

Major Environmental Concerns : State of our environment

8. A country's environmental problems vary with its stage of development, structure of its economy, production technologies in use and its environmental policies. While some problems may be associated with the lack of economic development (e.g. inadequate sanitation and clean drinking water), others are exacerbated by the growth of economic activity (e.g. air and water pollution). Poverty presents special problems for a densely populated country with limited resources.

Land/Soil Degradation

9. Most of the land area in the country show evidence of degradation, thus affecting the productive resource base of the economy. Out of the total geographical areas of 329 million hectares, 175 million hectares are considered degraded (Table 11.1).

10. Erosion by water and wind is the most significant contributor to soil erosion with other factors like water logging, salination etc. adding to the in situ degradation. While soil erosion by rain and river in hill areas causes landslides and floods, deforestation, overgrazing, traditional agricultural practices, mining and incorrect siting of development projects in forest areas have resulted in opening up of these areas to heavy soil erosion. In the arid west, wind erosion

causes expansion of desert, dust storms, whirlwinds and destruction of crops; while moving sand covers the land and make it sterile. In the plains, riverine erosion due to floods and eutrophication due to agricultural run off are noticed. Increased dependence on intensive agriculture and irrigation also results in salination, alkalization and water logging in irrigated areas of the country.

11. Controlling such land/soil degradation is a sine qua non to achieving and maintaining food security, sustainable forestry, agricultural and rural developments. The Government strategy towards preventing land degradation include treatment of catchment areas, comprehensive watershed development, emphasis on low cost vegetative measures, survey and investigation of problem areas through remote sensing techniques, bio-mass production in reclaimed land, micro level planning and transfer of technology.

Deforestation

12. Forests are a renewable resource and contribute substantially to the economic development by providing goods and services to forest dwellers, people at large and forest based industries, besides generating substantial volume of employment. Forests also play a vital role in enhancing the quality of environment by influencing the ecological balance and life support system (checking soil erosion, maintaining soil fertility, conserving water, regulating water cycle and floods, balancing carbon dioxide and oxygen content in atmosphere etc.).

13. The country has a very diverse forest vegetation ranging from the moist evergreen forests in the North-East, along the West Coast and the Andaman & Nicobar Islands to the temperate and alpine vegetation in the Himalayas. However, this forest wealth is dwindling due to overgrazing, over exploitation, encroachments, unsustainable practices, forest fire and indiscriminate siting of development projects in the forest areas. Withdrawal of forest products, including fuel wood, timber etc. are much beyond the carrying capacity of our forests. The current annual withdrawal of fuel wood is estimated at 235 million cubic meters against a sustainable capacity of about 48 million cubic meters. The annual demand for industrial wood is about 28 million cubic meters against the production capacity of 12 million cubic meters.

TABLE 11.1

Soil Erosion and Land Degradation

(Million Hectares)

1. Total Geographical Area	328.7
2. Area Subject to Water and Wind Erosion	141.3
Area Degraded through Special Problems	
3. Water Logged Area	8.5
4. Alkali Soil	3.6
5. Acid Soil	4.5
6. Saline Soil including Coastal Sandy areas	5.5
7. Ravines & Gullies	4.0
8. Area subject to Shifting Cultivation	4.9
9. Riverine & Torrents	2.7
Total 3 to 9	33.7
Source : State of Environment, 1995 MOEF	

The area affected by forest fire range from 33 percent in West Bengal to 99 percent in Manipur.

14. Presently, the recorded forest area is 76.52 million hectare which works out to 23.3 per cent of the total geographical area and actual forest cover is 63.3 million hectare, which constitutes only 19.3 per cent of the total land area, as against the National Forest Policy 1988 stipulation of a target of 33 per cent. Even within this recorded area, only 36.7 million hectare, or only 11.2 per cent of country's total land area, comprises dense forest with a crown density of more than 40 per cent, thus reflecting a qualitative decline of forests in the country (Table 11.2).

