Country Environmental Profile

India

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Main environmental issues

The environmental problems in India are more health and livelihood threatening in nature. Air pollution, soil degradation, deforestation, desertification, shrinking wetlands, inadequate public health and sanitation, indoor pollution in rural areas, growing water scarcity, falling groundwater tables, lack of minimum flow in rivers, and over extraction of water for irrigation purposes are some of the environmental problems that need to be addressed first before any poverty alleviation programme can be truly successful.

The country can be classified into four broad geographical areas including the Himalayas (East & West), Indo-Gangetic Plains, the Thar Desert and the Southern Peninsula flanked by the Western and Eastern Ghats. In addition there are also the island systems of Lakshadweep & Minicoy Islands in the Arabian Sea and the Andaman & Nicobar Islands in the Bay of Bengal. Fourteen major river systems, besides a number of smaller water bodies, drain through the landmass of the country.

The Human Development Report (HRD 2001) places India at the 115th position in the world as judged by the Human Development Indicator (HDI). India's HDI was estimated at 52.9. In comparison, the average HDI of all other developing countries was 64.5. On other parameters such as infant mortality, literacy rates, access to amenities, etc., though there has been a distinct improvement over the last couple of decades, India's performance relative to the other developing countries in the world has been less than satisfactory.

Environmental health risks emanate from a combination of complex factors. Poverty, among others, is perhaps the most crucial that puts populations at risk. Other factors include access to safe drinking water and sanitation in rural and urban areas, air quality (especially in urban areas), indoor air pollution (especially in poor rural and urban households), solid waste management and agro-industrial pollution.

The ambient air quality has deteriorated all over the country, especially in the semi-urban and urban areas. Anthropogenic activities result in air pollution on account of 3 major sources: stationary sources (use of fossil fuels in industries and thermal power plants) mobile sources (vehicles) and in-door sources (burning of bio-mass). The relative contribution of the 3 sources varies across the country depending upon various factors.

The level of urban wastes being generated in different cities poses a serious threat to the environmental quality and human health. Approximately 36.5 million tonnes of solid waste is generated annually. Many cities generate more solid wastes than they can collect or dispose off effectively. Even when there are adequate resources available by way of

public provisions to the municipal authorities, the safe disposal of urban solid wastes often remains a major problem.

Vehicular traffic is the main source of noise pollution. In most Indian cities, noise levels in residential, commercial and sensitive areas (hospitals, educational institutions and courts) exceed the prescribed standards set by the CPCB.

Policies, strategies and the international agreements

According to the Draft National Environment Policy 2004 of the Ministry of Forests and Environment, Government of India, the key environmental challenges that the country faces relate to the nexus of environmental degradation with poverty in its many dimensions, and economic growth. These challenges are intrinsically connected with the state of environmental resources such as land, water, air, flora and fauna.

India is a signatory to six important conventions that have a direct bearing on environment protection and conservation. These are: a) The Convention on International Trade in Endangered Species (CITIES); b) The Convention on Wetlands of International Importance (the Ramsar Convention); c) The Convention on Climate Change; d) The Convention for Conservation of Biological Resources; e) The Vienna Convention/Montreal Protocol on substances that deplete the ozone layer; f) The Rio Declaration on Environment and Development and the Agenda 21, which is the operational programme for sustainable development.

On account of its backward and forward linkages with other economic sectors, changes in agricultural performance have a multiplier effect on the entire economy. Its performance is therefore crucial in the task of reduction and eventual elimination of poverty in India.

Despite the existence of a robust legal and regulatory framework as well as an elaborate institutional set up, a number of concerns persist with regard to forests and biodiversity. Some of the critical factors are: deforestation, over-cutting beyond silviculturally permissible limits, unsustainable fuel wood and fodder extraction, shifting cultivation, forest fires, over grazing and diversion of forest land for non-forestry purposes etc. However efforts to mitigate some of these pressures have also shown encouraging results.

Though a wide-ranging framework of environmental management is already in place in India, the challenge lies in improving the efficacy of these interventions. It is important to complement the existing laws with the introduction of economic instruments such as charges on industrial emissions, effluents and wastes and incentives for clean technologies etc.

Even though numerous measures for reducing emission levels of vehicles, in India, were initiated during the ‘90’s, the targets for emission reduction have not been fully met. Poor quality of fuels and low turn around of vehicles are primarily responsible for the high emission levels that characterize Indian vehicles. The renewed strategy for reducing vehicular pollution should revolve around mandating stricter emission standards coupled with stricter periodic certifications for ‘in-use’ vehicles; tightening the fuel quality standards and adhering to accepted ‘world-class’ technologies mandatory for newer vehicles.

India's energy sector is primarily characterized by low levels of per capita energy consumption, which leads to the question of equity; high dependence on bio-mass and drought power especially in rural areas emphasizing the need for improved access to modern sources of energy; significant share of coal as a source of primary energy with related environmental consequences and heavy reliance on petroleum and petroleum products' imports.

Strategies have also been formulated to augment power supply in short to medium run by increased generation through Renovation and Modernization (R&M) of old stations; utilization of the surplus capacity of the captive power plants into the grid; demand Side Management (DSM) to flatten the demand curves (introducing time of day tariffs and metering); introduction of a new system of matching time and load profiles for different zones in the countr; energy Conservation and improved efficiency; evacuation of power from the surplus to deficit regions and carrying forward liberalization of power sector from earlier reforms that were confined to generation to further reforms in transmission and distribution sectors.

On one hand, the energy requirements of agriculture, industry, trade and domestic consumers need to be met in a cost-effective and environmentally benign manner. On the other hand, the capital-intensive energy sector faces a greater degree of risk that is related to the investment becoming unviable due to changes on account of international prices, technology and demand shifts. In order to meet these twin objectives, India looks forward to new international partnership for concrete action.

93% of the available water resources are used for agriculture while only 4% is for industrial purposes. The total water requirement is projected to grow to 1,180 billion cubic meters by the year 2050. The national average of annual per capita availability of water is about 1,829 cubic meters. However this is likely to decline to about 1,557 cubic meters by the year 2015, primarily due to an increase in population.

Concerns in the water resources sector include groundwater depletion, degradation of water quality, inefficiency in water use and management, unrealistic water pricing policies, and inappropriate institutional framework and legislation etc.

A variety of specialized marine ecosystems like mangroves, coral reefs, salt lakes and mud flats form the habitat for a number of endangered marine species and commercially important marine flora and fauna. 3,960 sites of coastal wetlands have been mapped covering an area of 40,230 sq. km of which 97 major estuaries, 34 major lagoons and 241 creeks are reported to be important for conservation.

EC cooperation in India

If we look at the history of EC Cooperation with India we find that it has progressed from project–based funding to sector–wide approaches in health and education. Given India's vastness and administrative and political complexity, the new 'partnership for progress' approach between EC and India has concentrated on a state partnership rather than for the whole country. This has enabled EC to spend its limited resources more effectively. Under this new approach, the EC-India partnership would now evolve around sectors like

education, health and environment/natural resource management. These sectors constitute as the main public instruments through which poverty reduction could be achieved.

In the poor states of India like Chhatisgarh and Rajasthan there is always a cross cutting influence of environment issues in industries, agriculture, rural development, public health and infrastructure. In India in general and in the States of Chhatisgarh and Rajasthan in particular, attention would be required in water-land resource interface, participatory irrigation management, conversion of agricultural land for non-agricultural purposes, migration due to soil degradation, stake of landless communities in local water bodies for fishing, community participation and ownership in forestry, preservation of rare species and indigenous knowledge on useful species etc.

Challenges and plans

A major set of challenges arises from emerging global environmental concerns such as climate change, ozone depletion and biodiversity loss. India is of the view that multilateral regimes and programmes responding to these global environmental issues must not adversely impact its development opportunities. India also emphasizes that sharing of global natural resources must proceed only on the basis of equal sharing per-capita across all countries.

According to the Country Plan, DFID will support reforms in sub-sectors that can reward poor people's labour and promote sustainable and pro-poor growth: for example, the segments of the agricultural and unorganized non-farm sector where poor people are concentrated; provide support to enable the poor to access markets, better returns on their assets and improved opportunities from the labour market; work with governments to enhance public and private investment; and analyze the context-specific opportunities and constraints facing the poor and how they can participate more fully in growth.

ADB will also continue to increase its portfolio in environmentally oriented projects by seeking opportunities for leveraging concessional funds through co-financing, including from the Global Environment Facility.

USAID-India's Environment Strategic Objective (SO) is consonant with the Agency's Economic Growth, Agriculture, and Trade pillar and consistent with the GoI's Tenth Five-Year Plan. Environmental benefits will also be realized, both in terms of improved water resource management and reduced greenhouse gas emissions from the use of cleaner, more efficient technologies in the power sector.

1 State of the Environment

A poor environment undermines development, while inadequate development results in lack of resources for environmental protection.

The environmental problems in India are more health and livelihood threatening in nature. Air pollution, soil degradation, deforestation, desertification, shrinking wetlands, inadequate public health and sanitation, indoor pollution in rural areas, growing water scarcity, falling groundwater tables, lack of minimum flow in rivers, and over extraction of water for irrigation purposes are some of the environmental problems that need to be addressed first before any poverty alleviation programme can be truly successful.

1.1 Physical Environment

The country can be classified into four broad geographical areas including the Himalayas (East & West), Indo-Gangetic Plains, the Thar Desert and the Southern Peninsula flanked by the Western and Eastern Ghats. In addition there are also the island systems of Lakshadweep & Minicoy Islands in the Arabian Sea and the Andaman & Nicobar Islands in the Bay of Bengal. 14 major river systems, besides a number of smaller water bodies, drain through the landmass of the country.

1.1.1 Biological conditions, biodiversity, ecology and nature conservation

India occupies only 2.4% of the world's land area but its contribution to the world's biodiversity is approximately 8% of the total number of species.

India's wide range of climatic and topographical features has resulted in a high level of ecosystem diversity encompassing forests, wetlands, grasslands, deserts, coastal and marine ecosystems. Forest area stands at 63.73 million ha (19.39 of geographical area) including 37.74 million ha (11.48%) dense forest, 25.5 million ha (7.76%) open forest and 0.49 million ha (0.15%) mangroves. 16 major groups comprising 221 forest types are found. Nearly 45,000 plant species (including 6% of the world's flowering plants) have been identified. Of these, a third of the 15,000 flowering plants are endemic to India. Of the 81,000 identified species of animals in the country, 14% of its 1,228 bird species, 32% of its 446 reptiles and 62% of its 204 amphibians are endemic to India. The country also has 330 species of mammals. Two of 18 internationally recognized biodiversity hotspots are the Eastern Himalaya and Western Ghats. Wetlands include a rich diversity of inland and coastal wetland habitats covering 4.1 million ha of the landmass. The

coastline of India extends over 7,500 kms while the marine ecosystems cover 2.1 million sq.km. Deserts cover 2% of the Indian landmass.

A network of 586 legally designated protected areas that include 89 national parks and 479 sanctuaries. This cover 4.3% of the country's geographical area. It also includes 13 Biosphere Reserves and 27 Project Tiger Reserves.

Nearly 167 species of crops, 320 species of wild crop relatives besides several species of domesticated animals are known to have originated here. Among these are 50,000 varieties of rice, 1,000 mangoes, 5,000 sorghum, and 500 pepper varieties, 27 breeds of cattle, 22 goats, 40 sheep, 18 poultry and 8 breeds of buffaloes. Besides, 20,000 known deposits with as many as 87 minerals (including 4 fuels, 11 metallic, 50 non-metallic and 22 minor minerals) currently being exploited.

