

3rd Draft

Country Environmental Analysis

Bangladesh

Asian Development Bank

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Table of contents

I. INTRODUCTION	1
II. NATURAL RESOURCE AND ENVIRONMENT IN BANGLADESH ECONOMY	2
A. NATURAL RESOURCE AND ENVIRONMENT	2
B. THE ECONOMY.....	3
C. FUTURE DEVELOPMENT AND ENVIRONMENT AGENDA	4
III. NATURE AND EXTENT OF ENVIRONMENTAL PROBLEMS	6
A. POLLUTION.....	6
B. GROUND WATER CONTAMINATION WITH ARSENIC.....	9
C. LAND DEGRADATION AND LOSS OF SOIL QUALITY.....	9
D. RIVER BANK EROSION.....	12
E. LOSS OF WETLAND	12
F. DEGRADATION OF FORESTS AND LOSS OF FOREST LANDS.....	13
G. LOSS OF BIODIVERSITY	14
F. CLIMATE CHANGE AND VULNERABILITY	15
a. <i>Greater vulnerability in coastal areas</i>	16
b. <i>Impact on fresh water resources</i>	16
c. <i>Implications for Agriculture and Fisheries</i>	17
G. UNPLANNED URBANIZATION	17
IV. LEGAL, INSTITUTIONAL, AND POLICY FRAMEWORK	19
A. LEGAL AND REGULATORY FRAMEWORK.....	19
B. POLICY FRAMEWORK	21
C. NATIONAL INSTITUTIONS.....	26
a. <i>General institutional arrangement</i>	26
b. <i>Major government institutes in environment sector</i>	27
c. <i>Local government institutions</i>	30
D. INTERNATIONAL ENVIRONMENTAL AGREEMENTS.....	30
V. DONOR PROGRAM AND ACTIVITIES	32
A. ACTIVITIES OF DEVELOPMENT PARTNERS.....	32
a. <i>NEMAP Implementation</i>	32
b. <i>Sustainable Environment Management Program (SEMP)</i>	32
c. <i>Bangladesh Environmental Management Project (BEMP)</i>	33
d. <i>Air Quality Management Project</i>	33
e. <i>National Conservation Strategy Implementation Project (NCS IP)</i>	34
f. <i>Dhaka Urban Transport Project</i>	35
B. ROLE OF BANK IN ENVIRONMENT SECTOR	36
a. <i>Sundarbans Biodiversity Conservation Project</i>	36
b. <i>Southwest Areas Integrated Water Resources Management Project</i>	37
c. <i>Flood Rehabilitation Project</i>	37
d. <i>Upazila Afforestation and Nursery Development Project</i>	38

<i>e. Aquaculture Development Project</i>	39
IV. KEY CONSTRAINTS	40
A. LACK OF INTER-SECTORAL COORDINATION	40
B. CONFLICT IN SECTORAL POLICIES	40
C. LACK OF INSTITUTIONAL CAPACITIES	41
D. REGULATORY AND INSTITUTIONAL INADEQUACIES FOR POLICY IMPLEMENTATION...	41
E. OUTDATED LAW	42
F. NON-PUNITIVE APPROACH OF LAWS	43
VI. BANK’S FUTURE ROLE IN ADDRESSING ENVIRONMENTAL CONCERNS IN BANGLADESH	44
A. THE BANK’S STRATEGIC OBJECTIVES	44
B. RECOMMENDATIONS FOR ADDRESSING ENVIRONMENTAL ISSUES	45
C. OPTIONS OF BANK’S INVOLVEMENT	49

Abbreviations

ADB	Asian Development Bank
AQMP	Air Quality Monitoring Project
BBS	Bangladesh Bureau of Statistics
BEMP	Bangladesh Environment Management Program
BFIDC	Bangladesh Forest Industries Development Corporation
BFRI	Bangladesh Forest Research Institute
BSAP	Biodiversity Strategy and Action Plan
BWDB	Bangladesh Water Development Board
CBD	Convention On Biological Diversity
CCF	Chief Conservator of Forests
CHT	Chittagong Hill Tracts
CIDA	Canadian International Development Agency
CSP	Country Strategy Plan
DANIDA	Danish International Development Agency
DFID	Department for International Development
DoE	Department of Environment
ECA	Ecologically Critical Areas
ECNEC	Executive Committee of National Environment Council
ECR	Environmental Conservation Rules
EIA	Environmental Impact Assessment
FAP	Flood Action Plan
FCDI	Flood Control, Drainage and Irrigation
FD	Forest Department
FSP	Forestry Sector Project
FSRFD	Fisheries Sector Review and Future Development
FYPs	Five Year Plans
GDP	Gross Domestic Product
GMO	Genetically Modified Organisms
GoB	Government of Bangladesh
ICTPS	International Convention, Treaties and Protocols

ICZM	Integrated Coastal Zone Management
IFDP	Irrigation Fisheries Development Project
INC	Intergovernmental Negotiating Committee
IPCC	Intergovernmental Panel on Climate Change
IPR	Intellectual Property Right
IUCN	The World Conservation Union
IWRM	Integrated Water Resource Management
KNM	Khulna News Print Mills
LGED	Local Government Engineering Department
MDG	Millennium Development Goals
MoEF	Ministry of Environment and Forests
MPO	Master Plan Organization
NCS	National Conservation Strategy
NEC	National Environment Council
NEMAP	National Environment Management Action Plan
NEP	National Environment Policy
NGO	Non Governmental Organization
NRM	Natural Resources Management
NRMC	Natural Resource Management Council
NS-EGPRSD	National Strategy for Economic Growth, Poverty Reduction and Social Development
NWMP	National Water Management Plan
PA	Protected Area
PMEs	Public Manufacturing Enterprise
PRSP	Poverty Reduction Strategy Paper
RF	Reserved Forest
SBCP	Sundarban Biodiversity Conservation Project
SEMP	Sustainable Environment Management Program
SRF	Sundarban Reserved Forests
UNDP	United Nations Development Program
UNEP	United Nations Environmental Program
USAID	United States Agency for International Development
USF	Unclassified State Forest

WARPO	Water Resources Planning Organization
WHO	World Health Organization
WTO	World Trade Organization

I. INTRODUCTION

1. This report of Country Environmental Analysis (CEA) aims to assess ADB's future role and operational strategy in the environment sector and will also provide input to the Country Strategy and Action Plan (CSP). This CEA for 2005-2009 outlines the environmental issues that are most significant to the Bangladesh's economy. It will also provide background information on the environmental constraints, needs and opportunities in Bangladesh. Over the given period of this strategy document, ADB will be working with the Government of Bangladesh (GoB) for the improvement of the environment sector, wherein this report may be a basis for actions and/or interventions.
2. This work focuses on the aspects of understanding the important features of the Bangladesh environment that need to be essentially understood. The purpose of the report is to present the findings of a review done on the environment sector. The review considered the ongoing and past interventions, legal and policy regimes and finally outlined the outstanding issues facing the sector. Since environment is vast and broad and cut across almost all the formal sectors, the review was conducted as exhaustively as possible to cover all. While tabling the recommendations, recent policy directives like the National Strategy for Economic Growth; Poverty Reduction and Social Development (NS-EGPRSD); MDG etc. have been kept in mind.
3. While preparing this strategy document, implications and lessons learned from the Country Strategy Plan (CSP) 2003 Updates, Policy and Strategy Documents of Government of Bangladesh (GoB) have been duly consulted. Besides these, discussions were held with the Planning Commission, Department of Environment, Forest Department, Concerned ADB personnel, etc. with a view to incorporate their approach and strategy.
4. A half-day consultative workshop was organized on 25 April 2005 with participation from a wide range of stakeholders to share the draft CEA. The participants included representatives from government agencies, NGOs, private bodies and donor agencies. Participants provided their inputs on the draft report. They had also helped in identifying new issues that were not included in the first draft. The views and suggestion of the participants have been incorporated to finalize this report.

II. NATURAL RESOURCE AND ENVIRONMENT IN BANGLADESH ECONOMY

A. Natural resource and environment

5. Bangladesh is a country of about 147,570 square kilometers, including inland and estuarine water. 6.7% of the country are rivers and inland water bodies. The congruence of the three mighty Himalayan rivers – the Ganges, the Brahmaputra and Meghna drain into the Bay of Bengal and the alluvial deposits carried down mostly by these mighty rivers for thousands of years have formed Bangladesh. It is the largest delta in the world.
6. Bangladesh lies north of the Tropic of Cancer, located between 20⁰34' N and 26⁰33' N latitudes and 88⁰01' E and 94⁰41' E longitudes. Located in the northeastern part of the Indian subcontinent, it is bordered by India on the west, north and east, except for a small portion in the south – east by Myanmar. The Bay of Bengal occupies the entire south.
7. Nearly 50% of the country stands 10 meters above the sea – level. Bangladesh has three types of landscapes: floodplains spread over 80% of the country's land area, terraces covering 8% and hills dispersed over 12% of the land area of Bangladesh.
8. The three major rivers, the Padma, the Meghna and the Brahmaputra, and about 700 other rivers, distributaries, streams and canals totalled an enormous length of waterareas. Rashid (1991) estimated the area to be about 24,000 km. *Beels*, *baors*, *haors*¹, rivers and canals, floodplains, estuaries etc made up this vast network of wetlands which provide a huge refuge for wildlife, fish and other aquatic lives.
9. The tropical climate has made the country luxuriant in vegetation. The forests of Bangladesh can broadly be classified as: (i) Tropical evergreen or semi-evergreen forest in the eastern districts of Chittagong, Cox's Bazar, Sylhet, and the Chittagong Hill Tracts region collectively known as Hill forest; (ii) Moist or dry deciduous forest also known as *Sal* (*Shorea robusta*) forest located mainly in central plains and the freshwater areas in the northeast region; and (iii) Tidal mangrove forests along the coast, the Sundarbans in the southwest of the Khulna and other mangroves in the Chittagong and Noakhali coastal belt.
10. Bangladesh harbors a diverse and extensive fauna and flora. IUCN (2000a) reported 266 species of freshwater fish species and 442 marine species. The fauna, especially the wildlife includes 125 species of mammals, 750 species of birds, 500 species of fishes, 125 species of reptiles and 9 species of amphibian. The number of species, especially the flora and invertebrates, of Bangladesh are

¹ *Beel* is perennial waterbody; *baor* is a ox-bow lake; *haor*, endemic to Bangladesh, is saucer shaped depressed land which remains underwater for more than 6 months.

not known for certain. Khan (2001) reported that Chittagong zone alone possess over 2,259 species of flowering plants. Hassan (2003) stated that there are over 700 species of flowering plants, 500 species of medicinal plants, 300 species of mangrove and mangrove associate plants and 300 species of wetland plants in Bangladesh.

11. The total population of Bangladesh is 130 million, with a density of 720 people per square kilometers and a growth rate of 2.17% (BBS, 2001). The populace is comprised of 86% Muslims, 12% Hindus and the remaining 2% Buddhists and Christians. Infant mortality rate (IMR) stood at 153 deaths per 1000 live births in mid-seventies. The recent estimate for 2000 puts the figure at 62. The under-five mortality rate was over 250 deaths per 1000 births during the early seventies, which declined to 83 in 2000 (ERD, 2003). The human poverty index, which stood at 61 per cent in the early eighties, has declined to 35 per cent in the late nineties.

B. The economy

12. The targeted GDP growth rate for 2004 is 5.5%. It is likely that Bangladesh will achieve this target. 5.3% GDP growth rate was achieved in 2003. In 2002 it was to 4.8% compared to 5.3% in 2001. Services, industry and agriculture are the major contributors in country's GDP. The total share in GDP comprises 48% for service sector, 27% for industry and 25% for agriculture. In 1992, the Sectoral share to GDP was 49% for service sector, 22% for industry and 29% for agriculture. The trend in sectoral composition of GDP shows a slow decline of relative share of agriculture and increase in the shares of services and industry sector.
13. Bangladesh Bureau of Statistics (BBS) has recently drawn-up the provisional estimates as regards a number of key macroeconomic variables. These estimates show that the five top contributors to incremental GDP growth in FY04 are the following sectors: (i) manufacturing 20.8%, (ii) wholesale trade 15.8%, (iii) construction 12.5%, (iv) transport and communication 11.3%, (v) agriculture 11.0%, and (vi) crop sub-sector 3.9%. As may be seen, the GDP growth in FY04 was spearhead by manufacturing industries and various service sectors, while share of agriculture was below its sectoral share.
14. The agriculture sector comprises crops, forests, fisheries and livestock. The performance of agricultural sector has an overwhelming impact on major macroeconomic objectives like employment generation, poverty alleviation, human resources development and above all the food security. This sector generates 63.2% of total national employment, of which crop sectors share is nearly 55 %. About 84% of the total population live in rural areas and are directly or indirectly engaged in a wide range of agricultural activities (BBS, 2000a, 2000b). Rice and jute are the principal crops. Sugarcane, potato, pulse, tea and tobacco are also important cash crops. Wheat and cotton production has increased substantially in the last decade.

15. The total share of agriculture and forestry sub-sector to GDP is 19.2% (crop and horticulture- 14.4%, animal farming-2.9%, and forest and related services 1.9%). Fishing sub-sector contributes 5.4% to GDP. The output growth slowed down substantially in the crops and horticulture sub-sector of agriculture, from 8.1% and 6.2% in FY00 and FY01 to 2.8% in FY02. There has been a fair recovery in the fishing sub-sector. It recovered from 4.5% decline in FY01 to a 2.1% growth in FY02. The growth for animal farming and forestry stood at 2.9% and 4.9% respectively in FY02.
16. Foodgrain production has increased in FY03 after a decline in FY02. According to estimate of the BBS, actual foodgrain production for FY03 was 26.69 million metric tons (*Aus*- 1.85 million metric tons, *Aman*- 11.11 million metric tons, *Boro*- 12.22 million metric tons, and wheat- 1.51 million metric tons), which was about 3% higher than that of FY02. Total rice production in FY03 was more than 4% than that of FY02. It may be mentioned here that though the production of foodgrains has increased in FY03, it is still below the production level of FY01 (26.76 million metric tons).
17. Growth in inland aquaculture has been phenomenal during the last decade. In 1999/2000, total production from aquaculture was 657,120 MT, which is 39.44% of the total catch (BBS, 2000a). However, the full potentials of aquaculture are yet to be fully utilized. There is a great potentials for improvement in production. The shrimp sector contributes significantly to foreign exchange earning and employment in rural areas. The combined production from marine and brackish water ponds and from freshwater *ghers* (Shrimp farms), as reported by Fisheries Sector Review and Future Development (FSRFD) study in 2003, is estimated to be around 42,900 MT.
18. The lowest growth rate (3.2%) in the manufacturing sub-sector was recorded in the recent past during the 1990s in the year of severe floods. Since then, it has gradually recovered. In FY03, the sector recorded 6.6% growth with its medium and large component expanding at a slightly lower than average rate of 6.0 percent (CPD, 2004). The share of manufacturing sub-sector in GDP stood at 15.6% in FY02. In the industry sector, low share of power, gas and water supply (1.5%) indicates the infrastructural inadequacies constraining industrial growth.

C. Future development and environment agenda

19. Bangladesh has achieved several milestones in environment sector despite the hardship from poverty, resource scarcity, overpopulation, corruption and natural calamities. Achievements ranged from incorporation of environmental concerns in sectoral policy formulation to benchmarking success at the field level. Like any other countries, achieving environmentally sound development has emerged as the greatest challenge for Bangladesh.

20. The implication of future development should be carefully examined to take environmental concerns into account. The economic activities are still very much dependent on the natural resource base of the country. Future growth potential will definitely put stress on the fragile resource base. On the other hand, quality of environment will significantly affect the sustainable contribution of important sectors to Bangladesh's GDP. The recent growth in manufacturing sector will have great effect on overall economy. It might also have tremendous stress on the natural resource base and overall environment unless the pollution loads, arises due to industrial development, are not taken care of seriously. Service sector like housing, transport, real estate and urban activities also put pressure on the environment and in turn can affect the economic growth potential.
21. Integration of environmental issues and concerns into development processes should be a prime concern for Bangladesh. The growth of the country must be based on the principle of sustainable development. Economic growth and environmental sustainability should be treated as mutually interdependent aspect to improve the well-being of the nation. Multi-stakeholder partnership, involving government, private sector and public in general, and ownership in decision making is a preconditions for such development. Without such a consensus, the key challenges of environmentally sound, socially just and equitable economic development will be a far cry.

III. NATURE AND EXTENT OF ENVIRONMENTAL PROBLEMS

22. Bangladesh faces a growing number of multifarious environmental problems. The following are several environmental issues that significantly affect Bangladesh's economy.

