# JOHANNESBURG SUMMIT 2002

## INDIA

COUNTRY PROFILE


UNITED NATIONS

## INTRODUCTION - 2002 COUNTRY PROFILES SERIES

Agenda 21, adopted at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992, underscored the important role that States play in the implementation of the Agenda at the national level. It recommended that States consider preparing national reports and communicating the information therein to the Commission on Sustainable Development (CSD) including, activities they undertake to implement Agenda 21, the obstacles and challenges they confront, and other environment and development issues they find relevant.

As a result, in 1993 governments began preparing national reports for submission to the CSD. After two years of following this practice, the CSD decided that a summarized version of national reports submitted thus far would be useful. Subsequently, the CSD Secretariat published the first Country Profiles series in 1997 on the occasion of the five-year review of the Earth Summit (Rio + 5). The series summarized, on a country-by-country basis, all the national reports submitted between 1994 and 1996. Each Profile covered the status of all Agenda 21 chapters.

The purpose of Country Profiles is to:

- Help countries monitor their own progress;
- Share experiences and information with others; and,
- Serve as institutional memory to track and record national actions undertaken to implement Agenda 21.

A second series of Country Profiles is being published on the occasion of the World Summit on Sustainable Development being held in Johannesburg from August 26 to September 4, 2002. Each profile covers all 40 chapters of Agenda 21, as well as those issues that have been separately addressed by the CSD since 1997, including trade, energy, transport, sustainable tourism and industry.

The 2002 Country Profiles series provides the most comprehensive overview to date of the status of implementation of Agenda 21 at the national level. Each Country Profile is based on information updated from that contained in the national reports submitted annually by governments.

Preparing national reports is often a challenging exercise. It can also be a productive and rewarding one in terms of taking stock of what has been achieved and by increasing communication, coordination and cooperation among a range of national agencies, institutions and groups. Hopefully, the information contained in this series of Country Profiles will serve as a useful tool for learning from the experience and knowledge gained by each country in its pursuit of sustainable development.

## NOTE TO READERS

The 2002 Country Profiles Series provides information on the implementation of Agenda 21 on a country-by-country and chapter-by-chapter basis (with the exception of. chapters 1 and 23, which are preambles). Since Rio 1992, the Commission on Sustainable Development has specifically addressed other topics not included as separate chapters in Agenda 21. These issues of trade, industry, energy, transport and sustainable tourism are, therefore, treated as distinct sections in the Country Profiles. In instances where several Agenda 21 chapters are closely related, for example, chapters 20 to 22 which cover environmentally sound management of hazardous, solid and radioactive wastes, and chapters 24 to 32 which refer to strengthening of major groups, the information appears under a single heading in the Country Profile Series. Lastly, chapters 16 and 34, which deal with environmentally sound management of biotechnology, and transfer of environmentally sound technology, cooperation, capacity-building respectively, are presented together under one heading in those Country Profiles where information is relatively scarce.

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## LIST OF COMMONLY USED ACRONYMS

| | |
|---|---|
| ACS | Association of Caribbean States |
| AMCEN | Africa Ministerial Conference on the Environment |
| AMU | Arab Maghreb Union |
| APEC | Asia-Pacific Economic Cooperation |
| ASEAN | Association of Southeast Asian Nations |
| CARICOM | The Caribbean Community and Common Market |
| CBD | Convention on Biological Diversity |
| CIS | Commonwealth of Independent States |
| CGIAR | Consultative Group on International Agricultural Research |
| CILSS | Permanent Inter-State Committee for Drought Control in the Sahel |
| CITES | Convention on International Trade in Endangered Species of Wild Fauna and Flora |
| COMESA | Common Market for Eastern and Southern Africa |
| CSD | Commission on Sustainable Development of the United Nations |
| DESA | Department for Economic and Social Affairs |
| ECA | Economic Commission for Africa |
| ECCAS | Economic Community for Central African States |
| ECE | Economic Commission for Europe |
| ECLAC | Economic Commission for Latin America and the Caribbean |
| ECOWAS | Economic Community of West African States |
| EEZ | Exclusive Economic Zone |
| EIA | Environmental Impact Assessment |
| ESCAP | Economic and Social Commission for Asia and the Pacific |
| ESCWA | Economic and Social Commission for Western Asia |
| EU | European Union |
| FAO | Food and Agriculture Organization of the United Nations |
| FIDA | Foundation for International Development Assistance |
| GATT | General Agreement on Tariffs and Trade |
| GAW | Global Atmosphere Watch (WMO) |
| GEF | Global Environment Facility |
| GEMS | Global Environmental Monitoring System (UNEP) |
| GESAMP | Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection |
| GHG | Greenhouse Gas |
| GIS | Geographical Information Systems |
| GLOBE | Global Legislators Organisation for a Balanced Environment |
| GOS | Global Observing System (WMO/WWW) |
| GRID | Global Resource Information Database |
| HIV/AIDS | Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome |
| IAEA | International Atomic Energy Agency |
| ICSC | International Civil Service Commission |

| | |
|---|---|
| ICSU | International Council of Scientific Unions |
| ICT | Information and Communication Technology |
| ICTSD | International Centre for Trade and Sustainable Development |
| IEEA | Integrated Environmental and Economic Accounting |
| IFAD | International Fund for Agricultural Development |
| IFCS | Intergovernmental Forum on Chemical Safety |
| IGADD | Intergovernmental Authority on Drought and Development |
| ILO | International Labour Organisation |
| IMF | International Monetary Fund |
| IMO | International Maritime Organization |
| IOC | Intergovernmental Oceanographic Commission |
| IPCC | Intergovernmental Panel on Climate Change |
| IPCS | International Programme on Chemical Safety |
| IPM | Integrated Pest Management |
| IRPTC | International Register of Potentially Toxic Chemicals |
| ISDR | International Strategy for Disaster Reduction |
| ISO | International Organization for Standardization |
| ITTO | International Tropical Timber Organization |
| IUCN | International Union for Conservation of Nature and Natural Resources |
| LA21 | Local Agenda 21 |
| LDCs | Least Developed Countries |
| MARPOL | International Convention for the Prevention of Pollution from Ships |
| MEAs | Multilateral Environmental Agreements |
| NEAP | National Environmental Action Plan |
| NEPAD | New Partnership for Africa's Development |
| NGOs | Non-Governmental Organizations |
| NSDS | National Sustainable Development Strategies |
| OAS | Organization of American States |
| OAU | Organization for African Unity |
| ODA | Official Development Assistance/Overseas Development Assistance |
| OECD | Organisation for Economic Co-operation and Development |
| PPP | Public-Private Partnership |
| PRSP | Poverty Reduction Strategy Papers |
| SACEP | South Asian Cooperative Environment Programme |
| SADC | Southern African Development Community |
| SARD | Sustainable Agriculture and Rural Development |
| SIDS | Small Island Developing States |
| SPREP | South Pacific Regional Environment Programme |
| UN | United Nations |
| UNAIDS | United Nations Programme on HIV/AIDS |
| UNCED | United Nations Conference on Environment and Development |

| | |
|---|---|
| UNCCD | United Nations Convention to Combat Desertification |
| UNCHS | United Nations Centre for Human Settlements (Habitat) |
| UNCLOS | United Nations Convention on the Law of the Sea |
| UNCTAD | United Nations Conference on Trade and Development |
| UNDP | United Nations Development Programme |
| UNDRO | Office of the United Nations Disaster Relief Coordinator |
| UNEP | United Nations Environment Programme |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| UNFCCC | United Nations Framework Convention on Climate Change |
| UNFF | United Nations Forum on Forests |
| UNFPA | United Nations Population Fund |
| UNHCR | United Nations High Commissioner for Refugees |
| UNICEF | United Nations Children's Fund |
| UNIDO | United Nations Industrial Development Organization |
| UNIFEM | United Nations Development Fund for Women |
| UNU | United Nations University |
| WFC | World Food Council |
| WHO | World Health Organization |
| WMO | World Meteorological Organization |
| WSSD | World Summit on Sustainable Development |
| WTO | World Trade Organization |
| WWF | World Wildlife Fund |
| WWW | World Weather Watch (WMO) |

## CHAPTER 2: INTERNATIONAL COOPERATION TO ACCELERATE SUSTAINABLE DEVELOPMENT IN DEVELOPING COUNTRIES AND RELATED DOMESTIC POLICIES

**Decision-Making:** Almost all ministries of the Government of India are involved in decision making for sustainable development. Major participations are made by the ministries of: Environment and Forests; Agriculture; Water Resources; Finance; Industries; Rural Development; Commerce; Non Conventional Energy Sources; Health; Human Resources Development; and the Planning Commission. The Ministry of External Affairs is the political focal point for international negotiations on the subject. The authority for decision-making on a particular subject is bestowed upon the concerned the ministries of the Government of India. The Indian Constitution envisages a division of powers and functions between the centre and states. The Constitution was amended to provide powers to local bodies. In matters of international relations and cooperation the central government coordinates the overall decision making process and has the power to take final decisions. Coordination within the different bodies of the Government is mainly through consultative meetings and discussions. There are inter-ministerial and inter-departmental committees, Core Groups for coordination to formulate the optimum policy and legislation on issues concerning international cooperation/development assistance for sustainable development.

The Government has formulated legislation, regulations and policy instruments to address matters concerning cooperation for sustainable development at sub-regional, regional and International level. There are legislations, regulations and policy instruments framed to fulfill obligation under the agreements signed under the International Conferences, Multilateral Environmental Agreements (MEAs), etc.

The Ministry of Environment and Forests (MOEF) functions as a modal agency for United Nations Environment Programme (UNEP), South Asia Cooperation Environment Programme (SACEP), and International Centre for Integrated Mountain and Development (ICIMOD), International Union for Conservation of Nature and Natural Resources (IUCN) and various international agencies, regional bodies and multilateral institutions. India is signatory to the following important international treaties/agreements in the field of environment: International Convention for the regulation of Whaling; International Plant Protection Convention; Antarctic Treaty; Convention on Wetlands of International Importance; Convention on International Trade in Endangered Species of Wild Flora and Fauna; Protocol of 1978 relating to the international convention for the prevention of pollution from ships; Vienna Convention for the protection of the Ozone Layer; Convention on Migratory Species; Basel Convention on Trans-boundary movement of hazardous substances; Framework Convention on Climate Change; Convention on Conservation of Biodiversity; Montreal Protocol on the Substances that Deplete the Ozone Layer; and, International Convention for Combating Desertification.

All major groups identified in Agenda 21 are involved in decision making in different capacities. Their participation is ensured through consultative meetings and discussions at local, state and national levels. The Government has made public hearings mandatory for developmental projects wherein affected person; stakeholders are given opportunity of hearing/discussion before arriving at a decision. Public participation is also an important step in every major decision for social, economic and sustainable development. Bringing in transparency in decision making encourages participation. Major groups participating in international cooperation programmes include: civil society groups; NGOs; industrial associates; investigators; research institutions; advocates; etc. The Government facilitates the participation of various groups in decision-making in a more participatory manner.

**Programmes and Projects:** Several activities and programmes involving multilateral financing in India include:

*Global Environment Facility (GEF) through the World Bank, UNDP and UNEP*: India is the second largest recipient of GEF funding. The salient feature of the GEF portfolio are: a diverse and varied portfolio comprising projects that are environmentally, socially and financially sustainable; projects involving a range of issues and approaches to address the questions of innovation, experimentation, demonstration, cost effectiveness and replicability; projects that are country-driven, based on national priorities; capacity building, human resources and skills at the community level and into the Government.

*The Country cooperation Framework - I Environment Programme through the UNDP*: Development Objective. The thrust areas reflect the national policy and plan statements: management of natural resources; capacity building for decision making; management of development; and, information, advocacy and participation.
*Montreal Protocol*: The Protocol sets out a time-schedule for freezing and reducing ozone depleting substances (ODS) or controlled substances. A Multilateral Fund established by the parties to assist developing countries meet the control measures as specified in the Protocol assists the Government and the industry to design, implement, monitor and evaluate ODS phase-out projects and programmes in the aerosols/foam/solvent refrigeration and fire extinguishing sectors, covering large, medium and small scale enterprises. The MOEF is the national executing agency for the Institutional Strengthening projects for the phase-out of ODS under the Montreal Protocol. In Asia, India is number three in receiving funds for CFC phase out programme, next to China and Malaysia.
*Capacity 21 Initiative*: There is only one Capacity 21 Project in India, which is being implemented by the Indira Gandhi Institute for Development Research (IGIDR) through the Ministry of Environment & Forests. Its main objective is to build capacity at various levels of the Government, national institutes and the community at large through NGOs by introducing concepts of environmental economics into their resource use and planning decisions. Specific interventions of natural resource accounting through practical applications at policy and field levels include – Air quality, Water Quality, Biodiversity and Common Property Resources. IGIDR have come out with documentation on the above areas.
*Local Initiative Facility for Urban Environment (LIFE) Programme of UNDP*: The Programme of Action for Sustainable Development Worldwide, Agenda 21, was adopted by more than 178 governments at the Earth Summit in Rio de Janeiro in 1992. The LIFE was launched by UNDP at this Summit. The main goal of the programme is to help city dwellers to help themselves, to find local solutions to local problems.
*Sustainable Development Network Programme (SDNP)*: The SDNP is a UNDP initiative launched globally in 1990 to make relevant information on sustainable development readily available to decision-makers responsible for planning sustainable development strategies. There are several ongoing projects being implemented through various bilateral programmes, i.e. CIDA, IDRC, OECF/Japan, JICA, and other bilateral cooperation programmes with countries *inter-alia* including U.K., Norway, Sweden and Germany. Their main thrusts are: basic human needs; women in development; support to infrastructure; private sector development; environment; good governance; and, eco friendly goods and technologies. See also under **Capacity-Building, Education, Training and Awareness-Raising**.

**Status:** India believes that environmentally harmful processes should be stopped and that over-exploitation of non-renewable resources should be controlled. However, the specific production process to be used would depend upon the absorptive capacities and development priorities of the country concerned and hence, no global harmonized standard for production processes can be developed. The solution lies not in unilaterally banning trade, but rather in transferring technology and offering prices to developing countries for commodities, which would not then necessitate their overexploitation or jeopardize their development priorities.
The issue of technology transfer from developed to developing countries has been a recurring theme in all multi-lateral and bilateral negotiations/ discussions and is at the heart of the North-South divide. At the same time, efforts to develop a mechanism to carry out such a transfer have met with only moderate success so far. Indian research and development (R&D) efforts, unlike in the developed countries, has remained largely in the Government domain e.g. the CSIR and University laboratories. However, many private organizations have done remarkable R&D work especially in IT, Biotechnology and pharmaceutical sectors in the recent years. In India, initial steps have been taken through the National Productivity Council established with GEF assistance and UNEP as the implementing agency. The initiative however, has a limited scope in so far as it only addresses a small portion of the problem.
The largest shares of international cooperation are focused upon poverty eradication, natural resource protection and capacity building in that order. The amounts are miniscule compared to the needs of the country.
There is a need to further strengthen international cooperation to move towards sustainable development. India recognizes contribution of various multi-lateral and bilateral agencies in support of national efforts in this direction.

Some of the major challenges for building partnership with countries, which are in various stages of economic development, are inadequate implementation of commitments, transfer of technology, financial constraints market access and standards.
The programme areas/issues of Agenda 21 which require most immediate attention for bilateral/multi-lateral cooperation are fulfillment of obligations of transfer of technology, financial assistance, capacity building, public participation, involvement of NGOs and private sector, R&D institutions and scientific/business community. Some of the major challenges in building partnerships with NGOs and private sector scientific community include: the difficulty of recognizing the sustainable development as mutual goal; the lack of understanding of issues for achieving sustainable development; development of various tools/instruments and their implementation; and the paucity of financial resources.

**Capacity-Building, Education, Training and Awareness-Raising:** Capacity-building initiatives include: Environment Management Capacity Building Project (World Bank) (UNCTAD Project); strengthening of capacities for trade and environmental policy integration in India and trade environment investment (UNCTAD); and, strengthening of research and policy making capacity on trade and environment in development countries (UNCTAD). The following initiatives have been taken to promote public awareness on environmental issues in general they include awareness about international co-operation and sustainable development:
*Environmental Information Systems*: Since environment for sustainable development is a broad-ranging, multi-disciplinary subject, a comprehensive information system on environment has necessarily involved effective participation of concerned institutions/organizations in the country that are actively engaged in work relating to different subject areas of environment. Realizing the importance of Environmental Information, the Government of India, established an Environmental Information System (ENVIS) as a plan programme in December 1982, since when the focus of ENVIS has been on providing environmental information to decision makers, policy planners, scientists and engineers, research workers, etc. all over the country. A large number of nodes, known as ENVIS Centres, have been established in the network to cover the broad subject areas of environment. Similarly the Sustainable Development Networking Programme (SDNP) is a UNDP/IDRC initiative launched world-wide in 1990 to make relevant information on sustainable development readily available to decision-makers responsible for planning sustainable development strategies. SDNP-India is being implemented by the ENVIS a GOI programme, over a period of three years.

*Environment Education and Awareness Generation*: Capacity building initiatives by the GOI in various sectors relating to the environment are an ongoing process and form an integral part of most projects and programs on sustainable development. Steps are taken to involve NGOs in organizing orientation training courses for teachers. The two centres of Excellence, namely the Centre for Environment Education, Ahmedabad and the CPR Environment Education Centre, Chennai provide the backup support to the NGOs. GOI's efforts towards Non-formal Environmental Education & Awareness include: National Environment Awareness Campaign (NEAC); Eco-clubs; Paryavaran Vahinis; Publicity through State Transport Bus Panels; Seminars/Symposia/Conferences/ Workshops; Films on Environment related Areas; Communication & Awareness Programme of NAEB; Early Childhood Education Scheme started in 1982 to reduce the drop out rates and to improve the rate of retention of children in primary school in educationally backward areas of the States of Andhra Pradesh, Assam, Bihar, Jammu & Kashmir, Madhya Pradesh, Orissa, Rajasthan, Tripura and West Bengal. None of the government and civil society actions would mean much without the media. The GOI's Ministry of Information & Broadcasting, through the mass communication media consisting of radio, television, films, the press, publications, advertising and traditional mode of dance and drama plays a significant part in helping the people to have access to free flow of information on issues including environmental protection. Programmes (as mentioned above) have been carried out to nurture technical experts and professionals in international relations through UNCTAD. The areas of project formulations, project management and implementation require strengthening. Technical experts, managers and administrators are coordinating their efforts to ensure co-operation is relevant and practical.

**Information:** Information is available through: http://goidirectory.nic.in/ministry.htm; and http://envfor.nic.in.

**Research and Technologies:** India has increasingly recognized the critical role of technology. India has a strong base in technology and R&D institutions. As regards Environmentally Sound Technology, India still needs technical, financial assistance. These issues are the current priorities in the programmes/policies being implemented in achieving sustainable development. Public investment for sustainable development through fiscal incentives and concessions has always been emphasized. Since energy-efficient technologies and non-conventional energy technologies directly improve the protection level of the atmosphere, several tax concessions, 100% depreciation allowance, and investment subsidies have been made widely available. The promotion of environmentally sound technologies through international cooperation is mainly in the form of FDI Joint Venture. However, ESTs as envisaged in various MEAs are not being transferred to developing countries on fair and favorable terms and conditions.

**Financing:** The following sources are being tapped for financial assistance and there are: bilateral sources other than ODA; private sources (specify forms: e.g. foreign direct investment, joint ventures, etc.); and multilateral sources. The goal of Agenda 21 was in part to raise additional external funds for sustainable development activities by increasing bilateral and multilateral Official Development Assistance (ODA) to 0.7% of GNP from donor countries. Barring a few exceptions, this goal remains elusive at the international level. Post Rio the flows of ODA have actually come down from about 0.35% in 1992 to 0.22% in 2000 for the developing countries as a whole.
In the context of declining ODA, we have to find adequate financing for environmental measures either from our own budgetary resources or by generating funds from the private sector. Domestic resources will continue to be an important source for financing sustainable development and countries need to develop an enabling environment to encourage the mobilization of additional financial resources. Key elements include: a sound macroeconomic framework; a dynamic private sector; and governance and participatory mechanisms. Special attention is being given to fiscal and budgetary policies, tax collection and transparency.

**Cooperation:** The Ministry of Environment and Forests and its agencies cooperate with various countries such as Sweden, Netherlands, Norway, Denmark, Australia, U.K., U.S.A., Canada, Japan , Germany among others bilaterally and from several UN and other multilateral agencies such as the UNDP, World Bank, Asian Development Bank, OECF (Japan) and DFID (U.K.) for various environmental and forestry projects.
The Ministry of Environment and Forests also functions as a modal agency for United Nations Environment Programme (UNEP), South Asia Co-operation Environment Programme (SACEP), and International Centre for Integrated Mountain and Development (ICIMOD), International Union for Conservation of Nature and Natural Resources (IUCN) and various international agencies, regional bodies and multilateral institutions.
India is signatory to various regional and international agreements, which provide financial assistance for development cooperation. India is signatory to the following important international treaties/ agreements in the field of environment: International Convention for the regulation of Whaling; International Plant Protection Convention; The Antarctic Treaty; Convention on Wetlands of international importance; Convention on International trade in Endangered Species of Wild Flora and Fauna; Protocol of 1978 relating to the international convention for the prevention of pollution from ships; Vienna Convention for the protection of the Ozone Layer; Convention on Migratory Species; Basel Convention on Trans-boundary movement of hazardous substances; Framework Convention on Climate Change; Convention on Conservation of Biodiversity; Montreal Protocol on the substances that deplete the ozone layer; and International Convention for Combating Desertification. Sustainable development is an important consideration in bilateral trade agreements that India has signed. The Government of India has played an active role in international cooperation. India has been the spokesman of the G-77 and China on Climate Change and has played a major role in UNEP. India considers international cooperation productive, cordial and mutually beneficial in the globalizing world.

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## CHAPTER 2: INTERNATIONAL COOPERATION TO ACCELERATE SUSTAINABLE DEVELOPMENT IN DEVELOPING COUNTRIES AND RELATED DOMESTIC POLICIES - TRADE

**Decision-Making:** The Ministry of Commerce and Industry is the coordinating ministry for trade policy. The Ministry of Environment and Forests provides inputs on the environmental aspects of trade. The Government consults all stakeholders at regular intervals.

India has a well-developed system of legislation to regulate trade. Over time these regulations have become more relaxed, providing better role to be played by market forces. Since 1991 India has made steady progress in eliminating quantitative restrictions, licensing, and discretionary controls over imports to remove the anti-export bias of existent policies and improve the efficiency of resource allocation as well as the competitiveness of domestic markets. Imports of capital goods, raw materials, and components have been de-licensed, tariffs on such imports reduced substantially, tariff categories streamlined and simplified, and quantitative restrictions replaced by tariffs. As a result, all goods can be freely imported and exported, except for those belonging to two negative lists.

With the objective of accelerating the pace of reforms, sustaining high export growth, and enhancing the opportunities for the domestic economy's participation in the dynamics of foreign trade, the Export-Import (EXIM) Policy 1992-97 has been reviewed and revised in several ways to further phase out quantitative and qualitative restrictions. The revisions include measures for trade promotion, as well as further simplification of procedures. The trade policy components of the Indian reform process undertaken since July 1991 have been motivated by a full recognition of the important role that trade can play in promoting sustained economic growth in the context of sustainable development. The document on the Approach to the Tenth Plan also recognizes the need to continue this policy and bring down tariff further. Restrictive trade barriers and practices must be curtailed, and tariffs, particularly peak tariffs, on exports of products and services from developing countries reduced so that the benefits of global economic growth are equitably distributed among all countries. Greater trading opportunities can enable developing countries to invest more in environmental protection.

**Programmes and Projects:** The Environmental Impact Assessment programme of the Ministry of Environment and Forests is intended to identify "hot spots" in the integration of trade and environment issues.

**Status:** The bulk of India's population is still rural, engaged in agriculture, which generates nearly one third of India's national income. Economic reforms, which have been mainly confined to the industrial sector, have affected agriculture as they have significantly altered relative prices and protection. A fall in agricultural prices has an undesirable effect on the welfare of the people depending on agriculture. In India's context globalization in terms of liberalization of agricultural trade can have a profound impact on the poor. India has already placed its proposals on the Agreement on Agriculture.

The expanded scope for specializing in areas of comparative advantage is manifest in the improved growth performance of the economy. Furthermore, while exports have responded to the removal of the anti-export bias of a protectionist environment, domestic industry appears to have been stimulated by the expanded availability of imports and capital goods, and the challenge of competing in the international market place. The positive response of Indian industry to deregulation is amply demonstrated by the capital goods sector. The capital goods industry, which witnessed a negative growth of 12.8% in 1991-92, registered an average growth of about 23% during 1994-96. The main agricultural commodities exported from India are Rice, Tobacco, Spices, Cashew, Oil meals, Fruits and Vegetables fresh and processed, marine products, tea and coffee. As regards imports, the main items are pulses, unprocessed Cashewnuts, vegetable oils and sugar. Export, as a percentage of GDP at constant prices is less than 1% in India. Hence, local or national environmental problems in India are more associated with domestic production. Trade, as a percentage of GDP, has more or less remained constant at about 20% in India.

The linkage between trade and poverty from the environmental point of view is addressed in a multifunctional manner in India. Environmental requirements in the markets for Indian exports could cause loss of exports. This could be unnecessary especially where there are environmental restrictions based on processes and production

methods or based on the precautionary principle and where the measures are susceptible to disguised protectionism. This in turn would make less money available to national policy makers to direct towards environmental protection. Poverty, it is said, is the biggest polluter and this holds particularly true for us, as fund constraints may be one of the major handicaps in addressing environmental problems through appropriate national environmental policy. The inability of the developed world to implement provisions of Agenda 21 in letter and spirit has added to the problems.

**Capacity-Building, Education, Training and Awareness-Raising:** The Indian Institute of Foreign Trade conducts various training programmes on these issues. The government of India also keeps people informed about development by holding seminars, consultations and posting information on the web-sites of the relevant ministries, specially the Ministry of Commerce.

**Information:** Information related to trade, investment and economic growth is made available to potential users via the Internet: http://commin.nic.in; and, http://envfor.nic.in.

**Research and Technologies:** universities and Economic Institutions in the country undertake research studies on matters pertaining to trade and commerce.

**Financing:** India has had modest, but increasing, success in attracting a growing part of private capital flows. Furthermore, much of these private capital inflows into India have been of the non-debt creating variety, which has helped boost the balance of payments as well as the availability of investable resources in the economy. The international community is very positive about India's effort to achieve a high rate of growth.

**Cooperation:** India is part of South Asian Preferential Trade Agreement (SAPTA) and BIMSTEC and in these regional groupings, the question of market accessibility and trade has received due consideration.
India believes that in order to make trade and environment mutually supportive, an open multilateral trading system makes possible a more efficient allocation and use of resources. This contributes to increased production and incomes, and lessens the demands on the environment. It also provides the additional resources needed for economic growth and development, and improved environmental protection. Trade measures should be applied for environmental purposes only when they address the root causes of environmental degradation so as not to result in an unjustified restriction on trade. Further, environmental standards valid for developed countries may have unwarranted social and economic cost in developing countries. India believes that global efforts at environmental protection are best addressed through Multilateral Environmental Agreements (MEAs), which contain a package of positive measures, including among them financial and technological transfers and capacity building.
Any models based on uneven rewards will not be supported by those members who are not beneficiaries. Credibility and realization of the potential of all international activities can only be achieved through the full participation of all countries in their formulation, implementation, and enjoyment of benefits. India is willing to work with all countries in a constructive manner to realize common goals.
India submits a report on its trade to the World Trade Organization (WTO) every four years as part of its trade policy review and reports to IMF and the World Bank. The WTO Committee on Trade and Environment has undertaken many of these activities. Further priority work under the Committee and the United Nations Conference on Trade and Development (UNCTAD) should include elaborate studies for better understanding of the relationship between trade and environment, particularly for sustainable development in developing countries. India realizes the vital need for international cooperation, bilateral, multilateral, and regional, in implementing Agenda 21. India is committed to developing and strengthening the process of international cooperation, which would cover not only cooperation among governments and international agencies but also among other major actors such as the private sector, civil society, and voluntary organizations. The international community should develop the appropriate open, equitable, rule based, cooperative, non-discriminatory, and mutually beneficial economic environment at the international level. It should take into account the special needs of the developing countries, in line with the concept of common but differentiated responsibilities affirmed in Agenda 21. The international community should,

therefore, aim to attain the target of 0.7% of GNP for the Official Development Assistance (ODA) from developed countries. There is also an urgent need for new and additional financial resources on a predictable and assured basis from the international community to developing countries. These resources should be available commensurate with the needs and priorities of developing countries and without any conditions.

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## CHAPTER 3: COMBATING POVERTY

**Decision-Making:** The coordinating bodies in this area include: the Planning Commission; the Ministry of Rural Development for rural areas; and the Ministry of Urban Development and Poverty Alleviation for urban areas. All Major Groups mentioned in Agenda 21 are involved in the grassroots level planning process. Implementation of various programmes is monitored by Panchayati Raj Institutions. The Constitution (73rd Amendment) Act, 1992 and (74th Amendment) Act, 1992 mark a new era in the federal democratic setup of the country and provides constitutional status to Rural and Urban Local Bodies. These Panchayati Raj Institutions (PRIs) have been further empowered to implement various poverty alleviation programmes and activities. India has a three pronged strategy for poverty eradication: economic growth and overall development; human development with emphasis on health, education and minimum needs, including protection of human rights and raising the social status of the disadvantaged sections of the society and the poor; and directly targeted programmes for poverty alleviation through employment generation, training, and building up the endowment of the poor's asset. Removal of poverty has been one of the main objectives of Indian planning process ever since the Sixth Five-Year Plan (1980-85).

Many of the programmes and activities outlined in the Programme of Action adopted at the World Summit for Social Development held in Copenhagen in 1995 are already in place in India, particularly the policies geared towards eradication of poverty, generation of employment, etc. India has taken a range of measures to implement the Programme of Action at the National level. India has established a National Committee for Social Development in the Planning Commission, and the State Governments are also being encouraged to establish similar committees. The pro-poor components of the poverty plan are fully integrated with the overall development plan of the country and the pro-poor perspective is fully harmonized with the strategy of market-oriented open-economy, industrialization and the requirements of structural adjustments. Economic growth enables expansion of productive employment and also generation of resources, which are vital to support any form of intervention for eradication of poverty. Since 1991, India has undertaken trade reforms, financial sector reforms, and removal of controls and bottlenecks. These reforms were introduced with the objective of improving efficiency and productivity, in order to further accelerate growth by improving competitiveness in international markets. The ultimate objective of such reforms is to ensure expeditious eradication of poverty. Adequate precaution was taken to protect the poorer sections of society against short-term effects of these changes. This has been done through increasing the resources for programmes for the poor in the National Plan and sharpening the focus of such programmes on the poor.

**Programmes and Projects:** The Government of India has adopted various schemes and programmes for accelerating the rate of economic growth, eradication of rural poverty through wage employment and self-employment, redistribution of land and security of land tenure, enhanced Minimum Needs Programme, protection of minorities, availability of opportunity for socio-economic uplift, and infrastructure development to help the poor. India is making sincere attempts to achieve the UN Millennium Goals especially pertaining to poverty eradication. The major interventions made by the Government of India for poverty eradication include:
*Sampoorna Grameen Rozgar Yojna (SGRY)*: One billion man-days of wage employment are envisaged to be generated every year. Under the Scheme, 5 million tones of food grains will be provided every year free of cost to the State Governments and Union Territories. Earlier schemes of Employment Assurance (EAS) and Jawahar Gram Samridhi Yojna (JGSY) had been merged with SGRY.
*Pradhan Mantri Gram Sadak Yojna (PMGSY)*: Keeping in view the fact that rural roads are vital to economic growth and measures for poverty alleviation in the villages, the programme seeks to provide connectivity to all unconnected habitations in the rural areas with a population of more than 500 people through good all weather roads by the Tenth Plan Period (2002-2007). In respect of hilly/special category states, the objective would be to connect habitations with a population of 250 persons and above. It is estimated that about 0.158 million unconnected habitations need to be taken up under PMGSY.
*Pradhan Mantri Gramodaya Yojna (PMGY)*: It aims to achieve sustainable human development at the village level.

*Swarnajayanti Gram Swarojgar Yojna (SGSY)*: Its basic objective is to bring the poor families above the poverty line by providing them income-generating assets through a mix of bank credit and government subsidy. The programme aims at establishing a large number of micro enterprises in rural areas based on the ability of the poor and resource endowment of each area.
*National Social Assistance Programme (NSAP)*: The NSAP aims at providing social security in case of old age, death of primary breadwinner and pregnancy. The goal of this programme is ensuring a minimum national standard of social assistance.
*Annapurna*: This scheme aims at providing food security to meet the requirements of those senior citizens (65 years or above) who are destitute and have no regular means of income. The eligible persons are provided 10 kg of food grains per month free of cost.

**Status:** Poverty eradication remains the overriding priority for India. The challenge is to find a development path that is not only sustainable but is also socially just and culturally acceptable. At the national level, the incidence of poverty on the Head Count Ratio declined from 44.48 % in 1983 to 26.10 % in 1999-2000. The decline has not been uniform either across states or across rural (45.65 to 27.09 %) and urban areas (40.79 to 23.62 %) during the period from 1983-2000. The greatest challenge facing the country is to eradicate poverty and ensure that the entire population has access to certain basic minimum needs for a sustained, healthy and a reasonably productive living.
India believes that poverty is a threat to prosperity everywhere and that concerted international action is essential to ensure global prosperity and better standards of life for all. Based on this belief, India has actively played a positive, constructive role in the deliberations of the UN, its specialized agencies, and various intergovernmental mechanisms. While the primary responsibility for implementation of the Programme of Action rests with the States, the National effort will need to be strengthened and supplemented by the efforts of the international community. It is necessary for the international community to dedicate itself to the task of fulfilling the commitments undertaken at Copenhagen. The Rio Declaration on Environment and Development adopted at the UN Conference on Environment and Development (UNCED) in 1992 states, inter alia, that "eradicating poverty and reducing disparities in living standards in different parts of the world are essential to achieve sustainable development and meet the needs of the majority of people." Agenda 21 emphasizes that the actions of individual governments in combating poverty require the support of the international community, as the struggle against poverty is a shared responsibility of all countries. A favorable international economic environment, combined with financial and technical assistance, favorable terms of trade, debt relief, access to markets, and transfer of environmentally sound technologies, will help pave the way for poverty eradication and sustainable development. Poverty has so many causes that no single solution will solve the problem in all countries. India expects an implement able programme of action for eradication of poverty as an important outcome of the WSSD.

**Capacity-Building, Education, Training and Awareness-Raising:** A large number of institutions had been established at the village, block, district, state and national levels for capacity building, education, training and awareness raising activities. The Council for Advancement of People's Action and Rural Technology (CAPART) and National Institute for Rural Development (NIRD), Hyderabad are the premier institutions.

**Information:** Further information could be obtained by contacting respective Secretaries in the Planning Commission and the ministries of: Rural Development; and Urban Development and Poverty Alleviation. Information is available at: http://planningcommission.nic.in; http://rural.nic.in; and, http://urbanindia.nic.in.

**Research and Technologies:** Under Rural Technology activity, the mandate of the Council for Advancement of People's Action and Rural Technology (CAPART) is to coordinate all efforts towards advancement of technology relevant to rural areas. CAPART has 19 technology resource centres. Some of the progressive states had taken steps to introduce technological elements in enhancing productivity of artisans by providing them with improved tools. A National Mission for Rural Housing and Habitat had been set up to facilitate the induction of scientific and technological inputs on a continuous basis into the housing sector for the poor.

**Financing:** India is spending substantial financial resources under various poverty alleviation schemes, which vary from year to year. Further details could be obtained by contacting Secretary, Planning Commission.

**Cooperation:** See under **Status**.

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## CHAPTER 4: CHANGING CONSUMPTION PATTERNS

**Decision-Making:** The responsible Government bodies dealing with aspects of sustainable production patterns include: the Agricultural Products Export Development Authority (APEDA), New Delhi; Indian Institute of Plantation Management (IIPM), Bangalore; Central Pollution Control Board, Bureau of Indian Standards and National Productivity Council, State Environment Protection Councils, and the National Consumer Council. At the local and provincial levels, the responsible authorities are the regional offices of the Bureau of Indian Standards (BIS), State Pollution Control Boards (SPCBs), and State Consumer Councils. The view of Major Groups and the public in general are solicited. Standards and criteria are evolved and finalized only after circulating them for public comments and views.

Legislation, which seeks to promote sustainable consumption and production includes: Environment Protection Act, 1986; and Forest Conservation Act, 1980. More stringent norms for vehicular emissions have been notified under the Central Motor Vehicles Rules, which came into effect in April, 1996. The supply of unleaded petrol in the four metropolitan cities of Mumbai, Calcutta, Delhi, and Chennai was introduced in April 1, 1995 for use in four wheel vehicles fitted with catalytic converters. The use of unleaded petrol will be gradually extended to other cities in the country. In order to enhance energy and material efficiency, waste reduction, recycling, public transport and quality of life, norms have been laid down by the Government of India. Industry has adopted, on a voluntary basis, Environment Management Systems (EMS), in order to attain more sustainable production.

National strategy and policies addressing the concerns of poverty include: National Conservation Strategy; Environment Action Programme; Statement of Abatement of Pollution Control; and, National Forest Policy. These strategies address specific issues such as: increasing energy and material efficiency in production processes; reducing wastes from production and promoting recycling; promoting use of new and renewable sources of energy; using environmentally sound technologies for sustainable production; reducing wasteful consumption; and increasing awareness for sustainable consumption. The ongoing initiatives of Government to improve the environment include preventive as well as promotional measures. Fiscal incentives are provided by the government to encourage the installation of appropriate pollution abatement equipment in the form of customs waivers and soft loans. Industries are encouraged and fiscal incentives support the installation of equipment for pollution control; punitive measures including legal action are taken against defaulting units.

**Programmes and Projects:** The Government programmes, in partnership with industries, consumer associations and others, to promote sustainable consumption and production patterns include: Ecomark Scheme; Green Rating; and ISO 14001 Certificate. In addition, twenty-four critically polluted areas in the country have been identified and action plans have been drawn up to improve the quality of the environment in these areas (1997). Adoption of Cleaner Production Technologies and formation of Waste Minimization Circles are being encouraged to minimize environmental pollution. Under the World Bank aided Industrial Pollution Control Project, technical and financial assistance is provided for establishing Common Effluent Treatment Plants (CETPs) in clusters of small-scale industrial units. An Eco-Mark scheme has been launched to certify various products of industries, which fulfill the prescribed standards of environment-friendly production, packaging, and waste disposal. The major programmes for new and renewable sources of energy which were developed and enlarged during the Seventh Five Year Plan included National projects on bio-gas development, improved Chulhas, solar, thermal energy utilization, Solar Photo Voltaics (SPV), wind energy, and conversion of bio-mass into energy, energy plantations, and bio-mass gasifiers. See also under **Capacity-Building, Education, Training and Awareness-Raising**.

**Status:** The Ministry of Environment and Forests had initiated a debate to ensure sustainable consumption patters within the country. However, a lot more needs to be done in this regard.

The process of development is sharply raising the consumption of household energy. It is imperative to support the development of non-conventional or renewable sources of energy to sustain the development process. Sun, wind, water, and biomass are renewable, perennial, dependable, and widely available sources of energy. The generation and utilization of energy from renewable sources have tremendous potential. According to available statistical data

(information provided in 1997), India accumulates 300 million tons of agro residues every year of which only a small quantity is used as direct fuel. The potential of bio-mass energy is 17,000 MW and have solar energy SX10l: KWHours/year. Based on a conservative assessment, wind power potential is around 20,000 MW and mini hydro-energy 5,000 MW. The total wave power potential from ocean energy along India's 1600 km coastline is 40,000 MW. Patterns of consumption by the very poor, even when unsustainable in the short term, must be regarded primarily as survival consumption. Overuse of agricultural land, over-grazing of pasture land, and the depletion of forests for fuel wood are all manifestations of a survival economy. To speak of such consumption as being unsustainable, and hence requiring change, without addressing the human condition that leads to such consumption, is not only unethical but also impractical. The efficient usage of energy, water and other materials by industries and by households is gaining recognition, acceptance and picking up progressively. Recycling and reuse has long been an established tradition in Indian society. Deposit and refund practices have been quite widespread in the consumer industry in India. An extensive and effective collection and recycling system for wastes such as glass, tin scrap iron, brass, rubber, paper, and plastics thrives in the non-formal sector. Consumers are increasingly aware of the health effects of residual pesticides and fertilizers. Textile, leather, and other industries are switching to cleaner technologies. In addition, the use of both recharging and reuse are having significant impacts in changing unsustainable consumption and production patterns. Priority constraints to implementing effective programmes in this area mainly include lack of: general awareness; technical knowledge; financial assistance; and infrastructure.

**Capacity-Building, Education, Training and Awareness-Raising:** The Government of India has been trying to create awareness towards moderation of demand and the adoption of a consumption pattern, which would not leave a deleterious impact on the environment, for example, an extensive awareness campaign through the print and television media to stress the need to save scarce water, energy, and petroleum resources. This is in conformity with the importance given by Mahatma Gandhi in his thinking on nation and character building. Programmes for policy makers, industries, and/or consumers designed to educate and raise their awareness for more sustainable consumption and production patterns include General Consumer Awareness and training and awareness programmes on: Ecomark Schemes; Comparative Testing; and BIS. Awareness campaigns to promote sustainable consumption patterns are carried out through Programmes of Quality Council of India/BIS/MOEF/CPCB/Consumer Protection Councils.

**Information:** To achieve the goal of pollution abatement, emission and effluent standards for air, water, and noise have been notified. Regular monitoring is carried out and enforcement efforts have been intensified. A majority of identified units have already installed the requisite pollution control equipment According to data collected by the Central Pollution Control Board (CPCB) on September 30, 1996, out of 1,551 units belonging to 17 categories of highly polluting industries, 1,259 units have facilities to comply with the environmental standards, 112 were closed, and 180 did not have adequate facilities. The kinds of national information available to assist both decision-makers and industry managers to plan and implement appropriate policies and programmes in this area include: Status; Data; Notifications; Standards; and, Policy documents. There is a monitoring system is in place to oversee enforcement of relevant laws, regulations and standards carried out by the State Pollution Control Boards (SPCB), Regional offices of SPCBs, and Regional offices of the Ministry of Environment and Forests. Environment indicators are being developed under the Environment Management Capacity Building Project.

**Research and Technologies:** Major research and pilot projects and activities are underway in: Life Cycle Assessment (LCA); and Green Rating. Clean and environmentally sound technologies are promoted and applied through the following means: statutory requirements; general awareness; development of demand for sustainable projects; encouragement on industries; creation of data bank on cleaner techniques; and creating of infrastructure. Other technology-related issues that are being addressed, in this area are: involvement of Foreign Financial Institutions for financial assistance; development of standards; capacity building; and, infrastructure awareness.

**Financing:** Activities in this area are financed by the national budget and through external assistance.

**Cooperation:** Cooperation is carried out between the Government and the World Bank, UNDP, ADB and through bilateral arrangements with a few countries in order to further activities related to promoting sustainable consumption and production patterns. See also under **Programmes and Projects**.

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## CHAPTER 4: CHANGING CONSUMPTION PATTERNS - ENERGY

**Decision-Making:** While each Ministry or Department frames the policy for the sector it administers, the Ministry of Power is responsible for overall coordination for energy-related matters. The coordinating bodies in this area include: the ministries of Power, Petroleum and Natural Gas, Non-Conventional Energy Sources, and Environment and Forests (MOEF); Department of Coal; Department of Atomic Energy; and Central and States Pollution Control Boards. The MOEF separately assesses the environmental impact of new power stations. Inputs are also provided by the Planning Commission, which is the highest federal body for planning purposes including for allocation of resources. The Energy Policy Unit in the Planning Commission, which studies and analyses the inter-sectoral issues on energy. Efforts are also made at all levels to integrate the views of Business and Industry, the Science and Technology community, local authorities and Non-Governmental Organizations (NGOs).
The civil servants and technocrats at the Government level assist the elected political executive in the decision making process in respect to energy. Based on the inputs received from the agencies concerned and after deliberations of the issues in the meeting(s) called for the specific purpose, decisions as deemed appropriate are taken by the competent authorities. Various interest groups like business and industry, farmers, local authorities, Trade unions and NGOs are increasingly playing an active role especially in the area of renewable energy. Legislators and legislative bodies often provide important inputs both through formal and informal channels. While formulating policies for renewable energy, views of all the concerned entities including Business and Industry, the Scientific and Technological Community, Local Authorities and NGOs are taken into consideration. NGOs provide an important interface between the people and the Government in the planning and implementation of renewable energy programmes, particularly in the rural areas. At the same time, the role of the local communities themselves as users of the locally available energy sources and generators of energy is crucial in planning and management of rural energy systems. Considering that a people-centred approach is vital to achieve greater universalization of energy supplies in the rural areas, the participation of NGOs has been encouraged. Further, in rural areas of India, women have traditionally shouldered the responsibility of managing the domestic energy requirements for their families. Therefore, their participation in implantation of renewable energy programmes is a part of the government's policy and their active participation is encouraged.

In accordance with the Constitutional Provisions, Electricity is a Concurrent subject at entry 38 in list III of the Seventh Schedule of the Constitution of India. The Ministry of Power is primarily responsible for the development of electrical energy in the country while the Ministry of Non-Conventional Energy Sources promotes renewable sources of energy. The Energy Conservation Act, 2001 enables the creation of the Bureau of Energy Efficiency which would recommend energy consumption norms and standards, create awareness and disseminate information for efficient use of energy and its conservation, promote R&D in the field of energy conservation and provide financial assistance to institutions to promote energy efficiency, implement international cooperation programmes relating to energy efficiency etc. Regarding Power Supply, the following Acts are in operation: Indian Electricity Act, 1950; Electricity Supply Act, 1948; and, Electricity Regulatory Commission Act, 1998. The Acts applicable for environment protection relating to the atmosphere includes: Environment Protection Act, 1980; and, Air (Prevention and Control of Pollution) Act, 1981. The Ministry of Road Transport & Highways deals with Indian Motor Vehicle Act, 1988 and Central Motor Vehicle Rules, 1989. The Motor Vehicle Act (Amendment), 2000 legislated the use of environment-friendly fuel like Compressed Natural Gas (CNG) and Liquefied Petroleum Gas (LPG) as auto-fuels. In addition to legislation, there are various incentives and award schemes to promote sustainable development: National Energy Conservation award for various types of industries; Reward schemes for meritorious performance which include efficient operation of Thermal Power Station (TPS); Incentive award for improved Station Heat Rate of TPS; Schemes for installation of energy saving lamps, computerized load management, installation of Time-of-Day energy meters, rectification of agricultural pump sets, etc.; Incentives offered for installation of electrical gadgets deriving energy from renewables; and Schemes for System Improvement and Transmission and distribution loss reduction. The major policy initiatives taken to encourage private/foreign direct investment to tap energy from renewable energy sources include provision of fiscal and

financial incentives under a wide range of programmes being implemented by the Ministry of Non Conventional Energy Sources, and simplification of procedures for private investment, including foreign direct investment in renewable energy projects.