Forest cover

Forests constitute an important component of livelihood resource, especially for the tribal people and those living in the forest fringes (estimated to be around 100 million people). The forests also provide environmental benefits such as watershed protection, prevention of soil and water run-off, ground water recharge, purification of air and water by acting as a sink for green house gases like carbon dioxide, conservation and genetic resources and bio-diversity, recreational services and aesthetic value.

However, in India less than 1/5th of the total land area is under forest cover and has remained so for nearly two decades. While the dense forest cover over the same period has stabilized to around 37 million hectares, approximately 25 million hectares are open forests. Since open forests have a canopy cover of less than 40%, it affects the quality of ecosystem services and the quality of life of some of the poorest people in the country, who derive their sustenance from this resource.

Water resources

India is considered rich in terms of annual rainfall and total water resources available.

However there are problems of uneven distribution of water resources and inequitable access, further compounded by deterioration in water quality. Improvement of water quality and conservation of water resources is therefore one of utmost concern.

Of the total estimated 432 cubic Km of replenishable ground water resources, nearly 92% are estimated to be utilizable. So far however, India has been able to exploit only 32% of the same. The total river water resources have been estimated at around 1953 cubic Km. Despite the estimated quantity of available water, it is predicted that the country's total water resources in the year 2050 will barely be able to match the country's total water requirements. This underscores the urgent need to develop an integrated approach to the development and management of water resources in the country. In addition maintaining a balance between the availability and requirements across basins, regions and between sections of the population adds another dimension to the challenge.

The other important issue is the deteriorating quality of water resources. The task of continually monitoring the water quality standards of the nation's aquatic resources is the

mandate of the Central Pollution Control Board (CPCB) in collaboration with the State Pollution Control Boards. The monitoring results indicate that organic and bacterial contaminations are the predominant sources of pollution in the water resources of the country. The unmitigated release of untreated municipal sewage into the rivers and river systems of the country is reducing the level of dissolved oxygen required to support aquatic life. As a result, the pollution levels in terms of Biological Oxygen Demand (BOD) are increasingly leading to the destruction of aquatic life. Chemical effluents released into the water are also similarly having a detrimental effect on the quality of the aquatic resources of the country.

1.2 Socio-economic and socio-cultural conditions and human health

The Human Development Report (HRD 2001) places India at the 115th position in the world as judged by the Human Development Indicator (HDI). India's HDI was estimated at 52.9. In comparison, the average HDI of all other developing countries was 64.5. On other parameters such as infant mortality, literacy rates, access to amenities, etc. though there has been a distinct improvement over the last couple of decades, India's performance relative to the other developing countries in the world has been less than satisfactory.

Indicators in Box 1.1 point to indicate that the challenge before the nation in terms of improving the basic factors that provide a decent quality of life to it's populace is rather onerous.

Box 1.1 Environmental challenges

10th Plan Targets	Millennium Development Goal Targets	Where we are now
Poverty to be cut to 20% by 2007 and to 10% by 2012	Extreme poverty to be halved	National definition 26% International definition 35%
All children to be in school by 2003; all children to complete 5 years of schooling by 2007	Ensure that all children can complete a full course of primary education	8 out of 10 children start primary school and 6 complete the full five years
Literacy to increase to 75% of the population by 2007; cut the difference between male and female literacy by half	Eliminate the difference between male and female literacy completely	Literacy 65% Women 52% Men 74%
Reduce infant deaths to 45 for every thousand births by 2007 and to 28	Reduce deaths of children under the age of 5 by two thirds (target 40 deaths for every thousand births) Reduce deaths due to child	Infant mortality: 68 per thousand births Under-five mortality: 93 per thousand births Levels around 4 to 5½ per thousand births

10th Plan Targets	Millennium Development Goal Targets	Where we are now
per thousand by 2012 Reduce deaths due to child bearing to 2 per thousand births by 2007 and to 1 per thousand by 2012 All villages to have sustained access to good drinking water by 2007	bearing by three quarters Halve the proportion of people without safe drinking water (target – 85% of people have safe water)	Access to safe water – 95% of urban families 84% of rural families (but not all sources are sustainable)

Source: India Country Plan: Partnership for Development, DFID, February 2004, P.4.

Combating poverty and its eventual eradication has been the central theme of all the major policies and programmes of the Government of India since independence. In the decade of the '90's, the 'focussed intervention' of the Government on various social development sectors bore fruit. At the beginning of the '90's, an estimated 320 million people, or 36% of the total population, were below the poverty line. However, by the end of the decade, India succeeded in bringing down the number of people living below the poverty line by 18.75% to 260 million. In absolute numbers, a huge 60 million people were brought above the poverty line in 10 year's time.

Despite the impressive statistics, the nation is aware that the absolute number of people still living below the poverty line is huge. The proportions of poor people in rural and urban areas are 27% and 23.62% respectively.

Understandably, a 1 billion strong populace has an immense impact on the total volume and quality of resources. The heterogeneous demands emanating from diverse set of claimants, ranging from subsistence goods to seeking support for opulent life styles, put pressure on the forest cover and water resources and its' contribution to environmental pollution is enormous.

1.3 Environmental challenges

1.3.1 Natural Disaster Risks

India is one of the most natural disaster-prone countries in the world due to its unique geographical position and behaviour of the monsoons. Frequent droughts, floods and cyclones are the hallmarks of these disasters. Recently, India's east coast was affected by Tsunami.

Rapid population growth and urbanization trends are accelerating vulnerability to disasters as settlements encroach into disaster-prone areas. In order to combat these

disasters, the country's strategy has now shifted from post-disaster management to advance disaster preparedness and mitigation. In order to make seismological observations, 57 seismic stations are operating in different earthquake-prone areas of the country. Periodic rainfall forecasts are made through Indian Meterological Department (IMD) as part of drought mitigation planning. A network of 132 forecasting stations are maintained by the Central Water Commission (CWC) to combat floods. IMD carries out cyclone tracking and warning through cyclone warning centers in various parts of the country.

1.3.2 Environmental Health Risks

Environmental health risks emanate from a combination of complex factors. Poverty, among others, is perhaps the most crucial that puts populations at risk. Other factors include access to safe drinking water and sanitation in rural and urban areas, air quality (especially in urban areas), indoor air pollution (especially in poor rural and urban households), solid waste management and agro-industrial pollution. The health effects measured in terms of Disease Adjusted Life Years (DALY) lost are in Figure 1. Some of the factors affecting environmental health are highlighted below:

1.3.3 Air pollution

The ambient air quality has deteriorated all over the country, especially in the semi-urban and urban areas. Anthropogenic activities result in air pollution on account of 3 major sources: stationary sources (use of fossil fuels in industries and thermal power plants) mobile sources (vehicles) and in-door sources (burning of bio-mass). The relative contribution of the 3 sources varies across the country depending upon various factors.

The National Human Development Report 2001 (Planning Commission) mentions that the ambient air quality recorded for 23 major cities in the country revealed that the Suspended Particulate Matter (SPM) levels are critical in many cities in the country. What is more startling is the fact that in smaller and medium towns of the country, the SPM levels are for higher than the larger metropolitan cities. Also, in addition to the common air pollutants like sulphur dioxide and the oxides of nitrogen, several toxic and carcinogenic chemicals are being detected in urban air.

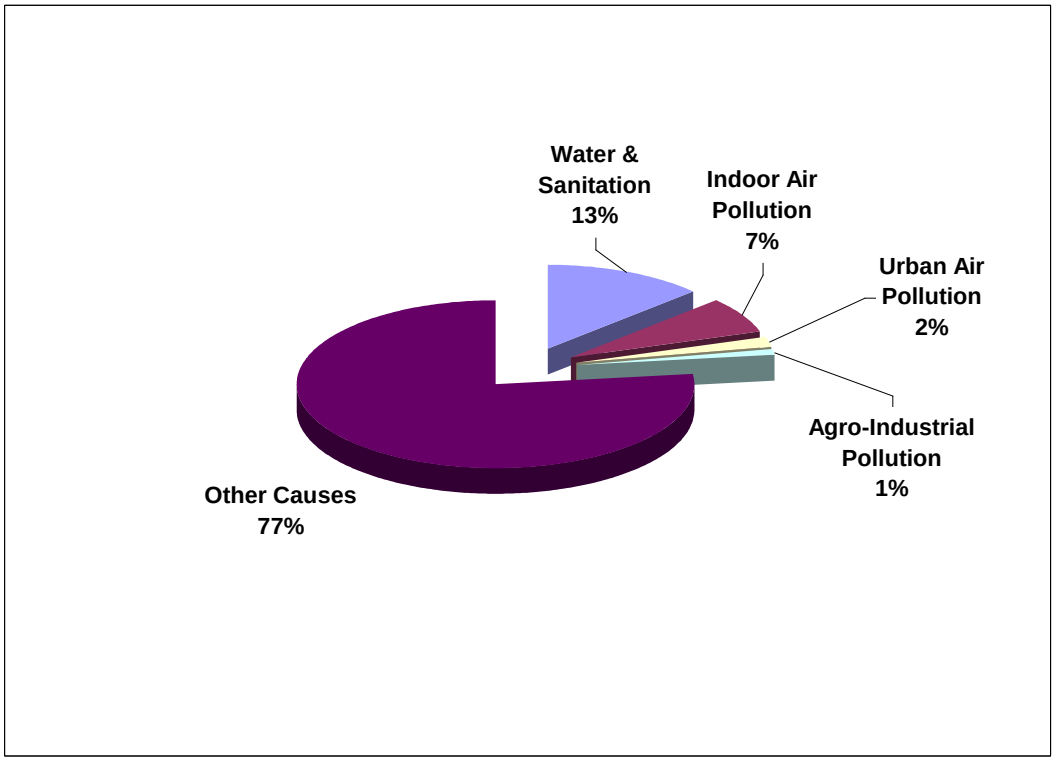
In the rural areas, the burning of unprocessed cooking fuels in homes is a major source of pollution. Rural households rely mostly on bio fuels like cow dung, fuel wood, and crop residues and in some cases low grade coal for meeting their fuel and energy requirements. The indoor pollution on account of pollutants released in closed and unventilated places is perhaps more harmful than outdoor air pollution. It is estimated that indoor air pollution in India's rural areas is primarily responsible for 500,000 deaths annually, mostly of women and children under 5. This accounts for 6 to 9% of the Disease Adjusted Life Years. These estimates make the health impact of indoor exposure larger than the burden from all but two of the other major preventable risk factors – malnutrition (15%) and lack of clean water and sanitation (7%).

1.3.4 Urban Solid Waste Management

The level of urban wastes being generated in different cities poses a serious threat to the environmental quality and human health. Approximately 36.5 million tonnes of solid waste is generated annually. Many cities generate more solid wastes than they can collect or dispose off effectively. Even when there are adequate resources available by way of public provisions to the municipal authorities, the safe disposal of urban solid wastes often remains a major problem. The problem is made worse by unscientific waste disposal systems used. Dumping and uncontrolled land filling are the two options that municipal authorities resort to. These methods of waste disposal are the primary cause for diseases. Due to inadequate collection, improper disposal and lack of proper storage facilities, solid wastes get into open drains and obstruct the free flow of water, which in turn becomes an ideal breeding ground for diseases.