A. Pollution

23. Concentration of people in urban growth centers simultaneously increase the concentration of domestic and industrial activities that lead to pollution problem for urban and its surrounding areas. In the rural area, runoff of agrochemicals from agricultural fields deteriorated water quality. It has mostly affected the fisheries sector. However, pollution issues are most acute in urban areas.
24. **Water Pollution** is mostly concentrated in urban growth centers and industrial belts. Due to lack of adequate regulatory measures and institutional setup for proper monitoring and control, pollutants from municipal, industrial and agricultural waste enter into the inland water system. Major causes of pollution that aggravate water quality are industrial effluents, agrochemical, fecal pollution, spillage and low water flow in dry season
25. Industrial pollution and deteriorating water quality is a growing environmental concern. Treatment of industrial waste and effluents has so far been considered as low priority. Most of the industries in Bangladesh are located along the bank of the main rivers. The most significant industrial growth has been recorded after 1982 especially the development of garments, textile and dyeing sectors. The industrial sector of Bangladesh can be categorized into 3 major categories based on its input: agro-based industries, non-renewable local resource based industry and imported resource based industries (Islam, *et. al.*, 2001).
- Agro-based Industries: It includes jute, pulp and paper, match, sugar, shrimp salt etc. The main polluter form this category are sugar, pulp and paper and tanneries.
 - Non- renewable local resource based industry: Includes industries based on mineral resources, hard rock, sands, glass, limestone and various types of clays. In this sector, the major polluters are cement and fertilizer factories.
 - Imported resource based industries: This category includes textiles, pharmaceuticals, plastic, petroleum/ refineries, and metal works. Most of these considered as highly pollutant.

Table 1 ranks the most polluting industries in Bangladesh.

Table 1. Top five polluters that causes water pollution (Islam, et. al., 2001)

Rank	Industrial sector	Emission (tons/Year)	% Contribution
1	Pulp and Paper	91768.10	47.4%
2	Pharmaceuticals	30866.72	15.9%
3	Metal	27174.61	14.0%
4	Food Industry	23403.39	12.1%
5	Fertilizer/Pesticides	12715.00	6.6%

26. These industries emit both organic and inorganic pollutants. The biodegradable organic pollutants reduce the dissolve oxygen of water and hamper the aquatic ecosystem of water and non-biodegradable organic component persist in the environment for a prolong period and pass into the food chain. Inorganic pollutants are mostly metallic substance. They undergo different chemical reaction in the river system and thus seriously deteriorate the water quality.
27. The main suspects sources of agricultural run off pollution are from the use of fertilizers and agrochemical like pesticides and herbicide. Water run off from the land pollutes the surface water and cause bioaccumulation of toxic substances in the food chain. It also directly affects aquatic ecosystem and its biotic component.
28. Pollution from feces also degrades the water quality to a large extent. Improper sanitation system and untreated sewage mixes with the water deteriorates its quality. It is still an acute problem even in areas under sanitation coverage. In rural areas, there is a problem to design adequately sealed latrine system that can cope annual flooding and prevent fecal pollution. Fecal contamination is more significant in wellhead areas rather direct aquifer pollution.
29. Water pollution problem is compounded by the low flow situation in dry season. Over the past 2 decades, the lowest water data level showed a declining tendency in the dry season (UNEP, 2001).
30. **Solid waste.** Estimates for solid waste generated in Dhaka city vary from 3,000 to 3,500 tons per day. They come from households, commercial and industrial establishments and street sweepings. Households generate most of the solid waste, accounting for nearly 45% of the total. Only 42% of the solid waste generated in Dhaka city is estimated to be collected by the municipal authorities. The indiscriminate disposal of solid waste in public places causes serious environmental hazards and health risks. Rotten and decomposed garbage make neighborhoods filthy, foul smelling and unhealthy. Uncontrolled and open

dumping also clog the urban drainage system, cause frequent drainage congestion and threaten the contamination of water supply.

31. **Hospital waste.** There are about 250 healthcare centers in Dhaka city that includes hospitals, clinics, nursing homes, dental hospitals etc. But inadequate waste management systems in these healthcare facilities are posing a serious threat to public health as well as to the environment. Disposable syringe, needles, blood- soaked pads, used blood bags and such other materials from more than 98 per cent of the health care are simply thrown in the open dustbins. The disposal of such hazardous portion of wastes from hospitals into public waste disposal system exposes the people to serious health risk.
32. **Hazardous and toxic wastes.** Very limited data is available on the hazardous and toxic wastes in Bangladesh. The top toxic chemicals polluters are the tanneries and leather industry, followed by pulp and paper, pharmaceuticals, fertilizer/pesticides and industrial chemicals. In most cases, the chemicals are disposed on land as part of the solid waste, parts of which are then collected and recycled. Exceptions are the pulp and paper and cement factories – these emit most of the chemical to air. However, it is quite likely that a significant part of the land pollution eventually ends up in water through direct runoff and seepage. Unfortunately, no information is available on the ultimate fate of these toxic chemicals.
33. **Air pollution.** Polluted air is harmful for human health depending on the nature of the pollutant, concentration, duration of exposure and the state of health and age group of the recipient. Polluted air causes respiratory problem, asthma, bronchitis, headache and dizziness, nasal congestion, renal damage etc. Lead pollution has harmful affect on children that is 3 times more at risk than adults. Apart from impact on human health, air pollution has detrimental impact on the ecosystem, vegetation and livestock.
34. Air pollution is more acute in urban areas than in rural areas. In urban area, the main sources of air pollution are emission of harmful gaseous matters from vehicle, industrial sectors, and construction and open dumping of garbage. In rural area, main sources are brick kilns and wood and biomass consumption. Due to rapid urbanization the total number of vehicles has increased rapidly. The automobiles on the road are often very old, overloaded and poorly maintained and emit smoke far exceeding the prescribed limit. Industrial development is another major source of air pollution. Most of the industries in Bangladesh are situated in major urban areas. Food industry emits maximum amount of pollutants followed by cement, pulp and paper industry and textile. Among food industry, most of the pollutants come from the sugar mills. Table 2 shows the top 5 industry that pollute the air most.

Table 2. Top five polluters that causes air pollution (Islam, et. al., 2001)

Rank	Industrial sector	Emission (tons/Year)	% Contribution	Cumulative Percent
1	Food industry	146356.06	38.7%	38.7%
2	Cement/clay	62725.88	16.6%	55.3%
3	Pulp and Paper	51963.92	13.7%	69.0%
4	Textile	39831.01	10.5%	79.5%
5	Tobacco	16992.22	4.5%	84.0%

35. A continuous monitoring is necessary to evaluate air quality and for the development plan to mitigate the health risk from air pollution. DoE has set up 4 monitoring station at four divisional towns namely, Dhaka, Khulna, Chittagong and Bogra. More stringent enforcement to reduce air pollution is required.

B. Ground water contamination with arsenic

36. Arsenic contamination of groundwater is major environmental concern in Bangladesh. Arsenic was first detected in groundwater in 1993. Contaminated wells exceeding the Bangladesh standard of 0.05mg/l have been identified in 61 of the country's 64 districts and in about 30% of the total number of hand pump tube wells. It has been estimated that a population of 25 to 36 million are exposed to arsenic contamination and related health risks. The number of identified arsenicosis patients was about 13,000 in mid 2002. However, there are a large number of patients still remain unidentified.
37. Arsenic is mostly found in water harvested from the upper and mid aquifers. It is of natural origin coming from sedimentary materials containing the arsenic in potentially soluble forms. It is believed to be released to groundwater under reducing conditions.
38. Since the late 1990s, the Government, international and national NGOs, research institutions, and external funding agencies launched many initiatives on this issue of arsenic pollution. Efforts have been focused on nationwide testing of wells and groundwater surveys, emergency relief to heavily affected areas and to identified patients, and pilot testing of mitigation options.

C. Land Degradation and loss of soil quality

39. Land degradation occurs in the form of loss of (i) soil quality through salinity intrusion, fertility decline, nutrient imbalance and (ii) top soil loss through

erosion. The soils of Bangladesh, in general, are very fertile and productive. However, high cropping intensity, loss of organic matter and imbalanced use of fertilizer and pesticides have taken a very serious toll on overall soil health. Soil quality and/or productivity is on decline. The indigenous agricultural practices, till 1970s, had very little impact on soil productivity. But the later adoption of more intensive agricultural practices, particularly mono-cropping, initiated application of NPK as chemical fertilizer which at present has boiled down to the applications manganese, sulfur, etc. coupled with wide spread use of insecticides and fungicides. The data on fertilizer use indicate that it has increased from 18 kg/ha/yr in 1973 to 108 kg/ha/yr in 1994 (Ullah 2001).

40. One of the major consequences of this practice is loss of organic matter, one of the best indicators of soil quality. The percentage of soil organic matter has deteriorated over the past decades. Karim *et. al.* (1994) reported the highest deterioration in Barind Tract, Madhupur Tract, Himalayan Foothill areas, the floodplain of Tista, Karatoya and Bangali and in the northern hill regions. Figure 1 shows the changes or organic matter from 1969-70 to 1989-90. Decrease in input of organic matter in the form of crop residue and cow dung is also the causes of organic matter depletion. Due to fuel shortage in the rural areas, these inputs are increasingly being used to generate heat.

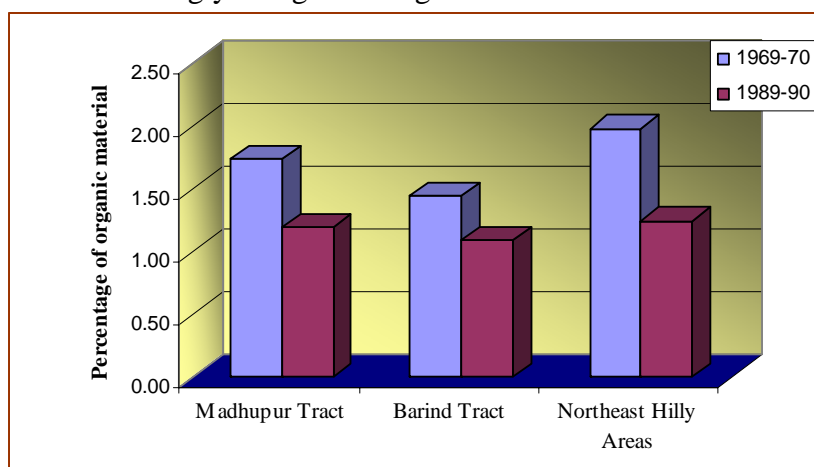


Figure 1

Changes in Organic matter from 1969-70 to 1989-90 (Karim *et. al.*, 1994)

41. Land degradation is a common phenomenon in the hilly and undulated areas of Bangladesh. About 10% of the country's land is hilly (Khisa, 1997). Table 3 gives brief idea of hilly areas in Bangladesh.

Table 3. Hilly Areas of Bangladesh (Khisa, 1997)

Region	Area in Hectares	Percent Hilly
Chittagong Hill Tracts	1,240,889	75.6
Chittagong	235,216	14.2
Sylhet	152,922	9.2

Region	Area in Hectares	Percent Hilly
Jamalpur	6,316	0.38
Mymensingh	1,431	0.09
Comilla	1,226	0.10
Feni	1,226	0.07

42. Land degradation in the form of soil erosion is mostly human induced and is more serious in Chittagong and Chittagong Hill Tracts. The Unclassed State Forest (USF) area of about 0.88 million hectares, since has no forest management, got drained of its valuable tree resources under the permits issued by the district administrative authorities, against the high demand of wood. At the same time with increase of the tribal population, practicing shifting cultivation over this tract of USF, reduced the cycle of slash and burn agriculture, from 25 year in 1960s to 4 years in 1990s. The land thus being subjected to more and more frequent regression of tillage under slash and burn practice, yielded to erosion, mostly to water erosion.
43. Shahid (1994) has calculated erosion rate per hectare. He found the erosion to be as high as 120 tons per hectare per year in deforested hill slops, compared to the erosion rate of 2.7 to 7.2 tons per ha per annum in the mixed forest-covered land.
44. Karim *et. al.* (2001) has estimated the cost of land degradation resulting from productivity loss due to water erosion, soil fertility decline (top soil) and salinity intrusion is equivalent of Taka 60,832.57 million per year and loss from nutrient is Taka 47245.34 million per year. The productivity loss per year accounts for 4.33% of GDP (of 1997) and nutrient loss accounts for 3.37% of GDP (of 1997). In total, Karim *et. al.* (2001) have estimated the cost of degradation as approximately 7.7% of GDP (of 1997).

Table 4. Valuation of losses from land degradation (after Karim et. al. 2001; Haque 2002)

Item	Total loss	Costs in million taka/year (% of GDP of 1997 at constant market price)
Water erosion – production loss	1.06 mt/yr	6613.84
Water erosion – nutrient loss	1.44 mt/yr	25,576.46
Soil fertility decline – production loss	4.27 mt/yr	26,641.48
Soil fertility decline – additional input needed to replace	1.22 mt/yr	21,668.25
Salanization (production loss)	4.42 mt/yr	27,577.25
A. Productivity loss		60,832.57 (3.33%)
B. Nutrient loss		47,244.71 (4.37%)
C. Estimated total loss		108,087.28(7.70%)

D. River bank erosion

45. Riverbank erosion is a perennial problem in this country. The Bangladesh Water Development Board (BWDB) has estimated about 1200 km of riverbank is actively eroding and more than 500 km face severe problems related to erosion. It is estimated that river erosion annually affects about 100,000 people living on the riverbanks. This particular problem imposes significant social hardship as they loss homestead and agricultural land.
46. Efforts to control bank erosion have only been carried out on the major rivers. Until the 1960s, bank protection works were mainly restricted to areas upstream of Hardinge Bridge on the river Ganges and to local town protection works such as those at Sirajganj. Under the FAP several studies for erosion control were conducted. The cost involved for undertaking any measure ranged from US\$10 to US\$30 million per km. Applicability and credibility of such high cost projects are questionable.
47. Contrary to the conventional approach, contemporary river management strategies comprise reducing hazard through precise forecasting and adoption of non-structural measures such as strategic retirement of infrastructure and re-settlement of affected habitation, and on developing low-cost measures for erosion control. The draft National Water Management Plan (NWMP) calls for preparation of a master plan for river training on the basis of past and ongoing experience, and provision of bank stabilization works in combination to non-structural measures.

E. Loss of Wetland

48. Wetlands are valuable resource for agriculture-based economy of Bangladesh. Wetlands support huge production potential for fisheries sector. With the loss of wetlands, the openwater fisheries production is declining gin Bangladesh. Besides the fisheries, wetlands function as retention area that controls floods, recharges the ground water, work as irrigation water source etc.
49. The area of fisheries totals to about 5.3 m ha (Table 5).

Table 5. Area of fisheries (BBS, 1999)

Types	Area (ha)
Ponds and tanks	915,506
<i>Dighis, beels, haors etc.</i>	417,854
Artificial reservoir	90,688
Rivers and canals	830,040

Floodlands	2,834,008
Estuaries	183,401
Irrigated canals	6,073
Total	5,277,571

50. According to MPO (1987), the total estimated area of floodplain was 5.5 m ha at the end of June 1985 after 0.8 m ha had been dried up through flood protection measures from the estimated 6.3 m ha of floodplain. Another 3.36 m ha of floodplain were brought under protection from flooding (MPO,1990). Total area of floodplain now stands at 2.8 m ha (BBS, 2000a).
51. Above figures depict alarming depletion of the floodplain resource. Flood control, drainage and irrigation (FCDI) projects are, in most cases, have been blamed for reduction in floodplain areas. It has an adverse affect on fisheries sector. FCDI projects have been a policy trade off for more grain production at the cost of fisheries.
52. Following impacts of degradation of the wetlands of the country have been identified:
- Serious reduction in fish habitat, fish population and diversity;
 - Extinction and reduction of wildlife including birds, reptiles and mammals,
 - Extinction of many indigenous varieties of rice with the propagation of high yielding varieties;
 - Loss of many indigenous aquatic plants, weeds and shrubs;
 - Loss of natural soil nutrients;
 - Increase in the recurrence of flashfloods;
 - Deterioration of living conditions;
 - Loss of natural water reservoirs and of their resultant benefits; and
 - Degeneration of wetland-based ecosystems, occupations, socio-economic institutions and cultures.

F. Degradation of Forests and Loss of Forest Lands

53. The problems in Bangladesh Forestry are many folds and intricate with various other sectors. According to the Forestry Master Plan drawn in 1993, the actual forest cover of the country will not exceed 6%. Per capita forestland in Bangladesh has shrunk to a 0.022 ha, one of the lowest in the world. The annual deforestation rate in South Asia is 0.6% and it is 3.3% for Bangladesh (Gain 1998). Available information suggests that currently only 10% of the 1,20,000 hectare sal forest in Dhaka, Rangpur, Mymensingh, Tangail, Dinajpur and Rajshahi districts carries a tree cover of Sal. In Tangail District alone the sal forest has shrunk to 1,000 hectare in 1990 from 20,000 in 1970.