There is a package of incentives for renewable energy projects, including: concessional/customs duty on import of projects, equipment and components related to renewable energy; a 100% depreciation is allowed in the first year of investment for the installation of renewable energy projects (except for small hydro projects); liberalized foreign investment approval regime to facilitate foreign investment and transfer of technology through joint ventures; proposal for up to 100% foreign equity participation in a joint venture qualify for automatic approval; and policy announcements by the state governments/SEB's for evacuation of power generated from renewable energy projects with facilities for wheeling, banking, third party sale and purchase of power by SEB's at remunerative prices.

The fiscal incentives provided for this purpose include 100 % depreciation in the first year of the installation of the project, exemption from excise duty and sales tax and concessional customs duty on the import of material, component and equipment used in renewable energy projects. In addition, the Government provides financial incentives, such as interest subsidy and capital subsidy from the Ministry and soft loans from Indian Renewable Energy Development Agency (IREDA). Fourteen states have so far announced such policies in respect of various renewable energy sources.

While Coal continues to be primary source of energy since it is in abundant supply in India, there is an attempt to improve the energy derived from renewables including hydro, bio-mass, wind and solar energy. A three-fold strategy has been adopted by the Ministry of Non Conventional Energy Sources for promotion of renewable sources of energy: providing budgetary support for demonstration projects and rural energy systems; extending institutional finance from Indian Renewable Energy Development Agency (IREDA) and other financial institutions for commercially viable projects, with private sector participation; and external assistance from international and bilateral agencies; and, providing private investment through fiscal incentives, tax holidays, depreciation allowance, facilities for wheeling and banking of power for the grid and remunerative returns for power fed into the grid.

Insofar as the protection of environment is concerned, the Ministry of Environment & Forests plays a pivotal role and administers the Environment Protection Act, 1980 and the Air (Prevention and Control of Pollution) Act, 1981. All power projects, which are set up in the country, require the approval of the Ministry of Environment & Forests.

The Government has evolved "India Hydrocarbon Vision – 2025," which lays down the framework to guide the approach and policies for the next 25 years in the hydrocarbons sector. The dependence on imported oil is increasing. It is expected to be about 70% by the beginning of the Tenth Plan and is likely to increase further in the course of the Plan period. It is also likely that the use of gas for power generation will increase rapidly in the coming years. Efforts would be made to increase indigenous production of oil and gas. To create an incentive for conservation and efficient use of petroleum products, the Administrative Price Mechanism (APM) for petroleum products has been dismantled since April 2002, and petroleum prices are now determined by market forces.

Important steps are also taken to deregulate the coal sector in the country. In this connection a proposal for amending the Coal Mines (Nationalization) Act 1973 has been introduced in the Parliament. See also under **Status**.

**Programmes and Projects:** Private sector is actively involved in the implementation of renewable energy programmes in the country. Some of the major programmes such as wind energy, solar thermal application, baggese-based cogeneration and small hydro power are mainly private sector driven. For promoting private investment fiscal incentives, tax holidays and depreciation allowance are also being provided. Some of the State Governments are also providing additional incentives such as sales tax exemption.

*Rural Electrification Programmes*: Rural Electrification involves supplying energy for two types of programmes: Production-oriented activities like minor irrigation and rural industries; and Electrification of villages. Rural Electrification Programmes are formulated and executed by the SEBs/State government departments. Rural electrification has received a high priority in the country. Government of India set up the Rural Electrification Corporation Limited (REC) in 1969 with the primary objective of providing financial assistance for rural electrification in the country. Rural electrification programmes financed by the Corporation cover electrification of villages including tribal villages and Harijan Settlements, energization of pump-sets, provision of power for small, agro-based and rural industries, lighting to rural households and street lighting. The Corporation has been providing

assistance to the state electricity boards for system improvement projects in the area of transmission and distribution as well as small generation power projects like wind energy and hydel projects. About 86.3% of the villages in the country have been electrified and the Government has schemes to electrify the remaining villages. The 2001-02 Union budget announced a package of incentives, including financial resources for rural electrification, which aims to complete electrification of bulk of the remaining villages over the next six years. Thirteen states in the country are completely electrified. As per the latest estimates, out of the agricultural pumpset potential of 19.5 million, 12.2 million had been electrified by March 1999. The Government of India also launched a special programme called Kutir Jyoti Programme where the Government bears the initial cost of internal wiring and service connection for households below the poverty line. The Kutir Jyoti programme, which provides for release of single point connections to the households of the rural poor below the poverty-line, including Dalit [Backward] and Adivasi [Tribal] families, continued to be given special thrust during 1998-99. By the end of March 1999 under the Kutir Jyoti programme, over 3.35 million connections have been released and a grant of $ 40million disbursed.

*Integrated Rural Energy Programme*: The Integrated Rural Energy Programme (IREP) was launched as a regular plan scheme during the Seventh Five Year Plan. The objectives of IREP are provision of energy for meeting the basic needs of cooking, heating and lighting, especially for the weaker sections, by utilizing locally available resources to the extent possible and provision of energy as the critical input in the economic development of rural areas. This would result in the creation of employment, increase in productivity and income besides accelerating the process of decentralized development.

*Special Area Demonstration Programme*: The Special Area Demonstration Programme (SADP) was started in 1992-93 for demonstrating the renewable/non-conventional energy systems in remote, far-flung areas, hilly terrain, islands, and other difficult areas, which are not electrified, for meeting their energy needs. The Energy Park Scheme at educational institutions has been introduced under SADP, with a view to create awareness amongst the students, teachers and public. 153 energy parks have been sanctioned so far.

*Renewable Energy*: The Government of India has signed a Protocol of Intent with the U.S. Government in September, 2000 for developing an IGCC project in India. All the renewable energy technologies are being developed in India. The Government is making special efforts for development, demonstration, extension and commercialization of renewable energy technologies. The programmes covers bio-gas plants, improved wood stove, solar photo-voltaic and thermal energy, solar energy, energy from urban and industrial waste, bio-gas combustion based power generation, bio-mass gasification technology, small hydro power, wind power technology, fuel cell technology, hydrogen energy, alternative fuel for surface transportation, ocean energy, and Geo-thermal energy. See also under **Research and Technologies**.

*National Programme on Improved Chulhas (stoves):* The National Programme on Improved Chulhas (NPIC) was launched during 1984-85 with the objectives of fuel conservation, removal/reduction of smoke from kitchens, check on deforestation and environmental degradation, reduction in drudgery of women and consequent health hazard, and employment generation in rural areas. As a result of continuing R&D efforts, different types of improved/smokeless chulhas have been developed. These are available as fixed and portable types. While the traditional chulhas have an efficiency of 8-10 %, these improved chulhas have a minimum thermal efficiency of 20-25 %. In order to ensure the quality and durability, the Bureau of Indian Standards has already introduced an ISI marking scheme on portable chulhas. The Technical Back-up Units (TBUs) located at eight different locations act as Test Centres for the BIS. The programme is implemented through a multi-agency approach involving state modal departments, state modal agencies and corporate bodies, Khadi and Village Industries Commission, National Dairy Development Board and NGOs. The Government provides financial and technical assistance in the implementation of the programme both to users and the implementing agencies. A total of 30 million improved chulhas have been installed till the end of 1998-99. These are expected to be saving over 100 lakh tones of fuel wood per annum besides, reduction in the drudgery to the women, improvement in kitchen environment resulting in reduction of health hazards, check on deforestation, etc.

*Transport*: For the transport sector, the Government of India has issued improved norms of emission, which have to be strictly adhered to. Green fuel (unleaded petrol, low sulphur HSD) is now available almost throughout the country. A major programme for improvement of automotive fuels such as motor gasoline and diesel is being

introduced in the country in a phased manner, with the objective of improving the air quality of the cities of our country. Low-lead petrol (0.15 gms/litre lead content) has been introduced at all retail outlets of the country from 1 April 1996. Unleaded petrol has now been made available all over the country. High-speed diesel containing 0.5 % sulphur has been introduced in the four metro cities from 1 April 1996. HSD with 0.25 % sulphur is being supplied in the Taj Trapezium area from 1 September 1996. It is also being supplied in Delhi from 15 August 1997.
Stricter emission norms for new vehicles effective from 1 April 2000 have been notified. This subject is handled by the respective states. In the state of Delhi, a strict norm for emissions from vehicles has been implemented and all vehicles plying in the city have to adhere to these norms. Recently, the Delhi Government has banned trucks which are more than 15 years old, to ply in the city. A programme to convert public transport buses from high speed diesel to Compressed Natural Gas (CNG) is being implemented on a time bound programme. A Metro Rail Transport Project has also been taken up recently and the first phase is expected to be operational by September 2002. Research, development and demonstration projects in the field of Electric Vehicles (EV's) under Alternative Fuel for surface transportation programme are also underway. The objective of this programme is to develop non-polluting EV's with rechargeable batteries and fuel cells as a power source.
*Energy Conservation*: The programmes undertaken for promoting energy conservation in India include: energy audit at selected Thermal Power Stations (TPS) to assess the controllable losses, measures to improve efficiency and reduction of secondary fuel oil consumption; Research project to mitigate GHG emissions from selected power sectors in selected Asian countries; Renovation & Modernization at selected TPS; Life extension assessment studies at selected TPS; Adoption of clean coal technology at selected TPS; Setting up of coal washeries at coal mines; and, Adoption of fluidized bed technology for boilers and super critical parameters for some selected TPS.

**Status:** The Government of India had announced a policy in 1991 that allowed private sector participation in power generation and distribution schemes. Since 1991, generation has been thrown up to private including foreign investment. Twenty five power projects (wholly) and one power project (partially) with an installed capacity of 5489.75 MW has already been commissioned in the private sector and another about 5200 MW are under construction. The private sector is likely to contribute about 40% of the generating capacity of 1,00,000MW required to be added during 2002-12. The Government of India has also enacted the Electricity Laws Amendment Act, 1998 to promote private sector investments in transmission. The Government has also issued guidelines for private sector participation in January 2000. Presently, 98 private power projects with 56,000 MW of installed generation capacity are being monitored by the Central government. In addition, there are several projects which are being set up by the private sector with the approval of the State governments and do not require the techno-economic clearance of CEA (Central Electricity Authority). So far, 51 private sector power projects with 24,700 MW capacity have been given techno-economic clearance by CEA.
To facilitate setting up of large sized thermal power plants in the country and in order to derive the economies of scale, revised mega power policy has been introduced. It is visualized that the country would be adding 15,000-20,000 MW of capacity through this policy at the most competitive tariffs payable by State Electricity Boards and consequently by consumers. The Government has established a Power Trading Corporation, primarily for the purpose of buying power from mega power projects under long-term PPAs (Power Purchase Agreements) and selling the power to the beneficiary States also under long-term PPAs. In order to achieve immediate capacity addition by setting up of short gestation power projects, the Government has announced a liquid fuel policy, under which a capacity addition of 12,000 MW was envisaged on liquid fuel based power projects (like LSHS, FO, Naptha, etc.). However, subsequently it was decided that the existing ceiling of 12,000 MW allocated to various States would apply only to naptha. This would be an addition to the FO/LSHS linkages already given. States would, however, be free to contract new power projects based on FO beyond the existing linkages. Already, LSHS is on OGL (Open General License) and this freedom would be extended for non-traditional fuels like condensate and orimulsion subject to actual user condition. HSD would be permitted for power generation only in inaccessible and isolated areas where small diesel based capacities are sought to be set up and use of other fuels is not feasible.
The influence of NGOs and consumer groups is primarily in the area of rural electrification. Non-accessibility to commercial energy sources has led to deforestation and to soil erosion. Some NGOs/consumer groups have been playing an active role towards afforestation. Promotion of bio-gas plants, both community and personal, are being

promoted by NGOs and also by the Government. The Government of India has been supporting scientific, financial and technical institutions/NGOs by way of financial support for organizations of national and international seminars/conferences and short duration awareness campaigns for information dissemination about renewable energy, which in turn influences the energy consumption pattern.

The present installed capacity for power in the country is about 1,00,000 MW: almost 71% of all is from thermal sources, about the 24% hydropower, 2.9% nuclear power and the rest from wind. It has been estimated that an additional 1,00,000 MW of installed capacity would be required to meet the demand for power by 2012. This implies that the power sector has to grow by approximately 10,000 MW every year for the next 10 years, which involves a huge quantum of investments, which is estimated to be US$ 200 billion, including investments to be made for matching transmission and distribution. The short-term goals are to fulfill the minimum energy needs of the entire population and reach the remote and isolated corners of the country at the earliest.

The problem of $CO_2$ emissions is a major concern to the Indian energy sector where coal accounts for over 60% of total energy resources used. In order to minimize $CO_2$emissions, efforts are underway to improve efficiency levels in the generation and use of energy. In addition, renewable energy technologies and afforestation measures to increase the "carbon sink" function are being promoted. Coal India Limited (CIL), a holding company of seven coal producing companies, coordinates the implementation of sustainable development programmes in the Indian Coal Sector. There is a special focus on ensuring conservation of coal sources during exploitation and use, and conserving energy in the production and transportation of coal.

*Rural Energy*: A major achievement has been in the area of cooking energy in rural areas with the establishment of 2.85 million family-size bio-gas plants and 30 million improved wood stoves, in both, India being second only to China. Only about a quarter of the total potential has been exploited so far. The bio-gas plants and improved wood stoves presently in use are resulting in a saving of over 13 million tones of fuel-wood every year. In addition, enriched organic manure is produced from the bio-gas plants to supplement and complement expensive and environmentally degrading chemical fertilizers, equivalent to about .85 million tones of urea per year.

The production of primary commercial energy has been as follows:

| | Units | Production | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1950-51 | 1960-61 | 1970-71 | 1980-81 | 1990-91 | 1999-2000 |
| Coal | MMT | 33 | 55.67 | 72.95 | 114.01 | 211.73 | 208.12 |
| Lignite | MMT | - | 0.05 | 3.39 | 4.80 | 14.07 | 16.0 |
| Crude oil | MMT | 0.26 | 0.45 | 6.82 | 10.51 | 33.02 | 24.33 |
| Natural gas | MCM | - | - | 1445 | 2358 | 17998 | 21348 |
| Hydro power | BKwh | 2.52 | 7.84 | 25.25 | 46.54 | 71.66 | 80.53 |
| Nuclear power | BKwh | - | - | 2.42 | 3.00 | 6.14 | 13.25 |
| Wind power | BKwh | - | - | - | - | 0.03 | 1.08 |

India's energy resources are: Coal (70 billion tons); Hydro (84000 MW at 60% load factor); Crude (658 MT); Natural Gas (628 billion cu.m.). India imports a large amount of crude oil for its domestic consumption. For example, while production of crude oil during the period 1998-99 was 11395 thousand tones, the import of crude oil for the same period was 39808 thousand tones. In India, the total estimated renewable energy availability is about 77000 MW from Commercially exploitable Sources, including: Wind (45,000 MW); Small hydro (15,000 MW); Biomass/Bioenergy (17,000 MW); Ocean energy (50,000 MW). In addition, India receives solar radiation sufficient to generate 35 MW/Sq. Km. using solar photovoltaic and solar thermal energy. Besides, there is a potential for setting up the following: Biogas plants (12 million); and, Improved cooking stoves (120 million).

Since India has an abundant supply of coal, the primary fuel for power generation continues to be thermal. While there has been considerable growth in the installed capacity, which has grown from about 1700, MW in the 1950s to over 1,00,000 MW today, the percentage of power generation derived from coal continues to be around 70%. The hydro-thermal mix, however, does fluctuate keeping in view the progress of commissioning of hydro projects. Today, about 71% is being derived from thermal, about 24% from hydro, about 2.9% from nuclear and the rest from wind. India primarily relies on coal as its basic fuel for power generation. India also has a considerable hydro potential but only a small portion has been tapped till now. The hydro thermal ratio keeps varying and has

fluctuated as 40:60 to the present level of 25:75. The contribution of nuclear and renewable sources has been minimal and there has not been much change in the ratios between hydro, thermal, nuclear etc. inter-temporally. Today, out of an installed capacity of approximately 1,00,000 MW, about 71% is thermal, 24% is hydro, 2.9% is nuclear and the rest from wind. The Indian power sector was opened up for private sector participation in 1991. Till now, while about 5000 MW have been installed from the private sector and another 5000 MW are under construction. Private sector participation is picking up and is expected to play a major role in the near future. As regards effect of liberalization, power is yet to be a traded good in India. In renewable, about 1.2% is from wind energy and rest is from small hydro (up to 3MW capacity) and biomass power.
The trend in power generation capacity installation in India is as follows:

| Year | Total (MW) | Hydro | Thermal | Nuclear | Renewable |
|---|---|---|---|---|---|
| 1990 | 63600 | 29% | 69% | 2% | -- |
| 1999 | 96000 | 22% | 74% | 2.3% | 1.7% |

Since a large part of energy needs in the rural economy is through collection of firewood this leads to deforestation. The reduction of tree cover is a serious problem though several programmes have been launched by the government towards afforestation. Problems of deforestation are primarily on two counts. While the first is the lack of access to commercial forms of energy, the second is the sheer lack of purchasing power. The government has been trying to mitigate the problems by giving subsidized kerosene to people subsisting below the poverty line. There is compulsory compensatory reforestation for power projects and other projects, which cause any forest degradation. Government is taking several steps on the pollution control front and there are strict pollution control norms for all energy generation projects.
There are no institutional or structural barriers towards development and usage of renewable energy sources. In fact, it is the policy of the government to promote energy from renewable sources. For this purpose, the Government has created the Ministry of Non-Conventional Energy Sources which looks into the policy measures, draws up programmes / schemes to popularize energy consumption through renewables. The government had also set up a specialized body by the name of Integrated Renewable Energy Development Agency (IREDA) to meet the funding requirements for setting up projects in the renewable sector. The major perceived barriers in development and usage of renewable energy sources are as follows: technology development — technology transfer developed countries; Renewable electricity generation: amendment of existing legislation in a regulated market environment or enacting new legislation; renewable-based electricity — mechanism for procurement; and multilateral and bilateral funding — availability of grants and concessional finances. The main reason why renewable energy projects have not grown at the desired pace is the high cost. While India has a phenomenal potential for solar energy exploitation is peripheral since the costs involved are quite considerable. Consequently, while there is a case for every household in India to put up solar panels, this actually has not taken place because they are currently quite expensive. There are other related problems of maintenance and servicing.

**Capacity-Building, Education, Training and Awareness-Raising:** There are several efforts being made by the Government at all levels to increase public awareness these include:
*National Environment Awareness Campaign (NEAC)*: The Ministry of Environment & Forests has been conducting a country-wide National Environment Awareness Campaign (NEAC) every year since 1986 with the objective of creating environmental awareness among each and every citizen of the country. Each year, a theme(s) is chosen for the NEAC around which the campaign activities are organized.
*Eco-Clubs*: Since the youth of today are the citizens of tomorrow, a special programme for creating awareness specifically among school students, is also being implemented by the government. Known as the Eco clubs programme, the main objectives of this programme are to educate children about their immediate environment and impart knowledge about the eco-systems, their inter-dependence and their need for survival, through visits and demonstrations and to mobilize youngsters by instilling in them the spirit of scientific inquiry into environmental problems and involving them in the efforts of environmental preservation. Such Eco-clubs are established in Government recognized schools and each club has 20-50 members. A group of 20-50 Eco-clubs is serviced by a coordinating agency, which may be an NGO, an educational institution or a professional body. Each year, about 1500-2000 such Eco clubs are supported.

*National Green Corps*: The Eco-Clubs programme is being intensified and expanded with a view to covering the entire country. It is proposed to raise a 'National Green Corps' through the Eco clubs with the objective of spreading environmental awareness and to motivate school children to carry out action based programmes for protection and improvement of environment. Under this programme, it is proposed to set up about 50,000 Eco clubs all over the country. The members of these Eco-clubs would organize and conduct a series of activities on specific environmental themes that are of local relevance and importance. Besides the programmes mentioned above public awareness on environmental issues is being taken up on mass scale and have been included in the school curricula. The issues included in the school curricula include topics like steps to increase forest cover, control soil erosion and reduce GHG emissions. Separately, major campaigns are launched by various schools on environmental issues whereby children try and educate the public on the need to improve the environment. The State controlled television and radio media very frequently feature programmes giving ways and means on how to contain environmental degradation. Renewable energy has been a part of the Environmental Studies curricula in schools for over a decade.

In National Campaigns under National Re-construction Corps schemes (NRC), which was launched in 80 districts of the country, volunteers from various walks of life have been involved in sensitization of the general public in electricity conservation measures, increased use of fly ash products, energy efficient lighting systems and use of standardized energy efficient equipments. Other details have been given in the previous question.

There are specific institutions in India which work solely on energy matters, such as the Central Electricity Authority, which works for the power sector, the Indian Institute of Petroleum, for the petroleum sector and the CMPDIL, which looks into the coal sector issues. There are other institutions, also set up by the government, for research and training activities like the Central Power Research Institute, the National Power Training Institute etc. The Ministry of Non-Conventional Energy Sources, through various institutions and State modal departments has been organizing training and capacity building programme for renewable energy professionals, NGOs, users etc, for over one and half decades, including such areas as: technology, management, economic analysis, O&M. The Government of India launched an Energy Conservation Cell in the early 80s with the purpose of starting a mass campaign for conservation activities and taking up assignments on energy audits. While this Cell was primarily devoted for conservation in the electricity sector, another organization called the Petroleum Conservation Research Association (PCRA) has been in existence for long. Major campaigns have been launched through advertisements in newspapers, radio, television and hoardings. The subject of conservation is given an added thrust through the energy conservation awards, which are given to industry every year. Separate programmes are also organized for giving recognition to power utilities, which bring down their auxiliary power consumption. At present, the Energy Management Centre under the Government of India coordinates several energy conservation activities.

**Information:** Information is available through: the Ministry of Power (http://powermin.nic.in); the Ministry of Non Conventional Energy Sources (http://mnes.nic.in); and, Planning Commission (http://planningcommission.nic.in).

**Research and Technologies:** Research and Development (R&D) in cleaner fossil fuels is an ongoing activity and a number of options regarding clean coal technologies are being explored. They include the Fluidized Bed Combustion, Circulating Fluidized Bed Combustion, Pressurized Fluidized Bed Combustion Combined Cycle, and Integrated Gasification Combined Cycle. A research project for GHG mitigation among Asian countries has been undertaken in association with the Asia Institute of Technology, Bangkok to determine the least cost supply side options for mitigating GHG and other harmful emissions from the power sector. Adoption of supercritical parameters for steam power stations will improve the efficiency and hence reduce emission of green house gases. Introduction of solar-based power projects and Integrated Gasification Combined Cycle will also reduce the effect due to GHGs.

*An overview of India's Renewable Energy Sources:* In the renewable sector also, a number of new technologies are being explored in the following areas: Solar energy; Energy from Urban and Industrial Waste; Biogas Technology; Biogas combustion based power generation; Biomass Gasification technology; Small Hydro Power; Wind power technology; Fuel cell technology; Hydrogen energy; Alternative fuel for surface transportation; Ocean energy; Geo-thermal energy; etc.

A capacity of 1267 MW from renewable sources of hydro, solar and wind energy in India has already been established. As a result of this a saving of fossil fuels equivalent of 870,000 metric tones of coal is estimated.

The importance of increasing the use of renewable energy sources was recognized in India in the early 1970s. During the past quarter century, a significant effort has gone into the development, trial and induction of a variety of renewable energy technologies for use in different sectors. The country has today among the world's largest programmes for renewable energy. The activities cover all major renewable energy sources of interest to us, such as biogas, biomass, solar energy, wind energy, small hydro-power and other emerging technologies. Several renewable energy systems and products are now commercially available, and are also economically viable in comparison to fossil fuels. The Ministry of Non-Conventional Energy Sources (MNES) created in 1992 is the modal agency of the Government of India for all matters relating to non-conventional/renewable energy. It undertakes policy making, planning, promotion and coordination functions relating to all aspects of renewable energy, including fiscal and financial incentives, creation of industrial capacity, promotion of demonstration and commercial programmes, R&D and technology development, intellectual property protection, human resources development and international relations. India is implementing the programme on renewable energy, covering the entire gamut of technologies including improved chulhas (stoves); bio-gas plants; short rotation fuel-wood tree species; bio-mass gasifiers, solar, thermal and solar photovoltaic systems; wind farms, wind mills, bio-mass based co-generation, small and micro hydel systems, energy recovery from urban, municipal and industrial wastes, hydrogen energy, ocean energy, fuel-cell, electra-vans and gasohol. In each of these areas, there are programmes of resource assessment, R&D technology development and demonstration. Based thereon, several renewable energy systems and products are now not only commercially available, but are also economically viable in comparison to fossil fuels. A large domestic manufacturing base has been established for renewable energy systems and products. India is the third largest producer in the world of solar cells and photo-voltaic modules. India now has a very good R&D base for the development of technologies for harnessing renewable/non-conventional energy sources. A substantial manufacturing infrastructure and consultancy services have also emerged in the country for the design, manufacture and supply of non-conventional energy equipment. These include small-scale and medium/large-scale industries, both in the public sector as well as the private sector. Technology development plans are being prepared in major areas such as biogas, solar energy, wind power, small hydropower and biomass power. R&D activities are being strengthened to cover areas such as improvement of bio-gas production at low and high temperatures and use of alternative feed-stocks; growing of polysilicon, and production of silicon wafers, thin film solar cells; use of solar energy in buildings including integrated solar roofs; medium to high temperature solar thermal technologies for cooling and power generation; economical ethanol extraction from bio-mass; variable speed wind turbines; ultra low head micro-hydel turbines; advanced biomass gasification; alternative transportation technologies; advanced high temperature fuel cells; electric vehicles; hydrogen energy; and such inter-disciplinary areas as new materials, energy storage and hybrid/ integrated energy systems.

R&D is of crucial importance for technology development and application of renewable energy sources. Some of the key achievements of R&D have been the development of a large number of high-efficiency smokeless wood stove designs; new and low-cost designs of family-size biogas plants using ferro-cement material and for leafy bio-mass feedstock; development and application of single crystal solar photo-voltaic technology, including polysilicon, ingots, wafers, cells and modules; low-grade solar thermal technologies including selective coating for solar thermal collectors and alternative designs of solar cookers; small-scale biomass gasifiers run on wood and agro-residues as fuel; optimized cogeneration based on high-pressure boilers; development of high-rate biomethanation processes; adaptation and indigenisation of wind turbines, including indigenous development of rotor blades and intelligent power controller; development of polymer electrolyte membrane and phosphoric acid fuel cell technology; and metal hydrides for storage of hydrogen.

*National Project on Biogas Development*: The National Project on Bio-gas Development was initiated in 1981-82 for the promotion of family type bio-gas plants which aims at providing clean and cheap sources of energy in rural areas, producing enriched organic manure for supplementing the use of chemical fertilizers, improving sanitation and hygiene and adding to the welfare of women. Three types of designs of bio-gas plants, namely, the floating drum-type design, fixed dome-type and bag-type portable digester made of rubberized nylon fabric are being propagated under this programme. The most remarkable achievement of this programme has been the acceptance

by the rural people of human night-soil as feed material in addition to other bio-degradable materials like animal dung, kitchen wastes, water hyacinth, etc. The Biogas programme is implemented by the State governments and Union Territory administrations, the State corporate and registered bodies, the KVIC, Mumbai and National Dairy Development Board (NDDB), Gujarat. Non-governmental Organizations are also being given targets for implementation of the bio-gas programme. In order to propagate large-scale use of biogas technologies in rural India, the Ministry is providing financial subsidies and other financial support to the consumers, entrepreneurs, corporate bodies and NGOs for the installation of biogas plants on a turn-key basis. There is also a free maintenance and servicing warranty for the first three years. Additional subsidies are given to sanitary toilet-linked bio-gas plants along with incentives for saving diesel. The State governments and other implementing agencies are provided service charges linked with targets for organizational set-up at different levels. Technical Back-up Units (TBUs) set up at nine locations are providing technical and training support in a decentralized manner. Apart from this, 15 bio-gas extension centres have been sanctioned. Commercial and cooperative banks are providing loans for the setting up bio-gas plants under the agricultural priority area schemes.

Apart from the family-size bio-gas plants; community, institutional and night-soil based bio-gas plants are also being installed for different applications. This scheme is also being implemented by the State government departments, State modal agencies and the NGOs. The Indian Renewable Energy Development agency has been providing interest subsidies for such projects. Up to the end of 1998-99, a total of 2.85 million biogas plants have been installed which are estimated to generate fuel gas equivalent to the saving of about 3 million tones of fuel-wood per year, valued conservatively at approximately $1bn per annum. Besides, these plants are generating enriched organic manure containing nitrogen equivalent to about .85 million tones of urea per annum for supplementing chemical fertilizers and improving soil fertility. The Ministry is constantly conducting R&D with a view to improve the technology and reduce the cost of bio-gas plants. Efforts are also made to develop technology for use in cold climatic regions of the country.

*Biomass Programme*: Fuel wood continues to be the main energy source followed by agricultural residues in rural parts of the country. Presently the common practice of direct burning of biomass in an inefficient manner is causing economic loss to the nation and also adversely affecting human health. Efforts are, therefore, being made to make use of biomass in an efficient and more scientific manner. The two main components of the biomass programme are production and utilization of biomass. Under the production programme, efforts are being made to develop new species, which could grow faster and mature in a shorter period so that fuel wood could be made available at the earliest possible time. To achieve the goals, biomass research centres located in six different agro-climatic regions of the country are developing new plant species depending upon the climatic conditions prevailing in their respective regions. These centres have been imparting training for different target groups, including farmers and representatives of forest departments, NGOs and banks. Many plantation organizations and individuals have also benefited from these centres.

*Animal Energy*: Animal Energy has been playing an important role in the economy of rural and semi-urban areas by providing huge draught animal power for short distance haulages and farm operations. However, the implements being used for this purpose have very low efficiency. Therefore, it is necessary to improve the designs of these implements to suit the rugged terrain, unpaved roads, and narrow pathways and also for agricultural operations. Several designs of carts and agricultural implements have been developed which are now being implemented in different regions of the country. In order to educate the farmers in utilizing these new devices, demonstration programmes are being held in different states. The State government departments and modal agencies, state agro-industrial corporations and Krishi Vigyan Kendras (Agricultural science centres) are implementing these programmes.

*Solar Energy*: India receives 5000 trillion Kwh of solar radiation per year. Most parts of the country have 300 clear sunny days in a year. It is possible to generate 20 MW solar power per square kilometer land area. Presently solar energy is being utilized through two routes: solar thermal route and solar photovoltaic route. The technology for the manufacture of the cells and panels has been developed and commercialized almost entirely on the basis of domestic R&D. India is one of the six countries that have developed the technology for manufacture of polysilicon material. About 9.5 MW of module production was achieved, which is 8 % of the world production. About 75

companies are involved in production of solar cells, modules and systems. Over 100 companies are involved in the local production of solar thermal systems such as solar cookers and solar water heaters.

*Solar Thermal Energy Programme*: Solar energy can be converted into thermal energy with the help of solar collectors and receivers. With the increasing demand for thermal energy in different sectors, there is vast scope for the utilization of solar-thermal devices. The solar-thermal devices are being utilized for water heating, space heating, cooking, drying, water desalination, industrial process heat, steam generation, for industrial and power generation applications, operation of refrigeration systems, etc. These devices have been put under three categories, viz., low-grade heating devices up to the temperature of 100 degree centigrade, medium-grade solar thermal devices between the temperature of 100°C and 300°C and high-temperature solar thermal devices above 300°C.

In the area of solar energy utilization, solar thermal technologies are readily acceptable for a variety of applications. About 4,50,000 square metres of collector area has so far been installed ranging from domestic water heaters of 50-100 litre capacity in about 25,000 homes to industrial and commercial systems of up to 2,40,000 litres of hot water per day. Around half a million box type solar cookers are also in use. Box-type solar cookers are quite popular in India. Over 4,75,000 box type solar cookers are already in use. About 25 manufacturers of solar cooker make box solar cookers with and without electrical back-up. Greater emphasis is now being given to make use of these technologies without any direct subsidy. The Bureau of Indian Standards has already introduced the quality control mechanism by having ISI markings on box solar cookers as well as flat plate box solar collectors for water-heating.

There are 39 BIS approved solar collector manufacturers with a production capacity of more than 1,00,000 sq m of collector area per year. Solar thermal collectors are now also being exported to other countries. Constant R&D efforts are being made to upgrade the technology and reduce the cost. Green House Technology for growing vegetables and flowers in cold climatic regions has also been successfully developed and introduced in the market. The Government has recently initiated efforts to open marketing outlets. The "Aditya Solar Shops" are being set up in major cities and towns with financial support of the Government to state modal agencies and NGOs for promoting spot sale of NRSE gadgets, servicing and repair of devices, and dissemination of information.

An estimated potential of 9000 MW has been identified. At present, 1024 MW of installed capacity has been achieved mostly in the coastal region. Erection of 140 MW Integrated Solar Combined Cycle Power Station in Rajasthan, which is first of its kind in the World is planned. In India, the world's largest photo-voltaic power plant is planned to be set up at a total cost of $ 280 million.

*Solar Photovoltaic Programme*: Solar Photovoltaic (SPV) technology enables the conversion of solar radiation into electricity without involving any moving parts. The photovoltaic systems have emerged as a useful power source not only for applications such as lighting, water pumping and telecommunication, but also as power plants for meeting the electricity needs of villages, hospitals, lodges, etc. Over 6,00,000 solar PV systems aggregating to about 40 MW have been installed in the country making this the largest such deployment in the developing world. They involve around 32 different types of systems for rural, remote area and commercial applications, including home and street lighting, water pumping and rural telecommunication systems. Solar lighting/water pumping systems are now being used in 3,00,000 homes. About 1,75,000 rural radiotelephones are also being powered by solar energy. Under the SPV programme about 2,20,000 solar lanterns, 90,000 home lighting systems, 35,000 street lighting systems, 2,900 water pumping systems and non-grid power plants/packs of 1 MWp aggregate capacity have been installed till May 1999. Based on single crystal silicon solar cells, several devices are now being deployed in the field. These include solar lanterns, domestic lights, street lights, solar pumps, community lighting systems, railway signals, power for off-shore platforms for telecommunication equipments, rural telephone systems, radio, television, etc. These SPV systems have been successfully installed in large number of villages in the country. Solar photovoltaic power is emerging as a rural revolution in isolated areas where grid power is not practicable. In many parts of the country, these programmes are being implemented by rural energy co-operatives. For example, in the Rural Energy Co-operative at Sagar Island in West Bengal, a 26 KW SPV power plant is providing electricity to 300 houses. Another plant of the same capacity is under installation. Shortly, the whole Island will become a Solar Island. Similar SPV systems are being planned for other remote and isolated areas including deserts. Constant R&D efforts are being made to develop new technologies and improve existing technologies.

About 20,000 MW capacity potential has been identified in co-generation area out of which 500 MW is currently installed. In terms of achievements, over 3 million biogas plants and 32 million improved wood stoves have been installed in the country. Solar Photovoltaic (PV) power systems are being used for a variety of applications such as rural electrification, railway signaling, microwave repeaters, TV transmission and reception and for providing power to border outposts. So far about 300,000 solar lanterns, 1,30,000 home lighting systems and 40,000 street lighting systems and over 3500 solar pumping systems have been installed in the country. Grid connected PV power plants with an aggregate capacity of 1310 KW have been set up for demand side management (DSM) or tail end voltage support. With an installed capacity of 1220 MW, India is among the first five countries in the world in wind power generation. Wind generators up to 750 KW capacity are being manufactured in the country. The total installed capacity of small hydropower projects (up to 3 MW station capacity) is 235 MW. Projects with an aggregate capacity of about 15.21 MW have also been completed in the areas of energy recovery from urban, municipal and industrial waste. At present renewable energy-based power is about 1.7% of the total installed Power generation capacity in the country. In the household sector, about 25% of the total potential for family size biogas plants and 26% of the potential for improved cook stoves have already been harnessed. In addition, 1.5% of the total potential for Solar Water Heating systems has also been realized. Major portion of the above achievements have been made since UNCED, such as: Environmental issues like land submergence, siltation and rehabilitation of displaced persons is a major problem in Hydro projects; Solar & Wind : high installation cost is the major hurdle; and, Co-generation need of financial assistance/subsidy to make co-generation scheme viable.

*Renewable Energy Potential and Achievements*

| **Sl. Source/System** | **Approximate Potential** | **Current Status (as of December 2001)** |
|---|---|---|
| 1. Biogas plants (No.) | 12 million | 3.27 million |
| 2. Improved Chulha (No.) | 120 million | 33.8 million |
| 3. Solar Water-Heating Systems | 140 million | 0.60 million/sq.m. |
| 4. Solar Photo-voltaic Systems | 20 MW/sq km | 82MWp (29 MWp exported) |
| 5. Bio-mass Power | 17,000 MW [Potential] | |
| (i) Bio-mass Gasifiers | (42.8 MW Stand alone applications) | |
| (ii) Biomass combustion/gasifier | 37 MW based power generation | |
| (iii) Biomass power/ Co-generation | 19,500 | 358 MW |
| 6. Windfarms | 45,000 MW | 1507 MW |
| 7. Small Hydro Power | 15,000 MW | 423 MW |
| 8. Solar Photovoltaic Power | 1590 KW | |
| (940 KW grid connected) | | |
| (650 KW non-grid connected) | | |
| 9. Integrated Rural Energy Programme | 860 Blocks | |

The following new technologies are being developed and adopted for the reduction of greenhouse gases emissions and cleaner production: fluidized bed combustion technology; use of coal having ash up to 34%; adoption of super critical boiler technology; integrated coal gasification combined cycle technology (IGCC); and, renewable energy sources. See also under **Programmes and Projects**.

**Financing:** The National Bank for Agriculture and Rural Development continues to provide automatic re-financing facility to the banks for the loan amounts disbursed for bio-gas plants. Funding in the energy sector is public sector dominated. The power sector was opened up for private sector participation in 1991 and about 5000 MW of private power has already been installed. Another 5000 MW approximately is under various stages of construction. For the 9th Five Year Plan period (1997-2002), the outlay for the power sector constitutes about 14.5% of the entire public sector outlay. There is no cap on foreign direct investments in the power sector. Some foreign investors have equity stakes in the ongoing / completed private sector projects. Government's budgetary support and investment from the private sector are the major financial sources for renewable energy-related projects and

programmes in India. Ever since the power sector was opened up in 1991, a series of measures have been taken for inviting private / foreign investment. Some of the major policy measures undertaken include: Foreign equity participation allowed up to 100% on the automatic approval route without any upper limit; Enactment of the Electricity Laws Amendment Act, 1998; Provision of counter guarantees for the eight initial fast track projects; Relaxation of 40% cap for debt exposure by Indian Financial Institutions; Setting up of a special inter-ministerial body called the Crisis Resolution Group to look into specific bottlenecks; and Streamlining of procedures. Similarly, for the petroleum sector, the Government of India, in January 1999, had invited bids under the New Exploration Licensing Policy (NELP) with attractive fiscal terms and incentives. NELP II has recently been launched. Foreign companies are free to bid with Indian firms for exploration activities.
The Government of India is encouraging foreign investors to set up such power projects on Build-Own and Operate basis. For the entire non-conventional energy sector, 100% foreign direct investment is allowed under the automatic route without prior information to the government. No prior approval of government is required to set up an industrial undertaking with FDI/NRI/OCB investment. The investor can bring funds directly and cooperate with an Indian Company, allot shares to foreign investors and inform RBI within 30 days.

**Cooperation:** India is now also in a position to offer its goods, technical expertise and services in this R&D in renewable energies, particularly to developing countries. Technical guidance and help has been provided for many developing countries for the construction of bio-gas plants. Products, which are being exported, include solar photo-voltaic systems, wind turbine equipment, selectively coated sheets for thermal applications and solar cookers. Indian made wind turbine and wind turbine components have been exported to Europe, Australia and Sri Lanka. Indian designs of gasifiers have attracted countries like Switzerland, Indonesia and the USA. A Swiss company has installed Indian designs of gasifier based decentralized power generation units in Switzerland. Indian scientists and engineers have provided consultancy services on different aspects of non-conventional/renewable energy through various UN Agencies like UNDP, UNESCO, UNIDO and other similar organizations.
India is also providing consultancy services for various projects under construction in the neighbouring countries of Nepal, Bhutan, Myanmar and Sri Lanka by way of planning and preparation of Detailed Project Reports (DPRs). In Nepal, Karnali (10800 MW), Pancheshwar (5600 MW) and Saptkoshi (3300 MW) in Bhutan, Tala (1020 MW), Kurichu and Manas (2800 MW) and in Myanmar, Tamanthi (1200 MW) are some of the hydro projects, which have been identified for development under mutual cooperation with these countries. Out of the above schemes, Tala and Kurichu are under construction and other schemes are at various stages of planning/investigation/discussions. Ministry of Non-Conventional Energy Sources has been cooperating with the Global Environment Facility, World Bank, UNDP, Asian Development Bank and also bilateral assistance from Denmark, Germany, USA and Japan and depending upon the specific nature of the cooperation project, efforts are made to obtain the concerned technologies.
India has signed bilateral/multilateral agreements for cooperation in the field of energy with some countries and the type of cooperation is related to exchange of information, conducting seminars/conferences/workshops, setting up of pilot projects and capacity building (HRD) in a few sectors like power etc. The nature of cooperation, however, differs from country to country and also depends upon the sector under consideration for example, power, coal, petroleum etc. There is very little bilateral/multilateral co-operation in research and development related to renewable energy. India as an Annex -II country, does not have any commitments under the Kyoto Protocol. India's per capita emissions are miniscule compared to those of developed countries. Nevertheless, India is making efforts to strike the right balance between environmental protection and sustainable development. India is a signatory to all the major environment related covenants and has ratified the United Nations Framework Convention on Climate Change (UNFCCC).

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## CHAPTER 4: CHANGING CONSUMPTION PATTERNS - TRANSPORT

**Decision-Making:** The various ministries and agencies involved include: Road Transport and Highways; Heavy Industry; Civil Aviation; Shipping, Railways; Urban Development; Petroleum; Environment and Forests; and, Planning Commission for formulating plans and policy. The Planning Commission has been entrusted with task of formulating the Integrated Transport policy for the country. As per the present system, amendments in existing Acts/notifications are carried out by the administering Ministry /Department in consultation with the other concerned Department/Ministries. The Ministry of Road Transport and Highways and the Ministry of Surface Transport deal with Indian Motor Vehicle Act, 1988 and Central Motor Vehicle Rules, 1989. Enforcement of these is done by the concerned State authorities. States play an active role in the decisions involving transport and their inputs are considered at all levels of decision making. To mitigate pollution problems in Indian cities, more stringent norms for vehicular emissions have been notified under the Central Motor Vehicle Rules. The Motor Vehicle Act (Amendment), 2000 legislated the use of environment-friendly fuel like Compressed Natural Gas (CNG) and Liquefied Petroleum Gas (LPG) as auto-fuels. In addition, Bharat Stage-I norms, which are akin to Euro-I norms, have been introduced all over the country w.e.f. 1.4.2000. Further, Bharat Stage-II norms, which envisage a Sulphur content of 0.05% as against higher quantities under Bharat Stage-I, have been introduced in NCR of Delhi and the other three metropolitan cities namely Mumbai, Calcutta and Chennai.

The Government of India constituted the Mashelkar Committee to recommend an auto fuel policy for the majpr cities of the country, to devise a road map for its implementation and recommend suitable auto fuel, automobile technologies and fiscal and institutional measures In September 2001. The Committee has recommended that the Bharat Stage II norms, which are in place in Delhi, Mumbai, Kolkata and Chennai be introduced into the entire country from 1 April 2005. Euro III equivalent emission norms for all categories of vehicles (excluding two- and three-wheelers) are recommended to be introduced in the seven mega cities from 1 April, 2005 and extended to other parts of the country from 2010. The necessity and the feasibility of extending the Euro III norms would be reviewed in the light of the experience gained after the introduction of Bharat Stage II norms in the entire country.

For Railways the Railways Act, 1989 is administered by the Ministry of Railways. The Ministry of Railways has its own codal procedures, safety norms, rules and regulations for all aspects of Railway working including Safety, Operations and Maintenance of assets.

The strategic objectives of the Civil Aviation policy of India are to create and continuously facilitate a competitive and service-oriented civil aviation environment amongst, which are the following: the interests of the users of civil aviation are the guiding force behind all decisions, systems and arrangements; safe, efficient, reliable and widespread quality air transport services are provided at reasonable prices; there exists a well-defined regulatory framework catering to changing needs and circumstances; all players and stakeholders are assured of a level playing field; private participation is encouraged and opportunities created for investors to realize adequate returns on their investments; recognizing that aviation today is an important element of infrastructure, rapid upgrading of airport infrastructure with priority to the busiest airports and those handling international flights; recognizing that transportation of air cargo is vital to the economic growth of the country, creation and development of specific infrastructure for air transportation of cargo and express cargo is encouraged; “airline operations and acquisition of aircraft” is conferred “infrastructure” status for overall growth of the civil aviation sector in the country. Indigenous development of aircraft, components and aviation products is encouraged; security of civil aviation operations is ensured through appropriate systems, policies, and practices; and effective systems are put in place for timely crisis and disaster management, including investigation of incidents/accidents.

India is a democratic country and the elected representatives of the people are invariably connected with the decision-making process. Their participation at the National level is through Parliamentary proceedings, meeting has the various Committees of Parliament as well as individual initiatives. States and local Governments have corresponding arrangements. The inputs of various organized Bodies/Associations are also considered during policy formulation. Parliamentary Committees such as the Standing Committee, Railway Convention Committee hold regular meetings with the Railway Administration regarding overall functioning of the Railways. Representations, suggestions and recommendations from various quarters such as the Passenger Amenities

Committee, Zonal Rail Users Committee and Trade Associations like the CII, ASSOCHAM and FICCI are also considered.
The Union Government and number of State Governments have approved the participation of private sector for construction, maintenance and operation of Highways on a BOT basis. A number of projects are under implementation. Government is encouraging and framing laws and regulations for promotion of private sector participation in various areas of transport including roads and civil aviation. See also under **Status**.

**Programmes and Projects:** Efforts are being made to make the roads more friendly for road users through a series of measures which include: widening of roads; construction of by-passes; improvements of road geometric providing paved shoulders; strengthening weak pavements; replacement of level crossings by road over bridges; retro reflective road signs provision of wayside amenities on high traffic density corridors; and creation of awareness amongst various categories of road users. Traffic efficiency of the railways is being achieved through the following programmes: use of more efficient locomotives; improvement of wagon productivity; increase of the axle-load; upgrading of signal and telecom; and modernization of terminals. Planning Commission has constituted a high level working group to look into various aspects of road safety. Besides, the Central Road Research Institute is also working on some projects. RSDO (Research Designs & Standards Organization) is under the Ministry of Railways, which takes care of the research needs of the Indian Railways through Mission Programmes. Some of the missions of RDSO include Heavy Haul Operation and High Speed Trains. To reduce the use of fossil fuel, the Government has launched a programme for alternative modes of surface transportation. The programme has demonstrated the use of electrical vehicles in major metro cities with encouraging signs of interest from a number of private companies who would like to manufacture such vehicles. A new programme to replace petroleum by ethanol has also been launched by the government. In order to encourage use of eco-friendly alternative fuel, a programme has been launched for use of Ethanol Blended Gasoline. For this purpose two pilot plant projects, one each at Maharashtra and U. P. have been taken up. Lead-free petrol has been inducted all over the country. The Ministry of Finance provides tax incentives for popularizing use of environment-friendly fuel like CNG, LPG etc. In August 2000, use of environmental-friendly fuel like CNG, LPG, fuel cell etc for automotive purposes had been legislated. See also under **Status**, **Research and Technologies** and Chapter 4-Energy in this Profile.