The municipal solid waste sites often receive industrial and hazardous waste including those from hospitals and laboratories adding to serious consequences for the environment and the health of individuals. The system of disposing non-biodegradable urban solid waste is at a very nascent stage in the country.

Figure 1.1 Diseased Adjusted Life Years (DALY) lost due to adverse environmental factors



Source: Empowering People for Sustainable Development, Ministry of Environment and Forests 2002 P.7.

1.3.5 Noise pollution

Vehicular traffic is the main source of noise pollution. In most Indian cities, noise levels in residential, commercial and sensitive areas (hospitals, educational institutions and

courts) exceed the prescribed standards set by the CPCB. Only in the industrial areas, the noise levels are within acceptable limits, but only during the night! In most residential and sensitive areas around the Indian cities, the noise levels even exceed the limits prescribed for industrial areas. This is a cause for serious concern. The existing legal provisions have largely remained un-enforced and adequate social awareness is yet to surface.

2 Environmental Policy, legislative and institutional framework

2.1 Environmental Policies

According to the Draft National Environment Policy 2004 of the Ministry of Environment and Forests, the key environmental challenges that the country faces relate to the nexus of environmental degradation with poverty in its many dimensions, and economic growth. These challenges are intrinsically connected with the state of environmental resources such as land, water, air, flora and fauna.

According to the Policy, environmental degradation is a major causal factor in enhancing and perpetuating poverty, particularly among the rural poor, when such degradation impacts soil fertility, quantity and quality of fresh water, air quality, forests and fisheries. The loss of the environmental resource base can result in certain groups of people i.e. Scheduled Castes (SC), Scheduled Tribes (ST) and other marginalized being made destitute, even if overall the economy shows strong growth. Due to lack of waste treatment & sanitation, industry and transport related pollution adversely affect air, water and soil quality, which differentially impacts the health of the urban poor. This, in turn, affects their capability to seek and retain employment, attend school, and even enhances gender inequalities. All these factors perpetuate poverty.

The Ministry of Environment and Forests sees the following major objectives to achieve in the national environmental policy:

- Conservation of critical environmental resources which are essential for life-support and livelihoods;
- Livelihood security for the poor ensuring equitable access to quality environmental resources;
- Integration of environmental concerns in economic and social development plans, among others by introducing the “polluter pays” principle;
- Ensuring efficient use of environmental resources in the sense of reduction in their use per unit of economic output;
- Applying principles of good governance to the management and regulation of use of environmental resources;
- Ensuring higher resource flows for finance, technology, management skills, and traditional knowledge for environmental conservation.

2.2 National approaches to key international environmental conventions

2.2.1 International Agreements to which India is a Signatory

India is a signatory to six important conventions that have a direct bearing on environment protection and conservation. These are:
a) The Convention on International Trade in Endangered Species (CITIES)
b) The Convention on Wetlands of International Importance (the Ram Sar Convention)
c) The Convention on Climate Change
d) The Convention for Conservation of Biological Resources
e) The Vienna Convention/Montreal Protocol on substances that deplete the ozone layer
f) The Rio Declaration on Environment and Development and the Agenda 21, which is the operational programme for sustainable development. Two important procedures to be observed in the context of environment protection in industry are:

Following the Earth Summit in 1992, several important agreements were arrived at. Among these were the UN Framework Convention on Climate Change, Convention on Biological Diversity and the Statement of Principles to guide the management, conservation and sustainable development of all types of forests. These added to the already existing Vienna Convention for the Protection of the Ozone Layer of 1989 (now better known as the Montreal Protocol) and in 1996, the UN Convention to Combat Desertification. Since then there have been several meetings of governments to try and sort out contentious issues, which have met with limited success. Several countries have ratified these treaties while others prefer to prolong negotiations before their specific concerns are addressed.

The current position of the Government of India on these international agreements is highlighted below.

UN Framework Convention on Climate Change
India signed the Convention on Climate Change in 1992 and ratified it in 1993. The Convention recognizes that there are common but differentiated' responsibilities that all countries have with regard to climate. The Kyoto Protocol of 1997 provides for flexible mechanisms that enable reduction in emissions of greenhouse gases. Among these is the Clean Development Mechanism, which allows project-based emission, trading between developing and developed countries and emission trading within developed countries. For a long time the position of the Government of India, as that of other developing nations, has been that the Convention should be based on the principles of equity and social justice. This essentially means that future growth needs to be ensured nationally while international efforts are made to avert the threat of climate change.

Convention on Biological Diversity (CBD)
India signed and ratified the CBD in 1994. Since then, the Ministry of Environment & Forests has submitted two full reports (1998 & 2001) on progress made on CBD-related commitments to the CBD Secretariat. In addition, the two significant national processes under this Convention are the preparation of the National Forestry Action Programme – India (NFAP) and the National Biodiversity Strategy & Action Plan (NBSAP). Several

other steps have also been taken on the other requirements of CBD at the policy and programme levels.

UN Convention to Combat Desertification

The MoEF has prepared a National Action Programme to combat desertification.

Montreal Protocol

In 1992 the Government of India acceded to the Montreal Protocol and a year later prepared the India Country Programme for phasing out production and use of ozone depleting substances (ODS). Incentives to industry to adopt new clean technologies includes waiver of duties for investment in non-ODS technologies, restrictions on financial institutions to fund ODS technology based enterprises, research and development in non-ODS alternatives. The Multilateral Fund has approved projects amounting to US$ 93 million for India in the aerosols, foams, refrigeration and air conditioning and solvents sector. Further assistance from the Multilateral Fund is expected in the coming years.

2.3 Environmental legislations and enforcement

Article 48A of the Directive Principles of State Policy of the Constitution of India provides for the State's commitment to protecting the environment. Article 51A(g) states that to protect and improve the natural environment shall be the fundamental duty of the citizens of India.

In observation of the Directive Principles, the Union of India has enacted the following major legislations:

a. The Environment (Protection) Act, 1986, which is the umbrella Legislation
b. The Water (Prevention & Control of Pollution) Act, 1981, as amended in 1978 and 1988
c. The Air (Prevention & Control of Pollution) Act, 1981, as amended in 1987. The above two Acts have been substantially amended in the recent past and some of the most significant aspects of amendments are:
    - A consent order is now valid for 15 years or till such time there is some significant change in the process, whichever is earlier;
    - A consent order cannot be provided provisionally and will be obtainable only when all the pollution prevention requirements are adopted in toto; Action under these two Acts are to be taken by the respective State Pollution Control Boards.
d. The Forest Conservation Act, 1980
e. The Wildlife Preservation Act, 1982; extended to cover biosphere resources and the Hazardous Wastes (Management & Handling) Rules, 1989.
f. Manufacture, Storage and Import of Hazardous Chemical Rules, 1989
g. Manufacture, Use, Import, Export and Storage or Hazardous Micro organisms and Genetically Engineered Organism or Cell Rules, 1989, to regulate the storage, use, trade, transport and disposal of hazardous wastes.
h. The Public Liability Insurance Act, 1991
i. The Motor Vehicles Act, 1939, amended in 1988, and

j. The Environment Tribunal Bill, 1992.

Based on the legislative provisions listed above, and spurred by the increasing claim development is putting on scarce environmental goods, GOI has over the years, developed a number of policies, of which the most important are listed below:

a. The National Forest Policy, 1988
b. The National Conservation Strategy and Policy Statement on Environment & Development, 1992.
c. The policy statement for abatement of pollution, 1992
d. The above policy statements complement the National Water Policy and Factories Act, 1948, besides other related legislation having a bearing on resources and economic activities
e. The national Housing Policy, 1988, the National Water Policy, 1987 and the National Land Use Policy, 1988, recognize the importance of maintaining ecological balance.

2.3.1 Environmental Audits

All units seeking consent under the Water or Air Acts or Authorisation under the Hazardous Wastes (Management & Handling) Rules, beginning 1993, are required to submit environmental statements for the period ending 31 March on or before 30 September every year to the concerned SPCB. The Central and State Pollution Control Boards are responsible for enforcing legal action against polluters. Detailed below are the different fiscal benefits for environment protection:

- Depreciation allowance at the rate of 100 per cent for installing pollution control devices.
- Customs duty at reduced rates of 35 per cent plus 5 per cent auxiliary charges levied on imported equipment and spares for pollution control.
- Customs duty at the reduced rate of 25 per cent and full exemption from auxiliary charges for kits required for conversion of petrol driven vehicles to compressed natural gas driven vehicles.
- Excise duty at the reduced rate of 5 per cent on manufactured goods that are used for pollution control.
- Excise duty exemption for bricks and blocks manufactured from fly ash and phospho-gypsum.
- Exemption under section 35 CCB of the Income Tax Act is given to assesses who incur expenditure by way of payments on any sum towards association or institutions which carry out programs for conservation of natural resources.
- Financial assistance towards capital investment up to 25 per cent or Rs. 50 lakh, whichever is less, is given as subsidy to industrialists from the small scale sector for setting up common effluent treatment facilities.
- Incentives in terms of rebate on water cess payable under the Water (Prevention & Control of Pollution) Cess Amendment Act, 1991.
- Provision of loans at reduced rates of interest by financial institutions for installing pollution control devices, for example:
    - The Industrial Credit and Investment Corporation of India (ICICI) has a $ a 25 million Trade in Environmental Services and Technologies (TEST) scheme

which carries loans at 12.5 per cent with no exchange risk for the dollar assistance (Funded by the USAID);

- Industrial pollution control projects funded by the World Bank; the Bank offers loans on concessional terms, which are received by the MOEF and disbursed through different financial institutions.

2.3.2 Environmental Clearance Procedures

Under the Environment (Protection) Act, 1986, 24 categories of projects and industries will require environmental clearance from the Central Government. In addition, any project proposed to be located within 10 km of the boundary of a reserved forest or a designated ecologically sensitive area or within 25 Kms of the boundary of a national park or sanctuary will require environmental clearance from the Central Government. For all other projects, environmental clearance needs to be obtained only at the level of the State Government. Clearance is required from the environmental (for site clearance) and pollution control angle, which has to be obtained by all units other than certain, specified non-polluting units in the small-scale sector.

No Objection Certificate (NOC) for the site clearance usually involves clearance from the concerned State Pollution Control Board. NOC is also required for adequacy of pollution control measures. In general, the State Pollution Control Board is the concerned authority, which will usually specify certain pollution control measures to be taken by the unit.

2.3.3 Setting standards and related legislation.

The environmental standards cover a wide spectrum of resources and sectors, ranging from drinking water standards to disposal of radioactive waste. Many institutions, laws and notifications working in tandem have propelled the movement to achieve these standards. How these standards and legislations work out for water, air and waste disposal is briefly described below.

Water

Specific standards have been set for drinking water, discharge of industrial effluents, coastal water, and marine outfalls and effluent discharge from selected specific industries. While the drinking water standards developed by Indian Council of Medical Research bear a close resemblance to WHO standards, discharge of industrial effluents is governed by Indian Standard Codes, which take into account the specificity of Indian conditions. There are specific standards for effluent discharge from industries such as, iron and steel, aluminium, pulp and paper, oil refineries, petrochemicals and thermal power plants.

The water quality monitoring results were analyzed with respect to indicator of oxygen consuming substances (bio-chemical oxygen demand) and indicator of pathogenic bacteria (total and fecal coliform).