54. There has been a great deal of deforestation in the Chittagong Hill Tracts (CHT). Of the major reserve forests in the CHT, the Reinkhyong reserve forests has been the worst affected one. Massive deforestation in the Kassalong reserve forests occurred in 1979-84 when people from the plain land were settled in this area. The Sangu and Matamuhuri Reserves have also suffered quite extensive destruction both due to encroachments by destitute jumias displaced by plain-land settlers and also because of illegal logging. Deforestation and destruction of natural reserves in the CHT was further intensified by development activities such as dam, highway, road construction and other infrastructure development.
55. The major causes of forest depletion in Bangladesh may be enumerated as under:
- Lack of proper monitoring
 - Lack of accountability and corruption
 - Absence of people's participation
 - Absence of NGOs' involvement
 - Inadequate legal backup
 - Lack of law and order
 - Poor administration
 - Absence of incentives of the FD employees
 - Low priority attached by the Government towards forests, forestry and the FD
56. Increased salinity due to reduced fresh water flow in the downstream regions, increasing spillage/discharge of fuel oils and lubricants from ships and industrial chemicals polluting the mangroves waters might have led to top-dying of several species of trees in the Sundarban. Already 40% of the Sundarban forest is affected by top dying, which is killing the famous Sundri tree from the top down wards.

G. Loss of Biodiversity

57. The number of species, especially the flora and invertebrates, of Bangladesh are not known for certain. Khan (2001) reported that Chittagong zone alone possess over 2,259 species of flowering plants. Hassan (2003) stated that there are over 700 species of flowering plants, 500 species of medicinal plants, 300 species of mangrove and mangrove associate plants and 300 species of wetland plants in Bangladesh. The fauna, especially the wildlife includes 125 species of mammals, 750 species of birds, 500 species of fishes, 125 species of reptiles and 9 species of amphibian.
58. Bangladesh has lost about 10% of its mammalian fauna, 3% avifauna and 4% reptile during the last 100 years. IUCN Bangladesh has identified 201 species of wildlife in the country are threatened under different degree of extinction risk (Table 6 and Table 7). Loss of species is mostly coupled with loss of habitat. For most of these endangered species the forest and wetlands are the last refuge. Forest cover,

is also under constant threat. Forests are increasingly being degraded and denuded by encroachment and faulty management practices. Wetlands are in worse condition compared to that of forests. Wetlands are being converted into agricultural land and substantially degraded through the so-called development activities.

Table 6. Status of inland and resident vertebrates of Bangladesh (IUCN, 2000a)

Group	Total no. of Living species	Extinct	Threatened				Data Deficient (DD)	Not Threatened (NO)
			Critically Endangered (CR)	Endangered (EN)	Vulnerable (VU)	Total		
Fishes (freshwater & brackish water)	266	0	12	28	14	54	66	146
Amphibians	22	0	0	3	5	8	7	7
Reptiles	109	1	12	24	22	58	39	12
Birds	388	2	19	18	4	41	158	189
Mammals	110	10	21	13	6	40	53	17
Total	895	13	64	86	51	201	323	371

Table 7. Status marine and migratory vertebrates of Bangladesh (IUCN, 2000a)

Group	Total no. of Living species	Extinct	Threatened				Lower Risk (LR)	Data Deficient (DD)	Not Threatened other than CR, EN, VU, LR and DD
			Critically Endangered (CR)	Endangered (EN)	Vulnerable (VU)	Total			
Fishes (marine)	442	0	0	1	3	4	0	0	438
Reptiles (marine)	17	0	1	4	0	5	0	0	12
Birds (migratory)	240	0	0	2	4	6	6	4	224
Mammals (marine)	3	0	0	2	1	3	0	0	0
Total	702	0	1	9	8	18	6	4	674

F. Climate change and vulnerability

59. The contribution of Bangladesh to green house gas emission is considered to be very negligible in the global context of this issue. But her vulnerability to climate change is considered to have massive and disastrous consequences for Bangladesh. IPCC impact assessments identify Bangladesh as one of the most susceptible countries of the world. These impacts range from an overall increase in sea level, atmospheric temperature, and rainfall to more intense natural disasters in the form of floods, cyclones, storm surges, drought and others consequential impacts.

60. The largest impact of global warming will be felt in the water resources of Bangladesh. Many projections suggest greater variability in future monsoon

patterns, with severe impacts upon agriculture and other related sectors due to either excess flow or severely low flows and draughts in other years. Increased vulnerability to these threats and erratic climate conditions dictates that Bangladesh will experience more extreme climatic conditions. Following sections provide the concerns that Bangladesh might face due to global warming. The review has been heavily borrowed from study “Strategy for adaptation: coping with climate change and climate variability in Bangladesh” conducted by IUCN Bangladesh Country Office.

a. Greater vulnerability in coastal areas

61. The coastal areas face the primary risk of inundation and the entire zone is predicted to have greater vulnerability to cyclones and storm surges. Coastal areas of Bangladesh will be affected by drainage congestion due to raised riverbeds, higher water levels, salinity intrusion, reduced drainage, higher sea level etc.

b. Impact on fresh water resources

62. A 10% increase in monsoon precipitation due to climate change in Bangladesh could increase runoff depths by 18 to 20%, resulting in a sevenfold increase in the probability of an extremely wet year. Since climate models predict an increase in monsoon precipitation by 11 and 20%, it follows that surface runoff is likely to increase in the order of 20 to 45 %, respectively. IUCN (2003) reported that, by the year 2030, an additional 14.3% of the country will become extremely vulnerable to floods, while the already flood-vulnerable areas will face higher levels of flooding.
63. Lower precipitation mostly during the dry season in combination with higher evaporation will lead to increased withdrawal of surface water. Low flow conditions of the rivers will be subsequently accentuated. Bangladesh will also be at risk from droughts from the effect of climate change induced moisture stress and resulting drought impacts. It is found that, under a moderate climate change scenario, *Aus* production would decline by 27% while wheat production would be reduced to 61%. Under a severe climate change scenario (with 60% moisture stress), yield of *Boro* might reduce by 55 to 62%. Moisture stress might force farmers to reduce the area for *boro* cultivation.
64. The effect of saline water intrusion is highly seasonal in Bangladesh. Climate change would increase saline intrusion through several means:
 - Directly pushing the saline/fresh waterfront in the rivers through higher sea levels
 - Lower river flows from upstream, increasing the pushing effect from the sea

- Upward pressure on the saline/fresh water interface in the groundwater aquifers (every cm of sea level rise will result in a thirty-fold rise in the interface because of the hydrostatic pressure balance)
- Percolation from the increased saline surface waters into the ground water systems
- Increase in the evaporation rate in the winter, leading to enhanced capillary action and subsequent salinization of coastal soils
- An increase in storm surges which carry seawater.

c. Implications for Agriculture and Fisheries

65. In Bangladesh, the largest demand for both surface and groundwater is to support irrigation in the dry months. Changes in climate may affect irrigation requirements for all the three cropping seasons: Rabi, Kharif-I, Kharif-II. Increase in temperature will scale up irrigation demands by 200 Mm³ for March alone.
66. Currently, the irrigation and fisheries sectors compete for water. Since the solubility of oxygen in water decreases with higher temperature, it could be a problem for fisheries. If river flow is reduced during the dry season, this problem will be worse. Moreover, freshwater migratory fish hatchlings will face a survival problem in the southwestern part of Bangladesh because of increased salinity from sea level rise.

G. Unplanned urbanization

67. The Brundtland Report (WCED, 1987) expresses considerable concern regarding four major features of urban development in developing countries:
 - The continuing growth of mega-cities with associated processes of urban decline, poverty, deprivation, and environmental deterioration
 - Sectoral, macroeconomics, and pricing policies of government that have reinforced the concentration of population in major cities and distorted the terms of trade between urban and rural areas
 - The lack of focus on the development of small towns and on strengthening the complementarity between rural and urban development
 - The lack of decentralization and devolution to municipal governments of political, institutional, and financial powers that could strengthen the municipalities capacity to find and carry out effective solutions for local urban problems and stimulate local opportunities
68. Bangladesh is classic example of all the above characteristics of unplanned urbanization. Rapidly growing urban areas in Bangladesh is facing:
 - very bad ambient air and water quality,

- high incidence (more than 27 per cent) of the population living in extreme poverty,
- substandard housing conditions resulting from high land prices, insecurity of tenure, and lack of loan finance, and
- non-availability of piped water in more than 80 per cent of the households.

IV. LEGAL, INSTITUTIONAL, AND POLICY FRAMEWORK

A. Legal and regulatory framework

69. The first major law that has been promulgated for the specific purpose of protection of environment and conservation of nature is the Environmental Conservation Act (ECA) of 1995, which was followed by the Environmental Conservation Rules (ECR) of 1997.
70. Besides, there are around two hundred laws in Bangladesh which have, in some cases, direct relevance to environment. In most of the cases, the primary objective of these laws does not concern natural resource management or addressing environmental pollution directly; these laws can, however, be invoked very much to cover various sectoral aspects of the environment that embrace pesticides use, land use, human health, urban facilities etc. public services and practices (IUCN, 2000b; Farooque and Hasan, 1996).
71. Laws having relevance to natural resource management in Bangladesh can be broadly divided into the following categories:
- Laws having non-sectoral approach- Environmental Conservation Act (ECA) of 1995 and Environmental Conservation Rules (ECR) of 1997.
 - Sectoral laws
 - Landuse laws
 - Agriculture and irrigation laws
 - Water resource laws
 - Fisheries laws
 - Forestry laws
 - Wildlife laws
 - Energy laws
 - Health laws
 - Food and consumer protection laws
 - Transportation laws
 - Local Government laws
 - Urban and rural development laws
72. Table 8 provides a list of available laws that have bearing on environment.

Table 8. Major laws and regulations in environment sector

Laws and relevant Regulation	Major components
Environmental Conservation Act of 1995	The Environmental Conservation Act of 1995 empowered the MOEF to formulate rules and guidelines for the management. It also designates DOE responsible for enforcing the 1997 EIA procedures air pollution, water pollution, noise
Environmental Conservation Rules of 1995	Air pollution, water pollution, noise
EIA Guidelines of Industries of 1997	The EIA process is categorized into four classes, that is, green, amber A, amber B, and red, according to the degree of impacts
Environment Court Act. 2000	The act is passed to establish Environment Court for speedy disposal of cases concerning environmental offences as defined in the Environmental Law
Environmental Pollution Control ordinance 1997	Including national water quality standards according to the WHO guidelines, air quality standards, noise, solid waste management
Factories Act 1965	Air pollution, occupational health
Motor Vehicles Act 1939	Air pollution, noise
Non Agricultural Tenancy Act 1947	Land use
State Acquisition and Tenancy Act 1950	Land use
Acquisition of Waste Land Act 1950	Land use
Town Improvement Act 1950	Land use
Municipality Ordinance 1977	Land use
Local Government Ordinance 1982	Land use
Land Reforms Ordinance 1984	Land use
Land Reform Board Act 1989	Land use
Chittagong Hill Tract Regulation Act 1990	Land use
Pesticide Ordinance 1971	Amended in 1980 Toxic and hazardous substance
Agricultural Pest Ordinance 1962	Toxic and hazardous substance
Dangerous Drug Act 1930	Toxic and hazardous substance
Dangerous Drug Control Order 1982	Toxic and hazardous substance
Agriculture and Sanitary Improvement Act 1920	Toxic and hazardous substance
Poison Act 1930	Toxic and hazardous substance
Explosive Substances Act 1908	Modified in 1983 Toxic and hazardous substance

Laws and relevant Regulation	Major components
Explosive Act 1884	Toxic and hazardous substance
Municipality Ordinance 1977	Solid waste management
Laws and relevant Regulation	Description
Private Forest ordinance 1950	Forest Conservation
Forest Act 1927	Modified in 1973 Forest conservation, biodiversity conservation, soil conservation
Wildlife (Preservation) Act 1973	Amended 1974. Wildlife conservation, wetland management, biodiversity conservation
Private Fisheries Protection Act 1889	Biodiversity conservation
Conservation and Protection of Fisheries Act 1950	Coastal resources management, biodiversity conservation
Marine Fisheries ordinance 1983	Coastal resources management, biodiversity conservation, marine pollution
Territorial Water and Marine Zone Act 1974	Coastal resources management, marine pollution
Mines Act 1927	Mineral resources development and management
Petroleum Act 1934	Mineral resources development and management
Antiquities Act 1986	Cultural heritage
Antiquities Ordinance 1986	Cultural heritage
Policy for management of closed waterbody (Jalmahal) 1990	Water resources management
Water supply and Sewerage Authority Ordinance 1963	Amended in 1989 Water resources management
Inland shipping Ordinance 1976	Water resources management
Embankment and Drainage Act 1952	Water resources management
Water Hyacinth Act 1939	Water resources management
IWTA Ordinance 1958	Water resources management
Canals Act 1864	Water resources management
Irrigation Act 1876	Water resources management
EPC Ordinance 1977	Marine pollution

B. Policy framework

73. The government has adopted a number of policies where environment and development issues have been addressed. Important policy documents in this respect are the Environment Policy (1992), the Forest Policy (1994), the Fisheries Policy (1998), the Water Policy (1998), the New Agriculture Extension Policy (1995), The Energy Policy (1995). Besides these sectoral policies, the National Conservation Strategy (NCS) and especially the National Environment Management Action Plan, 1995 (NEMAP) have been formulated to provide action plans to respond to environmental issues and promote sustainable development. Although these policies are not judicially enforceable according to the Constitution of Bangladesh, they are potentially important in guiding and

- influencing the activities of the concerned Ministries and other governmental agencies.
74. The policies of the Bangladesh Government have been and are developed mostly from a sectoral approach. However, the Water Policy, the Fisheries Policy and Agriculture Policy have cross-sectoral approach and tried to address environmental issues. These policy calls for a precautionary approach to minimize impact from other sectors like industry, transportation, urbanization, flood control etc. Policy documents generally refers to the principles that governs the action directed towards given ends. It provides a basis for plans, prescriptions and framework to maintain the dynamic growth of the sector. However, the Five Year Plans (FYPs) have not appropriately designed to push the policy directives. FYP is expected to be replaced by a fifteen year Participatory Perspective Plan, 1995-2010 (PPP), and a Three year Rolling Development Plan (the documents are yet to be publicly distributed).
 75. The most recent and important strategy document is the NS-EGPRSD or I-PRSP published in January 2003. The PRSP has given a major thrust on poverty reduction and pro-poor growth. Widespread dependence on environmental resource by majority of the population is emphasized in this strategy paper and it envisaged to integrate the environmental conservation issues problems like widespread resource depletion and ecological degradation, arsenic contamination and vulnerability to natural disaster under the overall pro-poor economic growth, especially under the rural growth policy. PRSP will be a major guiding document that will shape government activities in the coming years. Environmental issues, as stated in the PRSP, is most likely to be seen as a cross-cutting issue and integrated into national poverty alleviation strategy.
 76. NEMAP was developed for a period of 10 years (1995 to 2005) still likely to have influence in shaping policy directives regarding the environmental issues. It provides action plans for environmental development in combination with a set of broad sectoral guidelines which emphasis, inter-alia, the following:
 - Maintenance of the ecological balance and overall progress and development of the country through protection and improvement of the environment;
 - Protection of the country against natural disasters;
 - Identification and control of all types of activities related to pollution and degradation of environment;
 - Undertaking environmentally sound development programs in all sectors;
 - Sustainable long-term and environmentally congenial utilization of all natural resources
 77. The National Environment Policy (NEP), 1992 embraces a number of related different sectors including agriculture, industry, health, energy, water, land, forest,

fisheries, marine, transport, housing, population, education and science. The central theme of the Environment Policy of 1992 is to ensure the protection and improvement of the environment. It requires specific action in the development sectors of the country to facilitate long-term sustainable use of all natural resources. It provides for amending the existing laws, formulating new laws and implementing the same. It also assigned the Ministry of Environment and Forests (MoEF) with the responsibility of co-coordinating the implementation of the policies and constituting a high level National Environmental Committee (NEC) with the head of the Government as its chairperson, exercising direction, supervision and overseeing the implementation of the policies. The policy has provided guidelines for following sectors:

- Agriculture: Environmentally sound agricultural practices are to be encouraged and ensured for attainment of self-sufficiency in food. Among the various specific measures, use of natural fertilizers and insecticides is encouraged as opposed to the application of agro-chemicals and artificial materials exerting adverse impact on the environment.
- Industry: Environmental Impact Assessment (EIA) for new industries, corrective measures for polluting industries, ban on establishment of polluting industries and development of environmentally sound and appropriate technology is required for sustainable and efficient utilization of natural resources.
- Health and Sanitation: Healthy environment for rural and urban area, prevention of activities, which are harmful to public health and healthy workplaces for workers are to be ensured.
- Energy and Fuel: Reduction of the use of fuel-wood and agricultural residues, exploring alternative energy resources, precautionary measures against potentially harmful use of nuclear energy and nuclear radiation, conservation of forest fuel and development of improved energy saving technology are recommended options for the sector. Apart from these, EIA has been made mandatory before implementing projects for exploration and extraction of fuel and mineral resources.
- Water: Environmentally sound water resource management is suggested in utilization and development of water resources, construction of irrigation network and embankments, dredging of watercourses and in taking measures against river pollution. EIA is required before undertaking projects related to water resource development and flood control measures.
- Land: Activities that cause or result in land erosion, salinity and alkalinity, and loss of soil fertility are prohibited. Compatible land use systems for different ecosystems and environmentally sound management of newly accreted land are recommended.
- Forest, Wildlife and Bio-diversity: Conservation and expansion of forest zones, conservation of wildlife and biodiversity and conservation of wetlands are recognized as priority areas for action.
- Fisheries and Livestock: Conservation of fisheries and livestock, mangrove forest and others ecosystems and prevention of activities that diminish the

wetlands and natural habitats for fishes are the basic objectives in this sector. The need for an inter-ministerial co-ordination is indicated by requiring evaluation by the concerned agencies, of the existing projects on water development, flood control and irrigation, in order to minimize their adverse impact on fish growth and their habitat.

