 species of micro-organisms and plants and 81,000 species of animals have been described till date.

14. It has been estimated that another 400,000 species may still exist in India undescribed. A majority of these can be micro-organisms and invertebrates. Institutional support in the assessment of biological diversity in little known organisms such as micro-organisms and invertebrates is provided by Botanical Survey of India, Zoological Survey of India, National Institute of Oceanography, Central Marine Fisheries Research Institute, Indian Agricultural Research Institute and Institute of Microbial Technology.

15. Since the 1980s the Botanical Survey of India and Zoological Survey of India have brought out Red Data Books on endangered plants and animals following the IUCN guidelines. An exercise for validation of the status of such species in the country has been initiated. In addition to initiatives by the Botanical Survey of India and Zoological Survey of India, Non Governmental Organisations are actively involved in programmes of conservation prioritisation to assess the status of species in India. Initiatives on conservation assessment have so far covered medicinal plants, mangroves, soil invertebrates, freshwater fish, amphibians, reptiles and mammals.

16. MoEF has also sponsored workshops on Conservation and Sustainable Use of Medicinal Plants, Industries involvement in the Conservation and Sustainable Use of Biological Diversity and Conservation and Sustainable Use of Coastal and Marine Biological Diversity. An All India Co-ordinated Project on Coastal and Marine Biological Diversity is also being developed.

17. As per the Coastal Zone Regulation Notification of 1991, coastal zone management plans have been prepared by all coastal states and Union Territories. The Government of India has set up Standing Committees for monitoring development in fragile ecosystems such as islands. Development Authorities under the Chairmanship of the Deputy Chairman, Planning Commission review the progress of implementation and impact of the programmes in the aforesaid areas.

18. *In situ* conservation through a system of Protected Areas included 75 National Parks and 421 Wildlife Sanctuaries covering a total area of 146, 000 sq. km. The total area covered by PAs has been increased since 1993. There are at present 85 National Parks covering 35,919.03 sq. km and 448 Wildlife Sanctuaries covering 112,274.45 sq. km representing the major biogeographic provinces of India and covering 4.2% of the total land area, The total extent of Protected Areas include 5 designated as World Heritage Sites, 9 Biosphere Reserves and 6 Ramsar sites, besides 23 Tiger Reserves.

19. Institutionalised ex *situ* conservation of biological diversity in India started with the establishment of Botanic and Zoological Gardens. The Government of India has set up a number of gene banks for the ex *situ* conservation of plants and animals. Largest amongst these are the National Bureau of Plant

Genetic Resources, the National Bureau of Animal Genetic Resources, the National Bureau of Fish Genetic Resources (of Indian Council of Agricultural Research) and the Tropical Botanical Garden and Research Institute.

20. As early as 1982, Department of Environment launched an All India Co-ordinated Research Project on Ethnobiology to identify and document indigenous knowledge of biological diversity uses in the country. Based on the experience gained, India is working on appropriate and effective models of benefit sharing. The models for strengthening the *in situ* conservation traditions by sharing the derived benefits with the local communities are being developed in the government, NGO and private sectors. One such model is being tested with the *Kani* tribe of Kerala.

2 1. *The Ministry* of Environment and Forests, Government of India has initiated since 1993 a comprehensive ten year programme in southern India across the States of Karnataka, Tamil Nadu, Kerala, Andhra Pradesh and Maharashtra for *in situ* conservation of the medicinal plants diversity in the Western and Eastern Ghats. This medicinal plants conservation network is aimed at conserving the natural resources used by traditional communities.

22. The earliest institutionalised effort in regeneration, sustainable use and management of degraded forests with the active involvement of the primary stakeholders is however the Participatory Forest Management initiated by the State Forest Department of West Bengal in 1972. Following the success of this model, the Government of India has expanded the Participatory Forest Management Strategy to the rest of the country. This is now being implemented by the State Governments in most parts of the country. This strategy secures rehabilitation of degraded areas, conservation of biodiversity along with sharing of benefits with local people. Social and economic incentives to rejuvenate and conserve biodiversity are the important aspects of the strategy.

23. The approach of identifying and actively involving stakeholders in natural resource management is being seen as an effective and essential strategy for conservation and sustainable use of biological diversity. The framework National Policy and Action Strategy on Biological Diversity of the Government of India recognises the importance of involving the stakeholders including women, in conservation policies and programmes.

24. Government is developing a national legislation to regulate access to biological resources, sustainable use of these resources and equitable sharing of the benefits arising out of their use. The legislation will help achieve the three basic objectives of the Convention on Biological Diversity viz. conservation, sustainable use and equitable sharing of benefits derived from such use. A draft Plant Varieties Act has been prepared for consideration by the Ministry of Agriculture, which *inter alia* recognises and seeks to protect the interest of the traditional rural and fanning communities, who have made significant contributions to the conservation and enhancement of genetic diversity particularly at the intra-specific level.

25. MoEF has set up an Environmental Information System (ENVIS) to collect and disseminate information on the conservation and management of biological resources in selected regions of the country to researchers and the public through a network of 21 centres in the country. ENVIS also serves as the National Focal Point of the Clearing House Mechanism of the Convention on Biological Diversity in India.

26. In 1994, the Government of India, under the Environment (Protection) Act, issued the Environmental Impact Assessment notification by which Environmental Impact Assessment is mandatory for 29 selected sectors while undertaking developmental projects.

27. As a nodal agency, MoEF functions with a number of institutions as major partners for developing and implementing national strategies on conservation and sustainable use of biological diversity. These partners include ministries, state government departments, universities and other academic institutions, autonomous institutions, womens' organisations and NGOs.

28. In August 1998 MoEF organised a National Consultation on the proposed legislation on biodiversity.

29. India's policies are designed to make the conservation of nature and natural resources the concern of all citizens of the country. Under the system of democratic decentralisation of responsibilities enshrined in constitution amendment No.73 of 1993, local bodies consisting of elected representatives, one third of whom are women, have been entrusted with the responsibility of safeguarding the local environmental capital stocks. It is hoped these steps will lead to biodiversity conservation and enhancement becoming a people's movement.

Biodiversity Conservation In India : From Local Traditions to Fortified National Policies

Tradition	Age-old conservation practices	
	Conservation principles laid down by Gautama Buddha	500 B.C
	Conservation principles outlined in Arthasasthra	321-297 B.C.
Colonial	System of Reserved Forests	
	Indian Forest Act	1927
	Protected Areas	1935
Post Independence	Conservation principles in First Five Year Plan	1950
	National Forest Policy	1952
	Prevention of Cruelty to Animals Act	1960
	Wildlife (Protection) Act	1972
	Stockholm Conference on Environment and Development	1972
	National Wildlife Action Plan	1973
	42nd Amendment of the Constitution of India	1976
	Ratification of CITES	1976
	Department of Environment	1980
	Forest (Conservation) Act	1980
	Ratification of Ramsar Convention	1981
	All India Co-ordinated Project on Ethnobiology	1982
	Ministry of Environment and Forests	1985
	Amendment of Forest (Conservation) Act	1988
	Amendment of National Forest Policy	1988
	Rio Earth summit	1992
	National Conservation Strategy and Policy Statement on Environment and Development	1992
Post CBD	Environment Action Programme	1993
	High level Advisory Body: National Environmental Council	1993
	Ratification of CBD	1994
	MoEF as nodal agency for CBD	1994
	EIA notification	1994
	Consultation on Biodiversity amongst SAARC, ASEAN and other developing countries	1994
	Draft National Action Plan on Biodiversity	1997
	All India Co-ordinated Project in Taxonomy	1997
	National Environment Appellate Authority Act	1997
	MoEF/UNDP Capacity 2 1 programme	1997
	Inter-ministerial Task Force to develop Biosafety Protocol	1997
	GEF General Assembly	1998

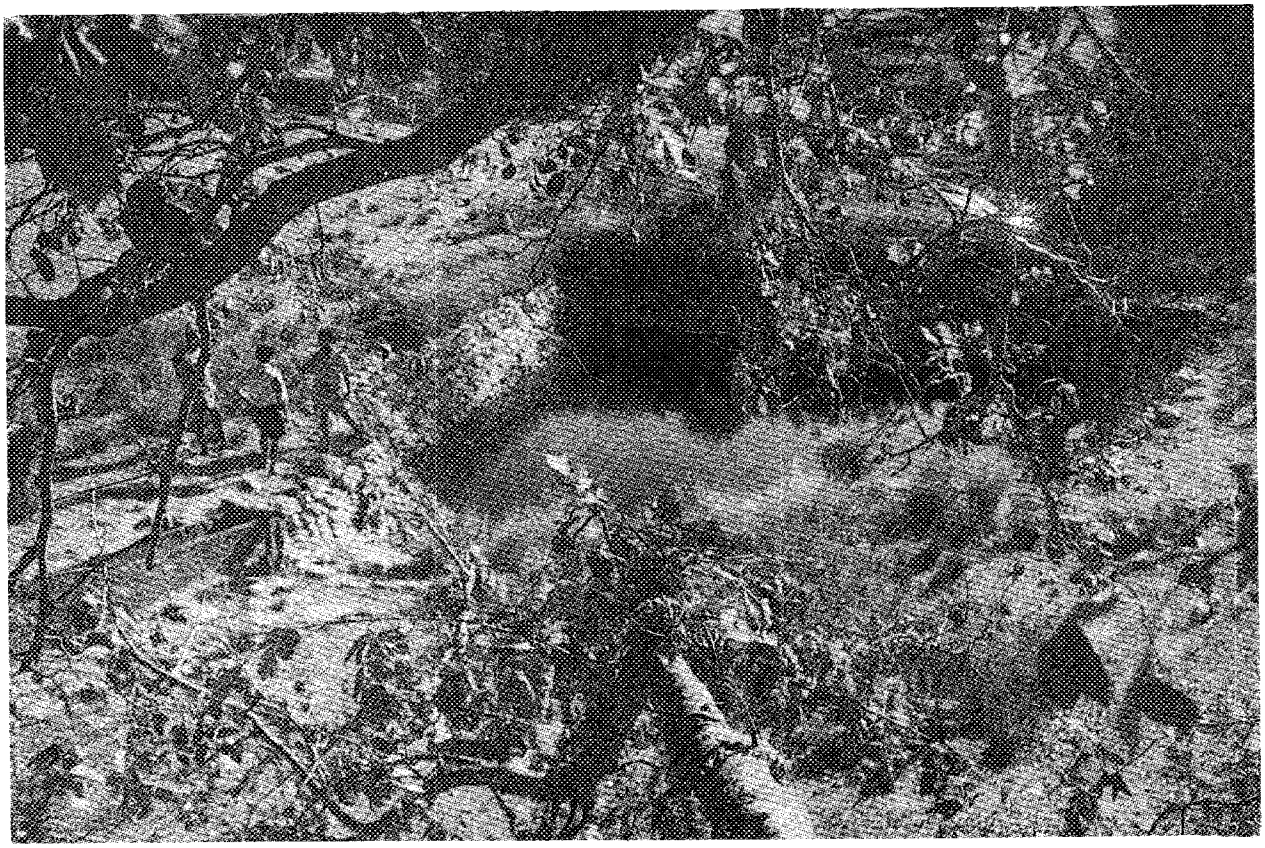
1.0 Conservation and Sustainable use of Biological Diversity in India - Cornerstones

1.1 India is one of the 12 megadiversity countries globally recognised. Its geographic position, extent - both land and sea, and the resultant varied climate and topographies have given rise to 10 biogeographic zones namely the Tram-Himalayan, Himalayan, Indian Desert, Semi-arid, Western Ghats, Deccan Peninsula (including the Eastern Ghats), Gangetic Plain, Northeast India, Coasts and Islands. Each of these biogeographic zones is characterised by unique ecosystems and species of organisms. Around 127,000 species of micro-organisms, plants and animals have been described till date. Estimates by experts suggest that there could be another 400,000 species yet to be identified. A large number of these would be micro-organisms and invertebrates.

Traditions and Lifestyles

"Trees are the only **living** organisms that are capable of unilateral love; they provide shade even to the axeman who comes to cut them"- Gautama Buddha.

1.2 India has a great diversity of people and cultures. The country's population of nearly one billion people represents over 4000 endogamous communities with as many traditions. Conservation, sustainable use and equitable sharing of benefits have been part of the traditional life styles and ethos of the people. This is reflected in Indian forms of worship, rituals, food habits, philosophy and culture.



1.3 In ancient India, efforts were oriented towards the preservation of nature. For instance, Kautilya's Arthasastra (321-297 BC) clearly laid down principles for protecting wild elephants. It is stated that "in the extreme limit of the country, elephant forests, separated from wild tracts shall be formed. The superintendent of elephant forests with the retinue of forest guards shall not only maintain the upkeep of the forests, but also acquaint himself with all passages for entrance into or exit from such of them as are mountainous or boggy or contain rivers or lakes. Whoever kills an elephant shall be put to death....." Widespread reverence not only for elephants, but also tigers, cattle, monkeys, snakes and plants still exist.

1.4 Reverence for plants and animals in India guided traditional people to even sacrifice their lives to protect biological diversity (biodiversity). A number of such instances where men and women have sacrificed their lives have been recorded in Indian history. The case of the *'Bishnois'* sacrificing their lives to prevent the destruction of trees by loggers drew world wide sympathy. Another well known movement is the *'Chipko'* (i.e., 'hug the trees') in the Garhwal district of Uttar Pradesh. This movement was in protest of logging and the local women expressed this by hugging the trees that were earmarked for felling.

1.5 Traditional conservation efforts in India went beyond individual species. Representative patches of major ecosystems that were preserved as sacred forests/groves, ponds, rivers, mountains and caves can be seen all over the country. In India there has been widespread awareness of the conservation and management of sacred groves.

1.6 Traditional farming practices identified, domesticated and preserved a wide range of plants and animals which gave rise to the rich heritage of agrobiodiversity. Women exchanging farm conserved seeds at the time of important ceremonies is a widespread practice throughout rural India. Seasonal dietary practices/restrictions, closed periods of animal harvests, taboos on hunting pregnant/gravid animals are prevalent to a large measure in the country.

1.7 There are many local traditions for conserving and enriching biodiversity which are yet to be chronicled. Indian tradition has nevertheless paved the pathways for all formal and institutionalised efforts in conserving biodiversity in the country. Conservation directives in India are sensitive not only to biodiversity *per se,* but also to the rich traditions that weaved human lives in the country with its plants, animals and other living and non-living resources.

Pre-CBD Initiatives and Efforts

1.8 India's rich tradition of natural resource conservation has given rise to several informal and localised systems of *in situ* conservation. *In* situ conservation of biodiversity in India became organised and institutionalised gradually . During the colonial period, the system of Reserved Forests was established. This system however, isolated the local humans from natural areas.

1.9 In Independent India, the need to conserve biodiversity integrating the needs of people was identified as a priority even in the early years of planning and development. This finds mention as early as 1950 in the first Five Year Plan.

1.10 The Government of India as early as 1952, enunciated the National Forest Policy with the aim of conserving a third of the forest cover in the country. The key issues that governed the formulation of this policy are,

- The need for evolving a system of balanced and complimentary land use under which each type of land is allotted to that form of use, under which it would produce most and deteriorate least.
- The need for checking denudation in mountainous region on which depends the perennial water supply of the river system whose basin constitutes the fertile core of the country, the erosion progressing space along the tree-less banks of the great rivers leading to ravine formation and on vast stretches of undulating wasteland depriving the adjoining fields of their fertility and the invasion of sealands on coastal tracts and the shifting of sand dune more particularly in the Rajputana desert.