15. The total forest area diverted for non-forestry purposes between 1950 and 1980 was 4.5 million hectare *i.e.* at an annual rate of 0.15 million hectare. To regulate unabated diversion of forest land for non forestry purposes, Forest (Conservation) Act, 1980 was enacted. It has resulted in reduction of diversion of forest area for non forestry purposes considerably and the present rate of diversion is 16,000 hectare annually. The forest area in the recent past has not changed much because its diversion for non forestry purposes has been more or less compensated by afforestation and natural regeneration programmes of the Government.

TABLE 11.2
Forest Cover Estimates 1981-95

Period	Total Forest Cover (Million hectare)	% of geographic area	% of area under	
			Dense Forest	Open Forest
1981-83	64.08	19.5	-	-
1985-87	63.88	19.4	59.1	40.2
1987-89	63.94	19.5	60.2	39.1
1989-91	63.94	19.5	60.2	39.1
1991-93	63.89	19.4	60.2	39.0
1993-95	63.34	19.3	58.0	41.3

Forest cover is the sum of dense forest plus open forest, plus mangroves forest (not shown)

Source : State of Forest Reports, FSI, MOEF.

Bio-diversity

16. The Country's unique phytogeographical and agro-ecological diversity endows it with a wide variety of agro climatic zones that harbor a rich repository of biological resources. With

only 2.4 per cent of the total land area of the world, the known bio-diversity of India contributes 8 per cent of the known global biological diversity. It is one of the twelve mega bio-diversity centers in the world. Currently available data place India in the tenth position in the world and fourth in the Asia in plant diversity. In terms of number of mammalian species, the country ranks tenth in the world and in terms of the endemic species of higher vertebrates, it ranks eleventh. It stands seventh in the world for the number of species contributed to agriculture and animal husbandry.

17. From about 70 percent of the geographical area surveyed so far, 46,000 plant species and 81,000 animal species have been recorded by the Botanical Survey of India (BSI) and the Zoological Survey of India (ZSI), respectively. These life forms, besides their ecological and intrinsic value, represent a considerable socio-economic and monetary asset value as these are actually and potentially important for developments in the fields of food, medicine, textiles, energy, recreation and tourism. The areas yet to be surveyed include the inaccessible Himalayan areas, Andaman & Nicobar Islands and Exclusive Economic Zone, which are expected to be rich repositories of endemic and other species.

18. The biodiversity in forests, grasslands, wetlands and mountains, deserts and marine ecosystems is subject to many pressures. One of the major causes of the loss of biological diversity has been the depletion of vegetative cover in order to expand agriculture. Since most of the biodiversity rich forests also contain the maximum mineral wealth, and also the best sites for water impoundment, mining and development projects in such areas have often led to destruction of habitats. Poaching and illegal trade of wildlife products too, have adversely affected biodiversity.

19. Such over-exploitation and loss of habitat is leading to the extinction of various plants, animals and microbial species. According to estimates, over 1500 plant species are endangered and about 79 mammals, 44 birds, 15 reptiles, 3 amphibians and several insects are listed as endangered. Such a biological impoverishment of the country is a serious threat to sustainable advances in biological productivity as gene erosion also erodes the prospects for deriving full economic and ecological benefits from recent advances in molecular biology and genetic engineering.

20. The loss of biodiversity is being addressed, besides their appropriate mapping and surveys, through a network of protected areas consisting of 85 National Parks, 448 wildlife sanctuaries, 10 Biosphere reserves and specific programmes for management and conservation of fragile ecosystems. Approximately, 4.2 percent of the total geographical area of the country has been so earmarked for extensive in situ conservation of habitats and ecosystems. Besides, ex situ conservation is also being undertaken through a network of 70 botanic gardens and 275 centres of wildlife preservation in the form of zoos, deer parks, safari parks, aquaria etc.

