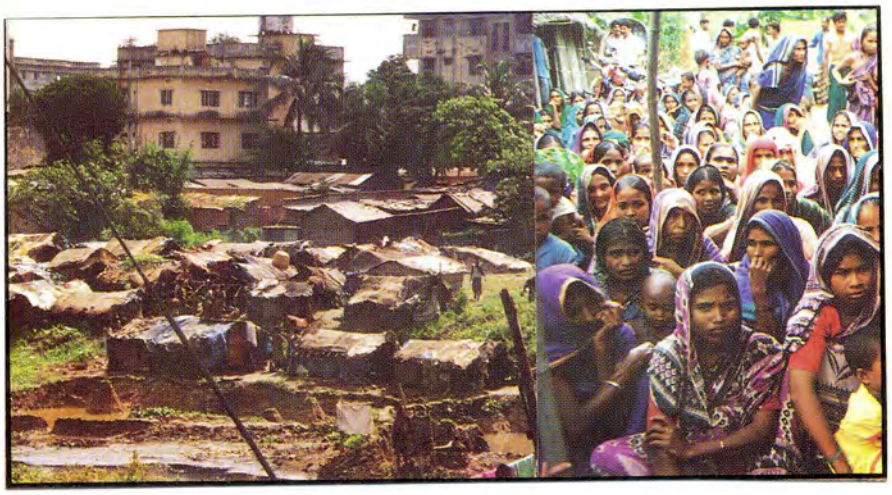
South Asia Co-operative Environment Programme
(SACEP)

NATIONAL STATE OF THE ENVIRONMENT REPORT BANGLADESH



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EXECUTIVE SUMMARY

The National State of the environment report of Bangladesh is a brief summary of the quantitative and qualitative state of various parameters of its environment and the dominant facts and factors which interact in the dynamic process of shaping its present and transforming its future. As environment does not confine itself within any limited geographical boundary and as the environment of any given area is substantially effected by regional as well as global environmental conditions and trends, a national state of environment report on Bangladesh, of necessity touches upon relevant Regional, Sub-Regional and Global environment and development paradigms. This aspect is of particular relevance in view of fact that a number of environmental issues are the consequences of regional, sub-regional and global developments.

The National State of Environment Report of Bangladesh can be summarized with the following salient features in view of the above context:

- Bangladesh is a country with a small landmass of approximately 14.40 million ha.
- It is endowed with very scarce natural resources having limited potentials.
- Its existing resource bases like land, forests, inland waters agriculture, energy sources both renewable and non-renewable, are under serious environmental pressure and degradation.
- An already high level of population (115 million) which is increasing at a very first rate of 2.2% is creating an ever increasing stress on the available resources base which is being exacerbated by an unsustainable development strategy.
- Inspite of scarcity of resources and unsustainable resource use patterns there are some points of hope which, if properly harnessed, can contribute to the improvement of the economy and environment. These are:
    - This country is located in one of the most fertile deltaic regions in the world.
    - The climate allows crops to be grown throughout the year
    - Freshwater is becoming a scarce resource world-wide, but Bangladesh has more freshwater per capita than any other country except Canada and Brazil.
    - Its rivers, wetlands, estuarine and marine waters are the natural habitats for a large variety of fishes, prawns and other flora and fauna of significant economic value.
    - The north-eastern and south-eastern part of the country, where forest cover is receding from the hilly areas, hold great potential for enrichment plantations.
    - Natural gas, enough to support the country for some more decades, has been located in several fields in the eastern and south eastern part of the country. These resources are being increasingly exploited for economic development.
    - The northern part of the country has deposits of coal, iron ore and hard rock. Very recently the government has started exploitation of coal at Bogra. The present Government is planning to ensure that an effective process is immediately started to exploit all different types of natural resources including oil and various minerals.
    - Radioactive minerals are known to exist in the sands of cox's Bazar. Bangladesh is also fortunate in having access to the oceans of the world through the Bay of Bengal.
    - The Economic Exploitation Zone in the Bay also holds great promise of fisheries and mineral resources.
    - There is considerable potential for development of the renewable and alternative sources of energy.
    - Though the rural Bangladesh sustains in the culture of poverty, it nonetheless, posses certain innately human qualities which provide a point of optimism for socio-economic development and environmental improvement.
- Important ecosystems including the coastal and marine ecosystems, the Sundarbans, the wetlands, the watershed areas in Chittagong hill tracts are facing serious degradation.
- Poverty is on the increase, illiteracy is massive, lack of safe drinking water and sanitation facilities are overwhelming, environmental pollution is also on the increase.
- Land is being misused and wasted, and there is no zoning and no national economic-cum-environmental land use planning leading to land degradation and unsustainable land use.

- The country does not have control on the most important natural/ecological resource i.e., water, because most of the major rivers enter the country from neighbouring countries. Water is the most important ecological variable affecting the environment and sustainable development of the country.
- The country is very vulnerable to various kinds of natural disasters like floods, cyclones, and those may increase further in future causing more and more environmental damage.
- Rural to urban migration is very much on the increase and will increase further deteriorating the urban environment and creating more slums.
- Urbanization is taking place in an unplanned manner with very limited civic amenities, waste disposal facilities, proper drainage, supply of adequate drinking water, housing, drainage and sewerage facilities etc.
- The present per capita income of the people is only US $ 220 per annum. Consumption of essential amenities and requirements is one of the lowest in the world.
- Rate of economic growth is low even compared to other developing countries of the region and there is no perceptible improvement in quality of life of the people for the last to decades.
- Lack of pure drinking water and adequate sanitary arrangements are still major problems in the rural areas.
- Practically no industrial unit has any effluent/emission treatment facilities installed with a very few exceptions.
- Most of the plying vehicles are poorly maintained and present procedures to issue fitness certificate to automobiles and their renewal do not help in controlling vehicular pollution.
- In general air pollution problem is much less than water pollution problem.
- 90 percent of the population still relies on ground water for potable water supply.
- Traces of desertification have been noticed, aridity is on the increase, deforestation and depletion of fishery resources are alarming.
- Agricultural production has increased in absolute terms due to introduction of HYV and improvement of irrigation facilities, application of fertilizers etc. but the rate of increase has gradually slowed down and soil quality is being degraded at many places.
- Agriculture is failing to cope up with the growing population and the achievements in the field of increased agriculture production and the hopes of attaining self sufficiency in food are being negated gradually thus causing serious socio- economic and environmental consequences.
- There is a threat of inundation of vast coastal areas due to sea-level rise by the middle of the next century. Sea-level rise probably be in the order of 30 cm but could possibly be as much as 1 m by the middle of the next century. This could inundate 22,890 sq. kms of low lying coastal land (about 15.8% of total land of the country), substantial amount of inland (mainly due to back-water effect) and 29% of forest area of the country. Sea-level rise will also reduce coastal fresh water supply, reduce agricultural productivity by increased salt water intrusion and damage existing coastal structures.
- The expected rate and magnitude of climate change due to global warming will greatly exceed those experienced since civilization began. Global warming will also increase both intensity and frequency of extreme events including natural calamities like droughts, floods, tropical cyclones and tornadoes.
- A dramatic increase in food production and change in food habits is required. High intensity cropping demands water control round the year which in turn requires environmentally sustainable flood control, drainage and irrigation.
- If the current trend continues, in 20 years, about 2 million hectares of flood plains would have been permanently removed due to flood control and drainage development, amounting to an estimated net loss of 73,000 to 110,000 tons per year of capture fishery.
- Transport pattern lacks discipline and is very chaotic.
- Energy crisis is severe and tends to cause more deforestation, soil erosion, biomass loss, reduction of soil fertility, acute shortage of fodder and subsequently hamper development.
- Tourism in Bangladesh is still mainly a seasonal activity and mostly during winter season, which is dry and pleasant. The beaches along the Bay of Bengal, the Sundarbans, the Chittagong Hill Tracts, provide attractive locations for tourism. Overall tourism activity has not contributed yet to significant pollution or environmental degradation, though there are

problems associated with over extraction of coral from St. Martin's island which may lead to destruction of the ecology of the island.

- Generation of toxic wastes and hazardous chemicals, though on the increase but still are not of very significant quantity or threat, except for a certain and localized cases. According to preliminary estimates, there are about 480 organized large sector industries in Bangladesh using approximately 40 types of chemicals. They are mostly located in the large towns of Dhaka, Chittagong and Khulna.
- Highly toxic imported chemicals are transported through populated areas without safety codes or emergency preparedness in a manner which would never be allowed in the countries of their origin.
- The concept of environmental technology in Bangladesh environmental management context is a relatively new one. The public in general are environment friendly in their daily actions and towards resource utilisation and conservation. Due to resource constraint, alternate means of resource use and curbing pollution and environmental degradation, need for environmental technology is becoming important in recent times.
- Most of the technology used in the existing industries are old, out dated and polluting the environment.
- Some cost effective and environment friendly appropriate technologies such as fuel efficient stoves, low cost three pitcher system sanitary latrines, Tara pump for irrigation, mechanized country boats are some of locally developed environment friendly technologies.
- Environmental management is being institutionalized since the last few years. New policies, institutions and monitoring mechanisms are being evolved towards that end. Some of the important developments are as follows:

  - Creation of a new Ministry of Environment and Forest in 1989, with the overall mandate to work as the nodal Ministry to coordinate environmental management and initiate necessary action in all sectoral fields.
  - Upgradation and expansion of the department of environment.
  - A new and comprehensive environment policy has been formulated with the objective of sustaining the ecological balance, production of the environment and to ensure sustainable development.
  - The National Conservation Strategy has been finalised. This document has identified existing resource use trends, environmental degradation in resource use, potentials and strategies for sustainable development, for all important areas and sectors.
  - There is no umbrella legislation for taking care of the basic elements of environmental protection. However, certain existing laws in the country contain provisions for conservation of natural resources, protection of the environment and control of pollution. But these laws are inadequate and need to be amended to include specific provisions for protection of the environment, conserving the rural resource bases and providing the legal basis for their sustainable use. Moreover, the people in general and more so the rural ones are largely ignorant about such laws. Enforcement of the provisions of the related laws is therefore a priority. A large number of new legislations also need to be considered. The important ones relate to inter-alia, subdivision and fragmentation of agricultural holdings, indiscriminate use of pesticides and chemical fertilisers, cutting of homestead trees, degradation of ponds and other water areas, open latrines, encroachment on grazing fields, etc.
  - A new umbrella legislation to take care of the basic issues in environmental protection and management is under finalisation. Compared to other previous laws, this law takes care of not only the control aspects but also the development aspect of environmental management. It also provides for Environmental Impact Assessment (EIA), and adoption of Environmental Quality Standards (EQS).
  - In order to protect bio-diversity and the gene pool, the Government has banned clear felling in the natural high forests. This ban will continue upto the year of 2000 when the situation will be reappraised.
  - Preparation of the Draft Forestry Master Plan is complete. Among other things, the

draft Forestry Master Plan has emphasized peoples participation, introduction of high yielding varieties, genetic improvement, privatisation of management approaches etc.

- The government has framed a law to ban the use of fuel wood for brick burning.
- The Department of Environment has carried out a survey of all major industries in the country and identified about 905 industries as polluters. Action is being taken to ensure that anti-pollution measures are incorporated in these existing industries.
- The New Industrial Policy-1991, for the first time recognises the need for environmental protection in Industrial Development. Specific policy goals have been identified to see that industrial Development takes place with no further damage to the environment.
- The existing import policy prohibits import out hazards wastes and their use as industrial raw materials.
- The government is now preparing a guideline for import of chemical fertilizers so that no toxic waste can be imported in the name of fertilisers.
- Under the existing Govt. procedure, all Govt. development schemes need to be screened by Ministry of Environment & Forest/Department of Environment to ensure that development schemes are free from any damaging impact on the environment. This Govt. procedure is being followed with very favorable results.
- The Department of Environment has conducted a number of training courses on Environmental Management and EIA.
- A National National Environment Committee to be headed by the Prime Minister to oversee the implementation of the environment policy and other national level environment related matters has been constituted. An Executive Committee has also been formed with the Minister, Ministry of Environment and Forest as Chairman to help the National Environment Committee regarding environmental management at the functional level.
- The democratic Government is firmly committed to the cause of environment and the Prime Minister has personal commitment to improve the State of Environment. Her government has undertaken an integrated approach in this regard which includes poverty alleviation , conservation of environment, and population control within the same policy framework.
- A number of government agencies are involved in sectoral management of environmental issues. The Ministry of Environment and Forests is monitoring the overall activities in these respects.

- In the overall policy and strategy for environmental management creating awareness, improving and expanding the level of environmental education is one of the key issues. The state of environmental education and awareness is very low in Bangladesh. The Government has taken a number of steps to improve the situation, some of which are mentioned below:

- A massive programme to improve the status of education in general by the year 2000.
- Introduction of compulsory primary education for all.
- Free education for girls upto class VIII in the villages.
- Introduction of food for education programme under which each school going children's family is given incentive by allocating 15 Kg of wheat per month.
- Introduction of environmental education in the primary school level.
- Giving prominence to environmental subjects in the lower and secondary levels.
- All the Universities have included different aspects of environmental education in their Degree and Master's programmes specially in the science faculties.

- A number of steps have also been taken to improve the state of environmental education and awareness through different non formal methods. Some of these are:

- Regular use of public media like radio, television, newspapers, periodicals etc. to focus on important environmental issues.
- Holding of seminars and workshops and discussion meetings at the grass roots, Thana,

District, regional and national level.

- Observance of awareness creation campaigns on important environmental issues.
- These programmes are organized on a target group wise basis.Different programmes are organized for various groups like farmers, children, women, policy makers, community leaders etc.
- Some action oriented programmes to improve the status of education and awareness and ensure active participation of the people in improving the environmental situation have also been undertaken in different areas. Some of these aspects are:
  - Afforestation/social forestry
  - Sanitary latrine-installation and distribution
  - Tubewells for supply of pure drinking water
  - Display/distribution of improved and energy efficient stoves.
  - Improvement of derelict ponds and water areas.
  - Setting up small size agro-based and environment friendly small industries.
  - Setting up bio-gas plants.
- As environmental pollution emanating from one politicogeographic location is carried by different natural agents across national boundaries, regional, sub-regional and global actions are essential to addresses these problems. In case of Bangladesh important global issues are:
  - Sea level rise
  - Climate change
  - Tropical Cyclones
  - Important regional issue are:
    - Upstream deforestation and destruction of regional water sheds,
    - Pollution in the Bay of Bengal
    - Water sharing of common rivers
    - Siltation, pollution and rise of salinity in the rivers
    - Degradation of coastal ecosystems including the mangroves in the Sundarbans.

Bangladesh is playing a leading role in finding it out both short term and long term solutions of the regional problems through bilateral and multilateral initiatives through regional organizations like SAARC, SACEP and ICIMOD. Increasing importance is being given to exchange of information, data, expertise, and experience in solving regional environmental issues. A number of regional issues have already been placed on the agenda for future collaborating action on a regional basis. The question of creating common resource pools to address inter-alia, environmental issues are also being considered by these regional bodies.

Bangladesh is also highlighting the seriousness of possible consequences to her environment and economy as a result of global environmental problems. This is being done by :

- Participation in most of the meetings and negotiations related to environment in the international fora.
- By signing most of the important international agreements/protocols/treaties related to environment.
- Bangladesh has also participated in the UNCED and tried to focus its problems including the global ones.

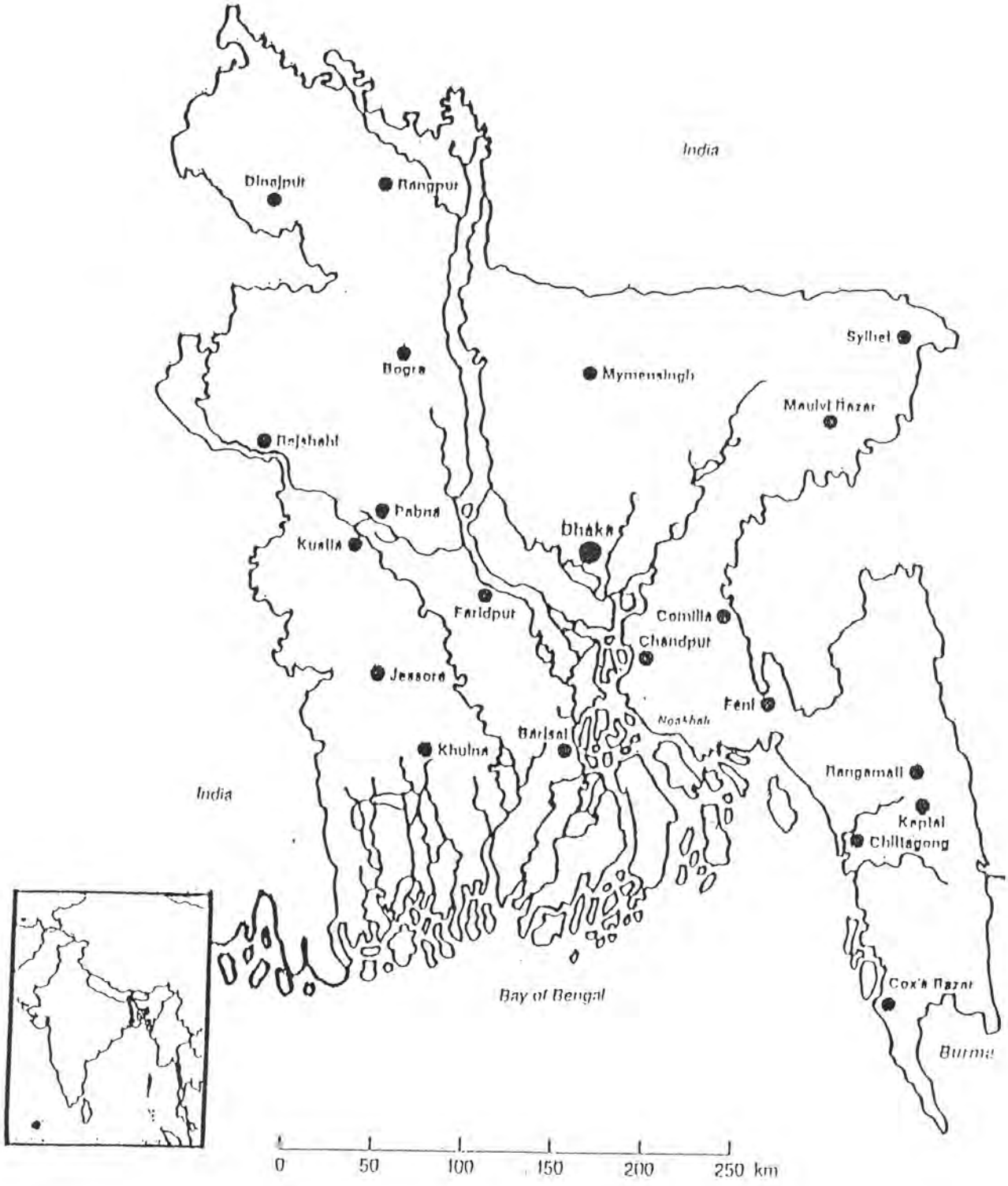
Bangladesh is actively participating in the process of follow up activities of the UNCED and implementation of the Agenda 21. Some of the steps being taken in this respect are:

- Attending the meeting of Commission on Sustainable Development (CSD) and taking necessary steps to implement the recommendations as far as possible.
- By submitting a number of projects for implementation under GEF.
- By trying to highlight important issues which are standing as challenges to sustainable development in the international and regional fora.
- By speeding up the process of formulating a National Agenda 21 with the help and cooperation all relevent national development agencies and actors both in the government and in the NGO's sector.
- By formulating National Environmental Management Action Plan (NEMAP) which reflects the tune and spread of the Agenda 21.

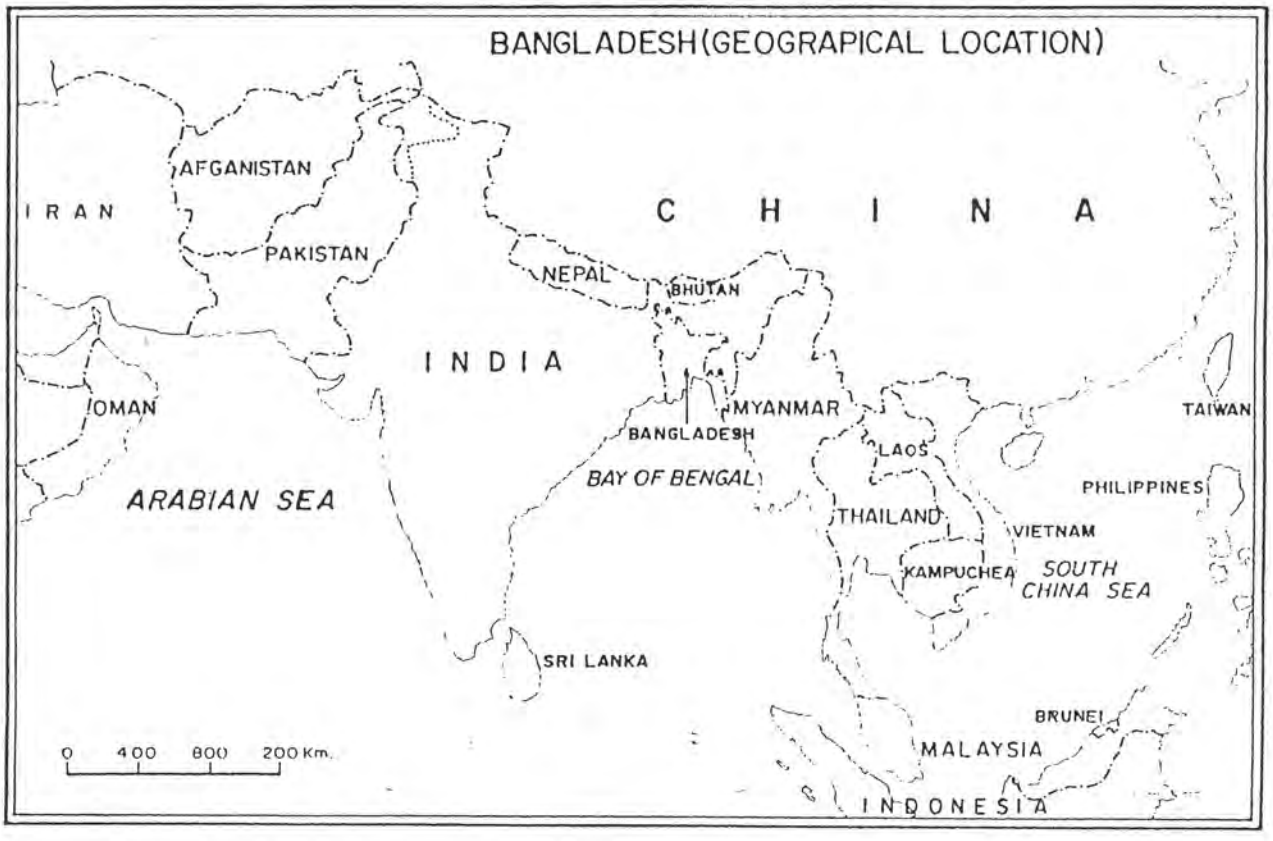
In collaboration with the regional and international community Bangladesh is making ceaseless endeavors to create a better future for its people and in this process to contribute towards regional and global improvement in the arena of economic and environmental improvement. A better prospect for the 21 century can only be possible through a concerted action by Bangladesh and other members of South Asia Region in collaboration with the international community. The important steps in these respects would be to solve basic and priority issues of this region including:

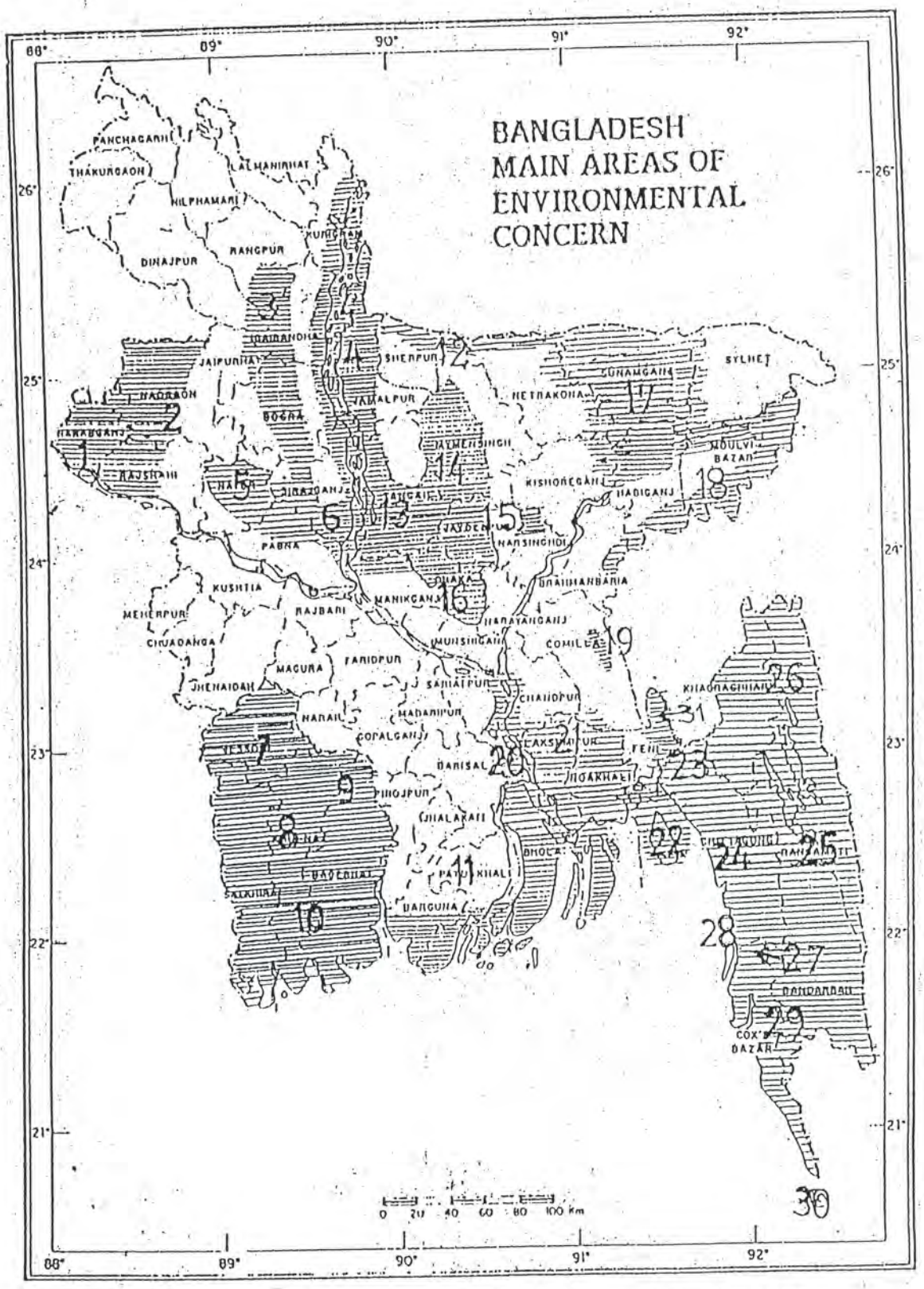
- Poverty
- Population pressure
- Unsustainable development strategies
- Degradation of important ecosystems
- Pollution of common rivers
- Unsustainable use of freshwater resources
- Unsustainable patterns of energy consumption
- Deforestation and decline of soil fertility
- Degradation of wetlands
- Natural calamities

Map of Bangladesh



Geographical Location





Main Areas of Environmental Concern

PART -I

ENVIRONMENTAL CONDITIONS AND TRENDS

Environmental Conditions and Trends

Chapter -1 : Land

1.1 Introduction

Total area of Bangladesh is approximately 14.40 million a. of which 13.46 million ha are land surface and 0.94 million ha are rivers and other inland water bodies. The actual areas fluctuate slightly year to year due to changes taking place in the courses of major rivers forming accretions in some places and erosion taking places elsewhere. The total land area of 14.40 million ha are distributed as follows according to different forms of land use :

Table 1 : Major Landuse by Area

Major Landuse	Area in Million ha.
Agriculture	9.25 a
Forests under FD	1.49
Unclassed State Forests	0.73
Village wood lots including fruit trees	0.27
Housing and Settlement	1.16 b
Water area	0.94
Other uses	0.36
Total land area	14.40

Source : 1/ and b/ BBS, 1989

These use-categorization areas are not constant every year as slight changes occur in actual use.

Agriculture is the mainstay of the economy of Bangladesh contributing 39.39 per cent to the GDP (BBS, 1989). This economic pattern will continue for a long time to come. Therefore, population pressure on land is a crucial factor in the management of land resources in the country. With the present population level, persons per hectare is calculated to be 9.6 for all cropped land including forests and plantation crops and 12.4 for land under agricultural crops only.

Land tenancy laws in Bangladesh are very complicated and land records in many cases are not upto-date leading to lengthy disputes. The existing inheritance law contributes to fragmentation of already small units. Such fragmentation reduces effective crop area.

There are four classes of agricultural land owners as follows:

- People who own homestead land only
- People who have some agricultural land and take additional land on lease from others for cultivation
- People who lease out part of their agricultural land because they cannot cultivate the whole.
- People who own land but lease out whole of it to others on consideration of cash or share of the produce.

There is a law to regulate share cropping and protecting the interests of share croppers (Land Reform ordinance 1984). Bangladesh Agricultural Census 1983 -84 has classified landless families into three categories e.g.