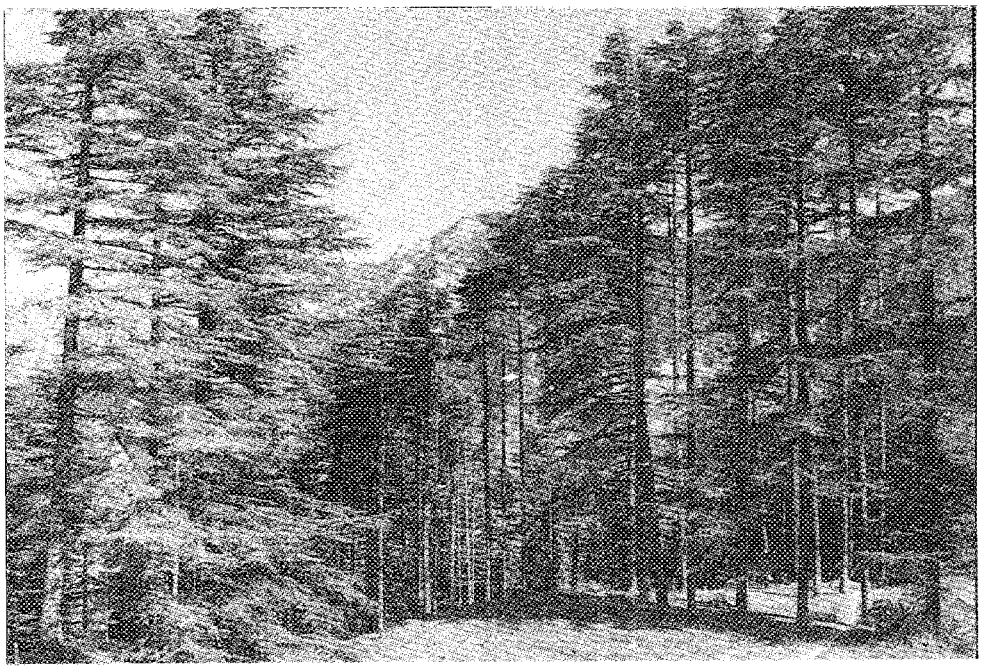
- The need for establishing tree lands wherever possible for the amelioration of physical and climatic conditions promoting the general well being of the people.
- The need for ensuring progressively increasing supplies of grazing, small wood for agricultural implements and in particular of firewood to release the cattle dung for manure to step up food production.
- The needs for sustained supply of timber and other forest produce required for defence, communications and industry.
- The need for the realisation of maximum annual revenue in perpetuity consistent with the fulfilment of the needs enumerated above.

1.11 The Wildlife (Protection) Act, 19'7% was the first major step taken by the Government of India to protect wildlife in the country. The forerunner of the Act was Project .Tiger, which was launched to specifically assess, conserve and rehabilitate prime tiger habitats in India. Subsequently, the National Wildlife Action Plan, 1973 specified the strategy and action programmes for wildlife conservation.

1.12 Environmental protection and the conservation of natural resources in the context of poverty alleviation emerged as key national priorities in India in the wake of the 1972 Stockholm Conference on Human Environment. At this conference the Prime Minister of India forcefully stated that "the environment cannot be improved in conditions of poverty. Unless we are in a position to provide employment and purchasing power for the daily necessities of the tribal people and those who live in or around jungles, we cannot prevent them from combing the forests for food and livelihood; from poaching and from despoiling the vegetation. How can we speak to those who live in villages and slums about keeping the oceans, the rivers and the air clean when their own lives are contaminated at the source?"

1.13 Between the Stockholm Conference and the Rio Earth Summit in 1992, India developed a stable organisational structure for environment and wildlife protection in the country. India's concern and commitment towards environmental conservation were reinforced in 1976 by the 42nd Amendment of the Constitution of India. Article 48a under the Directive Principles of State Policy and Article 5 IA(g) of the Fundamental Duties in the Constitution state that 'the State shall endeavour to protect and improve the environment and to safeguard forests and wildlife in the country' and 'ts protect and improve the natural environment including forests, lakes and rivers and wildlife, and to have compassion for the living creatures'.

1.14 In 1980, a Department of Environment was set up. Till this time environment and forests were the concern of the Ministry of Agriculture



and the Department of Science and Technology. The Forest (Conservation) Act, which came into force in 1980 had stringent provisions for preventing diversion of forest land for any other purpose. In 1985, the Department of Environment was upgraded as a full fledged Ministry of Environment and Forests. The Environmental (Protection) Act, 1986 set out the parameters under which MoEF operates to formulate and carry out environmental policy at the national level. The Forest (Conservation) Act was amended in 1988 to include provisions to allow certain developmental activities in and around forest areas.

Important Acts Relevant to Biodiversity

The Indian Forest Act, 1927 is a colonial legislation enacted mainly to enable the State to acquire ownership over forests and their produce and, specifically to facilitate trade and timber. The concern here is not on forest biodiversity but on controlling and regulating the timber trade.

The Wildlife (Protection) Act, 1972, amended in 1983, 1986 and 1991, provides for the protection of wild plants and animals and regulates hunting, trade and collection of specific forest products. Certain tribes are however allowed to pick, collect or possess specified plants for their *bona fide* personal use. The revised Act also provides a licensing system to regulate cultivation and trade of specified plants in a pattern similar to the trade in fauna. Licensees are required to declare their stocks and follow prescribed procedures.

The National Wildlife Action Plan, 1973, identified broad goals of establishing a network of representative protected areas and developing appropriate management systems which take into account the needs of local peoples and conservation requirements outside protected areas. The National Forest Policy, as amended in 1989, stressed the sustainable use of forests and the need for greater attention to ecologically fragile, but biologically rich, mountain and island ecosystems.

The Forest (Conservation) Act, 1980, amended in 1988 primarily deals with using forest lands for non-forestry purposes, mainly industry and mining. It requires state governments to acquire the approval of the central government before it degazettes a reserved forest, leases forest land to a private person or corporation, or clears it for the purpose of reforestation. Implementation of this act has reduced the annual rate of diversion of forest lands for non forestry purposes to 16,000 hectares a year, compared with 150,000 hectares per year prior to 1980.

The Environment (Protection) Act, 1986, empowers the central government to take appropriate measures for the purpose of protecting and improving the environment. It is authorised to lay down standards for controlling emissions and effluent discharges of environmental pollutants, to regulate industrial locations, to prescribe procedures for managing hazardous substances, to establish safeguards for preventing accidents, and to collect and disseminate information regarding environment pollution. In accordance with this act, the central government has issued a number of regulations affecting sectors such as hazardous and chemical wastes, genetically engineered micro-organisms, and industrial development of coastal zones.

The Foreign Trade (Development and Regulation) Act, 1992, is designed to stimulate sustained economic growth and enhance the technological strength and efficiency of Indian agriculture, industry and services. The central government regulates the import and export of goods by means of a Negative List of Imports or a Negative List of Exports, depending on the situation. Import and export are prohibited/restricted through licensing or routed through specified agencies. Provisions of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) are also implemented through this act.

1.15 A number of outstanding changes have occurred in the Indian economy over the last three decades. Rapid growth of Indian population has resulted in extensive demands of food, fodder, fibre, fuelwood, etc., The mounting pressure on natural resources led to revision of the National Forest Policy of 1952 in 1988. The revised Forest Policy emphasises the need to restore ecological balance and the conservation of the country's natural heritage by preserving the remaining natural forests. This objective is sought to be achieved through the prevention of soil erosion and denudation in the catchment areas, the restriction of the growth of desert areas, and the evolution of a system to meet the requirements of fuelwood, fodder, nonwood forest products and small timber for the rural and tribal population. Such felt needs set the stage for establishing the National Afforestation and Ecodevelopment Board (NAEB). This is an important body set up to help the Government of India to achieve the aforesaid objectives of the National Forest Policy.

1.16 A number of legislations, policies and programmes were initiated which directly or indirectly serve to protect, conserve and sustainably use the country's biological resources. Underlying the policy statements is the recognition of the principle that effective management and control of natural resources require the support and participation of the local people. The National Conservation Strategy and Policy Statement on Environment and Development, 1992 outlined the specific means through which environmental considerations could become a significant part of the developmental process.

1.17 There was a felt need to clearly establish priorities in the environment, forest and other sectors and design a programme of action for sustainable management of the environment in the country. This need arose on account of the changing economic structure of India on the one hand, and the national and global consensus for integrating environmental considerations into developmental programmes and projects for sustainable development on the other.

Other Conventions and International Agreements dealing with Biodiversity

1.18 India acceded to the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) in 1976. The enforcement of CITES is the responsibility of the Member States who are required to establish management and scientific authorities for the purpose. On behalf of the CITES Secretariat, data on world trade in wildlife are collected and analysed by the Wildlife Trade Monitoring Unit (WTMU) which is part of the IUCN Conservation Monitoring Centre in Cambridge, UK. The WTMU also receives and analyses relevant data and information from IUCN/ WWF, TRAFFIC offices in different countries. On initiative from IUCN, WWF and Government of India - TRAFFIC India has been established.

1.19 India became party to the Ramsar Convention in October 198 1. Two important mandates of the Convention are that the Parties

- designate at least one wetland in their territory for the list of wetlands of international importance and to conserve the ecological characteristic of the same and
- make wise use of all wetlands in their territory whether or not they are designated for the Ramsar list by developing National Wetland Policies.

1.20 In accordance, India has designated Chilka Lake (116,500 ha.), Keoladeo Ghana National Park (2900 ha.), Wular Lake (18,900 ha.), Harike Lake (4,100 ha.), Sambhar Lake (2,873 ha.) and Loktak Lake (26,600 ha.) as Ramsar Sites.

1.21 Under the U. N. World Heritage Convention, India has declared Kaziranga NP, Keoladeo Ghana NP, Manas Wildlife Sanctuary, Nanda Devi NP and Sunderban NP as World Heritage Sites.

1.22 India is a signatory to the BOM Convention on Migratory Species, the Framework Convention on Climate Change, the U. N. Convention on the Law of the Sea and the Desertification Convention.

2.0 Conservation and Sustainable Use Policy

National Biodiversity Conservation Strategies

2.1 The Union Ministry of Environment and Forests (MoEF) of the Government of India has been designated the Nodal Agency with the responsibility of implementing CBD in the country. MoEF involves a number of other ministries, departments, institutions and NGOs as major partners for developing and implementing national strategies on conservation and sustainable use of biodiversity.

Major Programmes of the Ministry of Environment and Forests

Areas of Emphasis	Organisational Set-up	Activities
Survey of natural resources	0 ZSI o BSI o FSI 0 NIO o CMFRI o Centres of Excellence o Universities and other organisations	o Floral/fauna1 surveys by BSI/ZSI o EIA on Ecology & wildlife o Forest survey by FSI
Conservation of natural resources	o Central Zoo Authority o Project Tiger o Project Elephant o National Parks and Sanctuaries o Biosphere Reserves o National Committee on Coral Reefs, Mangroves and Wetlands o Indian Board of Wildlife o National Committee for Biosphere Reserves o Nature interpretation centres for education on wildlife	o Designation of Wetlands under Ramsar Convention o MAP for Wetlands/Coral reefs/ Mangroves o Assistance to Botanic Gardens o NFAP for Forestry o Forest fire control o Protected area network o Project Tiger o Assistance to Zoological Parks o Eco-development
Environmental Impact Assessment	o Expert committees for different sectors	o Environmental clearances o Regulatory notifications for fragile areas o Carrying capacity studies o Monitoring of EIA conditions o Training in EIA
Monitoring/prevention and control of pollution	o EPTRI/PCRI o CPCB/SPCBs	o Monitoring Air/water quality o Vehicular pollution control o Environmental standards o Action plans for polluting industries o World Bank assisted industrial pollution control project 0 Eco-labelling o Clean technology for SSI o Bio-monitoring of river Yamuna o Monitoring water quality of Ganga

Areas of Emphasis	Organisational Set-up	Activities
Management of hazardous substances	o Research Projects for handling/treatment of HSM o Committees and expert groups 0 Central crisis group o SPCBs for managing HSM	o Assistance to States for EIAs studies in respect of HSM sites o Training for household disposal of wastes/sanitation of urban slum dwellers
Ganga Action Plan	o National River Action Plan	0 Infrastructure for sewage/effluent treatment in towns o Monitoring of industries along Ganga river o Epidemiological studies o Pollution abatement in Yamuna/ Gomti o NRAP o Public awareness education
Afforestation and Eco-development	o National Afforestation and Eco-development Board o State Forest Departments o Village Forest Protection committees	o Conservation of non-wood forest produce o Development of forest/pasture seeds o Aerial seeding o Integrated wasteland development project o World Bank assisted NSFP o Afforestation schemes in Rajasthan/ Haryana with Japanese/EC assistance o Fuel wood/fodder development projects o Seed development o Assistance for NGO projects for afforestation o Mapping of wastelands and GIS o Western Ghats forestry projects with U.K. assistance o National fund for afforestation o Regional centres for project evaluation o Eco-task force
Research on natural resources	o ICFRE institutions EPTRI/IIFM/WII/SACON/ IGNFA o GB Pant Inst. of Himalayan environment and development	o Support for research projects under MAB/Eastern & Western Ghats projects o Research projects for conservation and management of wetlands/ mangroves/biosphere o Support for plywood research and wood substitution programmes
Environmental Education and Awareness Programme	o Paryavaran Vahini o CPR environmental education centre, & CEE o SPCBs for strengthening manpower	o National Environment Awareness Campaign o Assistance to centres of excellence

Source : MoEF (1993)

Some of the Programmes relevant to Biodiversity Conservation which are handled by Other Ministries and Departments of Government of India

Ministry/Departments	Organisational Set-up	Activities
Agriculture	o All India Co-ordinated Research Project o Bureaus of genetic resources o Fisheries Research Support o Agricultural Colleges/Educational Institutions o Small Farmers Agri-business consortium o State Land Use Boards	o Watershed Development Programme o Agricultural Research & Education o Rainfed agriculture in National Watershed Development Project o Western Ghats Development Project 0 Soil Conservation o Bio-fertilisers o Schemes for women participation in agriculture o Integrated Pest Management
Water Resources		0 CADP o NWMP o Flood Control Programmes 0 People's participation in irrigation o R&D in Water resources planning
Rural Development	o National Wasteland Development Board (NWDB)	o Jawahar Rozgar Yojana o DPAP o IREP o Rajiv Gandhi National Drinking Water Mission for rural water supply o Waste land development projects of NWDB
Energy/Coal	o Solar Energy Centre o Energy Development Agencies	o R&D for energy plantations and agricultural waste utilisation o Training for Environmental Management of Power Projects o R&D for commercialisation of waste disposal
Urban Development		o Environment improvement of Urban Slums o Urban basic services o Integrated development of small and medium towns o NCR for Delhi 0 Low cost sanitation & small towns water supply schemes

Ministry/Departments	Organisational Set-up	Activities
Science and Technology	o Department of Bio-technology o Department of Ocean Development o Technology Information, Forecasting and Assessment Council o National Centre for Medium Range Weather Forecasting o Indian Vaccine Corporation Ltd. o Bio-technology Consortium Ltd. o CSIR Organisations	o Training/HRD in Bio-technology o National facilities for germ plasm collection o Technologies absorption/adoption scheme o Transfer and trading in technology scheme o Support for Research and Development o Support for Information Services 0 Support for Infra structure development o Support for Capacity Building
Special area development/Regional programmes		o Hill area development programme o Desert Development Programme

Source : MoEF (1993)

In *Situ* Conservation

2.2 Institutionalised management of biodiversity in situ started with the establishment of the first National Park in the country, the Hailey NP (now Corbett NP) in 1935. Following this, more than 300 PAs were set up representing a wide range of ecosystems. The Wildlife Institute of India proposed a biogeographic classification system recognising ten zones divided into 25 provinces in which over 300 landforms were identified. The existing network of PAs was evaluated for its representativeness vis-a-vis the classification system. Sites were identified to fill the gaps and the suggested network recommended 148 National Parks and 503 Sanctuaries covering 15 1,000 sq. kms which is about 4.6% of the country's total geographic area. These suggestions have found extensive support and already 4.2% of the total geographical area (excluding the open seas) has been brought under the system of Protected Areas (PAs). Currently there are 85 National Parks covering 35,919.03 sq. km and 448 Wildlife Sanctuaries covering 112,274.45 sq. kms in the major biogeographic zones of India. The total cxtent of PAs includes 5 designated as World Heritage Sites, 9 Biosphere Reserves and 6 Ramsar sites.

2.3 Institutionalised efforts at *in situ* conservation of endangered animals were initiated in the country about 20 years ago with the launching of Project Tiger. An all-India tiger census conducted in 1972 revealed that there were only 1,827 tigers in the country as against an estimated 40,000 at the turn of the century. Taking this as an indication of the deteriorating health of India's wilderness, the Government of India launched the Project Tiger in 1973 with the support of WWF-International. Twenty three PAs in the country have been designated as Tiger Reserves. The 1993 census placed the tiger population at 3750. MoEF has initiated the 1997 tiger census which is currently ongoing.

2.4 The tiger has not been the only beneficiary - a number of other endangered species such as the swamp deer, elephant, rhino and wild buffalo have received protection through Project Tiger. This programme has thus had a direct impact on conservation of biodiversity. The enhanced programmes introduced in the second phase of Project Tiger include the establishment of guidelines for tourism in tiger reserves, management of buffer areas, integration of local populations through eco-development programmes and establishment of Nature Interpretation Centres.