**Status:** To address the diverse issues facing the transport sector the need for a comprehensive policy package has been recognized. The Government has drawn a plan to strengthen the Indian railway system in its reach and capacity so that it effectively links the distant parts of the country, helps to develop the economic potential of the remote areas and carries the bulk of the nation's long or medium haul traffic. Similarly, the road network is being expanded and strengthened to improve accessibility of the hinterland, especially the rural areas and to facilitate the integration of the isolated parts of the country. The length and breadth and the quality of the highways has improved greatly as part of a national grid to provide for speedy, efficient and economical carriage of goods and people.
The Government is making efforts to regulate road transport for better energy efficiency and pollution control, and to make the mass transport network viable through a rational tariff policy and a refurbishment of the fleet. The capacity of the ports in terms of their berths and cargo handling equipment are being improved to cater to the growing requirements of the overseas trade. The shipping industry needs to be enabled to carry higher shares of the sea-borne trade in indigenous bottoms. The civil aviation sector is being expanded to increase its carrying capacity for passengers and cargo, improve the ground handling facilities and provide connectivity to areas like the North-East. Conditions need to be created to ensure full utilization of the capacities created in the public sector with large investments made in the past. In the metropolitan areas, on the one hand, the provision of mass public transport is being increased through a mix of environment-friendly modes - specially designed buses, light rail and metro and on the other, demand management is being ensured through price-based as well as non-price-based measures so as to minimize the dependence on personalized transport. Similarly, non-mechanized transport should be accorded its rightful niche in a well-conceived transport network. To bring about this sea change in the transport scene, many policy initiatives will be needed, each backed by adequate investment and complemented by suitable policy changes in other sectors. A Task Force on Infrastructure had been constituted with the aim of attracting investments

to specific projects. The domestic funding of the transport sector can be either public or private. Historically, the investments in the transport sector, particularly in the rail, road, ports and airports infrastructure, have been made by the State mainly because of the large volume of resources required, long gestation periods, uncertain returns and various externalities, both positive and negative, associated with this infrastructure. However, the galloping resource requirements and the concern for managerial efficiency and consumer responsiveness have led to the active involvement of the private sector in infrastructure services in recent times.

In India too, considerable private investment exists in trucking, inter-city bus travel, shipping and lately airline services. By and large, mobile transport units like trucks, buses, wagons, ships and aircrafts lend themselves easily to private investment while the large fixed infrastructure has remained in the domain of public investment. However, statutory and administrative initiatives have been taken in recent years to involve private capital in the expansion and strengthening of infrastructure in the railways, road, shipping and the airports. Private participation can take many forms like full or joint ownership management contract, leasing, and concessions like BOT. However, looking at the state of Indian capital markets, particularly for long-term debt, it may not be realistic to expect any large-scale contribution from the private sector in the transport area though evolution of a well-developed policy and regulatory framework can result in gradual inflows from the private sector.

The scope for private sector participation in providing rail infrastructure and services is limited. Attempts have, however, been made to involve the private sector in augmenting the capacity of the railway system in a number of ways. The "Own Your Wagon Scheme (OYWS)" was launched in the Eighth Plan in order to tap the private sector resources for augmenting the supply of wagons. The private sector firms would procure the wagons, own them and lease them to the railways with or without preferential claim on allotment of capacity for the firms' own use.

It has also been decided to undertake some of the projects through investment by the private sector under the "Build-Own-Lease-Transfer (BOLT)" scheme the private entrepreneurs and the financial institutions would build/manufacture/finance the assets for lease to the railways. Projects of gauge conversion, supply of rolling stock, electrification, doubling of existing single lines, and telecom are proposed to be implemented under this scheme.

Various fiscal and tax concessions have been offered for undertaking road projects on a BOT basis. The Government has assured help in land acquisition, environmental clearances and simplification of procedures. Some state governments have taken significant steps such as setting up dedicated organizations on the pattern of NHAI to promote road development financed through user charges on BOT or State toll basis. Some small stretches of roads and bypasses have already been commissioned under these arrangements. The role of this device may become more significant once the policy framework including an independent regulatory system is put in operation and investors are able to overcome their apprehensions with regard to uncertainties of these long-term investments in such infrastructure. The policy framework is sought to be kept flexible to permit allocation of risks on an acceptable basis and sharing of risks between the Government and the private sector through grants or equity sharing.

Projects relating to bypasses, bridges and four-laning of existing sections of National Highways are financially viable and bankable and taken up through private sector participation. Twenty projects involving an investment of about Rs. 1700 crores have already been initiated under the BOT Schemes. In addition six projects costing Rs. 1760 crores are being taken up under the annuity scheme. Viable sections of the four major corridors are also are being taken up under the BOT scheme for four laning. NHAI has been given considerable flexibility to financially collaborate with the private or the public sectors and projects, which are not viable on the basis of traffic density, will be provided equity/loan support from NHAI. Several other ROB/Bypass projects have been proposed under the BOT scheme through State Governments. In addition to the projects taken up through private sector participation under the programme of NHAI, some investment would be available under privatization programme for non-NHAI roads.

An overview of availability and accessibility is as following: *Railways*: The railways in India provide the principal mode of transportation for freight and passengers. It brings together people from the farthest corners of the country and makes possible the conduct of business, sightseeing, pilgrimage and education. Indian Railways have been a great integrating force during the last hundred years. It has bound the economic life of the country and helped in accelerating the development of industry and agriculture. From a very modest beginning in 1853, when the first train steamed off from Bombay to Thane, a distance of 34 km, Indian Railways have grown into a vast network

spread over a route length of 63,028 km. The growth of Indian Railways in the almost 150 years of its existence is thus phenomenal. It has played a vital role in the economic, industrial and social development of the country. About 22 % of the route kilometer, 30 % of running track kilometer and 29 % of total track kilometer is electrified.
*Roads*: India has one of the largest road networks in the world. The country's total road length is over 3 million Km. The Ninth Plan laid emphasis on a coordinated and balanced development of road network in the country under: primary road system covering state highways; secondary and feeder road system covering state highways and major district roads; and rural roads including village roads and other district roads.
*National Highways:* The Central government is responsible for the national highway system totaling a length of 58,000 km. In 1947 approximately 2,500 km of missing road links and thousands of culverts and bridges, which did not exist, were required to be constructed to have an integrated and continuous network. Though the national highways constitute only two % of the total road length, they carry nearly 40 % of road traffic. *State Sector Roads:* State highways and district rural roads are the responsibility of State governments and are maintained by various agencies in States and union territories. Roads are being developed in rural areas under the Minimum Needs Programme (MNP). The objective of it is to link all villages with a population of 1,500 with all-weather roads. The Government also assists in development of certain selected roads in States.
*Inland Water Transport:* India has got about 14,500 km of navigable waterways, which comprises rivers, canals, backwaters and creeks. At present, however, a length of 3,700 km of major rivers is navigable by mechanized crafts but the length actually utilized is only about 2,000 km. As regards canals, out of 4,300 km of navigation canals, only 900 km is suitable for navigation by mechanized crafts. About 1.60 million tones of cargo are being moved by Inland Water Transport (IWT), a fuel efficient and environment friendly mode. IWT is also known for higher employment generation potential. Its operations are currently restricted to a few stretches in the Ganga-Bhagirathi, Hooghly Rivers, the Brahmaputra, the Barak River, the rivers in Goa, the backwaters in Kerala and in the deltaic regions of the Godavari-Krishna rivers. Besides the organized operations by mechanized vessels, country boats of various capacities also operate in various rivers and canals. *Civil Aviation:* The civil aviation sector has three main functional divisions — regulatory, infrastructural and operational. On the operational side, Indian Airlines, Alliance Air (Subsidiary of Indian Airlines), private scheduled airlines and air taxis provide domestic air services and Air India provides international air services. Indian Airlines operations also extend to the neighbouring countries, South East Asia and Middle East. India has been a member of the International Civil Aviation Organization (ICAO) and is also on the Council of ICAO since its inception.

The Government has ended the monopoly of Indian Airlines and Air India on the scheduled operations by repealing the Air Corporation Act, 1953. There are at present three private scheduled airlines operating on the domestic network giving the passengers a wider choice of flights. Apart from this 37 Air Taxi Operators are providing non-scheduled air services. A new policy on domestic air transport service was approved in April 1997 according to which barriers to entry and exit from this sector have been removed; choice of aircraft type and size has been left to the operator; entry of serious entrepreneurs only has been ensured; and equity from foreign airlines, directly or indirectly, in this sector has been prohibited. The existing policy on air taxi services providing for a route dispersal plan to ensure operation of a minimum number of services in the North-Eastern Region, Andaman and Nicobar Islands, Lakshadweep and Jammu and Kashmir has been retained. The Airports Authority of India (AAI) manages 92 civil airports including five international airports, 28 civil enclaves at defense airfields. It manages the entire Indian air space. India has an integrated approach that seeks to improve all the modes -land, sea, inland water and air. The surface transport sector requires most attention. Financial resources, terrain, climate and population pressures are some of the constraints. The pressure of economic growth and urbanization would lead to increasing demand for transport services. Meeting this requirement in a manner that economically and environmentally sustainable is a continuous challenge. Transport and traffic systems that are not managed well put people at risk on the health front. Accidents, holdups and polluting vehicles cause problems that effect society.

**Capacity-Building, Education, Training and Awareness-Raising:** There are no rules at national level regarding non-motorized transport. However, local bodies may prescribe certain rules at their level. Government has incentives like seasonal tickets in public transport system. The Government has planned efficient mass rapid

transport systems for all metros. In Delhi construction is already underway and first phase is expected to be completed by the end of 2005/06. Awareness about road safety is being generated through use of audio-visual media, news media, conducting programmes in schools, campaigns through NGOs as well as distribution of posters, pamphlets, games etc. In addition, refresher driving training is being provided to drivers of heavy commercial vehicles through various NGOs/institutes. Nature study field visits coupled with audio visual presentations are part of school curricula. Children are made to do projects that are designed to learn more about the environment and its relationship with other sectors. There are many issues on environmental protection in the school curricula. Various programmes of trainings in the country and abroad for training of Highway/Traffic Experts, technical staff is in operation.

**Information:** The Ministry of Road Transport and Highways is maintaining the traffic census database for National Highways. The traffic census is made manually by the respective State Public Work Departments and hard copy of data is forwarded to this Ministry. This data is then entered into computers and analyzed. Railways maintain comprehensive data relating to all aspects of their working. These data are essential tools at the hands of the management in traffic planning, forecasting and fixing targets. Central Pollution Control Board, a statutory body under the Ministry of Environment and Forests has established 290 ambient air quality monitoring stations covering major cities and urban centres in the country and the data obtained is so processed and evaluated as to recommend necessary mitigating and control measures. Information from the relevant ministries is accessible on Internet through the common site: http://goidirectory.nic.in

**Research and Technologies:** Research, development and demonstration projects in the field of Electric Vehicles (EV's) under Alternative Fuel for surface transportation programme are also underway. The objective of this programme is to develop non polluting EV's with rechargeable batteries and fuel cells as a power source. CNG buses and other forms of less polluting modes of transport are being given incentives. The strategy of the government to develop an integrated transport system aims to improve the efficiency of the system. Railways have a well-devised system of working with regard to Traffic management and increasing safety. The improvement in traffic indices is being achieved through: improved terminal handling; upgrading of Signal and Telecommunication; introduction of new concepts like Engine-on-Train concept; and reduced detention to Rolling stock for improved turn-around.

**Financing:** The main sources of funding for building infrastructure like National Highways are the National budget, are collected from the sales of petrol and diesel and assistance from external, multilateral and bilateral agencies. In addition, small amount for funding comes from private sector.

**Cooperation:** India is a Member country of ESCAP and is a participating country in the Asian Highways System. Bilateral agreements for the transportation of goods between India & Bangladesh and India & Pakistan exist. Indian Railways is a member of both UN-ESCAP and UIC (International Union of Railways). UIC is a voluntary association of World Railways with over 140 members around the world. UN-ESCAP and UIC are currently engaged in the process of developing Trans-Asian Railway Corridor connecting Europe and Far East countries. The proposed corridor passes through Turkey, Iran, Pakistan, India, Bangladesh, Myanmar, Thailand and Singapore. Indian Railways cooperate with both UIC & UN-ESCAP with regard to the Corridor development plan. India is associated with various international organizations in the field of Highways and Management like PIARC, IABSE, and, IRF. India is also associated with regional groups like SAARC, BIMSTEC.

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## CHAPTER 5: DEMOGRAPHIC DYNAMICS AND SUSTAINABILITY

**Decision-Making:** The Planning Commission and the Ministry of Health and Family Welfare are involved in decision-making. In keeping with the move towards integration of social sector services, the National Commission on Population has been established as a coordination mechanism at the central level. Attempts are also made at the State/Union territories, district and block levels for setting up similar coordination mechanisms. National Population Policy (2000) aims to achieve a stable population by the year 2045 at a level consistent with the requirements of sustainable economic growth, social development and economic protection. Its goals for 2010 are: ensuring universal access to quality contraceptive services in order to lower the Total Fertility rate to 2.1 and attain two-child norm, full coverage of registration of births, deaths, marriages and pregnancies, universal access to information/counseling services for fertility regulation and contraception with a wide basket of choices, universal immunization of children against vaccine preventable diseases; decreasing infant mortality rate below 30 per thousand live births and sharp reduction in the incidence of low birth weight (below 2.5 kg) babies; and, universal access to primary education and reduction in the drop out rates at primary and secondary levels to below 20 % for both boys and girls; achieving 80% institutional deliveries and increase in the percentage of deliveries conducted by trained persons to 100 %; containing Sexually Transmitted Diseases; and, reducing Maternal Mortality Ratio to less than 100 per 100,000 live births. New Health Policy 2002 has been developed. India seeks to evolve a system that conceives and exploits inter and intra sectoral synergies between development processes directed at improving availability of drinking water, sanitation and public hygiene, access to elementary education, nutrition and poverty alleviation, on one hand, with awareness and access to public health and medical services, on other, with the active support and involvement of various NGOs and major groups.

**Programmes and Projects:** The primary objective of the Family Welfare Programme, which was started in 1951, has been to stabilize population at a level consistent with the needs of national development. During the 70s, the focus was mainly on terminal methods and remained fully voluntary and the main effort of the government was to provide services and encourage the citizens by information, education and communication to use such services. The experiences gained within and outside the country had amply established that health of women in the reproductive age group and of small children (up to five years of age) are of crucial importance for effectively tackling the problem of population growth, which has led to change the approach from family planning to family welfare. The first National Health Policy (1983) concretized supply-oriented approach by specifying quantitative targets for health and fertility gains and a timetable to 2000 for meeting them. These targets strongly emphasize the reduction of preventable mortality and morbidity affecting mothers and young children. All these interventions were operationalized through a chain of primary health care institutions set up according to the National Health Policy. Since the 7th (1984-89), the family welfare programmes have evolved with the focus on the health needs of women in the reproductive age group of children below the age of five years on one hand and on the other hand, to provide contraceptives and spacing services to the desirous people.

The Universal Immunization Programme (UIP) aimed at reducing mortality and morbidity among infants and younger children of Vaccine Preventable Diseases was started in 1985-86. India had achieved remarkable success under the Pulse Polio Programme. Barring a few remaining pockets in the country, Polio had been eradicated from India. A comprehensive programme of immunization had been recently launched to prevent Hepatitis B. The Oral Rehydration Therapy (ORT) was also started in view of the fact that diarrhea was leading cause of deaths among children. Various other programmes under Maternal and Child Health (MCH) were also improving the health of mothers and young children to provide them facilities for prevention and treatment of major disease conditions. While these programmes did have a beneficial impact, the separate identity for each programme causes problems in their effective management. Therefore, in the Eighth Plan, these programmes were integrated under Child Survival and Safe Motherhood (CSSM) Programme, which was implemented from 1992-93. The process of integration of related programmes initiated with the implementation of CSSM Programmes was taken a step further in 1994, when the International Conference on Population and Development in Cairo recommended that the participant countries should implement unified programmes for Reproductive Child Health (RCH). The RCH approach has

been defined as "People have the ability to reproduce and regulate their fertility, women are able to go through pregnancy and child birth safely, the outcome of pregnancies is successful in terms of maternal and infant survival and well being and couples are able to have sexual relations free of fear of pregnancy and of contracting diseases," which representing the evolution of an integrated approach to the programmes aimed at improving the health status of young women and children, which has been on-going. It is obviously sensible that the integrated RCH Programmes would help reducing the costs of inputs to some extent because overlapping expenditure would no longer be necessary and integrated implementation would optimize outcomes at field level. During the Ninth Plan, the RCH Programmes have integrated all related programmes of the Eighth plan, aiming to provide the beneficiaries with need-based, client centered, demand-driven, high quality and integrated RCH services.
The Family Welfare Programme is being implemented under the Target Free Approach (TFA) since 1st April 1996 all over India and under the system of decentralized participatory planning. Since 1997, TFA has been renamed as Community Needs Assessment Approach (CNAA), under which planning of family welfare services are formulated in consultation with the community at the grass roots level and monitoring and evaluation of performance requires a fresh look with a view to ensuring quality of care at different levels of the primary health care system This approach is expected to bring about improvement in quality of services to client satisfaction. Decentralized participatory planning implicates close association of the community and its leading lights and opinion leaders in formulation of the PHC based family welfare and health care plan.

**Status:** Decentralized participatory planning stresses quality of care, and assessment and provision of services on the basis of client needs. Voluntary and informed choice, which has always been the underpinning of the population programme, is emphasized. Service providers/ managers at the level of the Primary Health Centre are expected to draw up a health care and family welfare plan at their level after carrying out assessment of community needs and in consultation with the community and community leaders. An integrated system of monitoring has been devised and transmission of information is done using the countrywide public information network known as the NIC-NET. It is expected that this reporting system will relieve service providers of excessive record keeping and free their valuable time for providing services to and making contact with the community. The mobility of service providers has also been enhanced to facilitate greater and more frequent contact with the community. As many as 132,285 sub-centres at the peripheral level have a female para-medical, known as the Auxiliary Nurse Midwife (ANM), and the medical doctors at the Primary Health Centre (PHC) level include a fair number of women. The women's perspective is expected to be taken care of by this empowerment of service providers and managers. The greatest challenge before India is to stabilize its population through voluntary means by the year 2045. Another challenge is to correct existing asymmetry between male and female population ratio. The task is gigantic and all the resources need to be placed along with following an integrated approach for achieving these goals.

**Capacity-Building, Education, Training and Awareness-Raising:** Information Education and Communication (IEC) is carried out through a variety of modes of dissemination, including interpersonal communication, electronic and print media, animation groups and peer groups, population education through schools and colleges, adult literacy campaigns, youth clubs, etc. Required software for IEC is designed and supplied by various agencies. Efforts have been made to build capacity at the State level to design and create software more appropriate to local needs. IEC has been diversified from being contraception oriented to encompassing issues like the status of women, child survival, age at marriage, etc. Correspondingly, messages pertaining to fertility are also being carried in the IEC projects of other Departments such as Education and Rural Development. Training of all service providers at the block level was integrated from April 1, 1997 to facilitate appreciation of the inter-linkages between various aspects of development like literacy, poverty alleviation, and environment with population.

**Information:** Further information is available from Secretary, Department of Family Welfare website: http://mohfw.nic.in.

**Research and Technologies:** Extensive research has been undertaken in India on the reproductive health of the population. The National Family Health Survey (NFHS) provides a vast amount of data, which is being used for

policy and programme purposes. National Institute of Family Welfare, National Institute of Immunology, and National Institute of Nutrition are some of the premier institutions in the country engaged in research and development activities in this field.

**Financing:** In the Ninth Plan period, external assistance for the population programme is estimated about Rs.30 billion. Agencies like the United Nations Population Fund (UNFPA) and the United Nations Children's Fund (UNICEF) have and are continuing to provide valuable technical, monetary, and material assistance. Bilateral agencies are providing financial support for the population programme. The Pulse Polio Immunization initiative has attracted widespread international support.

**Cooperation:** The WHO, UNFPA and UNICEF are assisting India in a number of projects.

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## CHAPTER 6: PROTECTING AND PROMOTING HUMAN HEALTH

**Decision-Making:** The Department of Health and the Department of Indian Systems of Medicines and Homeopathy coordinate the health care programmes under the overall supervision of the Ministry of Health and Family Welfare. A number of regulatory measures had been taken to effectively manage the health sector in the country. Directions of the Supreme Court of India to ban pre-natal determination of the sex through ultra sound could be cited as important measures to prevent female fetus infanticide. The New National Health Policy 2002 recognizes the need for a time-bound programme for setting up network of comprehensive primary health care services. The strategy of Indian Health Planning is two pronged: first, to build up a primary health care infrastructure, and second, tackling specific diseases. The primary health care infrastructure, consisting of Sub-centres, Primary Health Centres (PHCs), and Community Health Centres on the basis of certain population norms had been set up in the country. The PHCs has been built around a population of 30,000 per unit. In hilly and tribal areas this norm is relaxed to the population of 20,000. This mechanism provides for a sustained and continuous outreach for all health and family welfare programmes in the country. The disease specific strategy consists of programmes aimed at prevention and control of specific diseases. These programmes are targeted for specific regions depending upon circumstances/spread of the disease.

**Programmes and Projects:** The National Health Programmes aimed at prevention, control and eradication of communicable and non-communicable diseases have been accepted by the Government for implementation. Efforts have been made to ensure that the ongoing reforms do not lead to any adverse effect on the provision of essential care to meet the health needs of disadvantaged segments of the population. Some of the measures include allocation of funds under the Social Safety Net Scheme to improve Maternal and Child Health (MCH) infrastructure in the poorly performing districts. National initiatives on communicable diseases include: National Anti Malaria Programme (launched in 1953); National Tuberculosis Control Programme (1962); National Leprosy Eradication Programme (1983); and National AIDS Control Programme (1992). For AIDS, a National Control Programme has been established with blood safety measures and sexually transmitted disease (STD) control through the National AIDS Control Organization. Through its implementation, 154 Zonal Blood Testing Centres have been established all over the country to provide HIV testing facilities. The programme aims at modernizing blood banks, training of medical officers, blood bank technicians, and drug inspectors. The "One World, One Hope" theme that was adopted for the World AIDS Day on December 1, 1996 reflects the coming together of various groups to prevent the spread of HIV.

National initiatives on some non-communicable diseases that were perceived as major public health problems have been undertaken, such as: the National Goitre Control Programmes (launched in 1962), the National Blindness Control Programme (1976), the National Cancer Control Programme (1975-76), National Mental Health Programme (1982) and Integrated Non-Communicable Disease Control Programme (launched on a pilot basis in the Ninth Plan). It is neither possible nor feasible to initiate and support vertical programmes for control of every non-communicable disease. During the Ninth Plan period, integrated non-communicable disease control programmes had been implemented using the experience gained from pilot projects, such as the diabetes control programme launched during the Eighth Plan. Under the Basic Minimum Services scheme, the Government is committed to providing credible primary health care at the 5000 population level. In addition to the Centrally Sponsored Schemes, funds will be devolved to States for meeting requirements under the Basic Minimum Services, including health and family welfare. The strengthening of rural health infrastructure has been undertaken over the years by the Department of Family Welfare through the provision of buildings, equipment, drugs, vaccines, and training at all personnel levels.

**Status:** Improvement in the health status of the population has been one of the major thrust areas in social development programmes of the country. This has to be achieved through improving the access to and utilization of Health, Family Welfare and Nutritional Services with special focus on under-served and under-privileged segments of population. Technological improvements and increased access to health care have resulted in steep fall in

mortality, but disease burden due to communicable and non-communicable diseases and nutritional problems continue to be high.

At the time of independence, communicable diseases were a major cause of morbidity and mortality in India. Initial efforts in public health care were, therefore directed to their prevention and control. A number of initiatives have been important interventions that have contributed considerably in bringing down the crude death rate per thousand, from about 25 in 1951 to fewer than 9 in 1999 (see under **Programmes and Projects**). However, morbidity due to communicable diseases continues to be high in spite of renewed effort at extending the immunization coverage of the population.

Deteriorating urban and rural sanitation, poor solid waste management has escalated the prevalence of communicable diseases. Until poor sanitation, contaminated water supply, and lack of adequate facilities for solid and liquid waste management both in urban and rural areas are corrected, it may not be possible to completely prevent periodic outbreaks of infectious diseases. Nevertheless, if outbreaks are detected early enough, it will be possible to control the epidemic and reduce morbidity and fatality rates. The emergence of drug-resistant pathogens and insecticide resistant vectors has compounded the problem of controlling communicable diseases.

Urban migration over the last decade has resulted in the rapid growth of urban slums. In some cities, the health status of urban slum dwellers is worse than that of the rural population. During the Ninth Plan period, steps were initiated to develop a well-structured organization of urban primary health care to ensure basic Health and Family Welfare dwellings. Appropriate referral linkages between primary, secondary, and tertiary care facilities in defined geographic areas will be established to promote optimal use of all available facilities. Increasing involvement of the Nagar Palikas (Urban Local Bodies) in the implementation of health, water supply, and sanitation programmes is expected to further improve the health status of the urban population, especially slum dwellers and those living below the poverty line.

Communicable diseases continue to be a major cause of morbidity and mortality in India. In addition to the existing bacterial, viral, and parasitic infections, there are newer additions such as HIV infection and re-emergence of some infections such as kala azar. This has led to a situation where disease burden due to communicable diseases continues to be very high. There are National Programmes for control of vectors, but performance in many of these has been sub-optimal, an important factor being the lack of key personnel such as lab technicians and multipurpose workers. Many of these programmes were initiated at a time when primary health care infrastructure was not fully operational and, hence, had their own vertical infrastructure. In the Ninth Five-Year Plan period, a major effort was made for horizontal integration of these programmes at the district and sub-district levels within the existing framework of primary health care infrastructure. Changing lifestyles, longevity, and dietary habits have resulted in increased prevalence and earlier age of onset for diabetes, and cerebro- and cardio-vascular diseases over the last decade and a concomitant rise in the disease burden and disability adjusted life years (DALY) due to non-communicable diseases. The overall cancer incidence in the country is low. Even though the two common cancers of the oropharynx and uterine cervix are easy to diagnose and treat, the available data indicate that the majority of cases are detected at a late stage when palliative rather than curative treatment remains the only possible therapeutic modality. Thus, there is a need to improve the facilities for early detection of cancers so that effective treatment could be provided. Country also faces the global challenge of control of AIDS.

**Capacity-Building, Education, Training and Awareness-Raising:** There is a need to train not only medical practitioners, technicians and paramedical staff in addition to raise awareness among the people. A large number of Indian Systems of Medicine (ISM) practitioners work in remote rural as well as urban slum areas and play an important role in enhancing health care outreach. There is a need to improve pre-service training and provide periodic updating after graduation so that there is improvement in the quality of service and greater participation in meeting the health care needs of the population. It is important to increase the efficiency of the health system through all categories of health manpower during the Ninth Plan period. The recommendations contained in the National Education Policy on Health Sciences, as approved by the Central Council of Health and Family Welfare in 1993, need to be fully implemented to ensure growth and development of the appropriate mix of health care manpower. Optimal use of human resources for health will be made through: creation of a functional, reliable health management information system, and training and deployment of health managers with requisite

professional competence; multi-professional education to promote team work; skills upgrading for all categories of health personnel as part of structured continuing education; increasing accountability of responsiveness to people's health needs by assigning an appropriate role to the Panchayati Raj institutions; and making use of available local and community resources.

**Information:** Information on health can be obtained from the Ministry of Health and Family Welfare. The ministry can be visited on the Internet at: http://mohfw.nic.in.

**Research and Technologies:** The Central Government supports bio-medical research in a number of areas. The Indian Council of Medical Research (ICMR) is the modal organization for undertaking and supervising this work. In addition Government agencies such as the Department of Biotechnology and the Council for Scientific and Industrial Research fund research programmes in biotechnology and medicine in universities and Research Institutions. The Department of Biochemistry in the University of Delhi has developed a vaccine for AIDS that is currently undergoing trials.

**Financing:** The new Health Policy 2002 envisages increased sectoral outlay on primary health sector and gradual convergence of all health programmes under a single field administration. However, in order to augment the resources for health care, user charges have to be gradually introduced for medical/diagnostic services in various hospitals and health care facilities. This is expected to help to provide better quality services, besides facilitating public funding of basic health facilities. With rising incomes, the demand for health care is increasing and substantial efforts should be made to augment infrastructure.

**Cooperation:** WHO, UNFPA, UNICEF and other multilateral and bilateral agencies are providing valuable support in the health sector.

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## CHAPTER 7: PROMOTING SUSTAINABLE HUMAN SETTLEMENT DEVELOPMENT

**Decision-Making:** The Ministry of Rural Development and the Ministry of Urban Development and Poverty Alleviation are the modal Ministries. Housing is a state subject. However, the Government of India is responsible for the formulation of policy with regard to programmes and approaches for effective implementation of social housing schemes, particularly those pertaining to weaker sections of the society. In order to provide greater access to land, Urban Land (Ceiling and Regulation) Repeal Act had been passed by the Indian Parliament in 1999. As one of the original signatories to the Vancouver Action Plan, 1976, India has introduced approaches in its human settlements programmes that seek to effectively provide access for people, especially vulnerable groups, to adequate and affordable shelter in human settlements that encompass the shelter unit and basic physical, economic, and social services, including access to livelihood programmes. India initiated the process through formulation of the National Housing Policy (NHP) with the long term goals to reduce the number of homeless, to improve the housing conditions of the inadequately housed, and to provide a minimum level of basic services and amenities to all. The foundation that has been strongly established over the past years enabled the activities to gather momentum and take the directions that were necessary to implement the Habitat II (Istanbul, 1996) National Plan for Action (NPA).

Major priority issues were identified in the NPA. The objective was to create the enabling environment in which participants outside the government system can become more active in the delivery of housing solutions and provision of services, so that the outreach is extended to all segments of the market, especially vulnerable groups. The NPA, a consensus effort of all the key actors, has two critical objectives, namely, giving people access to adequate and affordable shelter and social infrastructure and services, and developing sustainable urban and rural settlements in an urbanizing world. The NPA specifically encompasses the following major activities: creation of an enabling environment; development of all types of housing and related services; eradication of poverty and strengthening the activities in the informal sector; providing access for women, children, and other vulnerable groups to housing and basic services; monitoring and evaluation systems; and State shelter policies and action plans. All the key actors are committed to the implementation of the NPA and the Global Plan of Action, to which the NPA is closely linked. The Government of India reaffirms its commitment to realize the rights set out in relevant international instruments and documents relating to education, food, shelter, employment, health, and information, particularly in order to assist people living in poverty. Considering the magnitude of the housing problem especially in rural areas, the Central Government in 1998 announced a National Housing and Habitat Policy, which aim at providing "Housing for All". In addition to the efforts made by the public sector institutions, a large number of cooperative house building societies, private builders are involved in enhancing housing facilities in the country. See also under **Status**.

**Programmes and Projects:** In spite of rapid and widespread urbanization, India still has a large rural population. Some of the important programmes for rural housing are Indira Awaas Yojna (IAY), Pradhan Mantri Gramodaya Yojana (Grameen Awas), and Credit cum subsidy scheme for rural housing, which have improved housing conditions, income opportunities, and accelerated economic growth. Rural areas have contributed to the sustainability of urbanization by providing inputs for urban industry, trade and services, a large market for urban products, a source of competitively priced labour, and household savings to the financial system. Housing and Urban Development Corporation (HUDCO) and National Building Organization (NBO) had played an important role in ameliorating housing problem in India. In addition, the Union Government had announced major fiscal concessions for housing sector including permitting investment by Non Resident Indians (NRIs) in housing sector. The strengthening of the rural-urban continuum is high on the habitat agenda for India.

**Status:** The current state of human settlements in India presents a mixed scenario. There have been significant improvements in the coverage of the population's basic human settlement amenities and in the quality of the habitats. There has been a visible improvement in housing structure and quality and more market-sourced materials are being used in both urban and rural areas. Higher levels of affordability have been achieved. At the same time,

housing costs are rising, floor area per capita is falling, and a growing number of people are being pushed out of the formal housing market. The impact of the situation is reflected in the proliferation of urban slums.

Urban India has 25.7% of the National population, equivalent to 217.6 million people, one of the largest urban systems in the world. During the last four decades, the annual incremental population has averaged 5-6 million, about three-quarters of which is through natural population growth; and two-fifth through out-migration from rural areas, and administrative changes in classification of urban and rural areas. Urban processes have varied. The conventional route of large industry, trade, and seat of governance are still important, but other routes, typical of processes in developing countries, are evident all over the country. Urbanization through development of "mandi" (village marketing outlet) towns, small towns, social and cultural activities, including educational and medical centres of excellence, religious, cultural and historical centres, tourism, and induced growth of new economic activity centres have been some other urban processes that have successfully developed sustainable urban settlements. Urbanization has had a distinct impact on human settlements and people's lifestyle. Construction technology and land constraints have changed the housing typology in urban areas from single-unit, plotted development to vertical structures and multi-household complexes. This changing pattern is seen in mega and metro cities as well as in large towns, but is not so evident in small towns and rural areas.

The major concerns of city managers include the widening gap between the needs and supply of urban services, which has had a deteriorating impact on the urban environment leading to the inadequacy of urban planning, urban poverty, and degradation. The parallel development of formal and informal housing has produced the multiple-city syndrome in urban India: a city of the poor and a city of the rich, with distinct variations in levels of amenities, types of structures, level of income, and quality of life. While housing shortage is modest at around 5 million units in terms of new construction, the problem is serious in terms of upgrading and renewal of existing housing stock. Development of housing infrastructure and services has not kept pace with the growth of housing. The problem of upgrading and renewal of basic services like potable water and sanitation is serious. A similar situation of inadequacy is seen for social services, particularly for the poorer segments, slum settlements, women, children, and other vulnerable groups. The National Plan of Action places special attention on meeting the backlog in housing and infrastructure assets, including upgrading activities.

Financial intervention in housing has been developed, especially to promote home ownership, but the reach to the lower segments of the market has not been adequate. Credit instruments for rental and upgrading programmes have to be developed. The financial intervention for infrastructure development is also not adequate. Reducing transaction costs and risks, as well as accessing low-cost funds in the country and abroad, are major concerns. Initiatives along these directions will be taken during the next two decades, including appropriate fiscal and legislative measures to improve the financial environment and bring new credit instruments for specific activities and groups. The National Housing and Habitat Policy (NHHP) formulated in 1998 lays down the role of all the stakeholders for achieving the goal of providing shelter to all. As a part of the objectives of the NHHP, the Central Government would: take steps to bring in legal reforms including formulation of effective foreclosure laws; devise macro economic policies to enable flow of resources to the housing and infrastructure sector; develop a debt market for housing and infrastructure fully integrated with the financial markets in the country; set up a National Shelter Fund to meet the requirement of low cost funds for the housing needs of the poor; promote research and development and transfer of technology for construction of houses; devolve parameters for optimal use of available resources to promote development and growth in a sustained manner; provide fiscal concessions for housing, infrastructure, innovative and energy saving construction materials and methods and also set up a regulatory mechanism to ensure that the concessions are correctly targeted and utilized; develop and enforce appropriate ecological standards to protect the environment and provide a better quality of life in human settlements; and, promote the creation of a secondary mortgage market. The State Governments would: liberalize the legal and regulatory regime to give a boost to housing and supporting infrastructure; promote private sector and co-operatives in undertaking housing construction for all segments in urban and rural areas; undertake appropriate reforms for easy access to land; facilitate training of construction workers by converging other development programmes through Building Centres and other agencies; promote decentralized production and availability of building material; and, empower the local bodies to discharge their responsibilities in regulatory and development functions.

**Capacity-Building, Education, Training and Awareness-Raising:** See under **Status**.

**Information:** Information on human settlement development can be obtained from the Ministry of Urban Development and Poverty Alleviation and the Ministry of Rural Development. These ministries can be visited on the Internet at: http://urbanindia.nic.in; and, http://rural.nic.in.

**Research and Technologies:** Research, and Technology Transfer Organizations such as HUDCO, Building Material and Technology Promotion Council (BMTPC) and State Housing Boards are conducting their activities in the following areas: direct research efforts to locally available raw materials; reduce the use of scarce natural resources and replace them with renewable resources; standardize the new technology for easy adoption by various public and private construction agencies; promote energy efficiency in building materials and construction methods; promote use of renewable energy sources for the housing sector particularly, solar, bio-mass and waste based energy; promote disaster mitigation techniques for new constructions as well as strengthening of existing houses to prevent continuing loss of housing stock and human lives from natural hazards like earthquakes, cyclones and floods; and, disseminate information about new technologies and provide training to construction workers in the use of new technologies.

**Financing:** The following initiatives have been taken as part of implementation of National Housing and Habitat Policy:

- An Action Plan has been drawn up to achieve the target of Shelter for All enunciated in the National Agenda for Governance. Construction of seven lakh additional dwelling units in urban areas will be facilitated by the Government by providing fiscal and technological support. It will require all found-involvement of private sector/cooperatives and NGOs/CBOs (Community Based Organizations);
- The National Housing Bank set up in 1988 as a subsidiary of Reserve Bank of India, is functioning under administrative control of the Banking Division of Department of Economic Affairs. It is supervising and controlling various Housing Finance Institutions (HFIs). So far it has recognized 29 HFIs;
- Allocation by Life Insurance Corporation/General Insurance Corporation for direct and indirect finance for housing has been increased;
- During 2000-2001, HUDCO sanctioned loans of Rs. 7,912.73 crore for Housing and Urban Infrastructure schemes. The loan released by HUDCO during the same period was Rs. 4,829.32 crore. The 360 schemes, sanctioned during 2000-2001 with HUDCO loan assistance of Rs. 7,912.73 crore would enable construction and upgrading of 30.98 lakh residential units, development of 8,871 residential plots. More than 96 % of the total residential units sanctioned during the year were meant for EWS/LIG (29.93 lakh units). In addition, under 'HUDCO Niwas' the individual housing loan scheme, it has sanctioned Rs. 1,071.27 crore for 80,740 dwelling units in the country and released an amount of Rs. 662.14 crore during the year; and (e) As an action plan item, Night Shelter Scheme for Footpath Dwellers is being implemented as a Centrally-sponsored scheme in the metropolitan and other major urban centres. Since April 1990, 106 schemes benefiting over five lakh footpath-dwellers have been sanctioned by HUDCO in various parts of the country.

**Cooperation:** The Habitat II goal of adequate shelter for all in sustainable human settlements is an international responsibility. A healthy, safe, more equitable, and sustainable human settlement would contribute directly to achieving world peace, harmony, justice, and stability. An innovative framework for international cooperation must be developed to ensure timely, appropriate, and responsive technical and financial cooperation to meet the needs and priorities of the developing countries without any conditions. The international community should establish links with the informal sector and credit mechanisms so that this growing segment of the economy, a major component in the countries of the South, gets access to the global pool of resources. In this approach, the participatory efforts of Non-Governmental Organizations (NGOs), Community-Based Organizations (CBOs), and the community must be developed.

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## CHAPTER 8: INTEGRATING ENVIRONMENT AND DEVELOPMENT IN DECISION-MAKING

**Decision-Making:** The National Environmental Council is the key sustainable development coordination mechanism. The Council, chaired by the Prime Minister, is the highest policy making body on environmental issues. The Council consists of senior representatives of Central Ministries, Chief Ministers of States, representatives of Non-Governmental groups, distinguished scientists, and academics.

India's development objectives as reflected in the planning process have consistently emphasized the promotion of policies and programmes for economic growth and social welfare. The alleviation of poverty and the development of the country's economic and social infrastructure have been emphasized in the country's successive Five Year Plans. Investment resources were targeted to ensure the realization of these concerns. Environmental issues that have been an integral part of Indian thought and social processes are reflected in the Constitution of the Republic of India adopted in 1950. The Eighth Five Year Plan had identified people's initiative and participation as a key element in the process of development. It had also recognized that the role of the Government should be to facilitate and strengthen the process of involvement of major groups by creating the right types of institutional infrastructure. The Directive Principles of State Policy enunciate principles, which, though not enforceable by any Court, are nevertheless fundamental in the governance of the country. It is the duty of the State to apply these principles in legislation. The commitment of the State to protect environment and safeguard forests and wildlife is reflected by specific provisions in the Directive Principles of State Policy. Further, the Constitution states that it shall be the fundamental duty of every citizen to protect and improve the natural environment, including forests, lakes, rivers, and wildlife, and to have compassion for living creatures. By a 1976 Constitutional amendment, the subject of forests and wildlife was brought under the Concurrent List in the Seventh Schedule, thereby enabling Parliament and the Central Government to legislate on these subjects. The growing trend towards popular participation in the conservation and natural resource development programmes has resulted from these Constitutional provisions.

The National Conservation Strategy and Policy Statement on Environment and Development, adopted in June, 1992, provide the basis for integrating and internalizing environmental considerations in policies and programmes of different sectors. It emphasizes sustainable lifestyles, and the proper management and conservation of resources. The Government's policy statement of 1992 on Abatement of Pollution reiterates India's commitment to arresting deterioration of the environment, which reflects a shift in focus from problems to implementation of measures incorporating both short-term and long-term considerations. The statement recognizes that pollution particularly affects the poor. The complexities are considerable given the number of industries, organizations, and government bodies involved. To achieve the objectives, maximum use is made of a mix of instruments including legislation and regulation, fiscal incentives, voluntary agreements, educational programmes, and information campaigns. The draft National Strategies for Sustainable Development (NSSD) are under finalization. A National Environmental Appellate Authority has been constituted to hear appeals with respect to rejection of proposals from the environmental angle. The objective is to bring in transparency in the process and accountability, and to ensure the smooth and expeditious implementation of developmental schemes and projects.

Environmental Impact Assessment (EIA) has been made statutory for various developmental activities and the Coastal Resource Zones notification (1991) provides guidelines for protection and management of coastal zones. An EIA Authority for the National Capital Region has been constituted to deal with environmental protection problems arising out of projects planned in the National Capital Region (NCR). An Aquaculture Authority has been constituted to deal with the situation created by the Shrimp Culture industry in the coastal States and Union Territories. The Central Ground Water Authority for regulation and control of ground water management has initiated action regarding registrations for ground water pollution/depletion. It has also initiated a mass awareness programme. Besides this, different authorities have been created for dealing with specific problems in the States of Tamil Nadu and Maharashtra. The need to integrate the environment and development decision making process has been recognized as contributing to economically efficient, socially equitable, and responsible environmental management. More extensive use of analytical tools, such as EIA and Environmental Health Impact Assessment (EHIA) on strategic policies and development programmes which have an adverse effect on environment or on

human health, Environmental Risk Assessment (ERA) of industrial units, and Environmental Audit (EA) to increase efficiency in the use of energy and resources and reduce wastes can contribute to policy integration by making decision makers aware of the environmental consequences of their actions.
A very far-reaching notification by the Ministry of Environment and Forests gazetted in 1994 makes it obligatory for almost all development activities, small and large, to conduct an environmental impact assessment study which has to be evaluated and assessed by an impact assessment agency (Ministry of Environment and Forests) who may consult a Committee of Experts, if deemed necessary. The assessment shall be completed within a period of 90 days and the decision on the approval conveyed within 30 days after completion of public hearings when required.
In addition, Ministry of Environment and Forests has launched a new scheme to develop State of Environment Reporting mechanism for all the States/Union Territories in a systematic manner during the Tenth Five-Year Plan.
Indian Environmental legislations include: Environment (Protection) Act, 1986; Water (Prevention and Control of Pollution) Act, 1974, as amended up to 1988; Water (Prevention and Control of Pollution) Cess Act 1977, as amended by Amendment Act, 1991; Air (Prevention and Control of Pollution) Act, 1981, as amended by Amendment Act, 1987; National Forest Policy, 1988; Forest (Conservation) Act, 1980; National Environment Tribunal Act, 1995; Public Liability Insurance Act, 1991; Re-cycled Plastics Manufacture and Usage Rules, 1999; Manufacture, Use, Import, Export and Storage of Hazardous Micro-Organisms; Genetically Engineered Organisms or Cells rules, 1989; Hazardous Wastes (Management and Handling) Rules, 1989; Bio-Medical Waste (Management and Handling) Rules, 1998; Municipal Solid Wastes (Management & Handling) Rules, 2000; Noise Pollution (Regulation and Control) Rules, 2000; Ozone Depleting Substances (Regulation) Rules, 2000; and, New Biodiversity Bill – 2000; Prevention and Control of Pollution (Informed Consent Procedure) Rules, 1999.
Selected policy initiatives taken by the Ministry of Environment and Forests towards sustainable development are as follows: National Environmental Action Plan for Control of Pollution; Urban Pollution; Vehicular Pollution; Environmental Epidemiological Studies; Environmental Management System (EMS); Informed Consent Procedure City Afforestation Programme for Mitigating Pollution; National Biodiversity Strategy and Action Plan (NBSAP); Biosafety Protocol; Rules on the management of Lead acid Batteries; Regional Development Strategy based on Carrying Capacity concept; Development of Management Tools for preventing environmental degradation; Establishment of Indian Centre for Promotion of Cleaner Technologies (ICPC); Water Quality Standards for Sewage; Technology for Sewage Treatment; Water Conservation through recycling; Joint Forest Management; National Forest Action Programme; and, National Forestry Research Plan.

**Programmes and Projects:** See under **Decision-Making** and **Status**.

**Status:** India considers that there is no conflict between environment and development. Various efforts have been made to integrate environmental concerns into the decision making process. Environmental standards and environmental management plans are important measures to protect the environment. The same applies to environment audits, which have been made mandatory for major industries. An important element of sustainability pertains to the protection of the environment and preservation of the natural resources the nation. Rapidly growing population, urbanization, changing agricultural, industrial, and water resource management, and increasing use of pesticides and fossil fuels have all resulted in perceptible deterioration in the quality and sustainability of the environment. It should be realized that environmental protection does not only involve preventing pollution and natural resource degradation but has to be integrated with the overall development process and the well-being of people. No developmental activity can be taken up unless the conditions stipulated under the respective environmental and forestry clearance have been complied with. Environmental protection cannot be isolated from the general issues of development and must be viewed as an integral part of development efforts. Accordingly, the concept of sustainable development must include the fostering of economic growth, the meeting of basic domestic needs (including health, nutrition, education, housing, etc.), and the eradication of poverty so as to provide to all a life of dignity in a clean, safe, and healthy environment. Stress needs to be placed equally on the “development” and “sustainable” dimensions of the concept of sustainable development. The integration of environmental concepts into policies and programmes concerning economic development should be carried out without introducing a new form of conditionality in aid or development financing. Having achieved substantial progress in terms of software

and hardware requirements, the emphasis from now on should be on enforcement and performance evaluation of assets created. A monitoring mechanism will, therefore, need to be reoriented in the case of major projects and programmes to achieve this objective.
The Tenth Five-Year Plan (2002-2007) provides an opportunity, at the start of the new millennium, to build upon the gains of the past with the following targets: Reduction of: poverty ratio by 5% by 2007 and by 15 % by 2012; gender gaps in literacy and wage rates by at least 50 % by 2007; the decadal rate of population growth between 2001 and 2011 to 16.2 %; Infant mortality rate (IMR) to 45 per 1000 live births by 2007 and to 28 by 2012; and, Maternal Mortality Ratio (MMR) to 2 per 1000 live births by 2007 and to 1 by 2012; Provision of gainful high-quality employment to the addition to the labour force over the Tenth Plan period; Increase in Literacy rate to 75 % within the Plan period; All children in school by 2003; all children to complete 5 years of schooling by 2007; Increase in forest and tree cover to 25 % by 2007 and 33 % by 2012; All villages to have sustained access to potable drinking water within the Plan period; and, Cleaning of major polluted rivers by 2007 and other notified stretches by 2012. Enabling people to identify their own strengths and weaknesses and equipping them with the necessary skills and capabilities is an important step in their empowerment. Voluntary action helps this process. Traditionally, voluntary organizations have played an important role in India. The task of achieving Sustainable Development maintaining a harmonious relationship among social, economic, environmental and institutional aspects is really a daunting task. India with all the resources at her command is grappling with the barriers in the process of sustainable development.