Major land type units

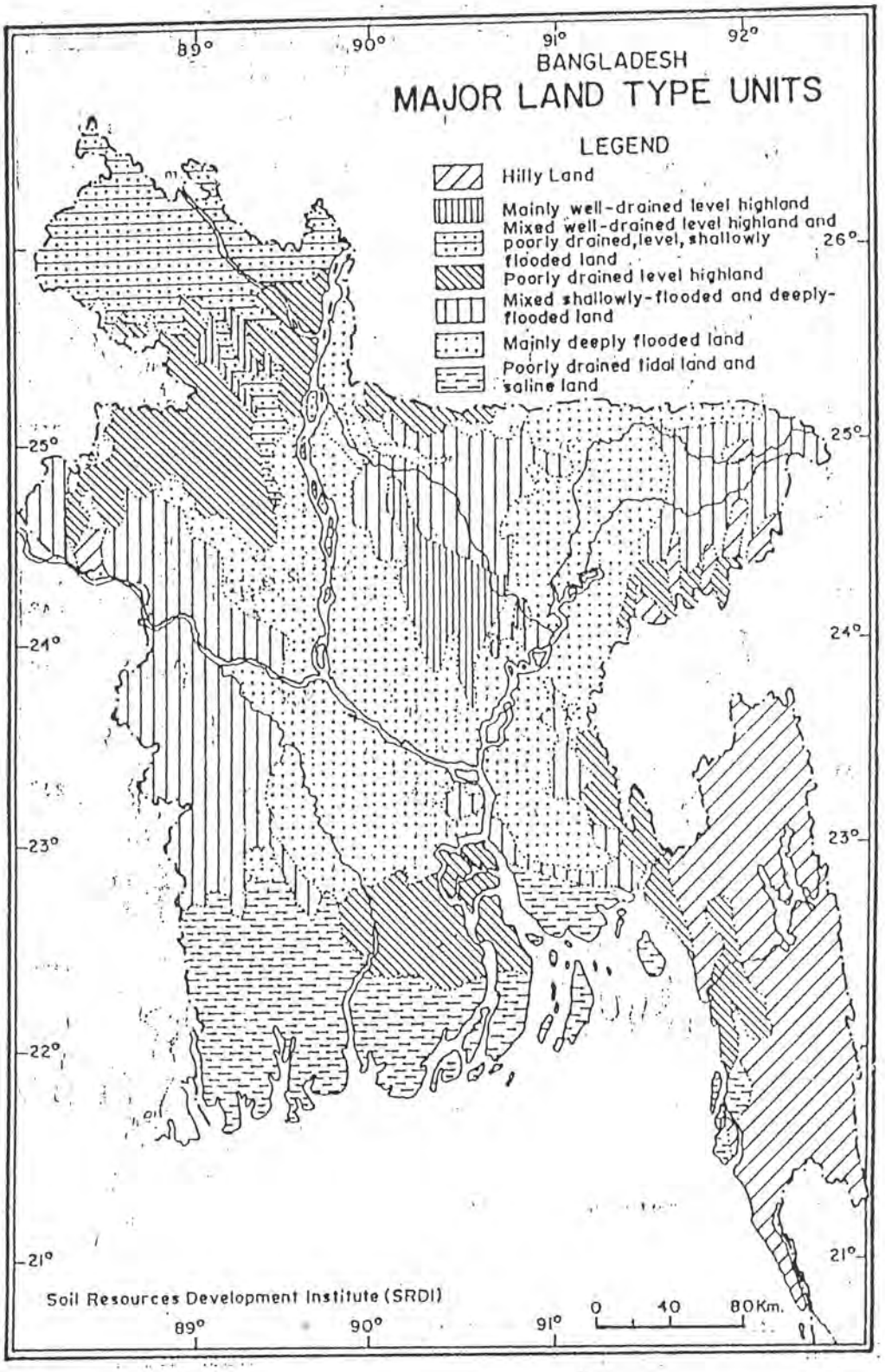


Figure — I

LAND UTILISATION IN BANGLADESH

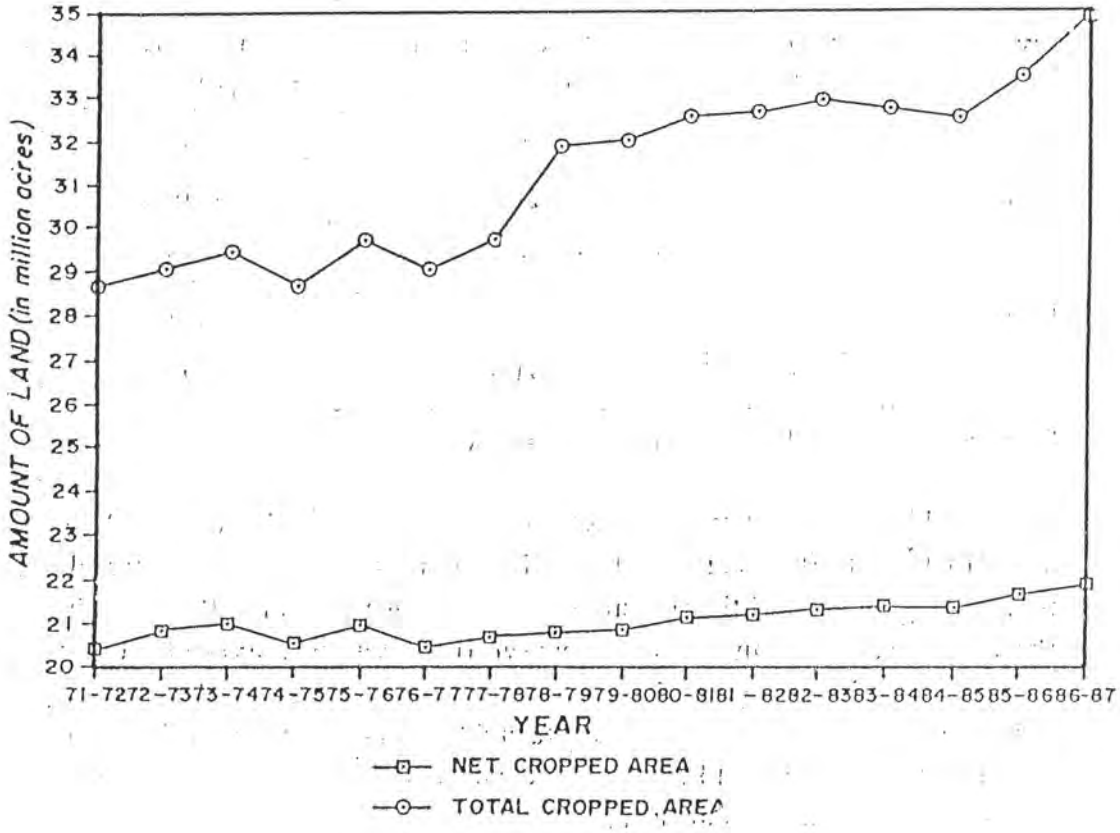
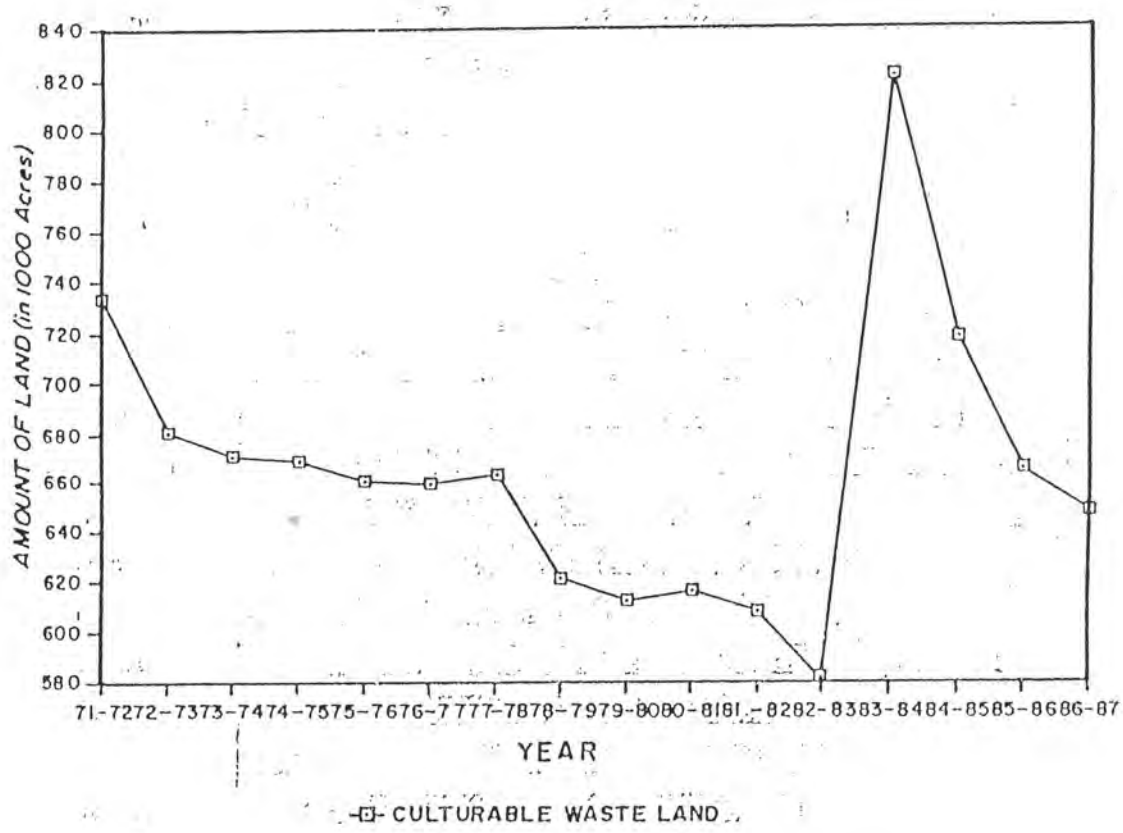


Figure-2



Category 1 : absolutely landless

Category 2 possessing only homestead land but no cultivable land

Category 3 cultivable land upto 0.2 ha

According to the census, structure of landless families are as follows:

Table 2 : Landless Families by Category

Category	Number in million	Percentage of rural households
1	1.20	8.7
2	2.71	19.6
3	3.89	28.2
Total	7.80	56.5

Landlessness is increasing every year with the growth of population.

In planning land use in the past, food crop production has been given the topmost priority even sacrificing the interest of forest, cash crops, fish, cattle feed etc. It is to be understood that it will be increasingly difficult every year to produce enough food crops for the increasing population from the fixed area of land available for agriculture and alternative source of food is to be sought from sources other than land, e.g., seaweeds and sea fauna, etc.

The reconnaissance soil survey classified agricultural land into following categories.

Table : 3 - Land Classification by quality

Very good agricultural land	1.5 per cent
Good agricultural land	34.2 per cent
Moderate agricultural land	39.3 per cent
Poor agricultural land	16.0 per cent
Very poor agricultural land	9.0 per cent

Land resource development done in recent years such as Chandpur Irrigation Project, Brahmaputra Right Embankment and other Flood Control Drainage and Irrigation projects have made some changes in the above pattern for which latest data are not available. However, more than half of agricultural land is still in the moderate to poor category.

1. 2. Causes of Land Degradation

Land Degradation occurs generally by two factors e.g. (i) Human Factor- that is Man's actions towards management of land to exploit its productive capability, and (ii) Natural Causes like floods, erosion, and land slide. However, it is also recognized that in certain cases land degradation takes place because of factors resulting from a combination of natural and anthropogenic phenomena.

Human Factors

i) Shifting Cultivation : Shifting cultivation, locally known as Jhum, is a common cultivation practice by the tribal population in the districts of Khagrachari, Rangamati and Bandarban. This is a traditional form of cultivation in the area by a slash and burn process. The fallow period,

necessary for recouping the fertility of the soil, is decreasing every year due to increasing population. As a result the reserved forests have come under attack. An evaluation in 1984 reports that in Sangoo - Matamuhuri reserve where shifting cultivation was practically nonexistent in 1963, jhum accounted for 17100 ha in 1984. In Kassalong reserved forest, 2100 ha were identified as Jhum area in 1963 which increased to about. 35000 ha. in 1983. In Rangkheong reserved forest approximately 38000 ha were identified as Jhumed area in 1983.

In the Hill Tracts where uncontrolled shifting cultivation is practiced 87 per cent of the total land has been classified as having severe limitation on crop cultivation and are subject to heavy erosion due to steep slopes. Only forest cover has been recommended for that area. Shifting cultivation not only degrades productivity of land but also causes excess run off, accelerates soil erosion and flash floods, resulting in silting up of valley lands with relatively infertile soil materials and also raises river and reservoir beds.

Faulty Cultivation Practice : Degradation of land has occurred and is continuing in the sloping areas of Modhupur and Barind Tracts and the Northern Piedmont Plain due to faulty cultivation practice. Soils of these areas are shallow sandy loam over shales or sandstones in case of hilly areas and over heavy compact clay in case of Modhupur and Barind Tracts and Northern Piedmont Plains. In these area soils are subject to erosion during monsoon rains when soils are loosened by ploughing. In many places heavy compact clay has appeared in the surface. Clearing of natural vegetation and cultivation of pineapple in rows across the contour is often being practiced in the hills of Rangamati district and Moulavibazar district. Such practice exposes the hill soils to a very high degree of erosion which can be prevented to a large extent by planting pineapples in rows along the contours with inward slope for moisture conservation.

Use of Pesticides: In Bangladesh, level of pesticide use is low as compared with other more developed countries. Total pesticides used is about 500 tons of which 90 per cent is used in rice fields and most of it on transplanted rice. Pesticides sprayed over standing crops ultimately contaminate soils which not only destroys harmful insects but also destroys benevolent microbes of the top soil which in turn retards biological nutrient replacement of the soil.

Mining from Agricultural Land : Sand and shingles are collected from agricultural lands in several places, eg. east side of the national highway from Comilla to Sitakunda, northern piedmont areas and greater Dinajpur and Rangpur districts. After mining the depressions are abandoned and left fallow.

Irrigation : Irrigation is one of the most essential input for agricultural production. Irrigation is being used to grow HYV Boro/Aus followed by transplanted Aman on the same field. In such a case the land remains water-logged round the year. This practice, though yields good harvest initially, degrade the soil by continuous submersion for a prolonged period.

The causes of soil degradation due to continuously submersion are :

- Continued absence of oxygen in the subsoil
- Chemical changes of soil materials by forming compounds toxic to plants
- Constant loss of soil nutrients by percolation, and
- Incidence of pests or diseases associated with water-logged environment

Overexploitation of Biomass from the Fields: One of the most important causes of degradation of land in Bangladesh is overexploitation of biomass from the cultivation fields for fuel, fodder and thatching. Due to the short supply of organic manure acute sulphur deficiency have occurred in many places (Figure -1). Organic matter is also one of the main media for retention of moisture in the soil. The critical areas in this respect are the areas where Aus followed by transplanted Aman are grown. Another critical area is the Barind Tract. The western part of the Barind Tract now shows symptoms of aridity during the dry months i.e. March - April.

Natural Causes

The characteristic coastal morphology of Bangladesh contribute to accretion in some places and erosion in other places. From satellite study made first time by SPARRSO it is found that between 1973 and 1987, an area of about 302 Sq. km has accreted in the coastal region. Out of this, about 60 per cent have been accreted from the Bay of Bengal and 40 per cent by the reduction of estuarine area. This reduction in the area is an aggravatory factor of flood hazard. The accretion of 302 Sq. km is balance of accretion and erosion. Some unstable land have been accreted at the south east of Hatia, but more valuable land have been eroded at the North of the island. Erosion in Bhola and Sandwip is still at a dangerous pace.

River Bank Erosion

River bank erosion is the worst cause of land loss and degradation in Bangladesh. Every year large areas along river banks erode mainly during the monsoons taking away good agricultural land, vegetation and human settlements creating acute socio-economic problems.

Deposition of Sandy Material on Agricultural Land : Another form of land degradation, though occurs locally, is deposition of sandy materials on agricultural land particularly in piedmont areas of northern part of Netrokona district and valleys of the hills in the greater Sylhet and Hill Tracts districts. This phenomenon is the result of deforestation of the hills and faulty cultivation practice in the upper catchment areas. Land degradation by deposition of infertile soil on agricultural land also occur by breach of embankment during floods.

Salinity : Land with saline soil occur in the Meghna estuary flood plain and the southern part of the Ganges tidal flood plain. An FAO study in 1988 estimated about 0.82 million ha affected by salinity. It has been reported that upstream withdrawal of Ganges water in Farakka beyond the border of Bangladesh has reduced fresh water discharge causing intrusion of salinity deep into the mainland.

Land Fragmentation : Continual land fragmentation is also regarded as a kind of land degradation factor because total or optimal productivity of land decreases due to segmented land management.

Institutions Dealing with Land : In the Government of Bangladesh there are 10 Ministries and 24 agencies under them who use land or administer land use. Though land in Bangladesh is a scarce resource, it has not received the required attention and coordinated efforts for optimum use.

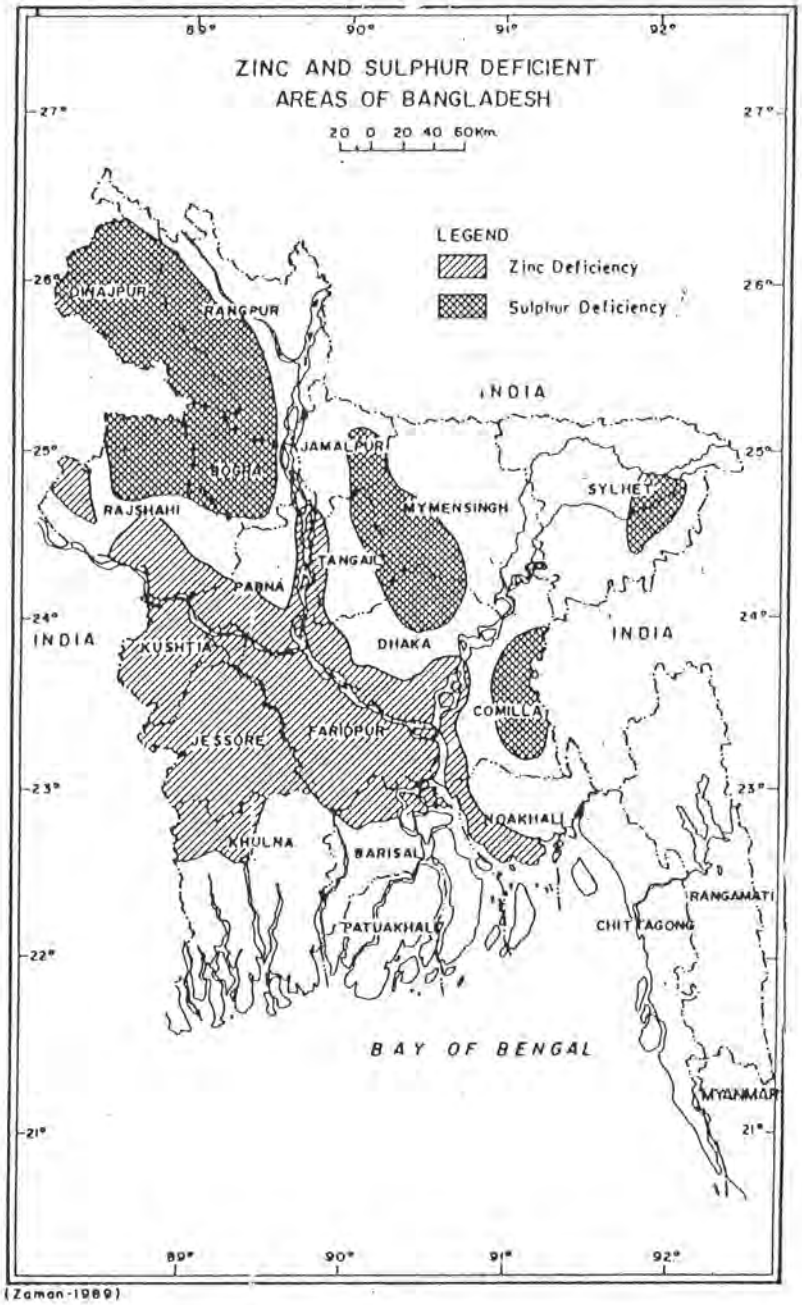
1.3. Conflicts in Land Use

i) Agriculture Versus Settlements : Demand for non-agricultural use of land is increasing day by day for housing the increasing population, construction of government complexes in Thanas, industries, brick fields, roads and highways, flood protection embankments, defense installations, and educational institutions Often good agricultural land and forest lands are taken up for such non-agricultural and non-forest purposes.

ii) Agriculture Versus Fisheries : Large areas of Beels and `Bheries' yielding fish are being reclaimed for agriculture resulting in reduction of the fish-harvest. Data on losses of fish through such practice is not available but there are glaring examples in Chalanbeel in Natore district and Hail Haor in Moulavibazar district where rich wetland and inland water bodies have been turned into single cropped land. The reverse condition exists in the polder areas of the South where agricultural lands are being grabbed and used by the shrimp cultivators.

iii) Forest Versus Fisheries : About 3000 ha out of about 7500 ha of mangrove forest of Chakharia Sunderban reserve in Cox's Bazar district have been allotted to large number of shrimp farmers. They cleared the area of trees to construct embankments and internal canals for shrimp farming. These have affected the ecological situation of the area and by the food chain and shelter of the shrimp. Production of shrimp is low in comparison with other producing countries and it is apprehended that the production will shrink further due to the loss of the mangrove vegetation.

Zinc and Sulphur Deficient Areas of Bangladesh



(Zaman-1989)

Destruction of hillocks in Cox's Bazar area

River bank erosion

iv) Forest Versus Agriculture : Forest lands adjoining human settlements all over the country are subject to encroachments for agriculture. This encroachment is more prominent in the Bhawal and Modhupur forests. The Forest Department has estimated that an area of about 76000 ha of forest lands are under encroachment. Many of such encroachments have subsequently been settled with the encroachers by the land administration authorities without the knowledge of the Forest Department. Actual area of such land is not known, but large number of disputes are pending in the courts. Because of uncertainty on the ownership of the land the encroachers only exploit the land without nourishing it for sustained outputs.

v) Agriculture Versus Livestock : Common - use lands in the villages kept ear-marked for grazing have all been settled to individuals for agriculture resulting in scarcity of fodder in the villages. Many Haor areas used to produce fish during the rainy season and fodder during the dry season. Most of these rich wetland areas have been turned into single crop paddy land. Chalanbeel, Dakatiarbil and Haors of the greater Sylhet and Kishoregonj districts are few examples.

1.4. Key Environmental Issues

Availability of land is a major constraining factor in the development of Bangladesh. Virtually all available land is utilised for crop production, forestry, fisheries and for urban and infrastructure development. The distribution of land ownership is skewed towards the comparatively more wealthy. A long term continuing trend in this direction has been exacerbated in recent years by a series of natural disasters which has forced many small holders to sell their land. Policy changes have done little to reverse this process. The number of landless increases yearly with the population increase, the occurrence of natural disasters and changes in rivers courses. Land fragmentation over several generations has also resulted in uneconomic farming which does not provide the subsistence needs of the families concerned. Much land has also been lost due to river erosion.

From the above observations on the present status of land use in Bangladesh, the following issues emerge for early resolution.

1. Absence of a NATIONAL LAND USE POLICY resulting in uncoordinated use of land giving rise to conflicts between different uses of land for forestry, agriculture, fishery, animal husbandry, water resource harvesting, human settlement, communication and institutional incompatibilities. Often, one form of land use without consideration to other or subsequent forms causes hindrance to production and degradation of land on long term basis.

2. Major landuse conflicts arise from insufficient coordinated action amongst the 10 Ministries and 24 agencies concerned with land management. There is currently no formal interactive framework.

3. Land in excess of requirement and land more suited to other purposes are allotted for public and private sector industries, organisations and institutions.

4. Despite general land shortage much derelict and unused land exists in urban areas.

5. Land is not being used at present with due consideration given to site capability and suitability. Land use needs to be regulated without affecting titles.

6. Degradation of land is caused by :

   * Improper use of land resources accentuated by ambiguities in record of rights and titles
   * Shifting cultivation

* Cultivation in slopes without taking measures against soil erosion
* Land left unproductive after mining, altering road alignments, abandoning brick-fields
* Irrigating rice fields throughout the year causing water logged conditions
* Over exploitation of biomass from the fields
* Reduction of crop yields by soil salinity in the coastal belt.

7. Use of pesticides for crop protection causing toxicity in soil and affects adversely the aquatic fauna particularly fish production. There is no study on the adverse effect of use of pesticides.

8. In several coastal polders land is being converted to shrimp farming and this has adversely affected agricultural production, caused loss of productive trees and has lead to substantial clearance of mangrove forests.

9. Traditional land use patterns are being changed with the introduction of HYV rice and irrigated agriculture.

10. Agricultural land is being lost to the expansion of urban settlements, for sand and gravel mining, transport, brickfield and industrial developments.

11. Erosion of agricultural land exacerbates problems of land availability and rural poverty.

12. Land fragmentation continues to render many families functionally landless.

13. Short term leasing and share cropping precludes the right to land purchase over the long term.

14. Land tenure and ownership patterns are unclear in many areas preventing long term investment in land productivity.

15. Inadequate land use planning based upon an assessment of land capabilities constrains land productivity.

16. Unregulated encroachment into forest lands leads to unsustainable agricultural exploitation of the land (short-termism) due to farmer uncertainty.

17. Public awareness to all land and related problems is lacking

18. Ministries and agencies under the Ministries for landuse lack in coordination. Ministry of land only administers land and does not exercise any function relating to optimum use of Land.

CHAPTER - 2
FORESTS AND WILD LIFE

FORESTS

2.1. Introduction :

Bangladesh has a total land area of 14.4 million ha. Out of this land area 2.20 million ha (15%) are under the forest area. But only 1.46 million ha (6.6%) has forest cover in the form of state owned reserved and protected forest area. 0.73 million ha are categorized as Unclassified State Forest which are under the control of Civil Administration of Chittagong Hill Tracts districts. The village homesteads cover an area of 0.27 million ha. Besides the land mentioned above, there are about 0.13 million ha. of land available for tree planting on sides of roads, railways, embankments, farm land ridges, tea states and khas land in the country as detailed below :

Khas land	--	0.03 million ha.
Tea estates	--	0.02 million ha.
Roads, Railways, Embankment, feeder roads, etc.	---	0.08 Million ha.

Demarcation by legal land category

As per legal classification, the status of the national forests is as follows:

Table -1: Legal classification of Forest Land

Legal Classification	Area in million ha.
Reserved forests	1.18
Protected forests	0.06
Acquired and vested forests	0.16
Unlcassed State Forests (Transferred to Forest Department for new plantation)	0.06
Total	1.46

2.2. Forest types

The forests under the control of the Forest Department can be classified into the following three of forest types :

Hill forests
Mangrove forests
Plainland Sal forests

Hill forests:

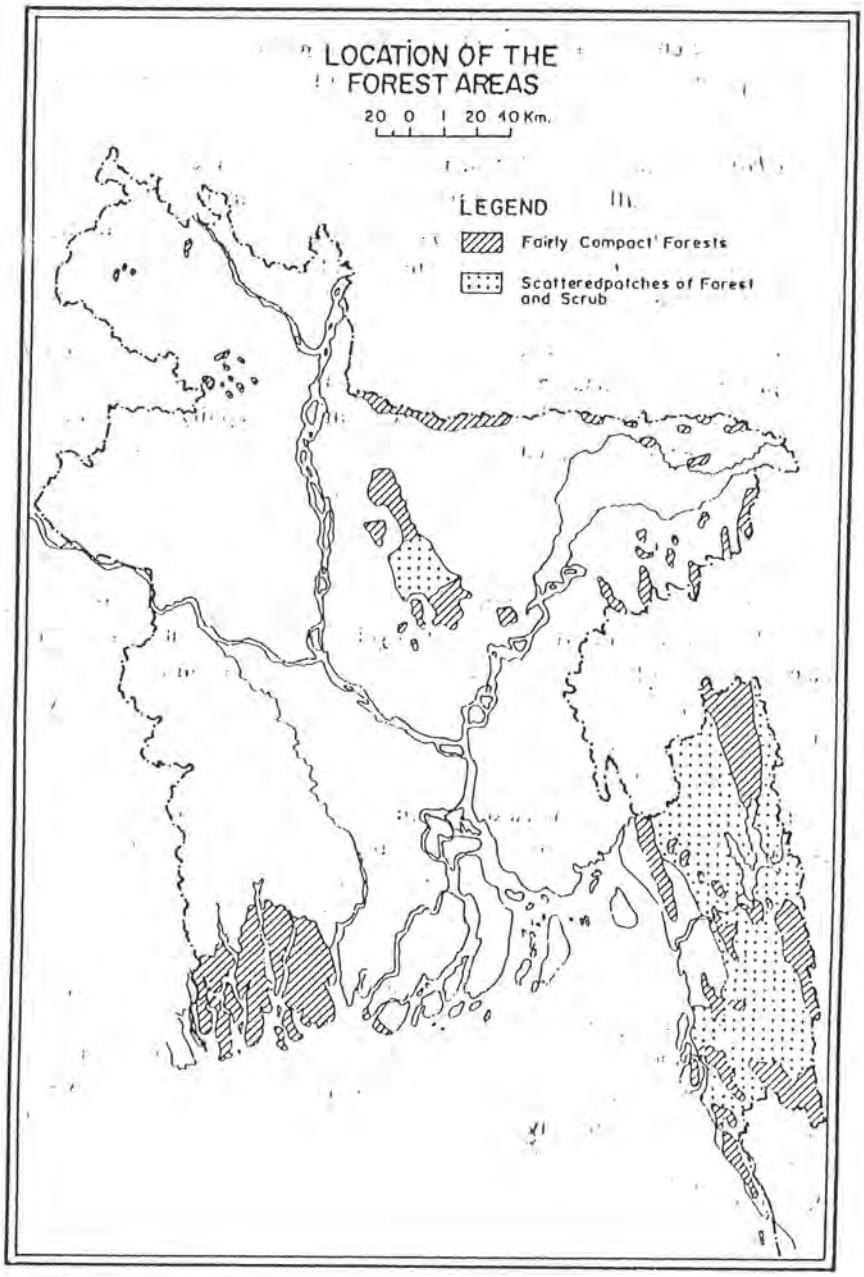
The forests in the hills in the eastern districts fall under this category. This includes natural forests and plantations in districts of Chittagong, Cox's Bazar, Rangamati, Bandarban, Sylhet, Habiganj and Moulvibazar. This forest type covers an area of 1.65 million acres including about 296,3000 acres of plantations which have been established by replacing the existing natural forests or raising plantations on barren hilly land, starting from the fourth quarter of the last century. The hill forest is the principal source of timber, fuelwood and bamboo.

Mangrove forests:

The mangrove forest of Bangladesh falls under two broad categories i.e. the natural mangrove forest in the southwest of Bangladesh which is commonly known as Sundarbans and the

LOCATION OF THE FOREST AREAS

Figure



plantations of mangrove species which have been established all along the coast and in off-shore islands in the Bay of Bengal.

Sundarbans stretches as a continuous belt of mangrove forests from Baleswar/Haringhata river in the east to Raimangal river bordering 24-Parghana district in West Bengal in the west. This formation is the largest mangrove forest in the world and the portion of Sundarbans which falls in Bangladesh is richer in flora, fauna and productivity than the portion in West Bengal. The Sundarban forests with an area of 1.45 million acres is the most productive chunk of mangrove forest in the world. It is the source of supply of raw material to a number of industries. In addition, thousands of wood cutters, fishermen, honey, mollusk and Golpatta collectors depend on Sundarbans for their livelihood. Sundarbans is the natural habitat for a large number of wild animals including the Royal Bengal Tiger. Sunderban is one of the richest natural wildlife habitat in this part of the world.

Plantation activities in newly accreted chars in the coastal areas were initiated in the late 60s. However, intensive plantation programme was taken up in mid 1970s and so far about 25,000 acres of plantation has been established in the coastal districts. Coastal plantations are established in the mud flats in the inter-tidal zone which is not suitable for any other sustainable productive purpose and in addition to the creation of a new tree resource base, the coastal plantations protect the hinterland from cyclonic storms, tidal waves, accelerated the rate of sediment deposition and accretion, provides shelter to birds and food to fish and crustaceans. This may be mentioned here that Bangladesh was the first country in the world to take up massive mangrove plantation programme. Techniques and mechanism for mangrove plantation establishment and management have been developed locally.

Plainland forests :

Plainland forest which is more commonly known as Sal forest is spread in small chunks over a number of plainland districts even though most of it is located in Tangail, Mymensingh and Gazipur districts. These forests were originally owned by a number of landlords and due to over exploitation for long period of time the crop has become highly depleted. Because of the serious depletion of the crop under landlords the management of Sal forest in Dhaka, Mymensingh and Tangail districts was vested with the Forest Department in 1925. These forests were subsequently acquired by the Government under the State Acquisition and Tenancy Act, 1950. The proposals for declaring these acquired forest as reserved forests were initiated but have not been completed. This has resulted in serious litigations and tenurial problems.

2.3. Forest Land

The forest land in Bangladesh falls under three broad categories.

1. Land under the control and management of Forest Department - 1.46 million ha.
2. Land under the control of the Land Administration Ministry - 0.73 million ha.
3. Privately owned land/Village homesteads - 0.27 million ha.

2.4. Growing stock of trees of the country :

Village Forest Inventory Survey was carried out in 1981; the Hill Forests in 1986 by FAO/UNDP Projects, whereas ODA carried out survey in Sundarban in the year 1984. Plane land Sal Forest is yet to be surveyed. The statement below shows the estimated growing stock of wood of the country :

Table 2: Growing Stock of Forests

Hill Forests	1000 million cft.
Mangrove Forests (Sundarban)	1000 million cft.
Mangrove Forests (Sundarban)	542 million cft
Plantation Forests	600 million cft
Plane land Sal Forests	91 million cft
Village Forests	1931.8 million cft.

2.5. Supply, demand and consumption :

As per study of the Planning Commission, through FAO/UNDP projects the demand of timber and fuelwood at present level of per capita consumption is 0.30 cft. and 2.3 cft. respectively as against supply in the year 1985-86 was 38 million cft. of timber and 230 million cft. of fuelwood. The sources of supply are as follows:

Table 3: Source of Supply of Timber and Fuelwood

(In million cft.)

Source	Timber	Fuelwood
Govt. managed forests	13.3	25.6
Village forests	24.7	204.5
	38.0	230.0

Due to increase in population, gap between demand and supply is also widening. It is estimated that if the growth rate of population is assumed at an average rate of 1.75% and the current per capita consumption rate of 0.38 cft. timber and 2.30 cft. fuelwood remain the same, the demand of timber and fuelwood by 2000 years would be as follows:

Consumption Projection :

Population of 1988 - 106.6 million
Population by 2000 - 131.3 million
(The growth rate being 1.75%)

With the current per capita consumption rate of 0.38 cft. of timber and 2.3 cft. of fuelwood, the scenario would be as follows:

Table 4: Consumption Projection of timber, fuel wood

(In million cft.)

Year	Timber	Fuelwood	Total
1988	40.50	245.00	285.50
2000	49.88	301.92	3541.80

Supply position by year 2000 :

It has been estimated from the Village Forest Inventory Survey carried by FAO/UNDP that in order to enable homestead forest to maintain their sustained yield bases, not more than 19.30 million cft. of timber and 77.70 million cft. of fuelwood can be extracted from Village Homestead annually. Thus, the supply position from different sources would be as follows:

Table 5: Supply position by 2000/

(In million cft.)