2.5 India holds the largest number of Asian elephants with 20,000 - 24,000 in the wild and nearly 3,000 in captivity. The state of the elephant in India was officially recognised in 1990 by the Government of India when MoEF set up a task force to prepare the baseline document for a conservation project on the species. The task force identified several elephant reserves throughout the country in addition to providing the basic guidelines for management. *'Gajatame'* or Project Elephant covering all the elephant states in the country was formally launched in 1992 based on these recommendations.

2.6 Other special conservation programmes have also been initiated, and these include the Indian Rhino, Lion, certain primates (Indo-US Primate Project in Northeast India), and aquatic mammals especially river dolphins.

2.7 *In situ* conservation of selected species of birds and reptiles have been fortified through captive breeding programmes. An Indo-British collaborative programme undertook captive breeding of the endangered white-winged wood duck. Captive bred and reared ducks have been released in PAs in Northeast India. Habitat improvement programmes for the conservation of wetland birds in PAs such as the Keoladeo Ghana (Bharatpur) are ongoing.

2.8 The Government of India started the crocodile breeding and management project in 1976 with FAO - UNDP assistance to save the three endangered crocodilian species namely, the fresh water crocodile, salt water crocodile and the rare *gharial*. The project surveyed the remaining crocodile habitats and facilitated their protection through declaration of sanctuaries and national parks. Captive breeding and reintroduction or restocking programmes involved the careful collection of eggs from the wild. Thousands of crocodiles of the three species have been reared at 16 centres and several of these have been released in the wild. Eleven sanctuaries have been declared

specially for crocodile protection including the National Chambal Sanctuary in Madhya Pradesh, one of the largest in India.

2.9 More than 30 species of turtles and tortoises are known in India. Countrywide surveys have been carried out on their present status and distribution. Forest departments, autonomous institutions, universities and NGOs are jointly working on the conservation of turtles and tortoises in India.

world. A programme to tag and monitor the nesting turtles has been launched by the Wildlife Institute of India (WII) in collaboration with the M.S.Swaminathan Research Foundation (MSSRF). This programme which is sponsored by NORAD aims at tagging at least 15,000 adult turtles of the species. Throughout the country, turtle breeding beaches are being protected and monitored by the respective forest departments. Students in the city of Chennai have founded a Sea Turtle Conservation

2.10 Captive rearing of fresh water turtles for reintroduction is being undertaken in the Chambal Valley by the Uttar Pradesh State Forest Department. This is one of the major fresh water turtle conservation programmes in India. The Gahirmatha beach in the state of Orissa is the largest rookery for the Olive Ridley Turtle in the

Group to monitor and protect sea turtles that breed along the coasts of the city. UNDP/GEF through their Small Grants Programme have initiated a project in Orissa for demonstrating the use of turtle exclusion devices (TED) in trawlers as an effort to protect turtles that arrive to breed.

Wildlife Sanctuaries and National Parks

State/Union Territory	Sanctuaries		National Parks	
	Total No.	Area (sq. km)	*Total No.*	Area *(sq. km)*
Andaman and Nicobar Islands	94	372.15	8	900.77
Andhra Pradesh	21	1 1 8 3 2 . 5 4	4	372.23
Arunachal Pradesh	9	6177.45	2	2468.23
Assam	8	990.58	2	930.00
Bihar	19	3881.75	2	567.32
Goa	4	355.18	1	107.00
Gujarat	21	16970.16	4	479.67
Haryana	10	342.65	1	1.43
Himachal Pradesh	30	4702.87	2	1295.00
Jammu and Kashmir	15	10157.67	4	3900.07
Kamataka	20	4238.21	5	2471.98
Kerala	12	2143.36	3	536.52
Madhya Pradesh	32	10567.05	11	6485.72
Maharashtra	25	13995.49	5	958.45
Manipur	1	184.85	2	81.00
Meghalaya	3	34.21	2	267.48
Mizoram	3	560.00	2	250.00
Nagaland	3	24.41'	1	202.02
Orissa	18	6214.96	2	1212.70
Punjab	6	294.82	0	0
Rajasthan	22	5662.87	4	3856.53
Sikkim	4	92.1	1	850.00
Tamil Nadu	17	267 1.03	5	401.63
Tripura	4	603.62	0	0
Uttar Pradesh	29	8 107.52	7	5429.83
West Bengal	15	1055.55	5	1692.65
Daman and Diu	1	2.18	—	—
Delhi	1	13.20	—	—
Chandigarh	1	25.42		—
Dadra and Nagar Haveli	—	—	—	—
Lakshadweep Islands	—	—	—	—
Pondicherry	—	—	—	—
Total	448	**112,274.45**	85	**35,919.03**

Source : MoEF(1997)

2.11 The Biosphere Reserves programme was launched by MoEF in 1986. The primary objective of this programme was to identify representative ecosystems which are still in pristine condition and strengthen the conservation efforts keeping in view the livelihood needs of the people. The various implications and facets of this issue are being debated through a consultative process.

Biosphere Reserves

Biogeographic Region	Name of the Biosphere Reserve & State / Union Territory	Area in sq. km	Date of setting up
West Himalayas	Nanda Devi (Uttar Pradesh)	2236.74	18.1.88
East Himalayas	Nokrek (Meghalaya)	80.00	1.9.88
	Manas (Assam)	600.00	14.3.89
	Dibru Saikova Duar (Assam)	765.00	28.7.97
	Dehang Dibang (Arunachal Pradesh)	5111.5	2.9.98
Gangetic Plains	Sunderbans (West Bengal)	9630.00	29.3.89
Coasts	Gulf of Mannar (Tamil Nadu)	10500.00	18.2.89
Western Ghats	Nilgiri (Karnataka, Kerala & Tamil Nadu)	5520.00	1.8.86
Islands	Great Nicobar (Andaman and Nicobar Islands)	885.00	6.1.89
Deccan Pennisula	Similipal (Orissa)	2750.00	21.6.94

Source : MoEF(1996-97) modified

Tiger Reserves

Name	State	Area in sq.km
Bandipur	Karnataka	866.00
Corbett	Uttar Pradesh	1316.00
Kanha	Madhya Pradesh	1945.00
Manas	Assam	2840.00
Melghat	Maharashtra	1597.00
Palamu	Bihar	1026.00
Ranthambore	Rajasthan	1334.00
Similipal	Orissa	2750.00
Sunderbans	West Bengal	2585.00
Periyar	Kerala	777.00
Sariska	Rajasthan	866.00
Buxa	West Bengal	759.00
Indiravati	Madhya Pradesh	2799.00
Nagarjunasagar	Andhra Pradesh	3568.00
Namdapha	Arunachal Pradesh	1985.00
Dudhwa	Uttar Pradesh	811.00
Kalakad - Mundanthurai	Tamil Nadu	800.00
Valmiki	Bihar	840.00
Pench	Maharashtra	758.00
Dampha	Mizoram	500.00
Panna	Madhya Pradesh	542.00
Bandhawgarh	Rajasthan	1162.00
Taroba	Maharashtra	620.00
Total		**33046.00**

Source : MoEF(1996-97)

2.12 Realising the importance of conserving ecosystems such as wetlands, mangroves, and coral reefs, a National Committee was constituted by MoEF in 1986 to advise the Government on policy guidelines for implementing programmes on conservation, management and research in the identified areas. 15 mangrove areas and 4 coral reefs have been identified for intensive conservation and preparation of management action plans. UNDP/GEF have supported projects for the preparation of management plans for coral reefs in the Gulf of Mannar and Andaman and Nicobar Islands. A training project to build capacity in mapping, identification and management of coral reefs has been negotiated and finalised with Australian Aid.

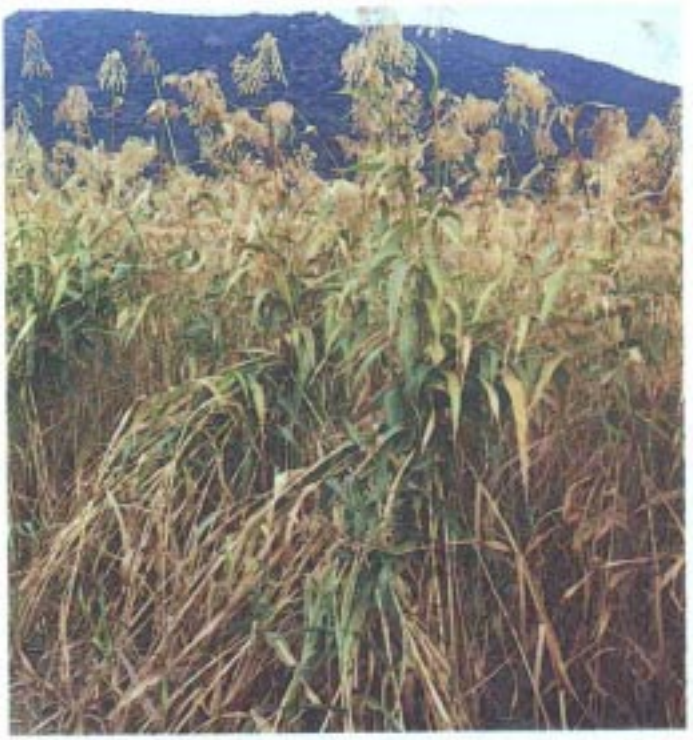
2.13 There are a number of NGO initiatives for *in situ* conservation in the country. One of these is the WWF-India's Community Biodiversity Conservation Programme. This programme which has supported 46 projects throughout the country primarily focuses on *in situ* conservation of habitats, species and biodiversity conservation traditions of local communities with the active participation of the people.

2.14 NGO initiatives have focused on medicinal plant conservation. The Medicinal Plant Conservation Area programme (MPCA) of the Foundation for Revitalisation of Local Health Traditions (FRLHT) has identified natural areas rich in medicinal plants in south India. With the collaboration of the state Forest Departments of Kerala, Karnataka and Tamil Nadu and leading community health NGOs, the FRLHT has established 30 MPCAs and is in the process of setting up 15 parks to store germplasm of threatened, rare and endemic medicinal plants.

In Situ On-farm Conservation

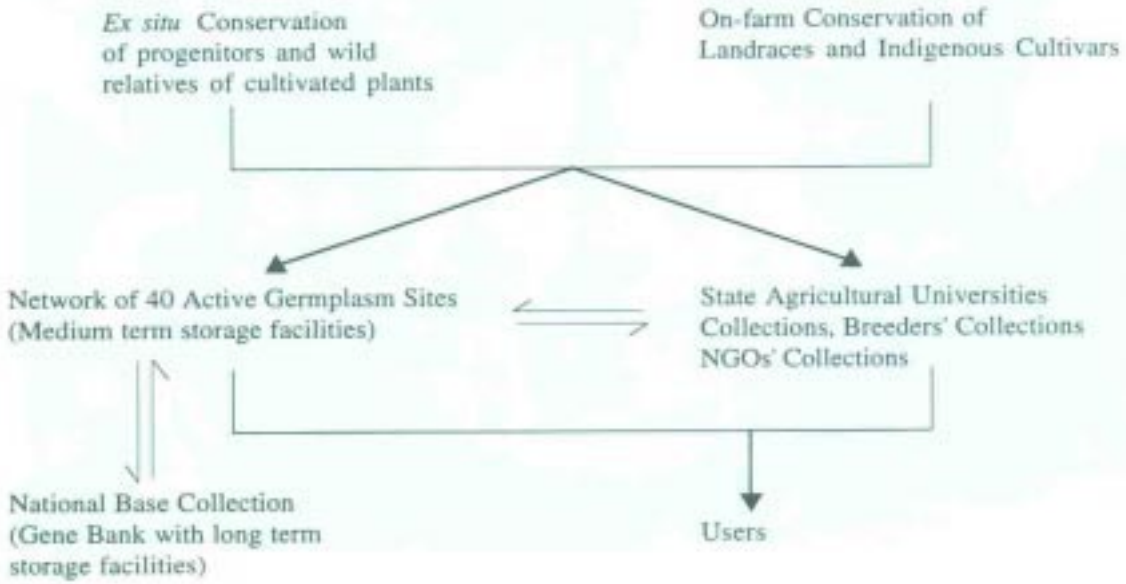
2.15 The complementary nature of *in situ* and *ex situ* conservation methodologies have become clear in recent years leading to advocacy of a holistic approach, combining these two technologies in suitable proportions that suit best in specific

situations, and also to the needs of species or species groups under attention. Whereas in situ methods provide for continuity of evolutionary process (creating of new variability and new species) and sustainable use of biodiversity, the *ex situ* techniques provide better safety under controlled conditions and easy access to and also more efficient use of collected genetic variability (independent of seasons). However, the main drawbacks of *ex situ* techniques are the cutting off of the evolutionary process in collected accessions, possible genetic erosion during rejuvenation/ multiplication and the results of system-failures.



2.16 On-farm conservation of agrobiodiversity is an important step in the integrated approach to conservation of genetic resources. Traditionally, farmers have conserved a variety of crops and landraces in their farms and home gardens.

Conservation of Agrobiodiversity in India



2.17 Recognising the need to strengthen the conservation traditions of farming communities, a number of steps have been taken by the NGO and Governmental sectors. One such NGO effort is the *Navdanya* movement which works with farmers for *in situ* conservation of crop genetic resources. This programme focuses on awareness in both the producer and consumer on the importance of sustainable agriculture and food security.

Ex Situ Conservation

2.18 *Ex situ* conservation of biodiversity in India was institutionalised with the establishment of Botanic Gardens and Zoological Parks. The tradition of Botanic Gardens dates back to 200 years when large spaces within major cities in India were set aside for the purpose. The Indian Botanic Garden at Calcutta was established in 1787. It now spreads over an area of 110 hectares and has around 15,000 plants belonging to 2,500 species. Besides the number of privately owned gardens, there are 33 Government managed Botanic Gardens in the country. The Botanical Survey of India is attempting to network these gardens. The Government of India has also initiated establishment of National Botanical Garden in NOIDA in Uttar Pradesh. This is the first National Garden for the National Capital Region.

2.19 The first zoo in India dates back to 1854, being the private zoo of a royalty. The first public zoo in India was established in Madras by the municipality. Current statistics place the number of zoos, animal parks, aquaria, etc., at 300. Species-oriented captive breeding programmes have been initiated in many of these zoos throughout the country. There are exclusive crocodile and turtle breeding parks established since the 1970s in India.

2.20 A Central Zoo Authority (CZA) has been set up under MoEF to provide guidelines to all zoos and monitor their activities. It also oversees the functioning of zoos which can sensitise the visitors about the need for protecting wildlife and habitats and carry out planned breeding of endangered species for augmenting their population in the wild. Captive Breeding Specialist Groups (CBSG) exist for a wide range of organisms in India.

2.21 The Government of India has finalised a National Zoo Policy for strengthening scientific and technical capacity for the management of zoos.

2.22 Besides the number of zoos and aquaria in India that conserve animals *ex situ*, NGOs have contributed by maintaining large collections of crocodiles, turtles/tortoises, snakes and lizards. Important NGO maintained reptile parks in India are Chennai Snake Park, Madras Crocodile Bank, Pune Serpentarium and Calcutta Snake Park.

2.23 Indian Council of Agricultural Research, an autonomous body established under GOI, has set up a number of gene banks for the *ex situ* conservation of plants and animals. Examples include the National Bureau of Plant Genetic Resources (NBPGR), the National Bureau of Animal Genetic Resources (NBAGR) and the National Bureau of Fish Genetic Resources (NBFGR).

National Bureau of Plant Genetic Resources: Mandate and Objectives

- Serve as the national organisation for collecting, exchanging, characterising, evaluating, documenting and conserving plant genetic resources.
- Provide quarantine services for exchange of seed and plant propagules.
- Undertake and promote characterisation, evaluation and documentation of germplasm collections of agri-horticultural crops, their wild relatives and their distribution to user scientists.
- Undertake and promote long-term conservation of plant genetic resources collections in genebanks employing *ex situ* seed, *in vitro* cultures and cryopreservation techniques and assist *in situ* conservation efforts.
- Develop and operate a national database and information network system on PGR; and
- Organise postgraduate training on PGR and short/medium-term training courses on diverse PGR activities at national, regional and international levels.

2.24 The Indian National Gene Bank (INGB) was established by the NBPGR to conserve the national heritage of germplasm collection in the form of seeds, vegetative propagules, tissue/cell culture, embryos and gametes.

The Indian National Gene Bank

- India is the original home of over 160 plant species including numerous major crops like rice, fruits and vegetables and spices. In addition, a large number of crop plants introduced here in remote past have been naturalised and diversified.