**Capacity-Building, Education, Training and Awareness-Raising:** In India, the need for community participation in development activities has been fully appreciated and recognized. It is realized that developmental activities undertaken with the active participation of major groups have a greater chance of success and can also be more cost effective. In the area of education, health, family planning, land improvement, efficient land use, minor irrigation, watershed management, recovery of wastelands, afforestation, animal husbandry, dairy and sericulture, considerable progress has been achieved by creating institutions for people and encouraging community participation. The Ministry of Environment and Forests has launched 'National Green Corps' (NGC) with the basic objective of creating environmental awareness through people's participation especially among school children. During the Tenth Plan it is expected that about 50,000 schools will participate in NGC related activities. In addition, 3,000 eco-clubs have been set up in schools with the Ministry's assistance.

Priority is accorded by the Ministry of Environment and Forests to promote environmental education, create environmental awareness among various age-groups and to disseminate information through Environmental Information System (ENVIS) network to all concerned. A major initiative to include environment education as a separate and compulsory subject in the educational curricula has been taken by the Ministry at all levels of formal education, i.e., secondary, senior secondary and tertiary levels. Paryavaran Vahinis (environment launch-vehicle) are proposed to be constituted in 194 selected districts all over the country, which have a high incidence of pollution and density of tribal and forest population. The Vahinis also play a watchdog role by reporting instances of environmental pollution, deforestation and poaching. They function under the charge of District Collectors, with the active cooperation of the State/Union Territory governments. This scheme is entirely financed by the Ministry of Environment and Forests. Seven Centres of Excellence have been set up by the Ministry to strengthen awareness, research and training in priority areas of Environmental Science and Management. These are: Centre for Ecological Sciences, Bangalore; Centre for Mining Environment, Dhanbad; Centre for Environmental Education, Ahmedabad; CPR Environmental Education Centre, Chennai; Salim Ali Centre for Ornithology and Natural History, Coimbatore; the Centre for Environmental Management of Degraded Ecosystems, Delhi, and the Tropical Botanical Garden and Research Institute, Thiruvananthapuram, Kerala. The National Museum of Natural History (NMNH) set up in New Delhi in 1978,is concerned with the promotion of non-formal education in the area of environment and conservation. Besides permanent exhibit galleries on various aspects of environment, the museum also conducts temporary exhibitions and a large number of educational programmes and activities for school children, college youth and the general public. Three Regional Museums of Natural History have been established at Mysore, Bhopal and Bhubaneswar.

**Information:** Additional information can be obtained by contacting the web-site: http://envfor.nic.in.

**Research and Technologies:** A large number of research and technological institutions are involved in finding solutions to various problems in their respective field of expertise.

**Financing:** Approach paper to the Tenth Plan indicates following broad parameters for financing: steadily increasing gross budgetary support for the Plan as percentage of GDP to 5 % by the terminal year of the Plan, implying an average annual growth of 18.3 % per annum; reducing the number of government employees by 2 % per year with no new recruitment during the five year period. (All additional requirements should be made through redeployment and rationalization of various Ministries.); holding constant Non-Plan expenditure excluding interest payments, defence allocations and pay and allowances in real terms to current level implying annual growth rate of 5 %; increasing gross tax (including diesel cess) to GDP ratio rising from 9.16 % in 2001-02 to 11.7 % in 2006-07 implying buoyancy of 1.44 %; accelerating dis-investment process to yielding Rs. 160 to Rs. 170 billion per year on the average over the first three years of the Tenth Plan; achieving higher tax revenue mainly through buoyancy and expansion of the tax base. Besides, a widespread and bold imposition of user charges of all non-merit goods; and, increasing tax revenues as a share of GDP through imposition of indirect taxes on the services sector. This can essentially be achieved by the imposition of a widespread value added tax on all sectors of the economy. This would mean the levy of tax at every stage of value addition from production to sale of both goods and services. Levying such a tax will require an amendment to the Constitution along with the achievement of the consensus with the States so that it becomes feasible to do so.

**Cooperation:** The outcome of World Summit on Sustainable Development (WSSD) will determine the degree of international commitment towards sustainable development. India is prepared to play its rightful role in the process. The Ministry of Environment and Forests functions as a modal agency for United Nations Environment Programme (UNEP), South Asia Cooperation Environment Programme (SACEP), and International Centre for Integrated Mountain and Development (ICIMOD), International Union for Conservation of Nature and Natural Resources (IUCN) and various international agencies, regional bodies and multilateral institutions. India is signatory to the following important international treaties/agreements in the field of environment: International Convention for the regulation of Whaling; International Plant Protection Convention; Antarctic Treaty; Convention on Wetlands of international importance; Convention on International Trade in Endangered Species of Wild Flora and Fauna; Protocol of 1978 relating to the international convention for the prevention of pollution from ships; Vienna Convention for the protection of the Ozone Layer; Convention on Migratory Species; Basel Convention on Trans-boundary movement of hazardous substances; Framework Convention on Climate Change; Convention on Conservation of Biodiversity; Montreal Protocol on the substances that deplete the ozone layer; and International Convention for Combating Desertification. India is a party to GEF both in its capacity as a donor and as recipient country. In addition, the Ministry and its agencies cooperate with various countries such as Sweden, Netherlands, Norway, Denmark, Australia, U.K., U.S.A., Canada, Japan, FRG, etc., on bilateral basis and with several UN and other multilateral agencies such as UNDP, World Bank, Asian Development Bank, OECF (Japan) and DFID (U.K.) on various environmental and forestry projects.

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## CHAPTER 9: PROTECTION OF THE ATMOSPHERE

**Decision-Making:** The Ministry of Environment and Forests is the modal agency that coordinates the monitoring of issues pertaining to the Atmosphere. The Ministry works in collaboration with the agencies such as the State departments of environment, Indian Meteorological Department, Indian Space Research Organization and the Central and State Pollution Control Boards. The following legislation and regulations are relevant: Air pollution (prevention and control) Act 1981 as amended in 1987; Motor Vehicles Act 1939, amended in 1988; Forest Conservation Act amended in 1988, which contributes significantly towards minimizing the causes of climate change; Environmental Protection Act 1986, which is an umbrella legislation empowering the government to formulate statutory rules on environmental matters; etc. The National Environment Tribunal Act, 1995 provides for strict liability for damages arising out of any accident occurring while handling any hazardous substance. The National Environment Tribunal had been established under this act for effective and expeditious disposal of cases arising from such accidents, with a view to giving relief and compensation for damages to persons, property and the environment. The National Environment Appellate Authority Act, 1997 provides for the establishment of a National Environment Appellate Authority to hear appeals with respect to restriction of areas in which any industries, operations or processes or class of industries, operations or processes shall not be carried out or shall be carried out subject to certain safeguards under the Environment (Protection) Act, 1986. Ozone depleting substances (Regulation and Control) rules, 2000 under the Environment Protection Act 1986 have been formulated to check the emissions of ozone depleting substances.

The policy statement on Abatement of Pollution, adopted in 1992, provides instruments in the form of legislation and regulation, fiscal incentives, voluntary agreements, educational programmes and information campaigns to prevent and control pollution of water, air and land. Since the adoption of the policy statement, the focus of activities has been on issues such as promotion of clean and low waste technologies, waste water minimization, reuse/recycling, improvement of water quality, environment audit, natural resource accounting, development of mass-based standards as well as institutional and human resource development. The issue of pollution prevention and control entails a combination of command and control methods; voluntary regulatory and fiscal measures; promotion of awareness and involvement of public. To facilitate industries in preparing environmental statements, sector-specific environmental audit manuals have been prepared. A software package, Paryavaran, along with a user manual has been prepared for analysis of information submitted in these environmental statements and distributed to all the State Pollution Control Boards (SPCB). An "Eco-mark" label has been introduced to label consumer products that are environment-friendly. Nineteen products have been identified for labeling and 18 notifications have been issued so far on different products criteria. The Bureau of India Standards (BIS)/Directorate of Marketing and Inspection (DMI) is the implementing agency for this scheme. Under the scheme for adoption of clean technology in small-scale industries and for extending necessary technical support, training and awareness programmes for personnel in Small Industry Development Organization and for entrepreneurs are being organized. Waste Minimization Circles (WMCs) have been established to promote group efforts in increasing productivity and improving the environmental conditions in small and medium-scale industries through adoption of waste minimization techniques. An Indian Centre for the Promotion of Cleaner Technologies (ICPC) with a network of institutions including industries, academic institutions and other user agencies has been set up with the assistance of the World Bank. Indian Forestry policy: India is one of the few countries, which have a forest policy since 1894. It was revised in 1952 and again in 1988. The main plank of the Forestry Policy of 1988 is protection, conservation and development of forests. It aims to: maintain environmental stability through preservation and restoration of ecological balance; conserve natural heritage; check soil erosion and denudation in catchments area of rivers, lakes and reservoirs; check extension of sand dunes in desert areas of Rajasthan and along coastal tracts; substantially increase forest tree cover through afforestation and social forestry programmes; meet requirements of fuel wood, fodder, minor forest produce and soil timber of rural and tribal populations; increase in productivity of forest to meet the national needs; encourage efficient utilization of forest produce and optimum substitution of wood; and create massive people's movement with involvement of women to achieve the objectives and minimize pressure on

existing forests. The Central Pollution Control Board (CPCB) is the national apex body for assessment, monitoring and control of water and air pollution. The executive responsibilities for enforcement of the Acts for Prevention and Control of Pollution of Water (1974) and Air (1981) and also of the Water (Cess) Act, 1977 are carried out through the Board. The CPCB advises the Central Government in all matters concerning the prevention and control of air, water and noise pollution and provides technical services to the Ministry of Environment and forests for implementing the provisions of the Environment (Protection) Act, 1986. Under this Act, effluent and emission standards in respect of 61 categories of industries have been notified. 17 categories of heavily polluting industries have been identified. They are: cement, thermal power plant, distilleries, sugar, fertilizer, integrated iron and steel, oil refineries, pulp and paper, petrochemicals, pesticides, tanneries, basic drugs and pharmaceuticals, dye and dye intermediates, caustic soda, zinc smelter, copper smelter and aluminum smelter.
All the major groups are actively involved in the policy making process and decision making members from Business and industry, Scientific and Technical community, NGK's and women groups are members of the Empowered Steering Committees and various other advisory Committees. All groups have been affected. The insurance sector does not have a compensation package as yet for climate change. Environmental Impact Assessment (EIA) is a pointer to the environmental compatibility of the projects in terms of their location, suitability of technology, efficiency in resource utilization, recycling and so on. Impact assessment was introduced in India in 1978 and now covers projects such as: river valley; thermal power; mining; industries; atomic power; rail, road, highways, bridges; ports and harbors; airports; new towns and communication projects; those which require the approval of the Public Investment Board/Planning Commission/Central Electricity Authority; those referred to the Ministry of Environment and Forests by other ministries; those which are sensitive and located in environmentally degraded areas; and public sector undertakings of the Centre where the project cost are more than Rs 500 million. A notification issued in January 1994 makes EIA statutory for 29 categories of developmental projects under various sectors such as industrial, mining (mining projects are subject to environmental clearance), irrigation, power, transport, tourism, communication, etc. The EIA Notification was amended in 1997 to provide for public hearing as well as for empowering State governments for according environmental clearance in respect of certain Thermal Power Projects. See also **Chapter 8** of this Profile.

**Programmes and Projects:** The National Ambient Air Quality Monitoring Programme has 290 stations covering over 90 towns/cities monitor the ambient air quality of the country. The Central and State Pollution Control Boards, which has a NGO Cell for interacting with NGOs, regularly conduct surveys in different cities of the country pertaining to vehicular and noise pollution, sanitation status, status of solid waste, etc. Simple water-testing kits are distributed free of cost to selected NGOs and financial assistance provided to them for conducting mass awareness programmes relating to prevention and control of pollution. A detailed India Country Programme for phase out of Ozone Depicting Substances (ODS) was prepared in 1993 to ensure the phase out of ODS according to the national industrial development strategy, without undue burden to the consumers and the industry and for accessing the Protocol's financial mechanism in accordance with the requirements stipulated in the Montreal Protocol. The main objectives of the programme has been to minimize economic dislocation as a result of conversion to non-ODS technology, maximize indigenous production, give preference to one-time replacement, emphasize decentralized management and minimize obsolescence. See also under **Decision-Making**.

**Status:** The problem of $CO_2$ emissions is a major concern to the Indian energy sector where coal accounts for over 60% of total energy resources used. In order to minimize $CO_2$ emissions, efforts are underway to improve efficiency levels in the generation and use of energy. In addition, renewable energy technologies and afforestation measures to increase the "carbon sink" function are being promoted. Coal India Limited (CIL), a holding company of seven coal producing companies, coordinates the implementation of sustainable development programmes in the Indian Coal Sector. There is a special focus on ensuring conservation of coal sources during exploitation and use, and conserving energy in the production and transportation of coal. Preliminary assessment of the Indian coast and its vulnerability to sea level rise reveal that the total number of people at risk is ~7.1 million persons on a nationwide basis. The simulation studies for wheat showed that an increase in temperature to 4°C caused a severe decrease in yield. Impact in general is being evaluated and assessed regularly. Current Indian gross Carbon dioxide

emissions on a per capita basis are merely 1/6th of the world average. Fresh land availability is sparse as already 4% of the geographic area is under nature reserves / forest land. The Department of Space in India has mapped the entire country on a 1:1 million scale to identify various land use categories. This study has shown that wasteland area is around 53.3 million hectares. The remote sensing forestry data is been used for GHG sink development and impact assessment of land use change.
The consumption of CFC has been reduced to 60% of the base-level consumption. Use of halon has been reduced to 20% of the consumption of the base-year. Preliminary studies on the impact of a rise in sea level of 1 mm on the Indian coastline indicate that 0.41% of India's coastal area will be inundated. Some studies suggest that as the greenhouse effect gains strength, the cyclones will become more frequent and more destructive making island archipelagos such as Lakshadweep highly vulnerable. The danger of frequent storms which generally originate in the Bay of Bengal is, however, higher in the Andaman and Nicobar islands than in Lakshadsweep. Also, as sea level rises, the fresh water aquifers of the islands will be subjected to saline intrusion. The metros and other big cities of the country are the worst affected by air and other forms of pollution mainly because of lopsided urban planning and incorrect location of industrial units. However, a strategy for corrective action has been initiated.

**Capacity-Building, Education, Training and Awareness-Raising:** Several training programmes are being organized on a regular basis for capacity building. India is a member of WMO and is participating in various international research programmes on systematic observation atmosphere and ocean through IMD/DST New Delhi.

**Information:** The India Meteorological Department (IMD) was established in 1875. It is the National Meteorological Service and the principal government agency in all matters relating to meteorology, seismology and allied subjects. The Department has units all over the country engaged in collecting meteorological and seismological data besides providing various meteorological services. Its main objective is to provide meteorological information for weather sensitive activities like aviation, shipping, agriculture, irrigation, offshore oil exploration and industries. The Department also issues warnings against severe weather phenomena like cyclones, dust-storms, heavy rains, cold and heat waves that cause destruction of life and property. Besides, it also provides climatological information, records earthquakes and promotes research in meteorology. The Department maintains an extensive network of modern observatories and communication links all over the country. Observations received through high power radars and weather satellites are extensively used these days for analysis and prediction of weather.

INSAT Meteorological Data Processing System is being upgraded to handle reception, processing of data from INSAT 2E Satellite. This satellite is similar to INSAT 2B but has got additional capability of providing imagery in water-vapor band and higher resolution imagery in visible, near IR and short wave IR bands, using charge coupled devices. Current satellites provide imagery in Visible and IR bands. A satellite based wide area network (WAN) using Very Small Aperture Terminals (VSATs) is being established for speedy dissemination of forecast products to various user agencies, particularly to AAS units. The plan is being implemented by installing VSATs in 127 locations out of which 47 have been installed. Scientific campaigns such as GAME-India (Global Energy Water Cycle Asian Monsoon Experiment), I-STEP (Indian Solar Terrestrial Energy Programme), OCEANSAT (IRS P4), Indo-US Agreement on Satellite Data Utilization, and INDOEX are being carried out. The Ozone measurement is being carried out at 5 stations by Indian Meteorological Department. These stations are at Srinagar, New Delhi, Varanasi, Pune and Kodaikenal. The total Ozone data and Umkehr data (vertical profile of Ozone) are being regularly sent in WMO format to the World Ozone Data Centre, Canada and are being regularly published by the Centre. India developed ozonesonde in 1963. Since 1970, vertical Ozone distributions are being measured at 5 stations at New Delhi, Pune, Thiruvananthapuram, Dakshni Gangtri and Maitri. Scientific data and information on the protection of atmosphere and ozone Layer are made available to potential users at national level via internet and other modes of information dissemination. Information on Atmosphere can be obtained from www.imd.ernet.nic.in.
It has been now decided to exempt prospecting through aerial survey and/ or test drilling in smaller areas from mandatory clearances. To ensure transparency, the position of forest and environmental clearance has been brought out on Webster: http://envfor.nic.in since February 1999.

**Research and Technologies:** India is disappointed by the non-implementation of commitments made by the developed countries on providing new and additional financial resources as well as technology for promoting ecologically sustainable development. In order to implement measures to protect the atmosphere, India need the following new technologies: IGCC and other advanced clean coal technologies; state of art power generation technologies; solar photovoltaic (advanced systems); mass rapid transport system for urban transport; New non-ODS technology for refrigeration, aerosol, foam fire extinguisher and solvent sector; and technology for manufacturing ODS substitutes.
Since 1983, IMD has maintained a meteorological observatory at the Indian permanent station in Antarctica. The Department has actively participated in various international and National observational efforts. A National Climate Centre (NCC) has been established at IMD's research wing in Pune to undertake climate research, applications, data collection and management, and impact awareness studies. Data collected from the extensive network of observations are archived at the Department's National Data Centre in Pune. The Centre holds over 60 million records in its archives. About 2.5 million records are currently being added to the archives. The Government of India through the Department of Science and Technology (DST) has undertaken several projects to promote technologies that will reduce pollution of the atmosphere. Technologies that use compressed natural gas (CNG) as fuel in internal combustion engines have been developed for generating electricity in remote hilly areas. To help promote waste reduction, the production of fuel pellets from waste has been successfully demonstrated to industrial users in Mumbai. DST supports R&D efforts to promote environmental conservation conducted by several autonomous institutions and service organizations. Considerable research work has been completed on climate modeling, air pollution, and atmospheric ozone at the Institute of Tropical Meteorology, Pune, which has climate change as one of its major thrust areas.

**Financing:** Activities concerning protection of Atmosphere cut across several government departments and the main source is public funding. Despite lack of external funding India has made big strides in protecting the atmosphere. Climate change/ protection of atmosphere considerations have been in built into the five year plan process in the country and an adequate thrust has been accorded to it by GOI. Ozone regulations and Market forces are driving the industries to invest money in non-ODS technologies.

**Cooperation:** India is signatory to the following important international treaties/agreements in the field of the protection of the atmosphere: Vienna Convention for the protection of the Ozone Layer; Basel Convention on Trans-boundary movement of hazardous substances; Framework Convention on Climate Change; and Montreal Protocol on the substances that deplete the ozone layer.

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## CHAPTER 10: INTEGRATED APPROACH TO THE PLANNING AND MANAGEMENT OF LAND RESOURCES

**Decision-Making:** At the national level, for effective coordination and management of land resources of the country, a National Land Use and Wasteland Development Council (NLWDC) has been constituted under the Chairmanship of Prime Minister. The Secretariat of the NLWDC is located in the Department of Land Resources of the Ministry of Rural Development. The following three boards are functioning under the Council for effective coordination on matters of land resources: National Land Use and Conservation Board (NLCB), located in the Ministry of Agriculture, Department of Agriculture and Cooperation, to serve as policy planning, coordinating and monitoring agency at national level for issues concerning health and scientific management of Land Resources; National Wastelands Development Board (NWDB), located in the Department of Land Resources, Ministry of Rural Development for matters related to non-forest wastelands in the country; National Afforestation and Eco-Development Board (NAEB), and, located in the Ministry of Environment and Forests for the matters related to the land belonging to forests and adjoining areas. In order to strengthen planning and management systems, the existing NLCB is being restructured. The NLCB is engaged in the preparation of zonal perspective plans for conservation, development, and management of land resources in order to adopt a strategic framework for sustainable land use planning and integration of both development and environmental goals. In all developmental programmes, planning is completed on a watershed basis. State Land Use Boards (SLUBs) have been set up in each State to implement the policies and guidelines issued by the NLCB.

At the local level, Panchayats, Watershed Committees, Self Help Groups, NGOs, State implementing agencies etc. are fully involved in decision making for planning, implementation, post care maintenance activities etc. for land resources. At the district level the concerned development Departments along with people's representatives in Zila Parishad take decision on land management issues. The role of women has been fully recognized on integrated planning and management of land resources by making reservations in the decision making body at Panchayat and Zila Parishad levels. Under India's Federal structure, land is a State subject, and there is so far no National legislation. All States have been requested to prepare Policy for Land Use for enactment. However, only few States, namely, UP and Kerala have prepared Draft Land Use policy so far. The NLCB is considering the enactment of a composite Land Resources Management Act encompassing various aspects of land use. National Land Use Policy Outlines (NLPO), which was established in 1986, takes into account environmental, social, demographic, economic, and legal issues. Its development objective follows the stated underlying principle that aims at the transition from resource use to resource management. The policy has been circulated to all concerned for its adoption and implementation. State Governments are responsible for policy implementation and the formulation of laws to conserve and manage land resources with encouragement to local communities, Panchayats, and district authorities. Some of the State Governments have taken initiatives to enact suitable legislation in this regard.

It has generally been the policy of the State to conserve good agricultural lands and this is reflected in guidelines under the Land Acquisition Laws. Diversion of agricultural lands to non-agricultural use is also regulated under the land revenue codes. For effective management of forest resources, the Central Government has brought the subject under the concurrent list and enacted the Forest (Conservation) Act (1980), which prohibits diverting any forestland for non-forestry purposes without prior approval of the Central Government. Permission is given only for site-specific projects provided no alternative is available. One of the important conditions for such approval is to carry out compensatory afforestation over equivalent non-forest land or in case of its non-availability or for certain category of projects, it can be raised over degraded forest area twice in extent to the area being diverted. Whereas during 1950-80, 4.5 million ha forestland was diverted (average 0.15 million ha per year), since 1980 to 1998 only 0.40 m ha has been diverted (average only 0.02 million ha per year). Since 1992, 0.11 m ha has been diverted.

States have their own legislation such as the land revenue code, which apart from dealing with issues of land administration regulate the use of land resources. On agrarian matters, there are several statutes dealing with tenancy, ceilings on land holdings, etc. A major programme for the consolidation of fragmented plots of land has been established to promote effective and scientific management of land resources, though progress has been

uneven in different states. The State Land Use Boards were established in the 1970s to ensure scarce land resources to be put to optimal use. Progress in this matter varies between states. An apex body, the National Land Resources Conservation and Wastelands Development Council, was established under the Chairmanship of the Prime Minister in 1985-86. Recently, this has been changed to the Central Land Use Council, under which the National Land Use and Conservation Board and the National Wastelands Development Board operate. These two bodies are expected to deliberate the evolution of effective guidelines for planning and management of land resources including appropriate modifications to existing legislation. Their recommendations are discussed with state governments.
The Land Use Strategy broadly covers elements such as food security, rural development, security of land tenure, viability of rural areas, minimization of negative environmental impacts of human-induced activities and social aspects including participation of a wide range of stakeholders, improved self-esteem of natural resource users. The National strategies and Action plans are catalyzed by the Conventions on Biodiversity, Desertification and Climate change. These need to be further integrated with sectoral plans to develop a comprehensive national land resource strategy. In the past, land resources, land use and socio-economic conditions were surveyed differently. More recently however, integrated community oriented approaches such as Participatory Landscape-Lifescape Appraisal (PLLA) and Participatory Rural Appraisal, are being introduced. Such strategies are developed at landscape scale and focus on the interaction of human activity with the biophysical environment. The land management policies focus on poverty reduction activities in the country. The employment generation schemes are linked with land management. In India since the First Five Year Plan, Land Reforms have remained a major issue of the National Agenda for achieving agrarian reforms for reconstruction of rural economy, ensuring social justice to actual tillers as well as land less rural poor and thus creating sustainable base for overall growth of industrial and tertiary sector of our economy. Generating greater access to land for the landless rural poor is considered important for poverty alleviation in rural areas.

**Programmes and Projects:** A number of ministries are involved in the following land based programmes:
*The Ministry of Agriculture:* The Department of Agriculture is implementing: National Watershed Development Project for Rainfed Areas (NWDPRA); Creation of Watershed Development Fund in NABARD; and, Soil Conservation in the Catchment Areas of River Valley Projects and Flood Prone Rivers (RVP and FPR). *The Ministry of Rural Development*: Department of Land Resources in the Ministry is implementing: Drought Prone Areas Programme (DPAP); Desert Development Programme (DDP); and, Integrated Wastelands Development Programme (IWDP). *The Ministry of Environment & Forests*: During the 9th Plan, the Ministry had initiated the management of degraded forest land and adjoining areas through: Integrated afforestation and Eco-development Projects Scheme (IAEPS); Area Oriented Fuelwood and Fodder Projects Scheme (AOFFPS); Non-Timber Forest Produce including Medicinal Plants (NTFPS); and, Association of Scheduled Tribes and Rural Poor in Regeneration of Degraded Forests on Usufruct Sharing Basis Scheme (ASTRP). Joint Forest Management (JFM) had been an integral part of all the schemes to ensure people's participation in afforestation activities. Till date, there are 63,168 JFMCs comprising of 2.8 million families covering an area of 14 million hectare of degraded forest areas in 27 States. In the 10th Plan, all the above schemes have been merged under a single umbrella scheme called the National Afforestation Programme (NAP), which is being operated through the mechanism of Forest Development Agencies (FDAs), a federation of Joint Forest Management Committees (JFMCs) at the Forest Division level.

**Status:** The per capita availability of land in India has declined from 1.37 ha in 1901 to 0.33 ha in 2000. It has been estimated that more than 5000 million tons of topsoil is eroded annually along with about 5 million tons of nutrients. About 38% of area in India suffers from moderate to high degree of water based erosion, most of which needs suitable soil and water conservation measures. Arid areas suffering from moderate to high degree of soil loss comprise up to 4% of the geographical area. Therefore, about 40% of the country's area requires soil and water conservation efforts on a priority basis. Land and Water are mutually reinforcing resource systems. However since the land use pattern has perceptible influence on hydrological characteristic and the soil erosion factors, there is an urgent need to have an integrated water-land management. The role of Watershed Management is very important in conserving both land and water. New guidelines are continuously being incorporated to achieve holistic

management of Watersheds. However, efforts to increase production through intensification and technology developments have in some cases led to increasing environmental and health hazards. Concerted efforts are needed to promote Integrated Land Management taking into account economic, social, environmental and cultural aspects of land use. There is a growing awareness of the need to improve land tenure institutions. Land tenure reform and development are the part of the process of effective decentralization.

**Capacity-Building, Education, Training and Awareness-Raising:** The National Bureau of Soil Survey and Land Use Planning, Nagpur and the Central Soil Conservation Research and Training Institution, Dehradun conduct training programmes. It is proposed to include the subjects of land use and land resources conservation in schools, technical and vocational institutions, and universities. Awareness-raising campaigns to educate and inform people about scientific land use planning and management are conducted by the NLCB and the SLUBs. Guidelines issued for the National Watershed Development Programme and catchment treatment programme of Soil Conservation, promote the active involvement of beneficiaries/communities in planning, project formulation, project execution, and maintenance of assets.

**Information:** Land survey/resurvey and settlement is the concern of Revenue Department of the State Governments. As regards land classification it exceeds more than 100 classes in some States. It is now being used as a source of collecting agricultural statistics. Land inventories use latest technologies such as satellite image processing, aerial photographs for updating and monitoring of the land resources along with ground truthing and verifications. Remote sensing techniques are adopted for interpretation and integrated analysis of data on land use and land resources. Land inventories are being generated on the basis of various soil characteristics such as those of soil type, slope, climatic and hydrological data, vegetation cover, land capability, land irrigatability etc. The maps depicting land parcels, particularly cadastral maps are required to be updated every 30 years. The following organizations/agencies are involved in maintaining and updating the land inventories: National Bureau of Soil Survey and Land Use Planning under Indian Council for Agricultural Research; All India Soil and Land Use Survey Organization under the Ministry of Agriculture; National Remote Sensing Agency; Indian Space Research Organization; Department of Land Resources under the Ministry of Rural development; the Ministry of Environment and Forests; Survey of India; the Ministry of Water Resources; and, State Agriculture universities and other Institutes. The information in respect of land inventories is published for the use of the land users. Efforts are being made to make all such information accessible to all, by creating Web sites and linking all the above-mentioned institutions through computer linkages.

**Research and Technologies:** The Department of Agricultural Research and Education is responsible for research in improved approaches to the use of land resources. For over a century, the State has been concerned with the effective survey and settlement of land. Detailed village records are maintained which include land use. Formal reporting systems based on detailed survey and settlements are lacking in only a small part of the country. The Government, through several agencies such as the Indian Council of Agricultural Research (ICAR) and the National Bureau of Soil Surveys and Land Use Planning, has been attempting to prepare a detailed geographic information system (GIS) for land resources. Many of these systems use satellite imagery for the generation of information and preparation of detailed maps.

**Financing:** The plan allocation for the Department of Land Resources has been increased from Rs. 3240 million in 1999-2000 to Rs. 9000 million for 2001-2002. There also has been enhanced allocation of financial resources in the Ministry of Agriculture and Ministry of Environment and Forests for implementing their land based programs.

**Cooperation:** In order to mobilize resources for development of wastelands in the country, presently six projects are under implementation with external assistance. Rural Livelihoods Projects in the states of Andhra Pradesh and Orissa are being implemented with financial assistance from the Department of International Development (DFID) of UK. The other projects such as Tree Growers Cooperative projects with the assistance from Canadian International Development Agency (CIDA) and Swiss International Development Agency (SIDA), Attapady

Wasteland Comprehensive Environmental Conservation Project with the assistance of Japan Bank for International Cooperation (JBIC) and Haryana Community Forestry Project with the support of European Community are being implemented in the country.

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## CHAPTER 11: COMBATING DEFORESTATION

**Decision-Making:** The Ministry of Environment and Forests is the coordinating agency and works in cooperation with the State Governments and other concerned Ministries such as the Ministry of Rural Development, Ministry of Agriculture and the Planning Commission. India's policies and programmes in forestry, particularly over the last fifteen years, have been largely in consonance with the Forest Principles adopted during the United Nations Conference on Environment and Development (UNCED). The Forest (Conservation) Act of 1980 initiated a process by which India's forests were treated as an environmental and social resource rather than as a revenue or commercial resource. The strictest controls have been placed on the diversion of forestland to other uses. In the rare cases when this is permitted for developmental purposes, compensatory afforestation is a prior requirement. Biodiversity conservation has been made an integral part of forest conservation. Various conservation measures have been taken to strengthen legislation and eco-development efforts. The Wildlife (Protection) Act, 1972 and its amendments to 1991 provide the legal framework for conservation of wildlife in the country. The amendment of 1991 is significant as it provides protection not only to wild animals and birds, but also to plant species. Thus, it addresses forest ecology in its totality. The Biological Diversity Bill 2000 aims to protect the biological resources of the country. Realizing the role of forests in controlling soil erosion, moderation of floods, recharging of ground aquifers, as habitat for wildlife, conservation of bio-diversity and gene pool, etc., several programmes have been launched from as early as the Second Five Year Plan. The Indian Forests Act 1927 is the main act, which regulates the management of forest by the States. A two-pronged strategy to increase forest cover has been adopted which essentially comprises of: 1) To improve canopy cover in the forestland; and 2) To undertake afforestation in non-forest and degraded lands preferably contiguous to forest blocks.

A National Afforestation and Eco-Development Board (NAEB) have been created for promoting afforestation, tree planting, ecological restoration, and eco-development. The NAEB pays special attention to the regeneration of degraded forests. The NAEB serves as a vital interface between external agencies and the State Governments.
The National Forestry Research Plan, 2000 aims to priorities and carry out research on various aspects of forestry required for sustainable development. The National Forestry Action Programme of 1999 is a comprehensive strategy and long-term work plan for the next 20 years formulated to address the issues underlying the major problems of the forestry sector in line with the National Forest Policy of 1988. The National Forest Policy, 1988 formulated four years before the Earth Summit embodies the direction emphasized in the Rio Principles. The Government's commitment to the management of forests through the participatory process is reflected in the active involvement of tribal and village communities (especially women and persons belonging to the weaker sections of society) and voluntary agencies. This strengthens the activities of State Forest Departments in forest protection and regeneration initiatives. Various problems and conflicts arising out of the tribal forest interface are resolved through administrative measures including the creation of village-based Forest Protection Committees, an experiment, which has met with remarkable success in some parts of the country.
Tree planting is the main focus, particularly through the Area Orientated Fuel wood and Fodder Scheme, and the Integrated Afforestation and Eco-Development Programme. Efforts are being made to ensure that weaker sections of society and women emerge as the major beneficiaries of the activities of NAEB. Up to 1994-95, about 237,781 ha of degraded forests has been planted under the Area Oriented Fuel wood and Fodder Project. The monitoring and evaluation of the plantations is required to assess the survival of the seedlings. The NAEB has proposed a proposal for an ambitious National Afforestation Programme (NAP) to be implemented from the Tenth Plan.
Participatory Forest Management as an effective means of regenerating degraded forests has been increasingly gaining ground in India. In 1990, the Government issued guidelines to State Governments highlighting the need and the procedure for the involvement of village communities and voluntary agencies in the protection and development of degraded forests. In response to these guidelines, 22 out of 25 States have issued orders for creating resolutions enabling mechanisms for public participation in the management of degraded forests. The participatory forest management approach promotes active participation and involvement of the people in forest conservation and development, including the development of micro-level plans and their implementation. At present, approximately

10 million ha of forest area is being maintained through more than 36,000 Village Forest Protection Committees. Although many States have accepted the initiative in principle, effective implementation of the new approach at the field level has taken root only in a few States. In future years, more emphasis will be given to field level implementation of this new concept. One of the important elements of the Participatory Forest Management System relates to the use of indigenous capacity and local knowledge regarding various aspects of conservation, development, and use of forests. The rural people, particularly women, have an intimate knowledge about various species, growth characteristics, utility, and medicinal value. They are also well informed about the species to be planted in a given locality to satisfy the specific requirements of fuel, fodder, timber, and other non-wood forest products. In participatory forest management, planning and implementation of most of the activities related to regeneration and protection are completed with the active involvement of rural people. Thus, the traditional knowledge base of the people is fully used for the benefit of the community. There is a symbiotic relationship between tribal people and forests. In 1991, various issues related to forest-tribal interface were examined and detailed guidelines issued by the Government of India to the State Governments in order to ameliorate the socioeconomic conditions of tribal people. These guidelines cover a number of subjects including addressing old encroachments of forest lands, disputed claims over forest land, elimination of intermediaries to stop exploitation, conversion of forest villages to revenue villages, and payment of compensation for loss of life and property due to depredation by wild animals. See also under **Status**.

**Programmes and Projects:** A review of social forestry programme launched during the 1980s resulted in a consolidation of gains and a strengthening of the weaker links. The conservation of the existing natural forests with emphasis on natural regeneration is given increasing focus. The current approach towards afforestation and forest conservation is to integrate the activities and expertise of different sectors so that various pressures responsible for forest degradation are adequately addressed. Introduction of the Eco-Development Programme has been one of the recent developments in the field of wildlife management. The objective is economic development for the people residing in and around sanctuaries and National parks, in order to reduce their dependence on forest products and improve the ecological health of the protected areas. The scheme aims to increase land and forest resource productivity so that alternative avenue of employment and income are made available in the immediate neighborhood of people. The Eco-Development Programme proposes a package of activities including developing agriculture, improving land productivity and developing minor irrigation, raising fodder and fuel plantations, providing livestock care and improvement, introducing fuel saving devices, providing medical care including family planning, and creating environmental awareness. It is increasingly thought that the eco-development concept should not be limited to protected areas. It is believed that the scope and content of such schemes should be extended to cover other villages lying in the immediate vicinity of forests. The comprehensive State Forestry Projects, which have been recently launched by a number of States, incorporate elements of eco-development as a means of ensuring sustained development of forests. The cross-sectoral issues like rural employment, water and soil conservation, fodder production, firewood production to meet energy requirements of 80% of the rural population, etc. has been taken care of in the National Forestry Action Programme.

**Status:** Under the provisions of the Forest (Conservation) Act, 1980, prior approval of the Central government is required for diversion of forestlands for non-forest purposes. Since the enactment of the Act, the rate of diversion of forest land has come down to around 25,000 hectares per annum from 0.143 million hectares per annum prior to 1980. Analysis of State changes in forest cover for 1991-1993 reveals that the country can be broadly classified into two regions, namely the Northeast region and the rest of the country due to the peculiar situation of shifting cultivation. While there has been a decrease of 635 sq.km of forest cover in the northeastern region, there has been an overall increase of 1560 sq.km. in the rest of the country, giving a gross increase of 925 sq.m. in the forest cover. However, in terms of qualitative forest cover loss, the dense forest in almost all the major states has gone down. On the whole, the country has achieved a partial success in the protection of forests. The wildlife scenario in India is not very encouraging. According to the All India Tiger Census of 1993, the tiger population has declined. There has been a loss of 553 tigers between 1989 and 1993. In spite of the stringent and tough provisions of the Wildlife Act, wildlife poaching still continues. There has been a change in the demand pattern from tiger skins to their bones.

Full analysis of this change is required so as to prevent poaching at the initial stages. Wildlife conservation has assumed new dimensions under the Eco-Development Scheme in and around National parks and sanctuaries.
Forest based livestock farming and forests are highly interdependent. Livestock development in the country has taken in two different areas in two different pretexts. The first pretext, which relates with dairy and poultry, is on an industrial base, involving more of person's management rather than persons of husbandry. However, in the second, who relates with the poor class of people/rural poor, is resource based and depends upon forest, grassland and pastures. Therefore, forest based livestock farming needs more attention in order to result in both improvement of the economic condition of the farmers and conservation of the forests. Major forest areas in India and other developing countries are owned and managed by government, and local people have rights and concessions over the usufructs. The main problem area of most developing countries including India is of financial resources or funding. Financial resources have been identified only as a supporting function under the Principle function of policy implementation. This needs reconsideration. It is suggested that one of the IAMs must be assigned this exclusive function. It should perhaps be mandatory for this IAM to ensure that funding is based on the National Forest Action Plan prepared by the country and not on other parameters.

**Capacity-Building, Education, Training and Awareness-Raising:** The network of Indian Council of Forestry Research and Education (ICFRE), Indian Institute of Forest Management and many other institutes are engaged in the capacity building exercise. In addition, the National Forestry Action programme includes as its objectives various aspects of capacity building. The ICFRE is the focal point for forestry education and extension development in the country. The Indira Gandhi National Forest Academy, Dehra Dun, imparts in-service professional training to Indian Forest Service (IFS) professionals. State forest service colleges provide training to the officers of the State Forest Service (SFS). The Indian Plywood Industries Research and Training Institute, Bangalore, organizes short-term courses in the area of wood science. The Indian Institute of Forest Management, Bhopal, also provides training in forest management and allied subjects to persons from the Indian Forest Service, forest development corporations, and forest-related industries to develop forestry programmes. The Wildlife Institute of India, Dehradun, provides in-service training to forest officers, wildlife ecologists and other professionals for conservation and management of the wildlife resources of the country.

**Information:** The Government has taken initiatives to identify the criteria and indicators for sustainable forest management. Information on sustainable forest management is available to potential users via: http://envfor.nic.in.

**Research and Technologies:** The forestry management in the country is being practiced on the basis of sustainable management for more than a century. However efforts are being made to ensure that the management plans of the forest areas are prepared taking advantage of the important latest technology like GIS, etc. and so as to reduce the period of preparation as well as the period of management plans in the country. Accordingly a comprehensive working plan code is being prepared for the whole country. The assessments of forest cover in the first three cycles (1987, 1989 and 1991) were based only on visual interpretation of satellite imagery, while the fourth cycle (1993) it is based on satellite imagery and has been subjected to computer analysis. As a result, it has become possible to systematically interpret the data in a more scientific and objective manner.

**Financing:** The Ministry of Environment and Forests, Department of Land Resources and the Department of Agriculture and Cooperation finance various forestry related activities. There is a need to infuse private capital on a large scale in forest related activities.

**Cooperation:** India has been participating in all the Intergovernmental Panel on Forests/Intergovernmental Forum on Forests (IPF/IFF) meetings and India agrees with the overall action relating to National Forest Programme, Forest assessment, criteria and indicators, traditional forest related causes and underline causes of deforestation. However, India has taken a view that there has to be an instrument to coordinate the efforts of various international instruments and institutions. Accordingly, India has moved for creation of a permanent forum like Global Forest Facility on the lines of the Global Environmental Facility (GEF), to further carry out the dialogue and discussions

on the contentious and unresolved issues. India has also taken a view that financial resources/funding is one of the major problem areas and therefore, it is necessary to assign this exclusive function to one of the International Arrangements and Mechanisms (IAMs). In consonance with the recommendation of IPF, India has prepared the National Forest Action Programme in the year 1999 in consultation with FAO, which incorporates the agreed commitments by India. India's economic and trade policies which have a bearing on forest and forest products are being progressively fine-tuned to facilitate the conservation and sustainable use of forests. This is reflected in liberal imports of forest products to relieve pressures on forests, nationalization of trade of certain forest products, incentives for wood substitution, subsidies for the use of fuel-saving devices and alternative sources of energy supply such as biogas and solar energy, and financial incentives to supply seedlings free of cost or at subsidized rates. India has actively participated in the deliberations of the Intergovernmental Panel on Forests, established by the Commission on Sustainable Development.

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## CHAPTER 12: MANAGING FRAGILE ECOSYSTEMS: COMBATING DESERTIFICATION AND DROUGHT

**Decision-Making:** The Ministry of Environment and Forests (MOEF) is the modal agency for combating desertification. The Department of Agriculture and Cooperation in the Ministry of Agriculture and the Department of Land Resources in the Ministry of Rural Development are the other partner Coordinating bodies. Although there is no legislation directly dealing with the subject of desertification, a number of environmental legislations could be the facilitator in combating the problem of desertification. In the National Conservation Strategy particular attention has been paid to arid and semi-arid areas. The strategy, inter alia, includes classification, zoning, and apportionment of land for designated uses; enactment of laws for appropriate land uses to protect the soil from erosion; pollution and degradation measures for runoff and wind erosion; development of suitable agro-silvipastoral techniques; measures for water conservation, recycling and optimal conjunctive use of surface and ground water; and encouragement for and improvement in traditional methods of rain water harvesting. In addition to the central and state level official machinery, a large number of NGOs, scientific and research institutions, local bodies and farmers groups are involved in combating desertification and tackling drought situations.

**Programmes and Projects:** The Desert Development Programme (DDP), initiated in 1977-78, covers both the hot desert regions of Gujarat, Rajasthan, and Haryana and the cold desert areas in Jammu, Kashmir, and Himachal Pradesh. It is functional in 131 blocks of 21 districts in 5 States covering an area of about 0.362 million km2 and a population of 15 million. The objectives of the DDP include controlling the process of desertification, mitigating the effects of drought, restoring the ecological balance, and raising the productivity of land, water, livestock, and human resources. At least 75% of the allocation is earmarked for activities, which would contribute towards combating the process of desertification. The DDP is implemented with 100% central assistance. The Programme Evaluation Organization of the Planning Commission evaluates this programme in order to assess its impact on the control of desertification, and on improvements in productivity and income for the people living in these areas.

The Drought Prone Area Programme (DPAP) was launched in 1973 in arid and semi-arid areas with poor natural resource endowments. The objective is to promote more productive dry land agriculture by better soil and moisture conservation, more scientific use of water resources, afforestation, and livestock development through development of fodder and pasture resource, and in the long run to restore the ecological balance. The DPAP covers 615 blocks of 91 districts in 13 States. This is a centrally sponsored scheme where the allocations are shared between the Centre and States on a 50:50 basis. Preparation of development plans on a watershed basis, participation of people in planning and implementation of the programme, and developing effective liaison between research agencies and implementing agencies are some of the priority areas of the programme.

The National Disaster Management Programme (NDMP) was established in 1992-93 to develop disaster preparedness with emphasis on mitigation measures and increase level of awareness of community about disasters, prepare them adequately to face the crisis situation through: Human Resources Development; Research and Consultancy Services; Documentation of major events; Operation of Faculty on NDM in State level training States; National Centre of Disaster Management; and, public education and community awareness programme. A comprehensive plan for control of desertification under the National Forestry Action Programme has been proposed to integrate and intensify the activities aimed at combating desertification. The plan would evaluate the present status of deserts in the country, assess the implementation of ongoing programmes for development of deserts and desert prone areas, formulate broad policy guidelines and action plans for implementation aimed at controlling desertification, develop strategies involving people in desert control through various means, and include appropriate measures related to research and training in desert control. The Integrated Wastelands Development Project aims to facilitate pilot projects using an integrated approach to wasteland development by initiating area-specific projects taking into account land capabilities, site condition and local needs, and ultimately aiming to promote optimal land use for both ecological and socioeconomic needs. The Project includes different types of problem lands such as saline/alkaline lands, arid/sandy areas, ravine areas, and Aravallis, covering soil and water conservation, afforestation, silvi-pasture development, grazing management, etc.

**Status:** About 10% of the 329 million ha of land area in India is arid, located in the western region. The State of Rajasthan accounts for 61% of the arid area, and a further 20% is located in the adjoining State of Gujarat. Cold deserts located in the High Himalayas of the North West account for the rest. Semi-arid areas account for 30.56% of the area and are located in 127 districts of 10 States. There is a well-defined desert region consisting of the great desert and little desert. The great desert extends from Rann of Kutch beyond Luni River northwards. The little desert is located between Jodhpur and Jaisalmer and a zone of sterile rocky land cut up by limestone ridges divides the two.
There is evidence that the arid area once had dense forest cover. A large-scale migration through the North Western Himalayan passes resulted in clearance of natural vegetation for settled agriculture. As arid areas are located on migration routes, the delicate balance of water and nutrient recycling was lost with the indiscriminate spread of agriculture, which started around three thousand years ago. The river "Saraswati" of Indian mythology vanished altogether while other rivers merged into the sand dunes. The semi-arid regions abutting the arid zone on the North and North East have a better water regime as a number of perennial rivers fed by Himalayan snow traverse this area. A well-knit irrigation system makes the area the most productive part of the country. In the East and South, however, agriculture is mainly rain-fed particularly in the plateau region. Periodic cycles of drought due to monsoon failure are a common feature. In view of ever-increasing biotic pressure, the main challenge is to stop further spread of desert in the country along with launching massive soil and water conservation measures to restore ecological equilibrium of existing deserts. Frequently recurring droughts in the different regions of the country offer another formidable challenge to take up large-scale mitigation measures.