Source of Forest Produce	Timber	Fuelwood	Total
Forest Department	15.00	81.00	96.00
Village Forest	19.30	77.70	97.00
Total	34.30	158.70	193.00

Hence the gap between demand and supply by 2000 years will be as following

Table 6: Gap between demand supply by 2000

Year	Produce	Demand	Supply	Gap
2000	Timber	49.88	34.30	15.58
	Fuelwood	301.92	158.70	143.22

2.6. Forest Plantation :

Forest Department is raising plantation since 1973. The statement below shows the plantation raised at different periods :

Table 7: Forest Plantation 1948-1993

Upto 1948	4140.9 ha
from 1949 to 1958	11635.6 ha
from 1959 to 1968	56207.7 ha
from 1969 to 1978	58753.4 ha
from 1979 to 1988	183220.2 ha.
from 1989 & 1990	21026.8 ha.
from 1991 to 1992	10600.3 ha.
from 1992 to 1993	14958.7 ha.
Total	360543.6 ha

2.7. Trees growing outside the forests

Out side the forest trees are grown in the homesteads, marginal lands like roadsides, sides of railway tracks, sides of embankments. So far the following areas have been planted out sides government/reserve forests:

Table 8: Plantation outside Reserve Forests

Location	Area
Roads and Highway sides	4228.55 KM
Railway tracks	1337.18 KM
Embankments	1606.17 KM
Feeder Road	7634.41 KM
	14806.31 KM

2.8. Deforestation in Bangladesh

In the case of Bangladesh, beauty of its lush green landscape is , today, only a painful reminder of the past. The country presents in some of its regions, unremitting grey images of barren tracts. The GEMS estimated an annual deforestation rate of 8000 ha in 1983-84, which represents 0.86

percent of the total area under `tree formations'. All such forests are increasingly encountering tremendous pressures from various uses, and signs of degradation are obvious. The extent of unequal distribution of forest resources among the districts, is alarming.

The districts of Dinajpur, Rangpur, Rajshahi, Bogra, Pabna, Kushtia, and Jessore constitute one of such regions that have virtually no reserved forest (Table 8). The estimate of the crown cover of the existing types of forests, is no doubt, extremely alarming. Almost 30 to 70 percent of the forest areas remain barren and grey. According to the Village Forestry Inventory (VFI) undertaken by FAO/UNDP between 1979 and 1981, north-western Bangladesh has the lowest standing volume per capita of the homestead forests of Bangladesh. The VFI further revealed that the homestead forests were being severely overcut to supply small local handsaw mills and brick kilns, and occasionally for private use. Visits to the brick-fields in the region reveal mountains of wood from the village forests, mango, jackfruit, date palm and bamboo stumps.

Table 9 : Regional Distribution of Forest Areas

Region	Percent of Population	Percent of Forest Land Area
Rajshahi Division	24	2
Dhaka Division	30	7
Khulna Division	20	42
Chittagong Division	26	49
All	100	100

Source: Forest Department

Another important region seriously affected by deforestation is the hill areas that embrace the districts of Chittagong Hill Tracts, Chittagong, Noakhali, Comilla, Sylhet, Mymensingh and Jamalpur. "The denuded hills of Chittagong Hill Tracts and Chittagong are almost barren and subjected to continuous severe soil erosion... converting these hills unproductive, silting up rivers, lakes and thereby creating navigational problems as well as reducing the lifespan of the lone Hydroelectric Project of the nation located at Kaptai" (Chowdhury 1982). In these regions, encroachment on, and over exploitation of the forest resources in the Reserved Forests and the failure of some plantation programmes, have reduced the supply of wood and bamboo to a level far below the country's actual and projected needs for timber, fuelwood and pulp.

Among the causes of mounting pressure on the remaining resources, one major tragic flaw of the environmental tragedy is the recurrent cycle of the "jhum" cultivation practiced by the tribal people. Such practice, involving the clearing and burning of patches of the natural vegetation for cultivation of crops, has led to an ecological imbalance. This method of cultivation has reduced for example, the amount of leaf litter on the soil, and also has adversely affected the contents of organic matter and worm-casts in the topsoil. Consequently, most of the existing soils have lost their capacity to absorb moisture.

Table 10 shows the comparative picture of changes over the past two decades (1963-1983) of Kassalong and Rainkhong Reserve Forests. In Kassalong, area under jhum cultivation increased from 2,096 ha in 1963 to 30,386 ha. in 1983. In Rainkhong, jhum cultivation, which was almost non-existent in 1963 alone increased to 20,572 ha. In Sangu Matamuhuri Reserve Forests the area of shifting cultivation, practically non-existent in 1961, accounts for 23 percent of the total area in 1983. The Shitapahar Reserved Forest area, had only 1,030 ha. or 18% of the area under natural forest.

Table 10: Composition of the Non-forested Areas as Percent of Total Forest Land in Kassalong and Rainkhong Reserve Forest.

Ground Cover	Kassalong		Rainkhong	
	1963 situation	1983 situation	1963 situation	1983 situation
Logged/Cleared for Plantation	0.15	1.46	0.13	1.18
Undifferentiated natural vegetation	0.50	5.57	0	6.15
Jhum/Mixed Jhum	1.27	21.12	0.01	33.62
Others	0.33	0.42	0.35	6.56
Total	2.25	28.57	0.49	47.51

Source : Computed from Hossain 1987

Signs of degradation are also obvious in the Sundarbans which have been a managed forest exploited for its timber, fuelwood, pulpwood and a wide range of minor products which include fish and honey. A re-inventory completed in 1983 with the assistance of Overseas Development Administration (ODA) revealed that the standing volume of "Sundari" and "Gewa" has declined to 40 percent and 45 percent respectively since the previous inventory in 1958-59. Specially, "Sundari " was overcut for both saw-logs and fuel wood. For "Gewa" the reason was its existing thin population and lower rate of growth. The incidence of `top-dying ' of `sundari' has been increasing over the years. Increasing salinity due to a reduction in freshwater discharge from the Ganges has been considered to be a probable cause. For careful investigation, a scheme titled "Integrated Development of Sundarban" has been undertaken by the Forest Department recently.

Encroachment of forest areas poses a serious problem and an estimated total of 76,000 ha have been lost to aquaculture, agriculture or homestead encroachment. The incidence of encroachment is more on the low hills and plain land forest areas. About 54 percent of the encroachment are in reserved forests, 26 percent in the acquired forest, 13 and 7 percent in the vested and protected forest respectively (Table - 10) . Only in a span of eight years the homestead forest land is reduced by 11 percent.

Table 11: Forest Areas under Encroachment

Division	Reserve Forest	Protected Forest	Acquired Forest	Vested Forest	Total Area
Dhaka	7.50 (23)	1.93 (6)	17.06 (51)	6.65 (50)	33.14 (100)
Chittagong	32.22 (89)	1.85 (5)	1.97 (6)	--	36.04
Rajshahi	0.29 (5)	1.65 (28)	0.55 (9)	3.36 (58)	5.85 (100)
Khulna	1.55 (99)	0.01 (1)	--	--	1.56 (100)
Total	41.56 (54)	5.44 (7)	19.58 (26)	10.01 (13)	76.59 (100)

Source: Forest Department
Note : Figures in parenthesis represent percentage

Over the years, about 54.69 thousand ha of valuable forest lands have bee either deforested or transferred to different organisations for use other than forestry (Table 12).

Clearly, decisive action is needed to arrest and eventually reverse this declining trend. Otherwise, with increasing population pressures, the situation will soon deteriorate from crisis to `catastrophe'.

PHOTOGRAPHS

Barren hills which were once rich forests in Cox's Bazar.

Illicit pluntering of forest in at Cox's Bazar District.

PHOTOGRAPHS

Fuelwood collection from homesteads in Gazipur districts.

Slash and burning of forest in Chittagong hill area.

Table 12 : Forest Areas Deforested and Transferred.

Name of Forest Division	Area (in ha)	Percent of Total
Dhaka	493	0.9
Mymensingh	134	0.2
Tangail	171	0.3
Chittagong	1808	3.3
Cox's Bazar	14279	26.1
Chittagong Hill Tracts (W)	19088	34.9
Chittagong Hill Tracts (S)	1376	2.5
Sunderbans	48	0.1
Sylhet	17294	31.7
Total	54691	100.0

Forest Department

2.9. Importance of Forests for Economy and the Environment

Forest plays an important roll in the economy of Bangladesh. It contributes about 4% to the GDP and 2% to the employment of manpower. The indirect contribution of the forestry sector in the economy is much more than that. Only in Sundarbans about 5-7 lakh people are dependent on different forest related activities. Trees in Bangladesh are used as fuel, timber, raw materials for paper Pulp plywood etc. In the rural areas different forest products including bamboo are used as basic materials for construction of houses. Forest products also have important uses in industry, transport and communication sectors. It is estimated that a tree with a life span of about 50 years contributes about 25 lakh taka of direct and indirect benefit to the economy and the environment. This includes the role of the tree as a supplier of oxygen, an agent of control of air pollution, a preventive agent of land erosion and a source of protein, food, fruits, fuel, timber, etc.

Trees play a vital role in the protection of the environment and the ecology. Some of the important roles played by trees in the protection of the environment are mentioned below :

Conservation of soil:

Tree roots work as soil binders and thus prevent erosion by air water, and other natural agents. Tree leaves and branches prevent direct contact of rain drops with the soil and thus reduce erosive impacts. Depletion of forests lead to erosion of the top soil through direct interaction between the soil and different natural agents like the sun, air, water, etc.

Purification of Air :

Trees purify the air by absorbing carbondioxide and producing oxygen. An average tree produces about 1 ton of oxygen every year. One hectare of natural forests produces about 600-650kg of oxygen and absorbs about 900 kg of carbondioxide.

Prevention of natural disasters:

Trees protect the soil and land from floods, and cyclones. In the coastal areas forests work as natural barriers against tidal bores.

Increase of rain fall:

Forests significantly increase the probability of rain fall, keep the air cool. In a temperate climate a 50-500 metre wide green belt of trees can reduce the temperature by about 3-5 degree centigrade.

Absorption of green house gases:

Forests work as carbon sinks. The depletion of forests are thus largely contributing to global warming by increasing the stock of green house gases. A serious consequence of this process of global warming will be the rise in the sea level which will cause alarming impacts to many island countries and lowlying countries like Bangladesh.

Increase of soil fertility :

Trees, increase soil fertility. Leaves of trees, fruits, droppings by birds etc. add to the humus and thus improve the quality of soil. Depletion of forests reduce the natural contents of the soil and lead to gradual degradation of the soil.

Controlling sound pollution :

Trees create a barrier against sound pollution. In industrial areas where there is a lot of noise and sound pollution and also around busy high ways, plantation of tree belts has successfully reduced the magnitude of sound pollution.

2.10. Causes of Depletion of Forests in Bangladesh

The major causes of depletion of forest resources in Bangladesh have been the following :

a) Increase of population in the country and in the areas near the forests.
b) Encroachment of forest land (about 1,89,000 acres)
c) Transfer of forest land for development purposes (about 1,35,000 acres).
d) Lease of forest land for agricultural purposes
e) Theft by organized groups
f) Unauthorized felling with the help of forest officials
g) Permit given by deputy commissioners in hill districts.
h) Jhum cultivation by the tribal people
i) Over exploitation for news print mills, pulp mills, hard board mills, match factories, and REB poles.
j. Top dying of Sundaries and stem borer attack on gewa in the Sundarbans.
k. Shrimp cultivation in the coastal areas
l. Overgrazing of cattle in coastal and other areas
m. Use of fuel wood for brick burning.
n. Natural calamities
o. Refugees and political upheavals.

2.11. Effect of Forest Resource Depletion on Environment

Depletion of forest resources create the following adverse impacts on the environment:

a. Causes serious erosion of the soil
b. Reduces soil fertility
c. Creates pollution of the air
d. Increases the destructive impact of natural calamities like floods, cyclones, etc.
e. Increases the probability of droughts and desertification
f. Reduces the probability of rain falls and adds to the warming of weather
g. Adds to global warming by reducing carbon sinks
h. Destroys biodiversity

PHOTOGRAPH

Replanting denuded hills with the help of forest dwellers at, Bandarban hill tracts districts.

Seasonal migratory birds in haor area of Sylhet district.

WILD LIFE

1. Status

Bangladesh Wildlife (Preservation, Amendment) Act 1974 defines "wild animal" as any vertebrate creature other than human beings and animals of usually domesticated species or fish and includes eggs of birds and reptiles.

Many species of mamals, amphibians, reptiles and birds are the magnificent heritage in the biological diversity of the country. A stable population of all the species form the ecosystem contributing to the health and sanitation of the environment they live in

Due to poor management and careless exploitation in the past, the rich wildlife population of Bangladesh are dwindling day by day. The Royal Bengal Tiger which as a symbol of courage and strength has been engraved in the badge of the Bangladesh Army, was widely distributed in the past and now it is confined to Sunderbans only, and occasional sighting is reported from Hill Tracts and Sylhet. It is on record that wild elephants existed even in the Bhawal -Modhupur Tract in the beginning of the twentieth century but now it is confined in the forests of Hill Tracts, Cox's Bazar and Sylhet each having common boundary with Burma and India. Spotted deer still abound in the Sundarbans and other deer like the barking deer are occasionally seen in other forest areas. White winged wood duck is now-a-days found in a small area of forests around Pablakhali in Rangamati district.

The estuarine crocodiles are found in the waters of the Sundarbans only whereas the species was of common occurrence in the coastal waters in the past. The Gharial has a limited distribution in the Padma.

The wildlife of Bangladesh has its share of contribution to the economy. Export of turtles, tortoise, frog legs, skins of of lizards, crocodile, snakes and tigers have earned foreign exchange for the nation. This has, however, been done without due regard to sustainability. As a result, the resource has become scarce now.

A summary of present status of wildlife is given in the table - 13.

Due to past misuse 18 species which had a wide distribution in the forests, fresh water and mangrove swamps have become extinct in the present century. The extinct species include Rhinoceros, wild buffalo, Indian bison (Gaur), Swamp deer, hog deer, wolf, blue bull, hispid hare, black duck, pink headed duck, peafowl and Bengal florican.

Table 13 : Status of wildlife in Bangladesh

Class	Number			
	Order	Families	Genera	Species
Mamalia	9	31	74	119
Aves (Birds)	20	60	261	578[2]
Reptiles	2	19	66	124
Amphibia	1	4	9	19

1. Source: GOB Report of the Wildlife Task Force

The International Union for Conservation of Nature and Natural Resources (IUCN) has enlisted 23 species of Bangladesh in its Red data Book as endangered species of which the major ones are the Royal Bengal Tiger, Leopard, Clouded Leopard, Asian Wild Elephant, White Winged Wood Duck, Python, Estuarine Crocodile, and Gharial. This list, however, is not an exhaustive one and many other species will soon acquire eligibility to be placed in the Red Data Book. At present there are 27 threatened and 39 endangered species of wildlife in Bangladesh.

PHOTOGRAPHS

Monkey in its natural habitat in Chittagong forest.

Two rare species of fresh water turtles in Chittagong area.

A list of endangered and threatened wild life in Bangladesh is given at Appendix.

Other endangered wildlife include another cat, Panthera pardus, as well as primates, bears, civets, a mongoose, reptiles, snakes and elephants. Most terrestrial wildlife depends upon land of the Forest Department for habitat, but the Forest Department's institutional capacity to promote and administer integrated wildlife management has not yet been developed. Furthermore, land use restrictions placed on lease holders of public lands, as well as constraints on private forestry, severely limit private sector involvement in wildlife management. Lack of public interest in wildlife conservation has also led to neglect of the system of protected areas. The reserve system that has been adopted was not planned with clear priorities, nor have sufficient funds been allocated to the protection and management of parks and reserves.

2. Habitat

The distinctive wildlife habitats in Bangladesh are :

- Hill forests in Hill Tracts, Chittagong, Cox's Bazar and greater Sylhet districts
- Plain land Sal forests in central zone
- Mangrove forests of Sunderban
- Newly created mangrove forests in the costal belt
- The small coral island of Narikel Jinjira (St. Martin)
- Large water bodies spread all over the country including rivers, Haors, Baors and manmade reservoirs.
- Agricultural fields and homesteads with scattered tanks, trees and bushes.

Each of these habitats provide distinct ecosystem for wildlife.

The hill forests provide environment for larger animals like the elephant, the tiger, the leopard, several species of deer, wild board, hornbill, storks and adjutants, monkeys , python and several other species. Plainland Sal forests once abounded in peafowl, monkeys leopards and even elephants; but the area is now devoid of such wildlife.

The coastal mangrove forests are the home of the Royal Bengal Tiger, spotted deer, monkey, wild boars and jungle fowl.

The coral island is an excellent habitat for sea turtles and wadders.

The wetlands provide habitat for large varieties of water fowl otters and birds of prey. The excreta of these birds help production of phyto-plankton for nutrition for fish.

The large area of agricultural fields and trees and bushes in the villages give shelter to Jackals, lizards, small cats and civets and different species of birds and reptiles. Some of these, although apparently appear useless, play a significant role in the ecosystem in maintaining sanitation of the environment.

3. Aquatic Diversity

Bangladesh's abundant fish population represents one of the country's most diverse biological resources. More than 500 species of fish enjoy Bangladesh waters, and constitute a vital resource for the economy and the diet of the millions of rural poor, as it provides 80 per cent of the protein to a rice based diet. Most of this diversity exists in fresh water fish, and the maintenance of this biological diversity relies heavily on the availability of large inland nutrient-rich waterbodies during annual monsoon flooding, when spawning, early growth and development of young fish occurs; it also requires open access for the adult fish to migrate to rivers for the start of a new reproductive cycle at the onset of monsoon rains.

PHOTOGRAPH

This aquatic diversity is highly threatened as its habitat is being destroyed by agriculture encroachment, river training, flood management activities, and groundwater development as well as by overfishing. This also impacts on coastal and marine species which spend part of their life cycle inland. In addition, despite increasing supplies from hatcheries, aquaculture is still largely dependent on wild fry and larvae. Experience in other countries suggests that open-catch fisheries in Bangladesh have several advantages: biological diversity offers risk-spreading advantages against pathogens or susceptibility to pollutants, and numerous species establish niches in a way that makes maximum use of available habitats. Yet there is insufficient data specific to Bangladesh's aquatic resources upon which to test these hypotheses.

4. Conservation of protected areas:

Part of the Forests mainly in the hill and mangrove forest areas are conserved as national parks, game reserves and wildlife sanctuaries. The main objective is to conserve both flora and fauna. Important Wildlife Sanctuaries (WS), National Parks (NP) and Game Reserve are mentioned in table -14 :

Table -14 - WS, NP and GR in Bangladesh

Name	Area (ha)	Year	Legal Status
1. Sundarbans East WS	5,439	1960/1977	No normal forestry operation. Maintained as WS.
2. Sundarbans South WS	17,878	-/1977	-do-
3. Sundarbans West WS	9,069	-/1977	-do-
4. Rema-Kalenga WS	1,095	-/1981	No normal forestry operation. Declared as WS.
5. Char Kukri -Mukri WS	40	-/1981	It is a coastal Island. Notified as WS.
6. Pablakhali WS	42,087	1962/1983	No normal forestry operation. Declared as WS.
7. Himchari NP	1,729	-/1980	No normal forestry operation. Detailed as WS
8. Bhawal NP	1,729	1974-1982	Notified as National Park
9. Modhupur NP	8,436	1962-1982	-do-
10. Teknef GR (Elephant)	11,615	-/1983	Notification
11. Chunati WS	7,761	-/1986	Notification as WS
12. Rampahar -Sitapahar WS	3,026	-	Managed as WS by F.D. not yet notified under the Wildlife ACt.
13. Hazarikhil WS	2,903	-	-do-

Total area 1175&(HA) (5.27% of total forest area and 0.81% of total land area).

5. Environmental Concerns

Depletion of Habitat

i. Population Presure : Population pressure coupled with the demand for forest produce have wiped off thick vegetable cover and trees of the villages, thereby causing fast loss of habitats of the wildlife common in rural areas.

ii. Clearfelling System: Clearfelling of evergreen and semi-evergreen forests followed by monoculture of Teak, Tea. Rubber and a few indigenous and exotic species by applying "Slash-and-burn" system has contributed to the depletion of wildlife habitats.

iii. Shifting Cultivation : In the hills of Hill Tracts region the local inhabitants depend on `Slash-and-burn' system of cultivation known as "shifting cultivation" causing destruction

of wildlife habitat and situation has further deteriorated by the settlement of plain land people in the Hill Tracts.

iv. Change in the Ecology of Sunderbans: A very serious threat to wildlife habitat is the threatened change in the ecology of the sundarbans as a result of reduced inflow of freshwater during dry season.

v. Oil Spills : Oil spills discharged by sea vessels while passing through the sunderbans or the adjacent sea and toxic waste discharge from industries are potential threats to the habitats of sunderbans, its ecosystem and to wildlife in general.

vi. Siltation in Wetlands : Siltation has raised the level of many of the flood plain wetlands and other areas which have been converted into rice fields for boro crop by drainage, depleting wildlife habitat in wetlands.

vii. Natural Hazards: Frequent storms, cyclones, floods and tidal waves cause substantial damage to the forests vis-a-vis wildlife habitat.

Other Relevant Issues

Policy

i. Wildlife Policy : A well defined socially acceptable Wildlife Management Policy does not exist for integration into the national development plan.

ii. Conservation of Wildlife : Bans have been imposed on hunting and capture of the wild animals. But there is no action for regeneration. On the other hand the ban is not enforced due to absence of any organization with specific responsibility. Regulated trade of species with short rotation regeneration potential can be an economic proposition provided exploitation is regulated to the extent of regeneration.

Legislation

The Wildlife (Preservation, Amendment) Act, 1974 is not applied strictly to deal with various offenses mentioned in this Act, as Forest Officers with whom the responsibility lies are occupied with the protection of the forests and various development activities therein and they are not well equipped to tackle the situations arising out of stricter application of the provisions of the Wildlife Preservation Act.

Institution

i. Institution : There is no institutional setup to deal specifically with wildlife and there is no trained manpower. Budgetary provision for preservation of wildlife is practically non existent.

ii. Management Plans : There is no management plan for protected areas. Except a ban on logging nothing has been done in the past for preservation and improvement of wildlife resources in the protected areas.

iii. Multiple Use Areas : Wildlife of multiple use areas such as productive forests and Haors are not given adequate protection.

vi. Wildlife Advisory Board: The Wildlife Advisory Board is not fully operational. There are three non official members in the Board. There is no provision to prescribe limit of tenure of non official members to make entry of new members possible.

V. NGOs: The NGOs have not been involved in the past in planning and implementation of

plans for preservation of wildlife.

Research, Education and Awareness

i. Survey : Comprehensive survey of wildlife of the country has not yet been done.

ii. Inventories : Inventories of wildlife in most of the protected areas are not available.

iii. Awareness : Publicity creating public awareness is inadequate.

CHAPTER -3
INLAND WATERS

3.1. Water availability

A contrasting feature in the annual water cycle dominates life in Bangladesh : excessive water during the monsoon causing flood and insufficient water during the dry season creating drought - like situation. These two extremes influence the planning for water resources development in Bangladesh requiring effective measures in flood control, irrigation and drainage.

The water resources of Bangladesh, whether derived from the immediate climate or from the inflow outside the country's political boundary, provide enormous opportunities for development. Bangladesh is endowed with a massive supply of readily accessed surface water and ground water. Water is also abundant for needs of industry and domestic use and provides ubiquitous means for the transport of goods and people. But the availability of water throughout the country is not fairly allocated/ distributed. Flooding is an annual occurrence in Bangladesh and occurs mainly during monsoon months between July to September, when rainfall is in its maximum intensity & rivers are swollen with waters. During normal flooding about 26,000 sq. km. of land surface inundates, where 52,000 sq. km inundates during more severe flooding. Recent estimates show that 50% of total land of Bangladesh is vulnerable to flood. The flood depth to which land normally is being inundated varies from 30 cm to 2.5 m.

Droughts are also an increasing environmental hazard in Bangladesh, particularly in recent years. The north-west region particularly the Barind Tract are actually affected by lack of water during the months of March to May in particular.

Water scarcity and increasing salinity which have been progressively getting worse in recent years and are like to become major problem if not tackled urgently. The problem of water scarcity in the surface water system stems from the increasing obstruction of water upstream both within Bangladesh but more particularly upstream of Bangladesh in Bihar and west Bengal province of India.

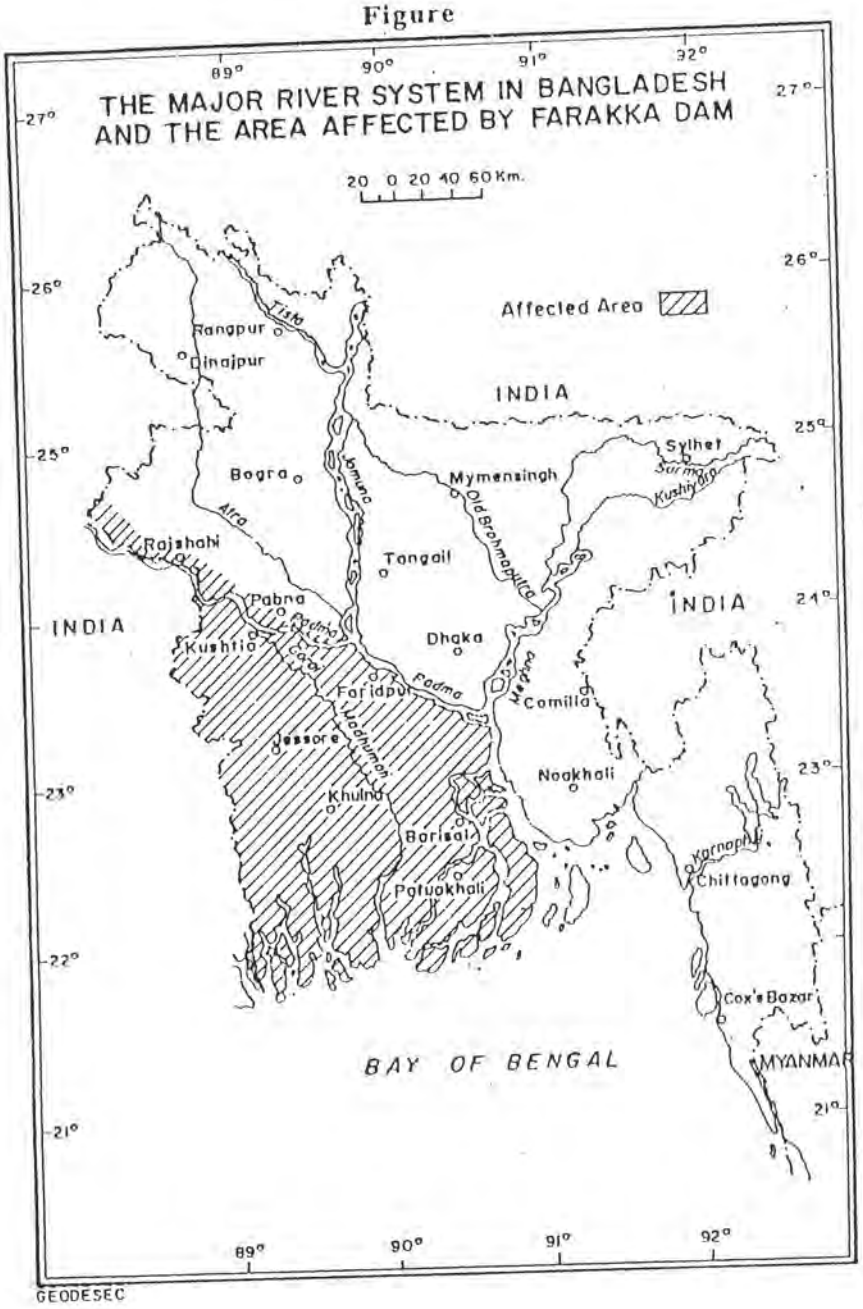
The drawing off water from the Ganges, particularly with the construction of the barrage of Farraka on the India-Bangladesh boarder has decreased dry season flows into Bangladesh considerably causing major problems with in the country. One of the major problems is the increasing sanitization in the coastal belt and encroaching in the agricultural production as well as domestic and industrial water use.

The river system that flows through Bangladesh comprises the third largest source of fresh-water discharges to the world oceans. Only the Amazon in Brazil, and the Congo in Africa, have larger discharges than the Ganges -Brahmaputra -Meghna river system. The annual volume of flow past Baruria just below the confluence of the Brahmaputra and Ganges is 795,000 Mm^3 which is equivalent to 5.52 meters of depth over the 14.4 Mha of land area of Bangladesh. In contrast, the average annual rainfall for the country is 2.32 meters, the comparable annual potential evapotranspiration rate is 1.30m, and the estimated mean annual water loss by evaporation and evapotranspiration is 142,000 Mm^3, which is equivalent to 0.99m.

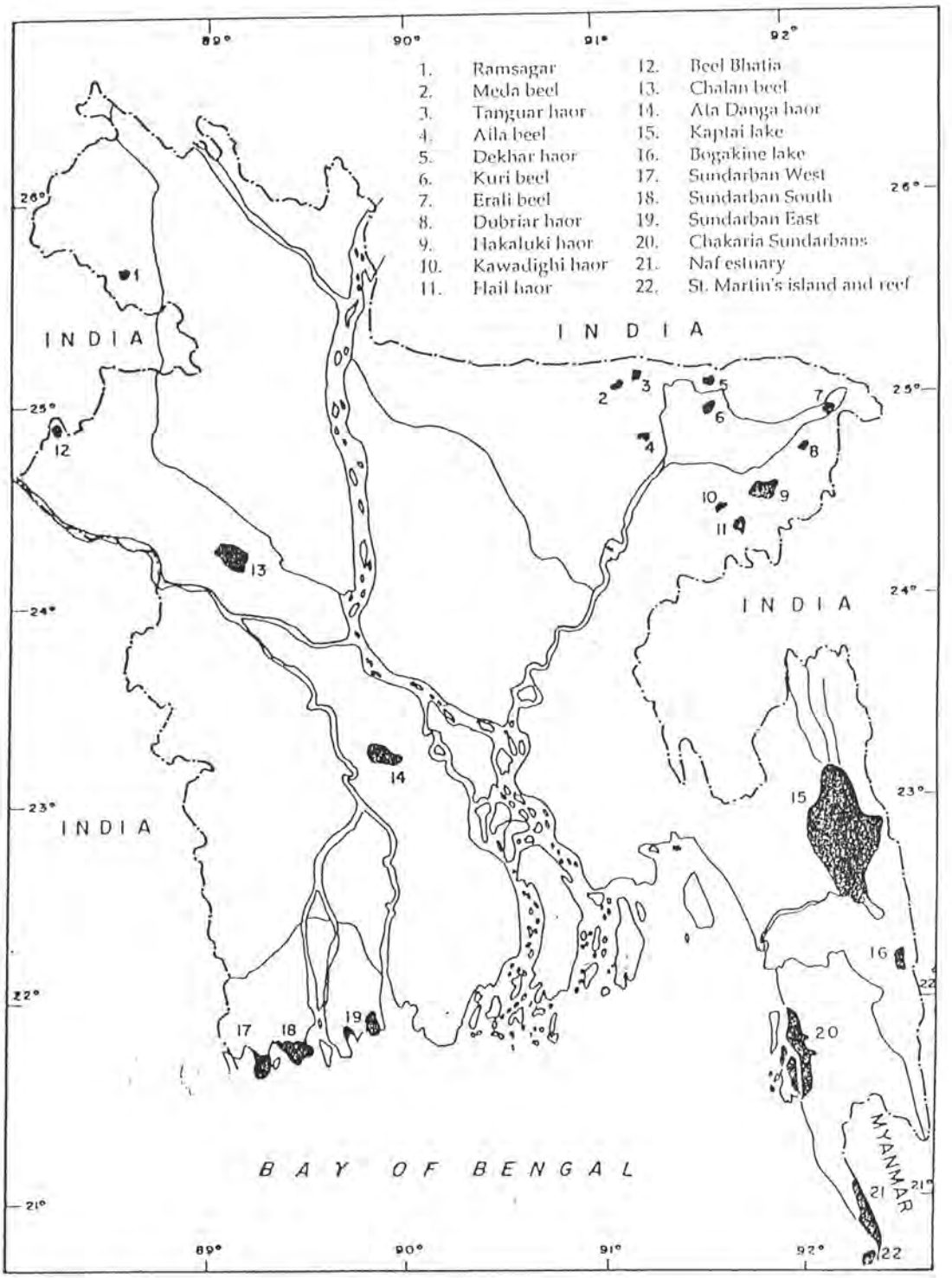
Although an immense quantity of surface water flows through Bangladesh, the development potential is constrained for a number of reasons. Most importantly there are very few opportunities for either gravity diversions or surface storage. Under existing conditions, annual outflows from the major rivers to the Bay of Bengal are essentially equal to inflows from India. Net diversions are far smaller than errors of measurement. A water balance study for the critical dry month of March indicates that even in this month of relatively high diversions for irrigation and low base flow, the net diversions from the entire system are only about five percent of the inflows. Under future development conditions, diversions may possibly increase to 15% without major barrages and up to perhaps 35% with barrages.

THE MAJOR RIVER SYSTEM MAP

Figure



: Major wetlands of Bangladesh



ource : World Resources Institute 1990

Hail Haor in Sylhet Area

Development in irrigation sector together with flood control and drainage infrastructures, in areas where it has already been completed, has created a regime when other agricultural inputs may be effectively utilized to enhance the yield rate. But this trend in water resources development with single objective of increasing production level in agriculture has led to neglect to other water sectors, e.g., fisheries, navigation, control of salinity level in the coastal area, etc. Concerns are being expressed about the various adverse aspects of present day water development activities in the country.