Atmospheric Pollution

21. Air pollution is widespread in the country and regular monitoring is being carried out under the National Ambient Air Quality monitoring System. A high level of Suspended Particulate Matter (SPM) is the most prevalent form of air pollution (Table 11.3). High concentration of Sulphur Dioxide (SO₂) and SPM occur in about 20 percent of the cities so monitored. High domestic use of coal or bio-mass fuel is still a serious problem in high human exposure to SO₂, SPM and carcinogenic agents.

22. The main factors contributing to urban air quality deterioration are growing industrialization and increasing vehicular pollution. It has been aggravated by developments that typically occur as countries industrialize: growing cities, increasing traffic, rapid economic development and industrial growth, all of which are closely associated with higher energy consumption. Industrial pollution is concentrated in industries like petroleum refineries, textiles, pulp and paper, industrial chemicals, iron and steel and non metallic mineral products. Small scale industries especially foundries, chemical manufacturing and brick making are also significant polluters. In the power sector, thermal power which constitutes bulk of the installed capacity for electricity generation, is an important source of air pollution. Various environmental pollution control measures adopted by the Government are listed in Box 11.1.

23. Vehicular traffic is the most important source of pollution in all the mega cities. The number of vehicles in these cities has increased manifold. This increase has been characterized by a boom in private transport. Other reasons for high vehicular pollution are two stroke engines, aged vehicles, congested traffic, poor roads and

outdated automotive technologies and traffic management system. It is estimated that two/three wheelers constitute about 75 percent of the total vehicles and cause more than 50 percent of the total vehicular pollution load.

24. Studies by Central Pollution Control Board (CPCB), on the ambient noise levels show that noise levels in most of the big cities exceed the prescribed standards (Table 11.4). The major sources of noise are vehicles, diesel generator sets, loud speakers, construction activities and bursting of fire crackers. An attempt is being made to control the noise pollution by notifying the standards and monitor their compliance through local authorities.

25. The toxic nature of air pollutants and their high concentrations in many industrialized regions are posing serious concerns both in terms of human health and damage to man

TABLE 11.3
Level of Air Pollution in the Metro Cities

Name of the Metro city	Levels of Air Pollution (micrograms/m ³)		
	SO ₂	No _x	SPM
1. Ahmedabad	5.4-110.9	3.6-70.0	72.4-575.4
2. Bhopal	8.1-22.0	12.2-32.4	85.0-393.3
3. Calcutta	6.0-122.0	6.0-73.1	77.3-833.3
4. Chennai	2.4-161.6	1.8-55.5	26.6-351.4
5. Coimbatore	0-8.9	0.3-19.1	2.5-133.0
6. Delhi	10.1-85.1	20.1-104.5	145.3-929.8
7. Hyderabad	5.1-70.7	7.5-124.13	59.3-458.0
8. Indore	2.6-10.2	4.4-17.4	77.0-812.0
9. Jaipur	6.1-53.7	4.0-64.3	81.6-570.1
10. Kanpur	8.2-22.4	7.7-63.0	233.7-809.2
11. Kochi	3.2-54.3	1.7-137.0	10.5-271.1
12. Lucknow	23.2-37.4	23.0-34.4	382.6-672.7
13. Mumbai	6.1-111.7	5.4-115.8	60.6-473.2
14. Nagpur	4.3-18.8	3.2-43.2	38.2-403.2
15. Patna	12.7-46.4	8.5-55.7	132.0-1307.0
16. Pune	17.1-29.0	10.1-34.0	112.0-166.5
17. Surat	22.4-304.0	10.0-135.7	81.7-1215.3
18. Varanasi	18.3-27.1	10.6-28.8	155.0-349.0
19. Visakhapatnam	5.5-80.8	5.1-92.0	46.7-482.7
NAAQ/Standards	15.0-80.0	15.0-80.0	70.0-360.0

NAAQ : National Ambient Air Quality standards.