**Capacity-Building, Education, Training and Awareness-Raising:** Research institutions such as Central Arid Zone Research Institute (CAZRI), Jodhpur and GB Pant Institute for Himalayan Environment and Development, Almora are working in the direction of capacity building to prevent further spread of desertification.

**Information:** Information can be obtained from the Conservation & Survey Division in the MOEF (http://envfor.nic.in), the National Disaster Management Cell (http://ndmindia.nic.in) of the Department of Agriculture and Cooperation in the Ministry of Agriculture and the Department of Land Resources in the Ministry of Rural Development (http://rural.nic.in).

**Research and Technologies:** Research activities pertaining to various aspects of arid zones are being conducted at the Central Arid Zone Research Institute (CAZRI). The majority of these activities are oriented towards agriculture and soil conservation. CAZRI, located in Jodhpur, was established in 1988 under the auspices of Indian Council of Forestry Research and Education (ICFRE) with the prime objective to complete research into sand-dune stabilization, afforestation of the arid saline land of Rann of Kutch, Aravalli Hills, and the Indira Gandhi Nahar Project (IGNP) command area, devising appropriate land use systems, silviculture of important shrubs and trees with emphasis on selection and tree improvement, vegetative propagation, etc. Important studies conducted include identification of species most suitable for restricting the movement of sand-dunes and checking the advance of the desert, the influence of moisture conservation practices in establishing plantations in arid and semi-arid areas, investigation of the influence of farm yard manure and nitrogen and potassium fertilizers on the establishment and growth of Prosopis cineraria and Tecomella undulate, irrigation management in forestry plantations in the IGNP command area of the Indian Desert, and the Combined Production System (Agri-silvi-pastoral) in arid regions. India has built up some degree of expertise in matters relevant to desertification. These include long range weather forecasting, remote sensing, research in arid zone agriculture, forestry and pastures, and dry land farming.

**Financing:** Funds are available from the government's scheme for overcoming natural disasters including drought.

**Cooperation:** India is a signatory to the International Convention to Combat Desertification in Countries Experiencing Drought and/or Desertification Particularly in Africa since December 26, 1996. India has also been

participating regularly in the Inter-governmental Negotiating Committee to Combat Desertification (INCD) process.

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## CHAPTER 13: MANAGING FRAGILE ECOSYSTEMS: SUSTAINABLE MOUNTAIN DEVELOPMENT

**Decision-Making:** The ministries of Environment and Forests, Rural Development, Non-conventional Energy Sources, and Tourism and the Planning Commission are responsible for integrated mountain development.
Relevant legislation and regulation include: the MOEF Notification, 1992 on restriction of certain activities in specified areas of the Aravalli range issued under the Environment (Protection) Act, 1986; and, the MOEF Notification, 2001 on protection and improvement of quality of environment in the Himalayas issued under the Environment (Protection) Act, 1986. All the concerned stakeholders are involved with the issues related to mountain development.

**Programmes and Projects:** Hill Area Development Programme aims at eco-preservation and eco-restoration with emphasis on preservation of biodiversity and rejuvenation of hill ecology. Western Ghats Development Programme adopts an integrated watershed development approach in Western Ghats area prioritizing eco-development, eco-restoration and meeting the basic needs of food, fuel and fodder. Under National Policy for the Integrated Development of the Himalayas, Specific Committee of Chief Secretaries of the states of the Himalayan region has been constituted to formulate and implement schemes in the following areas: Environment and Forests; Agriculture and allied activities; Industry and industrial infrastructure; Social sectors including health and family welfare; Transport, communications and tourism; Energy including non-conventional energy and science and technology.

**Status:** Mountains are important sources of water, energy, minerals, forests, and agricultural products; and serve as areas of recreation. They are store houses of biological diversity, home to endangered species, and an essential part of the global ecosystem. Therefore, the development of mountains has to be viewed in a holistic manner, encompassing economic development, technological improvement, environmental protection, and human resource development. All these activities are interrelated and gains in one will produce benefits in others. As a major ecosystem representing the complex and interrelated ecology of our planet, mountain environments are essential to the survival of the global ecosystem. Mountains are, however, vulnerable to human and natural ecological imbalance. The Himalayas represent one of the most fragile mountain ecosystems and, furthermore, sustain a large human population. This sets them apart from Alpine or other ranges, where human habitation is not so high. Mountains and their people deserve consideration and attention, so that local knowledge can be used, and sustained and accelerated development becomes a reality in the context of the promotion and protection of the ecosystem as a whole. The Himalayan system is vast and diverse, and represents the youngest mountain system in the world. It occupies 18% of the geographical area of India and regulates climate of the entire Indian sub-continent. The existence of valuable flora, fauna, and minerals exclusive to the region is unique. The Himalayas feed the major river systems of the Indian sub-continent. Pressure on the environment comes primarily from economic causes that stem from the requirements of power, shortage of arable land etc. The major challenge before the country is to ensure integrated development of mountains without disturbing the ecological balance.

**Capacity-Building, Education, Training and Awareness-Raising:** All the programmes described above have capacity-building objectives built into them. The GB Pant Institute for Himalayan Environment and Development, Almora are involved in capacity building exercise for mountain development in the country.

**Information:** Further information could be obtained from the Ministry of Environment (http://envfor.nic.in) and Forests and Planning Commission (http://planningcommission.nic.in).

**Research and Technologies:** In India, a number of important priority activities have been augmented and strengthened as a follow up of Agenda 21. While a large number of existing institutions in the region have continued their efforts, the Government has established the GB Pant Institute for Himalayan Environment and Development with the specific mandate for generating and strengthening knowledge about the ecology and

sustainable development of the Indian Himalayas. The Institute is also involved in integrating and collecting traditional knowledge for sustainable and integrated development of watersheds. Some of the major achievements are as follows: suitable models for efficient upland farming systems have been developed to apply soil, water, and nutrient conservation techniques in watersheds of the Sikkim and Garhwal Himalaya; integrated approaches for the management of irrigation systems were developed in selected areas of Kumaun keeping in view rural water supply and sanitation; sustainable natural resource management models are being developed in selected villages of the Nanda Devi Biosphere Reserve with the people's participation; preliminary studies on biodiversity assessment have been completed in selected Protected Areas of the Kumaun and Himachal Himalaya; an environmental awareness programme and biodiversity conservation for school children was continued in the district of Pithoragarh of the Kumaun Himalaya; resource use in the Kullu valley has been studied to evolve sustainable practices; conventional and in-vitro propagation protocols for selected multipurpose tree species have been developed; microbial interventions for improved plant species have been developed; and several on-site training programmes on nursery technology, conservation practices, and protected cultivation have been organized in remote villages with the participation of farmers and NGOs.

**Financing:** Planning Commission, Central and State Governments provide necessary financial support to various schemes for integrated mountain development.

**Cooperation:** The role of the International Centre for Integrated Mountain Development (ICIMOD), located in Kathmandu, in generating and strengthening knowledge about the ecology and sustainable development of mountain ecosystems has been recognized in Agenda 21. In this document, National governments and international organizations are encouraged to support ICIMOD.

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## CHAPTER 14: PROMOTING SUSTAINABLE AGRICULTURE AND RURAL DEVELOPMENT

**Decision-Making:** According to the VII Schedule of the Constitution of India, the subject of agriculture, including agricultural education and research, protection against pests and prevention of plant diseases falls within the purview of the State Subjects. Accordingly, the State Governments are responsible for matters pertaining to agriculture and allied areas. At the level of the Union Government, the Ministry of Agriculture, Ministry of Rural Development and the Planning Commission execute the planning and coordination of Agriculture and Rural Development activities in India. Important legislations and regulations in agriculture sector include: Seeds Act (1966), which provides for the legislative framework for regulation of quality of seeds sold in the country; Protection of Plant Varieties and Farmers' Right Act; Fertilizer (Control) Order, 1985 under the Essential Commodities Act 1955; Destructive Insects and Pests Act, 1914; and, Insecticides Act, 1968. Currently efforts are on to deregulate agriculture sector from various controls/restrictions for ensuring sustained growth in this sector.
Statutory environmental clearance under Environment (Protection) Act is required for the following types of projects: Agricultural Development Projects — major irrigation projects with command area of 10,000 hectares and more; and, Human Settlement Projects located in the Coastal Regulation Zone — statutory environmental clearance is required for 30 selected activities in sensitive areas. To save the Indian agriculture from exotic pests and diseases, legislative measures on Plant Quarantine are being enforced through 26 Plant Quarantine Stations located at International Airports, Seaports, and Land Frontiers. These Stations also discharge the responsibility of phyto-sanitary certification to help export of agricultural commodities.
In order to promote the use of safer pesticides and also increasing the export potential of pesticides, the Central

Insecticides and Registration Committee set up under the Insecticides Act, further simplified data requirements for both plant origin and provisionally registered neem-based pesticides and bio-pesticides. The main objectives of the Government's price policy for agricultural produce aims at ensuring remunerative prices to the growers for their produce with a view to encouraging higher investment and production. Towards that end, minimum support prices for major agricultural products are announced each year, which are fixed after taking into account the recommendations of the Commission for Agricultural Costs and Prices (CACP). The CACP, while recommending prices, takes into account all of the following factors: production cost; changes in Input Prices; Input/Output Price Parity; trends in market prices; inter-crop price parity; demand and supply situation; effect on Industrial Cost Structure; effect on general price level; effect on cost of living; International Market Price Situation (MSP); and, parity between Prices Paid and Prices Received by farmers (Terms of Trade). Since liberalization, several policy measures have been taken with regard to regulation & control, fiscal policy, export & import, taxation, exchange & interest rate control, export promotion and incentives to high priority industries. Food processing and agro industries have been accorded high priority with a number of important relief and incentives. Wide-ranging fiscal policy changes have been introduced progressively. Excise & import duty rates have been reduced substantially. Many processed food items are totally exempt from excise duty. Custom duty rates have been substantially reduced on plant & equipments, as well as on raw materials and intermediates, especially for export production.
The Committee on Pricing Water (as part of the National water Policy, 1987) deals with rationalizing water rates and has suggested increase in irrigation water rates in a phased manner. The pricing of water for various uses will have to take into account the paying capacity of the users including farmers and large population below poverty line.
As for regulations & control, no industrial license is required for almost all of the food & agro processing industries except for some items like: beer, potable alcohol & wines, cane sugar, hydrogenated animal fats & oils etc. and items reserved for exclusive manufacture in the small scale sector. Items reserved for S.S.I. include pickles & chutneys, bread, confectionery (excluding chocolate, toffees and chewing-gum etc.), rapeseed, mustard, sesame & groundnut oils (except solvent extracted), ground and processed spices other than spice oil and oleoresins, sweetened cashew nut products, tapioca sago and tapioca flour. The National Policy on Agriculture 2000 seeks to realize the vast untapped growth potential of Indian agriculture, strengthen rural infrastructure to support faster agricultural development, promote value addition, accelerate the growth of agro business, create employment in

rural areas, secure a fair standard of living for the farmers and agricultural workers and their families, discourage migration to urban areas and face the challenges arising out of economic liberalization and globalization.
The Agricultural Development Strategy was revised in 1999, as the national strategy on sustainable agriculture and rural development (SARD). The Strategy is essentially based on the policy on food security and alleviation of hunger. A regionally differentiated strategy based on agro climatic regional planning which takes into account agronomic, climatic and environmental conditions, has been adopted to realize the potential of growth in every region of the country. The thrust is on ecological, sustainable use of basic resources such as land, water, and vegetation, in such a way that it serves the objectives of accelerated growth, employment and alleviation of hunger.
At the macro level, the agriculture development strategy has to be differentiated by broad regional characteristics of an agro-economic character. The policy approach to agriculture, particularly in the 1990s, has been to secure increased production through subsidies in inputs such as power, water and fertilizer, and by increasing the minimum support price rather than through building new capital assets in irrigation, power and rural infrastructure. The Approach paper for the Tenth Plan seeks to remove unviable subsidies.

The document further recognizes that both land and water will be crucial constraints on our efforts to expand production in agriculture and seeks to evolve a comprehensive land-use policy, which lays down the contours of the ownership, and institutional framework that will encourage the productive utilization of uncultivated lands. In order to optimize the utilization of land resources, state governments are taking various initiatives to remove impediments coming in the way of productive utilization of cultivable land, including tenurial reforms. Increasing women's access to productive land by regularizing leasing and share cropping of uncultivated agricultural land by women's groups, encouraging collective efforts in bringing wastelands under cultivation and providing policy incentives to women in low-input subsistence agriculture are another important thrust area. Animal husbandry and dairying is another thrust area for generating employment opportunities and supplementing livelihoods of small marginal farmers and landless laborers, especially in the rain fed and drought-prone areas. *Major Groups involvement*: The Panchyati Raj Institutions (PRIs) function as effective institutions of local self-governance and prepare plans for economic development and social justice and implement them. The PRIs are the umbrellas for the integration of sectoral programmes with poverty alleviation and rural development programmes. In order to promote people's participation and create awareness, the practicing farmers, village youth and school dropouts are working as focal points for dissemination of information e.g. on low cost technology and producing plant material for conservation measures. Stress is being laid on organizing Self-Help Groups to institutionalize people's participation to improve household production systems.

**Programmes and Projects:** Major activities to implement the SARD policy are as follows: development of crops based on regionally differentiated strategy; development of Horticultural crops; adequate and timely delivery of core inputs; Integrated Pest Management (IPM); greater use of bio-fertilizers and bio-technology; National Agricultural Technology Project; Rained farming and Watershed Management; Soil and Water Conservation; animal husbandry and dairying; development of fisheries; agricultural research and education; and, development of Human resources. The major thrust of the agricultural development programmes in India is improving efficiency in the use of scarce natural resources, namely, land, water and energy. This can be achieved only through improved productivity in a cost-effective manner, which alone could increase the welfare of the farmers and agricultural labor. Balanced and integrated use of fertilizers, agricultural credit, institutional support, accelerated investments in agriculture, enhancing the competitiveness of agro-exports, creation of additional irrigation facilities etc. have been given encouragement through various schemes and activities of the Government.
A wide range of approaches have been employed to address problems of land degradation, some of which include: preventing soil loss from the catchments; promoting of multi-disciplinary integrated approach to catchment treatment; improving land capability and moisture regime in the watersheds; promoting land use to match land capability; reducing run-off from the catchments to reduce peak flow into the river system; upgrading skills in the planning and execution of watershed development programme; increasing productivity of land affected by alkalinity for increasing sustainable agriculture production; identifying critical degraded areas; generating data on land suitability and capability for regulating land use; preparing soil resource map and inventory of soil and land

resources; developing technical skills in soil and water conservation; building up and strengthening land capability of State Land Use Boards; and promoting and implementing land use policy related to land base programme. Many institutions are working on developing IPM system for crop protection. All three components including the pesticide promoters, the pesticide antagonists and the fence-sitting demanders of knowledge support IPM. Major steps towards safe and appropriate use of pesticides include: promotion of Integrated Pest Management; implementation of Insecticides Act; training in Plant Protection; Locust Control & Research; and, strengthening and modernization of Plant Quarantine Facilities in India.

**Status:** The agriculture sector has a vital place in the economic development of India as it contributes 24.8 % of GDP at current prices and employs about 64% of the workforce (1999-2000). Significant strides towards ensuring food security have been made in agriculture production. Food grain production registered a growth from 100 million tones in the year 1971-72 to about 192 million tones in 2000-2001. The significant improvement in agriculture productivity has helped in reducing rural poverty. Lack of any significant breakthrough in seed technology is perhaps one of the main reasons for the slow growth in good grain output during the nineties. The production of flowers has emerged as a promising area of high growth in recent years, particularly for its export potential. However, due to lack of technology and poor infrastructure support for handling, packing, processing and preservation, substantial post harvest losses of fruits and vegetables still characterize the horticulture sector. The country's irrigation potential was 89.56 million ha by the end of 1996-97, comprising 32.96 million ha under major and medium projects, and 56.60 million ha under minor irrigation schemes. Exported agricultural products include food grains, tobacco, cashews, groundnuts, beverages, sugar, molasses, horticulture and floriculture products, processed fruits and juices, and meat preparations. India's share in the world trade in agricultural commodities is about 1%. Agricultural exports have received special attention from the Government because of the potential for raising farm incomes, tackling unemployment, and earning foreign exchanges. A number of policy changes have been introduced to give an impetus to agricultural exports. It is estimated that about an average 16.75 tons/ha/year of soil are lost through erosion every year in India. At the cumulative level, it is more than 5,000 million tons loss of topsoil annually. Urgent effective measures are needed to retard the loss of topsoil. There is also a need to evolve a new approach to agricultural policy based on a careful assessment of current constraints and possibilities. Rapid development of rural infrastructure that supports not only agriculture, but also all rural economic activities remains another important challenge.

**Capacity-Building, Education, Training and Awareness-Raising:** Increased mechanization in agriculture has created demand for more trained manpower for the operation, maintenance, and management of agricultural machinery. The Government has set up Farm Machinery Training and Attesting Institutes to provide better quality equipment to farmers. The Indian Council of Agricultural Research (ICAR) plays a crucial role in promoting science and technology and its application in agriculture. A National Gene Bank, which is the biggest in Asia, is operational in New Delhi. Human resource development in plant protection and various disciplines of pesticides is being achieved by organizing regular and short-term training programmes at National Plant Protection Training Institute, Hyderabad.

**Information:** National information on sustainable agriculture is made available to decision-makers, advisory organizations and farmers via the Internet: http://goidirectory.nic.in. The government of India has analyzed and collected of information on various production systems and technologies through: developing on-farm and off-farm programmes to collect and record indigenous knowledge; and, analyzing the overall effects of technological innovations and incentives on farm household income. The Information Technology Division of the Ministry of Agriculture provides services relating to agriculture nationally and internationally by networking right from the level of farmers and the village/block to district headquarters on the one hand to State and the Central Government Departments and related institutions on the other hand. This is being done by facilitating availability of information with speed, quality and economy in every area connected with agricultural productivity e.g. fertilizer, insecticides pest attack, drought and other natural disasters, marketing, storage, pricing etc.

**Research and Technologies:** Research efforts have been accelerated through biotechnology, microbiology, genetic improvement of crops including hybrid technology, genetic up gradation of animal harvest technology, etc. In agricultural education, the thrust is on human resource development through upgraded teaching facilities. The existing infrastructure for technology transfer has also been made more effective and responsive to meet the needs of farmers. The infrastructure for human resource development and for testing and evaluation of agricultural implements/machines has been established. The emphasis has also been laid on the safety of farmers in operation of agricultural machines. The programmes have resulted in the increased adoption of improved farm machines and equipment by the farmers.
Realizing the importance of Genetic Stock for food security, the National Bureau of Plant Genetic Resources of ICAR has long been identifying areas rich in bio-diversity and Gene Pool for cereals, fruits and vegetables. Bio-Banks created have seed as well as tissue samples of the requisite crops..

**Financing:** The funding of major programmes is done mainly through the national budget. A public sector outlay of Rs. 42642 crore (at 1996-96 prices) had been earmarked for development of agriculture and allied activities in the Ninth Plan. The emphasis on agricultural credit has continued to be on progressive institutionalization for providing timely and adequate credit support to farmers with particular focus on small and marginal farmers and weaker sections of society for increasing agricultural production and productivity. The Government of India has taken many policy initiatives for strengthening the rural credit delivery system to support the growing credit needs of the agricultural and rural sectors. The Policy essentially laid emphasis on augmenting credit flow at the ground level through credit planning, adoption of region-specific strategies and rationalization of lending policies and procedures to enable the farmers to adopt modern technology and improved agricultural practices.

Agricultural credit is disbursed through multi-agency network consisting of Commercial Banks (CBs), Regional and Rural Banks (RRBs) and Cooperatives. The Cooperative Credit Institutions, both short and long term structures, have emerged over the years as the Prime institution agencies for dispensation of rural credit. In terms of network, coverage and outreach, Cooperatives have sizeable presence and play a significant role in meeting the short-term requirements of agriculture. However, several developments over a period of time have left the Cooperative Credit Structure (CCS) facing severe problems, which have restricted their ability to function viably and perform effectively the task of reaching out to all segments of farming community and meet in full their requirements of credit. In order to build up a strong and viable CCS, a proposal for revamping of CCS is under active consideration of Government of India. To provide adequate and timely support from the banking system to the farmers for their cultivation needs including purchase of all inputs in a flexible and cost effective manner, a model Kisan Credit Card Scheme had been introduced in the year 1998 for implementation by all the rural financial institutions in the country. A Scheme for providing insurance cover to farmers, known as "National Agricultural Insurance Scheme" (Rashtriya Krishi Bima Yojna) is functional since 1999-2000. The Scheme provides financial support to the farmers in the event of failure of their crops due to all types of natural disaster as well as pest attacks and diseases. Rural Infrastructure Development Fund (RIDF) was created in the year, 1995-96 to boost public investment in development of rural infrastructure. The assistance provided under RIDF has primarily facilitated augmenting resources of the State Governments for investment in rural infrastructure projects including projects that remained incomplete for want of resources.

**Cooperation:** India is having a fruitful cooperation with both multilateral (FAO) and bilateral agencies in the field of agriculture and allied sectors.

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## CHAPTER 15: CONSERVATION OF BIOLOGICAL DIVERSITY

**Decision-Making:** The Ministry of Environment and Forests (MoEF) is the modal Ministry for coordinating Biodiversity Conservation activities in the country. Conservation and sustainable use of biological resources based on local knowledge systems and practices are ingrained in Indian ethos and way of life. Formal policies and programmes for conservation and sustainable use of biodiversity resources date back several decades. The concept of environmental protection is enshrined in the Indian Constitution in Article 48(a) and 51(g). Major central acts relevant to biodiversity are: the Wildlife (Protection) Act, 1972; the Forest (Conservation) Act, 1980; and the Environment (Protection) Act, 1986. The various central acts are supported by a number of state laws and statutes concerning forests and other natural resources. India has developed a biodiversity legislation, which aims at regulating access to biological resources and making such access subject to terms and conditions, which secure equitable sharing of benefits for the resources accessed. This legislation was prepared after extensive consultations with all the stakeholders including local people, industry, academic institutions, state governments and ministries and departments. The biodiversity legislation is presently awaiting approval of the Parliament.
The objectives of the Convention on Biological Diversity (CBD) are: the conservation of Biological Diversity; the sustainable use of its component and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. Following the ratification of the Convention on Biological Diversity by India in 1994, several steps have been initiated both to meet the commitments under the Convention and to realize the opportunities offered by the CBD. A National Action Plan on Biodiversity has been prepared which seeks to consolidate the on-going efforts of conservation and sustainable use of biological diversity and to establish a policy and programme regime for the purpose. Legislation on bio-diversity is also under finalization. India regularly participates in important international conventions on Biological Diversity.

Following the ratification of the Biodiversity Convention by India, several steps have been initiated to meet the commitments under the Convention and to bring the legislative, administrative, and policy regime regarding biological diversity in tune with the Articles of the Convention. Policies and strategies directly relevant to biodiversity include: the National Forest Policy as amended in 1988; the National Conservation Strategy, and Policy Statement for Environment and Sustainable Development; the National Agricultural Policy; the National Land Use Policy; the National Fisheries Policy (under preparation); the National Biodiversity Policy (under preparation); the National Wildlife Action Plan; and the Environmental Action Plan. In 1999, the MoEF prepared a National Policy and Macro level Action Strategy on Biodiversity through a consultative process. This document is a macro-level statement of policies, gaps and strategies needed for conservation and sustainable use of biological diversity. There is a need to prepare detailed action plans at sub-state, state, regional, and national levels building on this framework document. Preparing such a detailed micro-level plan for the conservation of the country's biodiversity is also part of India's obligations as party to the Convention on Biological Diversity. In this context the Ministry has accessed funding from the Global Environment Facility (GEF) for preparing the National Biodiversity Strategy and Action Plan (NBSAP). The process of developing NBSAP is highly participatory in nature, involving to a large number of village-level organizations and movements, NGOs, academicians and scientists, government officers from various line agencies, the private sector and others, who have a stake in biodiversity. The NBSAP should be seen as much as a process as a final product. Through such a participatory approach, it will evoke much wider ownership of the process and product, and go a long way in ensuring the implementation of what is recommended in the final NBSAP.

**Programmes and Projects:** A programme called eco-development for in situ conservation of biological diversity involving local communities has been initiated in recent years through World Bank assistance. The concept of eco-development integrates the ecological and economic parameters for the sustained conservation of ecosystems by involving local communities with the maintenance of earmarked regions surrounding protected areas. Biosphere Reserve (multi-purpose protected areas to preserve the genetic diversity in representative eco-systems), Programme is being implemented to: conserve diversity and integrity of plants, animals and microorganisms; to promote

research on ecological conservation and other environmental aspects; and to provide facilities for education, awareness and training. Twelve biodiversity rich areas of the country have been designated as Biosphere Reserves applying the United Nations Educational, Scientific and Cultural Organization's Man and the Biosphere (UNESCO MAB) criteria. India is one of the 12-mega biodiversity centres in the world, representing two of the major realms and three of the basic biomes of the world. The country is divided into 10 biogeographic regions: Trans-Himalayan, Himalayan, Indian Desert, Semi-Arid, Western Ghats, Deccan Peninsula, Gangetic Plains, North-East India, Islands, and Coasts. Programmes have also been launched for scientific management and wise use of fragile ecosystems. Specific programmes for management and conservation of wetlands, mangroves, and coral reef systems are being implemented. National and state level committees oversee and guide these programmes to ensure strong policy and strategic support.

**Status:** Approximately 5.3 % of the total geographical area of country has been earmarked for extensive in situ conservation of habitats and eco-systems through a protection area network of 89 National Parks and 496 Wildlife Sanctuaries. This network has played a significant role in restoring viable populations of large mammals such as the tiger, lion, rhinoceros, crocodiles, elephants, etc. Attention has been paid to ex situ conservation measures as they complement and are important to situ conservation. According to a recent survey, the Central and State Governments together run and manage 33 Botanical Gardens. In addition, universities have their own Botanical Gardens. There are 275 centres of ex situ wildlife preservation in the form of zoos, deer parks, safari parks, aquaria, etc. The Government of India has set up a Central Zoo Authority to oversee, monitor, and coordinate the management and the development of zoos in the country. Shortage of land and resources has resulted in man-forestland conflicts in protected areas of the country. The NBSAP aims at tackling this core challenge to the biodiversity conservation programmes of the country by actively involving local stakeholders. India has a wealth of wetland eco-systems distributed in different geographical regions from the cold arid zone of Ladakh in the North to the wet humid climate of Imphal in the East, the warm arid zone of Rajasthan in the West to the tropical monsoon Central India and the wet and humid zone of Southern Peninsula. Most of the wetlands in India are directly or indirectly linked with major river systems such as Ganga, Brahmaputra, Narmada, Tapti, Godavari, Krishna, and Cauveri. A National Level Committee constituted to advise the Government on appropriate policies and measures to be taken for conservation and management of the wetlands has so far identified 20 wetlands for conservation and management on priority basis. Steering Committees have been set up by the concerned State governments in which representatives of State government departments, universities and research institutions are included. Modal research/academic institutions have been identified for each of the selected wetlands. Management Action Plans have been drawn up for most of the identified wetlands.

**Capacity-Building, Education, Training and Awareness-Raising:** The NBSAP project envisages the assessment and stocktaking of biodiversity-related information at various levels, including distribution of endemic and endangered species, site-specific threats and pressures, social/political/economic issues, ethical concerns, and ongoing conservation initiatives by various sections of society. The two bottom lines that all the agencies involved have to keep in mind are: ensuring the ecological security of the country and the area they are working on, and ensuring the livelihood security of communities most dependent on biological resources. The project aims to build on existing expertise and information, rather than reinvent the wheel. The NBSAP will not involve fresh field research; instead agencies preparing the plan are asked to concentrate on collating and analyzing information, and arrive at specific actions by which to conserve elements of biodiversity. Key features of the planning process include an emphasis on gender sensitive decentralized planning, and the use of interdisciplinary working groups to involve all sectors concerned with biodiversity conservation. These detailed action plans (at sub-state, state, and regional levels) will be consolidated and a national level action plan will be developed. In addition to the activities of the NBSAP, the Ministry of Environment & Forests and other scientific institutions fund research programmes aimed at surveying, inventorying and conservation of the biological resources of the country.

**Information:** Surveys of the floral and faunal resources in the country are carried out by the Botanical Survey of India established in 1890 and the Zoological Survey of India established in 1916. The National Institute of

Oceanography and several other specialized institutions and universities further strengthen the taxonomic database. The diversity of the country's biological resources is yet to be fully surveyed. Approximately 70 % of the total geographical area has been surveyed to date. Based on this, over 47,000 species of plants and 81,000 species of animals have been recorded. The vascular flora, which forms the conspicuous vegetation cover comprises about 15,000 species. Several thousands of them are endemic to India and they have so far not been reported from anywhere else in the world. This list is being constantly upgraded, especially in respect of lower plants and invertebrate animals. The biological diversity of the country is so rich that it may play a very important and crucial role in the future survival of mankind if it is conserved and used with the utmost care. Today, two hot spots in biological diversity have been identified in the country, namely, the Eastern Himalayan region and the Western Ghats. A comprehensive status report covering the various facets of biodiversity conservation in India is under preparation. Information on biodiversity conservation is available at the MoEF (http://envfor.nic.in).

**Research and Technologies:** The collection and preservation of genetic resources is accomplished through the National Bureau of Plant Genetic Resources for Wildlife for crop plants; the National Bureau of Animal Genetic Resources for domesticated animals; and the National Bureau of Fish Genetic Resources for economically valuable fish species. These Bureaus are assigned the task of collecting germplasm and supplying these on request to Indian and foreign agencies for research purposes.

**Financing:** The MoEF provides funds for the biological conservation programmes of the country. Finances are also obtained from multilateral agencies such as Global Environment Facility (GEF).

**Cooperation:** The Convention on Biological Diversity was signed and ratified by India in February, 1994. The Convention on International Trade in Endangered Species of Wild Fauna and Flora was signed in 1976. India believes that National action regarding conservation and sustainable use of biodiversity and equitable sharing of benefits arising from the use of genetic resources demands appropriate actions on the part of international community. Some key issues in this regard include:

- Development of a suitable enabling environment by the other parties, particularly the developed countries, to ensure benefits to countries of origin. These benefits should not only include measures like royalty payment or monetary compensation, but also location of research and technologies in the countries of origin in accordance with the provisions of the Convention.
- Development of a credible internationally regime for recognizing the intellectual and physical property rights of local communities. Development of such a regime may take time, pending which all patent applications should be required to disclose: the source and origin of the genetic material used; knowledge and practices about the use of the genetic resources by the local communities and identification of such communities; and a declaration that laws, practices, and guidelines for the use of such material and knowledge systems in the country of origin have been followed.
- Capacities of biodiversity rich countries should be built to enable them to bio-prospect and develop products from genetic resources.
- Introduction of transgenics, alien species should be only permitted with appropriate safeguards.

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## CHAPTERS 16 AND 34: ENVIRONMENTALLY SOUND MANAGEMENT OF BIOTECHNOLOGY AND TRANSFER OF ENVIRONMENTALLY SOUND TECHNOLOGY, COOPERATION AND CAPACITY-BUILDING.

**Decision-Making:**

*Technologies*: The Ministry of Environment and Forests (MoEF) and the Department of Science and Technology are the two important coordinating bodies. Individual ministries also take up work relating to technology development and transfer of technology. The various laws to regulate environment and the rules made under these laws that have been enumerated earlier provide a legal framework for transfer of technology. The facilitating role of Government has been increasing through, for example, the identification of and support for the development of environmentally sound technologies such as chlorofluorcarbon (CFC) alternatives, clean coal technologies, energy efficient technologies, and others. In the field of environmentally sound technologies, a number of research and development projects have been identified for support. The Ninth Five-Year Plan had stressed the initiation of measures for reducing the energy intensity in different sectors through changes in technology and industrial processes. A critical mass of Research and Development (R&D) capacity is crucial for effective dissemination of environmentally sound technologies and their generation locally. In order to strengthen the technological capabilities of Indian industries, both for meeting National needs and for global competitiveness, a number of new initiatives have been launched. A Technology Development Board was established in 1996 with a mandate to facilitate development of new technologies, and the assimilation and adaptation of imported technologies by providing catalytic support to enable industries and R&D institutions to work in partnership with each other. Matching grants to R&D institutions showing commercial earnings through technology services were also introduced in 1996 and will be continued and broadened. Already, a long-term perspective called Technology Vision for India 2020 has been prepared, which could form the basis of technology development programmes.
The Government remains in touch with major stakeholders like industry and research bodies.

*Biotechnologies*: The Department of Biotechnology (DBT) under the Ministry of Science and Technology is the coordinating body. The DBT has prepared recombinant DNA (rDNA) Safety Guidelines and Regulations. These guidelines encompass the areas of research involving: Genetically Modified Organisms (GMOs)/Living Modified Organisms (LMOs); Genetic Transformation of Plants and animals; rDNA Technology in vaccines and bioactive molecule development; and large scale production and deliberate accidental release of organisms, plants, animals and products derived from rDNA technologies. Recognizing the need to create a separate institutional framework to strengthen biotechnology research and development in the country, the Government of India first created the National Biotechnology Board in 1982 and then established a separate Department of Biotechnology DBT) under the Ministry of Science and Technology in 1986. There has been considerable achievement in the areas of basic research in modern biology and molecular biology relating to agriculture, health, environment, industry, human resource and infrastructure development, biosafety and ethical issues. The Department has supported a number of projects on assessment, conservation and characterization of biodiversity, molecular taxonomy and bioprospecting, preparation of digital database on bioresources and conversion of bioresources into economic products and process. More recently, the Government has set up the National Bioresource Development Board to specifically promote the sustainable development and utilization of bioresources using the tools of science and technology and, in particular, molecular biology. The Government consults scientific institutions, industry and other major stakeholders at regular intervals.

**Programmes and Projects:**

*Technologies*: See under **Status**.

*Biotechnologies*: In India, the Department of Biotechnology has constituted 16 Task Forces for the generation of R&D projects for the development of biotechnologies/techniques/processes, the perfection of techniques /technologies developed, and their field evaluation and transfer to industries for commercialization. This is to benefit the country in general and the affected population in particular. These Task Forces are: aquaculture and

marine biotechnology; animal biotechnology; biological control of plant pests, diseases, and weeds; biotech process engineering and industrial biotechnology; basic research in biotechnology; biotechnology based programme for the Scheduled Castes and Scheduled Tribes population, and weaker sections of society; biofertilizer; crop biotechnology and plant molecular biology; environment and conservation biotechnology; food biotechnology; human genetics; medical biotechnology; microbial biotechnology; medicinal and aromatic plants biotechnology; plant tissue culture; and sericulture biotechnology.

These Task Forces consist of experts in the respective areas from different parts of the country. All the Task Forces have identified the needed thrust areas in the Indian context. Based on the recommendations of the Task Forces, the Department has supported R&D in: stress resistant plant species (crop species, forest trees, and medicinally important plant species) for higher yields with less inputs; transgenic crop plants for higher yields, pest management, reduction in toxin contents in some crop varieties, etc.; biological pesticides using biotechnological tools to bring down the pollution load of chemical pesticides; more efficient bio-fertilizers that are economical to farmers compared to chemical fertilizers, and ultimately bring down pollution load of chemical fertilizers; new immunodiagnostic tools for detection of communicable diseases and certain physiological states, such as early detection of pregnancy, etc.; new/recombinant vaccines for the control of different diseases; new strains for improved production of antibiotics using/strengthening the existing infrastructure; highly efficient strains for the treatment of waste waters (domestic as well as industrial) and conversion of wastes and agro-residues into useful chemicals for industrial applications; ELISA, phase conjugate reflectivity (PCR) techniques, and DNA probes for the detection of enteric pathogens in drinking water so as to avoid epidemic outbreaks by quick corrective measures to be taken immediately after identification of the enteric pathogens; cleaner technologies using the biotechnological tools; biosensors for the detection of xenobiotics in the environment; conservation of endangered/threatened plant species on the verge of extinction and are of economically/medicinally importance using biotechnological tools, specifically for the development of protocols for ex situ conservation, which would be taken up by the MoEF for in situ conservation; gene banks in different parts of the country; high-yielding technology packages for aquaculture including feed development, breeding and seed production, and bioactive compound, health, development of spawning agents, etc.; and embryo transfer techniques, animal feed for high milching cattle and for development of vaccines and diagnostics for different diseases in the area of animal biotechnology.

The purpose of gene banks is for the preparation of an inventory of important species, preservation of genetic resources, and to optimize their uses. There is also a provision for networking of gene banks on a regional or inter-regional basis. Under this programme, banks have been established at: the National Bureau of Plant Genetic Resources (NBPGR), the Indian Agricultural Research Institute (IARI), New Delhi; the Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow; and the Tropical Botanical Garden and Research Institute (TBGRI), Thiruvanathapuram. The recombinant DNA (rDNA) technology heralded new opportunities for beneficial applications in agriculture, animal and human health, industry, and environment. It has also given rise to concern over possible unknown hazards from bridging the natural species barrier and the uncertain effects of new organisms on environmental and public health. In order to have effective and safe release programmes, it is necessary to have biosafety and regulatory arrangements in biotechnology. Realizing the immediate needs for these arrangements, the Department of Biotechnology has prepared the Recombinant DNA Safety Guidelines and Regulations. These guidelines cover the areas of research involving: GMOs/living modified organisms (LMOs); genetic transformation of plants and animals; rDNA technology in vaccines and bioactive molecule development; and large scale production and deliberate/accidental release of organisms, plants, animals, and products derived from rDNA technologies.

**Status:**

*Technologies*: Technology upgrading requires that Indian enterprises of all types have information on relevant technologies in international markets and within the country. Many countries have well-developed systems, computerized on-line technology information and dissemination services, often backed by constancy and financial assistance to enable small and medium enterprises to find out, test, and implement new technologies.

Indian technology policies are undergoing significant changes, and on the whole have improved greatly in recent years. They are not, however, ideal. A coherent technology strategy in India must address a number of interconnected elements in the incentive regime, and the relevant markets and institutions. Technology development generally requires the setting up of clusters of industries that can share information and skills, as in science parks or dedicated industrial estates. Some such facilities exist in India, but their efficacy and functioning need to be strengthened.

In India, there is considerable technological activity in a wide spectrum of firms. What is most impressive is the number of small and medium sized enterprises that are investing in new technology-based ventures, and often striking out in world market as exporters. However, the rest of the industrial sector still needs to invest in technology upgrading. The experience of many developing and industrialized countries suggests that a rapid acceleration of industrial technology development calls for a deliberate 'strategy', in the sense that it requires the government to coordinate and guide an essentially market-driven process. Technology development calls for both general and specific forms of human capital, and emerging technologies are highly skill intensive in both technical and managerial terms. While India is endowed at present with large amounts of high-level human capital, investments in the creation of new skills (as measured by enrolment levels in technical subjects at all levels) are low. In addition, firm investments in training are highly variable, with large segments of industry investing very little in training. The small and medium enterprise (SME) sector in particular suffers from very low levels of skill, while industrial training institutes are often unresponsive to their needs. R&D in Indian industry has been rising, but the overall level is still low and over three-quarters of the research effort originates from the public sector. The Government is undertaking an analysis of current technological trends in industry in order to formulate appropriate policies to encourage R&D. India has a large infrastructure of technology support institutions, some of which are undergoing reform to make them more relevant to industrial needs. A number of universities, especially the Indian Institutes of Technology (IITs), are increasingly interacting with industry on technological matters, while others are outside this circle.

Environmentally sound technologies are essential to achieving sustained economic growth and sustainable development. They encompass a total system, which includes know-how, procedures, goods, and services. Agenda 21 emphasizes the need for access to and the transfer of environmentally sound technologies to developing countries on favourable and preferential terms as mutually agreed. This would take into account the need to protect Intellectual Property Rights as well as the special needs of developing countries for the implementation of Agenda 21.The implementation of the commitments on the transfer of environmentally sound technologies and technical know-how has been disappointing.

Issues of natural resource conservation and agricultural growth cannot be effectively tackled in the absence of an appropriate technological base. In addition, technology is essential for increasing the competitiveness of the Indian economy in international markets. Indigenous development of technology is therefore of the highest importance and deliberate planned steps need to be taken to increase National technology self-sufficiency. Rapid technical progress is altering fundamentally the skills, knowledge, infrastructure, and institutions needed for the efficient production and delivery of goods and services. So broad and far-reaching are current technological developments that many see the emergence of another industrial revolution driven by a new technological "paradigm," which involves not only new technologies and skills in the traditional sense but also different work methods, management techniques, and organizational relations within firms. As new transport and communications technologies shrink international 'economic space,' it also implies a significant reordering of comparative advantage, and trade and investment relations between countries. There is a need to strengthen Technology Foresight Programmes to analyze the implications of emerging technologies, domestic strengths and weaknesses, and target future technologies for local development.

*Biotechnologies*: The federal Government is encouraging State governments to set up biotechnology parks to facilitate setting up of biotechnology based industries. Five States– Andhra Pradesh, Kerala, Karnataka, Tamil Nadu and Maharashtra have set up biotechnology parks. While the rDNA technology has opened up new opportunity for beneficial applications in agriculture, animal and human health, industry and environment, it has also given rise to concern over possible unknown hazards arising out of bridging the natural species barrier and the uncertain effects of new organisms on environment and public health. In order to have effective and safe release

programme, it is necessary to have biosafety and regulatory arrangements in biotechnology. Another issue of serious concern is the protection of intellectual property rights of indigenous knowledge.

**Capacity-Building, Education, Training and Awareness-Raising:**
*Technologies*: India has a vast network of universities and research institutes engaged in basic teaching as well as in programmes for training and awareness building.
*Biotechnologies*: Training and teaching covering different aspects of biotechnology have always been an integral part of DBT's overall plan. There are post-graduate and post-MD/MS programmes with a total intake of around 650 students each being supported in a number of prestigious institutions throughout the country. The DBT has also established a nation-wide bioinformatics network. The network offers single window information resource in the country covering the inter-disciplinary areas of biotechnology and molecular biology. Ten distributed information centres and 46 sub-distributed information centres converge into an apex bioinformatics centre at the DBT, which coordinates the activity. The network deals the development of databases and software as well as training of human resources. The DBT has established a Biotechnology Patent Facilitating Cell aimed at creating awareness and understanding on patents among scientists through workshops, seminars and providing facility for filing Indian and international patents.

**Information:**
*Technologies*: In India, the Department of Science and Technology has played an important role in terms of institutional support for building National strengths in scientific fields, and technology assessment and forecasting. A number of technology status reports on energy efficiency, environmentally sound technologies for pollution control, and many other areas have been published. Information can be obtained from Internet at: http://mst.nic.in.
*Biotechnologies*: Information can be obtained from the Department of Biotechnology: http://dbtindia.nic.in.

**Research and Technologies:**
*Technologies*: As indicated above the country does have a vast network of research and training organizations.
*Biotechnologies*: The thrust has been in R&D product development, technology transfer and demonstration, integrated manpower development, augmentation of infrastructure facilities and their optimal utilization, special programmes for specific groups and weaker sections, etc. Significant achievements have been made, besides launching of Technology Mission-mode projects, on bio-fertilizers, biological pest control, and aquaculture. There is a need to formulate a biotechnology profile for the country as well as to ensure transfer of technology.
The DBT has constituted 16 Task Forces to generate and oversee R&D projects for the development of perfection of biotechnology, processes or products, and their field evaluation and transfer to industries for commercialization.

**Financing:**
*Technologies*: While the country has its own capabilities for research and technology adaptation, it has often to pay for costly import of technology. The financing mechanisms envisaged in Agenda 21 have not materialized. If such a mechanism would be available the process of absorbing environmentally sound technologies from the developed country would be even faster.
*Biotechnologies*: Funds are provided from Union Budget.

**Cooperation:**
*Technologies*: Cooperation in the area of transfer of technology cannot be left to the commercial arrangement at global mechanism for ensuring that transfer of such technologies does take place, as a measure of cooperation outside the realm of commercial route is necessary.
*Biotechnologies*: Indian universities and research institutes are involved in active collaborative research with Foreign Research Institutes.

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## CHAPTER 17: PROTECTION OF THE OCEANS, ALL KINDS OF SEAS, INCLUDING ENCLOSED AND SEMI-ENCLOSED SEAS, AND COASTAL AREAS AND THE PROTECTION, RATIONAL USE AND DEVELOPMENT OF THEIR LIVING RESOURCES.

**Decision-Making:** The Ministry of Environment and Forests (MoEF), New Delhi and Department of Ocean Development are responsible for decision-making in the area of oceans and seas. The management of resources in high seas is with Department of Ocean Development, while management of resources in the Coastal Water lies with the MoEF. A national and 13 State/U.T. level coastal management Authorities and State/Union Territory level Waste Zone Management Authorities have been set up to identify and prepare an Integrated Coastal Zone Management Plan for ecologically important stretches. In India, the UN Convention on the Law of the Sea was signed in 1995 and ratified in June 1996. India has also ratified the International Convention for the Prevention of Pollution from Ships (MARPOL Convention 73/78) and adopted the provisions in the Merchant Shipping Act. Fisheries are regulated under the Marine Fishing Regulation Act (MFRA). The Notification on Coastal Regulation Zone 1991 (as amended from time to time) lists certain prohibited and regulated activities related to integrated coastal zone management and sustainable development. Its provisions also prohibit and regulate developmental activities in the Coastal Regulation Zone. The effluents/ discharges from various resources have to meet the standards listed in the EP (Act) 1986 before being discharged in the marine waters.

To address integrated coastal zone management and sustainable development, the following legislation has been adopted: Environment Protection Act (EPA), 1986, under which Coastal Regulation Zone 1991 has been notified; and, Forest Conservation Act, 1980. Standards for discharging effluents are listed in the EPA. In the area of fisheries development, the following are the legislation/rules/acts in force in the country. Maritime Zones of India (Regulation of fishing by Foreign Vessels) Act, 1981, which provides fishing regulations for foreign fishing vessels for operation in Indian waters, has authorized the Coast Guard and the State/UT Police to apprehend and prosecute unauthorized foreign fishing vessels/crew for fishing/poaching in Indian waters. Marine Fishing Regulation Acts enforced by the coastal States of India provide for regulating fishing and conservation measures in the territorial waters, including: regulation of mesh size to avoid catching of juvenile fish, regulation of gear to avoid over-exploitation of certain species, reservation of zones for various fishing sectors to provide exclusive rights to traditional fishermen to fish unhindered in near shore areas and also for declaration of closed seasons during fish breeding period to avoid catching of young juvenile fish. A Committee was constituted by the Government of India in March, 1995 to review the Deep-Sea Fishing Policy. On the basis of the recommendations of this Committee, the Deep-Sea Fishing Policy of 1991 was a rescinded and no new permit, extensions or renewal of the permits under the above policies has been given. The Government has also constituted a National Level Review Committee in 1996 to assess the area-wise requirements of different categories of fishing vessels below 20 m. and conservation of fishery resources, etc. A number of measures have also been taken by the government to conserve marine fishery resources and over-exploitation as per the provisions made in the Central/State Acts/Rules. Measures have also been taken to introduce resource-specific fishing vessels for oceanic fisheries. In addition, the guidelines have been adopted: under Environment Impact Assessment (EIA) notification for setting and operating various projects; and, on Sustainable Aquaculture Development for regulating coastal aquaculture. Major Groups are involved through public hearings that have been made mandatory before any project listed in EIA notification is cleared.