3. 2. Water quality

2. 1 Surface water quality

Surface water quality is one of the priority elements representative of overall environmental quality of an area.

The Department of Environment (DOE) has at present twenty monitoring stations throughout the whole country. Water quality at all these stations, other than that of Pagla in the Buriganga river, has been monitored since 1970s. Actually DOE has been monitoring surface water quality from 1973 on various surface water bodies including rivers, ponds, lakes, etc.

Till October 1988, DOE monitored 27 rivers in the country including all the major rivers and samples were collected from a total of 408 spots. Total number of samples collected and analysed by DOE till October 1988 was 9671.

As Bangladesh faces extreme situation of water availability and the dilution factor in wet season is very high, dry period water quality informations are very important. It has been noticed that, most of the river quality in general are not that bad, excepting river like Buriganga, Karnaphuli or Sitalkhya, Balu which show significant amount of organic load and some other problems from time to time. Bhairab and Rupsa faces increased salinity and most of the rivers high turbidity. A recent monitoring on Burriganga showed a near septic condition of the river which indicates its unsuitability for aquatic life.

Lakes in Dhaka and Chittagong and also Kaptai Kaptai lake have been monitored. Except Kaptai lake, other lakes are in general moderately polluted, but sometimes may become severely polluted. Some of these receive even sewage from some sources and causes quality degradation significantly.

Ponds are widely abundant throughout the country and are extremely used for various purposes including washing of utensils, cloth, bathing, fishing etc. Sometimes those are used for drinking too. As generally most of these ponds are mixed use type, those are polluted to various extent in general and not suited to drinking purpose.

Haors and beels which are other types of surface water bodies, are very important fishing rounds. It has been reported that due to increasing use of chemical pesticides and Fertilizers, these are having increased chemical pollution load, causing fish depletion.

3.3 Ground water Quality

Groundwater is one of the major natural resources of Bangladesh. It has been and may continue to be developed advantageously as a source of domestic, industrial and irrigation supplies.

Groundwater quality in Bangladesh is generally very good in term of overall mineralization, except in the south where rivers are tidal and the land almost at sea level, so that there is little chance of the formation of appreciable fresh groundwater lenses in line with the Ghyben-Herzberg principle. However, general hydrodynamic considerations suggest that in at least some parts of the south, groundwater of low to moderate salinity might be found at depth. This has been confirmed by deep drilling.

Elsewhere, there may be some problems with various minor chemical constituents of groundwater. Because of the abundance of organic material in the soil and general lack of line in the formations, the groundwater is generally acid (low pH) and of negative reduced oxygen (redox) potential; consequently it has the capacity to maintain in solution, under anaerobic conditions, relatively high concentrations of some metals, particularly iron and manganese. However, these constituents do not affect the suitability for irrigation; and for potable supplies, they can be readily removed by aeration and filtration.

No significant groundwater pollution has been identified so far in Bangladesh, but this may well be because no relevant surveys and analyses have been carried out. Since most urban waste water disposal is by cesspits, some seepage to the groundwater body might be expected leading to at least high local concentrations of nitrates. There might also be contaminants released to the ground at the various industrial enterprises. Lastly groundwater quality may also be affected by the residues of agricultural chemicals such as fertilizers and pesticides. Municipal landfill garbaze may contaminate ground water at places too. Though pollution problems are unlikely to be serious at present, a base-line survey of selected indices of contamination is needed and should be undertaken soon; which should be followed by a regular monitoring programme.

3.4 Water Pollution

The inland waters have been used by people for dumping of all kinds of wastes, produced by man, with the belief that waters flowing through the waterways will clear the wastes and purify itself. Disposal into a water body is very ancient method of dealing with unwanted wastes.

In the present days, all kinds of wastes - either in solid or liquid form, are being dumped into the water ways indiscriminately resulting in pollution of the aquatic environment. Currently the rivers and streams in Bangladesh received untreated wastes from industrial units (industrial effluents), domestic organic wastes (sewage) and chemicals, particularly run-off containing highly toxic agrochemicals. These pollutants cause pollution of the aquatic environment resulting in fish kills and alteration of the ecological balance in the waters. Very often many of the toxic chemical ingredients including heavy metals are recirculated back into human bodies through fish and other edible organisms which most often, are damaging to human physiology and health.

Water pollution in Bangladesh may be classed into three groups :

* Faecal pollution is widespread and has a strong negative impact on human health. Pollution continued unabated cause a number of water borne diseases.

* Industrial pollution is localized but untreated. Industrial waste are dumped into rivers causing pollution of both the terrestrial and aquatic environments.

* Agrochemical pollution is feared as residues are expected to enter the food chain.

3.5 Key Environmental issues

Due to the deltaic nature of much of Bangladesh, the management of water resources dominates environmental and developmental planning in many sectors. In the past there has been a tendency for planning to be sectoral in nature with a limited awareness of the impacts that FCDI and other infrastructure projects have on other sectors.

As a result, environmental impacts have arisen in several sectors and geographical areas. They include impacts on fisheries, mangroves wetlands agricultural land, settlements, water transport and the quantity and quality of water supplies. Some of the key issues of concern are as follows:

* Inadequate planning of FCDI projects and a failure to consider their wider impacts has led to environmental degradation in some areas due inter-alia to drainage of wetlands, flooding,

waterlogging, siltation and salinisation.

* Insufficient consultation of local groups and project - affected persons has provided little incentive for community cooperation which is necessary for the long term viability of projects.

* Poor design of flood control projects often creates problems of localised flooding in neighbouring areas because the wider patterns of natural drainage have not been considered in project design.

* The virtual lack of institutional capacity within key implementing agencies such as the BWDB for environmental planning and management in FCDI projects has both created and exacerbated environmental problems.

* Inadequate operation and maintenance of FCDI projects has led to siltation of khals, land drainage problems and extensive damage to coastal and river defences.

* Inadequate action has been taken to prevent embankments being damaged by squatters and shrimp farmers.

* Management of land use within polders has been inadequate with the result that land use conflicts have arisen; principally amongst rice and shrimp farmers and in areas where polder land levels and cropping patterns vary.

* Overabstraction of groundwater resources in some areas has arisen due to inadequate planning or regulatory control. It has lead to seasonal abstraction difficulties and salinisation of groundwater in some areas.

* Water management practices amongst many farmers are inefficient leading to wastage of water resources.

* Improved technology of water delivery systems has not been available to large sections of the farming community.

* Insufficient information exists in many areas on seasonal variations in surface water flows and groundwater availability to allow accurate determination of sustainable yields.

* Project feasibility studies have often failed to consider socio-economic costs and benefits and the economic costs of natural habitat degradation

* Insufficient expertise for the assessment and management of compensation and resettlement issues exists within key line agencies such as the BWDB.

* Increased water pollution due to untreated human excreta, untreated industrial effluent and agricultural run-off of agrochemicals.

CHAPTER -4
COASTAL AND MARINE ENVIRONMENT

4. 1.Characteristics of the Bangladesh Coastal Region

The coast of Bangladesh comprising the complex delta of the Ganges -Brahmaputra -Meghna river system, has immense resources for development. The river system while flowing through Bangladesh on its way to the Bay of Bengal carries an estimated annual sediment load of 2.4 billion tons. These sediments are subjected to coastal dynamic processes generated mainly by river flow and tidal and wind actions, leading to accretion and erosion in the coastal areas of Bangladesh.

4. 2. The coastal morphology of Bangladesh is characterized by :

a. A vast network of rivers;
b. An enormous discharge of river water heavily laden with sediments;
c. A large number of islands in between the channels;
d. The Swatch of No Ground running NE-SW partially across the continental shelf about 24 km south of the Bangladesh coast.
e. A funnel -shaped and shallow northern Bay of Bengal to the north of which the coastal area of Bangladesh is located;
f. Strong tidal and wind action;
g. Tropical cyclones and their associated storm surges;
h. Tectonically also active.

These factors act in complicated ways to bring about geomorphological changes in the Bangladesh coast. Based on geomorphological conditions and hydrological features, the coast of Bangladesh which is about 720 km long, can broadly be divided into three distinct regions: the eastern, central and western regions.

The dynamic nature of of the Bangladesh coast is apparent from the study of topographical changes which took place over a long time span. The maps at figure 1 and 2 show changes in the coast line over the last two centuries. These massive change have an enormous impact on the life-style of more than 20 million people of the coastal region, which covers bout 36,000 sq. km. area.

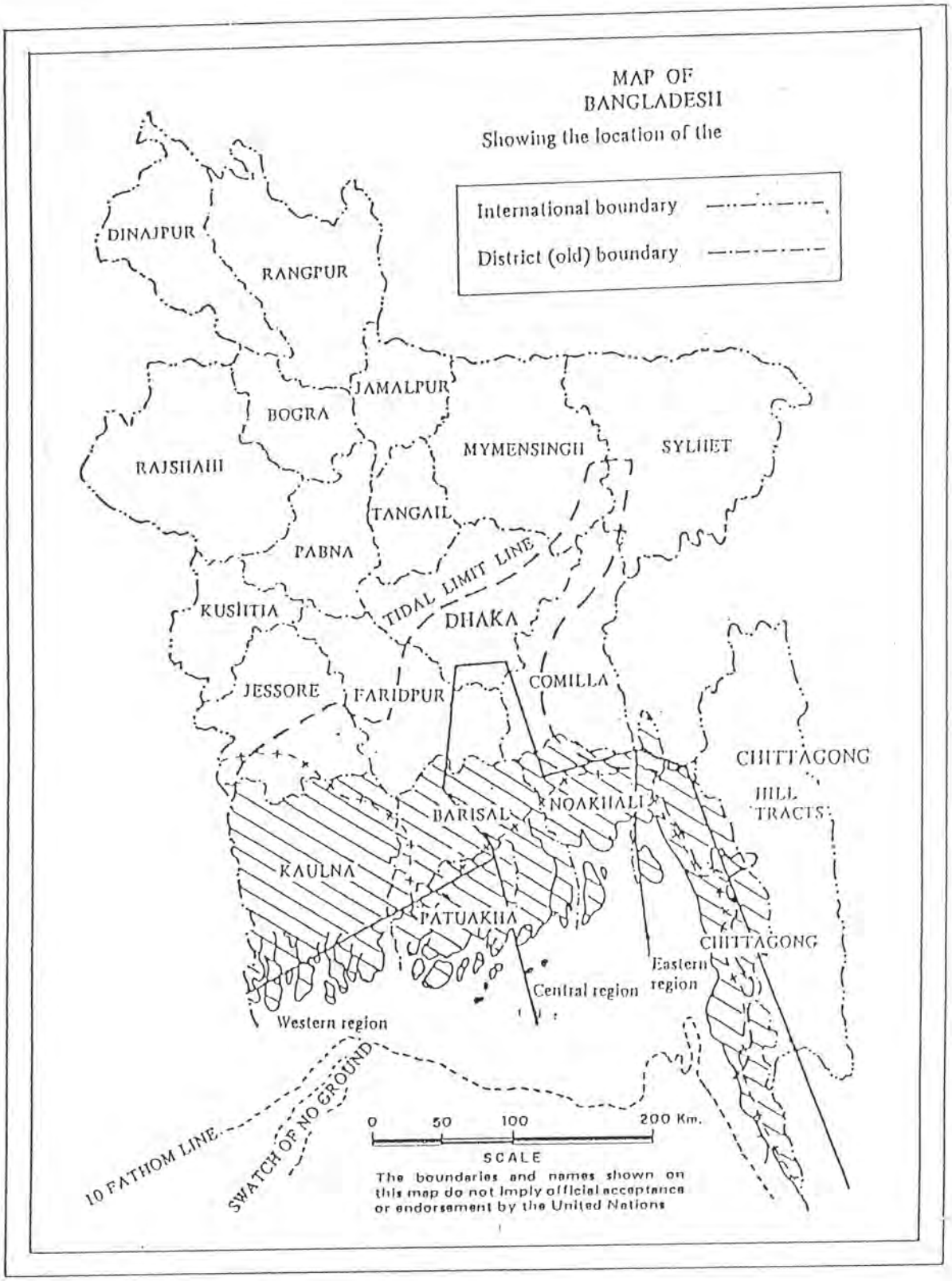
4.3. Trends in Uses of Coastal Resources

The coastal resource uses reflect primarily subsistence agriculture, some cash crops, coastal fisheries, aquaculture with an emphasis on shrimp production and some salt production. Major population pressure is exerted on the ecosystems and resources of the coastal zone, especially the near-shore zone, coastal islands and beaches. Land use conflicts and unsustainable uses are noticed in these areas. Other conflicts arise from land leases by Land Ministry, indirectly permitting deforestation of areas reforested in the recent past, leaving coastal areas unprotected to storm and tidal surge resulting insignificant loss of life and property; and degradation of environment.

Land uses in the coastal zone is adhoc and unmanaged, resulting in misuse of resources in some places and undue exposure of people to cyclone threats in others. There are many conflicts over land use between sectors e.g. aquaculture use versus forest use.

Other major land use conflicts involve aquaculture versus rice cultivation. Aquaculture for a longer period salinate these paddy fields and ultimately turn such fields unsuitable for rice cultivation. Another subject of confrontation is between, forestry, livestock, agriculture, and other interests over future uses of new charlands and barrier islands.

Cyclone protection efforts are uncoordinated and virtually unplanned, each initiative being a response to crisis or the willingness of a particular donor to act on a single aspect. Even though



Legend:

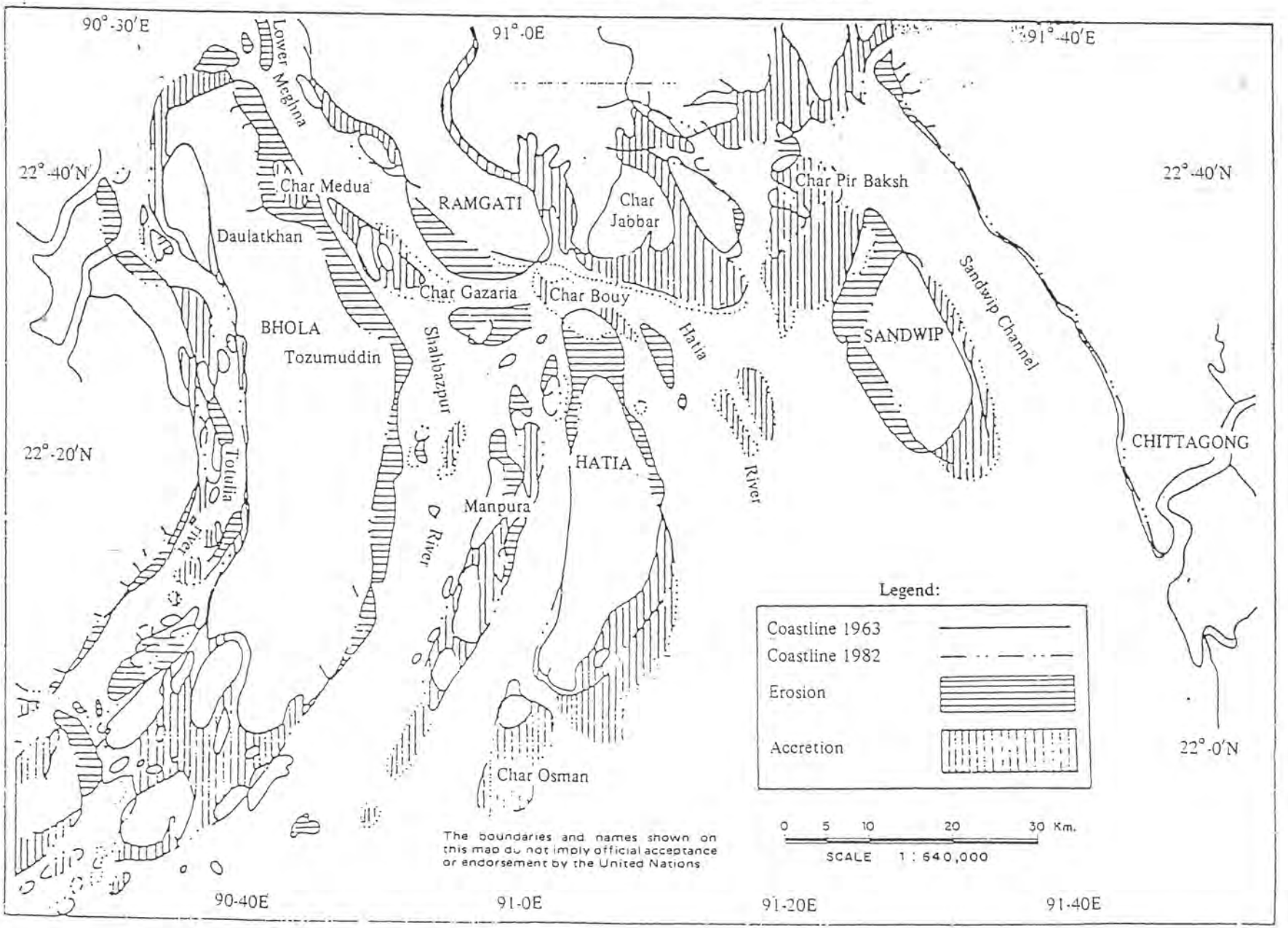
— — — — Tidal limit line.

+ – + – + – Line showing the salinity limit of 1,000 micro-mhos (approx. 6.76 ppt).

——— Three broad regions of the Bangladesh coastal area.

Study area.

Coastal change, 1963-1982 (after Ahmed, 1985)



PHOTOGRAPHS

Degradation of newly acceted coastal land by excessive grazing.

Marine fish resources: Sundrying of fish at st.Martins Island

much good rehabilitation work has been done, its value is much less than if it had been coordinated according to national objectives, priorities and designs.

Coastal shelter belts, particularly the mangrove plantation appear to work very well for protection of the embankments and other works necessary for protection of life and property.

4.4. Key Environment and Development Related Issues.

- Cyclonic storm is an important feature of the Bangladesh coastal zones. The storms usually form in the south-east portion of the Bay of Bengal, more in northernly or north -westerly direction and often turn north-easterly portion of the Bay of Bengal, more in northerly or north-westerly direction and often turn north-easterly or easterly towards the east coast of the country. Two different types of cyclones form in the bay, one is the tropical cyclone which forms during the pre and post-monsoon seasons and the other is the monsoonal depression which develops during the south west monsoon season. Dynamically they are different. Tropical cyclones are the most destructive ones. Cyclones generally causes damage in three different ways :

  a. storm surges
  b. flooding due to excessive rainfall and
  c. wind, blowing away houses and ships

  The impact of cyclones on the coastal belt are especially severe as it is aggravated by the conditions prevailing in the area, such as extreme poverty, erosion, exposure and insecurity of tenure, which increase the vulnerability of the large affected population and reduce levels of preparedness. The absence of sufficient forest cover on the coastal belt compounds this situation. The triangular or funnel shape of the bay concentrates the force of the storm as it moves north and eastward from the Indian ocean.

- Sea level rise due to global warming is one of the most important environment and development related issues.

  If the green house gases continue to be emitted at projected rates, their concentration could result in global mean temperature rising by 1.5 to 4.5 degree centrigrade in next 30 to 40 years, causing thermal expansion of the oceans which in turn would raise the sea levels by as much as a meter. The longterm projections of the relative rise of the sea level and its consequences for Bengal delta by the year 2050 and 2100 as predicted by Woods Hole Oceanographic Institute (USA, 1986) are as follows:

Table - I : Long Term Projections of sea level rise and possible impacts on Bangladesh.

	Average scenario (2050 AD/2100 AD)	Worst scenario (2050 AD/2100 AD)
Total relative sea level rise (cm)	83/340	153/460
Absolute rise of sea-level (cm)	13/220	13/220
Land subsidence (cm)	70/70	140/240
Shore line erosion (km)	1/2	1.5/3
Loss of habitable land (%)	7/26	16/34
Population displaced (%)	7/30	13/40
Reduction of mangrove areas (%)	50/75	75/95

- Even a modest rise in the sea level will cover low lying coasts, threaten storm barriers and salinate reservoirs and water treatment plants in estuaries. Such a rise will inundate

wetlands and low lands; accelerate coastal erosion; increase the risk of flood disasters; create problems with respect to drainage and irrigation systems; and increase salt water intrusions into ground water, rivers and farmland. These effects would damage port facilities and coastal structures; destroy quality farmland; disrupt fisheries and bird habitats; diminish storm buffer protection like mangroves etc. ; and result in the loss of recreational beaches. It has been estimated out that a one meter rise in the sea level would displace between 10-17% of Bangladesh land mass which will be submerged and more than 10 million coastal inhabitants would become ecological refugees.

- Pollution in the Bay of Bengal is a major threat to coastal and marine resources and ecosystems.

  In the port cities of the Bay of Bengal, nearly 1,000 ships and 40-50 oil tankers are handled annually, causing severe pollution of the water in the coastal reaches and the marine environment. Petroleum -based crude oil from abroad is handled mainly in Chittagong port, where the only Bangladesh refinery is located. Approximately 1.2 million tons of crude oil are handled through Chittagong every year. Refining of some 5 million tons of crude oil occurs in Singapore with the product delivered from the Singapore refinery to Chittagong storage facilities. Due to draught restrictions in the harbour, large tankers of 100,000 DWT carrying crude or refined products transfer the contents to small tankers of 19,000 DTW which are able to transit over the bar at the harbor entrance. At all these "international" transfer points, spillage takes place. The estimate of crude spillage at Chittagong is about 6,000 metric tons per year, while about 240,000 gallons per year of bilge water is also dumped. Moreover, there is always a possibility of accidental oil spillage from oil tankers through which the ecosystem of the Sundarbans could suffer irreversible damage. The threat of an oil spill to other marine and costal resources of the delta has not been estimated but can be expected to be severe, even if the spill is small and localized.

- Prediction, tracking and monitoring systems for cyclones.

- Development of warning system including generation of response awareness of the inhabitants regarding cyclones

- Post -cyclone relief is to be institutionalized and reconstruction of damaged buildings should be attended in such a manner that these also serve as cyclone shelters.

- Along with the probability, height and timing, and consequences of sea level rise it may be viewed as to what extent will sea level rise have an affect on the long term erosion and accretion patterns of sediments and sands in the delta and the upper reaches of the Bay of Bengal.

- Coastal erosion and accretion as a function of changes in sediment and surface water flows produced by various components of the Flood Action Plans. The construction of Flood control embankments, dams and barrages on the upstream rivers which carry large quantities of sediment will probably alter the geomorphological setting of the coastal delta system with consequent changes in both coastal accretion and erosion patterns and processes.

- The impacts of coastal accretion and cyclone management schemes proposed by cross dam projects. The ESCAP report (1988) states that cross dams have vast promise as well as great destructive potential. According to this report the experience of development of the vast tracts of land accreted as a result of the construction of the Noakhali cross dams 1 and 2 is not encouraging. The large tracts of land that were accreted led to land grabing by the powerful and to no dramatic agricultural transformation; they have also encouraged premature settlement of chars, leading to soil destabilization.

- Impediments to navigation from channel changes, sedimentation and reduced surface water

discharge.

- Saltwater intrusion into rice growing areas, reduction or elimination of rice production.

- The social and environmental impacts of total or partial conversion of coastal polders from rice production to brackish water shrimp and fish aquaculture. With strong international demand and high prices, brackish-water shrimp culture in brackish-water habitats in the coastal areas is a growing industry. Currently brackish-water shrimp fish aquaculture is practiced not only in the Khulna region (i.e. Satkhira, Khulna, Bagerhat) in the south-west but also in the Cox's Bazar district in the south-east. Such farming is also spreading to other districts on the coast. One of the major environmental impacts of the conversion of polders from rice to brackish-water shrimp/fish aquaculture is the reduction of post larval shrimp and juvenile fish populations that would naturally flow into the capture fisheries. There are at least three social dimension in the conversion of rice polders to brackish-water aquaculture or the construction of new aquaculture polders. Rice farmers with small land holdings are being forced to sell their lands to the aquaculture enterprises. A second social issues is the loss of the domestic consumption protein to the foreign export of brackish - water shrimp and fish. A third social issues is that shrimp farmers make unauthorized cuts or breaches in the BWDB embankments to install sluice gates for controlled flooding of their shrimp farms inside the polders. The rice farmers complain that such intake of water disrupts rice growing in lands adjacent to the shrimp farms.

- Land use conflicts among paddy, afforestation and grazing animals on newly accreted lands, particularly new islands. The poor landless people have for generations attempted to settle on newly accreted coastal lands in order to both claim title and to sustain their families by fishing, paddy production, grazing animals or some combination of all the three subsistence activities.

- Increase salt water aquaculture productivity : Bangladesh's salt water shrimp aquaculture production per hectre is one of the lowest in the world. There are two primary reasons for the low yields. With few exceptions there is no feeding of the ponds. All food source is derived from the biomass in the incoming brackish waters. To date no low cost domestic feed supplies have been found that brackish water shrimp/fish farmers can afford to use to profitably increase productivity. The second major constraint is the relative absence of hatcheries. Stocking of the ponds comes from two sources; species brought in by incoming waters or post-larvae shrimp caught in fine mesh nets by inshore fisherman.

- Potential reduction in salt and estuarine capture fisheries, and the concomitant reduction in the protein proportion of the national diet. Reliable data and information on standing stock, potential yield and maximum sustainable yield of marine fisheries in Bangladesh are lacking. Bangladesh is on the verge of over - exploitation of its marine fishery resources, leading to declining yields per unit effort, greater cost, soaring prices and probably higher protein deficiencies in the near future.

- Reduction in the size and quality of mangrove habitat and ecosystems: Grazing of livestock in coastal mangrove appears to be a common practice. Such grazing retards new growth and can lead to total elimination of the coastal mangrove community. Another common stress on the mangrove community is the illegal cutting of trees for lumber and fuelwood. It is reported that another imminent threat to the forests of the Sundarbans and the fauna in the waters is the oil spills from ships entering and leaving Mongla Port.

- The development of nature and cultural tourism in the coastal zone; Bangladesh appears to have a significant potential for coastal tourism. The wildlife of the Sundarbans -- particularly --- the Royal Bengal tiger --- are internationally known, the Rocket steamships provide an educational and exciting cruise along the waterways between Dhaka and Khulna. The beaches of Cox's Bazar and its offshore islands are attractive for swimming and sunning. St. Martin's Island has coral reefs and white sandy pocket beaches. Also the

ridley turtle nests on the island.

- The impacts of point source pollution from coastal cities and/or industries : Effluent from pulp mills and other industrial plants at upstream locations should be monitored to guard against possible pollution hazards. Nearly 144 industries have been listed in eight industrial zones of Chittagong. All industries discharge their untreated wastes directly into the river Karnapuli or the bay. None of these facilities have any existing or planned pollution treatment facility. New industries are being set up in the Chittagong area and a few major industries are at the planning stage. With rapid growth of industries without treatment plants, the pollution load in the river will pose a threat to aquatic life and the estuarine ecosystem.

- The townships and human settlements in the coastal areas of Bangladesh do not have any domestic waste treatment facilities and therefore effluents directly or indirectly find their way untreated into the rivers and hence into the Bay of Bengal. The amount of domestic as well as industrial pollution load discharged by outfalls from the Chittagong area is adversely affecting the local fisheries. The fish catch is diminishing year by year as a result of oxygen depletion. Irrigation has also been adversely affected by the deteriorating quality of water of the River Karnapuli.

- The volume of shipping in the Bay of Bengal and the lack of control over waste disposal and tanker flashing represent a high potential for Pollution of mangrove forests such as Sundarbans.

- Lack of emergency response system and general preparedness for major releases and accidents along the coast are causes for concern.

- Absence of services for isolated groups of coastal people. All along the coast are families and villages of people who are isolated from normal community services such as education, drinking water, health clinic, etc. A special effort will be required to "de-marginalize" these people.

- Pollution of the marine and coastal environment arises due to disposal of untreated municipal and industrial waste (including oil and grease from ship breaking activities) and sewage.

- Concentration of industry in specific areas causes localised pollution from a variety of untreated wastes.

- The lack of regulatory control and facilities for the disposal of ship wastes leads to substantial localised pollution from bilge and trans-shipment of materials and resources such as oil.

- The volume of shipping in the Bay of Bengal and the lack of control over waste disposal and tanker flushing represents a high potential for pollution of mangrove forests such as the Sundarbans.

- The lack of emergency response systems and general preparedness for major disasters and accidents along the coast are a cause for concern.

- Uncontrolled tourism development and exploitation of marine resources for the tourist trade threatens unique marine habitats within Bangladesh.

- High population densities along the coast and upon coastal islands lead to environmental degradation and loss of natural habitats, flora and fauna

- Minining of reef materials, sand,gravel and coastal rock formations increases the rate of

marine erosion in some areas.

- Deforestation of mangroves due to shrimp farming affects coastal defaces, adversely affects marine fisheries production and leads to a loss of biodiversity (especially animals) and of livelihood to over 5 million people who depend on mangroves.

- Lack of coastal management strategies and land use plans for specific coastal areas has lead to unplanned development and widespread environmental degradation.

- Failure to implement wildlife and habitat protection measures in mangrove forests has lead to continued decline in biodiversity.

- Absence of an environmentally sustainable tourism development strategy prevents development of the industry and an economic return for habitat protection measures.

- Evidence of top-dying of sundri trees appears to be linked to reductions in the discharge of coastal rivers which is due to over-abstraction for irrigation purposes.

- Closure of coastal rivers due to flood control and drainage measures has affected migratory fish populations such as hilsa.

- Unclear responsibilities for the management of char lands leads to their premature colonisation preventing their stabilization through vegetation and forest development, and natural soil development (which could support agriculture).

CHAPTER -5
ATMOSPHERE AND CLIMATE

5.1 Introduction

Bangladesh is situated at the confluence of the Ganges, the Brahmaputra and the Meghna rivers, which drain the Himalayas and empty into the Bay of Bengal forming the world's largest delta, with one third of the country less than 10 meters above sea level. There are only a few small tracts of higher land in the north and southeastern part of the country. The southeastern region consists of an older delta with numerous dead or cut off rivers. The coastal part of this region harbours the single largest stand of mangrove forest in the world.

Bangladesh lies in tropical monsoon region to the south Eastern Himalayas. These mountains act as a barrier and modify the climate of the country to a large extent. Due to the Himalayas the country is saved from the rigors of the cola Siberian winds. The tropical monsoon climate is characterized by heavy rainfall during monsoon season and little or no rainfall during the dry winter months. The wind direction reverse from northeast in winter to southwest in summer.

Bangladesh has seasonal rainfall, divided into four period. During monsoon period (June - September) the rainfall varies between 1250 mm to 3700 or more. Pre and post monsoon rainfall varies between 200 mm to 900 mm and 100 mm to 300 mm respectively. During the winter months (December - February) rainfall occurs less than 90 mm.

Like rainfall, temperature also exhibit seasonal variation. Normal maximum temperature in the summer months vary between 30.50^0C to $36,50^0$C with temperature occasionally exceeding 37.70^0C during April and May. Zones with five days or more extremely high temperature exceeding 40.0^0C lie in the western part of the country. But rest of the country, such temperature are rarely experienced. At Dhaka, the average is 1 day in two years.