Source : Central Pollution Control Board

BOX 11.1

Major Environmental Pollution Control Activities

- Policy initiatives to improve environment like the National Conservation Strategy and Policy Statement for Environment & Development, 1992, Policy Statement for Abatement of Pollution, 1992 and National Forest Policy, 1988.
- Notification and implementation of emission and effluent standards for air, water and noise levels. Standards are formulated by a multidisciplinary group keeping in view the international standards, existing technologies and impact on health and environment.
- Identification and Action Plans for 17 categories of major polluting industries.
- Identification of 24 critically polluted areas for pollution abatement and improving environment.
- Use of beneficiated coal with an ash content not exceeding 34% irrespective of their distance from pit head.
- Action Plans for 141 polluted river stretches to improve quality of river water.
- For controlling vehicular pollution, progressive emission norms at the manufacturing stage have been notified, cleaner fuels like unleaded petrol, low sulphur diesel and compressed natural gas (CNG) introduced.
- Identification of clean technologies for large industries and clean technologies/processes for small scale industries.
- Setting up of Common Effluent Treatment Plants (CETPs) for clusters of SSI units.
- Implementation of an Eco-mark scheme to encourage production/consumption of environment - friendly products.
- Preparation of a Zoning Atlas, indicating status of the environment at district levels to guide environmentally sound location/siting of industries.
- Mandatory submission of annual Environmental Statement which could be extended into environmental audit.
- Initiation of environmental epidemiological studies in seven critically polluted areas to study the impact of environment on health.
- Setting up of authorities like the Environment Pollution (Prevention & Control) Authority for the National Capital Region for protecting and improving the quality of environment and preventing, controlling and abating environmental pollution.
- Provision of fiscal incentives for installation of Pollution control equipment and also for shifting of industries from congested areas.

TABLE 11.4
Ambient Noise levels in Cities

(All values expressed in decibels)

Cities	Residential		Commercial		Sensitive		Industrial	
	Day	Night	Day	Night	Day	Night	Day	Night
1. Bhopal	60	44	75	57	73	42	68	47
2. Bangalore	59-79	37-59	68-81	46-64	58-74	-	63-86	42-65
3. Calcutta	76-86	58-76	70-90	57-78	69-89	65-70	75-82	53-70
4. Chennai	57-84	45-50	74-80	69-71	46-70	47-50	69-76	63-69
5. Delhi	53-71	-	63-75	-	62-68	-	65-81	-
6. Dehradun	50	38	70	50	58	42	50	45
7. Hyderabad	56-73	40-50	67-84	58-73	62-78	51-67	44-77	42-70
8. Jaipur	46-82	43-78	64-88	51-80	60-75	55-66	59-81	48-78
9. Kanpur	49-69	39-59	68-82	57-76	47-61	35-57	63-78	57-63
10. Kochi	70	51	85	56	72	51	70	61
11. Lucknow	55	50	70	58	50	40	60	58
12. Mumbai	45-81	45-68	63-81	60-75	58-77	46-66	73-79	56-72
13. Varansi	50	40	70	50	55	40	50	50
14. Vizag	74	59	85	70	75	57	75	51
Prescribed Standards *	55	45	65	55	50	40	75	70

* Ambient noise standards prescribed by CPCB.

Source : Central Pollution Control Board

made structures and to country's ecology in general. Health effects associated with different types of air pollution are given in Table 11.5.

Water Pollution

26. According to an analysis of water quality over 12 years (1986-97) by CPCB, the Biochemical Oxygen Demand (BOD) values, in a sample of 4500 observations, below 3mg/l were above 60 percent during 1986 to 1991, the values gradually declined down to 54 percent in 1994-95 but rose to 58 percent in 1997. This indicates that the water quality which had gone down during 1986-91, improved during 1991-95. Similarly, there was a gradual increase in number of observations having BOD more than 6mg/l from 7 percent in 1989 to 16 percent in 1997. However, there is no significant change in the number of observations belonging to BOD range between 3 and 6 mg/l. The water quality monitoring results indicate that organic and bacterial pollution continue to be pre-dominant source of pollution in our aquatic resources. A large part of municipal sewage is allowed to flow in untreated form to nearby receiving water bodies, thereby reducing dissolved oxygen required for supporting aquatic life, increasing the pollution load in terms of BOD and

TABLE 11.5
Health effects associated with different types of air pollution.