Water (Prevention and Control of Pollution), Act was promulgated as early as 1974. The Act prohibits discharge of pollutants into the water bodies beyond a given standard and also lays down penalties for non-compliance. Water (Prevention and Control of Pollution)

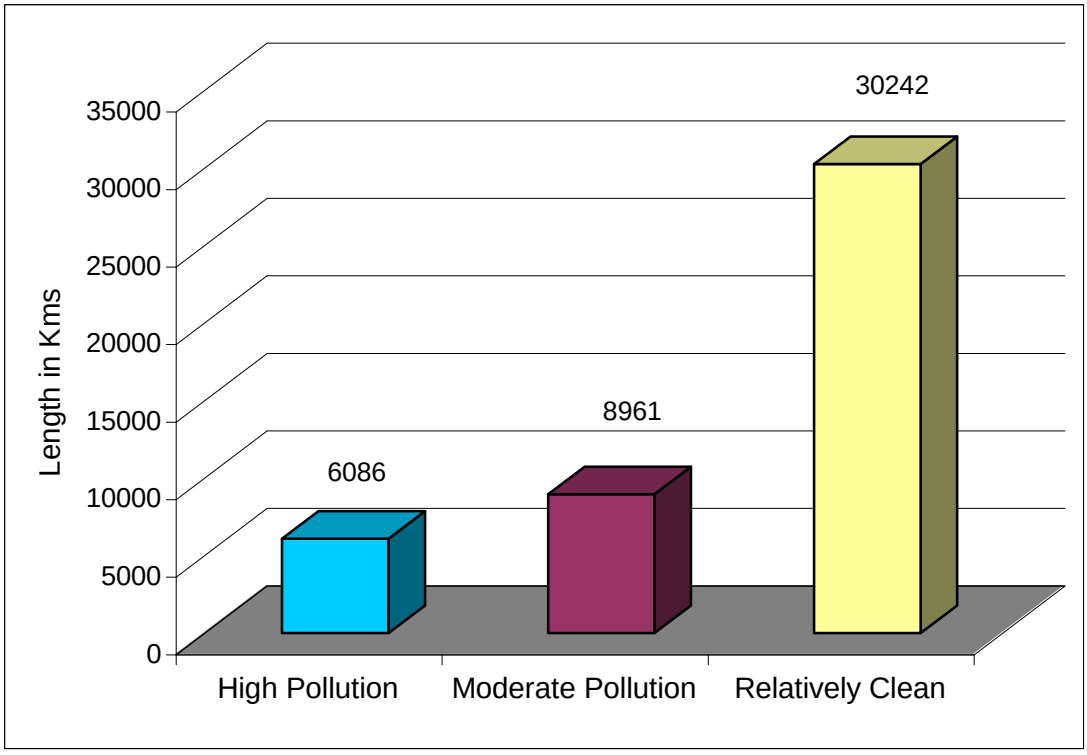
Cess Act 1977 provides for a levy and collection of cess on water consumed by industries and local (municipal) authorities to augment the resources for regulatory authorities.

Air

Air pollution poses a major health hazard. It has been a subject of major debate in media, environmental circles and judiciary.

National Ambient Air Quality Standards (NAAQS) for major pollutants notified by the CPCB in 1994 are deemed to be levels of air quality necessary with an adequate margin of safety, to protect public health, vegetation and property. The NAAQS prescribes specific standards for industrial, residential, rural and other sensitive areas. Industry specific emission standards have also been developed for iron and steel plants, cement plants, fertilizer plants, oil refineries and the aluminium industry. The NAAQS are similar to those prevailing in many developed and developing countries.

Figure 2.1 Length of river stretches as per level of pollution



Source: Empowering People for Sustainable Development, Ministry of Environment and Forests 2002 P.28.

MoEF plays a coordinating role with the concerned ministries and associated bodies for upgradation of automobile technology, improvement in fuel quality, expansion of urban public transport systems, promotion of integrated traffic management and setting of emission standards for transport sector. Accordingly, for vehicles with gross vehicle weight (GVW) equal or less than 3500 kg, emission standards known as Bharat II (akin to Euro II) have been enforced in the four metropolitan cities. Similarly Mass emission standards have been notified for vehicle with GVW exceeding 3500 kg for the four

metros and for the vehicles driven by liquefied petroleum gas and compressed natural gas.

CPCB, SPCBs, Pollution Control Committees, specified Universities and Institutes monitor the ambient air quality. The National Ambient Air Quality Monitoring Programme (NAMP) comprises 290 stations in 92 cities/towns. The air quality of different towns/cities with respect to three critical pollutants has been compared with the respective NAAWS and has been categorized into four broad categorized based on Exceedence Factor (EF). EF is defined as the ratio of observed annual mean concentration to the annual standard for the criteria pollutant for the specific area class. The four air quality categories are given in Box 2.1.

Box 2.1 Air quality categories

Air Quality Category	EF
Critical Pollution (C)	>1.5
High Pollution (H)	1.0 – 1.5
Medium Pollution (M)	0.5 – 1.0
Low Pollution (L)	<0.5

The available data for 70 cities/towns shows that level of Suspended Particulate Matter is at critical level in residential areas of 33 cities/towns.

Air (Prevention and Control of Pollution) Act provides means for the control and abatement of air pollution. It seeks to combat air pollution by prohibiting the use of polluting fuels and substances, as well as by regulating appliances that give rise to air pollution. Under the Act establishing or operating of any industrial plant in the pollution control area requires consent from the state.

Waste Disposal

Municipal services and industrial waste disposal facilities have not been able to keep pace with the growing population and rapid industrialization. As a result India faces serious challenge of disposal of municipal solid waste, hazardous waste, bio-medical waste and radioactive waste in environmentally sound manner. In the last ten years a framework of laws, rules, research and institutions is emerging that attempts to meet this challenge. Environment (Protection) Act has been used to issue notifications to tighten the rules of management of waste, fix institutional responsibility, enhance resources for waste disposal and specify standards for land fill sites and treating of pollutants. The following notifications issued by MoEF under the Environment (Protection) Act lay down the guidelines for management of various types of wastes:

Municipal Wastes (Management and Handling), Rules, 2000, aims to enable municipalities to dispose municipal solid waste in a scientific manner. Biomedical Waste (Management and Handling) Rules, 1998, brought out a guide for manufacture, storage and import of hazardous chemicals and for management of hazardous wastes. Hazardous

Wastes (Management and Handling) Amendment Rules, 2000, a recent notification issues with the view to providing guidelines for the import and export of hazardous waste in the country. In addition, the Atomic Energy Act of 1982 deals with radioactive waste.

2.4 Environmental institutional framework

2.4.1 Institutions

The Ministry of Environment and Forests, created in 1986, is the nodal regulating agency. The Ministry has four divisions:

a. Environment: The Central Pollution Control Board (CPCB) functions under it and this Ministry is responsible for exercise of promotional and regulatory functions under the Water, Air and Environment Protection Acts.
b. Forests and Wildlife: Wildlife preservation offices responsible for implementing the Wildlife Protection Act, 1972 and the Regional Offices of the MOEF for implementing the provisions of the Forest Conservation Act, 1980.
c. Ganga Project Directorate
d. National Afforestation and Eco-Development Board.

In addition to the above, there are various bodies and institutes under the MOEF or working with it on other areas such as research, awareness drives etc. Other important Ministries and Departments of the Government of India looking after environment protection include:

a. The Ministry of Rural Development - Regeneration of bio-mass outside recorded forest areas;
b. The Ministries of Power, Industry and Non Conventional Energy Sources - Energy conservation and development of alternate sources of energy.
c. The Ministry of Water Resources - Monitoring of water quality and environment impact assessment for water resource projects.
d. The Ministries of Water Resources and Agriculture - watershed management;
e. The Ministry of Agriculture - soil conservation;
f. The Department of Biotechnology - technical support for ex-site conservation and bio safety;
g. The Ministry of Urban Development - Solid waste collection and disposal in 500 urban areas. State-level machinery:

All the state governments looking after environment and forests collectively.
Most of the states have State Pollution Control Boards (SPCBs) which have a significant role to play in enforcing environmental management and pollution control as required under different laws.

A Central Pollution Control Board (CPCB) monitors water quality of national aquatic resources in collaboration with State Pollution Control Boards (SPCBs). It has a network of 507 monitoring stations covering rivers, groundwater, lakes, canals, creeks, drains, ponds etc. The Central Water Commission also has a network to measure flow and monitor water quality at about 369 field stations. In addition, the Central Ground Water Board (CGWB) monitors groundwater quality at 15355 stations. In an effort to assess the

health of a water body, the CPCB has also initiated a bio-monitoring project under the Indo-Dutch collaboration Programme on Environment and selected 215 locations for the purpose.

A number of specialized institutions established and/or supported by the government have for several years been engaged in carrying out inventories of biodiversity resources, making collections, classification, experiments on commercial uses as well as basic research and training of scientists and field staff. These include the country's premier institutions, like the Botanical Survey of India (BSI) and the Zoological Survey of India (ZSI), for monitoring the state of the country's flora and fauna, the Forest Survey of India (FSI) which monitors and reports every three years on the state of the country's forests while the India Council for Forestry Research and Education (ICFRE) co-ordinates research and training via numerous smaller specialized institutes and organizations spread across the country. The Wildlife Institute of India (WII) and the Salim Ali Institute of Conservation, Ornithology and Natural History (SACON) are the two leading agencies undertaking research and training on wildlife and protected areas.

2.5 Integration of environmental concerns into the main sectors

2.5.1 Agriculture and forestry

Agriculture

Agriculture continues to be the mainstay of the Indian economy. At around 26.8%, agriculture and allied activities remains the single largest contributor to the gross domestic product (GDP). The dominance of the sector is even more vital, in the area of employment as it employs two-third of the country's workforce. Several major Indian industries, such as sugar, textiles, jute, food processing, and milk and milk processing depend on agriculture. On account of its backward and forward linkages with other economic sectors, changes in agricultural performance have a multiplier effect on the entire economy. Its performance is therefore crucial in the task of reduction and eventual elimination of poverty in India.

Small and marginal farmers dominate the Indian agriculture scene. Together they constitute 78% of Indian cultivators. Agricultural labourers constitute the other significant component of agriculture workforce whose numbers are almost equivalent to that of cultivators. Despite the structural domination by small landholders and agricultural labourers, Indian agriculture has shown remarkable capacity for technology absorption and innovations as would be seen from the following sections.

Diversification of agriculture

The true potential of Indian agriculture can be realized only with the diversification of agricultural products, both geographically and over time. The food and nutritional requirements of the people for leading healthy lives, demand a wider range of food products than are presently consumed on average. It also calls for increasing the production of pulses and oilseeds. Keeping in mind the fact that non-food-grain food products are perishable in nature it is important to encourage diversification through minimization of wastage. This will require considerable focus on post-harvest

technologies and marketing infrastructure. It would also require a reconsideration of the various rules and regulations that govern agricultural trade. In the current scenario these rules frequently act against the interests of the farmers and distort their incentive structure. Science and technology, especially biotechnology, will play an important role in diversification of agriculture and also in increasing productivity of various crops. Transgenic varieties in rice and wheat have been produced to improve stress tolerance. A number of initiatives to increase plant resistance against virus and pests using biotechnology are already under research.

The Government of India has adopted Integrated Pests Management (IPM), which lays stress on pest management through a combination of agronomic, chemical and biological methods. IPM is being promoted in the country through 26 integrated pest management centers. Timely sowing, use of tolerant and resistant plant varieties, bio-control agents and need based application of chemical pesticides have resulted in the reduced consumption of technical grade pesticide from 75,000 tonnes in 1991 to 49,160 tonnes in 1998-99. Similarly, a strategy for judicious combination of chemical and bio-fertilizers will be pursued to reduce dependence on chemical fertilizers alone. The Department of Biotechnology has initiated the integrated nutrient management programme through 17 centres. The programme focuses on development of integrated nutrient management packages suitable for specific cropping systems.