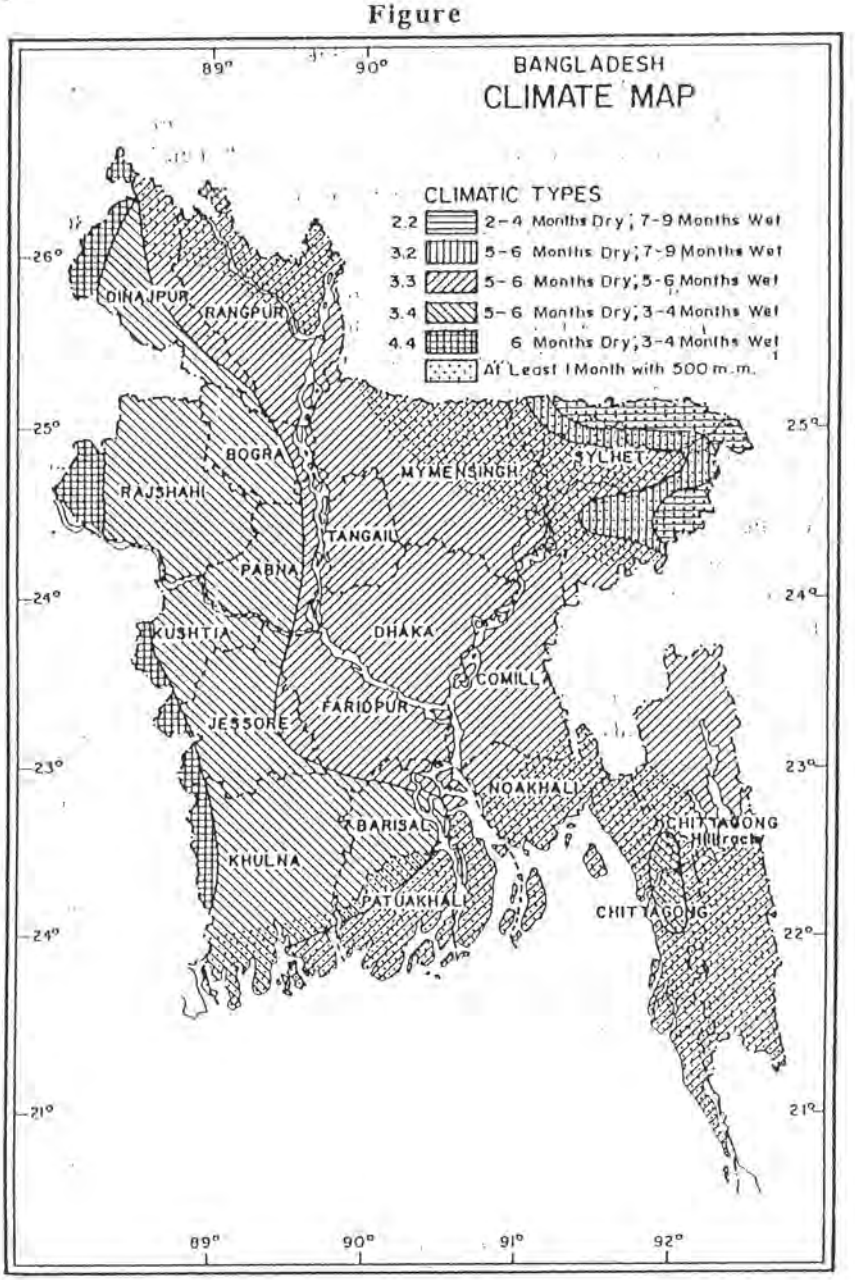
The significant of these extremely high temperature is that they create a very high potential evapotranspiration (PET) demand which plant root may not be able to satisfy, especially in kharif (monsoon) crops at the seedling stage. The occurrence of such high temperature - almost always accompanied by very low humidity and often by a strong mid-day windcap prevent pollination of HYV Boro paddy (winter rice) if they occur when crops are in the panicles initiation or flowering stages, resulting in sterile heads. Accompanying high temperature in shallow water standing on Boro paddy fields can also reduce crop yield if they occur at the panicle initiation to grain setting stages.

The winter months are characterised by minimum temperature seldom falling below 10.0^0C and that only in Chittagong Hill Tracts, south Sylhet and North Bengal. It is important to note that, the longer the mean daily temperature below 20.0^0C or minimum temperature are below 15.0^0C , the greater is the climatic suitability for temperature crops, such as, wheat, potato, mustard and lentil to be grown. Conversely, minimum temperature below 20.0^0C may interfere with pollination in aman paddy and minimum below 15.0^0C retard the vegetative growth in HYV boro paddy; however, the performance of local boro paddy varieties is less affected by cold than that of existing HYVs.

As has been already mentioned the country is mainly an alluvial deltaic plain with plain topography and lot of rainfall and sunshine. It is a developing country and still primarily an agricultural with limited industrial development. Number of automobiles compared to the number of people is still few. The neighbouring countries in the immediate neighbourhood are not that urbanised and industrialised and the apprehended quantity of transboundary pollution seems not that significant, though it is not quantified yet. Overall all there facts are mostly favourable for a good quality air environment in the country and the air quality in general is still very good with very little exception.

CLIMATE MAP

Figure



5.2 Global climate changes and their impact in Bangladesh

Global Warming

For Bangladesh , the environmental implications of a rise in global temperatures due to the emission of greenhouse gases (CO^2 CH4, N20, etc.) is likely to be significant. Bangladesh's own contribution to `greenhouse' gas emissions is relatively minor. Industrialisation is low and the majority of industries are small or cottage based. Regarding non industrial sources, the volume of methane emanating from irrigated paddy fields (23.5 million acres of total cultivable land) and from livestock slurry (21 million cattle heads) can be considered to be only marginal contributions.

A rise in global mean temperature is predicted to result in two principal environmental impacts both of which will have implications for Bangladesh

* rising sea levels
* climate change

Rising Sea Levels

Under the global scenario of `Business as Usual'(which includes the incorporation of measures to abate emissions), one prediction is for global temperatures to rise by a rate of 0.4^0C/decade. Associated with this magnitude of increase is predicted the medium to long term rise in mean sea levels - a result of the warming and expansion of ocean waters, the melting of mountain glaciers, and the melting of polar ice sheets. Under the same `Business as Usual' Scenario, a temperature rise of 0.4^0C/decade will correspond to a rate of sea level rise of 0.06 m/decade.

Projecting this rate of sea level rise into the future, the Intergovernmental Panel on Climate Change (PCC) predict a range of global environmental impacts which include :

- the inundation and displacement of wetlands and lowlands
- erosion of shorelines
- exacerbation of coastal storm flooding
- increase in the salinity of estuaries thereby threatening freshwater aquifers and impairing water quality
- alterations of tidal ranges in rivers and bays
- alteration of sediment deposition patterns
- decrease in the amount of light penetrating water bodies

The IPCC have stated that a simple measure of a country's vulnerability to sea level rise is the proportion of its population and productive land that is within a few meters of present mean sea level. Given that one third of Bangladesh is at an elevation of less than 10m above sea level, the potential socio-economic impacts (effects on health, livelihood and food security) resulting from a small rise in sea level could be extensive. For example, it is estimated that a 1 meter rise in sea level in the Bay of Bengal would result in 12-18% of the total land area of Bangladesh being lost, including the majority of the Sundarbans. It is also suggested that the land area normally subject to seasonal flooding would increase by 17% as higher sea levels slow the drainage of flood water. Furthermore, the affected area are likely to suffer significant increase in salinity both of soils and groundwater.

Although it is difficult to predict the timing and magnitude of global environmental changes, it is anticipated that one of the most serious consequences for Bangladesh would be a potential reduction in the land/person ratio. This reduction would increase pressure on remaining land and natural resources and create a trend towards rural to urban migration. It is estimated that a 30% reduction in land availability due to sea level rise would displace 30-40% of the population.
Climate Change.

Global warming is also predicted to result in modifications to atmospheric circulation patterns, bringing alterations in the frequency and seasonality of precipitation. Predictions for the year 2030 made by four General Circulation Models all suggest increased precipitation over. Bangladesh, with estimates ranging from 5 to 100%. Such changes in the water cycle will likely affect water availability, agricultural activity, flood protection practices, infrastructure planning and natural habitats.

It is quite possible that Bangladesh may also experience an increase in severe weather - related events such as droughts, floods and severe tropical cyclones. One global estimate is that an effective CO2 doubling will increase the intensity of tropical cyclones by as much as 40%.

CHAPTER -6
WASTES TOPIC AND HAZARDOUS CHEMICALS

6.1 Introduction

Bangladesh is not an industrialised or highly urbanised country and mining activities are very limited too . Subsequently generation of toxic wastes and hazardous chemicals , though on the increase but still not of very significant amenity or threat except for a certain and localised cases. Even generally the wastes produced by industries in Bangladesh are of Primary types where the pollutants are mostly biodegradable, through in recent times, problems of hazardous toxic wastes from chemical industries electroplating, fertilizer, tanneries, textile processing, paper mill and Other chemical industries tend to gradually become matter of environmental concern.

6.2 Preset status

Information on types of chemicals used and hazardous wastes generated is still extremely limited while that on quantities generated is practically non-existent.

The inventories of toxic chemical users and hazardous wastes generators in Bangladesh are still preliminary and presented in Table- 1 & 2 for major industries and the list does not include information on hazardous wastes from small and cottage industries.

According to preliminary estimates, there are about 480 (the actual number may be larger) organized large sector industries in Bangladesh using approximately 40 types of chemicals. They are mostly located in the large towns of Dhaka, Chittagong and Khulna. Large quantities of chemicals, such as chlorine, ammonia, inflammable petroleum products, technical grade highly poisonous pesticides and solvents are used, stored , handled and transported through populated areas without any safety codes.

Out of the 480 industries, 19 units (urea - 6, TSP -1, chlor-alkali-1, pesticides - 10 refinery -1), have inadequate or no safety or risk management plans and have potential for large - scale accidents. Ten units are very close to the populated area. Some of these installations are 15 to 20 years old with obsolete systems and are surrounded by slums with large populations at risk.

Highly toxic imported chemicals are transported through populated areas without safety codes or emergency preparedness in a manner which would never be allowed in the countries of their origin. Reportedly, accidents involving transport of these chemicals have occured, (the latest one on 9 February 1993 involving chlorine cylinders near Chittagong killed six persons and injured an unknown number).

Inspection of the industrial units indicates numerous safety shortcomings in their installations. The managements do not appear to be fully aware of the chemical safety requirements. The equipment and installation, being 15 to 20 years old, were designed when safety requirements were very basic, and create a potential for serious large-scale accidents.

No units have any emergency response and action plan for accidental release of toxic chemicals. Simple devices such as wind sock, detectors and alarms are absent even in new units. The local administration and the factory management are not even aware of such needs.

The available information on hazardous wastes is limited to the recognized industrial units and no information is available on small- scale or cottage industries. According to the data obtained, 614 registered units (the actual number can be far higher), produce a variety of wastes containing 62 hazardous substances of both categories of high-risk toxic chemicals (cyanides, pesticides, chromium toxic sludge) and low-risk categories (such as phosphogypsum, fly ash and metalliferous slags) (Table - 2).

PHOTOGRAPHS

Outlet of chemical wastes from Tanneries at hazaribagh area of Dhaka.

Smoke from brick burning

PHOTOGRAPHS

Vehicular Black Smoke

Outfall of sewer being discharged directly without treatment.

The most dominant sources are major tanneries - 160, fertilizer -1, pharmaceuticals -185, and chloro alkali plant-1. About two hundred tanneries generate about 4000 m3/day of highly toxic waste. The chloro alkali unit using graphite electrode uses 900 g of mercury per ton of alkali as against 55-65 g used elsewhere. About 75 per cent of the mercury consumption of about 4 t/yr has been reaching Karnaphuli river for the last 26 years, totalling about 78 tons. This is just a preliminary sketch of the situation as no data regarding the quantities generated and methods of disposal are available on wastes from hundreds of small units containing acids, chromium, zinc, copper, nickel, etc.

It is reported that every year 6000 tons of crude oil from spills and 240000 gallons (600 M^3) of bilge water from ships is dumped into Karnaphuli river and Chittagong Harbour, creating severe estuarine pollution. This has serious implications for fish and other primary aquatic life.

Wastes from 12 governmental hospitals, it appears , are routinely disposed of with the cities domestic wastes. Barefooted scavengers who hand -pick salvageable materials from the dumps are subject to the risk of infections with HYV and hepatitis -B viruses and other infectious diseases (Table -2).

6.3. Other issues of concern

The Department of Environment is greatly concerned about the management of toxic chemicals and hazardous wastes, but its organizational set-up does not show any programme or designated responsibility to any group, unit or individual for toxic chemicals and hazardous wastes. The major responsibility of DoE is to implement field programmes to manage the environment by enforcing the control measures. This is not reflected in the planned organizational set-up as it does not include monitoring and enforcement activities with necessary laboratory and field work capacities.

DoE does not at present have adequate laboratory facilities for monitoring and enforcing control measures: The efforts to utilize available facilities from other laboratories in Bangladesh, such as the Bangladesh Agricultural Research Council (BARC) and the Bangladesh Atomic Research Centre, have not met with much success due to delays in obtaining results.

Out of the 45 pieces of legislation concerning environmental issues, only 11 are relevant to toxic chemicals and hazardous wastes. Others are enacted for different objectives as shown in their titles. The Environment Pollution Control Ordinance of 1977 does not have any direct reference to toxic chemicals or hazardous wastes.

Manpower skills for risk assessment and risk management for toxic chemicals and hazardous wastes are urgently needed, since only a few in industry are aware of the risks involved. Regulatory agencies do not have such skilled staff nor are these skills readily available among the young graduate engineers or scientists. No courses in university or non formal programmes on this subject are available in Bangladesh.

Promotion and application of clean technology for industries using toxic chemicals or generating hazardous waste has not been emphasized as a management tool, particularly for new and upcoming industries.

Land use planning, requirements of safety or buffer zones for industries classified as hazardous to public health or the environment are not enforced, though many developed and developing countries have been enforcing them for new industries for the last many years.

The National Environment Policy draft of 1992 overlooks issues of toxic chemicals and hazardous wastes in its article on industry, though it does not mention the use of environmentally sound and appropriate technology.

Research and development of indigenous technology for environmental pollution and hazard control does not find a place in NEMAP or environmental policy drafts. It is a vital national activity.

Table -1.

Preliminary list of Industries using, handling and storing toxic chemicals in Bangladesh.

Sl No.	Trade/Industry	Chemicals	No.
1.	Acid Handlers Suppliers	Nitric Acid, Sulfuric Acid, Oleum, Hydrochloric Acid, Phosphoric Acid.	6
2.	Adhesives & Glue makers	Methylethyl, Ketones, Toluene, Acetone	5
3.	Bleaching Powder	Chlorine	3
4.	Battery Manufacturer	Lead, Sulfuric Acid	36
5.	Chloro Alkali (Caustic Soda)	Chlorine, Mercury, Hydrogen Gas	1
6.	Fertilizer N.P.	Ammonia, Carbon Monoxide, Phosphoric Acid, Sulfuric Acid	7
7.	Paint and Varnishes	Solvents, Metalic oxides of Pb, Ti	20
8.	Pesticides	Benzene, Toluence, Butane, Organo phosphorous materials	16
9.	Pharmaceutical	Oranic Chemicals	185
10.	Industrial Chemicals	Sulfuric Acid, Sodium silicate	21
11.	Plastics	PVC Solvents, Phatalates	80
12.	Rayon Manufacture	Mercury, Chlorine	1
13.	Synthetic Foam	Cyanates, solvents	3
14.	Transformers	PCB Stabilizers	3
15.	Vegetable oil, Vanaspati Ghee	Hydrogen	8
16.	Textile dying & Printing	Toxic dyes	85

Source: WHO (1993)

Table-2 : Preliminary list of Hazardous waste Generating Establishments in Bangladesh.

Sl No.	Name of Industrial Sector	No. of Industry
1.	Fertilizer	7
2.	Drugs and pharmaceuticals	185
3.	Tannery	160
4.	Paint, varnishes and lacquers	34
5.	Caustic soda	1
6.	Disinfectants, insecticides and pesticides	16
7.	Dyes, pigments and colours	1
8.	Synthetic foam	3
9.	Industrial gas (nitrous oxide, carbon dioxide)	3
10.	Industrial chemicals (sodium silicate, sulphur, potasium chloride, sulphuric acid, chlorine, etc.)	21
11.	Duplicating and offset printing ink	8
12.	Vegetable oil refiner	72
13.	Soap and detergent (mechanized)	25
14.	Steel and special alloys	8
15.	Transformers	9
16.	Vanaspati ghee	8
17.	Iron and Steel rolling mills	10
18.	Pulp and paper	10
19.	Printing press	41
20	Government and private hospitals	12
Industries Total		626
No. of chemicals released		62

Source :WHO (1993).

CHAPTER -7
NATURAL DISASTERS

7.1. Introduction

Throughout the world, Bangladesh is known for its vulnerability to natural disasters.

The major natural disasters to which Bangladesh is subjected are cyclones, tornadoes, floods river bank erosion and droughts etc.. In the past major earthquakes have occured. Table-1 lists major disasters over the last 350 years.

7.2 Floods

In Bangladesh, flooding is very much a part o the normal cycle of the seasons. A delta cannot develop physically without flooding and it is to floodwaters bearing plant nutrients in the form of dissolved and suspended solids that much of Bangladesh's fertility can be attributed. Each year, about 26,000 sq. km. i.e., 18% of the country is flooded. During severe floods, the affected area may exceed 52,000 sq. km i.e., 18% of the country is flooded. During severe floods, the affected area may exceed 52,000 sq. km. i.e., 36% of the country and nearly 60% of the net cultivable area. In an average year, 775 billion cubic metre of water flows into the country from June to September through the three main rivers.

Bangladesh experiences mainly four types of floods. They are :

1. Flash floods characterized by sharp rise and fall in water levels causing high flows from nearby hills/mountains that damage crops and property.
2. Rain floods due to high intensity rainfall over Bangladesh. Due to inadequate drainage capacity, such rainstorm of 3 to 10 days duration sometimes cause localized floods inundating crops, houses and roads.
3. Floods arising from storm surges due to cyclone in the coastal areas.
4. Monsoon floods from overspilling of rivers especially the major rivers which usually rise slowly. Major floods occurs when the peak flow of Ganges coincides with that of Brahmaputra.

For two consecutive years, 1987 and 1988, Bangladesh has been deluged by exceptionally severe floods. Both these catastrophic floods attracted worldwide attention and concern. The 1988 flood was generated by intensive rainfall extending over north-east of the sub-continent. The flood peak of the Brahmaputra was the highest ever recorded. The flood peak of Ganges was also severe and most significantly, the two peaks usually coincided, with devastating effect on the country. The frequency of 1988 flood peak of Brahmaputra at Bahadurabad was in the order of 100 year event.

Devastating effects of 1988 flood were enormous. It inundated more than 90,000 sq. km of land area affecting nearly half of 110 million population, with 2300 deaths. Damage to the standing monsoon rice crop was about 1.6 million tons. Many schools, houses, livestock telecommunications, roads, railways and railways and bridges were damaged or destroyed. Production in much of the country came to a standstill. Lines of communication were disrupted for over a month. Capital stock losses were well over US$1 billion and GDP growth was setback severely.

The occurrence of catastrophic floods in two consecutive years, necessitated close examination of the possibility of occurrence of simultaneous major peak in the rivers involved. In a recent study, a detailed analysis involving the date of occurrence of the major yearly peak has been carried out for several stations of significant interest. The major findings of the study are :

* A first flood event occurs frequently around August 8, such a situation is associated with normal occurrence of floods on the Brahmaputra.

* Second flood event happens classically around September 2 which corresponds to the period of the Ganges yearly peak.
* Likelihood of having simultaneous highstages on both the rivers is quite high and it depends on the date of occurrence of the Brahmaputra peak flow.

Based on above findings the flood events of Bangladesh can be classified into two types :

1. Type A flood (Late Brahmaputra peak): Major flood occurs when the Brahmaputra peak usually occurs around September 2 (+12 DAYS) which is also the very day with yearly peak for the Ganges.

2. Type B flood (Normal Brahmaputra peak). This type of flood occurs when the Brahmaputra peak occurs, on average on around August 9 whereas the Ganges is 26 days late with respect to the Brahmaputra with its occurrence on around September 6.

Flood data show wide annual variations in flood area as illustrated by the exceptional floods in 1987 and 1988. Extensive river floods cause great disruption and damage to infrastructure, and the loss of crops and other property can be the `last straw' for subsistence farmers and others already struggling to survive. Modified cropping has reduced reliance on aman and other crops vulnerable to monsoon flooding.

Flash floods cause considerable localized damage to crop, fish ponds, property , and infrastructure, particularly in the north, north east and east of the country.

7.3 Cyclones

Cyclones originating from the Bay of Bengal are the most devastating disasters threatening the coastal districts of Bangladesh. In the last thirty five years, they have been responsible for the largest number of disaster related deaths as well as considerable losses to agriculture and damage to infrastructure in the coastal areas

The coastal regions are subjected to damaging cyclones almost every year. Because of high density of population occupying a flat deltaic area north of the funneling tidal estuaries, the loss of human life and property has at times been very great. The severe killer cyclones develop during spring and autumn, of which 75% occurs strictly from 15th April to 15th June and 15 September to 15 December (see Table -2). A comparative study of monthly frequency of tropical cyclone for the period 1891 -1960 against subsequent 14 year period (1961-1974) clearly indicate that in every month, the frequency of tropical cyclone during the latter period (i.e. 1961 -1970) is significantly greater than that of pre-satellite period as shown in Table -3 (Chowdhury 1977). Although tropical cyclone frequency during 1975-1988 is slightly less than that of 1961-1974 period (except in the month of November), but it is higher than the period 1891-1960.

Storm surge associated with tropical cyclones is one of the most serious problems in the coastal areas of Bangladesh. Records show that world's most pronounced storm surge disasters are observed in the Bay of Bengal. The impact of the cyclone of November 1970 was particularly severe. A wave of upto 9 m high was produced by this cyclone and is thought to have killed over 300,000 people.

Table - 2 : Monthly Distribution of Tropical Cyclones in the Bay of Bengal

	J	F	M	A	M	J	J	A	S	O	N	D	Total
Moderate tropical Cyclones (a)	3	0	2	11	10	30	31	24	1	3	33	17	214
Severe tropical cyclones (b)	1	1	2	7	18	4	7	1	8	19	23	9	100
Tropical cyclones (A+B)	4	1	4	18	28	34	38	25	2	53	56	26	314

Source: Ananthakrishnan & Rao. 1964 as quoted by B Chowdhury MHK, 1977

PHOTOGRAPHS

Demaged trees by cyclones at coastal area of Chittagong.

Paddy is collecting from under water by a tribal women in a flooded area of Sherpur district.

Table - 3: Frequency of Tropical Cyclones with Winds>35Kt

(Number per month)

Period	April	May	Sept.	Oct.	Nov.	Dec.	Total
1891-1960a	0.26	0.40	N/C	0.76	0.80	0.37	2.70
1961-1974b	0.14	0.86	0.79	1.07	1.29	0.64	4.00
1975-1988b	0.07	0.50	0.29	0.86	1.36	0.36	3.86

Source Mahtab 1989

Experience has shown that coastal embankments and associated afforestation can reduce losses and damage. There is also the recognition of the life-saving potential of shelters and any form of pucca building, provided they are sufficiently accessible and people understand the seriousness of the threat and move to shelters in time.

7.4 Drought

The consequence of drought can be as far reaching and disastrous as the effect of major flood. In 1975, Bangladesh had a major drought when about 47% of the area and 53% of the population were affected. Bangladesh also experienced severe drought conditions in 1951, 1958, 1961, 1979, 1981, 1982 and in 1989.

Although annual rainfall ranges from 1400 mm in the dry Rajshahi (North -west) region to cover 5000 mm in the wet Sylhet (North -east) region, but about 80% of the precipitation generally occurs during four months from June to September. Therefore, droughts of various intensity occur in almost all parts of Bangladesh during the eight months from October to May. Droughts are particularly severe in the North west and South -west part of Bangladesh where monsoon rain occurs for about three months as compared to 5 months in the north-east.

In Bangladesh, in fact, droughts of different intensities occurs both in wet season (kharif) and dry season (Rabi). During Kharif season about 0.574 million hectares of T. Aman crops (main rice crop) are very severely affected by drought and more than 1.748 million hectare of T. Aman crops are severely affected by drought. The areas under different intensity of drought for one in five year drought period during July-October are shown in Figure 4.

The effect of soil-moisture on crop yield depends on stress day index, SDI (which is the ratio of number of stress days during a particular growth stage of the crop and duration of growth stage), crop susceptibility factor CS, and normal achievable yields in the farmer's field. The crop susceptibility factor CS indicates crop susceptibility to a given water deficit at each growth stage (GP) of the crop development and stress day SD is the number of those days during which the actual evapotranspiration is less than PET.

Maximum CS factor 0.59 for HYV rice occurs during the 10-days heading to milk period. The next highest CS factor of 0.48 occurs during 30-days period between panicle initiation to heading. For wheat most susceptible period occurs during booting to flowering period (CS value 0.58) which is slightly higher than that during joining to boot stage (CS value 0.57). For T. Aman maximum stress occurs in the district of Rajshahi, Jessore and Bogra. Although these districts have high achievable yield potential due to very favourable temperature and sunshine during growing period of T. Aman, but higher intensity of drought reduces the achievable yield potential to a great extent. Yield loses may exceed 50% of achievable yield. In general, yield losses are mostly in between 45 to 60% in the very severe drought areas (Table 9.1). In the severe areas, yield losses vary from 35 to 45% depending on rainfall, soil types and planting time of the crop. In moderate drought prone areas in the district of Dinajpur, Rangpur, Bogra, Kushtia and Jessore yield losses range from 20 to 35%. The minimum yield reduction (8%) is likely to occur in the wettest district (Sylhet) of the country.

Table 4. Intensity of drought, Yield Reduction and Supplemental Irrigation Needs of Modern T. Aman Rice Cultivars.

Classes	Area (ha)	Present Avg. Yield (t/ha)	Reduction Over no stress yield (%)	Stages Vulnerable to moisture stress need (cm)	Supplemental Irrigation	Yield with no stress (t/ha)
Very severe	573534	1.7-2.5	>45	Preplanting, tillering, PI to milking	30-40	4.5-5.5
Severe	1747597	2.0-2.8	35-45	Preplanting, PI to milking	20-30	4.0-5.0
Moderate	2178263	2.5-3.5	20-35	PI to miling	15-20	4.5-5.5
Slight	2595363	3.0-4.0	<20	PI to milking	8-10	3.5-5.0

* In case of desired early planting in June/July.
**With limited irrigation practiced by the farmers
Source: Karim et. al., 1990 BARC Soils Publication No. 3.

Yield reduction of T. Aman crop can be reduced considerably by adjusting planting time, and improved management of dyke height with rain water. Early planting allows the crop to grow mostly within the monsoon period, thus, the crop experiences minimum stress. With increasing the dyke height up to 200 mm. as against 100 mm. the yield reduction could be reduced up to 25 per cent. This practice offers an excellent opportunity to reduce moisture stress effect on T. Aman crop.

During Rabi season, major crops grown are wheat, potato, mustard, Boro rice, vegetables and pulses. At the time of rabi growing period (mid-October to late February) precipitation is minimal whereas during pre-kharif transition period (24 March to 18 May) rainfall is irregular and unreliable. Due to this unfavourable agroclimate, rabi crop in general suffers from moisture stress except for HYV Boro paddy which is generally irrigated. Soil moisture stress during pre-kharif transition delays sowing of Aus and Jute. Aus and sugarcane suffer from drought at their early stages of growth while non-irrigated crop suffers drought during the later part of the dry season.

Yield reduction under different drought intensity for wheat, potato, mustard and Broadcast Aus paddy is shown in Table -5. Yield reduction under very severe drought condition ranges between 50 to 70%. On the other hand, in severely drought affected areas, mainly due to relatively favourable soil moisture situation, yield reduction varies from 30 to 70% depending on crop and time of planting. In moderately rough prone area, depending on topography, type of crop grown and soil characteristics, yield reduction varies from 20 to 60%. The area under less moderate class though have on average few days of >40^{0}C temperature but because of low moisture holding capacity of the soils of hills and char lands suffers from water stress affecting yield to the tune of 10-50%. Northern and eastern part of Bangladesh is under slight drought prone class. Crop's grown during rabi performs well, but due to adverse agroclimatic behaviour yield loss may vary from less than 10 to 40% in extreme cases.

Table-5: Intensity of Rabi and Pre-kharif Droughts and Yield Reduction of Crops

Classes	Area (ha)	Per cent of yield reduction of crops			
		Wheat	Potato	Mustard	B. Aus
Very Severe	363855	60-70	>70	>50	>40
Severe	864063	50-60	60-70	40-50	30-40
Moderate	3284698	40-50	50-60	30-40	20-30
Less Moderate	1457740	30-40	40-50	20-30	10-20
Slight	4352410	(30	30-40	(10	

Source: Karim et. al. 1990, BARC Soils Publication No. 3.

7.5 Tornadoes

A tornado is an intense atmospheric vortex, violently rotating tall, narrow column of air that occasionally extends to the ground from a cumuliform cloud. They are more common in the central part of Bangladesh and 76% of them occur during pre-monsoon period (See table -6)

A severe tornado razed some parts of Dhaka district in 14 April 1969. According to the official version received upto 30 April 1969,922 people died, 16,511 people were injured, 119,944 houses were completely destroyed, and 125,876 families were affected (Chowdhury 1985). A more recent tornado (26 April 1989) affected 6 Thanas of Manikganj, Dhaka and Tangail districts and left over 100,000 people homeless, more than 10,000 people injured and 800 dead. The devastation brought by this tornado was so colossal that barring some skeleton of trees, there were no signs of standing infrastructure anywhere in the most affected areas.

Table -6 : Seasonal Distribution of Norwester and Tornado (1975-1979)

Name of Season	No. of Nor Wester & Tornado	Occurrence (%)
Winter	16	03
Pre-monsoon	397	76
Monsoon	28	17
Post-monsoon	22	04
Total	423	100

Source : The Role of meteorological Satellites in the Study of Local Severe Storms A.M. Chowdhury, 1985

7.6 River Bank Erosion

River bank erosion along many rivers, both major and minor, carried away land and destroys houses and other structures. Close to a million people are displaced every year as a direct result of erosion.

7.7 Earth Quake

A seismic Zone extends across the country and there is a risk of earthquake that could cause serious damage to infrastructure including embankments and other flood control structures.

7.8 Desertification:

A major problem that Bangladesh faces is that of too much water in the wet season and rain water flooding that acts as a limit on agricultural development, necessitating the cultivation of lower-yielding varieties and sometimes resulting in extensive damage to crops, livestock and infrastructure, and too little in the dry season (when irrigation is needed to intensify agriculture).

Surface water resources are used extensively for dry season irrigation. In addition, there are groundwater resources in the country which are tapped for irrigation and potable water. Groundwater resource potential is regionally variable and depends on recharge from monsoon rainfall and floods.

The twin problems of excess of water during the flood seasons and scarcity during dry periods which is heavily disturbing her ecosystems. As excessive rainfall and flood threats overhang as serious risks to agricultural production, so is aridity emerging as an important phenomenon impeding growth.

Shortage of water is created not only by withdrawal of water at the upper riparian, but there are also such factors as excessive seepage, inadequate shortage, inefficient use of surface and groundwater and the like that affect overall water availability for agriculture, fisheries, navigation, domestic and industrial purposes, shortage of rural energy and indiscriminate felling of trees for

firewood without adequate measures for their regeneration has been responsible for disturbance to the transpiration-evaporation cycles. Mean annual water loss due to evaporation and evapotranspiration in Bangladesh is stated to be about 142,000 Mm3, equal to 43% of the annual rainfall. If precipitation is caused to be adversely affected by the deforestation and desertification process as already visible in the NW part of the country, problem of net water availability is bound to be further compounded.

At present only 1.92 M ha is under irrigation and about 26% f the regional river flow is withdrawn for irrigation purposes. However main river water is currently used upstream for salinity control, fisheries and navigation. Ground water availability in March is about 29% of the total seasonal volume of available charge of 24,414 Mm3. Of this only 5054 MM^3 is used currently for irrigation, domestic and industrial purposes. Master plan heavily depends on ground water resource exploitation as well as use of easily available surface water. But success of the proposal depends critically on improvement of the water management practices, establishing workable correlation amongst deep tubewells, shallow tubewells, lowlift pumps, manually operated shallow tubewells without neglecting gravity flows and traditional practices. It is believed that currently there is considerable mismanagement and wastages in this matter.

7.9 Trends in Disaster Management

`Disaster Management' includes all aspects of planning for and responding to disasters. It refers to the management of both the risks and the consequences of disasters, and includes:

i) the incorporation of preventive/mitigation measures into overall development plans and activities at all levels in disaster prone areas: this may include structural and non-structural measures to reduce the risks of disaster occurring and the consequences of those that cannot be prevented;

ii) preparedness plans and related measures in disaster prone areas to warn people of imminent threats and organize appropriate emergency responses, when necessary: this includes forecasting, warning dissemination systems, and standing arrangements for evacuation and the organization of rescue, relief and short-term rehabilitation activities;

iii) emergency response to disasters when they occur, including rescue, relief, short-term rehabilitation (including repairs); and

iv) post-disaster reconstruction/long -term rehabilitation

This broad concept is relatively new. Many people understand `disaster management' to mean only the management of an actual disaster situation, i.e. to be concerned only with the response to disasters. The prevention/mitigation of and preparedness for disasters are considered separately.

For optimum effectiveness it is necessary to consider disaster management in its wider context in which disaster management activities may be divided into actions to be undertaken in normal time, in the emergency phase and during recovery phase as follows:

A. NORMAL PHASE

a) Prevention/Mitigation -Protection/Hazard Reduction

b) Preparedness -Forecasting and Warning
-Contingency planning
-Contingency planning for response

B. EMERGENCY PHASE

a) Warning	-Warning dissemination -Precautionary measure
b) Impact	-Rescue -Casualty care -Public health measures -Damage and need assessment -Restoring essential communication -Assuring shelter, water, food and clothing -Restoring/Rehabilitating essential services -Agriculture inputs/employment -Support to self help rehabilitation
Reconstruction/long term rehabilitation of damaged infrastructure and other economic assets	*Increased protection/reduced hazard *Increased proofing/reduction o vulnerability *Increased capacity

Strategies for Disaster Management in Bangladesh

a) **Prevention/Mitigation Measures**

The formulation of policies, and the planning and implementation of measures to prevent disasters, or mitigate their effects, are one component of integrated development planning for any disaster-prone area. They must be incorporated fully into the general development planning and management process at all levels, and be accorded due priority.