**Programmes and Projects:** The Coastal Ocean Monitoring and Prediction Systems (COMAPS) is a programme being carried by the Department of Ocean Development since 1990-91 with the objective of constantly assessing the health of Indian seas on a long-term basis. The status of marine pollution in the coastal waters has been assessed and current level of pollution in the waters has also been determined. Further, it is planned to include physical oceanographic studies and incorporate the techniques for determination of waste assimilation capacity of water bodies to have predictive capabilities on pollution levels, which will enable establishing site specific regulatory measures to maintain the desired quality of the coastal waters. In 1998, the Department took up an infrastructure development and capacity building programme to facilitate adoption of the concept of Integrated Coastal and

Marine Area Management (ICMAM) by coastal areas in the coming years. The programme focuses on development of expertise in ICMAM oriented activities and dissemination of knowledge gained to the coastal areas through organized training programmes. Towards accomplishing these activities, the following priority activities are being undertaken: Capacity Building and Infrastructure. With regard to the management of Marine Environment and Biodiversity as well as for their monitoring, major activities relate to the monitoring of the health of India's coastal waters and to capacity building and infrastructure development to facilitate adoption of the concept of ICMAM.

**Status:** Mangroves are salt-tolerant forest ecosystems found mainly in the tropical and sub-tropical inter-tidal regions of the world. They are reservoirs of a large number of plant and animal species associated together over a long evolutionary period and exhibiting remarkable capacity for salt tolerance. They stabilize the shoreline and act as a bulwark against encroachments by the sea. India harbours some of the best mangroves in the world and these occur all along the Indian coastline in sheltered estuary, tidal creeks, backwaters, salt marshes and mud flats covering a total area of 4,827 sq km. Under the scheme on Conservation and Management of Mangroves, 15 mangrove areas have been identified for intensive conservation and management purposes: Northern Andaman and Nicobar, Sunderbans (West Bengal), Bhitarkanika (Orissa), Coringa, Godavari Delta and Krishna Estuary (Andhra Pradesh), Mahanadi Delta (Orissa), Pitchavaram and Point Calimer (Tamil Nadu), Goa, Gulf of Kutch (Gujarat), Coondapur (Karnataka), Achra/ Ratnagiri (Maharashtra) and Vembanad (Kerala).

Coral reefs are shallow-water tropical marine ecosystems, characterized by high biomass production and rich floral and faunal diversity. Four coral areas, Gulf of Mannar, Andaman and Nicobar Islands, Lakshadweep Islands and Gulf of Kuchch have been identified for conservation and management. State-level steering committees have been constituted for the formulation and implementation of management action plans. Such action plans have been sanctioned for Andaman and Nicobar and Gulf of Mannar coral reefs so far. *Fisheries*: Fisheries play an important role in the Indian economy and supports about 6.0 million full time or occasional fishermen. It continues to be a thrust area of India's development programmes due to its vital contributions to employment generation, food security and foreign exchange earnings. Fish production in India reached a level of about 5.40 million tons in 1998 and the country is now sixth largest producer of fish in the world. Out of this, 2.90 million tons is from the marine sector. The earnings from export of fish and fishery products crossed US$1.30 billion in 1998. While fish production form 0-50 m. zone has been harvested to maximum sustainable yield levels, the zone beyond 50-200 m and 200-500 m has been harvested up to about 50% levels. The oceanic resources are harvested up to 10% of the potential. In the Indian Ocean context, the over-exploitation and destruction of eco-system and habitat is not alarming as in some other parts of the World. The recent review of the state of World fishery resources by FAO has revealed that while the Atlantic Ocean and in different parts of the Pacific Ocean the fishery resources are largely over-exploited, in the Indian Ocean fish production is on the increase with relative stability and healthy state of fish stocks. Various measures are being undertaken to optimize and rationalize the fishing fleet as well as the fishing effort by area-wise deployment of different categories of fishing vessels, regulation of fishing, gear and mesh size, uniform closed fishing season, development of deep sea fishing including diversified fishing, replenishment of fish stocks by undertaking projects on sea ranching, setting up of artificial reef, etc.

*Enhancement of Marine Living Resources*: The seas around India, including Island Groups, are endowed with a variety of finfish and shellfish resources. The over-exploitation of these commercially important resources has resulted in significant depletion of their population. The objectives of the work contemplated in the present technology development programme are steps towards conservation of these resources through breeding and sea ranching. *Oil Spills and Shipping*: The western part of the Indian Exclusive Economic Zone, i.e., the Arabian Sea adjoining the peninsular India, forms the main international route for oil tankers originating from the Gulf. It has been estimated that some 450 mt. of crude oil is transported annually along this route, involving approximately 2500 laden tankers. Considering the large volume of oil transported and increased ocean traffic, the probability of tanker accidents is high. The last major accident in the area occurred in January 1993 when a few thousand tons of oil spilled into the Andaman Sea. Any accidental spillage of oil along the tanker route will cause severe and in

some cases irreparable damage to the marine ecosystem. In addition to offshore oil exploration and production activities, transfer operations of oil at single buoy mooring stations, as well as lightening and bunkering operations in major ports, cause spillage of oil. *Disposal of Domestic and Industrial Waste*: It has been estimated that a large quantum of domestic sewage reaches the coastal environment each day. These wastes contain degradable organic matter, which utilizes enormous amounts of oxygen from seawater for its oxidation. The resultant fall in oxygen in seawater leads to a decrease in the population of marine flora and fauna. Domestic wastes in certain coastal areas are discharged without treatment due to lack of such facilities in most cities and towns. Under the Integrated Coastal and Marine Area Management Programme of the Department waste assimilation capacity and preparation of model Integrated Coastal and Marine Area Management plans, etc., have been envisaged. With a view to control marine pollution from land based activities information relating to assimilation capacity of coastal waters, particularly with reference to the thermal waste discharges including fly ash, aquaculture waste and sewage and other industrial wastes. Studies have been initiated on discharge and assimilation of fly ash and other pollutants from industries located along Ennore Creek, North off Chennai. Application of modern tools like computer based modeling for prediction of the impact of the various integrated activities occurring in the coastal areas is also incorporated in the Integrated Coastal and Marine Area Management Programme.
Constant monitoring of the health of the seas and taking up remedial measures for preventing and controlling pollution from land based activities is another activity, for ensuring sustainable development of the seas around India. The various measures taken up by the Government for regulating the activities along the coastal zone, fishing and fisheries, etc., have a definite role to play in sustainable development and utilization of the ocean and its resources. Substantial population of India lives all along the coast. In view of predicted rise in sea level, suitable mitigation strategies have to be adopted in the country.

**Capacity-Building, Education, Training and Awareness-Raising:** The Department of Ocean Development has been sponsoring research projects in different disciplines in a large number of national laboratories and academic institutions with the guidance of a Research Advisory Committee. Special grants are given to selected academic institutions to build infrastructure. Research Fellowships and Research Associate ships are granted for Post-Graduate and Post-Doctoral Research in Marine Science in universities and national laboratories. With a view to have a coordinated approach to promote specialization in marine science in different universities, the Department formulated a scheme for establishing Ocean Science and Technology Cells (OSTC) in consultation with the universities engaged in research in Marine Science. These cells in the academic institutions will grow into Centres of Excellence in due course. So far 8 OSTCs have been established. To create awareness among the wide section of the society, the Department of Ocean Development organizes and sponsors seminars, symposia, workshops and conference at universities, national laboratories, scientific institutions, Government and Non-Government Organizations with national and international participation. In addition, Department brings out quarterly newsletter, technical reports and books.

**Information:** Data Bank and information networking exist between the coastal states and decision-making body with regard to ecologically important resources, economically important resources, etc. With a view to synergize and generate reliable coastal and ocean data and data products, the various related projects of the Department of Ocean Development were restructured and reoriented in 1997-98 as Ocean Observation and Information Services (OOIS). This programme has four major elements viz., Ocean Observing System using Conventional and Satellite Remote Sensing Observations, Ocean Information Services, networking different ocean observations and marine data centres to serve the user demands, Satellite and Coastal Oceanographic Research utilizing the advances in Satellite Remote Sensing Technology, and Ocean Dynamics & Modeling to establish predictive capacity of ocean parameters. Geographic Information System has been introduced as a means of Decision Supporting System in the management of critical habitats like mangroves, coral reefs, areas rich in biodiversity, etc., under the Integrated Coastal and Marine Area Management programme. See also under **Research and Technologies**. The website has been set up for disseminating information pertaining to the policies and programmes of the Government in the field of ocean science and technology: http://dod.nic.in.

**Research and Technologies:** The Department of Ocean Development sponsors R&D projects in academic institutions, National laboratories and societies. These projects train and orient the scientists, who often associate themselves with the universities and improve their academic qualifications, in specific fields in the ocean sector and deploy them in the R&D activities. The Department also provides Research Fellowship to do doctoral and postdoctoral work to enhance their potentials, knowledge and expertise, sponsors short term training programmes in specified areas, and plans to establish adequate infrastructure to train coastal states on the advanced tools and techniques for planning coastal zone management systems. Oceanographic data are essential for understanding the oceanic processes and undertaking developments relating to ocean sector. The UNBED (1992) emphasizes the need for Global Ocean Observing System (GOOS) to collect long term systematic scientific oceanographic data at a national, regional and global level. The world climate research programme needs effective contributions for oceanographic observations. Thus the need of the hour is reliable oceanographic data and data products of quality, which are application oriented, and user driven. The application areas are Weather Climate prediction, Fisheries, Port and Harbour Development, Navigation and Shipping, Environment Pollution Monitoring, Coastal area development and R&D in oceanography.

Over the years the Fisheries Survey of India has assessed the fishing resources up to 50-70 m. depth and published the fishery atlas. It is also noted that the fishery resources in India's coastal waters up to 50-70 m. depth is almost fully exploited. Some of the species are over-exploited and are endangered. In addition, the marine pollution has led to degradation of the marine resource potential and marine biodiversity. Indian R&D institutions have carried out studies on fish biology and technologies for culture fisheries, controlled harvesting, etc. to aid sustainable resource utilization. The Department of Ocean Development has initiated a multi-disciplinary and multi-institutional programme aimed at making an assessment of the marine living resources beyond 70 m. depth within the Indian EEZ and correlating the marine living resources potential with the oceanographic parameters in 1997-98. The major objectives of this programme are to have realistic and reliable information on the potential of marine living resources in the Indian EEZ for sustainable development and management and to enhance the marine living resource potential of Indian seas. In addition, it is planned to develop technologies and implement pilot projects to increase the productivity of India's coastal waters selectively by sea ranching and mariculture and thereby augmenting the sea food production and improving the life of our coastal community. Design and development of a remotely operated underwater mining system with collector module, lifting module and instrumentation and Control Systems, was initiated in 1990. In 1996, India reoriented its polymetallic nodule programme to establish the technologies in a phased manner. India is implementing a joint developmental programme on seabed mining technology with the participation of the National Institute of Ocean Technology (NIOT), Chennai and the University of Siegen, Germany, with the initial efforts to demonstrate shallow bed mining technology in Indian seas up to 500 metres depth through successful exploration of sulphides, phosphorites, placer deposits and other seabed minerals in the Exclusive Economic Zone of India. Technology development for extractive metallurgy from polymetallic nodules, marine acoustic instrumentation, ocean energy including Ocean Thermal Energy Conservation, etc., is also given appropriate priority. For acquiring surface meteorological and upper oceanographic parameters on real-time basis 12 moored data buoys have been deployed along the Indian coastline at selected locations. These buoys are equipped with sensors for accurate measurement of a number of oceanographic parameters. The data are disseminated to the India Meteorological Department for forecast of cyclones, and to other scientific and research institutions, port authorities, National Hydrographic Office, etc., for wider utility and application. The transmission of the data between the buoys and a store station is effected through a two-way communication system of INMARSAT-C satellite. The oceanographic data are also collected through drifting buoys and are transmitted via ARGOS satellite to various user agencies.

**Financing:** The programme and activities of the Department of Ocean Development are fully funded by the Government of India, from the National Budget. External assistance is also available for specific programmes such as National Data Buoy Programme and the Capacity Building Component of Integrated Coastal and Marine Area Management from NORAD and World Bank, respectively.

**Cooperation:** India actively participates in the UN on ocean matters and other international arrangements such as: Intergovernmental Oceanographic Commission; UN Convention on the Law of the Sea; Antarctic Treaty System; and Regional Seas Programme. India also has scientific and technical bilateral cooperation with: Russia, Germany, Republic of Korea, Argentina, Peru, Italy and others.

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## CHAPTER 18: PROTECTION OF THE QUALITY AND SUPPLY OF FRESHWATER RESOURCES: APPLICATION OF INTEGRATED APPROACHES TO THE DEVELOPMENT, MANAGEMENT AND USE OF WATER RESOURCES.

**Decision-Making:** The Ministry of Water Resources (MoWR) and the Ministry of Environment and Forests (MoEF) are the modal ministries coordinating the supply, management and pollution control of freshwater resources. While all projects and schemes are being implemented in India with the objective of sustainable development, presently a number of policies/guidelines are being finalized through the National Water Resources Council (NWRC), including: the Water Information Bill; a policy note on setting up a river basin organization; a National Policy for Resettlement and Rehabilitation of persons affected by reservoir projects; modification of water allocation priorities specified by the National Water Policy; overall policy guidelines for water management and pricing of water for industrial purposes; an approach to organizational and procedural changes in the irrigation sector; an irrigation management policy; national policy guidelines for water allocation for inter-State rivers amongst States; and guidelines for planning conjunctive use of surface and ground water in irrigation projects.
The Ministry of Environment has also explicitly enacted the Water (Prevention and Control of Pollution) Act, 1974, with the primary objective of preventing and controlling of water pollution. The Water Act empowers the State Pollution Control Boards to lay and maintain location and source specific standards for discharge of wastewater. The actual provisions for enforcement such as penalties, imprisonment, etc. are confined to source-specific standards for individual polluters. The Ministry of Environment also enacted the Environment (Protection) Act, 1986, which is an umbrella act providing for the protection and improvement of environment and for matters connected therewith. It authorizes the Central Government to intervene directly in order to protect the environment and also allows public interest litigation for the same purpose. The nature of penalties under this act is similar to those authorized under the Water Act.

The NWRC under the Chairmanship of the Prime Minister establishes National Water Policy, reviews development plans, and advises on implementation. National Water Policy (NWP) adopted in September, 1987 aims at planning, developing, and conserving the scarce and precious water resources on an integrated and environmentally sound basis recognizing the needs of the State Governments. The policy facilitates strategies on ground water development, water allocation priorities, drinking water, irrigation, water quality, water zoning, conservation of water, and flood control and management. The State Governments in India make their water policies within the overall framework of the NWP. An updated version, the National Water Policy (NWP) 2002, has been formulated, taking into account issues and challenges that have emerged in the development and management of water resources since 1987. Main thrusts of the revised policy are encouragement of beneficiaries and other stakeholders in planning and management of water resources, conserving water in the catchments, provision of adequate safe drinking water facilities to the entire population, achieving optimal productivity per unit of water in irrigation, ensuring minimal flow in the perennial streams for maintaining ecology and social consideration, flowing principle of "polluter pays" in management of polluted water and emphasizing need of paradigm shift from development to management of water resources. The new NWP lays down principles to regulate and administer various aspects of water resource management. Policies and programmes to manage India's freshwater resources are based on the strategies outlined in the NWP. As part of which famine and irrigation Commissions were set up. The new NWP envisages management of water resources should incorporate a participatory approach by involving not only the various governmental agencies but also the users and other stakeholders, in an effective and decisive manner, in various aspects of planning, design, development and management of the water resources schemes. NWP emphasizes participatory approaches through: formation of water-user's groups such as Pani Panchayats, Maharashtra; group irrigation schemes, UP and Bihar; sukhomajri experiment in Haryana; lift irrigation cooperatives, Gujarat etc. Under the 1994 EIA notification, an EIA has been made mandatory for 30 categories of development activities involving investments of more than Rs.500 million and above and environmental clearance for activities is given by the Central Ministry. The Ninth Five-Year Plan emphasized on the introduction of the rational pricing of water supplies for agriculture. This emphasis continues in the Tenth Plan, which is just started.

The Central Water Commission, an attached office of the MoWR is responsible for initiating, coordinating and furthering schemes for control, conservation and utilization of water resources throughout the country for the purposes of: flood control; irrigation; navigation; drinking water supply; and water power development. Some of its major activities involve: formulating Guidelines for sustainable water resources development and management; preparing Master Plans for river basins for optimization and inter-basin transfers; setting up National Commission on Floods; and preparing documents on the non-structural aspects of flood management in India — a National Flood Atlas is under preparation. Necessary legal and institutional changes are being evolved at various levels for the purpose, duly ensuring appropriate role for women. Water Users Associations and local bodies such as municipalities and gram panchayats are particularly to be involved in the operation, maintenance and management of water infrastructures/facilities at appropriate levels progressively, with a view to eventually transfer the management of such facilities to user groups/local bodies. An action plan to formalize a mechanism for implementation of water policy 2002 with the involvement of various group/stakeholders is under preparation. See also under **Status** and **Financing**.

**Programmes and Projects:** With domestic and external assistance, there are a number of important ongoing National programmes and projects supporting the implementation of recommendations of Agenda 21 in India. Some of the recent initiatives taken by the Indian Government to reverse the trend of using freshwater in an unsustainable manner include: the establishment of the Central Ground Water Board by the Central Ground Water Authority (under the MoWR) for rainwater harvesting; National Drinking Water Mission launched in 1986 to implement the priority of drinking water; encouragement of clean technologies for large-scale industries and Common Effluent Treatment Plants (CETP) for clusters of small-scale industry units; a Hydrology Project with World Bank assistance, which is under implementation for the systematic collection and analysis of data; flood and drought management and environmental and social impact assessments that are an integral part of project formulation, implementation, and monitoring in various States and are continuous processes of all plans; documents on non-structural aspects of flood management in India that have been prepared (a draft bill on the flood plan zone has been prepared and a National Flood Atlas is updated at regular intervals); pilot projects on recycling and reuse of waste water and artificial recharge of ground water (under implementation); guidelines on the conjunctive use of surface water and ground waters, which have been prepared and are under implementation; Command Area Development Programmes that have been implemented since 1974; Participatory Irrigation Management (PIM) through Water Users' Associations — women's participation is being actively encouraged and implemented; etc.
India has initiated various programmes for improvement of water quality, which include programmes such as Ganga Action Plan (GAP) and the National River Conservation Plan (NRCP). The first phase of GAP was launched in July, 1985 with the main objective of pollution abatement of the Ganga from domestic and industrial sectors. The GAP model envisages interception and diversion of municipal sewage falling into the river from2 5 large urban conglomerates in 3 States, namely, Uttar Pradesh, Bihar, and West Bengal, along the riverbanks. The intercepted sewage is taken to a sewage treatment plant from where it is either discharged back into the river or used for irrigation. Low-cost toilets, electric/improved wood-based crematorium, and dhobi ghats have been constructed to tackle non-point sources of pollution. A complete ban on the use of DDT and phasing out of the use of benzene hexachloride (BHC) in agriculture are some of the measures taken to reduce the river pollution from agricultural run-off. The action plan also envisages construction of bathing platforms to provide a clean and hygienic access to the river for bathers. See also under **Decision-Making**, **Status**, **Information**, and **Research and Technologies**.

**Status:** In planning and operating systems, water allocation priorities are broadly as given under: drinking water; irrigation; hydro-power; ecology; agro-industries and non-agricultural industries; and, navigation and other uses. These priorities could be modified or added if warranted by the area/region specific considerations. To control pollution from industries, 'minimal national standards' have been formulated for discharge of effluents from various types of industry. For improving resource efficiency in industrial processes, mass based standards are being formulated which will set specific limits to encourage minimization of waste, promote recycling and reuse of materials, and conserve natural resources. The Hazardous Wastes (Management) Rules have been enacted in 1989, which provide for control of generation, collection, treatment, transport, import, storage and disposal of wastes

listed as hazardous. Hazardous waste inventories have been initiated in various States together updated information and the State Governments are in the process of identifying hazardous waste disposal sites based on EIA of the potential sites.

The Government has approved the revamping of the Accelerated Rural Water Supply Programme, which will pave way for an institutionalized, community based, demand driven rural water supply programme gradually replacing the current service which is government driven, centrally monitored, with no participation of the stakeholders. The decision was made to implement the reform in 63 pilot districts across the country, out of which 61 have already been sanctioned at a project cost of Rs.1820.45 crores. These projects will enable the community to plan, sanction, partially fund, implement, operate and maintain rural water supply schemes of their choice. In order to instill a sense of ownership in the project, the community has to contribute at least 10% of the capital cost in either cash or kind (labour, land or material). The community will also shoulder the entire operation and maintenance cost.

India has undertaken some of the most innovative methods to revive its aquifers, through fusion of age-old traditions with new technologies. For instance, in western regions of India, a massive well-recharge movement where 300,000 wells have been modified to divert rain water into them, and thousands of ponds, small dams and other rain water harvesting and recharge structures have been constructed to keep the rain water from flowing into the Arabian Sea. Additionally, family cisterns for rainwater harvesting and domestic use have been brought into reuse. In south India - transformation of irrigation tanks into recharge tanks by filling them up with canal water- impact on groundwater recharge and revival of dried-up springs and rivulets.

Even though important ongoing National programmes are in progress at various stages, quite a few constraints are being faced in their implementation, such as: deficiencies in systematic data collection and establishment of a good data base (a periodic review and implementation of the hydrology project may improve the situation); lack of proper implementation of a suitable blend of structural and non-structural flood management measures; urgent need for effective control and improvement in water quality through water pollution control measures; degradation of fish habitat due to increased water abstraction, land development, and pollution; need to improve catchment area treatment and compensatory afforestation to combat soil erosion, mismanagement, and other over-exploitation of natural resources; the constraint of funds as the greatest obstacle to the implementation of Agenda 21 and the need for global consideration and assistance; and need for greater human resource development including adequate training. While about 82% of the population has access to safe drinking water supply in rural areas, the accessibility in urban areas is around 85%. The access in most of the cities and towns is still inadequate, particularly in slums inhabited by the poorer sections of the society.

**Capacity-Building, Education, Training and Awareness-Raising:** At the central level the Union MoWR is responsible for development, conservation and management of water as a national resource, i.e., for the general policy on water resources development and for technical assistance to the states on irrigation, multipurpose projects, ground water exploration and exploitation, command area development, drainage, flood control, water logging, sea erosion problems, dam safety and hydraulic structures for navigation and hydropower. It also oversees the regulation and development of inter-State rivers. These functions are carried out through various Central Organizations. Human resource development is being implemented through a National Water Academy, water and land management institutes in different states and other organizations and agencies. Water Resources Day is being observed every year as part of a mass awareness programme. Hydrology Project (HP) launched by the Government with World Bank (IDA) credit assistance of 90.1 million Special Drawing Rights (US$ 142.0 million) would introduce standard procedures for data collection, processing, validation and management including the use of software for routine quality control and general water resources analysis. This necessitates development of qualified staff for all hydrological activities with wide understanding of hydrological data evaluation. The training programme envisaged under the project will ensure that these standardize procedures are followed uniformly throughout the project area and the staff capabilities developed during the project period by continuous internal training within the agencies are sustainable without further external support.

**Information:** The Central Pollution Control Board (CPCB) in collaboration with the State Pollution Control Boards (SPCBs) monitors the quality of freshwater resources of the country through a network of 480 monitoring

stations located all over the country. Based on such monitoring, 13 heavily polluted and 26 medium-polluted river stretches have been identified. A network of hydrological stations, hydrometric observation stations, and ground water measurement stations collect data, including water quality data, through organizations under the Central and State Governments on a continuous basis (water resource data are collected and transmitted through the network of the National Informatics Centre). Information can be obtained from the MoWR (http://wrmin.nic.in); and the MoEF (http://envfor.nic.in).

**Research and Technologies:** The MoWR provides financial assistance to promote research work in the field of Water Resources Engineering. The assistance is provided as grants to academicians/experts in the universities, IITs, recognized R&D laboratories, Water Resources/Irrigation departments of the Central and State Governments and NGOs. Research proposals of applied nature as well as basic research are considered for the MoWR support. The MoEF funds research programmes in water resources conservation and pollution mitigation. Wastewater treatment technologies are well established for the removal of turbidity, suspended solids, organic pollutants, and coliform. Treated sewage is used for irrigation to the maximum extent. High-rate anaerobic treatment technologies are being implemented in all upcoming industrial and domestic wastewater treatment plants, which not only consume less energy but also produce methane – a by-product for energy generation. In fact, India is one of the few countries to apply the UASB process for sewage on such a large scale. Research and development programmes on different subjects in the water resources sector are being undertaken through Five Indian National Committees by universities, research institutes, and other organizations.

**Financing:** The NWP, 2002 envisages the need to ensure that the water charges for various uses should be fixed in such a way that they cover at least the operation and maintenance charges of providing the service initially and a part of the capital costs subsequently. The government has introduced as a supplementary measure, market based instruments for pollution abatement, besides the 'command and control' regulatory mechanism. The Water (Prevention & Control of Pollution) Cess Act of 1977, have empowered the State Pollution Control Boards to levy a cess on water consumed by persons carrying on certain industries and by local authorities, with a view to augmenting the resources of the Central Board and the State Boards for the Prevention and Control of Water Pollution. The cess rates were increased three fold in February 1992. A rebate of 25% on the cess payable has been provided to those industries whose wastewater discharge does not exceed the quantity declared by them and which also comply with the effluent standards prescribed under the Water Act and the Environment (Protection) Act. However, water being essentially a state subject, the state governments bears primary responsibility for use and control of this resource. The administrative control and responsibility for development of water rests with the various State departments and corporations. The main agency responsible for planning, investigation, execution and maintenance of major and medium projects is the irrigation and water resources department of the concerned State Governments.

**Cooperation:** India participates in many of the regional programmes sponsored by the Economic and Social Commission for Asia and the Pacific (ESCAP), particularly on flood control and reservoir sedimentation studies/schemes. The country also provides training in water resources development to the candidates nominated by various developing countries and participates in the training programmes of its own people in other countries.
There are a number of inter-national rivers flowing through the territory of India. The agreements, which have so far been reached with other countries on the utilization of river waters, have been arrived at through bilateral discussions. India has already concluded agreements with Pakistan on the use of Indus waters with the Indus Water Treaty (1960). A permanent Indus Commission exists with commissioners from both India and Pakistan to oversee the implementation of the treaty. A Joint River Commission with representation from Bangladesh and India oversees the agreement with Bangladesh (1996) regarding sharing Ganga water at the common boundary. Similarly a Joint Group of Officers puts into action the agreement with Nepal on the integrated development of Mahakali River including Sarda Barrage and Pancheshwar Project (1996). Beneficial use of waters of many other rivers flowing in the Himalayan region through Nepal and India has been under negotiation. There are other rivers following from other neighboring countries like China, Bhutan and Myanmar. In course of time, agreements may

be reached with these co-basin countries on bilateral basis in respect of the use of waters of such rivers. Any disputes, which take place in the use of river waters, are also to be resolved bilaterally or by mutual discussions leading to consensus with the concerned countries. Data concerning flows and floods in the common rivers is being shared with Bangladesh, China, Nepal and Pakistan.

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## CHAPTER 19: ENVIRONMENTALLY SOUND MANAGEMENT OF TOXIC CHEMICALS, INCLUDING PREVENTION OF ILLEGAL INTERNATIONAL TRAFFIC IN TOXIC AND DANGEROUS PRODUCTS.

**Decision-Making:** The Ministry of Environment and Forests (MoEF) is the main coordinating agency. In India, the Environment (Protection) Act, 1986 lays down procedures and safeguards to regulate the handling of hazardous and toxic chemicals and prevent accidents. Four sets of rules have been notified under the Environment (Protection) Act: the Manufacture, Storage and Import of Hazardous Chemical Rules, 1989; the Hazardous Waste (Management and Handling) Rules, 1989; the Manufacture, Use, Import, Export and Storage of Hazardous Micro-organisms/Genetically Engineered Organisms or Cells Rules, 1989; and the Chemical Accident (Emergencies Planning, Preparedness and Responses) Rules, 1996. Legal provisions exist for the strict control of chemical poisons under the Insecticides Act, 1968; the Poison Act, 1990; and the Hazardous Chemicals Rules, 1989. There is a well-established procedure under the Import and Export (Control) Act, 1947, implemented by the Director General of Foreign Trade, regulating the export and import of various products. The import and export of many products are also covered under the Environment (Protection) Act. After the Bhopal disaster of 1984, the Government took regulatory and non-regulatory steps to reduce the environmental risk from exposure to chemicals. The Environment (Protection) Act was the first step. The Public Liability Insurance Act (1991) provides relief to chemical accident victims. Steps have been taken to phase out, for example, benzidine and benzidine based dyes through this instrument. For preventing and controlling major chemical hazards, legal safeguards have been framed under the Hazardous Chemicals Rules. Specific requirements have been prescribed for the safe transportation of hazardous chemicals. Exposure limits for chemicals and toxic chemicals have also been established. Recently, environmental audits have been made mandatory, among others, to reduce environmental risk. The main law regulating pesticides in the country is Insecticides Act of 1968. The following Acts also regulate the different aspects of pesticides: Poisons Act, 1919; Indian Drugs and Cosmetics Act, 1940; Indian Factories Act, 1940; Prevention of Food Adulteration Act, 1955; Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981; Narcotic Drug and Psychotropic Substances Act, 1985; Environment Protection Act, 1986; and, Consumer Protection Act, 1986. The Government is also encouraging the use of Cleaner Production Technologies by providing fiscal benefits. The award of the Ecomark on environment friendly consumer products also encourages the use of safer chemicals and technologies. To limit the discharge of pollutants into water and into the air, standards have been laid down under the relevant Acts. The "Polluter Pays Principle" has also been adopted. Environmental impact assessment has been made mandatory for specified projects. Where feasible, such assessment is also recommended for less toxic chemicals, prior to the sanction of environmental clearance. Major industries, NGOs and other public opinion makers are involved in the management of toxic chemicals.

**Programmes and Projects:** Several work programmes for the promotion of safety in the handling of hazardous substances have been planned and implemented. Risk assessment of chemicals is time and resource intensive. At the National level, the following efforts are underway: a centrally sponsored scheme to create infrastructure in certain regulatory organizations; hazard analysis and off-site emergency plans in sensitive industrial pockets; the establishment of emergency response centres; the establishment of poison control centres at select places with some available infrastructure (at present, except for a limited number of hospitals, cases of chemical poisoning are treated only in general emergency wards); and the promotion of epidemiological studies in areas of high risk involving the collection of data from hazardous installations and relating this to the pollution status. See also under **Status**.

**Status:** To complement the legislation listed above, there is a need in view of the anticipated rise in the number of cases of chemical poisoning for institutions with qualified staff that would treat poison cases, using the latest information and detection methods. The MoEF and the Ministry of Health and Family Welfare have felt the need for setting up a National Poison Control Centre with a network of Regional Centres. A Poison Control Centre has been set up at the All India Institute of Medical Sciences (AIIMS), New Delhi to provide a full range of clinical,

analytical, toxicological and information services to provide quick response against the effects of chemicals on human health. India is in the process of formulating and implementing a National Strategy and Action Plan to meet with the requirement of the Convention on Persistent Organic Pollutants.

Chemicals occupy an important place in India's effort to meet the social and economic goals of the community. However, many chemicals are toxic, highly reactive, explosive or flammable, or have a combination of these characteristics, and represent a potential risk to human, animal and plant life and the environment in general. Extreme care is necessary in handling such chemicals at all stages of manufacture, processing, transportation, and use. The risk of poisoning from exposure to dangerous chemicals is acute and casualties occur each year. The adverse effects of pesticide poisoning are well known. In 1982, it was estimated that while developing countries accounted for only 50% of the use of pesticides worldwide, over 50% of pesticide poisonings occurred in these countries. A global survey undertaken in 1984-86 indicated that while most developed countries had well-established capabilities for poison control, very few developing countries had such facilities. To reduce the risk, the long-term objective of Government is to eliminate the use of chemicals. However, the technological information on viable alternatives is generally not available. Consequently, the immediate and complete elimination of toxic chemicals seems difficult. Purification techniques and other end-of-pipe measures are capital and energy intensive and, taken alone, have not yielded the desired success in reducing the discharges of hazardous substances. Considerable research expertise exists in India on issues related to the manufacture, use, and handling of toxic and hazardous materials. However, the difficulty lies in the inadequate exchange of information and the training of persons actually involved in such processes. It is recognized that capacity building is essential in industry especially at the factory and plant levels.

**Capacity-Building, Education, Training and Awareness-Raising:** The following institutions are working in this area: Indian Institute of Chemical Technology, Hyderabad; Industrial Toxicology Research Centre, Lucknow; Indian Agricultural Research Institute, New Delhi; INTOX, Pune; Facility for Ecological and Analytical Testing, IIT, Kanpur; IIT, Delhi; and, Sri Ram Institute of Industrial Research, New Delhi.

**Information:** If the Agenda 21 recommendation that major pollutants be assessed by the year 2000 is to become a reality, data collection and availability have to be fully organized. Such a database with full information is essential for the management of hazardous substances. However, available data on even certain commonly used chemicals is inadequate for the completion of a comprehensive risk or hazard assessment. While there are some infrastructure facilities at local, State, and Central levels, the management of emergencies cannot be satisfactory because of the lack of an efficient database. The MoEF has set up a Central Crisis Group Alert System with a Central Control Room for the management of emergencies due to hazardous chemicals. The Ministry has also established the National Register for Potentially Toxic Chemicals (NRPTC) for the collection, collation, analysis, and dissemination of existing National and international information on the lines of the International Register of Potentially Toxic Chemicals (IRPTC). However, the Centre requires a widespread network throughout the country to facilitate coordination with other organizations. An effort in this direction has been made with the establishment of Regional Registers in three regions.

**Research and Technologies:** Active research on toxic chemicals and toxicology is undertaken in the various universities and research institutions of the country.

**Financing:** India is spending considerable amount of resources in the management of toxic chemicals. Scientific Departments also finance research projects in universities and research institutes. Central and State Pollution Control Boards fund various studies and monitor status of toxic chemicals.

**Cooperation:** There is increasing concern over the movements of products across the boundaries of developing countries completed in contravention of internationally adopted guidelines and principles. This is especially true of developing countries, which do not have the adequate infrastructure to determine the risks associated with such products or to adequately monitor their ingress and egress. India participates regularly in the meetings of the

London Guidelines for the Exchange of Information on Chemicals in International Trade. Modalities for strengthening the legal basis of these guidelines are being considered. A voluntary code of ethics on international trade in chemicals has also been finalized in consultation with representatives of the chemical industry. India is a member of International Programme on Chemical Safety (IPCS) and the IRPTC.

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## CHAPTERS 20 TO 22: ENVIRONMENTALLY SOUND MANAGEMENT OF HAZARDOUS, SOLID AND RADIOACTIVE WASTES

**Decision-Making:**

*Hazardous Wastes*: The Ministry of Environment and Forests (MoEF) is the main coordinating body for handling issues related to the management of hazardous wastes in the country. The Hazardous Wastes (Management and Handling) Rules, under the authority of the Environment (Protection) Act, 1986, were announced by the MoEF in July, 1989. These Rules regulate the generation, collection, storage, transport, treatment, disposal, and import of hazardous wastes. The Rules apply to 18 categories of hazardous wastes, which have been identified and listed in the Schedule annexed to the Rules. One of the important stipulations under the Rules is that the importation of hazardous wastes from any other country to India is not permitted for dumping or disposal. However, importation is allowed for processing or reuse as raw material, after examination of the merits of each case by the competent authorities. Under Rule 11 of the Hazardous Wastes Rules, 1989, the exporting country or exporter is required to communicate details about the proposed transboundary movement of hazardous wastes to the Central Government. The importer is also required to provide details regarding the wastes to the relevant State Pollution Control Boards. After examining the details provided by the importer/exporter, suitable instructions are issued by the concerned authorities. The Port Authorities are also advised. Other regulations include: Amendments to the Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 amended in 1994 and notified on January 20, 2000; a comprehensive set of amendments to the Hazardous Wastes (Management and Handling) Rules, 1989 as notified on January 6, 2000; and, Recycled Plastic Manufacture and Usage Rules, 1999 are under implementation since September, 1999. See also under **Status**.

*Solid Wastes*: In India, a National Waste Management Council (NWMC) has been constituted by the MoEF to provide advice on various matters related to waste management including the incentives/disincentives required to facilitate waste utilization. Representatives of concerned Central and State Government departments, municipal corporations, industry associations, experts, NGOs, and media people meet from time to time under the Chairmanship of the Minister for Environment and Forests. Legislation and regulations on solid wastes include: Municipal Solid Wastes (Management and Handling) Rules have been finalized based on the comments and suggestions from the public and notified on September 25, 2000; and, the Biomedical Waste (Management and Handling) Rules, 1998. There are three centrally sponsored schemes for pollution abatement of rivers presently under implementation by the Ministry: the Ganga Action Plan (GAP) Phase I, GAP Phase II, and National River Conservation Plan. The main objective of the GAP is to improve the water quality of the Ganga to acceptable standards by preventing the pollution load reaching the river through focusing on improving sewage treatment technologies. The GAP primarily addresses itself to the interception, diversion, and treatment of 873 million litres per day of municipal sewage out of the estimated 1,340 million litres per day from 25 towns, 6 in Uttar Pradesh, 4 in Bihar, and 15 in West Bengal. Action Plans for other major rivers are also under implementation.

*Radioactive Wastes*: Department of Atomic Energy is the modal agency for coordinating matters related to handling and disposal of radioactive wastes in India. The Atomic Energy Act of 1962 provides a legal framework in India for the management of radioactive wastes and an independent regulatory body with responsibilities to carrying out statutory control with regard to health, safety, and environmental protection. Radiation Protection Rules have been promulgated in September, 1971. India is concerned with the environmentally sound management of radioactive wastes. The Atomic Energy Regulation Board as a separate body has been entrusted with the responsibilities to carry out regulatory and safety functions in an effective manner with powers to lay down safety standards. In accordance with the stipulated norms and existing rules and regulations, a detailed public hearing is conducted before approval of a nuclear power plant in the country.

**Programmes and Projects:**

*Hazardous Wastes*: Six feasibility studies on industrial safety and disaster prevention and four studies on hazardous wastes management had been undertaken under a Japanese Grant Agreement. A feasibility study for transportation of hazardous chemicals on national highway no. 8 has been undertaken with the objective of creating a database on accident occurrence, nature of dangerous goods transported, accident reporting system, preparation of emergency planning and combating accidents that occur in transportation of chemicals is ongoing.
*Solid Waste*: For proper management of urban solid wastes, it is essential to know the quantity and nature of wastes being generated and utilized. The MoEF has initiated a scheme to survey the solid wastes generated, utilized, and disposed off in important towns of the country. A scheme to develop pilot projects, conduct surveys, and fund promotional activities in the following areas have been initiated to emphasize waste reduction, recycling, and reuse in industries, and better management of municipal solid wastes: survey of urban municipal wastes in important cities and the setting up of pilot plants on the utilization of municipal solid wastes; establishment of pilot plants to utilize industrial wastes; and development and other promotional activities for municipal and industrial wastes. See also under **Status** and **Research and Technologies**.
*Radioactive Wastes*: The need for the establishment of a nuclear waste management system in the country was recognized at an early stage of India's nuclear programme. The system takes care of all radioactive waste generated from nuclear facilities as well as nuclear materials from industry, research, and medicine.

**Status:**
*Hazardous Wastes*: Industries, local bodies and several NGOs are involved in the issues related to handling and management of hazardous wastes. With rapid growth of population and industrialization during the last two decades, there has been a tremendous increase in the generation of domestic, urban, and industrial wastes. Although a major part of the wastes generated are non-hazardous, substantial quantities are hazardous wastes. In spite of the several steps taken for the management of wastes generated by various sources, only a small proportion of solid wastes are properly utilized and disposed of, with the result that some wastes cause environmental degradation and health risks. The status of implementation of Hazardous Waste Rules is being continuously monitored. As on 30th May, 2000, there were 13011 hazardous waste generating units. They generate over 4.4 million tons of wastes: 1.68 million tons are recyclable, 0.19 million tons are incinerable; and 2.52 million tons are disposed on land. The wastes from other countries are exported in large quantities and are received in bulk shipments. Such shipments enter through India's ports and the Ports and Customs Authorities have a major role in checking and granting permission for entry of these shipments. The hazardous wastes are included in the restricted lists of imports requiring a license, which is granted subject to the recommendation under the Hazardous Wastes (Management and Handling) Rules
Intimations are required to be given by the exporter/importer concerning the proposed transboundary movement of the hazardous wastes. Under the Hazardous Wastes Rules, complete information on the exporter, importer, source of generation, type of waste and its constituents, method of disposal, safety data sheet, etc., is required on Form 6 of these Rules. According to the Basel Convention, the exporter should seek prior consent in writing from the importing country's Competent Authority (of the MoEF) before the commencement of the shipment. A movement document should accompany the consignment. Due to indiscriminate exports, including those from non-signatories to the Basel Convention, huge quantities of hazardous wastes may reach Indian ports. In order to arrest this phenomena, cyanide waste (waste category No. 1), and mercury and arsenic bearing wastes (waste category No. 4) under the Hazardous Wastes Rules have been prohibited for export and import from December 26, 1996. There is a need to further streamline the mechanism for monitoring, storage, handling and transportation of hazardous substances in the country.
*Solid Wastes*: Local Bodies, NGOs and other public opinion makers are involved in solid waste management and sanitation. At present, solid wastes are utilized to the extent possible by the following processes: conversion of garbage into energy pellets; anaerobic digestion/biogas generation from garbage; and composting by vermiculture and other means. A pilot plant has been set up in Bombay for the conversion of garbage into energy pellets. It is proposed to set up ten more such plants for which external assistance is likely to be sought. The process of anaerobic digestion/biogas generation from garbage is being applied at medium and small-scale levels at several places in India, and is being encouraged at other places. The conversion of garbage into compost by vermiculture

and other processes is also being promoted. All these processes not only help in waste utilization but also in producing energy or useful products. Apart from organic wastes, several other urban wastes such as wastepaper, plastics, glass, rubber, textiles, metals, coconut shells, etc. are extensively recycled. This is encouraged by the Government. Some of the industrial wastes such as fly ash, blast furnace slag, lime sludge, phosphogypsum, red-mud, etc. are generated in large quantities and are sources of environmental pollution. Reuse and recycling of these wastes is being encouraged. Fiscal incentives in the form of excise duty exemption have been provided on the production of building materials using fly ash or phosphogypsum. An exemption of custom duty is also applied on imports of equipment and machinery for the conversion of these wastes to useful purposes.
The collection and disposal of solid wastes is another area of concern for city management in India. No city collects and disposes of its solid wastes in a safe manner and the coverage are often inadequate. An ORG study of 24 cities in 1989 revealed that, while daily solid waste generation was about 15,000 tons, only 11,500 tons was collected, leaving almost one-fourth to degenerate within the city environment. Even when the collection rate is high, say 90%, the collection frequency is not satisfactory. There is no relationship between solid waste collection and city size. Furthermore, collection does not necessarily suggest regular service and the frequency varies from twice a week in the mega cities to fortnightly collection in the intermediate towns. This relates to domestic wastes as collection of industrial and commercial wastes is more regular. The disposal of wastes is another issue of concern to city managers. The method seems to improve with the level of urbanization, from open-dumps in the small and intermediate towns to sanitary landfills in the mega cities. The major environmental concerns in an urbanizing India relate to high levels of water pollution due to poor waste disposal, inadequate sewerage and drainage, and improper disposal of industrial effluents. The dumping of solid waste in low-lying areas contributes to land and groundwater pollution. All these developments have contributed to the deterioration of the urban environment, a critical concern that requires specific interventions to achieve sustainability of human settlements. In order to improve the management of urban solid wastes and sewage related issues, there is need for capacity building, awareness and training, improved technologies, and the creation of infrastructure facilities. The lack of adequate financial resources, especially at the municipal and local levels remains a constraint.
*Radioactive Wastes:* India has so far an unblemished record in nuclear safety and handling of radio active wastes. Indian atomic energy installations follow a stringent safety regulation framework. To continuously meet standards laid down by International Atomic Energy Agency, Indian scientists and engineers are always on their vigil to ensure unblemished safety record of India.

**Capacity-Building, Education, Training and Awareness-Raising:**
*Hazardous Wastes*: The MoEF has commissioned hazardous analysis studies for spreading awareness in industries, monitoring authorities and among the citizens. In addition, universities and research institutes also undertake various studies in this regard.
*Solid Wastes*: See under **Programmes and Projects**.
*Radioactive Wastes*: Department of Atomic Energy carries out a number of activities to ensure capacity building, training and awareness raising activities in connection with handling of radioactive wastes.

**Information:**
*Hazardous Wastes*: Further information can be obtained from the MoEF from the website: http://envfor.nic.in.
*Solid Wastes*: The Central Pollution Control Board continues to monitor the water quality of national aquatic resources in 507 stations, out of which, 414 stations are on rivers, 25 on groundwater, 38 on lakes and 30 are on other water bodies like canals, creeks, drain, ponds. Water Quality Profile of the major rivers in the country were prepared and were analyzed by the CPCB on the levels of Biochemical Oxygen Demand (BOD), Dissolved Oxygen (DO) and Total Coliform (TC). See also above, under *Hazardous Wastes.*
*Radioactive Wastes*: Documentation and dissemination of information regarding waste generation storage and disposal is undertaken. There is a scope for increased interaction and exchange of information, especially among the developing countries.

**Research and Technologies:**

*Hazardous Wastes*: Industrial Toxicology Research Centre, Indian Institute of Petroleum and National Environmental Engineering Research Institute are involved in carrying out research and developing technologies for the management of hazardous wastes.
*Solid Wastes*: Active Research on Solid Waste Management and Sanitation is undertaken in the various universities and Research Institutions in the country. Municipal and medical wastes consist of biodegradable wastes as well as plastics like PVC and heavy metal contaminated waste. Burning of waste contaminated chlorinated compounds leads to the formation of toxic compound like dioxins, furans and polychlorinated bi-phenyls. These are formed when the individual components of residues recombine in the stake as the fumes cool. In India, incineration is rudimentary. Most incinerators in India are single chambered with smoke stack. Except for the biomedical waste rules, which stipulate that incinerators should be double chambered with smoke stack of a particular height, other incinerator users do not have any such stipulation. There is a need to further revise various rules and go for environmentally sound technologies for the disposal of solid wastes. The Ganga Action Plan (GAP) has led the programme to develop some appropriate technologies like the Upflow Anaerobic Sludge Blanket (UASB), improved oxidation ponds, sewage treatment through plantation, etc. These technologies are cost effective in terms of operation and maintenance and, thus, will reduce the burden on the State Government. These developments will make the GAP and future programmes sustainable. The programme also emphasizes resource recovery from sewage treatment to improve its sustainability. These aspects include utilization of biogas for co-generation of power, and sale of treated sewage and sludge (a bio-fertilizer and nutrient rich treated effluents for agriculture). Pisciculture is proposed in most of the stabilization ponds constructed under the GAP. The Plan serves as a model for other river systems.
*Radioactive Wastes*: R&D support for updating the continuously evolving radioactive waste management technology is provided through identified agencies.