Forestry

The forests constitute an important resource for conservation of biodiversity and maintenance of eco-system functions. They also constitute a critical livelihood resource for the people who live in and around forests. It is estimated that out of 260 million people that live below the poverty line, more than 100 million are partially or wholly dependent on forest resources for their livelihoods. These include more than 70 million tribal people of India. There are strong correlations between the locations of tribal people, forests and areas with a concentration of poverty. Ability of poor to continue their livelihoods is partially dependent on the health of forest resources and their ability to access these resources. The National Forest Policy of 1988 recognized these concerns and radically changed the objectives of forest management wherein the conservation of forest resources and subsistence needs of forest dependent communities were given paramount importance and revenue motive was also downgraded. Thus conservation of forest resources and livelihood of forest dependent people are two parallel and equally important objectives of forest management in the country.

Conservation of Forests and Terrestrial Biodiversity

Despite the existence of a robust legal and regulatory framework as well as an elaborate institutional set up, a number of concerns persist with regard to forests and biodiversity. Some of the critical factors are: deforestation, over-cutting beyond silviculturally permissible limits, unsustainable fuel wood and fodder extraction, shifting cultivation, forest fires, over grazing and diversion of forest land for non-forestry purposes etc. However efforts to mitigate some of these pressures have also shown encouraging results. For instance, between 1950-1980, the total area of forestland diverted for non-forestry uses was 4.5 mha at an average annual rate of 0.15 mha. Following the promulgation of

the Forest Conservation Act in 1980, the annual rate of diversion has come down to 0.02 mha.

Forest based livelihoods found full recognition in the National Forest Policy (NFP), 1988. While the forest-dependent communities had certain rights and privileges on forestlands even before the NFP was adopted, most such rights were considered as largesse granted by the state to the forest dwellers. The NFP completely reversed this notion as it recognized the fact that decentralized management of natural resources improves the resource as well as livelihood. The policy is unambiguous "The holders of customary rights and concessions in forest areas should be motivated to identify themselves with the protection and development of forests from which they derive benefits. The rights and concessions from forests should primarily be for the bonafide use of communities living within and around forest areas, specially the tribals". As far as tribal communities are concerned, the policy recognizes that "The life of tribals and other poor living within and near forests revolves around forests. The rights and concessions enjoyed by them should be fully protected. Their domestic requirements of fuelwood, fodder, minor forest produce and construction timber should be the first charge on forest produce. Similar consideration should be given to scheduled castes and other poor living near forests". The policy became a major instrument in bringing about a change in the forest management from policing the forest area to co-managing forests with the people. The new management system is widely known as Joint Forest Management and has been extended to peripheral areas of Park and Sanctuaries under the name of ecodevelopment. Similarly Panchayati Raj Extension to Scheduled Areas Act (PESA) provides greater authority to tribal people to manage their forest resources.

Future Strategy

The Ministry of Environment and Forests has been instrumental in preparing the National Forestry Action Programme (NFAP) that provides a comprehensive work plan for sustainable development of forests in India for the next 20 years. Following the provisions of National Forest Policy it incorporates both concerns; conservation of forest resources and sustainability of forest based livelihoods. The NFAP identified five interrelated basic issues confronting forestry development in India, for which detailed programmes have been made. The programme structure of NFAP is explained in Box 2.2.

Box 2.2 Programme structure of NFAP

Protect Existing Resources: Comprises of three main programmes: (i) Forest Protection, (ii) Soil and water conservation, and (iii) Protected areas and biodiversity conservation. These include, forest survey, demarcation and mapping, industry, biodiversity conservation, protected areas management, protection against poaching, encroachment and fire, etc., and other related issues.

Improve Forest Productivity: Includes four main sub-programmes of (i) rehabilitation of degraded forests, (ii) research and technology development, (iii) development of NWFPs, and (iv) assisting private initiatives with community participation. These involve mainly research, improvement in technology, enrichment planting, soil and water conservation, regeneration, rehabilitation and afforestation mainly in existing forests.

Reduce Total Demand: Has three sub-programmes for the efficient use of (i) fuelwood and fodder, (ii) timber, and (iii) NWFPs. This includes the programmes for reduction of demand placed on forests through the technology of preservation, seasoning, substitutions, and other measures for the efficient utilization of forest products and also through biomass plantations.

Strengthen Policy & Institutional Framework: Has three main sub-programmes aimed at strengthening of (i) central forestry administration, (ii) central forestry institutions, and (iii) state forestry administration and institutions. These include the development of infrastructure such as buildings, communications, etc. and the strengthening of staff including HRD. This issue covers all aspects of capacity building, forest policy and legislation, public forest administration and organizational structure, research, planning and budgeting, etc.

Expand Forest Area: Has two main sub-programmes: (i) tree plantation on forest and non-forest lands, and (ii) people's participation in plantations and its protection. This issue includes the extension of forestry programmes in all kinds of wastelands and marginal farmlands. It also includes the programmes of certain kinds of plantation forests through wastelands reclamation, afforestation and promotion of agro forestry.

2.5.2 Industry, mining and oil extraction

The Industrial Sector

The major challenges on the path to the sustainable development of the industrial sector are:

- Linking existing laws with environmental performance. Though a wide-ranging framework of environmental management is already in place in India, the challenge lies in improving the efficacy of these interventions. It is important to complement the existing laws with the introduction of economic instruments such as charges on industrial emissions, effluents and wastes and incentives for clean technologies etc.
- Improving resource efficiency. There is considerable scope for improving resource efficiency in Indian industries (for example, the energy saving potential alone is around 25%). Measures such as recycling and use of secondary materials, development of mandatory energy efficiency norms for new process industries and energy labelling for equipment are some of the measures that would help increase energy efficiency. Voluntary agreements by industry associations on behalf of their members could be another means for improving efficiency.
- Strengthening the role of the private sector. Although the role of the private sector has been considerably strengthened in the last decade and the Government has begun a process of disinvesting from non-strategic areas, the envisaged extent of disinvestments of the public sector has not taken place. The situation is expected to improve with the Tenth Five Year Plan period. The Approach Paper to the 10th Five Year Plan calls for the creation of an industrial policy environment in which private sector companies and the erstwhile public sector units will compete in an open market and move towards greater efficiency in resource utilization.
- Trade liberalization. Even though the need to bring down tariff levels has been emphasized by successive governments, import protection is still very high and tariff levels are much higher than those prevalent in other nations. To streamline the import protection measures with that of other countries, it has been proposed that India's import tariffs be lowered to match that of other East Asian countries. A three-year frame for the implementation of this proposal has been announced.
- Employment generation and labour welfare. Though two Acts have been passed (in 1996) with the aim to regulate employment and conditions of service as well as safety health and welfare measures for a vulnerable section of workers in the unorganized sector, these have not been enough to protect the interest of workers in the

unorganized sector. It is imperative that the existing legislations are strengthened and new legislations focusing on environmental health and safety of workers be introduced.

Petroleum and Natural Gas

India Hydrocarbon Vision 2025, a document brought out by the Government of India, lays down the framework to guide the approach and policies in the petroleum and natural gas sector for the next 25 years. Understanding the need for an efficient market for this sector, the Government dismantled the Administrative Price Mechanism (APM) for petroleum and natural gas products on 1st April 2002. It was felt that dismantling the APM would allow a clearer reflection of the scarcity value of such an exhaustible natural resources in its prices. It was also felt that the removal of arbitrary administrative restrictions on consumption and imports of petroleum products would further accelerate process of economic growth of the country.

2.5.3 Transport, Power & Energy and Water & Marine Resources

India's Transport Sector

The trend of increasing passenger and freight movement by roads has lead the road sector to grow disproportionately in comparison to the other transport sub-sectors. This has several environmental and social repercussions. Some of the major challenges facing the transport sector today are:

- Improving the energy efficiency in the transport system. Improving the energy efficiency in the transport system is a major challenge for the transport sector. Though the railways are a more energy efficient means of transportation, there is a distinct skewedness in favour of road transport as compared to the rail and the other sectors. The policies for the road and rail sectors also fail to address this issue. Liberalization of the transport sector has put further pressure on railways' share in freight transport. In the road sector, the share of public transport in passenger movement is declining because of a gradual withdrawal of state funding. This has lead to a disproportionate growth in the number of personal vehicles and their regular use. As a result, the consumption of petroleum and petroleum products has increased substantially. This has led to greater air pollution and release of green house gases (GHGs) in the atmosphere.
- Meeting emission targets. Even though numerous measures for reducing emission levels of vehicles, in India, were initiated during the '90's, the targets for emission reduction have not been fully met. Poor quality of fuels and low turn around of vehicles are primarily responsible for the high emission levels that characterize Indian vehicles. The renewed strategy for reducing vehicular pollution should revolve around mandating stricter emission standards coupled with stricter periodic certifications for 'in-use' vehicles; tightening the fuel quality standards and adhering to accepted 'world-class' technologies mandatory for newer vehicles.
- Creating the right climate for private sector investment in the transport infrastructure. Private sector participation in the area of transport infrastructure has not produced the desired results. The primary reasons for this are:
    - The huge investments involved with road projects and their long gestation period makes this area highly risky for the private sector to invest in. Hence the

private investment in the road sector has been limited to the building of over-bridges and bypasses, which are commercially more viable.
    - Though Private Sector participation in the development of the parts and airports sectors has been high on the agenda, very little has actually been done to make the plans into a reality.
    - The fact that the operations and control of major ports in the country still remains in the hands of the Government, makes this sector unattractive to private investments.

India's Energy Sector

India's energy sector is primarily characterized by:

- Low levels of per capita energy consumption, which leads to the question of equity.
- High dependence on bio-mass and drought power especially in rural areas emphasizing the need for improved access to modern sources of energy.
- Significant share of coal as a source of primary energy with related environmental consequences.
- Heavy reliance on petroleum and petroleum products' imports.

Despite high GDP growth rate of the nineties, India's Total Primary Energy Supply (TPES) remains one of the lowest in the world. At 0.48 toe/capita, it is approximately 30% of the world average of 1.65 toe/capita and far lower than that of industrialized countries like Japan (which is at 4.07 toe/capita) and USA (which is even higher at 8.32 toe/capita). Even in terms of electricity consumption, which is a good proxy measure for energy consumption, India remains at the bottom of the world table.

India's Power Sector

Over the last few decades, especially in the last 10 years, the country has made significant progress towards the augmentation of its power infrastructure. In absolute terms, the achievement of increasing the installed power capacity from 1,362 MW in 1947 to over 100,000 MW by 2000, and the electrification of more than 500,000 villages are quite impressive. However, universal access to a cost-effective mix of energy resources that are compatible with the different needs and requirements of various sections of Indian society still remains to be achieved. In so far as commercial power is concerned, almost 71% of the present installed capacity is generated from thermal sources, 24% from hydropower, 2.9% nuclear sources and the rest from wind energy. In a growing economy, usage of electricity is bound to increase rapidly changing inter-sectoral consumption pattern and intensity.