This include the follow-on programme including construction standards for buildings in flood/cyclone prone areas. Large scale programme of construction of pucca buildings and cyclone resistant huts, cyclone shelters and raised ground may be undertaken. Embankments, afforestation, roads life line, jetties in the coastline and offshore islands, telecommunications also fall in this category.

Disaster prevention/mitigation and preparedness measures should complement each other. Development co-ordination committee/bodies at all levels should focus on disaster risks, and the possibilities to reduce risks through prevention/mitigation measures and preparedness.

Preparedness and Emergency Response

At community level, the resilience, initiative and efforts of the people themselves are important (probably the greatest) resources in coping with and recovering from disasters.

During and immediately after a sudden disaster, rescue and survival depends largely on the coping strategies and capacities of the people themselves. Initial assistance to stricken communities then depends, during the first few days, on the mobilization of locally-available resources in all relevant sectors, from governmental and non-governmental agencies. Such relief operations typically involve telecommunications, water supply, medical care, public health, transport, storage, etc., in addition to the distribution of relief supplies. Preparedness, at local and national levels, should ensure effective, co-ordinated, inter-sectoral action.

The community as a whole should be involved in arrangements for preparedness, and the organization of emergency response (including evacuation and subsequent relief operations). Disaster preparedness and response should be the responsibility (at village/union level) of a committee comprising: all locally-posted government officers/extension workers; teachers ; religious leaders, elected representatives' NGO representatives including BDRCS (and CPP in coastal areas) and VDP. Enhanced public awareness is essential.

At district and thana levels, the civil administration (the DCs and TNOs) are, and should be responsible for ensuring preparedness and for the overall management (direction and coordination) of emergency response. This includes mobilizing locally available resources and requesting specific expert advice or material assistance (including financial sanctions) if and when required. They should have delegated authority to take initial action.

The Armed Forces have special capabilities in terms of communication and logistic equipment, and large numbers of trained and disciplined personnel who can be mobilized rapidly and operate effectively in difficult circumstances. These capabilities are particularly relevant and valuable in relation to large-scale search and rescue, initial reconnaissance, and initial relief operations, following a sudden disaster. The Armed Forces have always been very successfully involved in initial, post-disaster response. Standing arrangements in detail should be made to ensure that their capabilities are effectively used in support of the civil administration in the context of both preparedness and response.

c) Rehabilitation and Reconstruction

Short-term rehabilitation requires closely co-ordinated action within each sector (line agency) and between sectors at local level. Inter-sectoral priorities and co-ordination should be established at district level, by the DC and the district disaster management subcommittee (including people's representatives), under the overall guidance of the national-level co-ordination committee and specialist unit. Reconstruction/long -term rehabilitation, on the other hand, should be planned and managed in a manner similar to that of regular development projects using accelerate, "fast-track" procedures. Special arrangements are needed within the Planning Commission to ensure overall co-ordination of the reconstruction efforts, and expedite to action.

d) Co-ordination

Concerted action is essential in all aspects and phases of disaster management. It is important that action in all sectors and at all levels be in harmony, within the framework of agreed overall priorities, and that none are left unattended or lag behind. Clear, shared understanding of the competence and capacity of each body/agency involved is an essential prerequisite for effective co-ordination.

Reliable, up-to-date information on the situation and the progress of operations/activities in various sectors, and the capacity to analyze and synthesize that information, are prerequisites to effective co-ordination. The following will contribute to good co-ordination in emergency :

(1) Agreed written standard operating procedures and guidelines for specific contingencies, covering priorities, roles, responsibilities and authority of each actor.
(2) Data collection and reporting procedures specifying for each contingency precisely which agency will provide what information, when, and to whom, and by which primary and alternative routes.
(3) Quick access to senior decision-makers
(4) Attempts to plan activities to be as self-contained as possible.
(5) Regular direct contact between involved groups from different organisation task forces if possible; even regular teams. Horizontal linkages by both formal and informal contacts.
(6) Creative use of integrators: Chairmen of committees, task force facilitators and team leaders.

Major steps in Disaster Management

Bangladesh has well developed institutions and procedures for managing natural disasters and has made considerable efforts and been fairly successful in organizing disaster relief operations but, much is done on an `ad-hoc' basis rather than on the basis of advance planning.

The Standing Orders for Cyclone issued in 1985 and Emergency Standing Orders for Flood issued

in 1984 list pre-disaster responsibilities for many ministries and agencies, and assign specific preparedness responsibilities to Ministry of Relief (MoR), DCs, thana and union level authorities. A lot need to be done to implement them in the field by way of local orders, committee formation, local action plans and periodic exercises to test and refine the action plans.

The Government, in 1991, designated the MoR as `the focal point for the co-ordination of all disaster -related activities', particularly short-term repair and rehabilitation following the April 1991 cyclone. Specific mechanisms need to be established to promote preparedness activities and, to realize the objective of improved disaster preparedness. The newly created Disaster Management Bureau is expected to meet this requirement. Considering the role of the Ministry perhaps it will be more appropriate to name the Ministry as the Ministry of Disaster Management and Relief.

National -level forecasting arrangements exist for cyclones and floods, managed by the BMD and BWDB respectively. BMD operates the Storm Warning Centre, and BWDB the Flood Forecasting and Warning Centre/Information Centre. The main `preparedness' programme is that of the Cyclone Preparedness Programme (CPP), established by the Red Crescent (following the 1970 cyclone) and administered jointly by the Ministry of Relief and the Bangladesh Red Crescent Society (BDRCS). This has established an impressive mechanism for the dissemination of warnings with a view to ensuring timely evacuation of people form threatened coastal areas in the face of an imminent cyclone threat. Apart from this, much more need to be achieved by way of helping local communities or the civil administration to prepare for and cope with cyclones, floods, or other potentially disastrous events.

The Armed Forces, have Standard Operating Procedures (SOPs). The Ministry of Agriculture/Department of Agricultural Extension has issued departmental instructions. The Ministry of Health is developing an emergency preparedness and response programme, with Italian Government and WH(O assistance.

Following the floods of 1987 and 1988, a project for Comprehensive Disaster Preparedness was envisaged as part of the Flood Action Plan (as Flood Action Plan Project, 11, FAP : 11). The main objective and output of the project was to be the establishment of a special disaster management unit. This unit was to plan and co-ordinate disaster-related activities. Twenty six studies are currently in progress on Flood Action Plan (FAP).

National Policy on Disaster Management (Draft)

The Government in the Ministry of Relief has recently drafted a national policy on disaster management. This is now being under active consideration of the government for adoption and implementation. The salient features of this policy are as follows:

Introduction

This emphasizes the colossal loss sustained by the country almost regularly by different natural disasters and the need to have a comprehensive policy for their appropriate management to reduce the impacts.

National Level Committee

The policy recommends three national level committee to determine appropriate policies, take timely decisions, and ensure supervision and coordination. These are :

*National Disaster Management Council
*National Disaster Management Advisory Committee
*Inter-Ministerial Disaster Management Coordination Committee

Responsibility of Ministry of Relief and its affiliate agencies

The policy proposes the Ministry of Relief to work as the focal point for implementation of the policy recommendations. It also fixes the responsibility of (a) Department of Relief and Rehabilitation , and (b) Disaster Management Bureau.

Role of All Concerned Ministries and Agencies

The policy recommends formulation and issue of standing orders by different ministries/agencies at national, district, and thana levels. These standing orders relate to -

* normal times
* during emergency
* post disaster recovery

Disaster and Environment

The policy emphasizes on the requirement to ensure that the steps to be taken for disaster management do not create any adverse impact on the environment. It also proposes for Environmental Impact Assessment at project design and apprisal stages and also at approval stages of the projects to be taken for disaster mitigation.

Disaster Action Plan

The policy also proposes a Disaster Action Plan. It recommends for closer coordination among all concerned specially between Disaster Management Bureau and Department of Relief and Rehabilitation.

Inclusion of Disaster Management in the Academic Curricula

The policy proposes inclusion of Disaster Management Curricula at School, College and University levels.

Control of Habitation in newly accreted Chars/Islands

The policy proposes controlled and planned habitation in the newly accreted Chars/Islands specially in the Coastal Areas.

Disaster Management as a Social Movement

The Policy proposes to convert disaster management steps into a social movement through creation of mass awareness, motivation and active participation at all levels - government, non government, and private.

Some Other Initiatives

Coastal Afforestation

Since the early eighties, the Forest Departments is undertaking plantation of Mangroves in all the newly accreted Chars/Islands in the Coastal Areas. So far it has planted more than 2 lacs acres of newly accreted lands with mangrove species. These new plantations are working as effective shelters against cyclones and coastal tidal bores. The on-going Forest Resources Management Project has a target of planting another 80 thousands acres of newly accreted land with mangrove varieties.

Coastal Green Belt

The Ministry of Environment and Forest has recently undertaken a study with the help of ADB for the establishment of Greenbelt along Coastal Areas through plantation of coconuts, other palms and other suitable tree species. The study report is under active consideration of the government and is likely to lead to the formulation of an investment project for creation of a coastal green belt in the immediate near future. Protection of the coastal areas from the severe impacts of natural disasters is one of the primary objectives of these proposed Coastal Green Belt Project.

Integrated Coastal Zone Management

As a follow up of the World Coast Conference held in the Netherlands in 1993 and also as a result of growing regional cooperation in the South Asian Seas Region, the Government of Bangladesh is working to formulate and implement pilot projects for Integrated Coastal Zone Management in the near future. Technical and Financial Assistance is expected from the Government of Netherlands, UNEP, ESCAP, and SACEP. Disaster Management is one of the main issues to be addressed through these proposed pilot projects with the active participation of the local people.

Recommendations

With in the framework of the given social, political and economic parameters the following recommendations are made:

* Believing in the philosophy of "Living with natural disasters" appropriate system of warning, forecasting and preparedness programme should be developed in the country.
* The reliability and accuracy of various natural disasters related data in the fields of geo-agro-hydro-meteorological, topographical and environmental aspects should be ensured at the various stages of operations in natural disaster management
* Conception and participation of the local people should be sought in the disaster management process through strengthening the institutional capability of the concerned agencies and developing interactions between the various target groups including decision-makers, planners, administrators and people at the grass-root level.
* Technical capability and sophisticated methodology should be developed in the management of natural disasters through appropriate human resources development, know-how and technology transfer and information-data-base system.
* Close interfaces and linkages between different disaster related institutions and much more collaboration should be streamlined for disaster management.
* Disaster management systems, both formal and informal should be institutionalized through appropriate action-oriented programmes like erecting shelters, embankments, afforestation, income-generating activities etc. on site-specific approaches.
* Continuous monitoring and research in the disaster management methodology and procedural technology on subject-related natural disasters like floods, cyclones, droughts, etc. should be developed in the country.
* International collaboration, globally and regionally, should be developed in disaster management techniques through financial assistance, know how and technology transfer of related issues.
* Instruction manuals and emergency guidelines for various natural disasters should be adopted within a framework of a disaster Management Policy having interaction with other national policies promulgated in the country.
* Operation and maintenance and follow-up actions can be undertaken through direct involvement of the beneficiaries and local people.
* Mandatory Environmental Impact Assessment of all development projects, particularly Flood Action Plan (FAP) and Flood Control Drainage and Irrigation (FCDI) Projects should be undertaken.
* Formation of international network for exchange of information/data/expertise on disaster warning and management should be made.

* Mass awareness, public information methodology and mass-media activities should be strengthened, particularly. for disaster management, survival techniques and time-space - based action-oriented approaches, etc.

PART II :

CAUSES AND CONSEQUENCES

CHAPTER -8
POVERTY AND ENVIRONMENT

8.1 Introduction

The linkages between poverty and environmental stress have been highlighted for many years. At the 1972 Stockholm Conference on the Human Environment, Indira Gandhi, then Prime Minister of India, stressed that poverty was the world's greatest pollutant. This point was re-emphasised in the Brundtland Report a decade and a half later which described a "downward spiral of poverty and environmental degradation", whereby the poor are forced to draw unsustainably on available natural resources to satisfy immediate survival needs (WCED, 1987). Poverty can also stimulate greater population growth which in turn places further pressure on scarce resources.

Table 1: The state of Deprivation in Developing Countries

	Millions of Persons
People below poverty line	1200
Without access to health services	1500
Without access to safe water	1550
Without access to sanitation	2200
Illiterate adults	1200
Malnourished children under five	177
Children dying before age five	14.4
Children not in primary or secondary school	330
(of which female)	200

Source: UNDP, Human Development Report, 1991.

8.2 Linkages of Poverty and Environmental Degradation

The processes which create and perpetuate poverty and environmental degradation are closely interlinked. There are general poverty processes common to most developing countries. These processes influence the level of resources available to the poor and the way in which these resources are managed. Each of these processes increase poverty which in turn can result in the adoption of unsustainable patterns of resource use leading to environmental degradation. Environmental degradation, itself a poverty process, provides a feedback loop.

The Dualistic Process in which historical patterns of land division persist, with most high potential land resources pre-empted by large, export -oriented commercial farms, forcing small farmers to practice subsistence farming on marginal lands. This process is most strongly evident in Latin America, and to a lesser extent in Africa. In Asia, the dualistic process has been manifested in the uneven distribution of benefits from the "Green Revolution" which missed the landless, the marginal resource poor farmers and rural women. Subsistence farming in marginal areas operates without technical, institutional, or policy support resulting in a vicious circle of poverty and environmental degradation.

The Demographic Process in which high population growth promotes land scarcity and creates pressure on the natural resource base leading to increased poverty. Through various feedback mechanisms the population process is self-generating and perpetuating. The process represents a major constraint to the attainment of sustainable agriculture.

The Policy Process in which policy biases militate against sustainable agriculture in the smallholder sector. Policy biases exclude the rural poor from sharing in development and amplify the effects of other poverty processes. These include the urban bias, the export crop bias, pricing policies which set the terms of trade against local crops, subsidies to capital intensive sectors, subsidies for import intensive technologies, and the heavy indirect and direct taxation of small-farmer export

crops. The policy process constrains the ability of small farmers to make the transition towards sustainable agriculture.

Interlinked Processes in the land, labour, capital and product markets which keep employment and wages down, interest values high, and returns to land below its potential. The labour markets operate in such a way as to lead, on the one hand, to labour shortages for local crop production (due to outmigration or commercial employment) and on the other, to seasonal unemployment. In the product markets, the poor are subjected to "exploitative intermediation" by land owners, money lenders and traders. These processes hinder capital accumulation among the poor and force a drawing down of natural capital.

International Processes which are beyond the control of the poor and also of developing countries themselves. Some of the relevant factors include: fluctuations in international interest rates and commodity prices; debt repayment burdens; and protectionist agricultural policies. These processes tend to set the terms of trade against the small farmer and reduce the incentive to invest in sustainable agriculture.

Processes linked to Administrative Controls and Institutional Rigidity Institutional biases which tend to perpetuate rural poverty include lack of access to land and water resources, inequitable tenurial arrangements, under-developed markets, barriers to access tend to increase the small farmer's discount rate, making long term conservation unprofitable.

Gender Processes which tend to discriminate against rural women both as poor people and as women. The lack of recognition for the crucial role women play in agriculture, especially in food production, and the growing dependence of poor rural households on women's earnings , limits the potential of a large proportion number of small farmers to manage resources in an optimal manner.

Cultural and Ethnic Processes which have forced tribal, nomadic and indigenous populations into remote areas where their traditional lifestyles are now being threatened through encroachment by other, newly marginalized groups. These processes lead to conflicts in the use of resources in time and space.

Processes Unleashed by Natural Disasters which include drought, floods, pests, etc. hit the poorest and most vulnerable populations hardest and serve to reduce their chances of escaping the poverty trap.

Processes Linked to Internal Political Fragmentation and Civil Strife, in which political and civil strife disrupt the agricultural sector, with serious consequences for production, savings, capital accumulation and investment. These processes result in unfavourable conditions for sustainable agriculture.

Technology Processes in which technology generation and transfer systems neglect the needs of small farmers in resource poor conditions, locking the rural poor into unsustainable patterns of land use.

Environmental Processes, in which degradation of the resource base further impoverishes the poor. Various feedback mechanism shape the interaction between environmental degradation and poverty processes, to create a downward spiral of deepening poverty and worsening degradation of the resource base.

8.3 The Bangladesh Scenario

Despite the adaptations and resourcefulness of the people of the people of Bangladesh, the overall economic and development statistics for the country are daunting. With a per capita average annual income of about $220 in 1988 and about 80% of the people living below the poverty line, government policy is understandably oriented towards poverty alleviation as an overriding

development objective. 60% of Bangladeshi households are without sufficient land to produce enough food for their families. 20% of Bangladeshi households do not even have enough land for a homestead.

Some 60% of the total land area is cultivated, one of the highest percentage in Asia. Agriculture represented slightly more than one third of the GDP in 1989 (37.08%) and average annual rate of growth in agricultural production was about 2.7% from 1980-1986, which are barely enough to keep pace with population growth Food shortages affect more than half the population, and food imports are rising to keep abreast of demand. Exports volumes are relatively small, and not well diversified.

Access to clean water and proper sanitation is problematic for many households and as a result of contaminated drinking water, gastroenteritis and other water-borne diseases are common. The effect of these diseases, together with chronic malnutrition and inadequate health services is a high rate of infant mortality; 25% of infants die before the age of 5. Maternal mortality rates are nearly 100 times greater than the rates for Scandinavian countries.

Despite relatively high growth rates for urban areas (over 10% p.a.) , 85%-90% of the population still resides in rural areas. Because of the relatively high population growth rates (.16% p.a.), a large proportion of the population is young, and will soon greatly increase the ranks of those needing schooling and employment. Literacy rates are only 15%-18% for females and 25% -35% for males.

In Bangladesh per capita development assistance amounted to about $14/year in 1986, and now totals some $2 billion/year, or about 10% of the GNP and 85% of the annual development program budget. Current development objectives stress the importance of poverty alleviation through higher production, increased employment, and comprehensive programs for rural development. The promotion of self reliance is also an important objective, and is addressed in part by the decentralization and devolution of administration and development to the local level. The Government also supports a "rational sharing" of development between the public and private sectors, and acknowledges the need for improved health services, education, the development of energy and other supporting programmes, including family planning.

After its emergence as a sovereign independent state, in 1971, Bangladesh started with planning efforts in 1973, as the initial years of her independence had to be concentrated for rehabilitation and reconstruction of the war-ravaged economy. Bangladesh has now embarked upon her Fourth Plan (1990-95) and is presently on the threshold of the first year of its implementation. The Fourth Five Year Plan (FFYP) has been formulated within the broad framework of a 20 - Year Perspective Plan (1990-2010) which has been prompted by the built -in inherent dynamism of the Bangladesh economy for promotion of sustained economic growth. In keeping with the inherent dynamism of the economy, the FFYP has adopted three major objectives, namely, (1) acceleration of economic growth envisaging a growth rate of 5% of GDP, (2) alleviation of poverty and generation of employment opportunities through development of human resources, and (3) increased self-reliance. The main focus of the FFYP has been set to overcome the existing constraints to development process in the economy and to facilitate expansion of inherent dynamism with the expectation that it will be possible to raise the GDP growth rate to 6-8% in the subsequent plan. An innovative strategy adopted in the FFYP is integration of sector -based planning with socio-economic group-based planning for creation of greater possibilities for alleviation of poverty along with rapid economic growth. In keeping with this integrated approach, the entire population of Bangladesh has been divided into ten socio-economic groups with eight groups for rural areas based on land ownership and resource position and two for urban areas on the basis of resources position activities. The adoption of bottom-up decentralized participatory planning process envisaged in the FFYP aims at creating necessary consciousness about inter sectoral linkages and dependence thereby achieving inter sectoral balance in respect of fund allocation and maximization of sectoral efficiency.

Socio-economic imperative for planned development of Bangladesh is alleviation of poverty. It

constituted the basic theme of all the three Five-year development plans in its post independence period. But successive efforts for planned development in the desired direction have been frustrated by various unforeseen developments. There had been recurrent floods and droughts, more so in recent years, which continuously weakened the vitality of the farming population. The economy continued to remain in a fragile state, mainly because of its predominantly agricultural sector which depends on the weather. At the same time, international economic environment also grew increasingly adverse having debilitation effect on the economy of Bangladesh. They led to sagging growth of the economy against a rising population and to further deterioration of economic status of common people. Ever increasingly proportion of the household fell below recommended minimum level of food intake of 2273 calories per capita per day. Poverty, unemployment, malnutrition, illiteracy, rapid population growth and frequent natural disaster continue to remain the endemic problems of Bangladesh.

From the economic point of view, the most important characteristic of the state of under development of Bangladesh is low average productivity and consequently low income and widespread poverty. Available data shows that despite significant development efforts poverty and employment situation in Bangladesh continue to deteriorate. Whatever yardstick one uses, nearly three-quarters of the population are found to be deprived of a conservatively defined threshold living. Less than 5% of the population consume an adequate quantity and quality of food. Malnutrition most severely affects children under five years of age, and also pregnant and lactating women. Daily per capita caloric consumption has deteriorated significantly in the last two decades - from an estimated 2,301 in 1962-66, to an estimate of 1,943 in 1981-82. These figures may be compared with an estimated minimum daily requirement of 2273 calories per capita per day - showing that average consumption is 15% below requirements, even ignoring unequal distributions of food between and within families.

Clearly, there is a relationship between poverty and environmental stresses; the poor are forced to address short term needs, even if their actions contribute to the long term depletion and degradation of the resource. And the poor are often the most vulnerable and least able to cope with environmental changes and the impacts of "natural" disasters and hazards. Poverty can also seen to be a factor in continued high rates of population growth - owing to the associated lack of health care services, security, educational and employment opportunities.

The links between poverty, environment and development in the country also argue for careful analysis of alternative means to alleviate poverty and promote development while safeguarding and even increasing the extent and productivity of natural resources which can be used and managed by the poor as they develop more sustainable and productive livelihoods.

The poor are alienated not only from the mainstream economic process but also from socio-political processes. Politicians have been routinely pronouncing that the people are the source of all power, but this is done usually as ploy to gain or retain or legitimize power or just by way of paying lipservice. Very little has been done to improve their lot by those who held power in past. The question of the power of the people was invoked whenever the power-that-be felt the need or the urge - to be forgotten soon enough. Now that a process of transition to democracy has begun and the important milestone of holding free and fair elections has been crossed successfully, the people at large can reasonably hope to see a democratization of the society as a whole characterized by free speech, free press, open debates on national issues, democratically established tiers of governance at different levels of the society, and initiation and pursuit of socio-economic processes toward an equitable socio-economic order in the country.

CHAPTER -9
POPULATION AND LIFE STYLE

9.1 Introduction

Population growth is the most important, constantly changing factor in the ecological equation affecting the demands on the natural resources of Bangladesh. Greater number of people require more food production, more energy, more water, more forest products, more fish and more land. From 1951 to 1981 the population of Bangladesh doubled from 44.2 million to 89.9 million.

9.2 Population and environment linkages

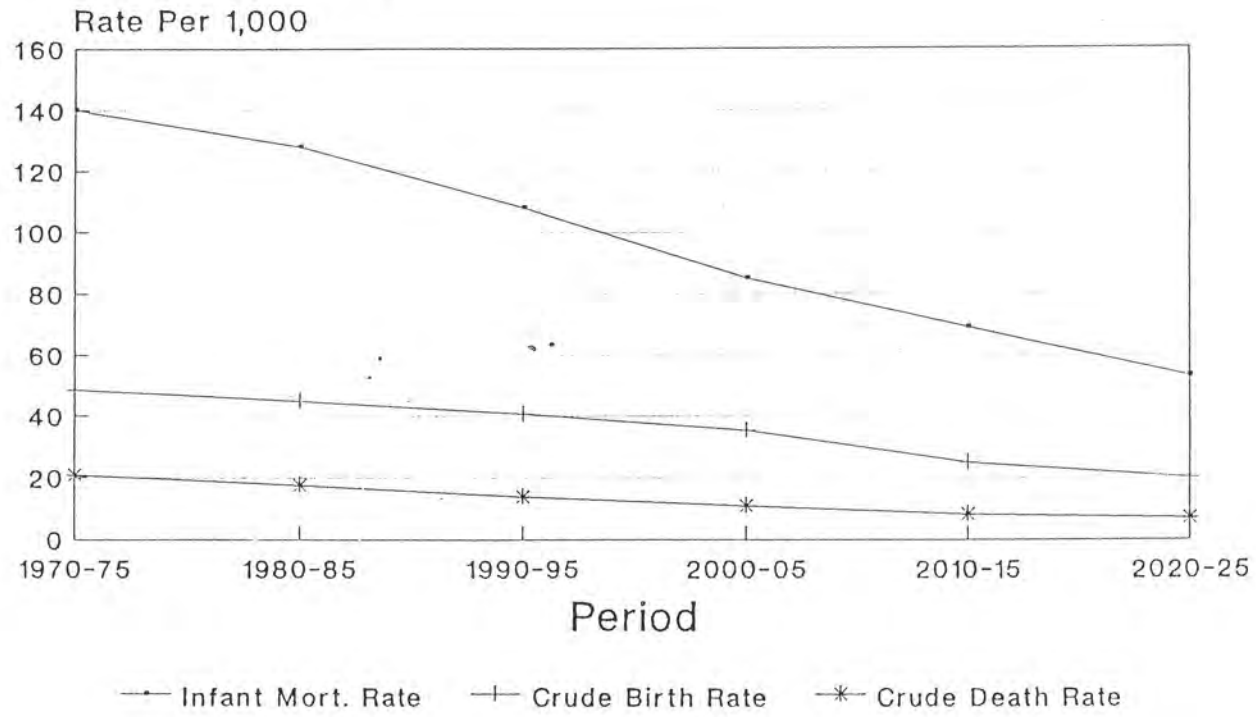
Bangladesh's present population is about 115 million confined within 144000 KM^2, making its population density the highest in the world. Assuming various fertility rates, population projections of Bangladesh by planning commission, for the year 2000 is in between 133 to 140 millions. The World Bank estimate based on the assumption that HRR would be lower to unity by 2030 indicate that the population would be 139.8 million by the year 2000.

The present age structure of the population is an immediate threat to the environment and sustainable development. The striking feature of present population is that around 50% of the population is below 15 years of age, who are supposed to be school going but will be in their prime of life in 10-20 years' time. If new births can not be controlled very effectively, the ensuing population in two decades from now is bound to cripple the economy and resource base in an irrepairable manner. Another feature to look at is that currently the number of females in the very fertile age group of 15-45 is 47% of all females. Only 16% of female population is literate compared to 31% of the males and 23.8% of national average (1981 census).

The present growth trends in population and the very large percentage of under 15 population will result in very large addition to the labour force, thereby causing dramatic rise in demand for employment. Presently the economy is primarily based on agriculture and the sector has been the primary source of labour absorption. But recently there has been a real decline in wages in the sector. Share cropping, tenancy, credit polices and aspects of the social structure have contributed to a significant transfer of land assets to a minority of larger landowners. Land reform legislation, minimum wage standards and land ceilings by acreage so far have not had much impact in creating more employment in the agriculture sector. Agricultural productivity is low compared to other Asian Countries. So employment opportunities in agriculture appear to be very limited and other sectors are not creating sufficient new jobs. The urban population was 13 million in 1981 and is expected to reach 41 million in 2000.

The female population of Bangladesh has been estimated at 53.3 million in 1989-90, representing 48.5 per cent of the total population. Of these, 22 million are in the reproductive age group. This age structure will have serious implications for future population growth. Whether these implications will be positive or devastating depends on the efficiency and effectiveness of an immediate focus on this age group. The general poorer health of women in Bangladesh is of great concern. Although the gap between life expectancies of men and women narrowed recently, Bangladesh deviates from the pattern seen in most developed countries where women live longer than men. Furthermore, whereas literacy rates in Bangladesh are low, there is a significant disparity on the basis of gender, as female literacy rates were only 18.8 percent in 1987, compared to male rates of 39.7 percent. Such basic gender-based disparities, as in health and literacy, will necessarily impede the success of family planning, health, nutrition, skills, training and employment opportunities for women. And under those conditions, awareness of environmental issues can only be low and women's participation in, or contribution to, conservation, limited. Thus, as poverty, malnutrition, illness and illiteracy are largely centered on women, and as women are potentially the most powerful agents for change in Bangladesh, the Government has recognized that improving the status of women is critical to the economic development of the country and to long-term reductions in population growth. Over the years, participation of women

Figure Crude Birth Rate, Crude Death Rate, and Infant Mortality Rate Per 1000, Bangladesh, 1970 to 2025



Source: United Nations, 1991

in the labour force has slowly increased. It can now be recorded in both the informal labour sector (family-based nutritional agriculture, livestock and fisheries, homestead forestry and domestic fuels) and in the export-oriented garments, electronics , frozen fish and small cottage industries). But the relative , status, wages, and participation of women in the work force are still low, yet opportunities are bright.

The extremely high population density has already caused overuse of forests, fisheries, and land, and is closely linked to increasing landlessness, soil erosion, loss of fertility of the soils, decline in capture fisheries, and widespread deforestation. Population pressures are contributing to an overharvesting of homestead and other accessible forest area and demand rises for fuel, biomass, and land for agriculture and housing. The resource to population ratio is already very low. Female headed households are becoming more common in rural areas as men migrate to the cities to look for work. Loss of land due to river bank erosion causes whole communities to move. In 1989, half the population migration to the cities from rural areas was directly linked to environmental issues, namely river erosion and landlessness.

Most of the increase in the urban population will take place in the poorest areas of the cities, and the consequences for sanitation and health are enormous. Already the rapid population growth has resulted in severe shortfalls in basic infrastructure, services and shelter; and it has severely encroached on prime agricultural and forest land. The projected further population growth would lead to critical shortages in water and sanitation facilities, homesteads, solid waste collection, drainage, electricity, transport and roads.

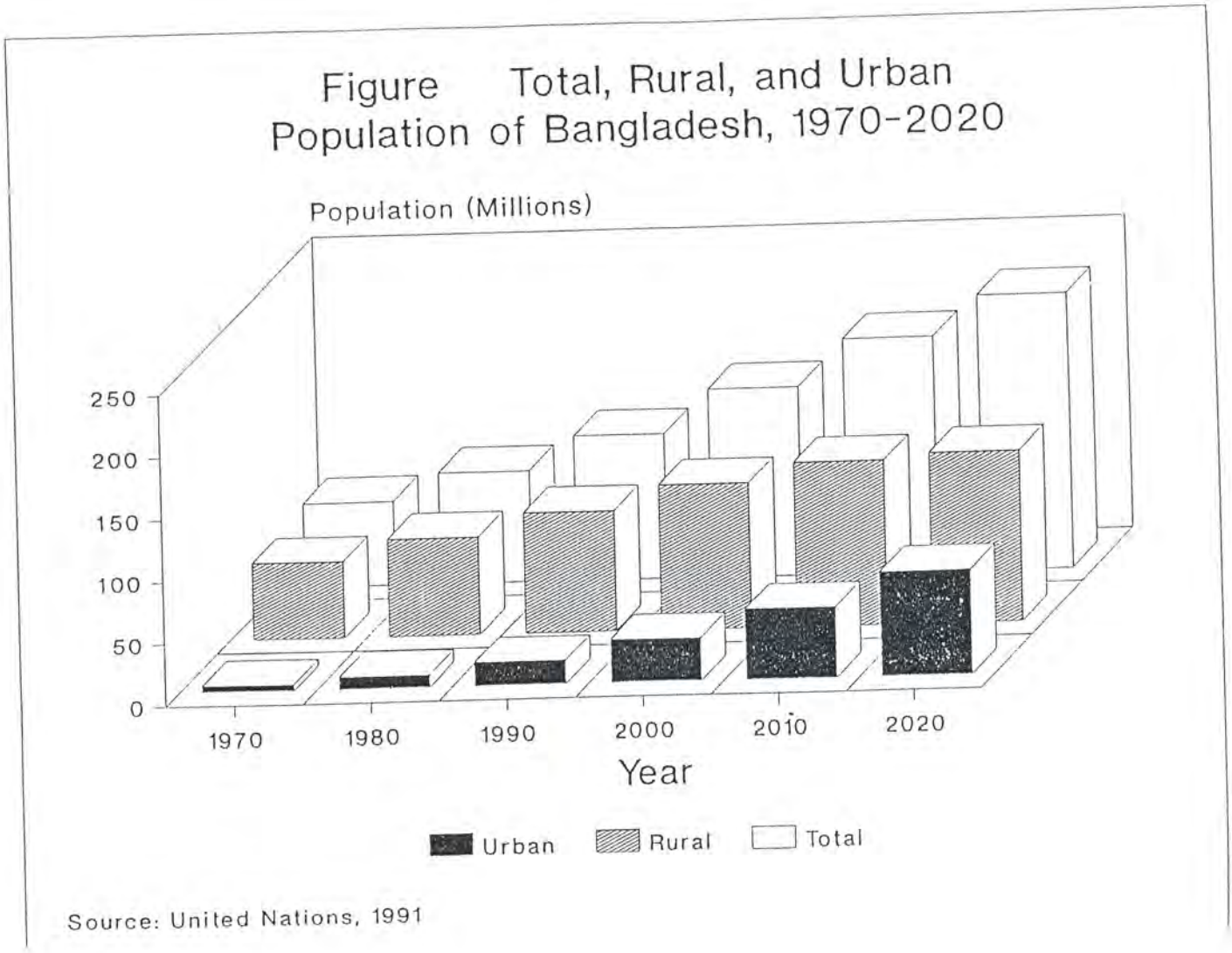
The GOB recognizes that if growth of the labor forces is to be slowed in the early part of the next century, continued reductions in fertility need to be achieved now. It also recognizes that the strategy to attain a lower growth rate has to be rooted in the major causal factors of high fertility, i.e. lack of security of the poor in terms of both health and economic survival. And women in particular, are the most affected by malnutrition, lack of sanitation, water supply and health services, environmental degradation, abject poverty, illiteracy and large families. However, if supported women can also be the single most powerful agents in reversing those trends, because of their role as educators, their close association with the environment, their potential contribution to the work force and their obvious participation in family planning.