- Food: Hygienic and environmentally sound method of production, preservation, processing and distribution of food and measures to ensure prohibition of import of harmful food items are recommended.
- Coastal and Marine Environment: Coastal and marine eco-systems are identified as potential areas for intervention, where all internal and external polluting activities should be stopped. Fishing in coastal and marine environment within regeneration limits is recommended.
- Transport and Communication: Road, rail, air and water transport systems should be operated without polluting the environment. EIA is required before undertaking any projects in these sectors.
- Housing and Urbanization: Environmentally sound planning and development of housing and urban centers is required. Existence of water bodies in the cities is recommended for maintaining environmental and ecosystem balance in the urban areas.
- Population: Planned and proper utilization of manpower including ensuring the participation and mainstreaming of women in all spheres is targeted for environmentally sound development activities.
- Education and Public Awareness; Eradication of illiteracy through formal and non-formal education, building and raising public awareness of the environmental issues, dissemination of environmental knowledge and information are the policy guideline for conservation, improvement and sustainable use of natural resources.
- Science, Technology and Research: Research and development institutes are required to consider the incorporation of the environmental issues in their research programs.

78. The National Forestry Policy, 1994 is the amended and revised version of national forest policy of 1997 and has been formulated in the light of National Forestry Master Plan. The policy provides scope for bringing about 20% of the country's land under the afforestation programs of the govt. and private sector by the year 2015 through the coordinated efforts of GO-NGOs and active participation of the people. Natural habitat for bio-diversity particularly for threatened flora and fauna will be conserved as National Parks, Wildlife Sanctuary and Game Reserves. Commitment also made to increase the amount of such protected area by 10% of the reserved forest land by the year 2015. Apart from these, rural area, newly accreted char land in the coastal areas, denuded unclassified state forest area of Chittagong and northern zone including Barind tract have been identified as potential area for afforestation program. Depending on the caring capacity of nature limited 'Eco-tourism' facility might be developed as an option of the policy. Responsibilities and commitments under various ICTPs have also been recognized as important tasks in the policy. Amendments of existing laws, rules

and regulations relating to the forestry sector and creation of new laws, rules and regulation of such sector have been recognized as an important factor for achieving goals and objectives of National Forestry Policy, 1994.

79. The Fisheries Policy (1998) aims at increasing fish production and create self-employment to improve the socio-economic condition of the fisherman. It calls for taking control of the wetlands under the Fisheries and Livestock Ministry. It reflected the need to stop the release of untreated effluents from the industries into the water bodies by describing it as a criminal offence. Although this conforms to the relevant provision of the Environment Policy, the Industrial Policy has neither explicitly spelled out the consequences of harmful effluent release into the open water bodies nor provided any guideline for impact assessment in this connection.
80. The National Agriculture Policy (1999) aims to ensure, inter alia, sustainable agricultural production, conservation of crop biodiversity, introduction of new technology, increased use of organic manure, integrated pest management system, efficient irrigation system, diversification of crops and establishment of agro-processing and agro-based industries. It also underscores the need for taking into account the relevant provisions of the ICTPs and the regulations of WTO and SAFTA. The policy requires broad based public awareness and participation by ensuring, inter alia, agricultural education and training, women's participation, co-ordination among the GO-NGOs and private sectors, food-based nutrition plan and reliable database. Although it mentions the need for crop diversification, specific emphasis is put only on rice, wheat and maize. Its omission in addressing the guidelines for non-traditional crops is not being helpful towards preserving the biodiversity of crops of the country. The policy itself recognizes that 'chemical fertilizers and pesticides used for increased crop production' may lead to 'environmental pollution', but does not explain how increased use of HYV seeds would not involve increased use of chemical fertilizers and pesticides as well and is silent about the need for assessing the impact of the use of agro-chemicals on soil, water bodies, fisheries and overall biodiversity.
81. The National Water Policy, 1999 was passed to ensure efficient and equitable management of water resource, proper harnessing and development of surface and ground water, availability of water to all concerned and institutional capacity building for water resource management. It has also addressed issues like river basin management, water rights and allocation, public and private investment, water supply and sanitation and water need for agriculture, industry, fisheries, wildlife, navigation, hydropower, recreation, environment, preservation of wetlands etc. People's participation in water development projects is also recognized as an essential part of project planning process.
82. The National Industry Policy, 1999 calls for environmentally sound industrial development along with its other goals of ensuring high rate of investment by the public and private sectors, strong productive sector, direct foreign investment, development of labor intensive industries, introduction of new appropriate

technology, women's participation, development of small and cottage industries, entrepreneurship development, high growth in export and infrastructure development. WTO guidelines are proposed to be followed in the industry policy. Following the guideline may result in conflicts with the intellectual property rights regime. Guideline for mitigating such possible conflicts is absent in the policy document. No specific guideline is given for sustainable extraction and utilization of raw materials for different industries as well.

83. The National Energy Policy, 1996 provides for utilization of energy for sustainable economic growth, supply to different zones of the country, development of the indigenous energy sources and environmentally sound sustainable energy development programs. The policy highlights the importance of protecting the environment by requiring EIA for any new energy development project, introduction of economically viable and environment friendly technology and putting a ban on the use of fuel-wood for brick burning. Disposal of ash and reduction of environmental emission are encouraged in coal-based power plants.

C. National institutions

a. General institutional arrangement

84. Formal responsibilities of overall environment sector are vested with the Ministry of Environment and Forest (MoEF). However, many other institutions, directly and indirectly, are involved in managing or shaping the environment sector. These embrace public sector, private sector and civil society institutions. Major institutions involved in the development and implementation of plans and policies are the Planning Commission, Department of Forest, Department of Environment, Ministry of Agriculture, Ministry of Fisheries and Livestock, Ministry of Water Resources, Ministry of Energy, Ministry of Health and Family Welfare, Ministry of Education, Ministry of Housing and Public Works etc.
85. At the higher level, National Environment Council (NEC) headed by the Prime Minister and Executive Committee of National Environment Council (ECNEC) headed by the Minister for Ministry of Environment and Forest provide guidance to the sectoral Ministries/Agencies on matters of national environmental issues. At the Divisional level, Divisional Environment Committee chaired by the Commissioner with representation from all other government is supposed to deal with environmental issues at the local level. However, these institutional arrangements are yet to be fully functional.
86. Each of the Ministry have their own policy and program frameworks which provide a basis for addressing fundamental issues of environmental management and protection in Bangladesh. Institutional capacity of all the concerned ministries for implementing the various action measures identified still remains weak. It was acknowledged in the NEMAP document that neither the fledgling Ministry of Environment and Forest nor its Department of Environment have developed the

institutional capacity to substantially tackle problems of environmental management and protection.

87. The MoEF bears the responsibility for working with other ministries to ensure that environmental concerns are given due recognition in their development program. The Ministry has an active role to play in policy advice and coordination of the implementation of action plans across all sectors. MoEF is also responsible for reviewing and monitoring the impact of development initiatives on the environment across all sectors.

b. Major government institutes in environment sector

88. Table 9 provides the public organizations that have a role in environment sector. While some of major institutions that have direct role in managing natural resources are given in the following sections.

89. The **Department of Environment (DOE)**, as the technical arm of the Ministry, is responsible for environmental planning, management, monitoring and enforcement. The mandate of the Department includes: assessment and monitoring of tasks such as on-site surveillance of environmental improvement components of development projects; promoting environmental awareness through public information program; and controlling and monitoring industrial pollution; environmental impact assessment, and in formulating guidelines for line agencies involved in activities affecting air quality, soil and water conservation, afforestation, wildlife, critical habitats, fisheries and other natural resources issues. DoE has the legal authority to declare any ecosystem as Ecologically Critical Area (ECA) and so far 8 ECAs have been declared. However, management issue of declared ECAs has not been resolved. DOE has been unable to consistently respond to its complaints largely due to lack of well positioned field resources. Recently DOE has done an institutional assessment and developed strategic plan to clarify its goals, expected results and propose major initiatives. The strategic plan has five major priorities:

- Enforce the Environment Conservation Act and international obligations
- Administer the clearance process competently and transparently
- Address major air and water quality management problems
- Expand public awareness efforts
- Build DOE's capacity.

90. **Forest Department (FD)** is entrusted with the primary responsibility of managing all the government owned forests of Bangladesh. The Forest Department, following the recent reorganization, has 8,681 positions, headed by a Chief Conservator of Forest (CCF). Under the CCF, it has 4 Deputy Chief

Conservator of Forests, 9 Conservator of Forests, 44 Divisional Forest Officers, and other officers and staff of various ranks. The manpower in the FD is far below the actual need. The manpower aspect is further aggravated since many of the positions are lying vacant since long and due to FD's large scale involvement in participatory forestry activities. The major responsibilities of the FD are:

- Manage all the government forests to foster a steady supply of the forest produces such as wood, fuel-wood, bamboo and other forest produces towards the demands of the members of the public
 - Protect and conserve the protected areas to meet the mandate of conserving the gene pool and biodiversity, including those of the wildlife, for the nation at large
 - Enhance the tree cover of the country
 - Undertake the social forestry activities towards the awareness raising and encourage the tree planting among the members of the public
 - Involve the members of public as participants not only for harvest oriented social forestry, but also in the conservation of protected areas
 - Evolve and implement scientifically sound, economically viable and biologically sustainable forestry management programs for the nation at large
 - Implement the forestry policy of the nation through acts, rules and regulations
91. **Water Resources Planning Organization (WARPO)** is the major institution involved in water resource management. WARPO was established as the secretariat to the National Water Resources Council (NWRC). NWRC is the water sector apex body chaired by the Prime Minister that has the authority for formulating water policy and ensuring inter-agency coordination. WARPO's mandate is supported by the National Water Policy, 1999 and National Water Management Plan (NWMP). WARPO is responsible for national water planning; monitoring; formulation of water legislation and regulations; inter-sectoral coordination of water plans and maintaining central data system.
92. The **Department of Fisheries (DOF)** is the primary institute engaged in managing fisheries resources. DOF was created with strong focus on enhancing the production. DOF has been steadily fulfilling its mandate mostly through aquaculture extension. The National Fisheries Policy, 1998 address all aspect of fisheries. Policy statements related to inland fisheries predominantly concern production, culture and enhancement but also emphasizes on the ecological balance and maintenance of biodiversity. DOF is on the process of developing a fisheries development plan to implement National Fisheries Policy.

Table 9. Functions of major organizations in environment sector

Organization	Current function
Planning Commission	Responsible for the preparation of development plans and allocating funds to individual Ministries responsible for implementing specific projects. Authorized to supervise and coordinate cross-sectoral and inter-ministerial activities affecting the use of natural resources and the environment.
Department of Agriculture Extension	Responsible for extension of new technologies, to farmers at the field level
Department of Livestock	Works for improvement of livestock resources and production
Bangladesh Water Development Board (BWDB)	Project planning and implementation; flood control and watershed management; salinity control; maintaining water channels for transportation; regulating water channels
Local Government Engineering Department (LGED)	Planning, designing, and implementing rural infrastructure development projects; Thana/Union drainage and embankment planning, irrigation planning, land and water use planning; small scale water schemes, canal digging programs, town protection schemes
Roads and Highway (RHD)	Constricting and maintaining primary and secondary roads
Department of public health Engineering (DPHE)	Rural and urban water supply and sanitation
Water Supply and Sewerage Authorities (WASA)	Construction and upkeep of potable water supply, sewerage and storm drainage in major cities
Bangladesh Inland Water Transport Authority	River conservancy work, including river training for navigation and meteorological information, including river charts; hydraulic survey; programming for dredging and reviving dead or dying water bodies; developing, maintaining, and operating inland river ports; developing rural water transport
National Herbarium	Surveys and authenticates locally used genetic resources, taxonomic identification of floral species
Botanical Garden	Maintains <i>in-situ</i> floral diversity
Zoo	Maintains <i>in-situ</i> faunal diversity
Livestock Research Institute	Conduct research production of livestock
Barind Multipurpose Development Authority	Responsible for improvement of the Barind area
Bangladesh Bureau of Statistics	Environmental statistical data compilation

c. Local government institutions

93. Local government institutions like Union Parishad, Upazila Parishad, and Zila Parishad have been vested with a wide range of development functions including planning for the provision of general physical infrastructure such as roads, culverts, bridges, potable water supplies, flood control, and irrigation infrastructure. Local Government Ordinances mandate Union Parishad and Upazila Parishad to coordinate development activity implemented by Government and Non-Government Organizations by their territorial and functional jurisdiction.
94. The Government has promulgated the Gram Sarkar (village government) Act of 2003. Under this Act, the Gram Sarkar is now recognized as an entity of the Union Parishad. A Gram Sarkar will be formed in each of the nine existing wards of a Union Parishad. Each Gram Sarkar will have 13 members representing various socio- economic groups. It is likely that local government system, once they start functioning properly, will take control of local development projects and provide responsive services at the local level.

D. International Environmental Agreements

95. Policy regime is also very much influenced by the international policy regimes. i.e., International Convention, Treaties and Protocols (ICTPs) that Bangladesh choose to become signatory. Recently promulgated Environment Policy, National Conservation Strategy, National Biodiversity Strategy and Action Plan (under development) are examples of offshoots that developed under the influence of obligations entailed due to signing of ICTPs.
96. Not much significant work has been done so far to implement the obligations with regard to the ICTPs signed. Participation in the negotiations and subsequent adoption and implementation stages are handled mostly on an ad-hoc basis. No attempt is made for maintaining the continuity of documentation. Little attempt is made to develop the right kind of expertise in the concerned agencies (Islam, 1996). Following are some of the important ICTPs signed and ratified by Bangladesh which are likely to initiate changes in the policy or commence new projects/activities towards that.
97. **Convention on Biological Diversity (CBD).** Bangladesh signed CBD at Rio in 1992 and ratified the same in 1994. All signatories were expected to develop their own Biodiversity Strategy and Action Plan (BSAP). Bangladesh has just started to develop its own BSAP.
98. Framework Convention on Climate Change and the Montreal Protocol on Ozone Depleting Substances- Bangladesh signed the Framework Convention on the Climate Change at the Earth Summit in Rio de Janeiro, Brazil in June, 1992 and ratified it in 1994. The level of Government of Bangladesh participation in the

negotiation through the Intergovernmental Negotiating Committee (INC) has been minimal. In terms of institutionalization, a National Steering Committee was formed to oversee the activities under the Climate Convention (Nishat, 1999). The people and the ecosystems of the south, particularly the southern and the coastal areas in Bangladesh are extremely vulnerable to adverse climate change and sea-level rise, threatening the survival of the very poor of this region. Further, northwestern Bangladesh region is going to be increasingly drought-prone due to climate change.

99. **The Ramsar Convention** – In view of the fundamental ecological functions of wetlands as regulators of water regimes and as habitats supporting characteristic fauna, especially waterfowl, the broad objectives of the RAMSAR Convention are to reduce the loss of wetlands and to ensure their conservation (Belbase, 1997). Bangladesh has declared two wetlands- Tanguar Haor and Sundarbans, have been declared as Ramsar sites.
100. **Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal**- Bangladesh has ratified the Basel Convention and has begun enforcing it since 30th June 1993 and also attended in the voluntary information exchange of the Amended London guidelines, 1989 (Khan, 1997).
101. **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)**- CITES is not a self-executing convention, consequently domestic measures must be in force at national level to provide Parties to the Convention with the authority to: (i) designate at least one Management Authority and one Scientific Authority; (ii) prohibit trade in specimens in violation of the Convention; (iii) penalize such trade; and (v) confiscate specimens illegally traded or possessed (Raymakers and Vasquez, 1999). The designated Management Committee for the CITES is Forest Department. So far, no significant action could be taken under this convention (Nishat, 1999).