Access and availability of power is an issue that is of concern to the nation. Though 500,000 villages have been electrified till date, there are more than 80,000 that are yet to receive electricity. In addition, even in the villages that have been electrified, there are large numbers of households that do not receive any electric power. The Ministry of Power estimates that only 31% of the rural households and 45% of the urban households in the country have access to electricity. The Approach Paper to the 10th Five Year Plan suggests that all non-electrified households would receive electricity by 2012. In order to electrify remaining 80,000 villages and cover all the urban and rural households, India has launched the Accelerated Power Development Programme (APDP). Decentralized

generation and distribution through district level Energy Committees have been envisaged to contribute in this endeavour within the proposed time frame.

India's power sector is characterized by the following problems:

- Inadequate power generation capacity
- Non-optimal utilization of the existing power generation capacity
- Inadequate inter-regional transmission links
- Inadequate and rapidly ageing sub-transmission and distribution network
- Rampant power theft
- Skewed tariff structures
- Slow pace of rural electrification
- Inefficient use of electricity by the end consumer
- Lack of grid discipline

Table 2.1 Energy consumption by fuel source

Sector	Fuel Source			
	Coal	Natural Gas	Petroleum	Power
Agriculture	-	1.27	9.51	89.22
Industry	73.10	2.36	13.61	10.93
Transport	-	-	98.49	1.48
Residential	-	1.12	71.32	27.56
Others	-	33.90	60.88	5.22

The Government of India in the Ministry of Power has developed appropriate strategies and a blueprint to address the above issues within a time frame. In addition to the efforts made by the Union Government, on increasing number of the State Governments are being encouraged to play a proactive role in making necessary institutional and other result oriented changes in their own power domains.

To bridge the gap between demand and supply of power, over 100,000 MW additional generation capacity needs to be added. The Government of India proposes to achieve this by 2012. In order to meet this goal, a capacity addition of 46,500 MW has been planned for Central Public Sector Undertakings, state level utilities and the private sector is expected to add another 41,800 MW; nuclear power 6400 MW and 10,700 MW is expected to come from non-conventional resources. In addition to capacity augmentation, which takes relatively longer time, strategies have also been formulated to augment power supply in short to medium run by:

- Increased generation through Renovation and Modernization (R&M) of old stations.
- Utilization of the surplus capacity of the captive power plants into the grid.
- Demand Side Management (DSM) to flatten the demand curves (introducing time of day tariffs and metering).
- Introduction of a new system of matching time and load profiles for different zones in the country.
- Energy Conservation and improved efficiency.
- Evacuation of power from the surplus to deficit regions.
- Carrying forward liberalization of power sector from earlier reforms that were confined to generation to further reforms in transmission and distribution sectors.

Renewable Sources of Energy

The general interest in non-conventional energy sources in India received an impetus following the oil shock of the 1970s, backed by political commitment on the Government's part. The Ministry of Non-Conventional Energy Sources (MNES), which is perhaps the only Ministry of its kind anywhere in the world today, has developed one of the largest renewable energy programmes covering the whole spectrum of renewable energy technologies for a variety of grid and off-grid applications. The country has the largest decentralized solar energy programme, the second largest biogas and improved cooking stoves programme, and the fifth largest wind-energy programme in the world. A substantial manufacturing base has been created in a variety of New and Renewable Sources of Energy (NRSE), placing India not only in a position to export technology but also to offer technical expertise to other countries. These sources have begun to emerge as an attractive option. Sometimes these are the only options for providing light and power to areas too remote for grid electrification.

Table 2.2 Renewable sources of energy – potential & utilization

Technology	Potential	Cumulative installation up to	
		March 1993	December 2001
Family-size bio-gas plants (million)	12	1.76	3.27
Improved cook-stoves	120	14.50	33.8
Solar hot water systems (million m^2)	140	0.25	0.60
Solar cookers (million)	-	0.29	0.48*
Solar photovoltaics	20 MW/km^2	-	82.0 MWp**
Bio-mass	17000 MW	-	-
Bio-mass gasifier (MW)	-	-	42.8
Bio-mass power/co-generation (MW)	19,500	-	358.00
Wind-farms (MW)	45,000	53.00	1507.00
Small hydro (MW)	15,000	93.00**	1423.00
Waste to energy (MW)	1,700	-	17.10

* April 2000

** Of this, 29 MWp SPV Products have been exported

*** The MNES was handling projects upto 3 MW capacity initially but recently projects upto 25 MW capacity have been transferred to its charge from the Ministry of Power

Source: Empowering People for Sustainable Development, Ministry of Environment and Forests, P.45.

In addition to small hydro, the country has about 1,50,000 MW hydel potential. So far however, less than one-fourth of the country's total hydropower potential has been exploited.

India's Coal Sector

India's large coal reserves provide a ready and economical energy resource that also ensures some degree of energy security. Coal has, therefore, been identified as the mainstay fuel for power generation till 2012. Appreciating the huge costs associated with the transportation of coal to power stations situated far away from the pit heads, emphasis has been laid on setting up large pit head power stations.

In the coal sector, the central government has taken a number of measures for the control of fire and subsidence in some coalfields, protection of the environment in all coal-mining areas, and dealing with the social consequences of mining. A comprehensive Resettlement and Rehabilitation (R&R) policy has been designed to ensure that the people affected by coal mining activities can improve or of least regain their former standard of living and earning capacity.

The Government has paid serious attention to the problem of fly ash disposal. Use of beneficiated/blended coal (with ash content not exceeding 34 per cent) has been made mandatory with effect from June 2002 for all power plants located beyond 1000 kms from pitheads and those located in critically polluted urban and ecologically sensitive areas.

Initiatives for Energy Security and Environmental Protection

The Government of India has taken various steps to ensure the long term energy security needs of the country. Some of the measures include strategic storage of crude oil and petroleum products, diversification of oil imports and holding of equity oil abroad. In order to enhance global competitiveness of the Public Sector Units (PSUs) operating in this sector, an exercise of restructuring and disinvesting from these PSUs are being undertaken in a systematic manner. The private sector is also being actively encouraged to augment its presence in petroleum sector.

With a growing emphasis on environmental protection, the Government has taken major initiatives to improve the quality of fuel in the country and to ensure compliance with sulphur emission norms. All Indian refineries comply with the applicable minimum national standards prescribed for SO2. These measures include use of low sulphur fuel oil, desulphurisation of refinery fuel gas in sulphur recovery unit and taller stacks for better dispersion. To reduce the vehicular air pollution, a time bound introduction of unleaded petrol was introduced in the country from April 1995. The progress in this endeavour is indicated Box 4:

Box 2.3 Initiatives towards the reduction of vehicular pollution

By February 2000, the entire country had access to unleaded petrol. The sulphur content in petrol was reduced from 0.2% to 0.15% by March 1997 and to 0.1% by April 2000. Ultra low sulphur petrol with sulphur content of 0.05% has been introduced in he four metropolitan cities of the country.

From April 2000, the benzene content in petrol has been limited to 3% in the metropolitan cities and 5% for the rest of the country. In addition, low benezene petrol (1% volume max) has been introduced in the National Capital Territory (NCT) of Delhi and in Mumbai.

In order to further improve the quality of High Sulphur Diesel (HSD) 9 diesel hydro desulphurisation units have been commissioned. The sulphur content in diesel was brought down to 0.25% throughout the country from January 2000. In addition, ultra low sulphur diesel (sulphur content less than 0.05 per cent) was introduced in selected retail outlets in the NCT for newly registered vehicles in April 2000. Since March 2001, all outlets in the NCT sell diesel with less than 0.05% sulphur. Some of the oil companies have launched a massive quality assurance drive (Pure for Sure) as a part of the overall environmental management strategy.

Compressed Natural Gas (CNG) has been introduced for use in commercial vehicles in Delhi and a few other states in the country. The Supreme Court of India has played a sterling role in ushering in this initiative.

The Energy Sector – Challenges for the future

There is strong linkage between energy sub-sectors (and energy sector as a whole) and the other sectors of the economy. Therefore a framework for an integrated view and vision for energy sector planning is of paramount importance. This should ensure the use of least cost options in energy supply to meet the needs of India's economic growth plans. This integrated energy planning would ensure economic growth on the foundations of social equity, environmental considerations, and promotion of market-based industry.

Since modern energy services, including those based on renewables and incorporating end-use efficiency measures are often found to be of higher cost than the conventional energy options, the challenge lies in designing and developing innovative energy service delivery mechanisms that are commercially viable and are affordable by the low income households.

On one hand, the energy requirements of agriculture, industry, trade and domestic consumers need to be met in a cost-effective and environmentally benign manner. On the other hand, the capital-intensive energy sector faces a greater degree of risk that is related to the investment becoming unviable due to changes on account of international prices, technology and demand shifts. In order to meet these twin objectives, India looks forward to new international partnership for concrete action.

Water Resources

93% of the available water resources are used for agriculture while only 4% is for industrial purposes. The total water requirement is projected to grow to 1,180 billion cubic meters by the year 2050. The national average of annual per capita availability of water is about 1,829 cubic meters. However this is likely to decline to about 1,557 cubic meters by the year 2015, primarily due to an increase in population.

One-sixth of the country is drought prone while another 40 million ha is flood-prone. An area of about 7.5 million ha is affected by flood annually.

The Central Ground Water Board has constituted the Central Ground Water Authority (CGWA) for regulating the development and management of groundwater resources. The CGWA has issued strict guidelines for exploitation of groundwater in the country besides promoting rainwater harvesting and implementing artificial recharge projects.
Concerns in the water resources sector include:

- Groundwater depletion
- Degradation of water quality
- Inefficiency in water use and management
- Unrealistic water pricing policies
- Inappropriate institutional framework and legislation

Keeping in view these concerns it is important that conservation of water resources and access of water to the people is ensured. These and other issues are addressed in the National Water Policy 2002 that has emphasized on several aspects, of which the following are important from the point of view of sustainability:

- Water resources planning
- Ground water development
- Drinking water
- Irrigation
- Participatory approaches to water resources management
- Private sector participation
- Water quality
- Flood control and management
- Drought-Prone Area Programme
- Water sharing/distribution amongst states
- Application of science & technology

Marine Resources

The marine environment in India includes a roughly 7,500 km coastline of the mainland as well as the Andaman & Nicobar Islands in the Bay of Bengal and the Lakshadweep Islands in the Arabian Sea.

A variety of specialized marine ecosystems like mangroves, coral reefs, salt lakes and mud flats form the habitat for a number of endangered marine species and commercially important marine flora and fauna. 3,960 sites of coastal wetlands have been mapped covering an area of 40,230 sq. km. Of which 97 major estuaries, 34 major lagoons and 241 creeks are reported to be important for conservation.

India has about 6,740 sq km of tidal forests of which approximately 4,871 sq. km. (0.15% of geographical area) are under mangroves. 50 species of mangroves are found in India, which contribute to 7% of the world's mangrove cover. In 1986 the MoEF initiated an exclusive scheme on Conservation & Management of Mangroves. Subsequently, a National Committee on Mangroves & Coral Reefs was also set up which identified 32 mangrove areas as critical for conservation. Management Action Plans have been prepared for many of these areas. In addition, a National Mangrove Genetic Resource Centre has been established. A draft National Action Plan on Mangroves & Strategy for Implementation is currently under circulation.

The central and state pollution laws provide legal cover for the protection of marine areas. In addition, the Environmental Protection Act, 1986 sets standards for effluent and waste discharge into marine waters, besides the Merchant Shipping Act, 1958 which controls offloading of wastes from ships at sea.

In 1991 the Coastal Regulation Zone (CRZ) notification was issued under EPA, which classifies coastal areas into four zones and sets limits on the types of construction and development activities that can take place along the coastline. Prohibited activities include setting up of new industries, expansion of existing industrial units.