- The importance of safeguarding genetic resources has been recognised by India in its allocation of resources of the development of the Indian National Gene Bank (INGB). In 1996, a new building for the INGB became operational. The completed facility has provided long term storage for nearly 1.5 million samples of seeds or cultures.

- India's gene bank is managed and operated by the National Bureau of Plant Genetic Resources. Its functions include collection of indigenous germplasm, preservation of seeds and other propagules, seed increase and maintenance for distribution and exchange, and the safe keeping of duplicate germplasm holdings of other organisations.

- The INGB handles the genetic resources of nearly 200 cultivated plants and their wild relatives. Refrigerated modules currently store over 160,000 seed samples of different crops at -20°C (Base collection). In addition, cryotanks using liquid nitrogen (-196°C) hold some 1250 samples of small-seeded crops, gametes and embryonic axes. Tissue culture is used to preserve other vegetatively propagated material (850 samples covering 25 genera). This capacity for preservation of genetic material has been increased several fold in the new facility for the INGB.

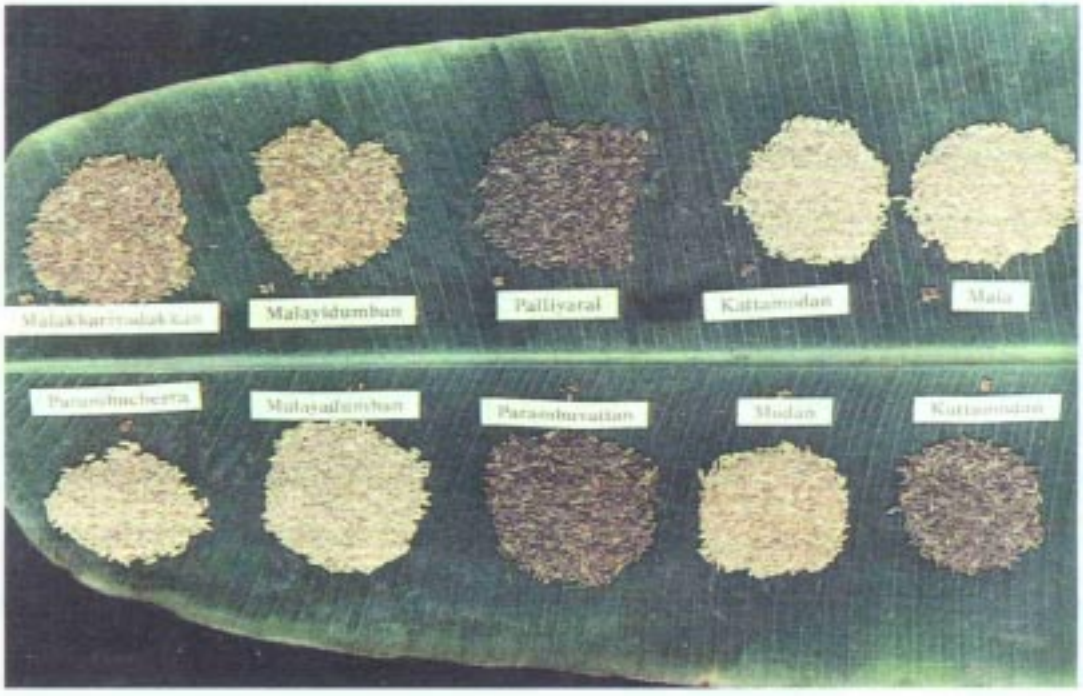
2.25 The INGB conserves

- primitive cultivars and land races of cultivated crops and vegetables associated with traditional agriculture and inbred lines of released hybrids
- released varieties and any survivor varieties
- wild species closely related to crop plants and
- genetic stocks and populations having desirable genes.

The Indian National Gene Bank Base Collections

Crop Groups	No. of Accessions
Cereals	67,613
Pseudo cereals	1,364
Millets & Minor millets	16,585
Oil seeds	24,857
Pulses	26,542
Fibre crops	5,872
Forage crops	24
Vegetables & Spices	9,225
Medicinal & Aromatic Plants	338
Narcotics	778
Released Varieties (Reference Samples)	949
Genetic Stocks (Registered Germplasm)	4
Safety Duplicates (Gene Banks of IARCs)	9,004
Total	**163,155**

Source : NBPGR Database, New Delhi, (As on 31 August, 1997)



Germplasm Facilities

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

i) The National Facility for Microbial Type Culture Collection at the Institute of Microbial Technology, Chandigarh, with over 1,600 cultures in its stock.

ii) 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.

iii) The National Facility for Marine Cyanobacteria at the Bharatidasan University, Tiruchirapalli, which is co-ordinating extensive surveys on the southern coast.

iv) The National Facility for Plant Tissue Culture Repository at NBPGR, 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.

v) The National Facility for Laboratory Animals at the Central Drug Research Institute, Lucknow and the National Institute of Nutrition, Hyderabad have made available quality animals for biomedical research and industry in the country.

vi) The National Facility for Animal Tissue and Cell Culture, Pune, an autonomous institution under Department of Biotechnology (DBT) has 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.

vii) 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 have been established. These banks will 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 co-ordinator for Asia and also the overall co-ordinator for the establishment of Gene Banks of Medicinal and Aromatic Plants among G - 15 countries.

viii) The Centre for Cellular and Molecular Biology has been undertaking the development and maintenance of DNA profiles.

2.26 The Department of Biotechnology supports ex situ conservation efforts through research programmes on germ plasm facilities, tissue culture pilot plants, biocontrol agents, biofertilisers, bioprospecting, clean technologies and bioinformatics.

2.27 Three national gene banks have been established under the G- 15 Gene Banks for Medicinal and Aromatic Plants Initiative: the Central Institute of Medicinal and Aromatic Plants, NBPGR and TBGRI.

2.28 One of the well known NGO initiatives in ex *situ* conservation of plants is *Navdanya* which has centres established in important biogeographic areas of the country such as the Garhwal Himalayas, the Deccan and the Western Ghats. Specialised Gene Banks have also been established by NGOs like MSSRF and TERI. The Community Gene Bank of the MSSRF has facilities for medium term cryopreservation of seeds, for the purpose of serving as a reference centre for documenting the contributions of tribal families in the conservation and improvement of local food grains.

National Bureau of Fish Genetic Resources (NBFGR)

India abounds in fish genetic resources that inhabit its river systems, wetlands, coastal areas and marine zones. Out of nearly 20,000 documented fish species of the world, 2200 fin fish species have been recorded in India from cold fresh waters of upper stretches of the Indus, the Ganges and the Brahamaputra (73 species), warm waters of its 14 major river systems draining the plains (544 species), brackish waters of estuarine areas (143 species) and marine waters of the three surrounding seas (1440 species). Twenty seven species are considered to be rare/endangered/ vulnerable.

The NBFGR, located at Lucknow and administrated by the Indian Council of Agricultural Research, is devoted to the conservation and sustainable utilisation of fish diversity in India with a mandate that includes:

- collection, classification, and evaluation of information on fish genetic resources of India;
- cataloguing genotypes;
- maintenance and conservation of fish germplasm in collaboration with other centres;
- conservation of endangered species; and
- monitoring the introduction of exotic fish species in Indian waters.

National Bureau of Animal Genetic Resources

The establishment of the National Bureau of Animal Genetic Resources (NBAGR) at Karnal in 1984 marked the beginning of India's formal efforts to conserve the livestock genetic resources in the country. The large infrastructure for research and conservation of indigenous germplasm of livestock includes state and central animal husbandry departments, species-specific institutes of the Indian Council of Agricultural Research (ICAR), and state agricultural universities. Many livestock farms maintain indigenous breeds which can form the nuclear herds for *in situ* conservation. Various bull mother farms and frozen semen banks are interlinked for *ex situ* conservation of semen of indigenous breeds for posterity.

With estimates from preliminary studies indicating that the current condition of India's animal genetic resources is threatened, greater emphasis is now being given to generate documentation of India's livestock. The following strategies have been proposed:

1. conduct a survey in the breeding tracts to understand the status of the breed and its utility and sustainability;
2. objectively characterise a breed by its morphological, productive and reproductive characteristics, and breed accreditation;
3. determine the geographic and demographic distributions of the breed and assess the need for conservation;
4. identify suitable germplasm for conservation;
5. create a repository on livestock information;
6. form breed societies with full participation of farmers as an important component in making the breed viable for ultimate conservation;
7. create a National Watch List of all the breeds of livestock and poultry found in the country, including the present status, demographic trends and conservation approaches; and
8. develop conservation programs using both *in situ* and *ex situ* methods.

To increase effectiveness of its conservation programmes, a comprehensive plan for 25 years has been prepared by the NBAGR. An All-India Network Programme was recently initiated to form linkages between the various organisations in the country associated with animal genetic resources and to best utilise the vast infrastructure and necessary labour for the genetic characterisation and conservation of indigenous germplasm that now face extinction.

2.29 India has over 400 million cattle - which is the world's largest population. However, the milk yield per animal is still very low. There is also heavy demand for grazing land leading to the under-nourishment of the cattle. Efforts are being made to improve the quality of cattle livestock while at the same time control the overall numbers thus minimising their impact on the environment. Institutions such as the National Bureau of Animal Genetic Resources have played a key role in this initiative.

in India include 45,000 micro-organisms and plants and 8 1,000 animals. Institutionalised efforts in identifying and cataloguing India's biodiversity began during the later half of the 19th century. Surveys of flora and fauna of the country started with the establishment of the Botanical Survey of India (BSI) in 1890 and the Zoological Survey of India (ZSI) in 1916. The BSI today functions with 9 circle offices and the ZSI with 16 regional stations distributed throughout the major biogeographic divisions of

Cryopreserved Germplasm of Indian Cattle and Buffalo Breeds

Cattle Breeds Herds (No.)	Organised Breeding Stations (Nos.)	Frozen semen Banks/Bull (Nos.)	Breeding Bulls doses	Available Frozen semen (000s)
CATTLE				
Sahiwal	10	5	15	80
Red Sindhi	18	3	13	25
Tharparkar	7	3	3	2
Gir	5	5	15	50
Hariana	18	5	21	54
Kankrej	6	5	27	5
Ongole	6	2	6	7
Rathi	1	1	1	10
Malvi	1	1	2	11
Nagori	1	1	2	7
BUFFALO				
Murrah	50	12	300	540
Nilli Ravi	2	2	8	17
Surti	5	8	80	160
Jaffarabadi	1	3	10	31
Mehsana	3	5	42	19

Source : NBAGR, Karnal.

Identification, creation of databases and monitoring of India's biodiversity

2.30 70% of the country's land area has been surveyed for biodiversity. The catalogued species the country. Other national institutions with regional facilities that contribute to the identification and cataloguing of biodiversity in India include the National Museum of Natural History.

Documentation of Biological Diversity

TAXA	Number of Species		Percentage of India to the World
	India	World	
Bacteria	850	4,000	21.25
Viruses	unknown	4,000	-
Algae	6,500	40,000	16.25
Fungi	14,500	72,000	20.14
Lichens	2,000	17,000	11.80
Bryophyta	2,850	16,000	17.80
Pteridophyta	1,100	13,000	8.46
Gymnosperms	64	750	8.53
Angiosperms	17,500	250,000	7.00
Protista	2,577	31,290	8.24
Mollusca	5,050	70,000	7.21
Arthropoda (Insecta, Crustacea, etc.)	60,383	1,065,000	5.67
Other Invertebrates (including Hemichordata)	8,329	87,121	9.56
Protochordata	116	2173	5.34
Pisces	2,546	21,723	11.72
Amphibia	206	5,145	4.00
Reptilia	485	5,680	8.54
Aves	1,228	9,672	12.69
Mamalia	372	4,629	8.03
Total	126,656	1,719,183	7.36

Source : UNEP-GBA (1995), MoEF (1997), ZSI and BSI

Endemic Species

Plants	
Group	No. of species
Pteridophyta	200
Angiosperms	4950
Animals	
Group	No. of species
Protozoa	
Parasitic	550
Free Living	90
Lepidoptera	9
Mollusca	
Land & Freshwater	967
Pisces	
Freshwater	64
Marine	14
Amphibia	123
Reptilia	182
Aves	60
Mammalia	44

Source : MoEF (1997), ZSI & BSI

2.31 Many autonomous institutions and universities have contributed to the identification and documentation of biodiversity. Important amongst these is the School of Entomology at the St John's College, Agra. Besides the pioneering work done on the high altitude Himalayan insects, the institution has also served as the largest facility in India for taxonomic capacity building in entomology in the country. State and regional floras have been identified, catalogued and documented by the Centre for Taxonomic Studies (Bangalore) and Rapinat Herbarium (Tiruchirapalli). Both these facilities are affiliated to the network of St Joseph's colleges. Centres for Advanced Studies (CAS) in different Universities in botany, zoology and marine biology established by the University Grants Commission (UGC) have added significantly to the knowledge of India's flora, fauna and micro-organisms both in the land and seas.

2.32 The Bombay Natural History Society (BNHS) during its over 100 years service has expanded the knowledge base of India's biodiversity resources. The Society houses one of India's largest collections of preserved plants and animals, in non-government sector. Also, noteworthy is the strong foundation that the BNHS laid for the science of studying Indian birds. The small mammal survey and the bird ringing programmes initiated by BNHS early this century are the earliest of the systematic efforts at monitoring any component of biodiversity in the country in the non-government sector. Some other NGOs including Centre for Ecological Sciences, MSSRF and FRLHT have added to our knowledge base of plants. Other NGOs have provided taxonomic service in the study of amphibians and reptiles.

2.33 International institutes in India such as the French Institute in Pondicherry and ICRISAT in Andhra Pradesh provide support in the identification and monitoring of biodiversity. The French Institute in collaboration with the respective State Forest Departments has published detailed vegetation maps

for most parts of the country. These maps are being increasingly used in monitoring habitat quality in the country. The French Institute also serves as a source of information on the flora of the Western and Eastern Ghats. ICRISAT focuses on the identification and cataloguing of agrobiodiversity in semi-arid tropics.

2.34 Identification, cataloguing, creation of databases and monitoring have largely been at the level of species. Efforts to identify and build databases below the level of species in the past have primarily focused on domesticated biodiversity and agrobiodiversity. Institutions such as the National Bureau of Plant Genetic Resources (NBPGR), National Bureau of Animal Genetic Resources (NBAGR), National Bureau of Fish Genetic Resources (NBFGR), Indian Institute of Spices Research, Indian Institute of Horticultural Research, Central Plantation Crops Research Institute, Sugarcane Breeding Institute, Central Rice Research Institute and others besides maintaining large collections of live plant and animal germplasm, have identified and catalogued the genetic variations in these accessions. Although the primary focus of these bureaus and research institutions is on the *ex situ* conservation of plant and animal genetic resources, a wide network of *in situ* on-farm conservation facilities have also been established throughout the country. Further, these institutions periodically conduct surveys in the remote and biodiversity rich parts of the country as that of the Eastern Himalayas, Western Ghats and islands to collect, identify and conserve plant and animal genetic resources. The Central Government has established a number of Active Germplasm sites in agricultural universities and research stations all over India to document and conserve genetic variation in cultivated plants.

India's National Active Germplasm (NAG) Sites

Crop	NAG site	No. of accessions
Wheat	Directorate of Wheat Research, Karnal	18,000
Rice	Central Rice Research Institute, Cuttack	42,000
Maize	Directorate of Maize Research Indian Agricultural Research Institute	2,500
Barley	Directorate of Wheat Research, Karnal	11,030
Sorghum	National Research Centre for Sorghum Rajendranagar, Hyderabad	5,160
Pearl millet	All India Co-ordinated Pearl Millet Improvement Project, College of Agriculture Shivajinagar, Pune	2,794
Small millet	All India Co-ordinated Small Millet Improvement Project, College of Agricultural Sciences, Bangalore	8,572
Pulses	Indian Institute of Pulses Research, (ICAR), Kanpur	9,310
Soybean	National Research Centre for Soybean, Indore	2,500
Oilseeds	Directorate of Oilseeds Research (ICAR) Rajendranagar, Hyderabad	15,629
Rapeseed	National Research Centre on Rapeseed & Mustard, Bharatpur	8,082
Groundnut	National Research Centre for Groundnut Timbawadi, Junagarh	6,432
Sugarcane	Sugarcane Breeding Institute, Coimbatore	3,979
Cotton	Central Institute for Cotton Research, Nagpur	6,896
Jute and allied fibres	Central Institute for Jute & Allied Fibres, Barrackpore	3,226
Vegetables	Directorate of Vegetable Research, Varanasi	16,139
Potato	Central Potato Research Institute, Shimla	2,375

Continued

Crop	NAG site	No. of accessions
Forages	Indian Grassland and Fodder Research Institute, Jhansi	6,267
Spices	National Research Centre for Spices, Mar'ikunnu, Calicut	2,847
Tobacco	Central Tabacco Research Institute, Rajamundry	1,500
Plantation crops	Central Plantation Crops Research Institute, Kasargod	307
Medicinal and aromatic plants	All India Co-ordinated M & AP Improvement Project, NBPGR, New Delhi	375
Agro-forestry	National Research Centre for Agro-Forestry, Indian Grassland & fodder Research Institute, Jhansi	40
Fruits (semi-arid)	National Research Centre on Arid Horticulture, Bikaner	541
Fruits (sub-tropical & temperate)	NBPGR Regional Station, Phagli, Shimla	454
Fruits	Indian Institute of Horticultural Research, Bangalore	13,118
Citrus	National Research Centre for Citrus Seminary Hills, Nagpur	51
Fruits (northern)	Central Institute for Horticulture for Northern Plains, Lucknow	587
Tuber crops	Central Tuber Crops Research Institute Sreekariyam, Trivandrum	3,586
Pseudo-cereals	NBPGR Regional Station, Phagli, Shimla	3,682

Source : Rana, R.S. (1995) Conservation of Plant genetic resources in India, NBPGR.