V. DONOR PROGRAM AND ACTIVITIES

A. Activities of Development Partners

102. Development Partners (DP) have their own priority areas for investment. World Bank and ADB have substantial programs in the mainstream forestry sector development projects. The World Bank and DFID are assisting in the fisheries sector as lead donors. The United Nations Development Program (UNDP), CIDA, World Bank and ADB are also implementing large-scale programs in industrial and urban environmental management programs including abatement of air pollution. The larger issue of surface water management, including the development of the National Water Management Plan, is being addressed by a number of donors. In the water and sanitation sector, including the arsenic contamination of groundwater main lead agencies are The World Bank, ADB, WHO, UNICEF and DFID. The Canadian International Development Agency (CIDA) and a number of US government and academic agencies are also involved in programs contributing to the scientific understanding of arsenic contamination and to developing cost-effective and sound mitigation measures. A brief summary of a few important projects are given below:

a. NEMAP Implementation

103. UNDP, World Bank, CIDA and NORAD are providing assistance to implement various components of NEMAP. In the Figure 2, intervention areas have been presented. All the four projects are in progress. NCS Implementation Phase was completed in 2002. Air Quality Monitoring Project (AQMP), Bangladesh Environment Management Programme (BEMP) and Sustainable Environment Management Programme (SEMP) are the on-going projects. They are being implemented by the DoE and the MoEF since 1999.

b. Sustainable Environment Management Program (SEMP)

104. With a grant of US\$26 million, SEMP is the largest environmental program of UNDP across the world. It has 26 components being implemented by 21 Sub-Implementing Agencies (Government:08, Professional bodies:02 and NGOs:11). SEMP has five broad sub-programs: a) Policy and Institution; b) Participatory Eco-system Management; c) Community Based Environmental Sanitation; d) Advocacy and Awareness; and e) Training and Education. SEMP is intended to benefit the grass-roots level population, particularly women in the eco-specific areas. It supports enhancement of community capacities for sustainable management of environmental resources and strengthens the capacity of the public sector to develop new framework for policy development in support of enhanced community participation and sustainable management of the country's environment and natural resource (Haque, 2000).

105. It may be noted here that SEMP mainly addressed the "green" issues related to environmental conservation leaving the "brown" issues to be addressed by other projects of the government. Couple of "brown" issues that have been addressed under SEMP are: i) treatment of urban waste water through duckweed by Prism, Bangladesh; ii) transforming solid waste into compost by Waste Concern; and iii) management of effluents of small dying factories by the Department of Environment.

c. Bangladesh Environmental Management Project (BEMP)

106. The overall goal of BEMP is to increase the capacity for sustainable environmental management in Bangladesh. This CAN\$ 12 million CIDA funded project will strengthen the institutional capacity of the Department of Environment to enable it to carry out its legislative powers, mandate and functions. Components of the institutional capacity development project include: Institutional Planning; Policy and Legal Reform; Environmental Management Demonstration Areas; Environmental Initiatives; Environmental Awareness Activities; Resource Information Systems, Human Resource Development and Project Management.

d. Air Quality Management Project

107. The project aims to develop components of an air quality management system to reduce human exposure to air pollution in Bangladesh. The estimated cost of the project is US \$ 5 million jointly funded by The World Bank and Government of Bangladesh. The project commenced in July, 1999 and is scheduled for completion in June, 2004. However, the project will develop a sustainable, permanent air quality management unit within DoE. The project is mostly concentrated in Dhaka city and may be extended to the other major cities, such as Chittagang and Khulna later.

108. The project has two major components.

- Component-1: Enforcement, Standards and Pilot Control Programs.
 - Developing vehicular emission standards for new and in-use vehicles.
 - Carrying out spot-checking of in use vehicles for emission compliance.
 - Development and implementation of pilot programs for vehicular emissions reduction.
 - Improved enforcement of rules and regulations.

- Component-2: Air Quality Monitoring and evaluation.
 - Air quality monitoring and assessment.
 - Developing ambient air quality standards.

- Provide information about the daily air quality through Air Quality Index (AQI).
 - Awareness raising campaigns.
 - Emissions inventory.
 - Development of an Air Quality Management Plan.
109. One of major milestone achieved under AQMP is establishment of a Continuous Air Monitoring Station (CAMS) in Dhaka. The station is now continuously monitoring gaseous pollutants and meteorological parameters.

e. National Conservation Strategy Implementation Project (NCS IP)

110. MoEF in 1994 started the NCS IP with an aim to piloting conservation practices in selected ecosystems with financial support form the NORAD. The project was started with the following objective:
- Promotion of sustainable development through institutional development at national level and instituting conservation concerns in the national planning process
 - Improvement of environmental management of biodiversity
 - Raising the level of environmental awareness of various sections of the society
111. A number of projects have been planned under the NCS IP. Among which Important projects are Tanguar Haor, Wetland Biodiversity Conservation, Conservation of Coral Resources of Narikel Jinjira (St. Martin). Different activities undertaken through the NCS IP can be summarized in table 10.

Table 10. Summary of activities under the NCS IP

ACTIVITIES	PROGRESS
Integration of NCS recommendation into Economic Planning	Sectoral Reports on Forestry Crop, Fisheries and Livestock have been published as a book for wider dissemination.
Preliminary Environmental Screening Manual Development	Draft Manual prepared by the consultant. It will be published as a book after approval from the competent authority.
Environmental Education Materials	Environmental Education materials for BCS foundation course, primary and secondary school teachers training course prepared by the consultant.
Baseline Survey of Areas of Concern	

ACTIVITIES	PROGRESS
a. Land Cover and Landuse maps	Final maps of the project area have been prepared by SAPRRSO. Maps have been distributed among the relevant agencies for their use.
b. Flora Survey	Flora survey conducted in prioritized areas by National Herbarium.
c. Fauna Survey	Fauna survey completed.
d. Ecological Survey	Ecological survey on the project area was carryout.
Preparation of Management Plan	
b. Wetland: Tanguar Haor Management Plan	Tanguar Haor Management Plan developed.
c. St. Martin Island Management Plan	For implementation of St. Martin's Island Management Plan, a five-year project titled 'Conservation of Biodiversity, Marine Park Establishment and Eco-development' has been accepted by ECNEC.
Training for Human Resource Development	
a. Training program on Environment protection, ecosystem conservation, habitat restoration, and importance of Biodiversity and sustainable use of biological resources.	Under capacity building and human resources development program as of now 166 field level GO/NGO officials, 50 mid level officers and 60 Senior Officer of the Govt. have been trained on mentioned area.
b. Logical Framework Approach (LFA) Training	Logical Framework Approach (LFA) training for desk level GO-NGO officials was held November, 1999 and April, 2000. Sixty-two participants were trained on development project identification, preparation of project proposal and project implementation approach. This training will help to develop a core potential group in the development sector of economy.
Awareness program	Awareness campaigns on environmental issues are being organized by NCS IP as a integral part of the project activities.

f. Dhaka Urban Transport Project

112. This is a US\$ 177 million World Bank funded project of the Government of Bangladesh. The project has two major objectives: (i) to improve urban transport services in an economically and environmentally sustainable manner; and (ii) to strengthen the institutional and policy framework and address long-term transport planning issues in Greater Dhaka Metropolitan Area.

B. Role of Bank in Environment Sector

113. As of 31 December 2001, a total of 141 public sector loans for 131 projects amounting to \$6,371 million were approved by the Bank. The agriculture, energy and transport and communication sector received the bulk of the public sector loans (Table 17). Besides the public sector loans, ADB assisted Bangladesh through TA grants totaling US\$ 146 million as of 31 December 2001. For the period of 2004-2006, 17 projects totaling US\$ 1,205 million have been proposed.

Table 17. Sectoral distribution of lending (ADB, 2003c)

Sector	Average Share (%)	
	1973-85	1986-2001
Agriculture and Natural Resources	50.3	32.2
Energy	22.2	18.6
Transport and Communications	0.9	3.4
Social Infrastructure	9.6	23.3
Industry and Non-fuel Minerals	4.0	17.2
Finance	12.9	1.7
Multi-sector	0.0	3.5

114. Projects fall under the agriculture and natural resources, especially those related to forestry, fisheries and water resource management can be considered as major environmental projects. Projects fall under other categories also have different degrees of environmental implications. Since the early 1990s, ADB's interventions have focused increasingly on forestry, water resource management, rural infrastructure, livestock etc. During 1986-2001, ADB financed 13 projects in the agriculture and natural resource sector for a total of US\$562 million. In addition, 25 TA grants totaling US\$25 million were made in this period. Most significant TA intervention was for a forestry master plan (ADB, 2003b). A brief note on a few ADB assisted projects are being mentioned here.

a. Sundarbans Biodiversity Conservation Project

115. The Bank has given financial support to MoEF to launch the Sundarbans Biodiversity Conservation Project (SBCP). The overall objective is to "develop a sustainable management and biodiversity conservation system for all SRF resources on the basis of rational plans and the participation of all key stakeholders." To achieve this objective, the Project aims at:

- Improved institutional capacity to manage the SRF;
- Adoption of biodiversity conservation and sustainable resource management measures;
- Reduction in the poverty level of the 3.5 million people living in the impact zone through expanded economic opportunities, improved social infrastructure,

- improved organization for resource users, and facilitated stakeholder participation in resources management;
 - Eco-tourism and environmental awareness programs, as well as basic public infrastructure and training;
 - Significant improvement in planning, monitoring, and applied research capacity; and
 - Reduction of pollution by effluents from KNM.
116. This funded project falls under Environment Category B. The initial environmental examination is done. Its impact on environment is generally positive, with no major adverse impact. Only a small number of activities may have some adverse impacts, but are supposed to be outweighed by other positive benefits of the project. Over 3.5 million people are expected to be benefited. The proposed benefits include (i) reduction of poverty by expanding economic opportunities, (ii) improving social infrastructure, (iii) improving organization for resource users, and (iv) facilitating stakeholder participation in resource management.
117. It needs to be mentioned herein that this project has recently been suspended by the ADB on the plea of ownership problems by the Forest Department.

b. Southwest Areas Integrated Water Resources Management Project

118. This Technical Assistance (TA) project has the objective to prepare an investment project to support the Government's efforts to promote integrated water resources management (IWRM) through integrated planning at sub-regional levels and position a sustainable Integrated Water Resource Management (IWRM). A comprehensive investment package is expected to be designed for institutional strengthening and service delivery towards flood control, drainage, irrigation, pilot testing of arsenic mitigation interventions, etc.

c. Flood Rehabilitation Project

119. It was a 38.5 million US dollar project funded by ADB, GOB and UNDP. It was initiated in 1987 and completed in June 1992. The main activities were the rehabilitation of the damages caused to Flood Control Drainage and Irrigation structures by the 1987 and 1988 floods. The rehabilitation of FCDI facilities had both positive and negative impacts on the environment. They protected the rivers within the project areas from further erosion, secured homesteads from further flooding, increased productivity of farm lands and improved the rural communication. But these facilities, constructed and/or reconstructed, created obstructions to the natural fish passes and jeopardized the natural breeding. Such obstructions impaired the biodiversity and depleted the fish resources as well as the ecological values.

d. Upazila Afforestation and Nursery Development Project

120. The total cost of the project was 46.8 million US\$ of which 40.9 million US\$ was ADB loan. This project was started in September 1986 and was completed in December 1995. The main goal of this project was to

Increase the production of biomass

Enhance the institutional capacity of forest department, ministry of environment and forests and upazila administration, so that they can implement a self-sustainable social forestry program in the country.

121. The targets and achievements of this project are as follows (Personal Communication with FD):

Activity	Target	Achievement
Raising of woodlot Plantations	16,000 hectares	19,562 hectares
Raising of agro forestry plantation	3,200 hectares	5,180 hectares
Raising of strip plantation	17,750 Km	18,180 Km
Raising of block fuel wood plantation	800 Hectares	800 hectares
Raising of seedlings for sale and distribution	70 million	80 million
Improvement of forestry extension and nursery training centers	40 Number	38 Number
Establishment of upazila nurseries	346	346
Raise public awareness		90,900 persons trained

122. The project generated positive environmental impacts. The tree cover re-established in degraded forest area and on under utilized forestland. It generated a tree planting aptitude among the members of the general public. This program however, used a few exotic species for large scale planting. Though yet to be fully supported by scientific findings, there is a general feeling that such large-scale use of exotics may cause problems in future. But the participants are in favour of those species, since they fetch higher monetary benefit for them.

e. Aquaculture Development Project

123. The 1st Aquaculture Development Project was expected to increase fish production by 45,140 MT of which 764 MT was for shrimp export. The project was judged by the PCR to be “seriously constrained by a number of factors.” 2nd Aquaculture Development Project was initiated in 1986 and was completed in 1996. The total cost incurred in this project was US\$38.29 million. The project promoted the aquaculture practices. The recommended fertilizer and feed doses were low and was supposed to be not harmful to the environment. However, the spontaneous expansion of shrimp and prawn farms posed serious environmental threats. In case of prawn farming the use of snail’s meat as feed, led to heavy exploitation of snails from the nature. Besides this, excessive feeding increased the organic loads in the ponds and that reduced the carrying capacity. The technology suggested in the project was supposed to maintain water quality and recycling of the nutrients. The large-scale use of snails has adversely affected the snail population, ecology and biodiversity at large.

IV. KEY CONSTRAINTS

124. There are quite a few examples where environmental issues have successfully been addressed. Bangladesh has been able to create an enabling policy regime for better management of environment and natural resources. The policies has adopted in principle the concept of sustainable development and recognized the importance of economic development that goes in hand with the control of environmental pollution and maintaining ecological balance. An enabling legal environment has been tried to create by establishing Environment Court, enacting Environmental conservation Act and Rule, making EIA mandatory for all development activities etc. However, the usual practices (in terms of environmental pollution and natural resource management) still lag behind the policy. The challenges in the year to come are on how to achieve the accountability and governance in managing the natural resources and environment. Some of the constraints, in terms of institutional, legal, policy framework, for an effective environmental governance are discussed below.

A. Lack of inter-sectoral coordination

125. Inter-sectoral coordination in dealing with cross-cutting issue like environment is a major issue in Bangladesh. The management responsibilities of different environmental components are divided into different sectors and ministries. This hinders smooth operation and execution of sustainable management regime. For example, the Department of Fisheries is responsible for the improvement of the fisheries sector, but legally the owner of the water bodies other government bodies. Access rights to *jalmohals* larger than 3 acres are controlled by the Ministry of Land and Ministry of Youth and Sport. The Ministry of Water Resources is responsible for *haor* development. Only recently a small number of selected *jalmohals* have been handed over to DOF to develop community based fisheries management. Often activities of the Water, Communication or Local Government Ministry cause damage to the fisheries sector as well as to the natural ecosystems. These give rise to inter-sectoral conflicts, mainly due to lack of coordination. In the process, the subject of protecting the resources and the ecosystems does not happen to be treated with appropriate urgency and priority and thus creates inconsistencies.

B. Conflict in sectoral policies

126. Sectoral policies are sometimes found to be in conflict with each other. Some provision of the Fisheries Policy contradicts that of the Land or Industrial Policy; Environmental Policy does not conform to the narrow objectives of the Export Policies etc. For example, the Environment Policy stresses the necessity of “encouraging land use systems compatible with various ecosystems”. It emphasizes the adoption of measures to “prevent spread of salinity and alkalinity on the land”. On the contrary, the Export Policy 1993-1995 emphasizes the rapid expansion of traditional/semi-intensive cultivation of shrimp to increase export.

Similarly the Forest Policy 1994 prohibits conversion of forest land for other uses. But the conversion of tree cover for setting industries, institutions such as universities, army cantonments, firing ranges etc. are very common. This sort of conflicts among the policies are serious flows in this aspect.

C. Lack of institutional capacities

127. Institutional capacity for implementing the various action measures identified for fulfilling the primary functions of environmental planning, monitoring and enforcement remains weak. MoEF has yet to develop a strong functioning Planning Cell to support its work. It lacks essential baseline data on resources and areas of environmental concern. Although it now acts as a "clearing house" for all development projects put forward by the different line ministries, it lacks the necessary basic technical expertise to effectively assess and monitor projects for their environmental impact and it suffers from a shortage of basic facilities, equipment and logistic support (MoEF, 1995).
128. The Department of Environment and Forest Department faces similar weaknesses. They have shortage of adequate and trained manpower. There is lack of an information management system supported by a strong data bank to back up planning, policies and monitoring activities. Absence of regular training programs to support staff development
129. In NEMAP document, it has been emphasized to set priority to identify a systematic program to strengthen the Ministry's institutional capabilities, based on its present and projected requirements. Towards this, under the BEMP, a strategic plan has been developed to strengthen DOE's capacity. Institutional capacity of other cross-cutting Ministries and their technical departments in dealing environmental issues also remain as a key concern.