As a demographic factor, the per capita cropped area has been dwindling at an alarming rate. This was 0.23 ha/head in 1949 50 but dropped to 0.166 ha. in 1961, 0.133 ha in 1974, 0.093 ha. in 1981 and 0.086 ha in 1986. Population Development and Evaluation Unit (PDEU) of the planning commission forecasts this to drop further to 0.065 ha/head in 2000 A.D. on the basis of their population projection of over 30 million at that time (Husainy 1988).

Even at the current population of about 114 million, economic and environmental management has been a horrendous task, and except for a thin cross section of the people, the goals of basic needs supply or improvement of the standard of living for the mass has remained mostly unfulfilled. The magnitude of the environmental and consequent economic stress to be created when the present population further increases by 30-40% with the same resource base and without dramatic increase in the technological capability is likely to be unmanageable and the environmental degradation that may occur through over exploitation of land and other natural resources to support the ever increasing population will be catastrophic. It is assumed that the rate of advancement of technology to cope up with the degrading situation will not be able to cope with the diminishing returns from the finite supplies of essential resources. Some resources like Forests, fisheries etc. are renewable but their sustainable yields have a limit and the situation is not likely to be mitigated by decrease in consumption owing to the rise of prices of the depleted resources or lowering of per capita income of the consumers.

The links between population environment and development in the country also argue for careful analysis of alternative means to alleviate poverty and promote development while safeguarding and even increasing the extent and productivity of natural resources which can be used and managed by the poor as they develop more sustainable and productive livelihoods. For example

FIGURE : TOTAL, RURAL, AND URBAN



Source: United Nations, 1991

save the children has supported an income-generation project based on aquaculture development; 5 ponds covering 5 acres have been developed, to yield an annual catch of 20,000 pounds of fish, which will generate an income of some $7,000 to defray the costs of a primary health care center, extension activities and primary school. The project also provides employment, and the produce from fruit trees planted around the borders of the ponds.

While it is very difficult to define the upper limits for continued growth which are related to natural resources, there are clearly both practical or near term (if not absolute) limits and costs associated with accommodating a growing population in a finite environment. Even the most carefully considered resource management plans cannot cope with ever-increasing populations; in this respect, it is vitally important to maintain a strong commitment to family planning and population stabilization, and to increase the effectiveness of programs in this area alongwith economic development.

9.3 Deprivation of the majority from economic opportunities and basic amenities.

It is obvious that only a tiny minority of the people of Bangladesh belonging to elite (military, bureaucratic, land owner, political, economic, professional) classes is in control of the affairs of the economy and the state - directly or indirectly. They are generally well educated and organized and largely control or have access to sources of income (land, assets, trade licenses) and power (money, official or social position) and connection with the high and mighty. The poor, who constitute large majority of the population, are uneducated, unorganized and have little access to sources of income and power.

When looking at income distribution, as of 1985-86, 21.4% of the national income accrued to top 5% of the population and 1.18% to the bottom of 5%. And top 20% of the population accounted for 46.0% of the national income while bottom 20% received only 7.0%.

When it comes to distribution of sources of income, for example, as of 1983-84, 68.8% of the households were completely or functionally landless, who owned no land at all or no more than one acre of cultivated land plus homestead. Some of the landless have certain vocations and jobs, but most of them are in the category of agricultural or day labourers.

In so far as industrial assets are concerned the deprivation is much wider and deeper. Some of the rural development programmes such as those of Bangladesh Rural Development Board a(BRDB), Grammen Bank, Bangladesh Rural Advancement Committee (BRAC), and Bangladesh Small and Cottage Industries Corporation (BSCIC) have assisted some of the poor to take up income earning rural industrial and other non-farm activities, but their combined coverage is still a small proportion of those in need. Moreover, in general , the activities taken up are low productivity type and incomes earned are usually not sufficient to carry them over the poverty threshold on a sustained basis. However, these are useful endeavours to the extent they go.

The majority of the population in Bangladesh illiterate. And as such are usually unaware of the importance of environmental conservation, hence they cause further environmental degradation via indiscriminate tree cutting, water pollution, wrong usage and doses of pesticides and chemical fertilizers.

The lack of safe water and of adequate sanitation facilities for the poor is a major problem, both in the rural and most of the urban areas. In Bangladesh, 20 per cent of the rural population still rely on ponds and other surface sources to meet all their water needs. Waterborne diseases like diarrhoea account for 30 per cent of deaths among children under the age of 5. Only a minority of people in rural areas and in poor urban localities have access to sanitary latrines, which are in any case subject to flooding during the monsoon season.

Extreme poverty and poor understanding of basic hygiene ha severely limited access to, enduse of, safe water and sanitation. The typical poor family in Bangladesh can not afford to use even the subsidized community tubewells and basic latrines, and often does not understand the benefits of using water from public tubewells or standpipes, rather than from closer surface sources which are contaminated.

The Government has undertaken programmes to expand safe water facilities. Piped water systems are now partially available in 57 out of 62 district towns and 7 thana headquarters. In 1986-88, about 10 per cent of the population in district towns and 3 per cent in thana towns were estimated to have piped water. It is estimated that about 80 per cent of the rural population use tubewell water for drinking although only 12 per cent use it to meet all their water needs. People living in the saline coastal belt have less access to safe water than those further inland.

During the last few years, the Government has also expanded sanitation facilities, hence 30 per cent of rural people are now using some form of latrine, although only about 5 per cent of the rural people use sanitary latrines. In cities and towns, less than a quarter of the population uses latrines, septic tanks or sewer connections. The hygienic conditions in squatter slums are particularly poor. Since the slums are illegal, no tubewells nor latrines are encouraged by any Government or non-government agency.

With assistance from UNICEF, UNDP and IDA, the Government is currently developing a variety of low cost latrines which are likely to provide affordable and more socially acceptable models than the present ones. In addition, an integrated approach to water supply, sanitation, and hygiene education is being experimented within some parts of the country, with support from CIDA, UNDP and IDA. Preliminary results are promising.

In view of Bangladesh's limited resources, it is essential to focus parallel efforts, to slow down population growth on the one hand, and to stop depletion of forest, loss of inland wetlands, over exploitation of fisheries, destruction of fish habitat and larvae, and inadequate land and soil management on the other. Symptoms of environmental disequilibrium already exist in the country, and environmental deterioration will only accelerate poverty and fertility.

CHAPTER - 10
URBANISTION

10.1 Trends of Urbanization in Bangladesh

Bangladesh is characterized by low level of urbanization with about 20% of the nation's population living in urban areas in 1991 which however has experienced one of the most rapid rates of growth during the last three decades, on an average about 8 per cent during 1961-81, and an estimated 6 per cent during 1981-1991 (see Table 1). Even with a projected declining trend, the urban growth rate would not possibly be less than 4 per cent until 2010 or 3.6 per cent until 2015 (see Table 2).

Table 1. Growth of Urban Population in Bangladesh 1901-81

Year	Popn. mill	Growth Rate/Yr. (%)	Urban Popn. mill	Urban Popn. as % of tot. popn.	Urban popn. Growth rate/10 yrs. (%)	Growth rate /yr. (%)
1901	28.92	-	0.70	2.43	-	-
1911	31.56	0.94	0.80	2.54	14.96	1.39
1921	33.25	0.60	0.87	2.61	8.85	0.84
1931	35.60	0.74	1.07	3.01	22.20	2.00
1941	41.99	1.70	1.54	3.66	43.20	3.59
1951	44.47	0.50	1.83	4.34	18.38	1.58
1961	55.27	2.26	2.64	5.19	45.11	3.72
1974	76.19	2.18	6.00	8.87	137.57	6.70
1981	89.91	2.32	13.56	15.54	115.76	10.97

Source : Government of Bangladesh, Bangladesh Population Census Report on Urban Areas, 1987.

Table 2: Urban Population Projection in Bangladesh 1981-2015

Year	Total Popn. (m)	Rural popn. (m)	Urban popn. (m)	Urban growth (% p.a.)	Level of urbanization (Share of urban popn. %)
1981	90.0	76.5	13.5	10.3	15.1
1985	100.6	83.1	17.5	6.5	17.4
1990	113.7	90.8	22.9	5.4	20.1
1995	126.8	97.4	29.4	5.0	23.2
2000	141.1	103.8	37.3	4.8	26.4
20005	155.8	109.4	46.4	4.4	29.8
2010	170.5	113.7	56.8	4.0	33.3
2015	184.6	116.7	67.9	3.6	36.8

Source : World Bank, Bangladesh Economic and Social Development Prospects Vol. III (Report No. 5409) April 1985, p. 126

Because of the large national population size, the absolute size of the urban population is also quite huge. Even at 15% level of urbanization the absolute urban population size was 13.56 million in 1981. The level has probably reached 20 per cent in 1991 with the absolute urban population size being nearly 23 million. By 2000 A.D. this number would rise to 37 million, by 2010 to 57 million and by 2015 to 68 million at levels of urbanization estimated to be 26% in 2000, 33% in 2010 and 37% in 2015 A.D..



The rapid increase in the level of urbanization and urban population in Bangladesh during the last three decades has been caused by a combination of three process:

a) the rapid rate of natural growth of population in urban areas.
b) the territorial expansion of existing urban centres and the creation of new urban centres due to changes in definition of such places, and
c) rural to urban migration.

The last process has made the more significant contribution. On the whole, rural to urban migration has been responsible for over 40 per cent of the growth of urban population while in some large and medium sized cities, this contribution was to tune of 50-70 per cent (see Table-3).

Table 3: Components of Population Growth in Major Cities 1961-74.

Cities	Growth components		Annexation (%)
	Natural increase (%)	Immigration (%)	
Dhaka	18	74	8
Chittagong	28	13	21
Khulna	27	73	-
Narayanganj	41	17	42
Mymensingh	17	25	58
Rajshahi	30	36	34

Source: Khan, Table 11, 1982, P. 383
A.U. Khan, 1989, USAID

Both rural push factors and urban pull factors played important role in the rural to urban migration process. Among the rural push factors have been the high rural population growth rate, increase in rural poverty, landlessness, unemployment, frequency and intensity of natural hazards of various types and social problems. On the other hand, the expansion of either real or perceived job opportunities and possibilities of socio-economic improvement in the cities have been the major urban pull factors.

Table 4: Growth of Major Urban Centres 1974-81

Urban Centre	1974 No. `000	1981 No. `000	Variation No. Annual (%)
Dhaka (SMA)	1680	3440	8.53
Chittagong (SMA)	945	1391	5.66
Khulna (SMA)	437	652	5.19
Rajshahi (SMA)	133	254	3.72
Mymensingh	76	191	5.12
Comilla	86	184	5.55
Barisal	98	173	7.17
Sylhet	57	168	15.86

feature of the recent trend of urbanization in Bangladesh been the very rapid growth of the metropolitan cities, particularly of Dhaka, the capital and the largest city (see Table -4). The population of Dhaka was only 0.5 million in 1961, 1.7 million in 1974, 3.4 million in 1981 (for the SMA with an area of 180 sq. miles) and had possibly reached an estimated 7 million in 1991 (for the same area as that of 1981). The growth of Chittagong and Khulna was also quite rapid. A few of the medium sized cities, such as Sylhet, Rangpur and Jessore, also recorded very rapid growth in population during 1974-81.

Poverty is a major feature of urbanization in Bangladesh. According to recent estimate about 56% of the urban population live below the poverty line income. Even if this share is estimated at 50%, there are nearly 11 million urban poor people in the country at present. The number would rise to 17 million in the year 2000 and to 23 million in 2010.

10.2 Urban Environment in Bangladesh

Environmental factors are directly related to urban development. The quality and quantity of urban environmental condition depends a great deal on the essential infrastructural facilities and utility services like health and sanitation, sewerage, drinking water supply, drainage, garbage disposal, educational institutions, electricity and gas or fuel for cooking. With very rapid urban population growth and fast area expansion of urban areas, low urban administrative and management skills and limitation of resources, the provision of services in urban areas quite obviously remain extremely unsatisfactory and highly inadequate. In some areas, the situation is simply catastrophic. This will be evident from the following accounts :

A. Flooding and Drainage

Due to rapid urbanization and unplanned and unregulated urban growth, many of the urban centres in Bangladesh now suffer from problems of drainage and stagnation of rain water. The situation is particularly bad in Dhaka both old and new areas, experience storm and rain water stagnation. Unwise closure of natural and old artificial drainage and navigational canals has aggravated the situation. Many urban centres suffer from annual as well as abnormal floods like the ones 1987 and 1988. The severity of floods has intensified partly due to unplanned urban development.

B. Water

Existing facilities in urban water supply and sanitation is not at all satisfactory. About 40 per cent of urban population get safe drinking water or good quality water. The situation is rather severe in urban poor settlements where majority of the population get sufficient quantity of safe drinking water. The major sources of water are private hand tubewells or other sources rather than municipal water (See Table -5).

Table 5: Status of Urban Water Supply, 1985 (Population Served in percent)

Urban Centres	House connection	Public Standpost	Hand Tubewell	Other
Dhaka	49	10	-	41
Chittagong	29	8	10	53
District Towns	14	9	29	48
Sub-district Centres	4	-	25	71
National Urban Average	24	7	17	51

'Other' includes own source of water, private hand tubewell and unspecified source.
Source: Third Five Year Plan, Planning Commission, GOB 1985 (and CUS, 1990).

C. Sanitation

Only small minority of urban population have access to hygienic sanitation system. The sewerage system is found only in Dhaka city and 15% households have access to it (see Table- 6).
Table 6: Coverage of Urban Sanitation 1989.

Coverage by sanitation facility in per cent of total population

Urban Centres	Sewerage Connection	Septic tank	Bucket latrines	Pit latrines	Other
Dhaka	15	35	-	12	38
Chittagong	-	31	12	15	42
District town (excluding Dhaka and Chittagong)	-	21	26	14	39
Sub-district centres	-	21	26	14	39

Source: Public Health Engineering, GOB

In other urban countries, different arrangements are in practice such as septic tank, pit latrine, bucket latrine etc. Majority of the people, particularly the poor have no fixed toilets or latrines.

D. Garbage disposal

Except for large cities like Dhaka and Chittagong, there are hardly any proper arrangement of garbage collection and disposal in urban areas. Even in Dhaka city, the garbage disposal management is unsatisfactory, piles of rotten garbage are awaiting for disposal along streets or neighbouring lanes. People are forced to "Co-exist with garbage" in the city. There is little evidence of garbage collection by formal municipal authorities from urban settlements.

E. Transport

Urban development depends heavily on transportation system. Unfortunately this essential, infrastructure is very poorly developed in the urban areas of Bangladesh. While the small towns can manage fairly well with pedal transports like the cycle rickshaw for passenger movement or the cycle van for goods movement, the large cities have to rely on motorized vehicles. The public mass transport system is avilable in the largest cities, but the services are highly inadequate. The number of vehicular transport has increased manifold, but still remains far short of the needs. The cheapest mode of urban transport is the bus but the number is highly inadequate against the demand. As a result the buses are found to be dangerously overloaded on the streets. In response to the growing needs, the number other vehicles also increased. Altogether in 1988 Dhaka city had over 182000 motorized vehicles but still can't fulfill the demand.

The insufficiency of the formal mass transport and the road system of the major cities have made a good reason for the popularity of the rickshaws. Although the rickshaw is a fairly expensive mode of public transport and occasionally quite unsafe, it has a few advantage for the users such as more private, easily available and easy entrance to small roads and even lanes. Altogether more than 1.5 million people in Dhaka are directly or indirectly dependent for their livelihood on the rickshaw. The huge number of small personalized motorized vehicles and cycle rickshaws, unplanned road system, the poor traffic and road transport management system, mismanagement in the traffic rules and discipline and host of other factors have been responsible for frequent and intolerable traffic jams in various needs and important roads in Dhaka and other cities. The frequency and fatality of road accidents within cities/towns is alarming.

F. Access to land and housing

Land is essential element in housing and the access to land is the most difficult thing for most of the people in urban areas. This has been so due to the excessive price of land and which in turn is due to its limited supply, high demand and speculative market. The price of land has increased by 60-80 per cent annually during 1974-78 in Dhaka. This is similar to other big cities too. A study of the Ministry of Land shows that less than 2 per cent of the households in Dhaka own 22.67 per

cent of private land of the city, which 56.63 per cent households own no land at all. One study showed that some 70 per cent of the population of Dhaka can have access to only 20 per cent of the residential land while the remaining 30 per cent enjoys access to the rest 80 per cent. The urban poor has the access mostly in rental accommodation in slums, or in illegal land occupied by squatters, slums are exploitative in terms of high rents for very low quality shelter. Poor household in Dhaka often spend more than 40 per cent of their cash income as rents alone.

Inspite of the fact that land in urban areas is an extremely scarce and valuable resource, the use of this land has not been very wise or optimum. According to Government sources, as much s 500 acres of publicity owned lands have remained vacant or unused for the purpose of these lands were initially acquired in Dhaka city. Even a lot of privately owned land are either partially vacant or of very low density use. On the other hand agricultural land in the urban fringe locations are being brought under urban residential and other uses without proper planning. The expansion of commercial real estate companies in the fringes has also been hampering availability of land for the use of the low income groups or the poor.

G. Housing conditions

The overall residential density, occupancy ratio and the structural condition of houses have all assumed critical situation. In urban low income areas or slums, the densities are extremely high, even more than 2000 persons per acre on singly story development while the ideal even by Third World Standard would have been about 300 persons per acre. The occupancy rate or the average number of occupants per housing unit in urban areas increased from 5.84 in 1961, to 6.05 in 1974 to over 7.07 in 1981. The occupancy rate in the major cities were even higher (See Table 7).

Table 7: Trends in average occupancy per Unit

Pourashava (Municipality)	Average Occupancy (persons per unit)	
	1966	1973
Dhaka	5.5	7.7
Narayanganj	4.9	6.1
Chittagong	5.0	6.4
Khulna	5.5	6.7

Source: Planning Commission

In terms of structural condition or building materials, urban situation show a predominantly temporary character. Thus in 1981, only about 15.72% of the urban houses in Bangladesh were made of permanent or pucca materials, 8.16% were of semi pucca type, 11.92% were of `Kutcha type and 68.18% were of simply thatched houses of very temporary and weak materials, most of the poor and the low-income groups in urban areas have found accommodation in the kutcha or thatched houses, while a few among them over-crowed in semi pucca units, with little or no utility services.

H. Slums and Squatters

The highly limited access to land for housing, the high cost of housing materials, coupled with the rapid growth of population mainly through the immigration of the rural poor, have caused the growth and proliferation of innumerable urban slums and squatter settlements. In many large cities in Bangladesh these settlements are nearly one-third to one half of the city population. The environmental and socio-economic conditions in the slums and squatter settlements are extremely poor. These conditions are health hazards to the residents of these settlements as well as to those outside. The densities as mentioned earlier are very high (upto 2000 persons or more per acre). The per capita living space is terribly low, even down to 10 square feet in some settlements. There is very little or highly inadequate provision for sanitation, pure drinking water and other utilities. Moreover, the tenure is often totally uncertain and the residents, particularly of squatter settlements, are under constant threat of being evicted from their present site.

I. Health

The health condition for the urban population is comparatively better than that of rural population. But this is alarming for urban poor population or those living in urban slums and squatters. The health conditions in urban slum settlements are extremely bad hazardous for both slum dwellers and other citizens. The dense and squalid environments with little or no essential health and sanitary facilities breed a host of communicable as well as non-communicable diseases. Children are more vulnerable than others. The major diseases affecting particularly the urban poor population are diarrhoea, respiratory tract infections, scabies, helminthiases, fevers, typhoid, whoooping cough and various eye diseases. Most of these diseases, as obvious are related to environmental conditions, particularly with pollution of water and air. Children suffer the most from malnutrition, 4.2% of all urban children suffer from stunting or chronic malnutrition and about 6.9% suffer from acute malnutrition. The health care service in the urban areas are inadequate in both public and private sectors. The poor find access to the service difficult.

J. Education

In the field of literacy and education, the urban areas in general show better record than the rural areas, or the national average. In 1981 literacy rate at the national level was only 23.8% while for urban areas it was significantly higher, 34.8%. But due to continuous in migration of the illiterate rural poor and the increase in the number of the native urban poor, urban literacy rate has actually been declining.

However, with ever increasing population and number of school and college age children, the demand for seats in urban schools and colleges have gone up tremendously. Almost all schools are over crowded. There is inadequate space for class rooms and inadequate or almost no space for children to pay. Many urban schools do not even have basic school facilities like benches or blackboards. Most of the urban slum settlements have no school at all, neither do their children have access to schools in neighbouring middle class schools.

K. Law and Order

The law and order situation in many of the large and small urban areas of Bangladesh has worsen remarkably in the recent years. Violence and crimes of various types, are regular head line news in the national daily newspapers.

Institutional Set Up of Urban Planning in Bangladesh

Mainly three Ministries are directly involved with urban planning in Bangladesh such as the Ministry of Works, the Ministry of Local Government, Rural Development and Co-operatives and the Ministry of Planning.

The Planning functions of the Ministry of Works are operated through:

- Urban Development Directorate
- Housing and Settlement Directorate
- Public Works Department
- Architecture Directorate and
- Four Divisional H.Q. Town Development Agencies such as RAJUK, CDA, KDA and RDA.

The Ministry of LGRD & Co-operatives operates its urban planning activities through Muncipal Authorities and Local Government Engineering Department (LGED) that has lately started planning to district towns and sub-district centres.

The Ministry of Planning through its Planning Commission Division of Housing, Water Supply

and Infrastructure operates at policy level in approving urban development projects and allocating budgets.

10.3 Future Strategies for Urban Development and the Environment

The recent trends in urbanization in Bangladesh and the situation of the urban environment today indicate an inevitable crisis in the future. Urbanization is a powerful factor in the process of development, but urbanization should take place within a manageable pace and desirable direction. This would require the presence of a widely accepted policy on urbanization. Such policy should consider the following goals:

(a) Effect rapid economic growth and increase potential for self reliance and self respect.
(b) Reduce inter-regional, rural urban, urban-urban and intra-urban inequalities on physical as well as socio-economic opportunities.
(c) Alleviate urban poverty at both rural and urban ends, to achieve a quality of life that is befitting of human beings.
(d) Co-relate environmental programmes with urban development.

In order to achieve the above goals, the following sets strategies for urbanization and urban development in Bangladesh should be incorporated.

i) A spatially balanced national urban development strategy,
ii) A strategy for the planning and management of individual urban centres.
iii) A strategy for the alleviation of urban poverty, and
iv) A strategy for environmentally sound and sustainable urban development programmes.

CHAPTER 11
AGRICULTURE AND FISHERIES :

11.1 AGRICULTURE

11.1.1 Introduction

The net cultivated area of Bangladesh encompasses 60 percent of the total land area, the highest percentage in Asia. The country's large population, however, means that there is less than 0.1 hectare of arable land per person. As the ratio of agricultural production to population is very low to reach self sufficiency in food cereal, the country would need to increase its yield by 2 million tons to 20 million tons of food grain. To achieve such an increase, more irrigation, agrochemical (chemical fertilizers and pesticides) and high yielding varieties of crops are required. However, there would be more environmental impacts of different magnitude and type because of these added efforts and interventions.

11.1. 2 Important Issues

The trends towards greater food grain production, principally through increased agricultural intensification and an increase in irrigated area has contributed to the development of a number of environmental problems which are apparent to varying degrees in different parts of the country.

Most Pressing Issues include the following : -

- Loss of biodiversity through the conversion of land to agriculture.
- Abandonment of many indigenous crop varieties in favour of HYVs which will lead to irreversible loss of the country's genetic resources. This may have considerable consequences when global climatic changes become manifest in Bangladesh.
- Depletion of soil resources due to intensive cropping; principally a reduction in soil nutrients and organic matter. This is manifest in some areas as crop micronutrient deficiencies and decreased yields.
- Loss of wetland habitats through abstraction, drainage and in-filling which results in depletion of aquatic fauna and flora and reduction in water availability to the rural poor.
- Loss of forest resources due to permanent agricultural encroachment and shifting subsistence farming in the Hill Tracts, which reduce aquifer recharge and lead to increased soil erosion.
- Desertification (in the Barind Tract for example) which has resulted from deforestation for agricultural development.
- Increased (and often inappropriate) use of Agro-chemicals which raises the possibility of pollution of surface and ground waters, accidental poisoning and eutrophication of surface water bodies.
- Increased emphasis on rice cultivation and decreased cultivation of pulses and oil seeds can lead to malnutrition amongst farm families.
- Fodder shortage due to increased cropping intensity and the cultivation of HYV rice which has less residual stubble and is less palatable to livestock
- Increased prevalence of surface water (for irrigation purposes) has resulted in an increase in waterborne diseases and of water associated pests (such as mosquitoes).

- Reduction in river flows due to surface water abstraction which adversely affects fisheries, downstream water users, navigation and ecology.

- Pollution from agro-processing facilities which discharge highly concentrated organic effluents into water bodies.

Certain amount of detail of some of the major issues have been discussed below :

Soil Nutrient depletion

Year round transplanted rice cultivation keeps the land water-logged continuously for many years. This, in turn, leads to the formation of toxic compounds in the soil, loss of essential nutrients like zinc and sulphur through deep percolation, and the spread of soil-borne diseases which thrive in this water - logged environment, and which have become difficult to eradicate. About 3.9 million ha and 1.74 million ha. of land is deficient in sulphur and zinc respectively. This has caused a crop reduction of about 10 percent on average; 17 percent for the rice crop.

The low stubble biomass of HYVs also accelerates the lack of nutrient replenishment through decomposition of crop stub. Stubble of local varieties, due to acute fuelwood demand, is removed after harvest; this results not only in decreased land productivity but in decreased vegetation, and soil erosion.

Soil erosion

Improper cultivation of sloping land results in landslides, topsoil erosion, and deposition of eroded sediments in riverbed, and on agricultural lowlands. This type of erosion has serious consequences: the eroded land becomes unproductive within a few years, and the sediment load enhances the altering of waterway beds, blocking drainage pipes, and raising reservoir beds, thus limiting water storage capacity for the dry season and hampering water transport; finally, the sand and silt low in nutrients spreads over the lowlands, and reduces soil fertility.

Another damaging method of cultivation consists of slash and burn agriculture, or shifting cultivation, which has been practiced for centuries by the tribal peoples of Chittagong and Garo Hills. When tribal people were fewer in numbers, there were no widespread repercussions of their traditional practices, as fewer and smaller forest patches were denuded at a time, and then left fallow for many years (15-20) for adequate regeneration to take place. However, with the present size of the population living off the top of hills, the clearing and burning of the same forest patch is repeated every 5 to 10 years, hardly leaving enough time for proper regeneration to occur. Such denuded areas are subjected to increased run off, lose their ability to absorb monsoon rains, and hence cause severe run off and floods in the foot hills.

Narrowing of cereal genetic base

As vulnerability problems have recently developed with the HYVs, there is now a growing concern that the broad genetic base of local varieties, which were more adapted to local conditions, has been lost to mono-cropping of genetically less diverse and, in many ways, less adapted HYVs. Thus valuable genes of indigenous crop plants could be lost unless active measures are taken to save them.

Food Imbalance

The displacement of traditionally grown pulses and oilseeds by cereals like HYV rice or wheat once irrigation is available has also caused a major shift in nutritional balance from protein and fats/oils to carbohydrates. This exacerbates the decrease in protein foods caused by the progressive destruction of inland capture fisheries.

Lack of land Zoning

The distribution of urbanisation and urban expansion is not always planned in Bangladesh and leads to growing environmental stress which include stress on prime agricultural land.

Urban centres are usually located on elevated land that rises up from the floodplains and have limited land available for expansion. The growing need for space for urban development has already put pressure on prime agricultural land. Good agriculture lands are generally free of extensive flooding, and thus also suitable for human settlement. And the increased demand for construction materials has led to the conversion of nearby agricultural lands to brick fields.

Use of chemical pesticides

More than 5,000 tons of commercial pesticides are used annually, primarily in the cultivation of rice, tea, jute, and sugarcane. Though banned from import, DDT and other highly toxic and environmentally persistent organochlorines are still either formulated and or indiscriminately used by the farming community. There is no training system yet for appropriate methods of pesticide use in the crop fields. Pesticide intoxification of handlers is widespread, although no studies have yet been done on pesticide residues in water, fish and humans.

11.2 FISHERIES

11.2.1. Introduction

The fishery sector contributes 3.5 percent to GDP and provides full time employment to an estimated 2.0 million people in catching, packaging , transportation and marketing. In addition 73 percent of rural population are engaged in part-time fishing for family consumption and to supplement income.

11.2.2 Environmental concerns:

Among the major environmental concerns to be considered in this sector are:

* the impact of flood control, drainage and irrigation projects on fish migration, breeding, recruitment and production.

* the impact of continued reduction in the stored dry season water for agro-related activities on the resident fish populations and resultant potentially reduced breeding levels during high water periods.

* the future impact of increased use of pesticide with the high yield crop varieties, on fish production.

* the blocking of rivers and natural channels by crossdams and embankments causing disruption in the migratory patterns of fish.

* the lowering of the surface water levels leading to enhanced harvesting of fish and hence to overfishing in the dry season.

* the impact of modifications to river flow on the breeding grounds of economically important varieties of fish. For example the straightening of the Halda River Channel caused the elimination of important carp breeding grounds in Chittagong District.

Further issues include :

* Displacement of inland capture fisheries impacts associated with recent quick expansion of

shrimp culture.

* The contamination of aquatic systems

* Reduction of aquatic habitat due to natural siltation

* Ecological alternations due to environmentally unplanned Flood Control Drainage and Irrigation (FCDIs) Projects can be considered as a major constraint to the viability of open water capture fisheries.

* Construction of coastal embankments, requiring the closure of tidal stream channels, has reduced the productivity of fisheries. It has also damaged traditional "gher" fish culture and replaced it with modified brackish water aquaculture.

* Water abstraction from permanent water bodies, like beels, and haors, during the dry season reduces the available habitat for fisheries.

* Inadequate regulation of shrimp culture in the coastal belt has contributed to increased soil salinity and damage to sensitive ecosystems like mangrove forests apart from the socio-economic impacts.

* The auction of freshwater bodies on a lease basis has led to over exploitation of fish resources to maximise short term profits.

* Over-fishing and harvesting of small fish fries are contributing significantly to depletion of fish resources.

Some details of certain major environmental issues are described below :

Displacement of Inland capture Fisheries

Despite the importance of fisheries in terms of nutrition, employment, and its contribution as an open-access resources, Bangladesh's inland fisheries have been displaced and disrupted by agriculture, flood control, road embankments, and other land uses. As a result of these interventions, inland capture landing have been declining at a steady rate since 1983. This economic loss has been offset at the national level by increased marine catches and shrimp culture exports. However, the decline in the inland capture fisheries has significant nutritional consequences for many Bangladeshis , since capture fisheries are a major open access resource for the poorer segments of the population and often the only source of protein, essential minerals and vitamins. Large number of children in poor families become blind every year because of improper and inadequate diet.

The reclamation of wetlands for urban and agricultural use is a major cause of the decline in capture fisheries. Low-lying areas in urban settings are increasingly been filled in to meet strong demands for land. Baors in particular are systematically filled with sediment in order to create new agricultural land, thus reducing fish spawning habitat and the amount of water percolating into underground aquifers during the dry season.