**Financing:**
*Hazardous Wastes*: The funds are provided by the MoEF for the comprehensive management of hazardous wastes in the country.
*Solid Wastes*: For the management of the wastes industries and local bodies spend significant amount of resources in installing and maintaining equipments such as effluent treatment plants and incinerators etc.
*Radioactive Wastes*: The Department of Atomic Energy provides funding for handling radioactive wastes.

**Cooperation:**
*Hazardous Wastes*: The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was signed by India in 1992. The MoEF has been designated as the Competent Authority for the Convention. The Convention seeks to promote the reduction in the generation of waste and calls for international cooperation in development of cleaner technologies. Forty-seven categories of waste (other than nuclear wastes) are included in the Convention. Developing countries have become major recipients of hazardous wastes generated in the industrially advanced countries. Due to stringent legislation and regulations, and the prohibitive costs of treatment and disposal of such wastes in the developed countries, producers of such wastes and their agents find it cheaper to ship hazardous wastes to developing countries. The MoEF has been receiving communications seeking permission to import hazardous wastes. These include metal-containing wastes (ferrous and non-ferrous), waste oil, oil sludge, etc. These are processed in accordance with the requirements of the Hazardous Wastes (Management and Handling) Rules and the Basel Convention. A Committee has been constituted for this purpose.
*Solid Wastes*: India is cooperating with various multilateral and bilateral agencies in the management of solid waste.
*Radioactive Wastes*: India is an active member of the International Atomic Energy Agency.

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## CHAPTERS 24 TO 32: STRENGTHENING THE ROLE OF MAJOR GROUPS

**Women:** Decision-Making: Department of Women and Child Welfare in the Ministry of Human Resource Development is the main coordinating body. Indian Constitution and legal framework uphold the dignity and status of women and seek to empower them for meaningful participation in all walks of life. A National Commission for Women has been established and the National Human Rights Commission has the mandate to examine human rights issues involving women. A Commissioner for Women's Rights has also been appointed. Special cells for preventing crime against women are also available. The Equal Remuneration Act stipulates payment of equal remuneration to men and women workers for work of equal value. The Act also prohibits any gender discrimination in recruitment and service conditions. The adoption of the 72nd and 73rd Constitutional Amendments in 1992 by Parliament to strengthen the Panchayati Raj System (the system of self-governance at the local level both in rural and urban areas) is a landmark event in the lives of Indian women, as they have reserved for women one-third of the total seats in all elected offices in local bodies both in rural and urban areas, which resulted in bringing women to the centre-stage in the nation's efforts to strengthen democratic institutions at the grassroots levels and to enter into public life through 2,30,000 local bodies all over the country. The National Policy for Empowerment of Women 2001 aims to bring about the advancement, development and empowerment of women. The Policy will be widely disseminated to encourage active participation of all stakeholders for achieving its goals, amongst which are the following: creating an environment through positive economic and social policies for full development of women to enable them to realize their full potential; ensuring women with the de-jure and de-facto enjoyment of all human rights and fundamental freedom on equal basis with men in all spheres, political, economic, social, cultural and civil, equal access to participation and decision making of women in social, political and economic life of the nation, and equal access to health care, etc; mainstreaming a gender perspective in the development process; and, eliminating discrimination and all forms of violence against women and the girl child.

"Swayamsidha" scheme has been initiated with the long-term objective of all-round empowerment of women, especially socially and economically, by ensuring their direct access to and control over resources through a sustained process of mobilization and convergence of all the on-going sectoral programmes. Its immediate objectives involve: establishing self-reliant women's Self-Help Groups (SHGs); creating confidence and awareness among members of SHGs regarding women's status, health, nutrition, education, sanitation and hygiene, legal rights, economic empowerment and other social, economic and political issues; strengthening and institutionalizing the savings habit in rural women and their control over economic resources; improving access of women to micro-credit; involving women in local-level planning; converging different agencies for women's empowerment and integrated projects accessing delivery of different schemes from a single window; and inculcating a subsidy-free approach to women's empowerment. Considering the strong impact of environmental factors on the sustenance and livelihood of women, full participation of women is being ensured in conserving and protecting the environment. Further, women are involved and their perspectives reflected in the policies and programmes of eco-system and natural resources management.

Programmes and Projects: The major strategy has been to launch innovative special programme through both demand side and supply side interventions. Mahila Smakhaya programme aims not to deliver services but to bring about changes in women's perspectives of themselves and society with regard to women's traditional roles and "to create an environment for women to seek knowledge and information in order to make informed choices and create circumstances in which women can learn at their own pace and rhythm." A number of interventions have been launched to making women economically independent. The Support to Training and Employment Programme (STEP) seeks to train women for employment in the traditional sectors of agriculture, animal husbandry, dairy, handlooms, handicrafts, etc., since 1987. STEP has benefited more than 250,000 women. A budget of Rs. 160 million has been made available for STEP during the year 1996-97. Mahila Samridhi Yojana (MSY), a central sector scheme launched on October 2, 1993, not only inculcates the habit of thrift amongst rural women but also gives them possession and control over their household resources. The scheme has received an overwhelming response from all over the country. Up to September 1996, a total of about 20 million MSY Accounts have been opened with total deposits amounting to over Rs. 2 billion. Economic empowerment of women is mainly based on

their participation in decision-making processes with regard to raising and distributing resources: incomes, investments, and expenditure at all levels. The entire effort of empowering women is to help them exercise their rights in decision making at all levels and in every sphere within and outside the household as equal partners in society. Efforts are being made to enhance women's capacity to earn, access to, and control/ownership of all family/community assets. In support of women in the informal sector, Rashtriya Mahila Kosh has been further strengthened to extend both 'forward' and 'backward' linkages of credit and marketing facilities. Status: India believes that gender issues cannot be solely left to market forces and remains the responsibility of both National governments and the international community. Gender equity is a necessary pre-condition for fulfillment of the goals agreed to at the Beijing Conference. The index of gender equality measuring the attainments in human development indicators for females as a proportion of that of males has improved, but only marginally, during the eighties. At the national level, GEI increased from 62 % in the early eighties to 67.6 % in the nineties. This implies that the average attainments of women on human development indicators were only two-thirds of those of men. The states that have done well in improving their female literacy levels are the ones that have substantially improved their gender equality. On the whole, gender disparities across the states have declined over the period. While for male education, motivation of the family/parents is not a problem except for very poor families, where the loss of wage labour can be a direct and immediate disadvantage, for female education, this is often not the case. It is a combination of parental apathy, socio-cultural norms, direct and indirect costs, market failure to capture and reflect the true costs and benefits of girl's education, the law and order situation, inadequate and inappropriate educational infra-structure as well as low participation of women in the system (insufficient number of women teachers) that has made female education trail behind male education. Public action, therefore, needs to address all these issues.

Capacity-Building, Education, Training and Awareness-Raising: The Central Social Welfare Board (CSWB), an organization for networking with NGOs working for women, runs a vocational training scheme under which women are given vocational training in different Trades leading to certification by the Directorates of Technical Education of the states. During the first three years of the Eighth Plan, 100,000 women had been awarded certificates under this scheme leading to impressed employability in the formal sector. In addition, there are a number of vocational training schemes linked with employment generation such as TRYSEM (40% reservation for women), NORAD and STEP (DWCD), Nehru Rozgar Yojana, EDP programmes of banks, SIDBI etc., which hare either women-specific or disaggregated targets and reservations for women. Information: Information is available at the Secretary, Department of Women and Child Welfare (http://wcd.nic.in). Research and Technologies: Application of science and technology is vital for the advancement of women. Technology will reduce household drudgery and provide better working conditions for women, particularly in rural areas. The Department of Women and Child Welfare sponsors research and evaluation studies in the field of women and child development with a view to filling up information/data gaps for better programme, planning and implementation. Financing: In addition to the Department of Women and Child Welfare, many other departments also run schemes benefiting women (see under **Programmes and Projects**). Specific financial break up and further details could be obtained by contacting Department of Women and Child Welfare. Cooperation: The Convention on the Elimination of All Forms of Discrimination Against Women was signed by India in 1993. India endorsed the three priority themes of equality, development, and peace from the Fourth World Conference on Women held in Beijing in 1995, and believes that economic independence and equality in tandem would create the necessary environment for the realization of the full potential of women. India also endorsed the Commission on the Status of Women as the most appropriate mechanism to fulfill this task. National mechanism to monitor the implementation of the Platform of Action of the Beijing Conference has been instituted. India believes that national commitments must be complemented by commitments at the international level.

**Children and Youth:** Decision-Making: The Ministry of Youth Affairs and Sports and Department of Women and Child Welfare in the Ministry of Human Resource Development are the coordinating bodies. The Convention on the Rights of the Child ratified by India in 1992 is the guiding principle for formulating policies and programmes of child development. The existing National Policy For Children (1974) is being suitably reviewed. The National Youth Policy was formulated in 1988 to: instill in the youth respect for the principles and values enshrined in our

Constitution; promote an awareness of our historical heritage; help develop scientific temper and the qualities of discipline, self-reliance, justice and fair play; and provide them access to education in addition to developing their personality. It also aims at making the youth conscious of international issues and involving them in promoting world peace and a just international economic order. India has always followed a pro-active policy for tackling the problems of child labour. The present regime of child labour laws has a pragmatic foundation consistent with the International Labour Conference Resolution of 1979, which called for a combination of prohibitory and mitigating measures. The policy of the Government is to ban employment of children below the age of 14 years in hazardous employments, and to regulate the working conditions of children in other employments. The Child Labour (Prohibition and Regulation) Act, 1986 seeks to achieve this objective. The Government announced the National Child Labour Policy (NCLP) in August, 1987. The Action Plan under the Policy comprises: a legislative action plan; general development programmes to benefit child labour; and a project-based action plan in areas of high concentration of child labour. Programmes and Projects: The NCLP has established Special Schools to provide basic needs like non-formal education, pre-vocational training, and supplementary nutrition to the children withdrawn from employment. A significant programme for the development of children in 1975 was the launching of the Integrated Child Development Services (ICDS), one of the world's largest and unique programmes, which aims at providing an integrated package of health, nutrition, and educational services to children below six years, pregnant women, and nursing mothers. The ICDS at present aims to: improve the nutritional and health status of children below the age of six years; lay the foundation for the proper psychological, physical and social development of the child; reduce the incidence of mortality, morbidity, malnutrition and school dropouts; achieve effective coordination of policy and implementation among various departments to promote child development; and, enhance the capability of the mother to look after the normal health and nutritional needs of the child, through proper health and nutrition education. The Government has planned several schemes for Youth Welfare and participation in nation-building. National Service Scheme (NSS), which was launched in the Mahatma Gandhi Birth Centenary year 1969 as a student youth service programme, aims at arousing social consciousness of the youth with an overall objective of personality development of the students through community service. Its motto is "Not me, but you." National Service Volunteer Scheme (NSVS) launched in 1977-78 aims to provide opportunities to students, generally speaking those who have completed their first degree, to involve themselves on a voluntary basis, in nation building activities for a specific period on a whole-time basis. National Reconstruction Corps (NRC) launched in 1999 aims at harnessing the youth energy in constructive channels on a sustained basis. Other activities undertaken involve: the National Plan of Action for children and the girl child; adoption of the National Nutrition Policy (1993); establishment of National Crèche Fund for child care services; crèches for children of working/ailing mothers; the Balwadi Nutrition Programme; early childhood education through assisting voluntary organizations; the Balsevika Training Programme; and assisting of voluntary organizations in the field of women's welfare and child development. The scheme of day care centres is being implemented through the Central Social Welfare Board to provide day care services to children below 5 years and belonging to the weaker sections of society.

Status: A number of NGOs are working in the areas related to welfare of youths and children. Investment in child development is viewed not only as desirable societal investment for the nation's future, but also as fulfillment of the rights of every child to 'survival, protection, and development' so as to achieve their full potential. The thrust in youth affairs has been to involve youth in the entire range of the developmental process recognizing youth as a major resource in the task of nation building. Youth activities will continue to focus on environmental and health programmes such as greening of wastelands, solid waste management, anti-smoking campaigns, prevention of drug abuse, health education with emphasis on reproductive health and prevention of AIDS, population control, and various adventure activities. According to the census of India, there are 10.75 million child workers in the age group 5-14 years in 1971, 13.64 million in 1981 and 11.28 million in 1991. Poverty is stated to be the most important reason for children to enter and work in labour market. Sometimes children seek employment simply due to the lack of access to schools, which should to be corrected urgently. The failure to provide even the elementary education has been a serious lacuna in the approach to addressing the problem of 'no where children.' Capacity-Building, Education, Training and Awareness-Raising: Major schemes undertaken during the Eighth Plan include the National Service Scheme (NSS) and Nehru Yuva Kendras (NYK). The NSS of Youth Affairs provides for the

development of their personalities through community services; it has successfully incorporated activities, which have a social orientation like literacy, environment enrichment, national integration, significance of community management of resources, etc. The NYK scheme aims at providing the rural and non-student youth with opportunities to take part in the process of National development in order to develop their own personality and skills. During the Ninth Plan, greater access had been given to rural and marginalized youth in the vocational training programmes of NYK by involving NGOs, self-help groups, and community polytechnics in the task. The thrust in sports will be on providing greater access to sport facilities through substantial investments in physical education, infrastructure development (including centres of sports physiology and sports medicine), and in creating widespread awareness for physical fitness through nutrition, health education, and yoga with special focus on school children. Area specific sports programmes, recognizing the traditional sports skills of the inhabitant's especially tribal populations, will receive priority consideration. Rural sports programmes will be revamped in order to tap the vast talents available in the rural areas. Special attention will be accorded to the promotion of sports and games among the disabled. The need for a holistic approach that will integrate youth programmes within the context of education is well recognized and will guide all actions. Information: Information is available through: Secretary, Department of Women and Child Welfare in the Ministry of Human Resource Development and Secretary, and the Ministry of Youth Affairs and Sports. These Departments can be visited on the Internet at: http://wcd.nic.in; and, http://vas.nic.in. Research and Technologies: More than any research and technologies, corrective steps need to be taken to enhance reach and operation of the preventive framework of laws and regulations that regulate the market of child labour in the country. Financing: Voluntary agencies are being financially assisted up to 75% for taking on welfare projects for working children under a Grants-in-aid Scheme. Cooperation: International cooperation is needed to provide new and additional resources to tackle various problems faced by youth and children in a comprehensive manner.

**Indigenous People:** Decision-Making: Although it is clarified at the onset that the normally understood concept of indigenous people is not applicable to India, we have certain disadvantaged sections of society such as tribes. All the references to indigenous people should be considered in that background. The ministries of Tribal Affairs and Social Empowerment coordinate this issue. India's Constitution provides special privileges to Scheduled Tribe communities: a reservation of 7.5% of vacancies for the Scheduled Tribes in the matters of employment and promotion. Tribal development in the Programme for Special Central Assistance (SCA) for Scheduled Tribes is an additive to State plans for implementation various socioeconomic programmes for the welfare of Scheduled Tribes. An Action Plan incorporating total food and nutrition security, health coverage, education, and financial assistance in keeping with their socio-cultural conditions has been prepared by the Government. The Plan has flexibility to cater to the specific needs of each Tribe and its environment. During the Ninth five-year Plan (1997-2002), a high priority was accorded to empowering Scheduled Tribes, both economically and socially, to enable them to join the mainstream of National development. To this effect, efforts will be made to create an environment conducive to their being able to lead a life of freedom and dignity, exercising their rights and privileges like any other citizen in the country. The necessary legislative support for this purpose will be provided. The development of the Scheduled Tribes will be consistent with the concept of economic growth with social justice. In Notified Areas, Tribal Councils regulate their own affairs.
Programmes and Projects: Special Central Assistance to Tribal Sub-Plan is given to 20 Tribal Sub-Plan states and Union Territories by the Government of India to supplement their efforts for tribal development. The scheme was introduced in the Fifth five-year Plan. Family oriented income generating schemes that give adequate weights to incidental infrastructure are undertaken out of Special Central Assistance. Ashram Schools in Tribal sub-Plan Areas, launched in 1990-91 to extend education facilities through residential schools for ST students, covers primary, secondary and senior secondary level of education. Under the scheme, teaching material and other facilities are provided by the States and Union Territories. Grant-in-Aid to Voluntary Organizations for the Welfare of Scheduled Tribes scheme undertakes welfare work programmes for Scheduled Tribes to improve educational and economic conditions of these communities through voluntary efforts. Under the scheme of Grant-in-Aid to State Tribal Development Cooperative Corporations for MFP operations, grant is given to State Tribal Development Cooperative Corporations, Forest Development Corporations and Minor Forest Produce Federations

to take up the minor forest produce (MFP) operations, under which grants can be utilized by the States for: strengthening the share capital base of TDCCs for increasing the volume of procurement of MFPs; and constructing scientific warehouses. Development of Primitive Tribal Groups scheme provides assistance to Integrated Tribal Development Projects, Tribal Research Institutes and NGOs for undertaking activities such as generation of awareness, confidence building, and training for the skill development of tribal youth organizations of self-help groups and provision of services/inputs not covered under any existing schemes for the development and welfare of Primitive Tribal Groups. The Centrally sponsored scheme of post-matric scholarship for Scheduled Tribe students has been modified from 1995, thereby revising the maintenance allowance rates, income ceiling for eligibility, and study charges. The restriction of providing benefits of the scheme to two children per family has been relaxed in the case of girl students pursuing correspondence courses, who are now eligible to get a book allowance besides earlier reimbursement of non-refundable fees. Status: The Government continues to endeavors to minimize the gap between these target groups and the rest of society by all round development, in both qualitative and quantitative terms, and taking advantage of inputs from both governmental and non-governmental agencies. The Government will also make efforts to ensure that the tribal economy is protected and supported against threats from external markets. The ownership/patent rights of tribal people in respect to minor forest produce vis-à-vis the use of medicinal plants needs to be protected. Status: The total population of the country is indigenous to India. About 7% of the people belong to tribal communities. The latest census shows that most of the Scheduled Tribe population living in rural areas continue to have low levels of literacy and are employed mostly in the primary sector. A Special Component Plan (SCP) and Tribal Sub-Plan (TSP) have been designed to channel the flow of funds from various sectors of development under State/Central Plans to benefit the Scheduled Tribes and their socioeconomic development. These plans are monitored in the sectoral plans for education, health, family welfare, housing and urban development, and women and children to ensure better provision for disadvantaged tribal groups. Capacity-Building, Education, Training and Awareness-Raising: Fourteen Tribal Research Institutes (TRIs), with sizable tribal population, are being used for research, evaluation, collection of data training, seminar workshops, and professional input in the preparation of TSP etc. Information: Information is available at the Secretary, Ministry of Tribal Affairs (http://tribal.nic.in). Research and Technologies: In order to project a national profile of needs of tribal people and tribal areas, a National Institute for Research and Training in Tribal Affairs (NITA) has been set up. The Institute is likely to play a leading role in coordinating tribal research activities at national level. Financing: A National Scheduled Tribes Finance and Development Corporation has been set up to accelerate economic growth and development for the members of the Scheduled Tribes through providing funds at concessional rates for starting projects in: agriculture and allied activities, horticulture, animal husbandry and dairy development, minor irrigation, small industries, trades and services, transport, etc. Cooperation: India prefers to provide indigenous resources for the development of its tribal population.

**Non-governmental Organizations:** Programmes and Projects: Voluntary agencies implement many programmes of the ministries of Rural Areas and Employment, and Tribal Affairs, Department of Women and Child Welfare and other ministries. The Council for Advancement of People's Action and Rural Technology (CAPART) has taken initiatives in promoting a variety of activities for the transfer of technology, people's participation, development of markets for products of rural enterprises, and promotion of other developmental activities and delivery systems in the non-government sector. Status: In India, the planning process places emphasis on people's participation and voluntary action in rural development. The role of voluntary agencies has been defined as providing a basis for innovation with new approaches and integrated development, ensuring feedback regarding impact of various programmes, and securing the involvement of local communities, particularly those below the poverty line. The Government alone cannot implement all the programmes and activities in the social sector. The participation of the community and the efforts of NGOs have always had a significant role in this sphere. Efforts have been made to strengthen the involvement of non-governmental and voluntary organizations, which reach vast sections of the population, and promote community awareness and participation in various programmes. There are over 10,000 NGOs in India ranging from National agencies to local groups, from research organizations to mass-based field organizations. Many are engaged in promoting eco-development, waste management, forest conservation, preservation of genetic diversity, and eco-friendly technologies in industry and agriculture. NGOs have developed a

variety of innovative approaches that could help secure the involvement of local communities, particularly the poorer sections, in various developmental activities. NGOs have largely been responsible for ensuring the better delivery of rural services that include drinking water facilities, sanitation, road development programmes, etc. To bring CAPART nearer to the people and to ensure closer interaction between it and voluntary organizations at the grassroots level, the functioning of CAPART has been decentralized to 6 regional centres. It is expected that this decentralization will not only result in improved efficiency and efficacy, but will also be successful in promoting, spreading, and strengthening the role of volunteer organizations in rural development. Financing: The costs of providing basic services have consequently been reduced due to the successful mobilization of local resources at low cost for implementation of development programmes. CAPART is the agency for financing and assisting voluntary action in the area of rural development. Its funds consist of grants from the Government of India. In many schemes, various ministries or departments have been providing funds to NGOs for undertaking development activities related to drinking water, health, sanitation, education, and the environment, etc.

**Local Authorities:** Decision-Making: The coordinating bodies are the ministries of: Rural Development; and, Urban Development and Poverty Alleviation. A decentralized approach to planning has been introduced in India through a system of Panchayati Raj and Nagar Palika (local self-governments of urban cities/towns) institutions. With the enactment of the Constitution Amendment Act (1992), Panchayati Raj Institutions (PRIs) have been revitalized and a process of democratic decentralization has commenced. Subsequent to the 73rd Constitutional Amendment Act, state governments have enacted enabling legislation to provide for elected bodies at the village, intermediate, and district levels, with adequate representation from the weaker sections and women. All States have constituted PRIs. The state governments are required to endow the Panchayats with the power and authority necessary to enable them to function as institutions of self-government, including the responsibility of preparing and implementing plans for economic development and social justice. During the Ninth Five-year Plan, 29 subjects identified in the Eleventh Schedule of the Constitution had been transferred to PRIs. Correspondingly, this involves a transfer of significant amount of resources. Under the provisions of the 74th Constitution Amendment Act, the Urban Local Bodies/Municipalities prepare plans for the development of urban areas. The municipalities are the focal institutions for the provision of urban infrastructure and delivery of services and the States should endow them with commensurate functional responsibilities and financial powers. Under Article 243 (G) of the 73rd Constitutional Amendment Act, the PRIs will prepare plans for economic development and social justice at the local level through the institution of the District Planning Committees, which will provide the umbrella for the preparation of integrated district development plans. However, certain broad principles have to be established to assign a role to each of the three-tiers of government. The actual devolution could be based on the rule that what can be done at a lower level should be done at that level, not a higher level. The Gramsabha would list out priorities and assist in the selection of beneficiaries for various programmes and schemes. In this way, the aspirations of the people would be articulated. Thereafter, the planning process would follow a bottom up approach with the preparation of village plans, which would be incorporated into intermediate level plans, and finally merged into a district plan. The PRIs provide an umbrella for the convergence of various sectoral, poverty eradication and area development programmes at each tier. The vertical integration has been facilitated by an integration of area plans from the village to the State level. This would ensure a synergy between macro-and micro- objectives. At the lowest tier of Panchayati Raj (Gram Sabha/Village Council) all adults are the members. Urban and higher tiers of Rural Local Bodies function on the basis of elected representative form of democracy.
In addition to having seat reservations for the disadvantaged sections of society, one-third seats are reserved for women in all the local bodies. Programmes and Projects: The ministries of Rural Development and Urban Development and the respective state governments have initiated many programmes for strengthening the local bodies. Status: All states have elected local bodies in rural and urban areas. The 73rd and 74th Constitutional Amendments have strengthened political participation and brought more than a million women into public life in India. Local bodies need further empowerment to meet the challenges of effective democratic decentralization. Capacity-Building, Education, Training and Awareness-Raising: Awareness-raising of the people will be given top priority. The government machinery, voluntary organizations, and self-help groups will be involved in the process of advocacy and in organizing the people, especially the poor. Participation of people can be encouraged through

beneficiary/functional committees, which should be given the responsibility of overseeing the implementation of various programmes. Social audit and transparency in the functioning of the PRIs is crucial for the growth and development of these institutions; these will be the important goals of the decentralization strategy during the Ninth Plan. Information: Information is provided by: Secretary, the Ministry of Rural Development, http://rural.nic.in. Research and Technologies: Many institutions are working to further empower local bodies. Many R&D activities had been taken up in low cost housing, conservancy services and waste management. Financing: While the urban local bodies have a share in the revenue of the States, they will have raised resources by levying their own taxes at the local level. These could include taxes on/for profession, property, entertainment, and motor vehicle, etc. They could also levy user charges and licence fees wherever feasible. Some of the municipalities in cities have also raised resources from the market by bond issue. Cooperation: Many cities in India have entered into MOU/Agreements with their sister local authorities all over the world.

**Workers and Trade Unions:** Decision-Making: The Ministry of Labour is the coordinating body. India's Labour policy derives its philosophy and content from the Directive Principles of State Policy enshrined in the Constitution of India. This has been evolving in response to specific needs of the situation to suit the requirements of planned development and social justice. It has been envisaged that economic growth should not only increase production but also absorb the backlog of unemployed and add a substantial proportion of additional work force. The Government has implemented many welfare measures for the benefit of workers. In 1995, the Government implemented a new pension scheme for workers to replace the family pension scheme. The Payment of Gratuity Act was amended in May 1994, scrapping the eligibility ceiling for its application and enhancing the ceiling on gratuity payment. The following legislations have been enacted in India for the welfare of labour force: the Minimum Wages Act 1948; the Contract Labour (Regulation & Abolition) Act 1970; the Bonded Labour System (Abolition) Act 1976; and, the Emigration Act 1983. The labour policy during the Ninth Five-year Plan (1997-2002) had attempted to rationalize, simplify, and integrate Labour Laws to bring them in tune with the changing socioeconomic scene. At the same time, the existing legislative framework needs to be strengthened to protect the interests of labour in the unorganized sector. The present Labour Laws are far too rigid since they do not allow firms to retrench or downsize without the permission of appropriate government, which in most cases is the State Government. Unfortunately, these provisions, which were meant to protect employment, have actually served to discourage growth of employment. The inability to shed labour in times of difficulty encourages entrepreneurs to avoid hiring labour. The approach paper to the Tenth Plan suggests the use of Voluntary Retirement Schemes. With a view to suggesting rationalization of existing laws relating to labour in organized sector and evolving umbrella legislation for ensuring a minimum level of protection to the workers in the unorganized sectors, the Second National Commission on Labour (NCL) has been set up in 1999.
Programmes and Projects: A comprehensive framework of projects is implemented for the labour welfare both in organized and unorganized sectors. National Child Labour Project Scheme aims to eliminate child labour. Enforcement Monitoring System is operational for compilation of quarterly returns giving statistics about the enforcement of various provisions under different acts/laws for elimination of child labour from State Labour departments. Other schemes include: Rehabilitation of Bonded Labour; Women Labour; Schemes for Improving working conditions of Mines and Factories; etc. Status: The majority of the workforce in India is unorganized in nature, with 80 % living in rural areas and 64 % engaged in agriculture. Only 16 % of the workforce is on regular salaried employment; the remaining 84 % is self-employed or employed on casual wages. Access of women to employment compared to men is lower because of their inferior access to education and skill development. A more innovative and broad based social security system for workers is needed to smooth the process of labour reforms and enable rationalization of labour laws. Capacity-Building, Education, Training and Awareness-Raising: In order to ensure effective implementation of the legislative framework for labour welfare, there is a definite need to further build capacity of field level enforcing agencies. Information: Information can be obtained from the Ministry of Labour (http://labour.nic.in). Research and Technologies: V.V. Giri National Labour Institute, Noida (Uttar Pradesh) is engaged in research pertaining to labour and training of labour administrators, trade unions, public sector managers and other functionaries concerned with labour. In addition, the Directorate General of Employment and Training (DGE&T) has evolved various training programmes. Cooperation: India is active member of ILO and

is working with various international agencies on the work related to labour welfare and abolition of child labour in hazardous industries.

**Business and Industry:** Decision-Making: Indian Business and Industry (B&I) associations, such as the Federation of Indian Chamber of Commerce and Industries (FICCI) and the Confederation of Indian Industry (CII), work in partnership with the Government, especially with the Ministry of Industry, Ministry of Environment and Forests, and the Ministry of Energy (Power and Non-Conventional Energy Sources) as well as Pollution Control Boards both at the Central and State levels. In recent years, B&I have made significant efforts towards reducing the impact of industrial activities on the environment, including the investment of considerable resources in the development of environmental management systems and environmentally sound technologies. The concept of green business is results oriented and will have far reaching effect on the Indian environment. The International Standardization Organization has introduced systems of quality control (ISO 9000) and methods for verifying environmental soundness (ISO 14000) of companies. The business community has recognized that in order to stay in business, it will increasingly have to integrate environmental consideration into business strategy and long term planning. In order to adopt best environmental management practices, Indian industry has initiated the development of their corporate environment policies on safety, health and environment issues. The approach paper to the Tenth Plan recognizes that the industry will have to face much stronger international competition, as our domestic market is now more open with Quantitative Restrictions (QRs) on imports having been removed with effect from April 1, 2001. It is also expected that the relative role of the public sector as a distinct entity will decline in the course of the Tenth Plan as the incremental capacities will be mainly in the private sector and the process of disinvestment converts many of the existing public sector enterprises from Government controlled enterprises to Non-government enterprises. The Government has taken various steps to gradually lower the level of protection offered to Indian industry, rationalizing labour laws and laws relating to bankruptcy and liquidation. Programmes and Projects: The Government is encouraging the development of biotechnology in the Country by creating high quality infrastructure through the strategy of setting up specialized Biotech Parks in different States of the Country, encouraging research activities, developing human resources and establishing links between research institutions, academia and industry. The State Governments will create a hassle-free environment for the biotech industry through simplification of procedures and a single window clearance mechanism. Presently five states have initiated the development of Biotechnology Parks. These are the states of Andhra Pradesh, Karnataka, Kerala, Tamilnadu and Maharashtra. 100 % Export Oriented Units (EOUs) and units in the Export Processing Zones (EPZs) enjoy a package of incentives and facilities, which include duty free imports of all types of capital goods, raw material, and consumables in addition to tax holidays against export. In order to provide impetus to the electronics industry, to enhance its export potential and to develop an efficient electronic component industry, Electronic Hardware Technology Park (EHTP) and Software Technology Park (STP) schemes offer a package of incentives and facilities like duty free imports on the lines of the EOU Scheme, deemed export benefits and tax holidays.
Status: Although some improvement in environmental performance can be expected from the adoption of a systematic approach, it should be understood that the environmental management system is a tool to enable the organization to achieve and systematically control the level of environmental performance that it sets for itself. The establishment and operation of an environmental management system will not in itself necessarily result in an immediate reduction of an adverse environmental impact. Indian industry today is on a fast track of growth, which is expected to accelerate with the Government's commitment for industrial liberalization. It is a big challenge for industry to respond to the Government's aspirations that the economy improves and the advantages of industrialization are passed on to the people. Industry is also aware of its responsibilities for the environment and committed to sustainable development. Compliance levels have gone up, as 1,259 of 1,551 units identified as highly polluting industries have provided the requisite pollution control facility. This high level of compliance is due to pressure from mounting legislation, growing awareness and commitment of industry towards social responsibilities, increasing realization that pollution prevention means good business and increasing public awareness. Further progress at this stage is not a function of desire or intent but one of technological and other feasibility barriers. Maintaining its competitive and comparative advantage in the globalizing world is the biggest challenge for the Indian industry. Capacity-Building, Education, Training and Awareness-Raising: The need for

capacity building is felt in almost all the sectors of industry. It is more pronounced in case of Small-scale Industries (SSIs) for their survival. Information: Information is available at: the Ministry of Commerce and Industry (http://commin.nic.in); and the Business Information Services Network of FICCI, www.bisnet.com. Research and Technologies: Industry, universities and research laboratories are involved in various R&D activities. Cooperation: There is a need to evolve an international mechanism for transferring environmentally sound technology to the industries in developing countries.

**Scientific and Technological Community:** The Government has achieved full cooperation of the Science and Technology (ST) community in the decision making process. As part of the Ministry of Science and Technology, the Department of Science and Technology (DST) was established in 1971 to formulate policy statements and guidelines on ST. Consistent with wider goals and objectives, various programmes and activities of the DST are aimed at encouraging the Scientific and Technological Community and promoting new areas of ST. A Cabinet Committee on Science and Technology has been established at the apex level to take an overall view of scientific efforts and policy guidelines for the development of ST in the country. The Scientific Policy Resolution of 1958 embodies an abiding faith in ST as both an instrument to bring material prosperity to the country and a means for emancipating people and quantitatively transforming a traditional society. Technology Policy Statement (TPS) was formulated in 1983 to develop indigenous technology and ensure efficient absorption and adaptation of imported technology appropriate to national priorities and availability of resources. The Science and Technology Policy 2001 that provides schemes for enhancing career prospects for scientists are essential for reversing the flow of talent away from science. It emphasizes the need to create an atmosphere in academic and research institutions, which will attract and even more importantly, retain and nourish young talented scientists. A major initiative to be considered would be a greater involvement and commitment of scientists in national institutions in teaching/training undergraduate science students. Initiatives to enhance the linkages between the vast networks of national laboratories with teaching institutions are needed for a long-term revival of science in colleges and universities. Science and Technology Advisory Committees have been set up in most of the development departments such as Steel, Coal, Mines, Petroleum, and Transport to formulate, implement, and monitor ST programmes relevant to the concerned sector. In order to promote ST activities at the grass root level, state ST councils and departments have been strengthened and their interaction with various scientific institutions and development departments assured for effective implementation of location specific projects and programmes. The following councils also work in the field of ST: Science and Engineering Research Council; Technology Information Forecasting and Assessment Council (TIFAC); and, Technology Development Board. Programmes and Projects: Recognizing the need for accelerating the people's participation in decision making, the National Council for Science and Technology Communication (NCSTC) provides a forum for ST aimed at introducing a value system receptive to ST among the people at large. Programmes of the DST are geared towards generating employment and entrepreneurial skills for motivating science graduates to participate actively in the economic growth of the country. Science and Technology Entrepreneurship Parks provide links amongst universities, research laboratories, and industry. For the socioeconomic development of the rural and urban poor, women, the disadvantaged, Scheduled Castes and Tribal populations, a number of technologies have been developed on carp breeding, seed raising, rain water harvesting, soak pits, water filters, water testing kits, low cost toilets, etc. The Science and Technology Entrepreneurship Development Programme have attempted to create a number of job opportunities through training and awareness. Several programmes to popularize science like Bharat Jan Gyan Vigyan Jatha, National Children Science Congress, radio and television serials on science themes have also been initiated. Status: It is critically important to ensure that higher education is available to the widest possible section of creative students, transcending social and economic barriers. The requirements of scientists and technologists in all spheres of national interest, notably health, education, agriculture, industry and defense will be continually assessed to ensure the constant supply of trained manpower. The Council of Scientific and Industrial Research (CSIR) has all encompassing charter, including promotion, guidance and coordination of scientific and industrial research, funding of laboratories and exploitation of research results for industrial development. From earlier government support, CSIR is generating about 25% of its resources from contract R&D licensing of its technologies, provision of technical services and consultancy; the industrial production based on CSIR know-how

in 1999-2000 was Rs. 44 billion. Recognizing that the comparative advantage in the globally integrated knowledge based world economy today is shifting to those with brain power to absorb, assimilate and adopt the spectacular developments in ST and harness them for national development, the challenge facing India is to further strengthen ST institutional infrastructure in both the public and private sectors.

Exchange of knowledge and concerns at all levels, and broadening of the range of development and environmentally sustainable activities need to be strengthened. This would lead to models of joint implementation through requisite cooperation and support. Capacity-Building, Education, Training and Awareness-Raising: The Government has been a major player in capacity building through increasing research support and encouraging training programmes, contact programmes, and fellowships. The financial support for basic research has been more than doubled in the last five years. The integration of ST with socioeconomic development has been initiated and different ministries have set up Science and Technology Advisory Committees (STACs) to identify, formulate, and support ST programmes relevant to the concerned sector with the participation of industry. Information: Information is available at: the Ministry of Science and Technology, http://mst.nic.in. Financing: To accelerate the development and application of indigenous technology in production processes, a new fund for technology development and application has been established. The DST supports 21 autonomous research institutions or ST professional bodies working in diverse areas for the promotion of Science and Technology. The Administration and Finance Divisions of the Department look after the support facilities of these organizations including the personnel and financial administration. The University Grants Commission extends financial support to Indian universities. Cooperation: The DST fosters international cooperation in ST leading to exchange visits and establishment of special joint centres or projects. As a part of the Science and Technology Policy 2001, international collaborative programmes are being specifically encouraged between academic institutions and national laboratories in India and their counterparts of the world. Special emphasis is on collaborations with countries of the South, with whom we share many common problems, for which scientific and technological solutions are desirable.

**Farmers:** Decision-Making: The activities of farmers are coordinated through village level self-governing institutions and cooperatives. Due to their large numbers, farmers constitute a strong interest group in India. At the Government level, the Ministry of Agriculture champions the cause of farmers. Although there is no legislation to regulate activities of farmers, a number of facilitating regulations exist to protect the interests of the farmers. Programmes and Projects: The major thrust of agricultural development programmes in India is to improve the efficiency of the use of scarce natural resources, namely land, water, and energy. This can be achieved only through improved productivity in a cost-effective manner, which alone would increase the welfare of the farmers and agricultural labour. Balanced and integrated use of fertilizers, agricultural credit, institutional development, accelerated investments in agriculture, enhancement of the competitiveness of agro-exports, and creation of additional irrigation facilities have been encouraged through various schemes and activities of the Government. A scheme entitled "Farmers-Scientists Interaction on Agro-Climatic Zone Basis," formulated by the Ministry of Agriculture, provides direct feedback from farmers to scientists on problems and constraints in agriculture while scientists can communicate relevant technological advances to the farming community, which provides a forum for on the spot identification of field problems and suggestions for remedial measures. Another important initiative taken by the National Cooperative Development Corporation (NCDC) is the Cooperative Farmers' Service Centre Scheme aiming to provide financial assistance to farmers' service cooperatives. Under this scheme, all types of societies engaged in retail distribution of fertilizer and other agricultural inputs, and non-credit activities are covered by assistance depending upon the requirement. Its main objective is the development of cooperative societies as effective Farmers' Service Centres for the supply of a wide range of agricultural inputs and also to meet the non-credit needs of farmers.

The Department of Agriculture and Cooperation as a part of its plan policy has commissioned a study entitled "Policy and Management in Agriculture: State of the Indian Farmer- A Millennium Study" to highlight the condition of farming community by their professional and socio economic environment. Government of India had also introduced a 'Comprehensive crop insurance scheme' and introduced Credit Card for farmers. Status: According to the Agriculture Statistics at a Glance 2001, 74.3% population lives in rural areas. Out of total rural population 35.2% are cultivators, 23.8% work as agricultural labourers and the remaining 41% are engaged in other

non-farm activities. The small (<1 ha) and marginal farmers (<2 ha) who constitute 78.2% of the total operational holdings in the country are engaged in subsistence agriculture. Only 2% of the large farmers (10 ha and above) are in a position to produce marketable surplus. Indian agriculture in general and farmers particularly face the challenge to compete and survive in the global economy. Women constitute a sizeable portion of population involved in farm sector activities, providing labour to both farm and non-farm sector. The Ministry of Agriculture is increasingly taking into consideration gender concerns in evolving various programmes and activities. Depending on the type and size of their holdings, and access to various inputs, farmers have different concerns in different parts of the country. The agriculture sector including food-processing industries provides one of the best avenues for creating greater employment growth. Capacity-Building, Education, Training and Awareness-Raising: The multi-tier infrastructure has been created at National, Regional, State, Divisional and District levels to train farmers, farm youth, and farmwomen. The National Institute of Agriculture Research and Management, Hyderabad caters to the needs of extension management. Four Extension Education Institutes have been established on a regional basis to provide training in communication technology and extension methodology. Krishi Vigyan Kendras and Farmers' Training Centres also provide grassroots level training facilities to farmers and farmwomen. Under the scheme "exchange of farmers within the country" in operation since 1990, opportunities are provided to farmers from less developed areas to tour agriculturally developed areas in groups and observe the progress in agriculture, horticulture, animal husbandry, and allied subjects, so that they can adopt the technology on their own farms. In order to promote participation, practicing farmers, village youth, and school dropouts are working as focal points for disseminating low cost technology and producing the plant material for conservation measures. Organizing self-help groups to institutionalize people's participation to improve household production systems (mushroom cultivation, sericulture, bee-keeping, etc.) is emphasized. Training and demonstrations have been undertaken to disseminate integrated pest management (IPM) technology. Bio-pesticides, like neem-based formulations, are being encouraged through Farmers' Field Schools. A Central Sector Scheme for Women in Agriculture has been launched in seven States during the Eighth Five-year Plan to motivate and mobilize farmwomen into groups so that the agricultural support, such as technology and extension, can be channeled through them. Information: Information can be obtained from the Secretary, Department of Agriculture and Cooperation and Secretary (http://agricoop.nic.in) and Department of Agriculture Research and Education (http://dare.nic.in) in the Ministry of Agriculture. Research and Technologies: Indian Council of Agriculture Research (ICAR) coordinates research in universities and other research institutes in agriculture and allied sectors. Cooperation: India cooperates with foreign and international agricultural research and educational institutions and organizations, including international conferences, associations and other bodies dealing with agricultural research and education.

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## CHAPTER 33: FINANCIAL RESOURCES AND MECHANISMS

**Decision-Making:** In respect of investments including foreign investments, the entrepreneurs are required to obtain Statutory clearances relating to Pollution Control and Environment for setting up an industrial project. A Notification issued under the Environment (Protection) Act (1986) has listed 29 projects in respect of which environmental clearance needs to be obtained from the Ministry of Environment & Forests. This list includes industries like petro-chemical complexes, petroleum refineries, cement, thermal power plants, bulk drugs, fertilizers, dyes, paper, etc. However, if investment is less than Rs.500 million, such clearance is not necessary, unless it is for pesticides, bulk drugs and pharmaceuticals, asbestos and asbestos products, integrated paint complexes, mining projects, tourism projects of certain parameters, tarred roads in Himalayan areas, distilleries, dyes, foundries and electroplating industries. Further, any item reserved for the small-scale sector with investment of less than Rs.10 million is also exempt from obtaining environmental clearance form the Central Government under the Notification. Powers have been delegated to the state governments for grant of environmental clearance for certain categories of thermal power plants. Setting up industries in certain locations considered ecologically fragile (e.g. Aravalli Range, Coastal areas, Doon Valley, Dahanu etc.) are guided by separate guidelines issued by the Ministry of Environment & Forests. The Foreign Investment Promotion Board has played an important role in expediting clearances for foreign investment. Over time a number of sectors have moved to automatic licensing. The Government periodically consults experts and major stakeholders. Detailed discussions on the Union Budget are also held in the Parliament and its various Standing Committees for different Ministries. The Government is also firmly committed to making the financing of the development process sustainable and for this purpose has introduced a bill in Parliament– the Fiscal Responsibility and Budget Management Bill. India's Eighth Five-Year Plan was drafted in the context of severe resource constraints, and a serious balance of payments situation. The sources of financing projected in the Plan differ from earlier plans in that it seeks to reduce dependence on borrowing, domestic as well as foreign, and on deficit financing, placing greater reliance on resource mobilization and economy in government expenditure. In the Ninth Plan the foreign exchange position had become comfortable but the overall problem of resources has remained. The Approach to the Tenth Plan has spelt out strategy for raising the resources required consistent with the requirement of the growth rate of 8% per annum.

**Programmes and Projects:** The Government has embarked on a macro economic stabilization programme since 1991. Structural reforms in the foreign trade and payments regime, the tax system, industrial policy, and the financial sector have been undertaken, all of which are likely to have implications for the environment. Since 1991 efforts have been made to involve the private sector in many areas hitherto reserved for the public sector, with a view to get additional resources. Subsidies have also been reduced and rationalized in important areas like food and fertilizers with a view to achieving better targeting. India has always emphasized the importance of public investment for sustainable development by providing fiscal concessions and incentives. Since energy-efficient technologies and non-conventional energy technologies directly improve the protection level of the atmosphere, several tax concessions, 100% depreciation allowance, and investment subsidies have been made widely available. Investments under the National River Action Plan on Control of River Pollution arising from both municipal and non-municipal waste also produce a major impact on marine and ocean-based resources since they control land-based sources of marine pollution in India. However, additional resources need to be made available through external sources for implementing various programmes and activities listed in Agenda 21.

**Status:** While the Government is attempting to raise resources internally for sustainable development, the importance of international assistance cannot be minimized. Implementation of sustainable development programmes as detailed in Agenda 21 requires large amounts of investment. The United Nations Conference on Environment and Development (UNCED) Secretariat estimated that implementation of all activities under Agenda 21 during 1993-2000 would require additional resources of US $ 125 billion a year. This is in addition to the US $ 500 billion a year from National governments and the private sector in developing countries to put their countries on a sustainable development path. The figure was arrived at by estimating the cost of addressing sector and

resource specific environment and development problems. At the national level, the other apparent funding mechanism is budgetary support by developing countries for environment protection programmes. However, public expenditure has its limitations. Developing countries, with their limited domestic savings rely on external finances to supplement their resources and overcome budgetary constraints. With the far from favorable trends in external financing, the ability of developing countries to undertake large-scale public expenditure in this field is doubtful. Debt servicing commitments further aggravate the situation. Besides, many developing countries are undertaking economic policy reform, especially fiscal consolidation, and are faced with even more stringent budgetary constraints.

**Capacity-Building, Education, Training and Awareness-Raising:** The country has many research organizations (for example the National Council for Applied Economical Research, the National Institute for Public Finance and Policy) apart from the universities that conduct training capacity building and research. These institutes are also used for specific design of policy instruments.

**Information:** Information related to financing sustainable development is made available to potential users through: http://finmin.nic.in.