D. Regulatory and institutional inadequacies for policy implementation

130. All the important policies including the National Environmental Policy of 1992 have been formulated in the last decade and only a very few of them seem to corroborate well with the older legal instruments of the given sector. Although the need of amendment of existing laws and formulation of new laws were the main cause of having many of the policies revised or declared a fresh, only a very few laws like ECA of 1995, ECR of 1997, Forest Act 2000, etc. could be tabled.
131. The formulated policies, although fairly rich in content, are not always supported by necessary actions of implementation. The policies are not that convenient to implement either. This is due to a number of factors including lack of consistency among the policies and the institutional weakness of the line agencies of the Government. Most of the concerned Ministries and Departments including the MoEF lack institutional capacities in terms of human, technological and financial resources needed for proper implementation of the policies.

132. The management of a given resource become very difficult, complex and cumbersome when it falls under the jurisdictions of two or more authorities, be they departments or ministries. The serious lack of coordination, the sense of domain and above all the underneath interest of the personnel of the authority are the basic causes that lead to such situation and is really difficult to resolve. The natural resource sectors such as water, fish, forests, etc. are the worst sufferers in this context. Polices are thus often criticized for their lack of directions for co-operation, coherence and coordination among the interested parties involved there in. For example, under the national Fisheries Policy, the MoFL is expected to “control all aspects of fisheries sector”. However, no reference was made to the required linkage with the numerous agencies and ministries those mange different aspects of fisheries. Though the policy states that “coordination’ will be established but the mechanism for that has not been spelled out. Under the Environmental Policy, the Ministry of Environment and Forest is assigned with the responsibility to implement the policies concerning protection of forest, wildlife, ecologically critical areas, biodiversity, etc. their responsibilities are not well defined. Besides these due to the absence of an overall monitoring authority of MoEF, no progress or suggestions for the improvement in this area has yet been achieved.

E. Outdated law

133. The majority of the environmental laws were passed under substantially different population and development conditions. These outdated laws and other improperly and incompletely updated laws are neither adequate to meet the present day needs of the country nor consistent with the changing environmental scenario of the world. A law passed two to five decades back cannot incorporate the concept of sustainable development or one’s right to healthy environment, which are the outcome of very recent concern about environment. Such laws can not play any effective role in combating environmental pollution in today’s Bangladesh, where overpopulation, poverty and illiteracy are aggravating this crisis everyday. For example, *Agricultural and Sanitary Improvement Act, 1920*; *Water Hyacinth Act, 1936*; *Embankment and Drainage Act, 1952*; *The Town Improvement Act, 1953*; *Shops and Establishments Act, 1965* and *Bangladesh Pure Food Ordinance, 1953*- important environmental laws - have not been updated yet. These laws, having been passed two to five decades back, can not possibly have incorporated the modern concepts of sustainable development or environmental protection.

F. Non-punitive approach of laws

134. The existing laws can be criticized for their non-punitive approach. Only a few legislations like *The Penal Code*, *Tea Plantation Ordinance*, *Wildlife (preservation) Order* etc. provide for punishment, but these are also too marginal to influence people's attitude. For example, the maximum punishment under the Penal Code for fouling water is only three months' imprisonment and that for making atmosphere noxious is only five hundred taka in fines. Under the Agricultural Pest Ordinance, 1962, punishment for transport or sale of infested crop is a maximum 500 taka fine and that under The Agricultural Pesticides Ordinance, 1971, is a maximum 1000 taka.

VI. BANK'S FUTURE ROLE IN ADDRESSING ENVIRONMENTAL CONCERNS IN BANGLADESH

A. The Bank's strategic objectives

135. The Bank's CSP Update (2004-2006) considered the strategies of environment section as
- Support stronger environmental management through strengthening and formulation of reforms.
 - Encourage greater private sector involvement through improved investment conditions and legal framework.
 - Work toward closer regional cooperation among Bangladesh, Bhutan, India and Nepal.
136. Four priority sectors of coverage of the strategy have been identified as
- Urban development, especially in the secondary towns
 - Water management
 - Transport and
 - Energy
137. Considering the above, following principles were set for formulating the recommendations:
- **The environmental aspects should be treated as a crosscutting issue. Environmental programs may not be under taken as separate program**
 - **For every sector, environment component should be identified so that these are duly addressed, while formulating programs or activities in that sector.**
138. Almost all policy documents of the government focuses on poverty alleviation as a key thrust of planning. Last CSP of ADB also focused on poverty agenda. Major target set by NS-EGPRSD is to achieve a pro-poor growth and ensuring sustainable livelihood. The policy document encourages striking a realistic balance between the existing livelihood requirements of the people and sound environmental resource management. Key sector like water, fisheries and agriculture now are equipped with sound policy and implementation plan, i.e., NWMP, towards sustainable resource management. Better coordination of policies, strategies and interventions are critical for to the improvement of pro-poor livelihood and sustainable resource management.

B. Recommendations for addressing environmental issues

139. **Controlling urban and industrial pollution.** The Environmental Conservation Acts and Rules and the National Water Policy have adequate clauses related to industrial pollution. This includes water quality protection, institutions to prevent pollution, effluent discharge monitoring, zoning regulations for new industries, and strengthening the regulatory system for agro-chemical pollution control. The number of industries that need attention in terms of pollution control is over 1000 in Dhaka city. Institutional capacity of the Department of Environment needs to be strengthened to cope with this problem. Alternatively, clean-up strategy can be mobilized through private organizations in a public-private partnership approach.
140. **Solid waste management.** With the high density of population and continued inward migration of more people, the task of managing solid waste has become a monumental challenge for major urban center like Dhaka, Khulna, Chittagong, Rajshahi etc. The present system, i.e., run by the Dhaka City Corporation, is inefficient and unsatisfactory. The problems will further accentuate when Dhaka becomes a mega city, as it is projected to become early next century.
141. Waste Concern, a local NGO, has already demonstrated the success of involving community in waste recycling. This community approach has been very successful in waste collection. But problem arises with the insufficient capacity of city corporation to collect this accumulated waste from community collection centers and further dumping in the landfills. Long-term planning is needed in identifying future landfills. Improved management of existing landfills should be given a high priority. Promising potential in reducing the need for landfills needs strong support from the Government. Government also should promote the reduce, recycle and reuse programmes. Solid waste from hospitals is a major concern for environmental quality in city areas. Structural interventions like installing incinerators at the hospital premises can be a major intervention option. But it has to be backed by proper monitoring from the designated authorities that deals with environment and health issues.
142. **Air pollution.** Introducing unleaded gasoline and banning of two-stroke are two successful initiatives taken by the government for combating air pollution in the Dhaka city. Efforts for controlling air pollution need to be further supported by improved traffic management, higher technical standard for motor vehicles and expansion of public transport system.
143. **Land resource management.** Effective ways to land resource management should be based on a integrated land use policy with respect to agriculture, industry and environment. GOB has made some progress in this direction. A draft Land Use Policy has been prepared. In order to implement the land use policy successfully, mass awareness programme for general people and government administration is required.

144. The other issue in land resources is its current trend of degradation. There are two major constraints in preventing land degradation: (i) high population pressure on land, especially in the center, west and northwest regions; and (ii) absence of a comprehensive national land use policy. There is wide gap between awareness of land degradation problem and actions needed for combating the problem. Present knowledge about the present status of the land degradation process and its level of impacts on national development and rural livelihood system is inadequate, requires further investigation and research. The potentiality of preventing further degradation in the future suffers from a lack of innovative technology, a low level of education and social awareness, and limited enforcement of laws and regulations. In order to tackle the land degradation problem, it is necessary to undertake field level research and apply the results through extension programs along with enabling policy makers to take necessary decision and to undertake appropriate mitigation measures.
145. **Water resource management.** National Water Management Plan (NWMP) provides the guiding principle for water resource management in Bangladesh. The plan is very comprehensive and includes a detailed investment option in water sector. The Bank assistance in combating environmental problem in water sector should also be guided by the NWMP.
146. **River bank erosion** has been identified as an important environmental and social problem. Major issues related to contemporary approach to river erosion will be to establish the strong institutions on a coordinated effort that integrates reliable forecasting of river behavior with sound planning and design of bank protection measures, construction that rigidly adheres to the planning schedules and designs, and post construction verification river surveys.
147. **Dealing with ground water contamination with arsenic.** Access to safe drinking water to the tune of 98% was achieved by 1999 through shallow tube wells all over the country. But the arsenic problem in many of these shallow tube wells has cut back this figure to 73%. This is a serious set back and need to be addressed urgently at national level. The two techniques namely the “rain water harvest” and use of “pond sand filter” have so far exhibited reasonable success.
148. In urban growth centers, use of surface water can be encouraged. Small water treatment plants with a distribution network can be set up to meet the domestic water demand in the growth centers.
149. **Sanitation activities** in the rural areas initiated since 1954 in this part of the world got the kick off only in 1970 when the UNICEF started to provide sanitary pit latrines at a subsidized rate. Only 8.3% and 29.1% of the population are using water sealed and pit latrines (BBS 1999). Such situation is the basic cause of diarrhea, a recognized health hazard for Bangladesh. Any rural development

program where government seek ADB assistance may have a component of this as a cross cutting environmental programme.

150. **Wetland loss** has been contributed by myopic view of conventional water resource management in the form of FCDIs. Wetlands are drained to accommodate more rice production. Water-environment nexus is thus embraces a wide range of environmental issues in agriculture and fisheries sectors, and the water itself in terms of quality, quantity and availability. Key water environment issues include: managing conflicts between agriculture and fisheries protection of remaining biodiversity and the distributive socio- economic impacts of altering access to common property resources. A comprehensive land use zoning and land use policy is required for the protection of the wetlands. On top of it, the typical mindset of considering wetlands as waste lands need to be changed with awareness raising at both policy and public level.
151. For halting the **degradation of forests and loss of forest lands**, general the future investments in forestry sector should look into the following aspects as crosscutting issues of environment, under the mainstream funding:
- Forestry sector activities should be participatory so that it is pro-poor and help in poverty alleviation.
 - Nursery raising may be completely be switched over to “Buy Back System” and NGOs may be involved.
 - Monoculture should not be allowed in any afforestation program.
 - Large scale clear felling should never be allowed in any forestry management activity.
 - Planting of exotic species in any of the PAs (protected area) should not be allowed.
 - Planting of exotic species in places other than PAs should be limited and scientifically weighted and balanced.
 - Conservation of ecosystems should get higher weight ages in formulating forest management prescriptions for government owned forest tracts.
 - Watershed management aspects need to get adequate weight ages in forest management.
 - Eco-tourism should be encouraged under a local people participation arrangement so as to assist poverty alleviation and combat adverse affects of eco-tourism, such as pollution, loss of flora and/or fauna etc.
 - The Park Service Department should be created and all the PAs should be placed under that for scientific management.
152. For the conservation of biodiversity an all out effort is necessary involving different levels of stakeholders engaged in its use, study, research, and protection. To this purpose, various steps need to be taken, e.g., education, information dissemination, action programs, preventive measures, and policy decisions. A multi- sectoral policy is required as conservation of biodiversity involves various stakeholders. The national policy planning authorities should recognize the

necessity for conservation of biodiversity, and ensure multi-sectoral coordination for it. Government agencies involved in biodiversity conservation should be strengthened. Awareness about the need for conservation of biodiversity among all sections of society should be encouraged.

153. To reduce the **vulnerability from climate change and climate variability**, two approaches are mitigating the causes and coping with and adapting to the changes occurring. For country like Bangladesh, adaptation is a possible measure to deal with the vulnerability arises from climate change and climate variability. Surveys conducted in villages and rural areas in Bangladesh clearly show that people are aware that the climate is indeed changing, but they may not understand the reasons causing the changes (IUCN, 2004). There are also long traditions of coping and adaptation strategies in response to flood and cyclone threats. From a historical perspective, people at the community level, have shown enormous resilience in combating and managing floods and river erosion related disasters. The inherent coping mechanisms within the communities and their traditional knowledge base enable them to organize at the community level and manage disasters. There is a need to revert to community-based mechanisms for coping the vulnerability and then ensure that state agencies are effective in fulfilling a primarily supporting and facilitating role.
154. Effective adaptation policies and actions are not something that is separated from the main thrust of normal development activities or institutional programs. They are rather the elements that need to be ‘mainstreamed’ into all aspects of life if they are to be truly effective in responding to the formidable challenges that Bangladesh will face in the future.
155. **Proper urbanization.** The urban population is expected to reach 50 million by 2010 and nearly 80 million in 2020. The urban population of Dhaka is expected to reach 14-16 million by 2010 and 15-20 million by 2020. Chittagong will double in size by the year 2010 reaching 9-12 million. These two urban giants will be the dominant cities in the next 25 years, home of almost half of the country’s urban population, or approximately 25-33 million by 2020 (World Bank and BCAS, 1998).
156. Urbanization is not intrinsically good or bad, it can have both positive and negative impacts on peoples’ well being and environmental conditions. It is possible to create better opportunities for efficient provision of badly needed services with proper planning and adequate investments. On the other hand, it can increase risks of disease, desperation and social turmoil if new jobs and services become insufficient. For a sustainable urban growth future investments need to be strongly balanced to ensure economic growth as well as quality of life. Keeping the trends of urbanization in mind, the challenges for a sustainable development are
 - Develop institutional capacity for urban management and planning

- Urban employment generation
 - Strategy development to tackle urban environmental problem
 - Extension of infrastructure and utility services
157. **Energy conservation.** Though Bangladesh has a proven gas reserve of 176 billion M³, over 90% of its population are dependent on biomass fuel, such as fuel wood, farm waste, cow dung, rice husk, leaves & twigs, etc. It could have been an environment friendly scenario if a sustainable output of these biomass fuels can be made available; leaving aside the organics from the farms to manure the agricultural fields to alleviate the soil degradation problem. Intensive afforestation and management of denuded sites; homesteads, roadsides, railroad sides, etc. may assist this issue to a great extent.
158. Use of higher quantum of per capita energy is definitely desirable. Under this context the fuel to generate the quantum target energy is a major case to decide upon, so that such increased energy consumption, instead of enhancing the pollution and degradation of environment, will be rather an environment friendly proposition.
159. Keeping in view of these stated above, investment projects on the following areas are suggested.
- Domestic use of solar energy may be initiated. The solar energy may be used for generating electricity or for heating the water. Small household type equipments need to be developed. ADB may come up with the required technical assistance to develop the devices and involve the NGOs for adoption, sale, distribution, etc. This should be included as an obligatory component of any ADB project assisting power plants establishment, to the government of Bangladesh.
 - Intensive afforestation on non-government land involving the communities through NGOs may be initiated with ADB assistance, for the production of fuel wood. This may be an obligatory component of any ADB project extending assistance to Railways for rail road sides, R&H for road sides, LGED for homesteads, and so on. In every such case the FD government of Bangladesh must be involved to provide all the required technical assistance in this regard.
 - Bottling of condensates that comes out with the natural gas to produce LPG for cooking. In every gas field a condensate processing plant may be established to produce the LPGs. ADB may assist the government in this regard and include this aspect as an obligatory component of any ADB project related to natural gas.

C. Options of Bank's involvement

160. The existing environmental problems and the future trends of development provide the necessary indications for identifying the high priority issues to support the future development. It is evident that Bangladesh needs to (i) improve the management of natural resources including its land and water and wetland

resources, protected areas and forests; (ii) pollution control associated with urban and industrial activities; (iii) better institutional capacity building for protection and management of overall environment; and (iv) public awareness raising on environmental issues. The following general framework can be used as a tool to develop Bank's future operation in environment sector.

SI No	Concerns	Interventions	Short Term	Mid Term	Long Term	Remarks
Agriculture Sector						
	Water pollution by toxic components of insecticides from agricultural fields through run off.	Extend integrated pest management programs. Fund may be given for such expansion of the program. Use of herbicides by the tea garden owners should be stopped through regulations.	√ √		√	Biological control of the pests and diseases may be put to practice through awareness and motivation programs. Agri. Departments should assist in marketing the products of these growers.
	Water pollution by toxic components of fertilizers from agricultural fields through run off.	Discourage use of chemical fertilizers. • Compost making programs may be boosted through NGOs such funding may be made available.	√		√	To enhance the use of organic manures such as cow-dung, the use of this as fuel, need to be reduced. This will need an integrated program of introduction of solar panels, growing of fuel-wood yielding trees in the homesteads, along with the motivation of farmers to use more of the organic manures.
	Water pollution by toxic components of fertilizers from agricultural fields through run off.	Encourage use of organic manures. • Private sector may be encouraged to making organic manures for the urban garbage through soft funding.	√		√	Large-scale compost making and commercial production of organic manures from the urban garbage may be brought to practice. The private investors may be assisted in this field.
	Loss of indigenous species	Discourage GMO • Regulatory government intervention needed.	√		√	Department of Agriculture should encourage farmers to grow indigenous varieties with supply of seeds at subsidized price and assisting in marketing.
	Loss of top soil, soil erosion and loss of natural productivity	Discourage slash and burn agriculture. • Rehabilitation program may be funded, where in Agri and FD need to work together.	√	√		Settlement of the nomadic jhumias should be the approach. It should focus more on forestry and horticulture. Agriculture and Livestock Departments need to join to have an integrated program.
	Loss of top soil, soil erosion and loss of natural productivity	Discourage growing crops along the slopes. • Motivation programs needed where in both NGO and Agri Department may work jointly.	√		√	Mostly the pineapple growers in CHT and Sylhet need to be motivated to give up this practice. Department Agri. Extension should take up programs in this context.