Cause	Effects due to prolonged exposure
Lead	Affects circulatory, reproductive, nervous and renal systems; suspected of lowering learning ability in children; hazardous even after exposure ends.
Particulate Matter	Fine particles may cause lung cancer; a strong correlation exists between suspended particulate and infant mortality in urban areas.
Carbon Monoxide	Affects foetal growth in pregnant women and tissue development of young children; impairs perception and thinking, slows reflexes and causes drowsiness, can cause unconsciousness and death.
Sulphur Dioxide	Exacerbates asthma, bronchitis and emphysema; causes coughing and impairs lung function.
Toxic Substances	Suspected of causing cancer, reproductive problems and birth defects; benzene is a known carcinogen

Source : Asia-Pacific Environmental Outlook, UNEP, 1997

exponential increase in number of coliform bacteria, an indicator of presence of disease causing organism in water.

27. The ranges of water quality parameters with respect to organic and bacterial pollution as observed in 1997 indicate that out of 4531 observations taken on BOD, about 65 percent were having BOD less than 3mg/l, 21 percent 3-6 mg/l and 14 percent more than 6 mg/l. Among most of the observations taken on BOD having values less than 3mg/l, Kerala stands first and Maharashtra tops in BOD values exceeding 6mg/l. The maximum number of fecal coliform bacteria values were found in the states of Uttar Pradesh, Gujarat, Tamil Nadu and Assam. Gujarat tops in chemical pollution followed by Maharashtra, Andhra Pradesh, Tamil Nadu, Uttar Pradesh and Punjab.

28. The major sources of water pollution are discharge of domestic sewage and industrial effluents which contain organic pollutants, chemicals and heavy metals and run-off from land based activities such as agriculture and mining. The major water polluting industries include fertilizers, refineries, pulp & paper, leather, metal plating and other chemical industries. Besides, non-point sources such as fertilizers and pesticides run-offs in rural areas are emerging as major cause of concern.

29. The rising industrial and domestic wastes have resulted in heavy stress of pollution of water bodies such as lakes, rivers, coastal areas and underground sources. A 1994 survey of groundwater quality at 138 sampling locations in 22 industrialized zones indicated that water was unfit for drinking due to high bacteriological and heavy metal contamination. As per data generated by CPCB, mean B.O.D values have shown a marginal increase in all the 28 major rivers between 1979-91. Minimum and maximum coliform values have shown many fold increase over the same period indicating severe pollution.

30. Facilities to treat waste water are woefully inadequate. In class I cities, only 5 percent of the total wastewater is collected of which only 25 percent is treated. More than half of the cities have no sewage. Access to safe drinking water, thus remains an urgent need ; 85 per cent of the population in the urban areas and 79 percent in rural areas have access to safe drinking water (Table 11.6). The diseases commonly caused due to contaminated water are diarrhoea, trachoma, intestinal worms, hepatitis etc. Recent

TABLE 11.6						
Population Covered with Drinking Water and Sanitation Facilities						
	Percentage Coverage					
	Drinking Water			Sanitation Facilities		
	Urban	Rural	Total	Urban	Rural	Total
India	85	79	81	70	14	29
Bangladesh	99	96	97	79	44	48
China	97	56	67	74	7	24
Pakistan	82	69	74	77	22	47
Philippines	92	80	86	88	66	77
Indonesia	79	54	62	73	40	51
Sri Lanka	88	52	57	68	62	63
Nepal	88	60	63	58	12	18

Source : World Resources 1998-99, p. 251, UNDP, UNEP and World Bank.

data show that about 21 per cent of all communicable diseases in India (11.5 percent of all diseases) are water borne diseases.