In 1991 the Department of Ocean Development launched the Coastal Ocean Monitoring & Prediction System (COMAPS) to monitor the state of marine waters of India including the impact of anthropogenic factors on marine flora and fauna.

The government ha also established on Island Development Authority specifically for overseeing the sustainable development of the islands.

3 EU and other donor co-operation with India from an Environmental Perspective

3.1 EU co-operation with India

Environmental mainstreaming has been defined by the EC as a priority for its development cooperation policy. The Commission Communication on integrating the environment into EC economic and development cooperation, SEC (2001) 609, examines how developing countries can be assisted in addressing environmental changes. The European Council in Göteborg adopted a general Sustainable Development Strategy for the EU in June 2001.

During the Johannesburg World Summit on Sustainable Development (WSSD) the EU committed itself to support achievement of the WSSD targets. Other commitments related to the International Conference on Financing for Development held in Monterrey in March 2002 called for new partnerships between developed and developing countries.

The Commission has been asked to closely monitor implementation of these commitments. The Communication, COM (2003) 829 final, reports on the implementation of the commitments of the WSSD one year on. At the WSSD, the EC jointly with the Member States launched the "EU Energy Initiative for Poverty Eradication and Sustainable Development", the "EU Water for Life Initiative", and the "Action Plan for Forest Law Enforcement, Governance and Trade". The first two partnership initiatives have a strong focus on Africa, the last partnership initiative concerns mainly stopping illegal logging and trade in illegally harvested wood.

The EU is also working on its WSSD commitments on trade and sustainable globalisation. The subject of the interface between trade and environment is on the Doha Development Agenda (DDA) and the EU supports a positive sustainable outcome within this framework of the DDA. For example, in order to help exporters in non-EU countries with technical information necessary for EU market access, a special Trade Helpdesk was set up. The trade in environmentally friendly goods is stimulated through eco-labelling schemes and building on other initiatives, such as the Fair Trade Initiative.

On the issue of water, an EU Water Initiative was launched at the World Summit for Sustainable Development (WSSD), as a catalyst and a foundation on which future action can be built to meet the water and sanitation MDG's.

The key elements of the Initiative are to:

- Reinforce political commitment to action and raise the profile of water and sanitation issues in the context of poverty reduction efforts;

- Promote better water governance arrangements. This includes encouraging the public and private sectors and local stakeholders to work together better. It also includes efforts to strengthen institutional capacity at the regional, national and local levels, by providing expertise and promoting good practice, improved partnerships for sharing technology, information, research and knowledge and awareness raising;
- Improve co-ordination and co-operation in the way that water-related interventions are developed and implemented. This includes a shift away from stand-alone projects towards sector wide approaches. It also includes establishing multi-stakeholder processes to reinforce partnerships for action and promoting south-south collaboration and co-operation;
- Encourage regional and sub-regional co-operation on water management issues, using the integrated water resources management approach. As part of the Initiative, the EU will be supporting the development of IWRM and water efficiency plans by 2005, including the adoption of policy, planning and management processes on a river-basin scale;
- Catalyse additional funding, through the development of new, flexible and innovative funding mechanisms to attract new partners.

On the issue of biodiversity, EU believes that MOP1 should adopt a transparent and effective Compliance Mechanism, which should be able to help Parties respect the commitments under the Protocol as well as address cases of non-compliance. MOP1 should adopt practical and adequate documentation requirements for GMO shipments that would empower importing countries to make an informed choice on whether or not to accept GMO imports. This is particularly important for developing countries with limited capacities.

MOP1, Parties to the Protocol will agree on some guidance for Parties in their dealings with non-Parties. This is particularly necessary at the early stages of the life of the Protocol when the number of non-Parties is higher. It also hopes that India will support EU on this issue.

MOP1 will succeed in launching a negotiation process for the establishment of rules and procedures in the field of liability of redress, in accordance with the mandate in Article 27 of the Protocol.

On the issues Trade and environment, India expressed its reservations on the linkage of trade and environment as environmental requirements that were not mutually agreed in the second Joint Working Group on Environment Meeting held at Brussels in January 2004, as these were likely to affect market access. India said that mutual understanding on this aspect was necessary and especially expressed itself against discussing process and product methods (PPMs) issues in the WTO. Indian side stressed that EU standards especially in the area of SPS/health related standards were very difficult to meet. Concerns were also raised about compliance costs associated with eco-labels and in particular the EU Flower. The EC side announced its intention to make a WTO submission on market access and environmental requirements in particular to address the concerns expressed by India in its 2002 submission on trade impacts of environmental legislation. The EC expressed willingness to further continue this discussion with India in a cooperative manner. EC side said that it wanted to develop win-win situation for both

sides and encouraged the Indian side to look into cooperation-facilitation in the field of certification and eco labels. As regards the EU flower imports from India, the EC pointed out that the developing countries benefit from a special and reduced fee. EC side expressed interest in a discussion with the Ministry of Environment and with the Ministry of Commerce on this subject.

3.1.1 State Partnership

If we look at the history of EC Cooperation with India we find that it has progressed from project–based funding to sector–wide approaches in health and education. Given India's vastness and administrative and political complexity, the new 'partnership for progress' approach between EC and India has concentrated on a state partnership rather than for the whole country. This has enabled EC to spend its limited resources more effectively. Under this new approach, the EC-India partnership would now evolve around sectors like education, health and environment/natural resource management. These sectors constitute as the main public instruments through which poverty reduction can be addressed.

In the poor states of India like Chhatisgarh and Rajasthan there is always a cross cutting influence of environment issues in industries, agriculture, rural development, public health and infrastructure. In India in general and in the States of Chhatisgarh and Rajasthan in particular, attention would be required in water-land resource interface, participatory irrigation management, conversion of agricultural land for non-agricultural purposes, migration due to soil degradation, stake of landless communities in local water bodies for fishing, community participation and ownership in forestry, preservation of rare species and indigenous knowledge on useful species etc.

If we look at the EC-India cooperation closely, we find that poverty alleviation is the central objective of all projects. Cooperation activities are foreseen under the State Partnership Programme with two Indian States: Rajasthan and Chhattisgarh. The State of Chhattisgarh, has considerable forest cover, a large population engaged in agriculture and forestry for livelihoods, and a rich mineral base. At the same time this State has inadequate water supply and sanitation systems, which warrant environmental attention. Similarly, in Rajasthan, the mainstay of the majority of the population is agriculture. However, due to scanty rainfall and depleting groundwater table, shortage of water for agriculture and drinking purposes have been the biggest environmental problem for this State.

As there is in both States a sizable population of Scheduled Castes, Scheduled Tribes and other marginalized groups - including women are dependent on natural resources, there is a need to remove institutional and legal constraints that hinder these communities to participate in the planning and decision-making process in relation to the environment.

In Chhattisgarh, the community is to be engaged in large-scale organically farmed agricultural goods and non-timber forest produce (medicinal products). Proper infrastructure for marketing is not available. If proper marketing standards are laid out, these products will attract a huge market in Europe.

Mining is an important source of revenue for the State of Chhattisgarh. Mining is also linked to environmental degradation. As mining lobbies are politically very powerful, there is a possibility of violation of environmental norms.

In Rajasthan, there is an overemphasis on the most important issue of the State i.e. water resources. This might undermine other environmental issues of the State, such as soil salinity and desertification.

3.1.2 Biodiversity Conservation

India is a member of the Group of Like-minded Mega-diverse Countries (GLMDC). India emphasizes creation of an international regime to efficiently promote and safeguard the fair and equitable sharing of benefits arising from the use of biodiversity and its components. The EU also sees continuing high rates of loss of biodiversity as a serious threat to the environment. Both parties agree to adopt an efficient compliance mechanism and have practical and effective documentation requirements for GMOs shipments.

3.1.3 Climate Change

India's strategy in contributing to global efforts to reduce the risk of climate change has been to develop the institutional capacity to formulate, assess, and implement economic and technical responses to climate change issues; This includes the transfer and adaptation of technology, and integration of sustainable development into the national development programmes. The EU is committed to meet its target of reduction of GHG by 8% by 2012. India opposes to reopen a dialogue on this issue, because so far the developed countries failed to deliver on their commitment.

3.1.4 Organic Agricultural Products

India has applied to the EU to obtain equivalency with EC standards on organic products, but the application is still pending.

3.1.5 Eco-labelling

India has not responded with great enthusiasm to the EC proposal for a positive dialogue on this issue. No Indian company has so far been granted the EC eco-label.

3.2 Co-operation funded by other agencies

3.2.1 Department for International Development (DFID), United Kingdom

Environmental issues need attention to improve the quality of growth; many poor people depend on agriculture and water resources.
According to the Country Plan, DFID will:

- Support reforms in sub-sectors that can reward poor people's labour and promote sustainable and pro-poor growth: for example, the segments of the agricultural and unorganized non-farm sector where poor people are concentrated;
- Provide support to enable the poor to access markets, better returns on their assets and improved opportunities from the labour market;
- Work with governments to enhance public and private investment;
- Analyse the context-specific opportunities and constraints facing the poor and how they can participate more fully in growth.

DFID will use a number of means to address this agenda. DFID is not well placed to add to macro-economic policy dialogue, where there is broad understanding of the required policies, so it will limit its engagement to working with other agencies.

Natural disasters such as earthquakes, cyclones and floods occur regularly in specific areas, where the immediate impact can be substantial. Slow onset disasters, particularly drought, are also common and environmental degradation is a long-term constraint to livelihoods. However, DFID feels that disasters are unlikely to have a major impact on India's overall progress on the Millennium Development Goals. The Indian Government assists state governments to respond to disasters, and the international community often supplements this support. There is a growing capacity in India in disaster preparedness and management.

3.2.2 Asian Development Bank (ADB)

The Ministry of Environment and Forests (MoEF) is the nodal agency in the administrative structure of the Central Government responsible for the protection and management of the environment in the country. The Central Pollution Control Board and the State Pollution Control Boards form the regulatory core for controlling and monitoring environmental degradation in the country. ADB has provided technical assistance (TA) for enhancing the capacity of the MoEF for environmental impact assessment, use of market-based instruments and cleaner production, and TA to strengthen capacity of the State Pollution Control Board (SPCB) in Madhya Pradesh. TA and a loan are programmed for replacement of coal by gas as a cleaner fuel in Kolkata. ADB has also promoted environment improvement through social infrastructure projects to develop water supply and sanitation systems, improve water resource management systems in Madhya Pradesh, and for conservation of biodiversity in the Sundarbans. ADB will assist the Government in tapping the potential of renewable energy estimated at 100,000 Megawatt. ADB will also continue to increase its portfolio in environmentally oriented projects by seeking opportunities for leveraging concessional funds through co-financing, including from the Global Environment Facility.

3.2.3 USAID

USAID-India's Environment Strategic Objective (SO) is consonant with the Agency's Economic Growth, Agriculture, and Trade pillar and consistent with the Government of India's Tenth Five-Year Plan. The premise of the SO is that success in improving the viability of the energy sector can be greatly enhanced by addressing water issues together with distribution reforms, and by improving India's access to clean energy technologies.

By reducing losses and improving cost-recovery, service delivery, and ultimately the fiscal health of the state and municipal governments, will improve. This in turn will free up resources for investments in the much-neglected social sectors (health and education). Environmental benefits will also be realized, both in terms of improved water resource management and reduced greenhouse gas emissions from the use of cleaner, more efficient technologies in the power sector.