SI No	Concerns	Interventions	Short Term	Mid Term	Long Term	Remarks
Fisheries Sector						
	Loss of wet land	Important wetlands should be declared as ECA. <ul style="list-style-type: none"> All ECAs should be brought under management through the creation of "Park Service Department". 	√	√		Any program of constructing polder, road, embankment, etc. should be thoroughly scrutinized through proper EIA to avoid future loss of wetland.
	Loss of fish passes	Research and fact-finding studies through Universities need to be under taken. <ul style="list-style-type: none"> No construction in wetlands should be allowed with out thorough EIA. 	√	√		Assistance to under take such studies should be made available to the academics through the Ministry of Fisheries so that correct data are at hand to combat such loss of fish passes from the constructions, earth work, etc.
	Loss of fish breeding grounds	Identified breeding grounds should be declared as ECA. <ul style="list-style-type: none"> Studies to identify breeding grounds may be funded. 		√	√	Management of the ECA through the creation of "Park Service Department" shall have to be ensured. Otherwise, such declaration will be of no use. Donor assistance may be conditional as such to push such institutional arrangement.
	Loss of species	Regular program need to be there to identify the endangered and critically endangered species. <ul style="list-style-type: none"> Experienced organizations in this field such as IUCN may be funded to under take such activities on a regular basis. 		√	√	Based on the data steps need to be taken before a given species get extinct for its protection and rehabilitation of the necessary ecosystems. Assistance of the FD, DoE and Agriculture may be sought by the Fishery department to achieve the desired goal of combating the loss of species.
	Loss of wetland productivity.	Ecosystem studies need to be under taken. <ul style="list-style-type: none"> Universities may be funded for such specific studies. Experienced organizations such as IUCN and NGOs may be funded under take such studies. Any wetland development program may have a component to fund studies suggested above. 	√		√	Data on this issue are scanty. Correct and dependable data has to be developed.
	Use of prohibited fishing gears in open water fishing	Motivation program needed. <ul style="list-style-type: none"> NGOs may be funded through the Fisheries Department to under take 	√		√	In effective application of the existing regulation and corruption have to over come.

SI No	Concerns	Interventions	Short Term	Mid Term	Long Term	Remarks
		such awareness programs. • Government should honestly impose the existing regulations.	√			
	Shrimp fry collections from the open water	Motivation program needed. NGOs may be funded through the Fisheries Department and FD (for RF land) to under take such awareness programs.	√		√	Very often this act is performed in the reserved forests of Sundarban. FD should honestly try to prohibit such shrimp fry collection from the Sundarban. The politicians need to extend their support in this regard. Motivation programs need to be under taken by the NGOs as partners of the FD.
	Unplanned conversion of agricultural or forestry land for shrimp culture	Regulatory as well as motivational programs needed. NGOs and organizations having experience in this field (such as IUCN) may be funded to under take motivations and pilot program on eco-restoration. Government may impose fines and punitive measures for the destruction of natural habitats.	√ √		√	
Forestry Sector						
	Loss of tree cover	Large-scale tree planting program need to be under taken. Support to both private and public sector may be made available. Existing FD should be split into two directorates such as “Social Forestry” and “Park Service”, so that SF Directorate can under take large scale social forestry program to restore the tree cover.		√ √	√	Tree planting programs of FD need to be kept up so that it does not get closed due to the paucity of funds. Participatory forestry programs of the FD need to be expanded and enhanced.
	Loss of tree cover	Capacity building and enhancement of manpower. Institutional reforms needed.		√ √		Inadequate manpower, low profile of accountability, corruption in the government machinery in general, very low incentives compared to the toil and risks involved are the basic causes of connivances and incapability leading to the loss of tree cover. Institutional

SI No	Concerns	Interventions	Short Term	Mid Term	Long Term	Remarks
						restructuring and capacity building are essential.
	Soil erosion	Large-scale plantation raising programs on denuded areas, need to be under taken. The practice of clear felling should be discontinued. Catchments management should be introduced.	√	√	√	All denuded areas irrespective of its ownerships should be planted by suitable species, preferably under a participatory approach
	Stabilization of newly formed mud flats	Funding for mangrove afforestation program may be made available to FD. <ul style="list-style-type: none"> • Proper coordination and understandings between the FD and MoL need to be there. • Such programs may be under taken on Social Forestry approaches involving the poor community. 	√		√	Such program will not only stabilize the newly formed mud flats along the coast but will ultimately assist in getting additional land for agriculture and shall definitely provide shelter to its hinter lands from cyclones and tidal surges.
	Loss of biodiversity	Intensive management of PAs may be undertaken through a “Park Service Department”. Funding need to be made available for such management. Institutional reforms needed.	√	√		A Park Service Department, by splitting the existing FD, should be created. Management of all the PAs, ECAs, etc. should be with this Park Service Department. Assistance and pressure for such institutional reorganization may be needed.
	Loss of species both flora and fauna	Encourage eco-tourism activities. The proposed ‘Park Service’ department should be entrusted to develop eco-tourism initially in the non-core areas of the PAs. NGOs and private tour operators may be involved in the second phase.		√		
	Use of organic wastes as fuel.	Encourage homestead planting with species that can be coppiced and pollard. Under the professional guidance and funding routed through the FD, (proposed SF directorate) NGOs may be involved to under take such programs.	√		√	
	Monitoring and Accountability	Monitoring aspects of all the entities under MoEF need to developed and enhanced.	√			Monitoring & accountability is seriously lacking in MoEF.

Sl No	Concerns	Interventions	Short Term	Mid Term	Long Term	Remarks
		Institutional reforms needed. Any foreign funding to MoEF may have such condition as such.	√	√		
Energy Sector						
	Acute shortage of rural energy	Solar power panels	√			Initially this may be used to save the Kerosene that may be diverted for cooking in lieu of cow dung
	General shortage of power supply	All new power generation plants should be gas based. <ul style="list-style-type: none"> Setting of each such plant should have an obligatory component of supporting the creation and maintenance of a certain quantum of tree cover, depending on the size of the plant, as long as it generates the power. 	√	√		Enhanced power supply is a must for industrial growth.
Industrial Sector						
	Water pollution	<ul style="list-style-type: none"> Setting of any new industry should not be allowed with out proper waste treatment arrangement. Funding towards the setting of a new industry may have a condition of installing of a waste treatment plants of one of the old industries. Monitoring of the river water must be ensured. The existing system is ineffective. Private companies may be involved for such activities and fund for this may be realized from the industrial sector through some sort of direct taxing system. 	√ √ √	√		River water pollution is a serious problem caused by the industries. Lack of proper monitoring of the river water is the most serious hindrance in unveiling the degree of pollution and its impact.
Water Sector						
	Riverbank erosion	River training projects need to be under	√			Over 0.1 million people are affected every year

SI No	Concerns	Interventions	Short Term	Mid Term	Long Term	Remarks
		taken. <ul style="list-style-type: none"> Engineering activities must be coupled with the creation of tree cover. 	√			by riverbank erosion. It causes them to be homeless and unwanted mobilization to urban areas. River training programs need to be undertaken including regular river dredging.
Transport Sector						
	Air pollution	Encourage CNG based transport system. <ul style="list-style-type: none"> Reduce the tax on CNG based engines and transports. Accessibility to CNG filling stations be enhanced. Encourage use of lead free fuel in road transport vehicles through tax manipulations. Honest monitoring of exhausts from the vehicles on a regular basis. Enhance public transport system in the cities Improve traffic management 	√		√	

Bibliography

ADB. 2002. Asian development outlook 2003. Economic trends and prospect in developing Asia. ADB, Manila

ADB. 2003a. Review of fisheries (coastal and marine resources) sector in Bangladesh. September 2003.

ADB. 2003b. Country assistance program evaluation for Bangladesh. January 2003.

ADB. 2003c. Country strategy and program updates (1004-2006), Bangladesh. July 2003

Ali, M. Y. 1997. *Fish, water and people*. BCAS. University press Limited. Dhaka, Bangladesh

Anon. 1984. Report on Forest land of Chakaria Sundarbans Range. Cox's bazaar Forest Division (Official record, unpublished).

Badruzzaman, A.B.M. and Ali, M.A. 2001 Water Supply and Sanitation. Bangladesh Environment Outlook 2001 CFSD.

BBS. 1999. Statistical Year Book of Bangladesh. Bangladesh Bureau of Statistics, Dhaka.

BBS. 2000a. Statistical Year Book of Bangladesh. Bangladesh Bureau of Statistics, Dhaka.

BBS. 2000b. Yearbook of Agricultural Statistics of Bangladesh. Bangladesh Bureau of Statistics, Dhaka.

BBS (2001). Population census report, 2001. Accessed through http://www.bbsgov.org/ana_vol1/census.htm

Belbase, N. 1997. *The Implementation of International Environmental Law in Nepal*. IUCN, Nepal.

Choudhury, J.K. 2001 Does Forestry Pay in Bangladesh? Lessons from ADB's Forestry Sector Projects. Forestry Sector Workshop organized by ADB and FD during December 3-5 2001 at Dhaka, Bangladesh. Pp33

CPD (2004). State of the Bangladesh Economy in the Fiscal Year 2003-2004. Second Interim Report.

DFID. 2003. Country Assistance Plan, 2003-2006. February draft

ERD 2003 Economic Relation Division (ERD), Ministry of Finance, Government of People's Republic of Bangladesh, March 2003 : A National Strategy for Economic Growth, Poverty Reduction and Social Development. Bangladesh Country Paper.

Farooque, M., Hasan. S. R. 1996. *Laws Regulating Environment in Bangladesh*. Bangladesh Environmental Lawyers' Association. Dhaka.

Haque, A. K. E. 2000. Strengthening of financial capacities for promoting sustainable development in Bangladesh. In Nishat, A. Waliuzzaman, M and Tabassum, S (eds.) *Proceedings of the National Forum on Multi-stakeholder Sustainability Planning in Bangladesh*. IUCN-Bangladesh, Dhaka, Bangladesh.

Haque, A. K. E. 2002. Economic impact of degradation of land on the economy of Bangladesh. IDESS, North South University. Bangladesh

Haque, M.2000. Situational analysis of the sustainable development initiatives in Bangladesh. In Nishat, A. Waliuzzaman, M and Tabassum, S (eds.) *Proceedings of the National Forum on Multi-stakeholder Sustainability Planning in Bangladesh*. IUCN-Bangladesh, Dhaka, Bangladesh.

Hassan 2003 Eco-Degradation and Rural Livelihood Relationship. The Bangladesh Observer, August 10, 2003

IFDP. 1979-1982.. Annual reports. Dept. of Fisheries, Bangladesh. M/S Snell Environmental Group, Lansing, Michigan, USA.

Islam, M. A. 1996. *An Inventory of International Conventions Treaties and Protocols Related to Environment and Bangladesh Context*. IUCN Bangladesh, Dhaka.

Islam, M. F., Shammin, Junaid, J. 2001. Industrial pollution. In Nishat, A. Ullah, M., Haque, A. K. E (eds.) *Bangladesh environmental outlook*. Centre for Sustainable Development. Dhaka, Bangladesh.

Islam, M.A. 2003 Selection of right species of indigenous and exotic trees for afforestation in Bangladesh. Presented in a National Workshop at Dhaka Bangladesh on September 08, 2003. pp9

IUCN 2000a. *Redbook of threatened animals of Bangladesh*. IUCN Bangladesh. Dhaka, Bangladesh.

IUCN. 2000b. Inception Report. Judicial and Administrative Arrangement for Management of Protected Areas and Prosecution of Environmental Offences. IUCN-Bangladesh, Dhaka, Bangladesh.

IUCN. 2003. *Strategy for adaptation: coping with climate change and climate variability in Bangladesh*. IUCN Bangladesh. Dhaka, Bangladesh. (to be published)

Karim, Z., Mia, M. M. U. and Razia, S. 1994. Fertilizer in the national economy and sustainable environmental development. *Asia Pacific Journal Environment and Development*, 1 (2):48-67.

Karim, Z. and Iqbal, A. (eds.) 2001. Impact of land degradation in Bangladesh-Changing scenario in agricultural land use. Bangladesh Agricultural Research Council. Dhaka.

Khan, M.H. 2001 Biodiversity. In Nishat, A. Ullah, M., Haque, A. K. E (eds.) *Bangladesh environmental outlook*. Centre for Sustainable Development. Dhaka, Bangladesh.

Khan, O. F. 1997. Hazardous Waste: Country Presentation, Bangladesh, in *Report of the Regional Workshop on the Strengthening Legal and Institutional Arrangement for Implementing Major Environmental Conventions in South Asia*, Kaniaru D. et al. (eds.) SACEP, UNEP and NORAD, Colombo, Sri Lanka.

Kuo, Chin S. 2002 The Mineral Industry of Bangladesh.

MoEF. 1995. *National Environment Action Plan (NEMAP)*, Bangladesh Progressive Enterprise Press Ltd. Bangladesh

MPO. 1990. National Water Plan-Phase II Draft Final Report.

MPO.1987. Openwater Capture fishery resources. Tech. report 16.

Mujeri, M.K. Bangladesh Agriculture and Rural Development Strategy Study. ADB Report.

Nishat, A, Waliuzzaman, M. and Tabassum, S. (ed) 2000. *Proceedings of the national forum on multi-stakeholder sustainability planning in Bangladesh*. IUCN Bangladesh, Dhaka, Bangladesh.

Nishat, A. & Choudhury, J.K. (2002) Forestry, Forest Biodiversity and Governance Towards a Pro-People Policy. US-Aid seminar held at Dhaka on July 31, 2002. Pp 16.

Nishat, A. (1993). Freshwater wetlands in Bangladesh: status and issues. In Nishat A., Hussain, Z., Roay M. K. and Karim, A. (eds) *Freshwater wetlands in Bangladesh: issues and approaches for management*. IUCN.

Nishat, A. 1993. Freshwater wetlands in Bangladesh: status and issues. In Nishat A., Hussain, Z., Roay M. K. and Karim, A. (eds) *Freshwater wetlands in Bangladesh: issues and approaches for management*. IUCN.

Nishat, A. 1999. Bangladesh and International Conventions, Treaties and Protocols Related to Environment . F R Khan Memorial Lecture at the 43th Convention, The Institution of Engineers Bangladesh.

Oil & Gas Journal 2002, Exploration and Development: Oil and Gas Journal, Vol 100 No 16, April 22, 2002. pp 48

Rahman, A K A. (1989). *Freshwater fisheries in Bangladesh*. Zoological Society of Bangladesh.

Rashid, H. 1991. *Geography of Bangladesh*. UPL, Dhaka.

Raymakers, C. and Vasquez J-C. 1999. The National Legislation Project, in CITES World, Official Newsletter of the Parties. Issue 3. November-June, Geneva, Switzerland.

Shahid, S. M. 1994. *Data collection and analysis of land degradation. Bangladesh report*. Bangkok. Rapa publication.

Siddiqi, N.A.; Shahidullah, M and Haque, A.K.E. 1994. Present Status of Chakaria Sundarbans – The oldest mangrove forest in the subcontinent. *Bangladesh Journal of Forest Science*, Vol.23(1): 26-34.

Tsai, Chua-Fa. and Ali, . L. 1987. The Changes in Fish Community and Major Carp Population in Beels in the Sylhet-Mymensingh basin, Bangladesh. *Indian J. Fish.*, 34 (1), pp 78-88.

Tsai, Chu-fa, Islam, M.N., Karim, M.R., and Rahman, K.H.M.S. (1981). Spawning of

Ullah, M. 2001 Economy and Environment. In Nishat, A. Ullah, M., Haque, A. K. E (eds.) *Bangladesh environmental outlook*. Centre for Sustainable Development. Dhaka, Bangladesh.

UNEP. 2001. *State of the environment. Bangladesh*. UNEP. Thailand

WCED.1987. *Our common future*. World Commission on Environment and Development, Oxford University Press, India.

World Bank 2002 World Development Indicators. Washington D.C.