2.35 Over the centuries, India has also selected, bred and conserved a number of breeds of animals. In an effort to preserve the genetic diversity in domesticated animals, all these breeds have been catalogued and a list of the threatened breeds in the country has been prepared for further action.

List of Threatened Breeds of Animals in India

Species	Breed	Place of Origin
Cattle	*Hissar*	Hissar and Hansi areas of Haryana
Yechuri	*Kerala*	
	Siri	Sikkim, Nepal, Bhutan and adjoining hilly tracts
Buffalo	*Nili-Ravi*	Ferozepur district of Punjab
Mithun	-	Arunachal Pradesh, Nagaland, Tripura and Manipur
Yak		Ladakb, Panni, Lahul, Spiti, Garhwal and Sikkim
Goat	*Jamunapuri*	Etawah district and Chambal ravines
	Beetal	Gurdaspur district of Punjab
	Su *rti*	Gujarat and Maharashtra
	Chengu	Mountainous ranges of Spiti, Zanskar, Tibet Plateau and Upper ranges of Kashmir Valley
	Changathangi	Mountain ranges of Himalaya, Tibet and Ladakh
	Black Bengal	West Bengal, Bihar and Orissa
	Barbari	Agra and Aligarh districts of Uttar Pradesh
	Malabari	Kerala
	Osmananadi	Osmanabad in Andhra Pradesh
	Marwari	Marwari district of Rajasthan, Mehsana district of Gujarat

Continued

Species	Breed	Place of Origin
Sheep	*Nilgiri*	Tamil Nadu
	Mandya	Kamataka
	Magra	Rajasthan
	Lohi	Punjab
	Marwari	Rajasthan
	Patanwadi	Gujarat
	Deccani	Maharashtra
	Muzaffarnagri	Uttar Pradesh
	Gaddi	Himachal Pradesh, Jammu and Kashmir and Hills of Uttar Pradesh
	Nellore	Andhra Pradesh
	Chennai Red	Tamil Nadu
	Hissar Dale	Hissar Haryana
Horse	*Zanskari*	Ladakh
	Spiti	Spiti valley in Himachal Pradesh
	Bhutia	Sub-Himalayan tract from Punjab to Darjeeling and along the Tibet Border
	Manipuri	Manipur and Assam
	Marwari	Rajasthan and Gujarat
	Kathiawari	Rajasthan and Gujarat
Camel	*Double humped*	Ladakh
Poultry	*Aseel*	Andhra Pradesh
	Kadaknath	Jhabua and Dhar district of Madhya Pradesh
	Chagus	Andhra Pradesh and Kamataka
	Burra	Maharashtra and Gujarat
	Miri	Assam

Source : National Bureau of Animal Genetic Resources, Karnal.

2.36 The need for further strengthening the taxonomic capacity in the country has been highlighted time and again. It has been felt that such capacity should be built throughout India in a decentralised manner. In February 1997, MoEF sponsored a National Workshop on Capacity Building in Taxonomy in India, with the following main objectives.

- To discuss the importance of taxonomy in biodiversity conservation and sustainable development planning.
- To review the present status of taxonomic research in India.
- To assess the level of trained personnel available vis-à-vis the tasks involved in case of different groups of biota, both recorded and potential.
- To identify and inventory micro-organisms.
- To strengthen taxonomy curriculum in universities.

2.37 At this workshop, the experts emphasised the need for identifying centres of excellence in taxonomic research and launching an "All India Co-ordinated Project" to fill the gaps in knowledge. MoEF has already initiated the work relating to launching an All India Co-ordinated Project, identification of centres of excellence, creation of chairs in universities and databases on experts in taxonomy. A project has already been developed. Funding avenues for the project are being explored.

2.38 The Government of India through MoEF and partners has launched a series of programmes for inventorying and monitoring India's biodiversity. Important programmes being implemented by the BSI, ZSI, Forests and Fishery Survey of India are given below.

- Ecosystem Surveys - Himalayan, Forests, Marine, Islands, Deserts, Mangroves, Wetlands and Coastal
- Species Diversity Surveys - State Level for every major group of biota
- Conservation Area Survey - Biosphere Reserves, Project Tiger Areas, Marine Protected Areas, Large National Parks and Wildlife Sanctuaries
- Inventory of forest resources of India
- Vegetation maps of India
- Biannual reporting of forest cover of India
- Bamboo area estimation including growing stock
- Forest species composition in 10 cm diameter class interval.
- Estimation of fish resources within the EEZ of India and
- Monitoring landing data of major commercially important species.

Coastal and Marine Biodiversity

2.39 The major institutional support system that India has in identifying, creating databases and monitoring coastal and marine biodiversity is that provided by the National Institute of Oceanography (NIO), a Council for Scientific and Industrial Research (CSIR) institution in Goa, Central Marine Fisheries Research Institute (CMFRI) (ICAR institution with a few Regional Stations in the coasts and islands) and ZSI. Maritime fauna1 explorations are undertaken by ZSI stations in Port Blair, Chennai, Calcutta and Digha. The Dhiga station has also initiated the first National Marine Aquarium for public in the country. Institutional support in the identification and documentation of coral reef biodiversity has been provided by NIO, ZSI and CMFRI.

2.40 ZSI and BSI have contributed primarily to knowledge of estuarine biodiversity. The regional station of ZSI in Behrampur, Orissa has surveyed the Chilka Lake, Mahanadi estuary, Hooghly estuary and the Godavari estuary. Further south, the estuarine flora and fauna have been extensively studied and documented by the Centre for Advanced Studies in Marine Biology, Annamalai University in Parangipettai. SACON recently concluded a study on the status of sea grasses throughout the country.

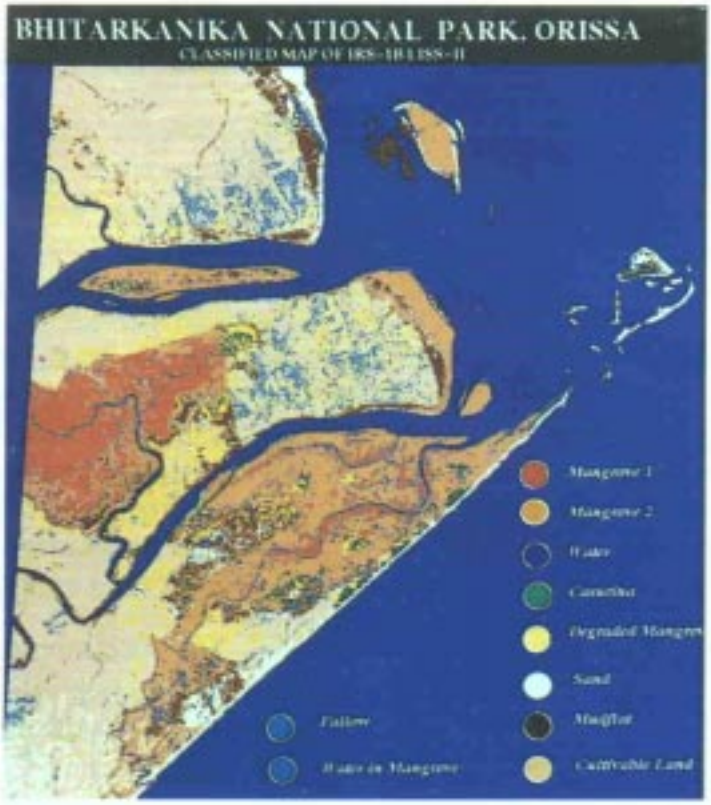
2.41 **The** Madras Science Foundation, an NGO, has conducted studies in the Krishna and Cauvery estuaries amongst others in south India. NIO and M.S. Swaminathan Research Foundation (MSSRF) have independently and collaboratively carried out extensive studies on the mangroves of the west and east coasts respectively. MSSRF has developed and maintained a database on Indian mangroves. Databases containing general information on marine fauna and flora are available with NIO, CMFRI, ZSI and BSI. The Annamalai University with the support of MoEF is also developing a database on Indian Mangroves.

2.42 National Remote Sensing Agency (NRSA) and such facilities in universities and institutions have launched a number of programmes to monitor India's coasts with the aid of satellites. Data thus generated have been used to monitor coastal vegetation, shoreline changes and movements of fish.

2.43 GEF supported programmes to conserve and monitor coral reefs in the Andaman and Nicobar Islands and the Gulf of Mannar have been initiated.

Island Biodiversity

2.44 Island ecosystem in India is broadly of two types: coraline as that of Lakshadweep in the Arabian Sea and submerged mountaintops harbouring tropical rainforests as in the Andaman and Nicobar Islands, Bay of Bengal. Submerged land mass between India and Srilanka has given rise to a set of islands in the Gulf of Mannar where coral reefs are distributed. Of the three groups of islands, rainforests and associated endemic island biodiversity is found only on the Andaman and Nicobar Islands.



2.45 The roles of ZSI, NIO, CMFRI and other institutions in inventorying and monitoring coral reefs were highlighted earlier. GOI has established and supported a number of institutions in inventorying and monitoring biodiversity in the Andaman and Nicobar Islands. The Central Agricultural Research Institute (CARI), an ICAR institute in Port Blair, is one such. Although agrobiodiversity is the primary mandate of CARI, it has contributed significantly to the study of insects, especially butterflies on the islands.

2.46 The Anthropological survey of India has a station in Port Blair. This facility inventorises and monitors tribal traditions, culture and people in the Andaman and Nicobar Islands.

2.47 BSI and ZSI have established regional stations in the Andaman and Nicobar Islands for inventorying and monitoring biodiversity. MoEF has financially aided autonomous Institutes such as SACON, University of Pondicherry and NGOs like MSSRF in the study of vertebrates on the islands.

2.48 NGO initiatives on the Andaman and Nicobar Islands also include the activities of Madras Crocodile Bank Trust (MCBT). MCBT has established a facility in the Andaman islands to study reptiles and amphibians and promote ecotourism. In collaboration with Kalpavriksh an NGO, MCBT has developed teaching aids to enable school teachers in the islands to monitor biodiversity. A network of local NGOs is being initiated in the Andaman and Nicobar Islands.

Forest Biodiversity

2.49 Forests in India are varied and widespread. According to the assessment of the FSI, the forest cover of the country is 633,397 sq. km (1997). This represents 19.27% of India's total geographical area. Forest cover and dynamics are being monitored by Forest Survey of India, NRSA and the French Institute (Pondicherry). Advanced techniques to obtain and analyse satellite data on forest cover and the application of GIS tools to classify and store the data are being used in India.

2.50 Forests in the Western Ghats, Eastern Himalayas and Northeast have been globally recognised as Biodiversity Hotspots. Regional stations of ZSI and BSI have been established in these biodiversity rich areas. Autonomous institutes such as the Tropical Botanical Garden and Research

Institute (TBGRI), Indian Institute of Science, Kerala Forest Research Institute (KFRI) and SACON are working in the Western Ghats. Wildlife Institute of India (WII) and G. B. Pant Institute work in the Himalayas. These institutes are being financially aided by MoEF.

2.51 A number of universities such as the University of Pondicherry, Northeastern Hill University, Banaras Hindu University and Guwahati University have ongoing programmes that inventory and monitor the biodiversity of Indian forests especially in the Himalayas, Islands and Western Ghats. BNHS, Ranthambore Foundation, FRLHT, MSSRF, TERI and SPWD are some of the NGOs that have ongoing programmes on inventorying and monitoring forest biodiversity in different parts of the country.

2.52 Many other government and autonomous institutions, universities, colleges and NGOs have contributed to the inventorying and monitoring of forest biodiversity in India. Considerable amount of data exists on angiosperms, butterflies and vertebrates. More and more of the lesser known organisms are being included in the inventorying and monitoring programmes.

Mountain Biodiversity

2.53 Montane ecosystems in the country are restricted to the Western and Eastern Himalayas and the southern Western Ghats. The G. B. Pant Institute of Himalayan Environment and Development, an autonomous institute of MoEF has primarily concentrated on biodiversity in the Himalayas. Important initiatives of the G. B. Pant Institute include the preparation of an Action Plan on Himalayan Biodiversity, and assessment of biodiversity using remote sensing. In addition it has proposed to undertake a medicinal plant conservation programme with the support of DBT and collaboration of NBRI and BSI.

2.54 The Wildlife Institute of India, Dehradun, an autonomous institute of MoEF also works in the Himalayas. Although the primary focus of WII is on the conservation of large mammals, the institute offers training to wildlife managers, offers wildlife forensic services to combat illegal trade of wildlife, supports ecodevelopment and EIA expert advise to activities in and around protected areas.

2.55 Biodiversity studies in the montane ecosystem of the Western Ghats have been

conducted by Centre for Ecological Sciences (Indian Institute of Science, Bangalore), SACON and WII. These autonomous institutions are being supported by MoEF, DBT and DST. Besides these institutes, organisations which are active in the Western Ghats include the French Institute (Pondicherry), Salim Ali School of Ecology (Pondicherry University), KFRI (Kerala), TBGRI, St. Joseph's College (Tiruchirapalli), BNHS and Palani Hills Conservation Council, an NGO.

Wetland Biodiversity

2.56 Inventorising and monitoring biodiversity in Indian wetlands have often focused more on migratory birds than any other group of organisms. The earlier projects of BNHS and the more recent countrywide Midwinter Waterfowl Census, popularised by the Asian Wetland Bureau (AWB) have generated enormous information on the distribution, status and dynamics of wetland birds.

2.57 A holistic approach to studying wetland biodiversity is being currently stressed. In 1990, MoEF laid the foundations for this by conducting a survey of the wetlands and publishing the first wetland directory (including paddy fields and mangroves). According to the survey, there are about 4 million ha of wetlands in India of which 2.6 million ha is man-made. In 1993 the WWF-India in collaboration with AWB further strengthened this by publishing a more detailed 'Directory of Indian Wetlands'. Such programmes are ongoing throughout the country wherein the focus on wetlands as important habitats is not exclusive to birds but broadened to include large animals such as crocodiles, rhinos and swamp deer and also plants, invertebrates, fish and amphibians. MoEF has identified SACON, WII and BNHS as institutional partners in monitoring Indian wetlands.

2.58 Under MoEF/UNDP sponsored Capacity 21 programme, a draft 'National Policy on Aquatic Ecosystems' has been proposed. The National Policy outlines an 'Action Plan for the Conservation and Wise Use of Indian Aquatic Ecosystems: 1997-2008'. The general objectives of the Action Plan are

- To obtain general acceptance, throughout India, of the Action Plan on Aquatic Ecosystems, at Central and State Government levels, and by relevant scientific, technical and technological bodies and Non Government Organisations.

- To develop and implement a broad planning approach to the conservation and wise use of aquatic ecosystems in India.
- To raise awareness throughout India and at all levels, of the functions and values of aquatic ecosystems.
- To reinforce the capacity of institutions throughout India to achieve conservation and wise use of the nation's aquatic ecosystems.
- To ensure the conservation and management of all protected aquatic ecosystems in India.
- To give protected area status to major aquatic ecosystems which are currently unprotected.
- To expand international and regional co-operation in conservation and wise use of aquatic ecosystems.
- To mobilise the financial assistance necessary for conservation and wise use of aquatic ecosystems.