Improved Power Distribution in Selected States

Only through financial viability can utilities enhance access to high quality and reliable power supplies to both urban and rural consumers. USAID and its partners will improve infrastructure, increase use of clean technology, support training and technical assistance on commercial best practices, and enhance awareness and knowledge of the reform process in order to accelerate acceptance of and participation in reforms by a wide array of stakeholders.

Change will occur at three levels over time. Initially, utility companies will be upgraded both in technology and capacity building so that they are able to provide more reliable and better quality power. This will translate into benefits for consumers who receive that power. Finally, as consumers begin to pay for enhanced services, and utilities improve their financial performance, states will benefit through less subsidization of the sector.

Improved Groundwater Management in Selected States

Groundwater management improvements, as represented by changes in technologies, policies, and behaviors in the agricultural sector, will be critical to improving the prospects for success of power sector reform in India. As activities are replicated and scaled up, less money will be needed by states to subsidize the agriculture power sector.

Interventions will take place at various levels. Farm families will be encouraged to increase on-farm water use efficiency through education, extension, and the development of proper incentives. Women will be encouraged to participate in and form community-based water and energy user associations. Utility partnerships and increased awareness of the water-energy nexus at the state and national level will be fostered.

Improved Urban Water Availability and Sanitation in Selected States

Improved management of urban water and sanitation systems will reduce water losses, energy consumption, and pollution and contamination, while increasing energy cost-recovery and financial viability of utilities.

3.2.4 The World Bank

The present Bank Environment Strategy for India include:

- Exercising selectivity in investment operations by (a) relying less on stand-alone environmental management projects implemented by central government agencies and more on mainstreaming the environment into sector operations; (b) promoting participatory and community-driven development approaches (particularly in watershed management, irrigation and drainage, and area-based poverty reduction initiatives), and private sector participation, particularly in urban water supply, independent power production, and transport; and (c) using GEF resources, when

appropriate, to support the sustainable management of natural resources on which vulnerable groups depend (protected area management, medicinal plants, and solar thermal power).

- Enhancing project quality by implementing the Bank's safeguard policies – a key pillar of strategy implementation. To this end, they have already The World Bank has initiated the following activities: (a) establishment of an independent safeguard review and compliance monitoring team; (b) systematic upstream review and input into project design beginning with the project concept stage; (c) a project risk management and compliance monitoring system, linked to the Bank's project document system; (d) thematic joint social and environment reviews focusing on specific sectors such as water resources, transport, and health, (e) periodic skills enhancement for all regional staff; (f) enhancement of local ownership and consensus building; and (g) strengthening of our clients' capacity through policy dialogue and training as a part of environmental strategies in India.
- Intensifying the use of sectoral-regional environmental and social assessments by building on the experience of the past three years in the water, roads, and power sectors to enhance the environmental content of sector policies and institutions.
- Strengthening analytical and advisory activities – (a) filling critical gaps in knowledge and information by undertaking new analytical work on indoor air pollution (in at least two countries), clean fuels (in at least two countries), and NRM and rural livelihoods (in at least one country), in collaboration with the Energy and Rural Development Units; (b) addressing institutional priorities by focusing on helping build client capacity in critical areas such as policy, incentives, and monitoring and enforcement; and (c) promoting techniques that foster cross-sectoral integration, such as improved monitoring and evaluation of poverty impacts and spatially based analysis of projects and policies.
- Strengthening its input into CASs and support to its clients' PRSP development processes, by building on the new merger of the Environment and Social Development Units in the region and increasing our participation in project, sector, and country teams. In particular, we will launch a regional network on Community-Driven Development (CDD) and will acquire staff skills in public health and support for the formulation and implementation of poverty reduction strategies.

4 Conclusions and Recommendations

4.1 Conclusions

State of the Environment:

The fact that India is the second most populous country that survives on just 2.4% of world's landmass creates its own population-resource tension. Combined with the colonial legacy of systems that sub-served the exploitative objectives of the then colonial administration, was made the task of change that much more difficult. Thus, despite the creation of an enabling framework for sustainable development, India continues to face enormous challenges in search of options for development that are environmentally sound and suitable to its specific social conditions.

The dynamics of having a large population being sustained on a comparatively low resource base has several disturbing repercussions. Over the last few decades, while India has made significant progress in the areas of poverty eradication, improvement of literacy rates and health standards, etc., there still remains a disparity between India and the rest of the world on various social development indicators.

Exploitation of environment like depletion of natural resources and emission of greenhouse gases can have adverse environmental impacts. India has a low-lying densely populated coastline and the coastal regions are also agriculturally fertile. Any change in sea level due to global warning will have devastating effect on the people and habitats in the coast.

Energy

On one hand, the energy requirements of agriculture, industry, trade and domestic consumers need to be met in a cost-effective and environmentally benign manner. On the other hand, the capital-intensive energy sector faces a greater degree of risk that is related to the investment becoming unviable due to changes on account of international prices, technology and demand shifts. In order to meet these twin objectives, India looks forward to new international partnership for concrete action

Wastes Management

A major problem in urban solid waste management relates to sewage disposal. With inadequate and often inappropriate and malfunctioning systems of sewage disposal, the mounting threat to the availability of safe drinking water is quite serious in most urban areas of the country. There is an urgent need for revamping and maintaining sewage systems in most cities and more importantly, increasing its coverage to slums and the shanties that are entrenched around most metro cities of the country.

Water

The water quality monitoring results obtained during 2000 indicate that organic and bacterial contaminations continue to be critical pollutants in Indian aquatic resources. This is mainly due to the discharge, from urban centers, of domestic wastewater in untreated form. This situation leads to spread of water borne diseases and has a particularly adverse effect on the poor as they are not in a position to make private investment in water filtration/treatment for domestic use.

Making safe drinking water available in rural and urban areas is a key planning concern in India. However, due to the variable population distribution and geographic features this objective remains unfulfilled. Another major concern is water for agriculture that in turn has implications for food security, especially given that a substantial part of agriculture is dependent on rainfall. Water is also necessary for livestock, which is a mainstay for the rural poor. However, there has been limited investment in making water sources available for livestock.

Environmental Policy and Legislation

In the guise of simplification of environmental clearance process, there is a further dilution in country's environmental regulation. The following provisions have been created to make it more toothless.

- Investment limit that necessitates clearance has been raised from Rs.50 crores (1 crore = 10 millions) to Rs.100 crores for new projects.
- The requirement of public hearing for small-scale industries located in industrial areas as well as widening and strengthening of highway has been dispensed with.
- EIA is no longer required for pipeline projects.
- Petrochemical complexes, bulk drug and pharmaceuticals, viscose staple fibre and filament yarn as well as mining projects are now removed from the State clearance. They now require clearance directly from the centre.

While the simplification seems aimed at facilitating industries, it may also end up pushing people's participation and transparency to fringes of the whole process.

4.2 Recommendations

- While industrial development has contributed significantly to economic growth in India, it has done so at a price to the environment. Not only is industrial pollution increasing public health risk, but abatement efforts also are consuming a significant portion of India's gross domestic product (GDP). India has made significant efforts in the field of environmental protection, developing environmental standards for both products and processes and introducing environmental audits. India's strong support of air quality and alternative fuel initiatives has brought progress to the country. However, there is a need for coordinated efforts at governmental level to combat pollution, especially air pollution.

- An integrated approach focused on civic amenities, appropriate technology and efficiency of public systems has become imperative for public policy and administration in most of the urban and rural areas of the country. An additional

requirement, especially in the rural and semi-urban areas, is the urgent need to make it possible for the people to quickly move up the energy ladder with a view to address the health impact of indoor pollution on account of the use of unprocessed cooking fuels.

- The process of setting standards, institutional development and legal empowerment and honouring the international agreements is not restricted to the efforts at containment of pollution. Increasingly, newer standards or quality parameters are to be set for various other sectors and alternate management systems are to be adopted.

- Clearly there is a need to shift the agricultural sector strategy from subsidies to creation of capital assets, diversification of agriculture, creation of rural infrastructure, and management of environmental concerns by greater public investment and application of frontier technologies.

- There is a need to create a climate that would encourage a deeper private sector participation in the development of the transport infrastructure in the country.

- There is a strong linkage between energy sub-sectors and the other sectors of economy. Promotion of renewable energy sources is an integral component of India's strategy for sustainable development. India has the largest decentralized solar energy programme, the second largest biogas and improved cooking stove programme, and fifth largest wind energy programme in the world. Replacing coal and fossil fuel-generated electricity supplied to India's cities with energy from renewable energy sources could aid in reducing air pollution.

- Promotion of renewable energy sources has to be an integral component of the country's strategy for sustainable development. The country also needs to try other means like pursuing the large-scale commercial use of coal gasification and liquefaction technologies.

- In order to mainstream environmental issues at national planning level, there is a need to bring linkages between environment, poverty and economic growth. There is also a need for strategic environmental assessment (SEA) for sectors like agriculture, mining and energy. Presently, environmental impact assessment is done for infrastructure and industrial projects under the Environmental Protection Act, 1986. Although the environment legislation is in place, the executing institutions are not endowed with sufficient resources to ensure enforcement. There is a need to provide more teeth to executing institutions.

- The local communities are the ones that are adversely affected by development activities. But at a stage when the affected communities are brought into the clearance procedure, the EIA report has been prepared and the no objection certificate (NOC) applied for the Pollution Control Board. The decision regarding the establishment of the project has already been made by the project proponents and by government authorities. The communities are not consulted during the assessment of alternatives nor do the EIA consultants consult them at the time of data collection and report

preparation. There is a strong need for public participation in every stage of environmental procedure.

- As a strategy to human development, sectors like health and education could be environmentally mainstreamed through introduction of environmental education for primary healthcare workers and school children. Provision of appropriate sanitation and water facilities at school and health centers and access to safe water will ensure a more healthy environment.

- In the livelihoods sectors like agriculture, water resources and forestry, people, especially the SC, ST and other marginalized communities, including women are to be ensured their rights over and access to land and common pool's resources. Also participation of the communities –through strong village development institutions- in the planning and decision-making processes is to be ensured. Capacity at the local level could be strengthened so that the communities could monitor the environment and deliver both products like Non-Timber Forest Products (NTFP) and organically farmed materials and public services such as water and sanitation.

- India is highly vulnerable to climate change as its economy is heavily reliant on climate sensitive sectors like agriculture and forestry, and its low lying densely populated coastline is threatened by a potential rise in sea level. Climate change resulting from anthropogenic emissions of greenhouse gases (GHGs) as result of use of fossil fuels, agricultural & industrial activities and deforestation, leading to their increasing concentrations in the atmosphere has the potential to alter global climate. According to an estimate, between 1990-2001, India's carbon emissions have increased by 61 per cent. The per capita carbon emissions are expected be increased further due to rapid pace of urbanization, increased vehicular usage and continued use of older and more inefficient coal-fired plants. Anthropogenic climate change due to increased carbon emissions may have severe adverse impacts on India's precipitation patterns, ecosystems, agricultural potential, forests, water resources, coastal & marine resources, besides increase in range of several disease vectors. Subsequently, this will adversely affect the poor and the marginalized that depend largely on agriculture, forests and marine resources for their livelihoods. India has very big challenges ahead. In this venture, EC can collaborate with India on issues like developing India's institutional capacity to formulate, assess and implement economic and technical responses to climate change issues. The EC can also help India in the transfer and adaptation of suitable technology.