Solid Wastes

31. Unregulated growth of urban areas without necessary infra-structural services and proper collection, transportation, treatment and disposal of solid wastes have resulted in increased pollution and health hazard from these wastes. Urban Municipal Wastes (MSW) is a heterogeneous mixture of paper, plastic, cloth, metal, glass, organic matter etc. generated from households, commercial establishments and markets. Based on surveys carried out, the urban MSW generated in 1997 is estimated at 48 million tonnes.

32. Although our current per capita waste generation is very low as compared to advanced countries, the actual quantum of waste is large owing to the enormous size of our population. Plastics wastes alone has increased tremendously over the last few years. The mode of waste disposal predominantly remains through land filling, which is a conventional but unhygienic method. Alternative modes like composting and other scientific approaches are sparsely used. An inadequate collection/disposal of such wastes pollutes and degrades land and water resources, besides being a health hazard.

33. Flyash, phospho-gypsum and iron & steel slags are the main forms of industrial solid wastes generated in India. It is estimated that 35-40 million tonnes of flyash is generated annually by the thermal power plants of which only 2-3

percent is currently being utilised. Besides, around 5 million tonnes of hazardous wastes is generated annually with very little infrastructure for proper disposal of these wastes.

Coastal and Marine Pollution

34. The coastal areas of India, with a coast line of over 7500 km. harbour a variety of specialized marine ecosystems like mangroves, coral reefs, salt lakes and mud flats which mainly form the habitat for endangered marine species and commercially important marine flora and fauna. These coastal areas are exposed to environmental stress for several reasons which include the following :

- Land based sources of pollution resulting from ship breaking, transport, tourism and industrial activities including oil spills, the discharge of sewage and industrial effluents and a heavy load of sediments.
- Prawn culture activities and aqua culture farms along the coastal land on the East Coast.
- Unplanned and improper development activities without appropriate coastal zone management plans.
- Shipping and sea based activities including oil spills, sludge disposal and mining in coastal areas.
- Offshore petroleum and gas exploration.

35. A number of chemicals, petro chemical and other industries in the coastal areas have resulted in significant discharge of industrial effluents into the coastal water bodies. Heavy metal such as lead and cadmium were found in Thane creek of Mumbai coast. The Cochin region of Kerala coast has been found affected by petroleum hydrocarbons. Coral reefs , which are very productive marine eco-system are adversely affected by their indiscriminate exploitation for

production of lime, recreational use and ornamental trade. An area of 6700 sq. km. under mangroves is under biotic pressure due to fishing, land use changes in land-sea interface and pollution of water. The country's unique wetlands covering an area of 1.45 million hectares are facing problems of weed infestation, siltation, pressure of agriculture & encroachment, chemical and organic pollution, conversion to industrial sites, urbanisation and habitation. Out of the 85 wetlands of international importance in the country, 45 percent are subject to moderate or high threat.

36. An important impact of climate change and global warming may be the rise in sea level. The primary effect of sea level rise will be increased coastal flooding, erosion, storm surges and wave activity. Primary studies on the impact of one meter sea level rise on the Indian coastline indicate that 0.41 per cent of India's coastal area will be inundated (Table 11.7).

TABLE 11.7		
Land Area and Population Affected in India by one Meter Sea Level Rise		
State	% of State area inundated	% of the State population affected
Goa	4.84	7.25
Tamil Nadu	0.52	2.91
Orissa	0.81	1.76
West Bengal	1.88	2.35
Andhra Pradesh	0.19	0.93
Gujarat	0.92	1.07
Maharashtra	0.18	1.75
Andman & Nicobar Islands	0.72	NA
Karnataka	0.15	0.56
Total	0.41	1.68
Source : State of Environment , 1995 , MOEF		