Desert Biodiversity

2.59 In India there are hot and cold deserts. Inventorying and monitoring biodiversity in the cold deserts is primarily being undertaken by WII. The most comprehensive studies in the past have been of migratory birds by BNHS. Biodiversity in the hot deserts in India is being inventoried and monitored by ZSI and the Central Arid-Zone Research Institute (CAZRI) in Jodhpur. Considerable knowledge has been gained through these facilities on the reptiles, birds and mammals of the hot deserts.

2.60 Many other institutions including the Saurashtra University (Rajkot) and Aligarh Muslim University have contributed to the monitoring of desert biodiversity. An autonomous institute, Institute for Desert Ecology has recently been set up in the state of Gujarat.

Microbial Biodiversity

2.61 Assessment of microbial biodiversity has largely been carried out by the Indian Agricultural Research Institute (IARI) and the Institute of Microbial Technology (IMTech). Besides IARI and IMTech, several academic and research institutes and industries are engaged in exploring microbial diversity of agroecosystems, forest ecosystems, mangrove ecosystems, and others.

2.62 The agroclimatic zones of India and the distribution patterns of agroecosystems are expected to render a rich microbial biodiversity profile. Lack of adequate expertise and funding support to establish a network of laboratories in all agroclimatic zones have been identified as major gaps.

Conservation Prioritisation

2.63 Efforts have been undertaken from time to time in assigning conservation priorities to biogeographic zones, ecosystems and species. The Wildlife Institute of India in 1988, prepared a major plan for identifying areas of highest conservation priority and developing a network of protected areas throughout the country. In 1990, the Indian Institute of Public Administration completed a detailed study of status of protected areas in India highlighting conservation priorities. More recently, in 1997, WWF-India with the financial aid of the Biodiversity Support Program (USA) sponsored a countrywide project on conservation prioritisation of ecosystems and habitats. As part of this initiative, the Zoo Outreach Organisation, an NGO, in collaboration with SACON is conducting Conservation and Management Plan (CAMP) workshops to assess the status of species in India. CAMPs have so far been conducted on medicinal plants, mangroves, soil invertebrates, freshwater fish, amphibians, reptiles and mammals.

2.64 Since the 1980s BSI and ZSI have brought out Red Data Books on endangered plants and animals following the IUCN guidelines. These are being validated by cross verification against the existing databases and in the field and the information is being updated. More specifically, SACON in collaboration with the Birdlife International has initiated the process of preparing a Red Data Book exclusively on Indian birds.

Research and Training

2.65 In India, research and training in taxonomy and systematics were offered by many institutions

starting early this century. The Indian Council of Forestry Research and Education (ICFRE) an autonomous organisation of MoEF organises and manages research, education and extension in the field of forestry. The Indira Gandhi National Forest Academy (IGNFA) was established in May 1987 by upgrading the Indian Forest College. INGFA functions directly under MoEF. The Academy imparts in-service professional training to the Indian Forest Service officers. The Directorate of Forest Education is responsible for controlling, co-ordinating and managing all the regular training courses of State Forest Service and Forest Range Officers in the country. Indian Institute of Forest Management (IIFM) an autonomous organisation under MoEF was established in 1982. The objective is to provide training in management and related subjects for officers of the Indian Forest Service, Forest Departments, Forest Corporations and Forest related industries. The Wildlife Institute of India was established in 1982 as an autonomous organisation under MoEF. Besides carrying out research on various aspects of wildlife, the institute is also responsible for orienting and training in-service personnel at various levels of conservation and management of wildlife resources.

2.66 Since 1983 DOE/MoEF has financially aided a number of institutions throughout the country as 'Centres of Excellence' in the field of research and training in ecology and environment. Examples of such centres are Centre for Ecological Sciences (Indian Institute of Science) Bangalore, Centre for Environment Education, Ahmedabad, C P R Foundation for Environment Education, Chennai and Salim Ali Centre for Ornithology and Natural History (SACON), Coimbatore.

2.67 Academic Staff Colleges in Universities have initiated in-service training programmes for science teachers on biodiversity. Annual programmes are being organised throughout the country to sensitise and train policy makers starting at the level of villages to that of states in conservation of biodiversity. Training programmes on biodiversity are also being organised for the personnel of the Armed Services, Indian Forest Service (IFS) and Indian Administrative Service (IAS).

2.68 The major sources of funding in the Government of India for Science and Technology such as Council for Scientific and Industrial Research (CSIR), University Grants Commission (UGC), Department of Science and Technology (DST), Ministry of Environment and Forests (MoEF), Department of Space (DOS), Department of Ocean Development (DOD) and Department of Biotechnology (DBT) have earmarked funds

specially for supporting biodiversity research throughout the country.

Public Education and Awareness

2.69 The Supreme Court of India has ruled that each day, seven minutes of broadcast time on the national television network should be devoted to environment related programmes. MoEF has set up an Environmental Information System (ENVIS) to collect and disseminate information to researchers and the public through a network of 21 centres in the country. Twelve of these centres can be accessed through e-mail. ENVIS functions as a National Focal Point and a Regional Service Centre for the South Asian Sub Region Countries for INFOTERRA network,. a global information network of the UNEP. ENVIS has also been designated as the National Focal Point of Sustainable Development Network Programming of UNDP. ENVIS serves as the Clearing House Mechanism for CBD in India. It maintains a close liaison with other national information systems like National Information System on Science and Technology (NISSAT) and Biotechnology Information System (BTIS).

National Environmental Awareness Campaign

The National Environmental Awareness Campaign (NEAC) was started by MoEF in 1986 for creating environmental awareness at all levels of the society. Twenty seven organisations located throughout the country have been designated as Regional Resource Agencies for assisting MoEF in this campaign. Besides helping MoEF, these Agencies are also responsible for monitoring and evaluating the activities conducted by the various organisations under the NEAC.

A large number of NGOs, schools, colleges, universities, research institutions, women and youth organisations, army units, State Government Departments and others throughout the country are provided financial assistance for conducting a variety of public awareness programmes. Diverse target groups ranging from students, youth, tribals, rural populations, professionals and others are reached through the campaign.

2.70 MoEF interacts actively with the University Grants Commission (UGC), National Council of Educational Research and Training (NCERT) and the Ministry of Human Resources Development (MHRD) for introducing and expanding environmental concepts and issues in the curricula of schools and colleges. In the area of formal education, the National Policy on Education, 1986 stresses on creating consciousness about the environment. NCERT has been assigned the responsibility of developing a prototype syllabi and instructional material in ten core curricular areas, of which protection of environment is one. The Ministry of Human Resource Development has launched the Environment Orientation to School Education scheme, wherein special cells are created in the state departments ofeducation for environmental education. Support is also extended through this cell to NGOs to facilitate the development of locale-specific programmes and materials.

2.71 Some of the initiatives taken by MoEF in promoting Environment Education and Awareness (EE&A) through non-formal media and methods are :

- The National Environmental Awareness Campaign.
- Establishment of Centres of Excellence in Environmental Education.
- Establishment of National and Regional Museums of Natural History.
- Setting-up of Eco-clubs in Schools.

- Production and dissemination of Films, Audio-Visual and Popular Publications on Environment.
- Supporting organisation of Seminars, Symposia and Conferences on Environmental Issues.
- Institution of Awards and Fellowships.
- Establishment of ENVIS Centres.

2.72 The Paryavaran Vahini scheme was launched by the Ministry 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.

2.73 Besides the training and research facilities offered by MoEF through its Centres of Excellence to students, teachers and NGOs, there have been a number of initiatives by the government and organisations such as the WWF-India for promoting public education and awareness. Government initiatives have been many in this regard. One such of significance is that which made 'interpretation centres' in PAs and zoos mandatory. Most PAs in India currently have interpretation centres and printed literature (in local languages also) for education and awareness. CZA set up under MoEF provides support in developing appropriate skills in zoo education and interpretation facilities.

2.74 NGOs in India have played a vital role in raising awareness about the issues related to environment and development, and in mobilising people to take action. To this end, a variety of techniques and media are being employed. Many NGOs use traditional and folk media to communicate messages for peoples' action.

2.75 The Centre for Science and Environment (CSE), New Delhi has brought out four widely circulated volumes on the state of India's environment, in addition to a number of other publications. Ekalavya, Bhopal develops innovative school programmes and teaching material. Kalpavriksh organises awareness programmes and carries out campaigns on specific issues. Another major effort to educate farmers and rural communities about CBD is that of the Indian Institute of Management, Ahmedabad, through its network 'Honey Bee'.

Impact Assessment and minimising adverse impacts

2.76 In 1991, MoEF issued a notification under the Environment (Protection) Act, 1986, for the protection of the coastal areas, declaring coastal stretches as 'Coastal Regulation Zones' (CRZs) and regulating activities in the CRZs. Following the notification, all coastal States and Union Territories have prepared their respective Coastal. Zone Management Plans (CZMP). The Government of India has also set up a Standing Committee of the Island Development Authority under the Chairmanship of the Deputy Chairman, Planning Commission to review the progress of implementation and impact of programme development in the Indian islands.

2.77 In 1994, the Government of India through MoEF formally notified the Environmental Impact Assessment (EIA) under the Environment (Protection) Act 1986 and included under this 29 sectors which need to go through the procedure of EIA before implementing their developmental projects. However, much before this, MoEF had made ETA mandatory to major projects that were likely to impact the environment adversely. A few institutions supported by MoEF such as SACON and WII have permanently established EIA cells. The Environmental Protection Training and Research Institute (EPTRI) in Hyderabad undertakes EIA of developmental projects. It also provides training, consultancy, applied research and analysis services for polluting industries.

2.78 A national contingency plan to deal with oil spill disasters has been prepared. India has ratified Marpol 73/78 and adopted the provisions in the Merchant Shipping Act.

2.79 The Department of Ocean Development (DOD) designated as the nodal department to oversee the implementation of Chapter 17 of Agenda 2 1 has committed itself to introduce the

concept as part of a larger programme on Environment Capacity Building (ECB). MoEF is the co-ordinating agency. Under the Integrated Coastal and Marine Area Management (ICMAM) component, activities that have been planned for execution over five years include drawing up model ICMAM plans, formulation of Geographical Information System (GIS) for critical habitats such as mangroves and turtle breeding grounds and determination of the level of pollution in the coastal areas.

2.80 Tribunal benches, to legally combat environmental damages, have been proposed in major cities such as New Delhi, Mumbai, Calcutta and Chennai under the National Environmental Tribunal Act, 1995. The National Environment Appellate Authority Act, 1997 provides for the establishment of a National Environment Appellate Authority to hear appeals with respect to site restriction of developmental schemes and projects.

2.81 Minimising adverse impacts of intensive agriculture, animal husbandry and aquaculture on biodiversity has been a major concern in the country. Increasing efforts are being taken by both government, state agricultural universities and NGOs to develop programmes of integrated farming all through the country and especially in fragile ecosystems as that in the Himalayas and rainfed agriculture.

3.0 Access to Bioresources, Benefit Sharing and Incentives

Access to Bioresources and Indigenous Knowledge

3.1 Age old practices of medicinemen using plants dating back to 1500 BC have been documented in Indian literature. India still has a tremendous wealth of uncoded indigenous knowledge relating to the conservation and use of biodiversity. DOE/MoEF in 1982 launched a countrywide All India Co-ordinated Research Project on Ethnobiology (AICRPE) to identify and document such indigenous knowledge. The first phase of this project was completed in 1988. During this period, 18 institutions including national research institutes and laboratories, state universities and local colleges were involved and about 65% of the country's tribal areas were covered. The second phase launched in 1989 is still ongoing. Till date 80% of the country's tribal areas have been surveyed.

Text Sources of Indigenous Knowledge on Indian Medicinal Plants

S. No	Text Name	Time Frame	No. of Citations
1.	*Charaka Samhita*	*1500* **BC** - *400* **AD**	**12301**
2.	*Susruta Samhita*	**1500 BC - 500 AD**	**9584**
3.	*Astanga Sangraha*	*500* **AD**	**17898**
4.	*Astanga Hrdayam*	*600* **AD**	**9887**
5.	*Astanga Nighantu*	*800* **AD**	**2800**
6.	*Paryayaratnamala*	*900* AD	2577
7.	*Dhanvantari Nighantu*	*200* **AD - 1000 AD**	**3155**
8.	*Cakradatta*	*1075* **AD**	**15976**
9.	*Dravyagunasangraha*	*1075* **AD**	**529**
10.	*Madhavadravyaguna*	*1250* **AD**	**1054**
II.	*Sarngadhara Samhita*	*1300* **AD**	**5482**
12.	*Nigantu Sesa*	**1200 AD**	**3427**
13.	*Siddhamantra*	*1210 - 1247* **AD**	**1275**
14.	*Hrdayadipaka Nighantu*	*1260-1271* **AD**	**1323**
15.	*Madasnapala Nighantu*	*1374* AD	2562
16.	*Bhavaprakasa*	*1550* **AD**	**15180**
17.	*Bhavaprakasa Nighantu*	*1550* **AD**	**2253**
18.	*Raja Nighantu*	**1700 AD**	**7365**
19.	*Saligrama Nighantu*	**1896 AD**	**6452**
20.	*Siddabhesajamanimala*	**1896 AD**	**813**

Source : FRLHT

3.2 Before CBD, India's biodiversity resources were formally protected by the Indian Wildlife (Protection) Act -1972. Although this Act has been amended for the third time in 1991, it still does not cover the entire gamut of genetic resources, especially of plants and micro-organisms. While a number of vertebrates, invertebrates and plants declared as endangered and categorised under Schedule I in the Wildlife Act or in the **CITES** Appendices enjoy certain levels of protection, most animals and plants can be collected and transported within and outside the country without much restriction. This is true of even crop genetic resources.

3.3 The Government of India is in the process of finalising Biodiversity Act, to provide legal backing required to achieve the objectives of the Convention. A public debate on the subject has been generated. Pending enactment of a legislation, Government of India is promoting a code of conduct by the users of biological resources to ensure sustainable extraction and equitable benefit sharing in the spirit of the Convention.

3.4 NGO initiatives in documenting indigenous knowledge is considerable in India. The Centre for Science and Environment (CSE), *Navadanya, Sristi,* MSSRF, Centre for Indigenous Knowledge Systems (CIKS) and the Foundation for Revitalisation of Local Health Traditions (FRLHT) and many other local level NGOs and other institutions have taken pioneering steps in documenting indigenous knowledge. MSSRF has set up a Technical Resources Centre for implementing the provisions of CBD (with special reference to Article 8(j)).

Equity and Benefit Sharing

3.5 The Government of India has given the task of implementation of Capacity 21 Project in India to Indira Gandhi Institute for Development Research (IGIDR), which is an autonomous organisation. The project covers four areas of environment, namely, Air and Water quality, Common Property Land Resources and Biodiversity. The project is being implemented under the overall supervision of Ministry of Environment and Forests. IGIDR is collaborating with several other premier organisations in the country working in these areas.

3.6 Management strategies are being developed based on interaction with various stakeholders. Finally, guidelines will be prepared on valuation and policy aspects, while including perspectives of decision-makers from Ministries, the Planning Commission, scientific community and other stakeholders. These guidelines aim at incorporating principles of environmental economics in decision making.

3.7 Central and Regional Research Institutes (e.g. Regional Plant Resources Centre, Orissa), State Departments of Forest, Forest Research Institutes such as Kerala Forest Research Institute (KFRI), Fisheries and Agriculture have established facilities for the mass culturing (in part or whole) of plants and animals of commercial value to minimise pressure on natural populations. These are often managed by local communities and the benefits are shared.

3.8 MoEF has from time to time promoted regional consultations and workshops to discuss different methods of implementing the various provisions of CBD. Examples are the Asia Pacific Workshop on Biosafety held at Chennai in 1997 which was designed to promote the development of an internationally agreed biosafety protocol as stipulated under Article 19.3 and the South Asian workshop on Access to Biological Resources and Benefit Sharing (co hosted by the IUCN) and held in Chennai in 1998. This workshop was designed for promoting co-operation amongst South Asian countries in the implementation of Articles 8, 9 and 15 of CBD.

3.9 The "Preamble" of CBD recognises "the vital role that women play in the conservation and sustainable use of biological diversity", and affirms "the need for the full participation of women at all levels of policy-making and implementation of biodiversity conservation". The Agenda 21 (Chapter 24) reinforces the concerns of the Third World Conference on Women (Nairobi 1985) enunciated in the Forward Looking Strategies for the Advancement of Women. Agenda 21 stresses the need for strategies which will strengthen women's involvement in natural ecosystem management and control of environmental degradation, and lists activities that governments should undertake. These concerns have been reiterated in the Platform for Action adopted with the Beijing Declaration at the Fourth World Conference on Women (Beijing, China 1995). As a signatory and a major contributor to all these international agreements, the Government of India has placed special emphasis on integrating gender analysis and perspectives into policies and programmes for sustainable development, and ensuring equal participation of women and men at all levels of environmental decision-making. Some women's groups are actively engaged in documenting how women use bioresources (such as the different parts of a plant) in traditional health care practices. As part of a biodiversity prioritisation project, WWF-India together with the Centre for Ecological Sciences (Indian Institute of Science, Bangalore) and other collaborating institutions is currently studying gender aspects of biodiversity management.