World Bank and BCAS. 1998. *Bangladesh 2020. A long-run perspective study*. University Press Limited, Dhaka, Bangladesh.

World Bank. 1991. Bangladesh fisheries sector review. The World Bank

Annex –1. Environmental Indicators for Bangladesh

Sector	Indicator	Unit	Data	Year	Source	Remarks
Air Quality	Air pollution at Dhaka (Farm gate).	Suspended Particulate Matter in microgram/M ³	739.50 to 2813.8	2000	Statistical Pocketbook, BBS, 2001	The exposure of the public to air pollution in Dhaka is estimated to cause 15,000 premature deaths and several million cases of sickness every year. The poor are particularly vulnerable to air pollution (BEMF Web site).
	Air pollution at Dhaka (Farm gate).	NO ₂ in microgram/M ³	30.36 to 150.50	2000	Statistical Pocketbook, BBS, 2001	
	Air pollution at Dhaka (Farm gate).	SO ₂ in microgram/M ³	65.40 to 187.10	2000	Statistical Pocketbook, BBS, 2001	
Water Quality	Burigonga river at Dhaka	Acidity i. e. pH of the water	6.7 to 8.0	2001	Statistical Pocketbook, BBS, 2001	
	Do	Electrical Conductivity (EC) micro S/cm.	141 to 859	2001		
	Do	Chlorides	1.5 to 6.0	2001	Statistical Pocketbook, BBS, 2001	
	Do	Total Solids (TS) mg/L	45 to 525	2001	Statistical Pocketbook, BBS, 2001	
	Do	Dissolved Oxygen (DO) mg/L	2.0 to 8.5	2001	Statistical Pocketbook, BBS, 2001	
	Do	Biological Oxygen Demand (BOD) mg/L at 20 ⁰ C & 5 days	0.7 to 240	2001	Statistical Pocketbook, BBS, 2001	
		Chemical Oxygen Demand (COD)				
Water & Sanitation (Environmental Health Risks)	% of total population having access to safe drinking water	National level	73	2001	Badruzzaman et al 2001 Water supply and sanitation. Bangladesh Environment outlook 2001. CFSD	
	% Urban population with access to safe water.					
	% Rural population with access to safe					

Sector	Indicator	Unit	Data	Year	Source	Remarks
	water.					
	% Urban population with access to sanitation.	At Dhaka	69%	2003	The Daily Star: July 13, 2003	
Land use and deforestation	Forest area	Thousand acres	6490	1999-2000	BBS, 2000	
	Do	% of total land	13.60%	1999-2000	BBS, 2000	
	Average annual deforestation	Thousand acres				
	Do	% change	1.3	2000	Forest Resource Assessment, FAO	
	Rural population density	No. of people / km ² arable land				
	Arable land	Hectares/capita	0.05 ha			Predicted for 2005
Biodiversity and protected areas	Nationally protected area	% of total land				
	No. of higher plants	No. of threatened species	95	2000	Redbook of Threatened Vascular Plants, National Herbarium	
	Mammals	No. of threatened species	40	2003	Bangladesher Bionno Bannyaprani, IUCNB	
	Birds	No. of threatened species	41	2003	Do	
	Reptiles	No. of threatened species	58	2003	Do	
	Amphibians	No. of threatened species	8	2003	Do	
Urban areas	Urban population	% of total population	7.73	2001	Statistical Pocket Book BBS 2001	Dipasis (2001) reported this fig as 20% Bangladesh Env. Outlook 2001
	Water shortage at Dhaka	Million Liters / day	470	1999	DWASA ¹	Estimated ² that this fig will be 2750 in year 2020
	Waste water treated at Dhaka	m ³ /day	150000	1999	Badruzzaman et al 2001 Water supply and sanitation. Bangladesh Environment Outlook 2001	
	Solid waste generated	Kg / day				

Sector	Indicator	Unit	Data	Year	Source	Remarks
Energy	Traditional fuel use	'000' tones of coal equivalent	10833	2000-01	Statistical Pocket Book BBS 2001	
	CO ₂ emissions	Gg	24297.63			
	Avg. per capita daily calorie intake	kcal	2240	2000	Statistical Pocket Book BBS 2001	During 1985-86 it was 2191
Natural Resources	Fish catches in river water	metric ton	154335	1999-2000	2000 Statistical Year Book of Bangladesh	During 1998-99 it was 151309 m.t.
	Fish catches in fresh water wet land	metric ton	1173250	1999-2000	2000 Statistical Year Book of Bangladesh	During 1998-99 it was 1091311 m.t.
	Fish catches in marine water	thousand m.t.	1402	2000-2001	Statistical Pocket Book BBS 2001	During 1999-00 it was 1327 thousand m.t.

About 30 per cent of the area of the city is covered by the conventional water borne sewerage system of Dhaka WASA and 20 per cent is connected to the separate sewerage system. About 11 per cent of people is oriented to septic tank and 18 per cent to pit sanitation system. Daily Star, July 13, 2003.

1 DWASA 2000 Management Information Report September 1999

2 Badruzzaman ABM and Ali M. A. 2001 Bangladesh Environment Outlook 2001 CFSD p 55-75

Annex-2. Major projects of Development Partners in environment sector (on-going and completed)

A. UNDP

Project	Major components	Implementer	Fund	Time frame
Utilization of Agro-Ecological Database and Installation of Geographic Information System for Agricultural Development	<ul style="list-style-type: none"> • Human Resource Development • Establishment of National AEZ/GIS database • Dissemination and Awareness among researcher and policy planners 	Bangladesh Agricultural Research Council (BARC)	US\$ 2,075,450	1996-2001
Empowerment of Coastal Fishing Communities for Livelihood Security	<ul style="list-style-type: none"> • Empowerment of communities • Enhancement of socio-economic capacity • Sustainable conservation and management of coastal marine and estuarine fisheries resources and habitats. 	Food And Agriculture Organization of the United Nations (FAO)	US\$ 5,886,200	2000-2005
Conversion to CFC Free Technology in the Manufacture of Aerosol Production at Advanced Chemical Industries	<ul style="list-style-type: none"> • CFC Free Technology Transfer 	ACI Ltd	US\$ 322,920	1998-2002
Institutional Strengthening for ODS Phase-out under the Montreal Protocol.	<ul style="list-style-type: none"> • National capability of phasing out of Ozone Depleting Substances in stipulated time to comply 	Department of Environment	US\$ 100,000	1999-2001

Project	Major components	Implementer	Fund	Time frame
(Phase-II)	with the Montreal Protocol			
Technical assistance to Strengthening RPGCL through Training on CNG as Transportation Fuel for Environment Improvement	<ul style="list-style-type: none"> • human resources needs for effective management practices • enhance capacity of RPGCL workshop and management personnel to conduct CNG conversions. • Transfer of technology • Development of a regulatory framework, • baseline national standards and safety codes for conversions and for CNG retail outlets. 	Rupantarita Prakritik Gas Company Limited (RPGCL)	US\$ 1,240,533	2001-2002
Coastal and Wetland Biodiversity Management at Cox's Bazar and Hakaluki Haor	<ul style="list-style-type: none"> • Conservation and sustainable use of globally significant wetland biodiversity • Institutionalize the concept of ECA management 	Department of Environment	US\$ 5,520,000	2000-2007
Biodiversity Strategy Action Plan		Ministry of Environment and Forest with IUCN-The World Conservation Union, Bangladesh	US\$ 278,900	2002-2004

B. CIDA

Project	Major components	Implementer	Fund	Time frame
Bangladesh Environmental Management Project	<ul style="list-style-type: none"> • Institutional Planning; Policy and Legal Reform • Environmental <ul style="list-style-type: none"> • management and • demonstration Areas • Resource Information Systems • Human Resource • development 	Department of Environment	US \$12,621,000	1999/2004
Environmental Monitoring Information Network	<ul style="list-style-type: none"> • Integrated water management system • Information network • National archive of satellite imagery and corresponding web-based information system • Community management information systems 	EGIS, Ministry of Water Resources, WARPO	US \$999,958	May 2001 - August 2002
Reducing Vulnerability to Climate Change	<ul style="list-style-type: none"> • Capacities of the low income households • Community-based structures and networks • Environmental awareness programs 	CARE Bangladesh, Local NGOs	US \$3,006,000	June 2001 - June 2004
Environmental Technology Verification-Arsenic Mitigation Project	<ul style="list-style-type: none"> • Arsenic mitigation technologies • Technology transfer 	Department of Public Health and Engineering (DPHE)	US \$4,462,800	2000/2003
Dampara Water Management Project	<ul style="list-style-type: none"> • increase crop production, improve quality of life • enhance economic activities 	Bangladesh Water Development Board	US \$4,725,000	1998/2003

Project	Major components	Implementer	Fund	Time frame
	<p>through flood protection to crop land, infrastructure and homesteads.</p> <ul style="list-style-type: none"> • Community training • Environmental awareness programs 			
Kalni-Kushiyara River Community Development and Monitoring Project	<ul style="list-style-type: none"> • Community development initiatives to improve social • Infrastructure • New income generation • Monitoring morphological changes in the river 	Bangladesh Water Development Board	US \$3,535,000	1998/2002
Modernization of the Ministry of Water Resources Financial Management Capability	<ul style="list-style-type: none"> • Planning and budgeting processes and better variance analysis • Overall financial management capacity • Reform of financial processes • Rules and regulations • Accounting and production of uniform 	Ministry of Water Resources (MWR)	US \$3,250,000	2002/03 to 2005/06

B. World Bank

Project	Major components	Implementer	Fund	Time frame
Air Quality Management Project	Environmental policies and institutions Pollution management and environmental health Vulnerability assessment and monitoring Environmental education programs	Ministry of Environment and Forests	US\$ 5.93 million	2000-2004
Aquatic Biodiversity Conservation Project – GEF	Biodiversity conservation Environmental policies and institutions Law justice and public administration	Ministry of Fisheries and Livestock	US\$ 5 millions	1999-2004
Fisheries project	Community based inland open water fisheries management Water regulatory structures, and, fish habitat restoration Development and management of coastal shrimp aquaculture Aquaculture extension training	Ministry of Fisheries and Livestock; Bangladesh Water Development Board	US\$ 60.8 million	1999-2004
Arsenic Mitigation - Water Supply Project	Developing a community-based organization Alternative water supply/sanitation infrastructure Water sanitation and flood protection Capacity building Audits, evaluates, and monitors project impact and groundwater quality	Ministry of Local Gov. & Rural Dev.	US\$ 44.4 millions	1998-2004
Agricultural research Management Project	Research management and organization	Bangladesh Agricultural Research council	US\$ 50 million	1996-2001

Project	Major components	Implementer	Fund	Time frame
	Economic analysis of research programs Priority research on crops, fisheries, livestock and forestry Participating farming systems			
Forest resources management project	Environment and natural resources management Forest resource information management system Integrating environment and socio-economic People's participation in forest development Formulating management plans for nature conservation Streamlining the organization of the Forest Department	Forest department	US\$ 58.7 million	1992-2001
Forestry project	Mangrove afforestation Establishment of Resource Management Systems Industrial plantation programs Forestry education and training	Ministries of Agriculture and Education	US\$ 28 million	1985-1992

Annex 3. List of new projects proposed for inclusion in the Annual Development Program (FY 2003-2006)

Sl. No	Name of the Project	Approval Status	Estimated Project Cost		Source of Aid
			Total	Taka	
A. Investment Projects (IP)					
(a) Agency : Forest Department					
1.	Pilot Participatory Watershed Management Project in the Three Hill Districts of CHTs	Unapproved.	2300.00	2300.00	
2.	Establishment of Softwood Plantation	Unapproved.	935.00	935.00	
3.	Wildlife Conservation and Management Development Project	Unapproved.	575.00	575.00	
4.	Establishment of Eco-park at Rajeshpur sal Forest	Unapproved.	387.50	387.50	
5.	Participatory Social and Extension Forestry in Chittagong Hill Tracts	Unapproved.	3081.00	3081.00	
(b) Department of Environment					
6.	Strengthening Environmental Conservation Activities at Regional and Sub-Regional Levels (Phase-1)	Unapproved.	5289.15	1744.76	GOJ/JICA
7.	Industrial Pollution Control in Phases	Unapproved.	19790.00	200.00	Germany/EC/Austria
8.	Recycling and Management of Homestead and Paper Waste for	Unapproved.	68.84	4.80	EC
9.	Support for the Production of Environment Friendly Alternative	Unapproved.	4901.00	4901.00	
10.	Construction of Bangladesh Environmental Research and	Unapproved.	6593.14	729.51	GOJ/JICA
(c) Agency : BMDA					
11.	Environment Restoration in Barinda Areas Through Afforestation	Unapproved.	9385.00	9385.00	
(d) Agency : BFIDC					
12.	Replanting rubber plantation areas which have completed economic life cycle	Unapproved.	1000.00	1000.00	

Sl. No	Name of the Project	Approval Status	Estimated Project Cost		Source of Aid
			Total	Taka	
(e) Agency : Bangladesh National Herbarium					
13.	Strengthening of Bangladesh National Herbarium Project	Unapproved.	275.00	275.00	
(c) Agency : BFRI					
14.	Agricultural Research Management Project (ARMP) Phase II	Unapproved.	8550.00	2499.50	
15.	Forest Resources Management Project (ARMP) Phase II	Unapproved.	1925.00	525.00	
A. Sub-Total IP			63322.63	28542.57	

Sl. No	Name of the Project	Approval Status	Estimated Project Cost		Source of Aid
B. Technical Assistance					
Agency : Ministry of Environment & Forest (MOEF)					
1.	Tanguar Haor Wetland Biodiversity Conservation Project	Unapproved.	2350.00	5.00	GEF/NORAD
2.	Formulation of the Bangladesh Program of Action for Adaptation of Climate Change (GoB in Kind)	Unapproved.	145.00	29.00	GEF/UNDP
3.	Sustainable Conservation and Management of Medicinal Plants in Bangladesh (TA)	Unapproved.	211.93	0.00	FAO/UNDP
4.	Developing Plan of Action to increase 20% Forest Cover by	Unapproved.	80.00	30.00	FAO/UNDP
5.	Strengthening capacity to Generate Quality Information on Forestry Resource	Unapproved.	97.00	30.00	FAO/UNDP
Department of Environment					
6.	Waste Treatment of Facilities for the Handloom/small scale textile industries	Unapproved.	52.94	4.80	EC
7.	Technical Assistance for industrial waste reduction, reuse, recycle and exchange programme	Unapproved.	575.80	4.80	ADB/Belgium
8.	A Study on Environmental Pollution due to ship Breaking Yard in Bangladesh	Unapproved.	30.80	2.80	ADB/Belgium

Sl. No	Name of the Project	Approval Status	Estimated Project Cost		Source of Aid
9.	Establishment of a Marine Environment Unit in the Department of Environment	Unapproved.	1000.00	4.80	BELGIUM
10.	Sustainable use of Fresh Water Free from Pollution (Environmental Protection of Inland Rivers)	Unapproved.	980.00	4.80	CANADIAN CIDA
11.	Monitoring and Enforcement of Industrial Pollution Control.	Unapproved.	476.00	26.00	AUSTRIA
12.	Market Development of Bamboo and rattan Products with Potential	Unapproved.	426.00	136.00	CFC/INBAR
	B. Sub Total TA:		6425.47	278.00	

Appendix 4. List of people met

Ministry of Environment and Forest

Mr. Sabihuddin Ahmed, Secretary

Ministry of Water Resources

Mr. Saif Uddin, Secretary

Planning Commission

Mr. K.M.S.A.Qaisar, Division Chief

Mr. Iqbal Talat, Joint Chief

Ms. Roksana Begum, Deputy Chief

Md. Akhtaruzzaman, Deputy Chief

Dr. Golam Sarwar, Deputy Chief

Mr. Rezaul Karim, Senior Assistant Chief

Mr. Mosaraf Hossain, Senior Assistant Chief

Mr. Ali Kabir, Assistant Chief

Mr. Noor Ahmed, Assistant Chief

Forest Department

Mr. Anwar Faruque. Chief Conservator of Forests.

Mr. M. Anwarul Islam. Deputy Chief Conservator of Forests.

Mr. Osman Ghani. Deputy Chief Conservator of Forests.

Mr. Iklil Mandal. PD. FSP.

Mr. Saiful Islam. PD. SBCP.

Mr. Abdul Motaleb. Conservator of Forests.

Department of Environment

Dr. Md. Omar Faruque Khan, Director General

Mr. Reazuddin Ahmed, Director, Technical

Mr. Abdus Sobhan, Director, Administration

Mr. Kazi Sarwar Imtiaz Hasmi, Deputy Director

Mr. Abul Kalam Azad, Analyst

ADB

Mr. Purnima Rajapaksee, Head, Economic Unit

Mr. Razaul Karim Khan, Economist