**Research and Technologies:** See under **Capacity-Building, Education, Training and Awareness-Raising**.

**Cooperation:** The goal of Agenda 21 was in part to raise additional external funds for sustainable development activities by increasing bilateral and multilateral Official Development Assistance (ODA) to 0.7% of GNP from donor countries. The fact remains that many of the developing countries are experiencing a net outflow of resources. The average ODA in the post-Rio period has been well below the target figure and even lower than the figure 1992. The Global Environment Facility (GEF) is the only new funding mechanism made available to meet the additional needs identified in Agenda 21. The amount of about US $ 2 billion from GEF, besides the Montreal Protocol Multilateral Fund to tackle ozone depletion, is almost negligible and has fallen short of even the most conservative estimates of the requirements for implementing Agenda 21. While outlining the estimates of financing needs, Agenda 21 fails to identify the mechanisms to ensure their delivery. Discussions at the earlier meetings of the Commission on Sustainable Development (CSD), and in the Finance Working Group, have developed a very useful framework for identifying new and innovative sources of funding, including a sectoral approach to mobilizing funds from within the economy and from external sources. Several of the alternatives highlight the important links between the creation of incentives for the reduction of pollution and wasteful consumption in the North and potential financing for sustainable development in the South. More research work on the formulation of such policy options needs to be undertaken to consolidate the progress achieved and to address the unresolved issues.

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## CHAPTER 35: SCIENCE FOR SUSTAINABLE DEVELOPMENT

**Decision-Making:** The promotion of science and technology for development has been one of the guiding principles of planned development in independent India. The Ministry of Science and Technology with its associate Departments of Biotechnology, Scientific and Industrial Research; and the Departments of Electronics, Ocean Development, Non-Conventional Energy Sources, Space, and Atomic Energy all have different responsibilities in this field. The Ministry of Environment and Forests, the modal agency in the Government for environmental protection and for natural resource management, is also a scientific Ministry. The linkages with scientific research and development are clear. The Ministry of Science and Technology promotes research in emerging areas, contributes to technology development, provides linkages for future commercialization, gives priority to areas for scientific research, and focuses on programmes based on developmental needs. The Constitution of India enshrines development of scientific temper, humanism and the spirit of enquiry and reform as one of the fundamental duties of the citizen. Subsequent developments in terms of evolution of the Scientific Policy Resolution (1958), Technology Policy Statement (1983) and National Science Policy (2001) evolve around basic objective of development of scientific temper among the citizen. It is also important to note the activities of institutions such as the National Institute of Oceanography, the National Geophysical Research Institute, and the large number of laboratories under the Council of Scientific and Industrial Research (CSIR), most notably the National Environmental Engineering Research Institute (NEERI). Several universities have departments of environmental sciences. There are also major non-governmental organizations involved in science, such as the Centre for Science and Environment (CSE), Tata Energy Research Institute (TERI), New Delhi and Tata Institute of Fundamental Research, Mumbai, which work in the field of science, environment, and development. See also under **Decision-Making**.

**Programmes and Projects:** Major activities in the science and technology sector include: research and development projects; development of National facilities, special technology development programmes; technology mission-mode projects on sugar production technologies; advanced composites, and fly ash utilization and disposal, promoting technology information system; home grown technologies through the Technology Information Forecasting and Assessment Council (TIFAC); international science and technology cooperation and joint programmes with developed countries; development of technologies for the socioeconomic sector largely directed towards the rural and urban poor; and augmentation of facilities for meteorological forecasting, seismological observations, etc. The Scheme to Enhance the Efficacy of Transfer of Technology (SEET&T) covers sub-schemes viz. National Register of Foreign Collaborations (NRFC), Transfer and Trading in Technology (TATT); and Promotion and Support to Consultancy Services (PSCS). The aim of various schemes implemented by Government of India is to ensure science and technology programmes remain relevant to socio-economic development. See also under the heading **Research and Technologies** in the various chapters of this Profile.

**Status:** During the entire planning process, the major thrust areas have been basic research in front line fields, innovative research to achieve self-reliance, diffusion of appropriate technologies, and integration of science and technology in socioeconomic and rural sectors. The Council for Scientific and Industrial Research (CSIR) has made significant achievements in the areas of drugs, pesticides, chemicals, biotechnology, etc. The mechanism for the export of technologies and the systems of patenting has been strengthened. A future thrust would be the modernization of various CSIR laboratories, up-scaling technologies, and extension of societal programmes. The thriving private sector in India had also done pioneering work in the areas of information technology and biotechnology. India has one of the largest scientific and technical human resources and infrastructure in the world. Many Indian scientists are working on the projects in frontier areas of science and technology. With dwindling public support by way of resources, many scientific institutions are facing the challenge to be self-reliant and generate resources by consultancy and other support from the industry.

**Capacity-Building, Education, Training and Awareness-Raising:** Awareness is required, particularly on intellectual property rights and patents, among science and technology institutions and universities in preparation for the post-General Agreement on Tariffs and Trade (GATT) scenario. The Indian Government, Industry and Research institutions have taken various initiatives towards infrastructure development, human resources development and for the purposes of science communication and popularization. Indian National Science Academy (INSA) is the premier scientific body involving various disciplines in the country. Facilities of sophisticated analytical instruments are provided to the scientists working in universities, R&D laboratories and industries through a programme of setting-up Regional Sophisticate Instrumentation Centres (RSICs). Similarly, National Accreditation Board for Testing and Calibration Laboratories (NABL), established in 1998 as a registered society, is involved in according accreditation to testing and calibration laboratories after thorough assessment by the experts.

**Information:** In the area of oceans, emphasis has been placed on stabilizing the Antarctic and polymetallic nodules programmes, and the development of ocean data and information system. Besides the expeditions to Antarctica, several achievements have been made in the polymetallic nodules programmes, the coastal ocean monitoring and prediction system, the marine satellite information system, the preparation and dissemination of potential fishing zones, and the establishment of a new institute, the National Institute of Ocean Technology (NIOT).
Further details could be obtained by visiting the Internet site: http://mst.nic.in.

**Research and Technologies:** A technology development fund has been created to accelerate the commercialization of indigenous technologies. In future, the emphasis will be to strengthen R&D efforts further, transfer of the knowledge to industry, strengthen international science and technology cooperation, implement the National Centre for Medium Range Weather Forecasting, selective modernization of the infrastructure facilities of aided scientific institutions, etc. The need in this area is the application of research results for technology development leading, through the involvement of industries and users, to improvements in the quality of life. There is a need for the science and technology entrepreneurship development programmes to be linked with the employment generation programmes. The thrust of space science and technology has been the development and implementation of indigenous satellites and launch vehicles. Significant achievements include the launching of multi-purpose communication satellites; the development of capabilities for the Augmented Satellite Launch Vehicle (ASLV), the Polar Satellite Launch Vehicle (PSLV), and the Geosynchronous Satellite Launch Vehicle (GSLV); remote sensing applications for forest mapping, crop inventory, ground water targeting, and flood mapping; and integrated management for sustainable development through micro-level planning, etc. In the future, second generation multi-purpose communication satellites will be launched. There is a need for action in indigenous technological development of strategic items, capability for launching India's INSAT class satellites, building the necessary inventories by involving industries, and stockpiling the inventories for future INSAT systems.

**Financing:** In the context of the New Economic Policy, the steps taken to re-orient science and technology activities include: the creation of a Technology Development Fund, closer interactions with user industries for technology transfer and the launching of application-oriented R&D programmes. Some additional steps are needed, such as vigorous market-oriented research, and creation of a corpus fund from 2-3% of the turnover of major industries for the promotion of industrial R&D. Such fund aims to reduce dependence on the budget support from the Government. Further details could be obtained by contacting the Secretary, Department of Science and Technology.

**Cooperation:** India has a thriving programme for international cooperation with various bilateral and multilateral agencies.

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## CHAPTER 36: PROMOTING EDUCATION, PUBLIC AWARENESS AND TRAINING

**Decision-Making:** The Departments of Primary Education and Secondary Education in the Ministry of Human Resources Development and the Directorates of Education in respective State Governments are the coordinating bodies. The Constitution (Eighty-Third) Amendment Act 2002 has made a right to free and compulsory education for children from 6-14 years of age a Fundamental Right. This is an important step to fulfill the goal of universal elementary education enshrined in the Constitution of India. Several articles in the Constitution outline the general principles for guiding and governing educational development in the country. Article 45 enjoins that the State shall endeavor to provide for free and compulsory education for all children. Approach to the Tenth Five-Year Plan (2002-07) has set the target of all children completing minimum five years of schooling by 2007. Article 29 (1) provides that any section of the citizens having a distinct language, script or culture of its own shall have the right to conserve the same. Article 29 (2) stipulates that no citizen shall be denied admission to any educational institution on ground of religion, race, caste, language or any of them. Article 31 enjoins that all minorities, whether based on religion or language shall have the right to establish and administer educational institutions of their choice. Article 32 provides that the State shall not discriminate against any educational institution on the ground that it is under the management of a minority. Article 350-A insists that it shall be the endeavor of every State and of every local authority to provide adequate facilities for instructions in the mother tongue at the primary state of education to children belonging to linguistic minority groups. Under Article 46 the State is obliged to promote with special care the educational and economic interests of the weaker sections of the society in particular, of the Scheduled Castes and the Scheduled Tribes and shall protect them from social injustice and all forms of exploitation. The National Policy of Education (NPE), 1986 aims at illiteracy eradication in the 15-35 age group to make right to free and compulsory education for Children from 6-4 years of age a fundamental right. An important aspect of the NPE is to ensure the protective discrimination for a large number of sections of society. It aims at enabling a large number of sections of society, through reservation of seats in higher education, special access to colleges and universities.

Universalizing access to primary education and improvement of basic school infrastructure is a core objective of the Tenth Plan (2002-07), which would target at providing one teacher for every group of 40 children for primary and upper primary schools, free textbooks to all Scheduled Castes and Scheduled Tribes (SCs/STs) children and girls at the primary and upper primary school, opportunities for Non-Formal and Alternative Education for out of school children in the most backward areas and for unreached segments of the population in response to local needs and demands articulated at the grass root level, opening a primary school/alternate schooling facility with in 1 km of every habitation, and managing and repairing school buildings through school management committees. A process of planning has guided this massive development and recommendations of several national commissions set up by the Government of India. The objectives of higher education have gradually become more and more precise and a system of governance is developing in the direction of increasing autonomy and accountability. See also under **Programmes and Projects**.

**Programmes and Projects:** Sarva Shiksha Abhiyan, a programme for Universal Elementary Education is a time-bound of the Central Government, in partnership with the States, the local governments and the community, provides elementary education to all children in the age group 6-14 years by 2010.The National Literacy Mission (NLM) was launched in May 1988 for achieving universal literacy in the 15-35 age group. The emphasis under NLM is on sustainability of literacy skills and the achievement of goals of remediation, continuation, and application of skills to actual living conditions. This programme also concentrates on education for weaker sections of society like the members of Scheduled Castes and Tribes, and women. The Total Literacy Campaign has become the principal strategy of the NLM in the eradication of illiteracy throughout the country. The target for achieving total literacy is now 2005 AD. As on December 1996, about 417 districts have been covered either fully or partially under this Campaign. Similarly, 178 districts have been covered either fully or partially under the Post Literacy Campaign. Under all the schemes of NLM, 57.96 million persons, out of an enrolment of 96.80 million, have so far been made literate according to NLM norms. The new scheme of Continuing Education for neo-literates

is now under implementation (approved in December 1995). As the main problem faced in the implementation of the programme of elementary education is the high dropout rates, efforts have been made to counter this by providing free elementary education, with a scheme of free textbooks and uniforms. A scheme for mid-day meals (Nutritional Support to Primary Education) has been recently launched. The scheme is under implementation in all the States to ensure regular attendance and retention in primary and middle schools. In every initiative to promote the spread of education, the girl child is given a special focus of attention. The District Primary Education Programme (DPEP), which became operational in 1994-95, attempts to take a holistic view of primary education development and seeks to implement the strategy of universality of elementary education, through district planning and desegregated target setting. The Mahila Samkhya Project was initiated in 1987-89 for education and empowerment of women in rural areas, particularly of women from socially and economically marginalized groups. Students from SCs/STs are provided scholarships, and there is also a provision for coaching classes for these students, which aim at overcoming their deficiencies.

**Status:** Education is a sector having involvement of various major groups. Special emphasis has come to be laid on women's education. The number of women's colleges has recorded a substantial increase, and India has 1195 women's colleges today. The enrolment of women at the beginning of 1997-98 was 2.303 million, 34% of them being of the postgraduate level. The Census of India currently defines the literacy rate as proportion of literates to total population in age group 7 years and above. It has increased from 18.3% (for the age group 5 years and above) in 1951, 43.6% in 1981 to 65,2% as per the Census 2001. There are, however, large inter state variations in literacy rates in the country. The literacy rate in rural areas increased from about 36% in 1981 to 59% in 2001. The corresponding rates in urban areas were about 67% and 80% respectively, and that in female literacy rate around 30% to 54%. The challenges ahead are achieving universal access to primary education, which requires substantial financial and managerial skills. Environmental education forms an essential ingredient in the education process of the country. The National Policy on Education provides for including environment, among other factors, as an integral part of the curricula at all stages of education. The National Council of Educational Research & Training (NCERT), New Delhi has developed syllabi and curricula on environmental education both for Primary and Secondary School levels. Region-specific training modules for District Institutes of Educational Training rich in environmental concepts have been developed. Environmental education is made an essential component of training programmes for teachers and teacher educators/trainers. The State Boards of Education have started follow up action for development of curricula with environment education as an important element. NGOs are also being encouraged by financial assistance from the government to produce experimental and innovative work in the field of environment education.

**Information:** Information can be obtained from the Department of Education, Ministry of Human Resources Development (http://www.education.nic.in).

**Research and Technologies:** Significant progress has been made in recent years not only in the development and strengthening of basic as well as higher education in terms of improved student access, strengthened research and training programmes, more equitable representation of different social groups, renewed curricula and adoption of new teaching and delivery methods. Progress made in terms of enhanced institutional infrastructure both in the private and public sectors, management and strategic planning capacity is also laudable.

**Financing:** From 1968 onwards, goal has been to set apart 6% of National Income on education. In spite of resource constraints as well as competing priorities, the budgetary expenditure on education by Centre & States as percentage of Gross National Product has steadily increased from 0.8% in 1951-52 to 3.3% in 1994-95. The share of both Central and State Governments, including local bodies, in financing educational institutions continues to be quite high. It accounted for 92.9% of the total income of educational institutions in 1990-91, whereas the share from fees, endowments, and other sources declined sharply. While the Central Government plays an important role for overall policy directions in education and funding of centrally sponsored schemes, the State Governments

provide most of the funding for the education system. Private initiative in education is continuously encouraged to supplement public resources.

**Cooperation:** India has been in the forefront to adopt the new 'information society' technologies. International cooperation in education must be seen in the context of partnerships where countries assist each other by sharing their successful experiences, technologies, material and financial resources and learning to appreciate each other's cultural heritage.

The Indian National Commission for Cooperation with UNESCO (INC), set up in 1949, is an apex advisory, executive, liaison, information and coordinating body at the national level. INC has been playing an active role in UNESCO's work, particularly in the formulation and execution of its programme in collaboration with the UNESCO Secretariat as well as the National Commissions of Asia and the Pacific Region.

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## CHAPTER 37: NATIONAL MECHANISMS AND INTERNATIONAL COOPERATION FOR CAPACITY-BUILDING IN DEVELOPING COUNTRIES.

This issue has been covered either under Chapter 2 or under the heading **Cooperation** in the various chapters of this Profile.

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## CHAPTER 38: INTERNATIONAL INSTITUTIONAL ARRANGEMENTS

This issue deals mainly with activities undertaken by the UN System.

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## CHAPTER 39: INTERNATIONAL LEGAL INSTRUMENTS AND MECHANISMS

**Decision-Making:** India is an active partner in evolution of international law in various fields. India is also committed to ensure compliance with and enforcement of International Agreements, where India is a party.

Legal and Treaties Division in the Ministry of External Affairs is the custodian of all the International Agreements related to India. However, the concerned subject matter Ministries are involved in the negotiation, implementation, follow-up and subsequent monitoring of International Agreements. The coordinating mechanism of Government of India is responsible for all international agreements. Major Groups such as NGOs, Farmers, Industry, Trade Unions are involved in opinion-making in the country.

Consistent with National goals and objectives and using the development planning process as a framework, activities and programmes have been initiated by the Government in the context of Agenda 21. These include legislation to enforce environmental protection, especially in the areas of environmental impact assessment (EIA), pollution control, hazardous waste management, and biodiversity conservation. The following representative cases decided by the Indian judiciary (Supreme Court of India and High Courts) in recent years illustrate the importance given to environmental protection by the Indian legal system:

1. In *Mathew Lukose vs. Kerala State Pollution Control Board*, the right to a healthy environment is referred to as one of the fundamental rights. This case also addresses the issues relating to competing claims that are the growth of industries and the definition of the outer limit of pollution so that it does not infringe the citizens right to a healthy environment. The court noted that: "When the degree of pollution crosses the tolerance limits, it invades the rights... and it cannot pass the mustering right of the Constitution". While considering these competing chims the Court also considered the feasibility of an environment audit preceding the licensing of an industry. It also mooted the creation of a National Environment Agency with powers in areas of planning, enforcement, and sanctions. It further noted that: "An institutional perspective must prevail in these areas and related questions must be upgraded to concerns of National priority." "The world belongs to us, but we owe a duty, to the posterity, to the unborn, to leave this world at least as beautiful as we found it." [1990 (2) Kerala Law Journal, page 717]

2. In M.C. Mehta vs. Union of India, the construction of the common Effluent Treatment Plants (CETPs) in the 28 industrial areas in Delhi was addressed. The Court also considered issues relating to the expenditure involved in constructing these treatment plants. Considering these expenditures, the Court took the view that the industries for whose benefit the treatment plants were installed are bound to cooperate. [1996 (2) Scale (SP) Page 89]

3. In *Subhash Kumar vs. State of Bihar and Others*, the Supreme Court laid down the following Constitutional norms for controlling pollution: right to life is a fundamental right under Article 21 of the Constitution and it includes the right of enjoyment of pollution-free water and air for full enjoyment of life; if anything endangers or impairs that quality of life in derogation of laws, a citizen has the right to have recourse under Article 32 of the Constitution for removing the pollution of water or air; and a petition under Article 32 for the prevention of pollution is affirmable at the instance of affected persons or even by a group of social workers or journalists.[(1991) 1 SCC page 598]

4. In *M.C. Mehta vs. Union of India*, the relocation of industries located near the Taj Mahal, which is known as "Taj Trapezium," to preserve the world famous monument was discussed. The Court requested a report from the National Environmental Engineering Research Institute (NEERI) to help it decide whether it is necessary to relocate the various industries. Considering the report from the NEERI, the Court outlined an elaborate plan to relocate the industries. Subsequent to the implementation of this decision, the Court sought to consider the following issues: Whether all the industries operating in the Taj Trapezium are to be relocated irrespective of the nature of the industry that is hazardous/noxious/polluting/non-polluting; If the answer to the above question is negative, then which type of industries are to be relocated; Whether the Government of India agrees with the suggestion of the relocation outside the Taj Trapezium; and Relocation scheme may be indicated. The industrial estates, within or outside the Taj Trapezium, where the industries can be shifted, may be indicated. [1996 (3) Scale (SP) page 58]

5. In *Indian Council for Enviro-Legal Action, etc. vs. Union of India and Others*, the Court sought to frame special procedure for setting up chemical industries. The court stated, "The Central Government shall consider whether it

would not be appropriate in the light of the experience gained, that chemical industries are treated as a category apart. No distinction should be made in this behalf as between a large scale industry and a small scale industry or medium scale industry. All chemical industries, whether big or small, should be allowed to be established only after taking into considerations all the environmental aspects and their functioning should be monitored closely to ensure that they do not pollute the environment around them. It appears that most of these industries are water-intensive industries. If so, the advisability of allowing the establishment of these industries in arid areas may also require examination." [1996 (2) Scale 44, page 73]

**Programmes and Projects:** A comprehensive plan of action is followed in the country to ensure implementation of various international agreements.

**Status:** International law derives from a number of sources, principally international conventions or treaties, international customary law, and the general principles of law recognized by States. In recent years, each of these sources has displayed features of interest to international environmental law. The inherent reservation notwithstanding, treaties and conventions have made a major contribution to developing international environmental law over the last few years. In order to achieve sustainable development, it is imperative to address on a priority basis the principal social, economic, and environmental challenges contained in Agenda 21. Most international agreements are sector specific in nature, concluded at different times with uneven international knowledge and concern. Therefore, innovative approaches are required in the field of progressive development of international environmental law.

**Capacity-Building, Education, Training and Awareness-Raising:** India advocates for an adequate and in-built mechanism within each international agreement for ensuring capacity-building, education, training and awareness raising efforts at the international, regional and national levels.

**Information:** For further details, please visit Internet website; http://meadev.nic.in.

**Research and Technologies:** Various International Agreements had suitable provision for research and technologies.

**Financing:** Global Environment Facility (GEF) and Multilateral Fund for Montreal Protocol are the important international funding mechanisms.

**Cooperation:** India has become a party to international conventions, which contribute to environmental protection and sustainable development. India has ratified almost all multilateral environmental conventions including the recent Framework Convention on Climate Change (FCCC), the Convention on Biodiversity, the Convention on Straddling Fish and Highly Migratory Fish Stocks, and the Convention to Combat Desertification in Countries Experiencing Drought and/or Desertification Particularly in Africa. Concrete actions have been taken to meet international obligations under these conventions to reaffirm India's commitment to pursue activities leading to sustainable development.

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## CHAPTER 40: INFORMATION FOR DECISION-MAKING

**Decision-Making:** Various ministries of Government of India are responsible for decision-making in the subject-areas allocated to them. In so far as environmental matters are concerned, the Ministry of Environment and Forests (MoEF) is the modal agency for decision-making on environment-related matters at the national level as well as for dissemination of information to the users in its allotted field. The ministries collect information in their specific area and submit it to the Government, with suitable recommendations for making a decision on behalf of the Government. The various departments publish their annual reports and periodically bring out brochures and host available information on the current policy and legislation on the Internet. Information management is carried out by each local government through its Department of Planning/Statistics. Each State is responsible for collection, collation, retrieval and dissemination of information on the subjects related to the particular State Government. Such information is and collated from the State Government by the respective Central Ministry in the Central Government according to the subject. The MoEF, through its agencies, coordinates information on forest cover, control of pollution in the State and environmental issues. Information requested by the Central Government is provided on environmental aspects and its related fields. Although no regulations/laws have been made so far by the Central Government, India is considering enactment concerning right to information. Several groups are consulted in the development of an information system. A Task Force was constituted with individual experts and private sector organizations. The observations/suggestions given by such groups have been incorporated in designing of the system. See also under **Programmes and Projects**.

**Programmes and Projects:** The Ministry of Environment and Forests (MoEF) has set up a National Environmental Information System (ENVIS) as a decentralized network for collecting, collating, storing, retrieving and disseminating information in the field of environment and its associated areas. The ENVIS has developed a home-page of the Ministry at: http://www.nic.in/envfor/envis. The ENVIS is a decentralized information system networks, having 25 nodes, known as ENVIS centres, located throughout India. Each node has been assigned a specific subject-area on environment for developing a database and has been assigned the responsibility for collection of data on a regular basis in its specific subject-area, which is carried out through a survey, collection from secondary sources, through research results, and so on.

The ENVIS has been entrusted with the responsibility of implementing the UNDP and IDRC-assisted project, "Sustainable Development Networking Programme (SDNP)," which is another decentralized information network concept as an externally aided project to provide information on various thematic areas ranging from pollution, biodiversity, and wildlife conservation to agriculture, biotechnology, poverty and climate-change. The SDNP was launched world-wide in 1990 to make relevant information on sustainable development readily available to decision-makers responsible for planning sustainable development strategies. The SDNP also disseminates knowledge on sustainable development and acts as a distributing clearing house of information and functions in close association with ENVIS. The SDNP has set up nodes on thematic areas of sustainable development in various parts of the country. Each node is in the process of developing a website on its earmarked area with an interface to the local language. The SDNP has developed a website to provide linkages with various national and international information systems at: http://sdnp.delhi.nic.in. The SDNP-India is being implemented by the ENVIS a GOI programme, over a period of three years. Similarly, each Central Ministry is having its own instrumental measure for collecting information and disseminating it as and when needed. Various steps have been taken to develop information network capabilities of both the public and private sectors. Information required in the existing network is fed by the scientists, local authorities, NGOs and the Village Panchayats at the grass-root level. Private sector contributes information both in the national network as well as local network. The ENVIS and SDNP networks located in the MoEF have set up nodes in various private sector organizations for collecting information on several thematic areas related to environment. Within the ambit of the Technology Information Forecasting and Assessment Council (TIFAC), an autonomous body set up by the Government, support has been provided to establish databases on energy and environmental technologies at the Tata Energy Research Institute (TERI), New Delhi and the National Chemical Laboratory (NCL), Pune respectively. The National Environmental Engineering

Research Institute (NEERI), Nagpur has a project on the preparation of an information package on cleaner technologies of industrial production. The experience gained in the establishment of information networks and databases, including manpower training and skill development to handle these systems, are an important strength.
Some of the studies completed with TIFAC support include areas like human settlements, industrial raw water treatment, industrial waste water treatment, water treatment technologies, technologies for disposal of thermal power station fly ash, energy conservation technologies (cement industry), energy saving technologies, biotechnology for waste water treatment, and technologies for the treatment of molasses from distillery effluents.
With a well developed space programme, India is fully capable of collating, collecting, analyzing, and applying remote sensing data obtained through its own and international satellites. Some of the uses of remote sensing technology are already far advanced in India and include: the efforts of the National Bureau of Soil Survey and Land Use Planning to use remote sensing techniques for the development of geographic information systems (GIS) for soils, topography, and underground water resources; the programme of the Forest Survey of India for using remote sensing to determine and monitor forest cover and its status; and the programme of the National Wastelands Development Board to map actual and potential wastelands in 146 districts which have more than 15% of their areas under wastelands.
Apart from remote sensing State Governments and the Government of India collect other kinds of data, including: ground surveys of land resources through assessment of the physico-chemical properties of soil along with topography which also leads to the production of useful and necessary village level maps; a mammoth project on water resources in the country undertaken by the Central Water Commission; the Agriculture Census and the Agriculture Input Survey which provide information on the classification of land, land use, and the levels of application of inputs such as fertilizers and organic manure; state data compiled by the Ministry of Rural Development on some of the basic rural indicators like the establishment of biogas plants which provide sources of alternative energy; traditional collection of data by the Registrar General of India through the decennial census; and collection of data on health, mortality and morbidity indices, as well as data on education, food security, employment, and earnings for the Physical Quality of Life Indices (PQLI). In a large and populous country like India, collection of data based on complete sampling is not fully relevant in all cases. The expenditure of both resources and time in the collection of such data might decrease its utility for effective decision-making. Hence, a National Sample Survey Organization (NSSO) has been established to provide trends and useful indicators for decision-making. Recently, the NSSO has commenced data collection on a gender-desegregated basis to provide information about women's status. This facilitates the development of mechanisms for improving their role as primary decision-makers and implementers. Some of the data generated is included as part of a GIS developed by the National Informatics Centre under the General Information Service Terminal-National Informatics Centre (GISTNIC) programme. The database is, however, yet to be fully synthesized and is presently available only to the government users. India has a reasonably well developed informatics network with computers in both Government, and the private and public sectors. These networks are connected through High Speed Optical Cables within India and with international networks. Connections through satellites for very high-speed data transmission have also become a reality and India is able to effectively use the data that may be available on international networks. India has online access to various international databases and networks through DIOLOG, STN, EASYNET, ESA-IRS, etc. CD-ROM databases are also available from vendors like DIOLOG, UMI, SILVERPLATTER and others. The Government has taken steps to strengthen electronic networking capabilities through its communication network. The Ministry of Communication, through its existing mechanisms, supports developing Internet facilities and communication linkages to all information systems in the country. The National Informatics Centre has also set up District Information Centres in various States. The question of bandwidth and regular supply of power is being addressed.

**Status:** Information on environment and sustainable development is accessible through Internet. A set of environmental indicators has been designed for collecting information in environment and its associated fields through ENVIS and SDNP. For example, the contents of oxides of sulphur, nitrogen and suspended particulate matters in case of collection of air pollution data, the BOD level, COD level, OD level, coliform level and total suspended solids are indicators in case of water pollution, and so on. These indicators help in the assessment of

pollution level and formulation of research programmes. The information network in a country like India exists at all levels, particularly at the local and grass root level. In the rural areas of the country, Panchayats, Village Protection Committees have been set up to collect information on various aspects at the grassroots level for onward transmission to the local and national level. With Internet reaching all districts in India the information collection and dissemination process has improved.

*National Decision-Making Structure*:

| | |
|---|---|
| 1.National Sustainable Development Coordination Body: | YES |
| 2.National Sustainable Development Policy: | YES |
| 3.National Agenda 21/other strategy for SD: | IN PROCESS |
| 4.Local/Regional Agenda(s) 21: | NO |
| 5.Environmental Impact Assessment Law: | YES |
| 6.Major Groups involved in Sustainable Development Decision-Making: | YES |

*National Instruments and Programmes*

| | |
|---|---|
| 1. Sustainable. Dev. or Environmental education incorporated into school curricula: | YES |
| 2.Sustainable Development Indicators Programme: | YES |
| 3.Ecolabel Regulations: | YES |
| 4.Recycle/Reuse Programs: | YES |
| 5.Green Accounting Programme: | YES - Municipalities |
| 6.Access to Internet: | YES |
| 7.Access to World Wide Web: | YES |
| 8.A national World Wide Web Site for Sustainable Dev. or State of the Environment: | YES |
| Internet address | www.nic.in/envfor |

*Policies, Programmes, and Legislation*

| | |
|---|---|
| 1.Combatting poverty: | YES |
| 2.Changing consumption and production patterns: | YES |
| 3.Atmosphere: | YES |
| 4.Land Use Planning: | YES |
| 5.Forest and Deforestation: | YES |
| 6.Desertification and Drought: | YES |
| 7.Sustainable Mountain Development: | YES |
| 8.Sustainable Agriculture: | YES |
| 9.Biological Diversity: | YES |
| 10.Biotechnology: | YES |
| 11.Oceans and Coastal Areas: | YES |
| 12.Freshwater Management: | YES |
| 13.Toxic Chemicals: | YES |
| 14.Hazardous Wastes: | YES |
| 15.Solid Wastes: | YES |
| 16.Radioactive Wastes: | YES |
| 17.Energy: | YES |
| 18.Transport: | YES |
| 19.Sustainable Tourism: | YES |

Various thematic areas, which require attention, are: conservation programmes of mangroves, wetlands, estuaries, etc.; biodiversity conservation; control of pollution in air, water including marine; hazardous substances

management; development of eco-friendly products; coastal zone regulations and managements; Joint Forest Management; documentation of medicinal plants, both traditional and herbarium based; and Development of eco-cities and eco-villages, etc. The user-groups like decision-makers, scientists, environmentalists are at the first level, researchers at the second level and the general public at the tertiary level. Major challenges experienced in implementation are the requirement of financial support to the various nodes for capacity building and infrastructure development.

**Capacity-Building, Education, Training and Awareness-Raising:** Several measures have been taken to publicize the existence of ENVIS and SDNP, for its use through electronic media and print media. The existing nodes of ENVIS and SDNP have been financed suitably to strengthen their capability in developing the web site as well as in the collection, collation and dissemination of information to the users.

**Research and Technologies:** The Indian Remote Sensing (IRS) satellites are the main-stay of National Natural Resources Management System (NNRMS), for which Department of Space (DOS) is the modal agency, providing operational remote sensing data services The IRS system has been further enhanced by IRS-1C, IRS-P3 and IRS-1D, the last two having been launched by India's own launch vehicle, PSLV, IRS-1C, launched on 28 December 1995 and IRS-1D launched by PSLV on 29 September 1997, have enhanced capabilities in terms of spatial resolution, additional spectral bands, stereoscopic imaging, wide field coverage and a more frequent revisit capability than its predecessors. Remote sensing applications in the country, under the umbrella of NNRMS, now cover diverse fields such as crop acreage and yield estimation, drought warning and assessment, flood control and damage assessment, land use/land cover information, agro climatic planning, wasteland management, water resources management, under-ground water exploration, prediction of snow-melt run-off, management of watersheds and command areas, fisheries development, urban development, mineral prospecting, forest resources survey, etc. Active involvement of the user ministries/departments has ensured an effective harnessing of the potential of space-based remote sensing. An important application of IRS data is in the Integrated Mission for Sustainable Development (IMSD) initiated in 1992. IMSD, under which 175 districts have been identified, aims at generating locale-specific action plans for sustainable development.

Survey of India (SOI), a national survey and mapping organization under the Ministry of Science & Technology fulfils the ever-growing demand of vast variety of maps of the country. In addition to topographical mapping, SOI is also charged with the responsibilities of other related activities, such as R&D programmes in the field of geodesy, geophysical studies, seismic city, glaciology, indigenization of instruments/equipments, etc. SOI has started creation of Digital Cartographic DataBase of topographical maps on 1:25 K, 1:50 K and 1:250 K scales. The digital data is being used by various agencies for planning and GIS applications. It also undertakes large-scale surveys for various developmental projects including hydroelectric, irrigation, command area, canal area, cantt. area schemes. Coastal mapping has also been undertaken in a phased manner to study the effect of submergence due to rise in sea-level and other natural phenomenon. Survey of India also provides support to neighboring countries in the field of survey education, transfer of technology and various other surveying technologies under bilateral programmes. Under Indo-Bhutan Survey Collaboration project, experts in the field of geodesy, cartography, digital cartography, computer application, printing, etc., have been deputed to Bhutan for acceptability tests of various machines/equipment including training to the officers of Survey of Bhutan. A Geomatics Centre has been planned at Delhi to meet the requirement of geomatics, viz., regional and urban planning, resource management, infrastructure development, environmental monitoring, agriculture, irrigation, soil conservation, forestry, railways, airways, inland water transport, mineral resources, etc.

In the recent years SOI has been involved in various inter-disciplinary scientific projects like Sea-Level, Modeling and Monitoring (SELMAM) project of Department of Ocean Development (DOD), modernization of cadastral surveys, glaciology programme of DST, etc. Survey of India has been participating in Indian Scientific expeditions to Antarctica and has strong international linkages especially with International Cartographic Association (ICA), International Society of Photogrammetry and Remote Sensing (ISPRS), South Asian Association for Regional Co-operation (SAARC), International Association of Geodesy (IAG), etc. A map awareness drive has been launched by Survey of India to bring attractive maps in convenient folded size and reasonably priced on various themes, viz,.

Antique Map Services, Discover India Series, State Map Series, District Planning Map Series, Tourist Map Series, Trekking Map Series, etc. A Survey Training Institute established under UNDP assistance is a premier institution for training in various disciplines of surveying to the trainees sponsored by the department, other State/Central government organizations and neighboring countries.

While SOI meets the national needs in cartography, some specialized thematic maps required to meet the needs of the specific users are taken care of by the National Atlas and Thematic Mapping Organization (NATMO), operating under the Department. It also concentrates its attention in a number of areas to integrate resource maps with other relevant socio-economic data and represent them in spatial forms, useful for developmental planning. NATMO is trying to develop the new technology of reverse printing for NATMO maps on experimental basis. It is also trying to introduce the technique of using metallic colors in map printing. These facilities are also being modernized. The new technologies like Remote Sensing Application, GIS, Application of Local Area Network and Wide Area Network are being introduced in this regard. The Botanical Survey of India (BSI), established in 1980, is responsible for surveying and identifying the plant resources of the country. With its headquarters at Kolkatta and nine circles located in different regions of the country, the BSI undertakes exploration tours of the country regularly and the results of such tours are published in the form of national, state and district flora. Established in 1916, the Zoological Survey of India (ZSI) is responsible for carrying out surveys of the faunal resources of the country. While the headquarters of the Zoological Survey of India is at Calcutta, it has 16 regional stations located in different parts of the country. ZSI also undertakes regular faunistic survey tours of the entire country.

The Forest Survey of India (FSI), established in 1981, is entrusted with the task of surveying the forest resources of the country. Besides the headquarters at Dehra Dun, FSI has four regional offices located at Bangalore, Calcutta, Nagpur and Shimla. It prepares thematic maps on 1:50,000 scale and forest vegetation maps on 1:2,50,000 scale of the country. The thematic maps are prepared for the entire country on a ten-year cycle. The vegetation represents 19.27 % of geographic area. Out of this, dense forest (crown density more than 40%) accounts for 11%, open forest (crown density 10-40%) represents eight percent, while mangrove forest occupies 0.15%. For data management and assessment along with ground truth verification, GIS model and other modern techniques are being used: Satellite based Communication Network; Application of Remote Sensing Technology with high resolution; suitable high-speed server for easy and quick dissemination; and laptop facilities at remote locations. The National Information System for Science and Technology (NISSAT) facilitates coordination of information services in the country. It has helped establish National information centres in various sectors like leather technology, food technology, machine tools and production, drugs and pharmaceuticals, textiles, chemical and allied industries, advanced ceramics, etc.

**Financing:** Various Ministries utilize the amount for information management and dissemination out of the budget allocated to them. In case of MoEF, roughly, 4% of its allocated budget is used by ENVIS. Efforts are being made to enhance the budget in case of ENVIS and to strengthen the system network depending upon the availability. Efforts are also being made to make SDNP network as a society for getting financial support from the private sector as well as from other corporate bodies to maintain its sustainability.

**Cooperation:** In case of SDNP, the entire requirement comes from the external sources such as the UNDP and IDRC. The ENVIS network is also linked with INFOTERRA, the Global Information Network of UNEP, in gathering and sharing information on sustainable development. The SDNP is also linked with SDNP-New York in this regard. The ENVIS is publishing a quarterly newsletter 'ENVIRO NEWS' on a monthly basis. Guidelines and assistance in terms of technology and methodology is received from time to time from International Information Networks like INFOTERRA, IRPTC and GEMS of UNEP. National indicators in the field of environment have been developed on issues related to sustainable development in the existing information network. Information is also retrieved from various other international networks through linkages for providing to policy planners and decision-makers. However, cooperation in other countries at the international level is still required in accessing information on various issues related to sustainable development. The major issues not covered earlier in this field are as follows: human resource development and gaining of knowledge through training and workshops at

international level for various information networks; cooperation on exchange of information from developed and developing countries; and, capacity building through bilateral cooperation for the existing information networks. See also under **Programmes and Projects**.

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## CHAPTER: INDUSTRY

**Decision-Making:** The Ministry of Commerce and Industry is the major coordinating body for industrial policy. Major stakeholders are periodically consulted by the Government. The basic legislation for regulating the industrial sector is the Industrial Development and Regulation Act, 1951. Environmental Regulation the relevant legislation has been listed elsewhere in this profile. In order to strengthen the technological capabilities of Indian industries, both for meeting National needs and for global competitiveness, a number of new initiatives have been launched. A Technology Development Board was established in 1996 with a mandate to facilitate development of new technologies, and the assimilation and adaptation of imported technologies by providing catalytic support to enable industries and R&D institutions to work in partnership with each other. Matching grants to R&D institutions showing commercial earnings through technology services were also introduced in 1996 and will be continued and broadened. Already, a long-term perspective called Technology Vision for India 2020 has been prepared, which could form the basis of technology development programmes. The Industrial policy of the country has changed over time and is reflected in the various planning documents. The latest document is the Approach Paper to the Tenth Plan, which has also proposed to carry forward the process of deregulation and de-reservation. Changes that have taken place in the last decade are the opening up to the private sector of several industries that had been reserved for the public sector. In addition, a number of industries have been opened up for foreign private investment on increasingly liberal terms.

**Programmes and Projects:** Adoption of Cleaner Production Technologies and formation of Waste Minimization Circles are being encouraged to minimize environmental pollution. Under the World Bank aided Industrial Pollution Control Project, technical and financial assistance is provided for establishing Common Effluent Treatment Plants (CETPs) in clusters of small scale industrial units at, for example, Mumbai, Surat, and Chennai. An Eco-Mark scheme has been launched to certify various products of industries, which fulfill the prescribed standards of environment-friendly production, packaging, and waste disposal.

**Status:** The expanded scope for specializing in areas of comparative advantage is manifest in the improved growth performance of the economy. Furthermore, while exports have vigorously responded to the removal of the anti-export bias of a protectionist environment, domestic industry appears to have been stimulated by the expanded availability of imports and capital goods, and the challenge of competing in the international market place. Major industrial cities along the coastline like Mumbai, Surat, Cochin, Chennai, Visakhapatnam discharge approximately 0-7 x 109 cubic metres of waste. There are 1,551 industries located along the coastline of the country and all the major ones treat their effluents before disposal. There are innumerable small and medium scale industries, which dispose untreated waste into creeks as well as sewage. Several tanneries located in Calcutta and near Chennai have been strongly recommended for closure in cases where they do not install treatment plants within the stipulated period specified by the Apex Court of the country. In addition to tariff barriers in certain sectors, a concern for Indian industry is the impact t of international environmental regulations on competitiveness and the potential for a rise in 'green protectionism'. Many developed countries have set physical requirement for imported products such as: standards and technical regulations, packaging, eco-labelling and recycling requirements. Indian export from the textiles, machinery equipment, leather and chemicals industry has faced such environmental regulation. The imposition of environmental regulations has significant trade implications for India, as the costs of compliance with the standard could be very large, particularly for the small and medium scale enterprises that form a sizeable proportion of the export sector. The technical and financial capacity of these firms to conform to environmental regulations set by developed countries is limited. The resulting loss of competitiveness, market access and export revenues could further limit ability to implement improved environmental standards.

**Capacity-Building, Education, Training and Awareness-Raising:** There are a large number of programmes for capacity building, training and awareness-raising for the industry adapt to the changing international scenario and the environmental standards and requirements.

**Information:** Information is available on the web at: http://goidirectory.nic.in/ministry.htm; http://commin.nic.in; and, http://envfor.nic.in.

**Research and Technologies:** universities and Economic Institutions undertake research programmes on industrial development and related subjects. Various industrial associations also undertake/commission studies on improving technology and competitiveness of the Indian Industry.

**Financing:** Funds are provided through National Financial Institutions, private sector, public sector, government sources and foreign collaborations/Foreign Direct Investments.

**Cooperation:** The adoption of a New Industrial Policy in 1991 was accompanied by a series of complementary reforms in fiscal, trade and foreign investment policies, which gradually opened up the industrial sector to international competition. There was a shift in focus from import substitution to competitiveness in international markets, with trade liberalization contributing to reducing effective protection for industry. The Foreign Direct Investment (FDI) policy was further liberalized and limits for foreign equity participation in domestic industrial undertakings were enhanced. In 1996, a list of nine industries, which included infrastructure, electronics and software, for which joint ventures up to 74% foreign equity would be automatically cleared, was approved. The number of industries eligible for automatic approval up to 51 % foreign equity was also expanded from 35 to 48. Domestic Industry is increasingly open to competition from international markets, with quantitative restrictions on imports removed with effect from April 1, 2001. Tariff levels have also been decreased drastically since the initiation of reforms. It is estimated that India's weighted import tariff has declined from around 90% at the start of reforms to around 34% in 2001/02.

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## CHAPTER: SUSTAINABLE TOURISM

**Decision-Making:** The Ministry of Tourism, Government of India is the modal agency for the formulation of national policies and programmes and for the coordination of activities of various central and state government agencies and the private sector for development of Tourism. However, all the environmental regulations are formulated by the Ministry of Environment and Forests. State Governments/District Administration/Local Bodies and Councils are responsible for sustainable tourism at the local level and enforcement of the regulations. There are several Acts and laws, which ensure sustainable tourism. These are the Wild Life Protection Act 1972, the Environment (Protection) Act 1986, and Prevention of Cruelty to Animals Act 1986. These do not set aside any specific area for tourism, but such areas have to be identified by the State Governments and obtain the required approvals/relaxation. There are established procedures stipulated by the Ministry of Environment and Forests for project clearance and monitoring. There are deterrents in these strategies to check, control or penalize damaging environmental practices on the part of businesses and visitors. The National Policy on Tourism lays emphasis on sustainable development of tourism. In addition, the Government has brought out a comprehensive Eco Tourism Policy and Guidelines. All issues relevant to sustainable tourism are covered in the policy and guidelines. The Eco tourism policy and guidelines will ensure regulated growth of eco tourism and nature based tourism with its positive impacts of environment protection and community development. Ecotourism policies and Guidelines have been formulated by the Government in consultation with the industry and are being implemented on a voluntary basis. The environment regulations are mandatory. All the players of the tourism industry including consumers have hailed these codes and have shown sensitiveness to the environment. The National Policy on tourism lays emphasis on development of ecotourism and preservation of natural and man-made tourist attractions and resources. The policies and guidelines on ecotourism are specifically on the development of sustainable tourism.
The National Tourism Policy envisages a very big role for all the stakeholders in the decision making process. They are involved in the development of tourism and have contributed substantially in sustainable tourism in the country.

**Programmes and Projects:** The major programmes to promote sustainable tourism include: preparation of Master Plans for tourism development; Tourism Awareness; Integrated Development of Destinations; implementation of Eco tourism policies and programmes. Examples of the ways in which eco-tourism and nature-based tourism are being promoted include: Eco-tourism projects in Kerala-Coconut Grove and Spice Village Resorts; the Bangaram Island Resorts; Bekal Resorts, Kerala; Jungle Lodges and Resorts, Karnataka; and, sustainable development project of Andamans.

**Status:** Tourism is second largest net earning of foreign exchange generating about 3 billion dollars. Tourism generates larger employment opportunities per tourist. The present level of tourist traffic has not adversely impacted sustainable development. Hotels and other tourist establishments follow the guidelines framed by the Ministry of Tourism. The main strength of Indian tourism at present is its cultural attractions, particularly monuments and archeological remains fairs and festivals, wild life and beaches. The aim of the tourism policy now is to diversify the tourism product in such a way that the development of ecotourism and nature based tourism is promoted to attract environmentally conscious tourists. The Ministry of Tourism is making vigorous effort for the sustained growth of tourism through synergy programme and establishing effective coordination with state governments and other agencies to develop infrastructure for sustainable tourism. There are no serious constraints on pursuing sustainable tourism.

**Capacity-Building, Education, Training and Awareness-Raising:** The Indian Institute of Tourism and Travel Management organize periodical training programmes on various aspects of sustainable tourism. They also organize separate programmes for policy makers and administration. The Ministry of Tourism has launched Tourism Awareness Programmes in collaboration with Pacific Asia Tourism Association (PATA) India Chapter and the Industry. The programme has been well received by the industry and the consumers.

**Information:** Information is disseminated through brochures, computer media, Workshops for tour operators, travel agents and other concerned parties. Mapping and inventorying of natural resources and ecosystem characteristics in tourist areas is an ongoing activity of the Government. Potential users of information have to approach the concerned agencies. Information is also available on the Internet at: www.tourismofindia.com.

**Research and Technologies:** Technology-related issues are already incorporated in the ecotourism and Environment Policies of the Government.

**Financing:** Activities in this area are through the national budget and private sector partnership.

**Cooperation:** The Ministry of Tourism and the Government of India are promoting India as a major tourist destination through its tourist offices in abroad and mission. The Ministry is also participating in international meetings/exhibition, fairs and festivals, seminars, etc. Sustainable tourism is promoted through all these efforts. The Environmental pledge is printed in every brochure produced by the Ministry of Tourism. Bangaram Island in Lakshadweep group of Islands, India is a model sustainable tourism destination. Cooperation is generally provided through guidance and financial assistance. Examples of other cooperation in this area include: The conservation project of Ajanta and Ellora, which has been taken up with the assistance of Overseas Economic Cooperation Fund (OECF) of Japan. A study for the development of a strategy for Environmentally Sustainable Tourism in Andamans has been completed with the assistance of World Tourism Organization (WHO) and United Nations Development Programme (UNDP).

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