3.10 By an amendment to India's constitution, provision has been made for representation of women in grassroots democratic institutions *(Panchayats and Nagarpalikas)* up to 33% of the total seats. These grassroots democratic institutions are being given the responsibility to protect and preserve the basic life support systems of land, water, flora, fauna and the atmosphere. Thus, steps have been taken to empower women socio-politically in matters relating to the management of natural resources

People's Participation and Incentives

3.11 The earliest institutionalised effort in the regeneration, sustainable use and management of degraded forests is the Participatory Forest Management (PFM) that was initiated by State Forest Department of West Bengal in the early 70s. This experiment that was started on 1272 ha area was managed by a Forest Protection Committee (FPC). The monetary returns from the experiment was shared by the Forest Department with the families that were involved. At the end of 1989, reports have placed the number of FPCs at 1200 together managing a total forest area of 152,000 ha which amounts to 37% of the forest area within the western circle of West Bengal.

3.12 The National Forest Policy, 1988 envisages people's involvement in the development and protection of forests to fulfil the objectives of providing fuelwood, fodder and small timber to local communities as well as to develop forests for improving the environment. In order to implement the policy prescription, MoEF issued guidelines in 1990 to involve the village communities in the development and protection of degraded forests on usufruct basis. The concept of PFM was accordingly initiated and endorsed by all States and Union Territories for operationalising the same by developing appropriate mechanisms. So far, 18 states have issued their resolutions for PFM. As per reports received from nine states, 4.05 million ha of degraded forests in the country are being managed and protected through approximately 40,300 village Forest Protection Committees (FPC).

3.13 To encourage people, institutions, communities, men and women to contribute to rehabilitation and conservation of elements of biological diversity, and reward excellence and achievement in these, several incentives and awards have been instituted by the Government.

Participatory Forest Management in West Bengal: The Arabari experiment

At a small research station at Arabari in Midnapore district of West Bengal, experiments were being conducted on sal, teak, eucalyptus, and other timber species. Efforts to study the growth and regeneration of trees were failing because local people kept grazing their cattle on the research plots and cutting the saplings for self consumption or sale. Frustrated by the constant disruptions, the forest officer began meeting with the local people of the surrounding villages to explore the possibility of obtaining their co-operation. After extensive discussions, it was concluded that any effort to protect and regenerate forests had to address the connection between poverty and deforestation. Further consultations with the village people led to a new arrangement guaranteeing their continued access to non-timber forest products (NTFPs), for example, fruit, leaves, mushrooms, twigs and fodder grass for consumption and for sale to generate household income. Also local people would receive a portion of the revenue from the harvest of the sal forests after they had regenerated.

After these initial discussions, the Arabari experiment (Socio-economic Forestry Project) in the east Midnapore forest division was initiated in 1972 with the following broad objectives:

- provide employment to forest fringe dwellers
- allow them to collect subsistence products from the forests
- give them the right to a portion of the sale proceeds from the harvest of the forest rehabilitated with their co-operation.

Approximately 1,272 ha of degraded government forests were selected for revival in 11 revenue villages. About 500 families with the total population of 2500 agreed to participate in the programme. In 1987-88,97 ha of the sal forest were harvested. After the operational expenses were paid to the forest department, a total of Rs. 604,887 was distributed to 618 families (@ Rs. 979 per family).

Source : Samar Singh ***et al*** (1997).

3.14 Commencing from 1983, DOE/MoEF have aided institutions in eco-development for biodiversity conservation. Subsequently there have been programmes implemented by the State Forest Departments for social forestry and eco-development in and around Protected Areas in selected parts of the country with the financial aid of international agencies such as SIDA, OCEF (Japan) and ODA (UK). Currently World Bank/ GEF have sponsored a programme on eco-development in seven PAs with the participation of the local communities. This is an attempt to mitigate the impact of PAs on people and vice versa. The programme is being implemented by the respective state forest departments. Initiatives on the sustainable harvest of Non-Timber Forest Produce (NTFPs) have been taken up by several institutions and NGOs throughout the country.

Incentives: recognition and awards

1. **Indira Priyadarshini Vrikshamitra (Friend of Trees) Awards**

Six of these awards are given every year to recognise pioneering and exceptional contribution of individuals/organisations in the field of afforestation and wastelands development under six categories, viz., individuals, village councils/village level institutions, educational institutions, voluntary agencies including womens' groups, youth groups, government agencies (district level and below) and corporate sector. Each award carries a cash amount of Rs. 50,000, a medallion, a scroll and a citation.

2. **B. P. Pal National Environment Fellowship Award for Biodiversity**

This Fellowship Award carries a grant of Rs.132,000 over two years. It is given to individuals for significant research and development contributions in the area of biodiversity.

3. **Desert Ecology Fellowship**

This Fellowship of Rs. 54,000 (one year's grant) is given in recognition of Bishnoi community's contribution to nature conservation and to encourage studies on Desert Ecology.

4. **Rajiv Gandhi Wildlife Conservation Award**

Two awards per year are provided to a) individuals and b) institutions. The individual award carries a fellowship of Rs.100,000 and a medal and the institutional award provides a fellowship of Rs.100,000 and a trophy.

5. **Dr. Salim Ali Fellowship for Avian Biology and Kailash Sankla Award for Mammal Study**

These awards are alternatingly offered and each award carries a monthly fellowship of Rs. 7,000.

4.0 Integrating Biodiversity Concerns in Sectoral Programmes

4.1 The National Conservation Strategy and Policy Statement on Environment and Sustainable Development, 1992 provides the basis for the integration and internalisation of environmental considerations in the policies and programmes of different sectors. It also emphasises sustainable lifestyles and the proper management and conservation of resources.

4.2 Important Central Acts relevant to Biodiversity are provided in a box (to follow). India's Environment Action Programme 1993, identifies conservation and sustainable utilisation of biodiversity in selected ecosystems as the first of seven priorities for future action. The Action Programme strengthens capabilities in the areas of environment assessment, increased environmental awareness and further facilitates the process of association of NGOs in the tasks of sustainable development. The process of strengthening is expected to further reinforce the functional areas of the Ministry of Environment and Forests as illustrated in the organisational chart (to follow) which have direct bearing on Programme for conservation and sustainable utilisation of biodiversity. Of direct significance to the process of biodiversity conservation is the programme for sustainable generation of NTFPs including medicinal plants initiated by the MoEF, and the tasks of afforestation, tree planting and eco-restoration being undertaken by the NAEB of the MoEF. To celebrate the 50th Anniversary of India's Independence, the NAEB initiated the Swarna Jaynti Kunj during 1997-98, whereby each village panchayat would take up plantations of 50 seedlings of popular demand in clusters in village common lands. The programme would involve planting of 25 million of seedlings spread over slightly more than 0.5 million villages of India by the 15th August 1998. A High-level Advisory Body called the National Environment Council was set up by the MoEF in 1993 under the chairmanship of the Prime Minister of India for conservation and sustainable management of biodiversity.

4.3 In line with the Government of India's thinking on the issue of popular participation for conservation and sustainable development, the EAP process adopted a decentralised system of generating information and perspectives. Consistent with the open approach of EAP, MoEF, the nodal agency for conducting EAP exercise, constituted an EAP Implementation Committee comprising the Ministries and Departments of GO1 concerned with the different sectoral issues to be addressed. The biodiversity relevant activities of the Departments of Ocean Development, Department of Biotechnology, Department of Science and Technology and the MPEDA coming under the Ministry of Commerce, as have been detailed in paras 4.4 to 4.7 explain the rationale of the inter-ministerial consultation process initiated as a part of the EAP exercise. The task of drawing up sectoral reports was also decentralised and assigned to non governmental institutes of academic excellence. The research institutions involved and the topics assigned to them are as follows:

Name of Institute	Sector
BNHS	Conservation of Wetlands, Coral Reefs and Mangroves
IIFM	Forestry
IIPA	Institutional Structures for Environmental Management Environment Education, Biodiversity/Wildlife Conservation
IIT, Mumbai	Environment Impact Assessment
IGIDR	Natural Resources Accounting
MIDS	Urban Environmental Management Strategy for Improvement of Tank Irrigation
NEERI	Clean Technologies, Water Quality
TERI	Alternate Energy, Action Plan

Important Central Legal Instruments Relevant to Biodiversity

1. Agricultural and Processed Food Products Export Development Authority Act, 1985186
2. Agricultural Produce (Grading and Marketing) Act, 1937
3. Air (Prevention and Control of Pollution) Act, 198 1
4. Cardamom Act, 1965
5. Coconut Development Board, 1979
6. Customs Act, 1962
7. Destructive Insects and Pests Act, 1914
8. Environment (Protection) Act, 1986
9. Fisheries Act, 1897
10. Foreign Trade (Development and Regulation) Act, 1992
11. Forest (Conservation) Act, 1980
12. Import and Export (Control) Act, 1947
13. Import and Export Control Act, 1947
14. Marine Products Export Development Authority, 1972
15. Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act, 1980
16. National Dairy Development Board Act, 1987
17. National Oilseeds and Vegetable Oils Development Board, 1983
18. New Seed Development Policy, 1988
19. Prevention of Cruelty to Animals Act, 1960
20. Rubber (Production and Marketing) Act, 1947
21. Seeds Act, 1996
22. Spices Board Act, 1986
23. Tea Act. 1935
24. Territorial Waters, Continental Shelf, Exclusive Economic Zones and Other Maritime Zones Act, 1976
25. The Indian Coffee Act, 1942
26. The Indian Forest Act, 1927
27. Tobacco Board Act, 1975
28. Water (Prevention and Control of Pollution) Act, 1974
29. Water (Prevention and Control of Pollution) Cess Act, 1977
30. Wildlife (Protection) Act, 1972 and Wildlife (Protection) Amendment Act, 1991

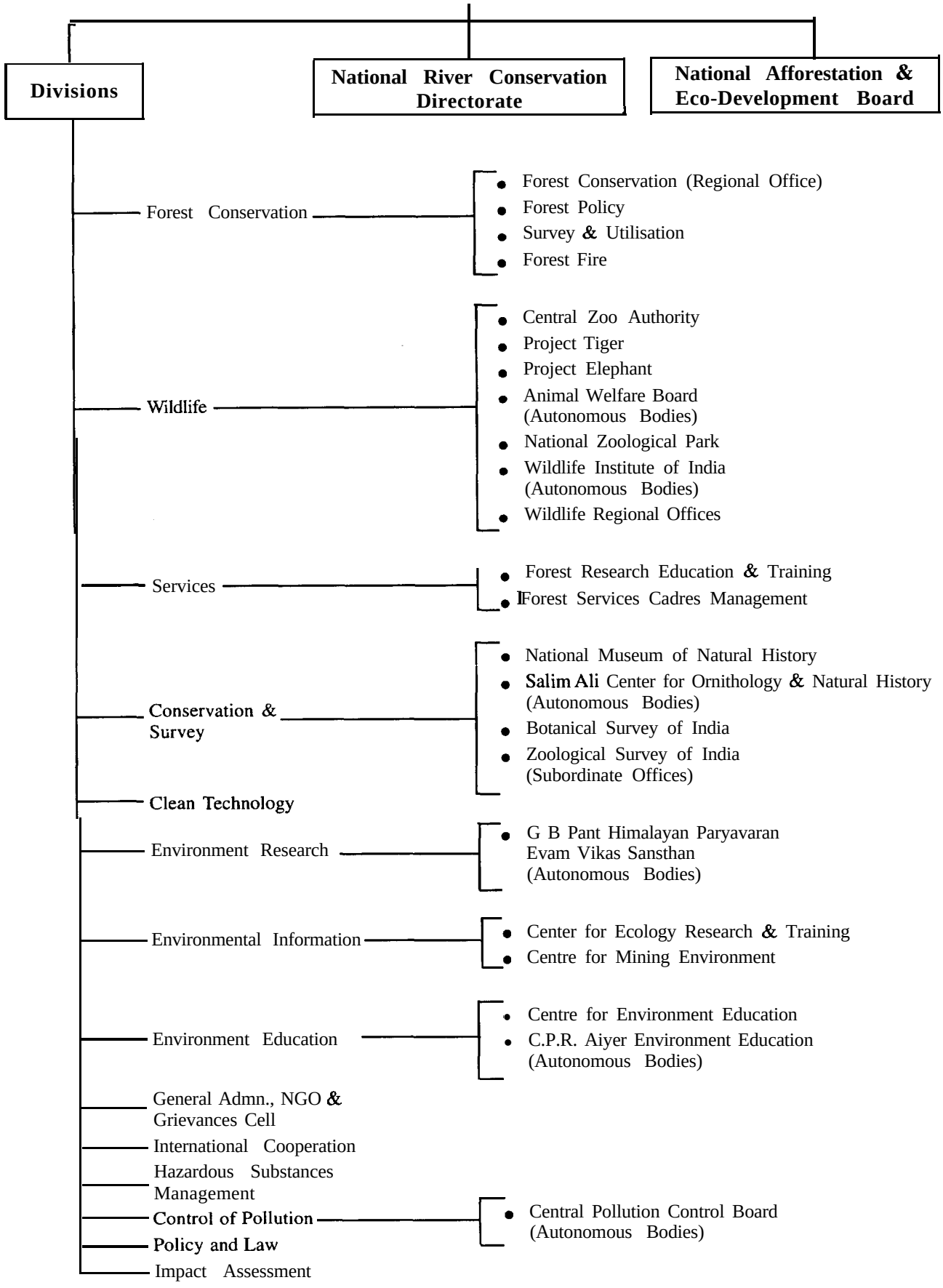
Source : MoEF (1997)

Government Sector

4.4 Concerted efforts are being made to identify culturable species which may provide the strategy to prevent over-exploitation of such resources from natural habitat. Considering increasing demand of frozen food from marine habitat, Marine Products Export Development Authority (MPEDA) has initiated a document on culturable marine species in collaboration with ZSI.

4.5 The Department of Ocean Development (DOD) while supporting an All India Co-ordinated Project on Drugs from the Ocean is also providing funds to promote research on regeneration of corals in the Andaman islands and sea weeds in Mandapam in Tamil Nadu.

Organisation Chart of the Ministry of Environment and Forests

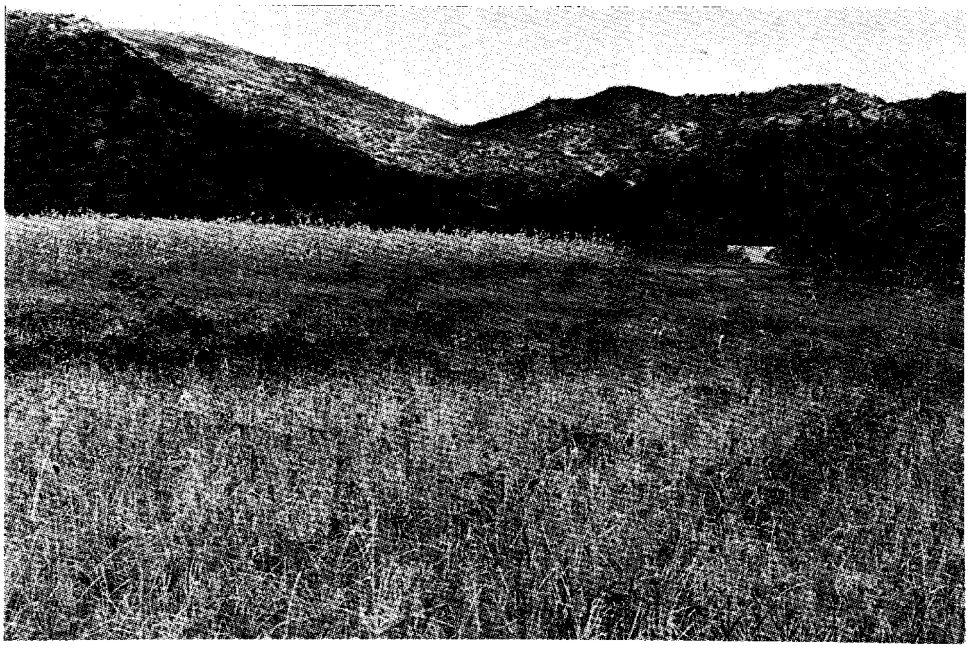


4.6 The Department of Biotechnology (DBT) supports a number of autonomous and non government institutions in setting up facilities for micro-propagation of endangered plants, especially medicinal plants. DBT also co-ordinates countrywide programmes on demonstration of biotechnologies at the farm level and in Integrated Pest Management.

4.7 The Department of Science and Technology (DST) and CSIR have sponsored research and development projects in the area of biodiversity conservation throughout the country. CSIR laboratories in the country have on-going programmes on conservation of medicinal plants, culturing of micro-organisms which are useful in soil reclamation and marine biodiversity.

Non Government Sector

4.8 As mentioned in the previous sections of the report, there have been a number of NGO initiatives to integrate biodiversity conservation in sectoral programmes in the country. A directory of active environmental NGOs published by the WWF recently lists 1400 NGOs spread across the country. The area of focus of a majority of NGOs has been in awareness building through a variety of methods and tools. Celebration of Environment days, *Vanamahostavs,* propagation of environment messages through traditional folk media, street plays, campaigns, and *Yatras* are some of the ongoing activities. NGOs have also played a significant role in functioning as facilitators between the tribal and rural communities and Government Departments. This is specially true in the case of conservation of important landraces. Some of the NGOs like *Sristi* and *Navdanya* have their own programmes for *in situ* conservation of crops. Some of the NGOs have also helped in building the capacity of local people in the technique. Many of the above mentioned activities are carried out through networks.



NGO Activities

Conservation	Sustainable Use	Access and Benefit Sharing
0 In situ	o Networking	0 Community co-operation
– Revitalizing traditions		
– Sacred groves (Medicinal Plants)	o Awareness creation	o Community-Industry linkages
– On-farm (Agrobiodiversity)	Women's organisation	
o Ex situ	Local community	o People's Biodiversity Registers
– Kitchen gardens (Medicinal Plants, agrobiodiversity)	Schools Teachers	o Empowering women
– Community gene banks	Policy makers	
– Live gene banks		o Policy recommendations
– Germ plasm collections	o Local administration	
– Parks and gardens		
o Evaluation	o Market linkages	
– Prioritisation		
– CAMP	o Value addition	
– Survey		
– Monitoring	0 Information	
o Activism		
– Public hearings		
– Campaigns		
– Awareness creation		
o Research		
– Captive breeding		

Academic Sector

4.9 One of the important steps taken by the academic sector in integrating biodiversity concerns with the existing programmes in universities and colleges is the attempt to introduce concepts of biodiversity in the curricula. A few autonomous institutions have already taken this initiative. Efforts are being made by National Council of Educational Research and Training (NCERT) to include lessons on biodiversity inventorying in the biology text books of higher grades of schooling.

4.10 The existing Centres of Excellence and Centres for Advanced Studies in Life Sciences are being strengthened by MoEF, UGC and CSIR to undertake research and training activities in conservation of biodiversity. The Indian Academy of Science and Indian Institute of Science have jointly launched a countrywide programme called India's Lifescape.

India's Lifescape Project

Recently, as part of countrywide biodiversity conservation initiatives to commemorate the birth centenary of the late Dr Salim Ali, India's foremost ornithologist and conservationist, a project has been launched by the Indian Academy of Sciences and the Indian Institute of Science to develop simple tools to help students and teachers identify and monitor biodiversity. This project has been called 'India's Lifescape'.

The main objective of the project is to enhance the quality of science education. It aims to publish illustrated accounts of 2500 to 3000 species of Indian micro-organisms, plants and animals. These accounts would help high school, college and post graduate students and teachers of biology reliably identify these species and thereby constitute a basis for field exercises and projects focusing on first hand observations of living organisms. The information thus generated could feed into a countrywide system of monitoring ongoing changes in India's lifescape to support efforts at conservation of biological diversity, as well as control of pests, vectors and diseases. These accounts would also help create popular interest in the broader spectrum of India's biological wealth.

Commercial Sector

4.11 Environmental Impact Assessment in India is mandatory to all developmental projects including those in the commercial sector. Under an agreement on development co-operation between the Government of India and the Government of Sweden the Environment Protection Training and Research Institute (EPTRI) was in 1991 established as an autonomous society. This institution offers training programmes especially to industries in the following areas.

- Environmental Impact Assessment and Management Planning
- Monitoring of Emissions and Effluents
- Environmental Policy Planning and Management
- Safety Management and Emergency Planning
- Toxic Chemicals and Hazardous Solid Waste Management.

4.12 The EPTRI also provides technology for common industrial effluent treatment, waste audit and minimisation, biological treatment of industrial effluents, application of microbiology in effluent treatment and environmental quality mapping and industrial zoning. The EPTRI has executed 49 consultancies for Central and State Governments, World Bank, State Pollution Control Boards and industries in environmental issues.

4.13 Besides, a number of corporate bodies in India, which use biological resources as primary raw material, have taken initiatives to conserve such resources. Examples include the cocoa germplasm collections of the Cadburys (India) Ltd, the tea germplasm of the Tata Tea and UPASI and the medicinal plant gardens of the Godrej (India) Ltd as that in Rajasthan supported by the State Government and Parry Agro Ltd.

4.14 Government issued a notification in 1989 entitled 'Rules for the Manufacture, Use, Import, Export and Storage of Hazardous Microorganisms/ Genetically engineered organisms under the Environment (Protection) Act 1986 to ensure *inter alia* safety in the development, handling, import and export of genetically modified organisms.

5.0 Some Major aspects of Implementation of Article 6

5.1 Article 6 of CBD stipulates that each Contracting Party develops National Strategies, Plans and Programmes for the conservation and sustainable use of biological diversity or adapts for this purpose existing strategies, plans or programmes which shall reflect, inter alia, the measures set out in this Convention relevant to the Contracting Party concerned; and integrates as far as possible and as appropriate, the conservation and sustainable use of biodiversity in the relevant sectoral or cross-sectoral plans, programmes and policies.

5.2 India had initiated the processes necessary for conservation and sustainable use of biodiversity much before CBD. These were reviewed and cross-sectoral policies and actions required for sustainable use and benefit sharing were outlined in the National Conservation Strategy and Policy Statement on Environment and Sustainable Development of 1992.

5.3 Following the ratification of CBD, India has taken important steps in developing new strategies and further strengthening those existing for the effective conservation and sustainable and equitable use of biodiversity. Some important post CBD developments are

- increased awareness cutting across the different stakeholder groups on conservation and sustainable use of biodiversity
- review of the existing strategies and policies and
- steps taken to plan and implement the insights or recommendations emanating from the review.

5.4 To carry forward the Agenda 21 of UNCED, India's Environment Action Programme of 1993 identified conservation and sustainable utilisation of biodiversity in selected ecosystems as the first of seven priorities for future action. The Action Programme strengthens capabilities in the areas of environment assessment, environmental awareness and the process of association of NGOs in the task of sustainable development.

5.5 The role of the Non Government Organisations in biodiversity conservation and sustainable use has received due recognition. A number of public hearings on environmental issues have been spearheaded by the NGO movement in India. Environment education and awareness creation through a range of social mobilisation activities has been one of the priorities of NGOs.

5.6 The system of Protected Areas in India was periodically reviewed and strengthened. The total area was 146,000 sq. km till 1993. This has since been increased to 148,193.5 sq. km. To prevent decline in forest areas, the Forest Conservation Act, 1980 was enacted, with the objectives of checking indiscriminate diversion of Forest lands in States for non-forestry purpose. Whereas 4.23 million ha. of forest land was diverted for non-forestry purpose during 1950 - 1980, at an annual average rate of 0.142 million ha., after 1980 the area diverted has come down to 0.016 ha. It is to be noted there even when diversion of forest lands is allowed, this is subjected to stringent environmental/ecological safeguards including compensatory afforestation measures. So far as against diversion of 0.43 million ha. of Forest lands for non-forestry purpose, compensatory afforestation of 0.55 million ha. has been stipulated.

5.7 In 1994, the Government of India under the Environment (Protection) Act notified the Environmental Impact Assessment of Development Projects to cover sectors which critically impact the environment. Such sectors need to undertake the procedure of EIA before implementing their developmental projects.

5.8 India hosted an International Consultation on Biological Diversity among SAARC, ASEAN and other countries of the region in 1994 to identify issues relating to the objectives of the Convention for implementation. In 1994, MoEF brought out a document entitled 'Conservation of Biological Diversity in India: An Approach', which basically outlined the work in progress and future course of action. A National Core Group with representation from diverse stakeholders was then created to

prepare a document for actions and strategies. The outcome of the consultation of the Core Group, supplemented by regional workshops with local level stakeholders, is a document entitled 'Draft National Policy and Action Strategy on Biological Diversity'. After being subjected to a National Consultation -with participation from sectoral Ministries and Departments, State Governments, experts, NGOs and technical institutions, the document is being consolidated for finalisation. The document provides a broad framework for actions and strategies for conservation and sustainable use of biodiversity. Consolidation and detailing of this document for viable action plans is visualised through a UNDP/GEF project.

5.9 The importance of safeguarding genetic resources has long been recognised by India. In 1996, a new facility was established in the Indian National Gene Bank with long term storage capacity of nearly 1.5 million samples of seeds and cultures.

5.10 In 1997 the Government of India brought out a White Paper on Pollution in Delhi with an Action Plan for pollution prevention and abatement for the city.

5.11 The Government of India has enacted the National Environment Appellate Authority Act, 1997 which provides for the establishment of a National Environment Appellate Authority to provide an appellate forum for cases relating to site restrictions, developmental schemes and projects.

5.12 Based on an assessment of gap areas that need strengthening, in 1997, MoEF sponsored a National Workshop on Capacity Building in Taxonomy wherein the need to launch an All India Co-ordinated Project was identified as a priority. The project has since been drawn up and funding avenues are being explored.

5.13 In 1997, MoEF/UNDP launched the Capacity 2 1 programme. As part of this programme, a draft National Policy on Aquatic Ecosystems has been developed. An action plan for the period 1997-2008 has also been' formulated: The programme has also identified economic valuation of biodiversity as a key to sustainable development in India.

5.14 Ministry of Agriculture has prepared a Draft Law known as the 'Plant Variety Protection and Farmer's Rights Act' to inter *alia* revitalise *in situ* on-farm conservation. MoEF has initiated steps for the preparation of a National Biodiversity Legislation. This proposed legislation will cover all biological resources in India.

5.15 India has continued to be in the forefront of all global initiatives that have culminated in various international conventions on environment and sustainable development. India has also been closely associated with the GEF movement since its inception and has demonstrated its resolve by supporting and strengthening GEF as a major global effort to address environmental challenges and threats. The first meeting of the GEF Assembly was held in New Delhi in April 1998.

5.16 GEF has extended support to 24 projects under the Small Grants Programme that address conservation and sustainable use of biodiversity. These projects in terms of thematic and focal areas are 20 on biodiversity and 4 on climate change, covering 12 States in India. Besides these are the GEF/World Bank sponsored eco-development programme currently operating in 7 PAs and the GEF/UNDP grants for preparing management plans for the coral reefs of Gulf of Mannar and Andaman and Nicobar Islands.

5.17 MoEF, has the nodal agency for implementing CBD in India, has taken the necessary steps to develop appropriate programmes. By identifying other ministries, departments, institutions and NGOs as partners, MoEF is making every effort to integrate the various provisions of CBD meaningfully in the conservation, sustainable use and equitable sharing of benefits in the country.

5.18 NGOs, academics andtechnical institutions, local people, industry and business are being actively involved in the development of issues and working out strategies of implementation which secure participation of all these stakeholders.

5.19 An Integrated Coastal Area Management System Programme has been started which strengthens the on-going initiatives relating to Coastal and Marine biodiversity.

List of Abbreviations

ACRP	Agro-Climatic Regional Planning Approach
AICRPE	All India Co-ordinated Research Project
AWB	Asian Wetland Bureau
BNHS	Bombay Natural History Society
BOBP	Bay of Bengal Programme
BSI	Botanical Survey of India
BTIS	Biotechnology Information System
CADP	Command Area Development Programme
CAMP	Conservation and Management Plan
CAR1	The Central Agricultural Research Institute
CAS	Centre for Advanced Studies
CAZRI	Central Arid-Zone Research Institute
CBD	Convention on Biological Diversity
CEE	Centre for Environment Education
CIKS	Centre for Indigenous Knowledge Systems
CITES	Convention on International Trade in Wild Species of Fauna and Flora
CMFRI	Central Marine Fisheries Research Institute
COP	Conference of Parties
CPCB	Central Pollution Control Board
CRZ	Coastal Area Regulation Zone
CSE	Centre for Science and Environment
CSIR	Council of Scientific and Institutional Research
CZA	Central Zoo Authority
CZMP	Coastal Zone Management Plans
DBT	Department of Biotechnology
DDP	Desert Development Programme
DOD	The Department of Ocean Development
DOE	Department of Environment
DOS	Department of Space
DST	Department of Science and Technology
EAP	Environment Action Programme
ECB	Environment Capacity Building
EE	Environmental Education
EE&A	Environment Education and Awareness
EEZ	Exclusive Economic Zone
EIS	Environmental Information System
ENVIS	Environmental Information System
EPTRI	Environmental Protection Training and Research Institute

FAO	Food and Agricultural Organisation
FPC	Forest Protection Committee
FRLHT	Foundation for Revitalisation of Local Health Traditions
GBA	Global Biodiversity Assessment
GEF	Global Environmental Facility
GIS	Geographical Information System
GO1	Government of India
HSM	Hazardous Substances Management
IARC	International Agricultural Research Centres
IARI	Indian Agricultural Research Institute
IAS	Indian Administrative Service
ICAR	Indian Council of Agricultural Research
ICFRE	The Indian Council of Forestry Research and Education
ICIMOD	International Centre for Integrated Mountain Development
ICMAM	Integrated Coastal and Marine Area Management
ICRISAT	International Crop Research Institute for Semi-Arid Tropics
IDBI	Industrial Development Bank of India
IFS	Indian Forest Service
IGIDR	The Indira Gandhi Institute for Development Research
IGNFA	Indira Gandhi National Forest Academy
IGNFA	The Indira Gandhi National Forest Academy
IIFM	Indian Institute of Forest Management
IIPA	Indian Institute of Public Administration
IMTech.	Institute of Microbial Technology
INFOTERRA	A Global Information Network of the UNEP
INGB	The Indian National Gene Bank
IUCN	International Union for Conservation of Nature and Natural Resources
KFRI	Kerala Forest Research Institute
LMO	Living Modified Organisms
MAP	Management Action Plan
MCBT	Madras Crocodile Bank Trust
MHRD	Ministry of Human Resources Development
MIDS	Madras Institute of Development Studies
MoEF	Ministry of Environment and Forests
MPCA	Medicinal Plant Conservation Areas
MPEDA	Marine Products Export Development Authority
MSSRF	M S Swaminathan Research Foundation
NAEB	National Afforestation and Ecodevelopment Board
NBAGR	National Bureau of Animal Genetic Resources
NBFGR	National Bureau of Fish Genetic Resources

NBPGR	National Bureau of Plant Genetic Resources
NCERT	National Council of Educational Research and Training
NCR	National Capital Region
NEAC	National Environmental Awareness Campaign
NEERI	National Environment Engineering Research Institute
NGO	Non Government Organisation
NIO	National Institute of Oceanography
NISSAT	National Information System on Science and Technology
NORAD	Norwegian Aid Society for International Development
NP	National Park
NRAP	National River Action Programme
NRSA	National Remote Sensing Agency
NRSE	New & Renewable Sources of Energy
NTFP	Non Timber Forest Produce
NWMP	National Watershed Management Project
ODA	Overseas Development Agency
PA	Protected Area
PBR	People's Biodiversity Register
PCRI	Pollution Control Research Institute
PFM	Participatory Forest Management
PGR	Plant Genetic Resources
SAARC	South Asian Association for Regional Co-operation
SACEP	South Asian Co-operation for Environment Programme
SACON	Salim Ali Centre for Ornithology and Natural History
SIDA	Swedish International Development Authority
SPCB	State Pollution Control Boards
SRS	State Forest Services Colleges
SSI	Small Scale Industries
TBGRI	Tropical Botanical Garden and Research Institute
TERI	Tata Energy Research Institute
UGC	University Grants Commission
UNEP	United Nations Environment Programme
WII	Wildlife Institute of India
WWF	World Wide Fund for Nature
ZSI	Zoological Survey of India

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(Printed at : Reliance Printers, Chennai, India.)