Most of the haors and beels of the Ganges-Brahmaputra floodplain have been converted into agricultural land, Chalan Beel, in the northwest, once covered more than 100,00 hectares and has been reduced to less that 2,500.

Embankments, which are components of flood control works interfere with natural recruitment and dispersal of inland fish stocks over the floodplain; they also disrupt migratory patterns of fish and freshwater shrimp. Haors and beels, as mentioned earlier, are interconnected with rivers through small channels which dry up in winter. As water rises from early monsoon rains adult fish migrates to the rivers. It is thought that the major carp species spends 3 years in a beel before

migration to rivers. The GOB Water resources planning organisation, formerly Master Plan Organization considers that the closure of the channels linking beels with rivers by submersible embankments (those that are designed to be overtopped by specified flood heights) may not only inhibit reproduction of the carp residing, in the beels but would also reduce their overall abundance in other beels and associated river systems.

Irrigation barrages in rivers similarly disrupt migratory movements of fish and shrimp. In addition, the increased use of low lift pumps for irrigation and drainage of surface water can contribute to a decline in fish stocks. It is estimated that the loss of one hectare of floodplain causes a reduction of 37-55 kg. in annual fish production.

Impact of Shrimp Culture Expansion

Bangladesh is the world's leading producer of freshwater shrimp, the great majority of which are caught by artisanal fishermen in the rivers, streams, and water impoundments of the lowlands.

However, the conversion of reclaimed paddy land to bracksih water aquaculture by the breaching of embankments to let the brackish water into the land, has caused violent conflicts over land tenure and use rights in some coastal areas. Most of the coastal areas are in the hands of rich landowners; and in these conflicts, the poor farmers always lose.

There are also concerns over localized changes in soil and groundwater salinity as a result of shrimp culture. Furthermore, the expansion of brackish water shrimp culture has also contributed to the clearance of mangrove forests in some areas. Approximately 41% of the Chakaria Sundarban mangrove forest in Cox's Bazar was converted to low-yielding shrimp ponds. In addition to the ruin of fertile spawning habitat by the destruction of mangroves, there is an estimated 80 to 100 fold diminishment of other aquatic larvae, among those collected with shrimp larvae, because of the wasteful larvae selection process currently utilized.

Impact of Coastal Embankments

Construction of Coastal embankments have eliminated or reduced the periodically available nursery and grazing grounds (during the high tides) for the young and juveniles for many marine and estuarine shrimp and fin fish.

Reduction of Aquatic Habitats due to Natural Siltation

It is also believed that in addition to man induced reduction and modification of inland openwater aquatic habitats, natural factors such as natural heavy siltation of the waterways do also bring about shrinkage in the quantity of aquatic habitats. No quantified information, however, is available as to the extent of shrinkage of aquatic habitats that has been produced by natural causes. Moreover, it would possibly be extremely difficult to islolate aquatic habitat reduction produced by man made causes from those produced by natural causes. For example, drying up over 500 km of rivers in the greater district of Jessore can be said to have been caused by natural causes. But this drying up could as well as described to closures and dams across river Ganges and its tributaries in the upper riparian country, which were the source of water flow into the rivers of Jessore. Department of Fisheries in conjunction with SPARRSO and the Department of Environment may launch a programme to quantify the shrinkage and reduction of aquatic habitat caused by natural causes.

Contamination of Aquatic Systems

The openwater ways have been used by people for dumping of all kinds of wastes man produce with the belief that waters flowing through the waterways will clear the wastes and purify itself. Disposal into a water body is a very ancient method of dealing with unwanted wastes.

In present days, all kind of wastes - either in solid or liquid form, are being dumped into the water

ways indiscriminately resulting in pollution of the aquatic environment. Currently the rivers and streams in Bangladesh receive untreated wastes from industrial units (industrial effluents), domestic organic wastes (sewage) and chemicals, particularly run-off containing highly toxic agrochemical resulting in fish kills and alteration of the ecological balance in the waters. Very often many of the toxic chemical ingredients including heavy metals are recirculated back into human bodies through fish and other edible organisms which most often, are damaging to human physiology and health.

The direct contamination of aquatic systems by industry is widespread and a source of considerable concern. Tannery, urea, newsprint, paper, pulp mills are releasing untreated waste directly into rivers and water bodies. Among the pollutants known to be discharged are ammonia, organic matters, mercury, lead, chromium, arsenic, and iron. Even at relatively low concentrations of some of these pollutants are harmful to aquatic fauna. The biological oxygen demand created by concentrated sewage outfalls from densely populated areas is another source of water quality deterioration that adversely affects fish production.

CHAPTER -12
INDUSTRY

12.1 Introduction :

The industrial sector in Bangladesh is small , but has potential for growth. From 1985 to 1990, this sector achieved an average annual rate of growth of 4.02 per cent. The contribution of the sector to the GDP has been estimated to be about 9.9 percent. Number of industries total to about 30000.

The earliest industries were based primarily on agricultural products like jute, sugarcane, tea, tobacco, forest raw materials, and hides and skins. During the mid-sixties, however, a modern industrial base emerged as heavy industries like steel, machine tools, electric machines, diesel plants, refineries, pharmaceutical plants and other chemical industries were set up. These industries are inefficient in consumption of energy and raw materials, which are mostly imported.

Generally the wastes produced by industries in Bangladesh are of primary types (agro-based industries, textiles, jute mills and tanneries, etc.) where the pollutants are "generally" bio-degradable. In recent times problems of hazardous/toxic wastes from chemical industries, electroplating, fertilizer, paper mills and other chemical industries are gradually becoming matter of concern.

There are three main industrial zones in Bangladesh. They are concentrated around the four principal urban centres of Dhaka, Chittagong, Narayangonj and Khulna. There are some industries scattered all over the country and some concentrations can be seen in Norsingdi , Pabna, Comilla and Tangail. The most important cottage Industry (in terms of both employment and value added) namely the handloom industry is spread all over the country.

Because of very poor industrial resource base, increasingly industries are being based on imported raw materials which includes textile raw materials intermediate chemicals, metal ores and scraps. The trend is likely to rise further aggravating environmental pollution and degradation due to industrial wastes.

12.2. Environmental concern

The industrial sector has significant impacts on the water, health, fisheries and human settlement sectors. Trends toward increased industrial production, not yet subject to monitoring or enforcement of environmental standards, contribute concretely to the following trends in other sectors: (1) decreased water quality in the water sector, (2) increased morbidity and mortality in the health sector (3) decreased production and quality of production in the fisheries sector (4) decreased quality of community life in human settlements sectors. Some inter sectoral conflicts also arise out of unplanned development which often leads to the establishment of industries in urban areas and upon prime agricultural land.

Basic resources like land, water and air are adversely affected due to industrial activity. Examples are overuse of fibrous agricultural raw materials resource base, inundation of large area due to construction of hydro-electric power station, pollution of land, water and air due to careless dumping and discharge of wastes on land, loss of land due to mining activities.

Both chemical and biodegradable organic wastes from industries pollute air and water. Toxic gases emitted from tanneries and chemical industries pose potential risk to the workers and the neighbouring population. The polluted water cause health problems to the users.

Most of the large industrial establishments discharge their wastes in the major rivers, adversely affecting the quality of water in these rivers.

Factories of various sizes are seen to be located intermingled with human settlements. These

industries are polluters of varying degrees creating health hazard for the neighbouring people and they exacerbate localised environmental degradation and exceedance of the arrying capacity of the receiving environment.

In most of the industries safety measures for workers are non-existent. As a result occupational health problems are high among factory workers which remain totally unnoticed, unreported or untreated due to lack of proper control activity.

Most of the large industries in the country are in the public sector and practically no industry with a very few exception has any pollution control or waste treatment arrangement. Permission to set up an industry is provided by various agencies including the Board of Investment, BSCIC and local authority. The present industrial policy allows contradictory issues, thereby not allowing to look deeply into environmentally sound location of an industry or ensuring its soundness in terms of pollution control. This is term can make pollution control from a regulatory point of view very difficult. There is lack of coordination among agencies involved in industrial development in the country.

Most of the older industries are based on inefficient technology without regard to economy in consumption of energy and raw materials. Lack of technologies appropriate to efficient use of resources and waste minimisation leading to unnecessary pollution loading in the environment is observed in new industries too.

With setting up of increasing number of industries, the pollution load on the environmental due to direct discharge of industrial wastes is on the increase. Environmental Impact Assessment (EIA) to find out ways for mitigating environmental problems has not been made mandatory yet.

Industries identified by DOE as highly polluting ones have not been made to take mitigating measures, due to weakness in enforcement of directives for various reasons.

Many polluting industries have been located within or near populated cities without provision for treatment of polluting wastes. The policy of locating industries in safe zones with centralized efficient treatment plant has not been implemented.

The existing Environmental Pollution Control Ordinance 1977 has been found inadequate to control environmental pollution in respect to coverage of polluting activities and in respect to enforcement.

There still exists low level of environmental awareness amongst industrialist and entrepreneurs.

There are economic constraints on pollution abatement and waste minimisation such as the cost of new technology, the competitiveness of labour, and intensive production methods as compared to more modern methods.

12.3 Industrial pollution

In the country the largest public sector factories do not have their own waste water treatment plants and private sector factories are also generally without such facilities. The resulting water pollution is a rather disturbing index of industrial development in several parts of the region. Industrial waste water discharge causes environmental pollution and requires urban remedial treatment. The resulting costs are often transferred to the consumer.

The urban centres very rarely maintain zoning in respective areas, which implies in Industrial zoning too. There is a mixture of residential and industrial activities, which pause significant hazards. The problem of Hazaribagh tanneries in Dhaka, or cluster of small industries in older part of the city and also the same kind of problems in other towns and cities are very common. It is also because of various types of approving system and agencies involved in clearing industrial proposal, not looking into environmental concerns.

Industrial effluent pollution in Bangladesh is a major contributing factor to pollution next to originating from domestic sewage and other municipal wastes. Discharges of toxic and harmful effluents are many times greater than safe allowable limits. Heavy metal pollution includes mercury, lead, chromium, cadmium and arsenic all entering the water directly.

The major source of industrial growth has been in textiles, with ready-made garment manufacture (not a polluter in general) expanding from insignificant levels in the 1970s to the leading export earner today. Leather exports have also grown quickly, and are likely to continue to do so in the future. However both industries are significant polluters due to the high level of toxicity of the chemicals involved in textile dying and leather tanning. Thus further growth of these industries is of concern.

Industrial plants are usually located along large rivers and usually discharge untreated waste directly into the rivers. Level of toxic materials of effluent have shown that they contain 10 to 100 times the permissible levels for human health. Large surfaces of polluted water surround tanneries and textile mills, which are separated from rice paddies by only low and narrow strips of land. Flooding results in the spread of polluted water across floodplains that are utilized for fishing and rice cultivation. The DDT manufacturing plant in Chittagong, just like many other industrial facilities, also dumps its waste directly into the bay. Health effects on people who rely on rivers for their source of drinking water is unknown.

Discharge of effluents in liquid or solid form, into the water-systems in increasing proportion is causing extensive pollution of the openwaters of the country. Industrial development in Bangladesh has, so far, taken place without an assessment of their impacts on environment, specially aquatic environment. Concerned industrial authorities have not considered the deleterious impacts of industrial effluents on fish, prawn and other aquatic animals in the rivers, estuaries and the sea while planning and implementing disposal of effluents from their industries, sited in the shores of rivers, their tributaries and distributaries. The pollution of Karnaphuly river caused by Karnaphuly paper mill (KPM) worth mentioning . This paper mill has no external treatment plant for treating the effluents. Facilities for recovering the "black liquor" from cooking of bamboo, wood chips and bleaching system were most inadequate. The Mill, according to the authors, was not only dumping solid wastes, fiber, bark, wood particles and inorganic compounds but also was discharging 1050 M3 /hour of bamboo and wood extraction products, spent cooking liquor, used bleaching chemicals and other such liquids into the Karnaphuly river causing pollution of water several miles upstream and downstream of the river. This devastated the fauna and flora in the affected zone of the river.

Karnaphuly paper Mill and Sylhet Pulp and Paper Mill are reported to discharge mercury 3000 kg and 560 kg. per annum respectively. Mercury is highly toxic and persistent.

Easter Refinery, and plastic and chemical industries discharge phenolic waste at about 2000 ppm. The acceptable limit of phenol in during water is 0.002 ppm. Fish flesh smells in concentration as low as 0.1 ppm.

Large scale fish kills used to occur in Sitalkhya river near Dhaka in the seventies and eighties. These fish mortalities were attributed to new ammonia released into the water by the Urea Fertilizer Factory located on the bank of the river. Department of Environment recorded the presence of ammonia at a level of 200 ppm from the sites of the Sitalkhya river where fish mortalities were occurring. Monitoring of the Sitalakhya river near Ghorasal Urea Fertilizer Factory from October 1988 to August 1989 by the Department of Environment scientists showed that the ammonia concentration in the river water ranges from 0.016 to 4.15 mg/1. This indicates that at times, the ammonia concentration in the river water exceeds the allowable limit of 3 mg/1. The main drain of the factory discharges wastes with an ammonia concentration of 8.0 to 61.0 mg/1 but this gets diluted in the river water.

Occasional fish kills from the Kushiyara rive in the greater Sylhet district have been reported due to

effluents discharged by a Paper Pulp Mill located at Fenchuganj. Effluents discharged from the Pulp Mill and Fenchuganj Fertilizer factory were found to have degraded the aquatic environment in the Kushiyara river downstream of Fenchuganj so badly that fish caught in these parts of the river emit a strong foul odour and thus become inedible. A Hilsa run into this river from the Bay of Bengal has reportedly ceased due to pollution of the river water.

Fish mortalities in waterways near Mobarakganj Sugar Mill in Jhenidah district and Setabganj Sugar Mill in Dinajpur district due to effluent discharge from these mills have been reported in the newspapers in the past. In the daily Bengali Newspaper - Dainik Bangla of 13 May, 1990, a news item appeared to the effect that fish mortalities occurred in Tulsiganga river due to discharge of industrial effluents by an industrial unit located at Battali in Khetlal Thana, Joypurhat district. According to this news item, some fisherman of Naogaon district complained that effluents discharged from Joypurhat Sugar Mill are causing this mortality of fish and other aquatic organisms. Manager of the Sugar Mill has denied this and stated that at the point where fish mortalities are taking place, Northern Distillery, another industrial unit producing liquid sugar, is releasing its affluents and wastes into the Tulsiganga river.

More than 150 industrial plants are located in eight industrial zones in Chittagong. The major type of industries are tanneries, textile mills, oil refinery, TSP plant, DDT plant, chemical complexes , fish processing plant, asphalt -bitumen plant, steel mill, paper mill and Rayon complex, soft drink factory, cement factories, soap and detergent factories, pesticide manufacturing plants, paint and dye factories and various other light industry plants. All these industries discharge their untreated toxic wastes directly into the Karnaphuly river or the Bay of Bengal. The effluent generated daily is huge quantity and contains both degradable and persistent organic and inorganic wastes and toxic metallic compounds and chemicals. The present pollution load in the river and estuary is already very large and alarming which have threatened the aquatic life and aquatic ecosystem in the Karnaphuly river and the adjacent estuarine area.

The arsenic-containing poisonous chemical (geomarkovetrock) used for absorption of CO2 gas in the urea fertilizer factory at Ghorasal is poured into drums, sealed and disposed of in the sea. The toxic chemicals discharged from tanneries, the Karnaphuly pulp and paper plant and the Barabkunda pesticide manufacturing industry ultimately pollute the coastal part of Bay of Bengal. Heavy metals like Mercury enter the Karnaphuly river from the chemical Complex and Karnaphuly paper mills, lead enters from the refinery, Chromium from tanneries, cadmium from dyeing, printing and paint Industries and arsenic compounds from Urea Fertilizer Factory Plant.

Most of the factories in Khulna city suburbs are situated in 3 industrial zones, namely, Rupsha, Khalishpur and Shiromoni Industrial Zones, which discharge their effluents into the local river system. These discharges eventually pollute the coastal water. The toxic chemicals from the Khulna Newsprint Mills are directly discharged in an untreated condition into the Bhairab river. The Newsprint Mills continuously discharge nearly 4500 m3/hour of waste water containing high level of suspended solids and sulphur compounds. Similar pollution and degradation of water quality are also occurring in the openwaters around industrial areas near Dhaka. The industries located in five industrial areas discharge an estimated 49 metric tons of pollution load in the river system around the city of Dhaka.

Toxic and obnoxious gases and dusts are emitted from pulp and paper mills, lime kiln, jute industries etc. Urea plants release ammonia and urea dust when production stops. Obnoxious smell causes air pollution problem in the tanneries. Acid fumes from metal processing industries and oxides of sulphur from sulphuric acid plants, TSP and other industries cause occupational health hazards to the people at work and those living near by. Jute Mills are very dusty and emission causes health problems. but no health damage assessment study has yet been done.
Air pollution problem created by industrial activities is still less than water pollution problem. But other than those mentioned above cement plants are major source of air pollution, particularly the one at Chittagong and. At least four new cement grinding plants are going to be installed in Chittagong and Khulna pretty soon and air pollution control measures should be mandatory for those plants.

CHAPTER -13 :

ENERGY

13.1 Introduction

The rational use of energy and mineral resources has an important role to play in maintaining sustainable development.

Energy is not only essential for meeting household needs but happens to be also a critical factor in industrial and agricultural production as well as for transport. Being still at a very early stage of development, the per capita energy consumption in Bangladesh is very low (164 kg of oil equivalent in 1990, of which 56 kg OE of commercial energy and 108 Kg OE is biomass energy). With these figures Bangladesh is one of the lowest users of energy in particular commercial energy, in the world. Even amongst the 40 countries classified as " Low income countries" (other than China and India) by World Bank, Bangladesh's commercial energy use stand less than 31% of the average of these countries (422 kg OE).

But the scenario is bound to change rapidly as Bangladesh will be compelled to increase the agricultural productivity and output in order to feed the burgeoning population with fixed arable land (0.10 hectare per head in 1990) and commence industrialisation to meet the domestic needs as well as exports. In terms of per capita commercial energy consumption, an accepted indicator of the state of development, Bangladesh has to step up progress in order to catch up atleast with the neighbouring countries most of whom are significantly ahead in this regard.

Bangladesh currently faces two energy crisis, one in the modern and the other in the traditional energy sector. Combined, the two sectors are unable to meet the country's present energy needs; the shortfall, equaling 10% of total consumption, is made up by petroleum imports. The share of Bangladesh's export earnings needed to cover the cost of importing commercial petroleum was 45% in 1985 (down from 90% of total export earnings in 1982).

13.2 Present energy use

* Energy consumption pattern in Bangladesh is characterized by heavy dependence of traditional biomass fuel. At the moment about 73.1 per cent of total energy use is biomass fuel.
* Domestic sector uses about 64.77% per cent of total energy and 81 per cent of total biomass fuel.
* At the moment, even in industrial sector about 69.6 per cent of energy used is biomass fuel.
* Imported fuels (petroleum and coal) account for 44% of primary commercial energy supply and required about 22% of the country's export earnings in 1983/84.
* By far the largest element 85% of imported fuels consists of crude oil and petroleum products, the balance being coal.
* With the commercial sector, there is a mismatch between petroleum products production and consumption, with almost 10% of refinery output being exported and a supplement of over 70% of refinery output being imported in the form of petroleum products.
* Natural gas consumption is dominated by power and fertilizer industry (36% and 44% respectively) penetration of other sectors has been much slower.
* Losses (technical and non-technical) in the electricity sector are very high amounting to about 34.2% of gross generation.
* Average per capita consumption of energy, in rural areas is estimated as 5.32 GJ/person per year, of which 67% of total energy was consumed for subsistence purposes.
* Only 32.90% of total - energy was used for productive purposes split between 16.4% and 16.59% respectively for agriculture and industries.
* Of the total energy consumed within the village area, 82.7% was met from local sources and 17.29% was supplied from outside. The latter comprise kerosene, Diesel, 17.29%

electricity and fertilizer which are vital for increasing agricultural production as well as for providing biomass fuels.

Although agricultural residues provided the major share (63.5%) of biomass fuels, its availability in future would depend on the agricultural development plan which is to be implemented. Therefore, it is necessary to assess the future production of agricultural crops and hence project the availability of agricultural residues as fuel.

13.3 Environmental concern.

Major environmental concerns in the energy sector are as follows:

* Deforestation to satisfy rural energy requirements has caused problems of flooding, soil erosion and siltation in many areas.
* Loss of forest cover greatly reduces biodiversity as many species lose their habitat and food supplies.
* Deforestation and local climate changes can lead to more substantial environmental problems such as desertification.
* The use of livestock manure for fuel in rural areas deprives the soil of natural fertilizer and leads to nutrient depletion and the loss of soil organic matter.

There has been a general reluctance for alternative renewable rural energy sources to be developed (such as solar, wind and micro hydropwer) and the technological base in Bangladesh for developing such sources is inadequate.

* Energy conservation awareness is generally low throughout the country.
* Flat commercial rates for natural gas encourages wastage of the resource
* Probable environmental impacts of coal, peat etc. mining projects in the near future.
* Air and thermal pollution of water bodies arises from power stations. This affects human health and leads to loss of aquatic diversity and fish productivity.
* The heavy reliance upon biofuel in the rural areas has direct influence on soil physio-chemical characteristics and the availability of fodder and fruit trees. Development within the energy sector can directly influence the rates of environmental degradation, particularly if there is a shift towards the use of coal and peat, increased use of gas for domestic purposes and the development of appropriate alternative energy production technologies in rural areas.

In 1990, about 28.8 million tones of agricultural residues were used as fuel. There is a general concern about decrease in fertility and deterioration of soil quality due to the use of agricultural residues as fuel instead of recycling as organic matter. Concerning the importance of residues as sources of biomass fuel, there is a need to ascertain the optimum quantity of residues that can be safely used as fuel without causing any significant harm to the environment.

CHAPTER 14
TRANSPORT

14.1 Introduction

Transport does not figure in the list of major environmental issues of the country, though increasing vehicular pollution in the major urban centres is becoming an issue of growing concern . But the imperatives of fast economic development and required growth in the modern sectors to reduce poverty and improve the standard of living calls for faster growth in industrialisation and urbanisation processes with concomitant and rapid expansion of the transport sector.

Transport sector in real terms contributed to 11.98% to the GDP in 1989/90. It absorbs 4% of the total labour force and 11% of the urban labour force of the country.

14.2 Transport Modalities

The main modalities of transport in the country consists of road, rail, river and air transport. For surface transportation the country has 150,000 km of roads (only 9% paved), 2746 km of railway track and 8372 km of waterways of which one third is available only during the monsoon season. Inspite of the high cost of construction of roads in a country, braided by complex water channels, inconveniences of river crossings and unsatisfactory conditions of road surface due to shortage of funds for maintenance, road transport seems to have become popular for both carrying goods and use by passengers.

The fleet of commercial road transport vehicles in 1990 is the following shown in Table

Fleet of commercial road transport vehicles, 1990

Type of vehicles	Number
Bus	
Public (BRTC)	712
Private	11585
Truck	
Public (BRTC)	488
Private	23008
Others	
Minibus	1191
Car	83655
Jeep	10100
Taxi	3000
Auto rickshaw/Tempo	24739
Tractor	4125
Motor Cycle	161486

Source : NCS (1991)

About 54% of public buses and trucks are road worthy and the rest are remaining unutilised due to lack of repair and maintenances. Although 90% of Private sector buses and trucks are generally poor with mechanical faults due to overuse without regular maintenance causing accidents and health hazards in urban areas.

In 1988-89 the railway fleet consisted of 307 locomotives, 1500 passenger carriages, freight wagons in terms of four wheelers 19077 and other carrying vehicles 287. With these railway stock the Bangladesh railway is maintaining services to 502 stations.

There are 1557 motorised passenger vessels/launches (1506 private, 51 public), 1031 cargo vessels (991 private, 40 public), 194 towing vessels (146 private and 48 public), 865 dump crafts

Photo - Rickshaws - the environmental friendly vehicles of Bangladesh

The environment protection act 1994 is in its final stage of approval and once promulgated, it will empower the concerned agency to control noise water and air pollution caused by the transport sector.

14.5 Overall trend

The overall trend of transport sector includes the following

* motorised vessel pollution including vehicular pollution is on the increase
* Number of motorised vehicles will further increase rapidly
* overloading is going to continue
* maintenance of road, railway and waterways network will be further difficult
* number of accidents, human health hazards may increase further.
* private sector transportation will develop more rapidly than public sector.

CHAPTER -15

TOURISM

15.1 Introduction:

Tourism is not very much developed in Bangladesh and the country has no significant tourist industry. Majority of local people are not interested in spending on tourism, mostly due to poverty and there are only a very few spots which can attract international tourists. Although the nation has what are reputed to be the world's largest sand beach and the world's largest area of contiguous mangrove forest - both almost completely unspoiled by tourists - few tourists stop in Bangladesh

Still the government has put increased importance on development of tourism in the country both for the local and expatriate. Places of recreational, cultural and historical importance are being protected, beautified and developed. Communication is being improved alongwith accommodation and other facilities.

Tourism in Bangladesh is still mostly a seasonal activity and mostly during winter season, which is dry and pleasant. The beaches along the Bay of Bengal in the Southeastern Part of the country gets crowded during this time. Tourism in Bangladesh means and for sometime will continue to mean domestic tourism, and implies Cox's Bazar. This is not to deny possibilities of international tours to see Royal Bengal Tiger in the Sundarban or to visit the beaches and islands of the southeast cost.

15.2 Environmental issues of tourism

Overall tourism activity has not contributed yet to significant pollution or environmental degradation problems, though there are problems associated with overextraction of coral from St. Martin's island which may lead to destruction of the ecology of the island, uncontrolled exploitation of other marine resources which include turtles shell and other wildlife, inadequate sewage treatment by tourist hotels, floating debris in the coastal water, higher turbidity along the beach shore line, damage to shrubs and bushes at some places, damage to historical and cultural monuments, etc.

15.3. Environmental problems and tourism in the coastal region

The sea water of the Bay of Bengal is turbid with a good amount of silt in it, unlike the much desired blue sea of the Frence Riviera. Some of this silt is washed onto the beaches, imparting to them a slight stickiness. Thus, the beaches are not always suitable for sunbathing, like for example, the Maldivian beaches made up of white sands.

To add to the problem, there is coastal erosion. The beach south of Cox's Bazar faces an open and violent sea. As a result, the part of the coast starting from Bhangamura (literal meaning "broken hill", 6 km south of Cox's Bazar) is continuously receding owing to erosion. The erosion of the bluff if contributing more sediments to the sea, making it more turbid, the turbidity in the water is affecting biological resources nearby. An obvious example of such destruction is the gradual decay and ultimate death of the corals, which are no longer growing , much to the detriment of the scenic beauty of Himchhari. Coastal erosion is taking place also on the north -eastern portion of Maheshkhali and on St. Martin's Island.

Among the man-made problems of the coastal environment, mention should be made of water pollution from industrial effluents and domestic sludge. The River Karnaphuli is the recipient of untreated domestic and industrial wastes in a large enough quantity to create widespread problems of health and sanitation.

The Bagkhali estuary at Cox's Bazar is also highly polluted. Here the pollutants are principally domestic sludge, bilge-water and kitchen wastes of about 2,000 mechanized and other types of

fishing and ferry boats, charcoal waste, tar and discards from shrimp processing plants. Although the self cleansing mechanism of the sea water at the river mouth seems to still be an effective check to sea-water pollution, continuous monitoring is called for.

Oil pollution of the beaches at Patenga and Fauzdarhat has been reported as a result of port activities, ship-breaking and the operation of several industries in the city. Oil slicks have also been reported in and around St. Martin's Island beaches.

At Cox's Bazar a pilot beach-sand exploitation plant has been in operation since 1981. So far only exploration work has been done along the beaches. Beach sands have been collected through boring and it has been estimated that the deposits along the beaches at Cox's Bazar, Badar Mokam, Teknaf, Maheshkhali, Matarbari, Kutubdia, Nijhumdwip and Kuakata will fetch an amount of Tk. 12 billion. Exploitation of the beach sand will interfere with tourism in the Cox's Bazar area if it destroys the beaches and sand dunes.

Salt production by solar drying is done on a wide scale in the entire western sea-front of Maheshkhali. The western beach, which could otherwise be used for development of tourism , is being claimed by the salt industry also.

Land use conflicts may also arise between agriculture and tourism. In Cox's Bazar particularly , where the possibilities of tourism development are still great, no space will be available for building accommodations for the growing number of tourists except around the place where the Parjatan motels stand today. The land between Cox's Bazar and Kalatoli, 5 km away, the only open space available for construction purposes, is at present occupied by agriculture. Toursim and agriculture may vie for the same land.

In the Chittagong estuary, a ship breaking industry has been established at Kumira. This causes a nerve racking noise in the nearby areas. Such noise pollution would definitely scare the tourists away from using Fauzdarhat Beach.

Noise is also made by tourists themselves. This has been observed particularly in Cox's Bazar. Dozens of groups of excursionists or picnickers throng places near Cox's Bazar beach, put up record players fitted with loudspeakers and create a tremendous noise.

Food waste is another form of pollution on Cox's Bazar beach. Since this beach is frequented by a large number of visitors, shells of groundnuts and various other food wastes are indiscriminately thrown on the beach. This causes pollution of the beach sand owing to putrefaction.

Damage done by tourists to vegetation is of far reaching consequence. In Cox's Bazar, trampling of the none-too-thick dune vegetation (ipomea prescapre) is a common phenomenon. Visitors to the place are also seen pulling up the loosely rooted plants in the heaped up sand deposits. This causes the plants to wither and the dune to be blown away, degrading the natural environment.

The collection of shells from the beach by locals and tourists causes immense damage to the beach environment. The practice is on such a scale that it has depleted the seashells from Cox's Bazar beach. In St. Martin's Island the resource is dwindling fast. In Sonadia, which is not yet extensively visited by tourists, exploitation is done by those who visit the island from time to time and by traders' agents.

Tourists (and others) have done irrepairable harm to the corals of St. Martin's Island. This is the country's only coral island. The corals are a great attraction to anyone who visits the island. Their growth has been checked by being walked on at low tide, by being broken from the top and by being collected as souvenirs. Traders of seasheel souvenirs collect coral pieces through their local agents, much to the detriment of the ecosystem of the island.

Cases of unfortunate killing of female Ridely turtles while they are on their way to make nests, or on their way back to the water, or killing of hatchlings or destruction of the eggs at St. Martin's

Island. Cox's Bazar beach and Maheshkhali have been described by various researchers. Cases of the senseless killing or enjuring of other endangered animals are also known.

15.4 Other Concerns

Uncontrolled tourism development may threaten unique marine habitat within Bangladesh. Further absence of an environmentally sustainable tourism development strategy presently prevents development of the industry and an economic return for tourism development and habitat protection measures. There is no well thought out plans for the management of the ecosystem of St. Martin's Inland. Prevention of water pollution beyond the coastal waters zone is not covered by the existing laws. Nor do the laws provide for any measures of control of degradation of the environment by individuals through apparently innocuous acts, e.g. collection of corals, seaweed and turtle eggs.

CHAPTER - 16

HUMAN HEALTH AND THE ENVIRONMENT

16.1 Introduction

The existing health infrastructure covers different strata of the population right from the grassroot level. The health care delivery system is organised on primary, secondary and tertiary tiers as the system has to meet the requisites of a vast population. It suffers due to inadequate logistic support. As a result only 40 per cent of the total population has access to static health services and health care is predominantly urban and curative in nature. The primary health care system has been substantially geared up during the last decade. In rural areas number of hospital beds have been expanded under the upazila (sub-district) health complexes which constitute 30 per cent of the total hospital beds in the country. 55 per cent of the doctors in the country are serving the rural population which is however inadequate to meet the demand for such expert services. Considerable success has been achieved in child immunization programme which has achieved 77 per cent of the target. The coverage of immunization achieved upto December 1989 is 88 per cent for BCG, 49 per cent for DPT, 52 per cent for measles, 49 per cent for polio (for children under one) and 22 per cent for TT (for pregnant mother).

Access to safe drinking water, due to contamination of ground and surface water is a major health problem. Adding to it, chronic malnutrition and lack of available health care results in high rates of mortality.

Caloric intake in Bangladesh has declined from more than 2300 calories in 1960 to 1920 calories per day in 1990. Malnutrition is widespread and a major cause of childhood mortality. Almost all rural mothers are considered malnourished.

Other common diseases affecting the general population include dysentery, typhoid, cholera, tuberculosis, worms, measles, malaria etc. Lack of safe drinking water and widespread water pollution is the main cause. Drinking water comes from tubewells for 53 percent of rural households, while 39.7 percent rely on ponds and shallow tubewells with the remaining 7.3 percent rely on rivers. Only 26 percent of urban households have access to tap water. The urban poor are also lacking proper nutrition, adequate sanitation and live in slums and squatter all of which are detrimental to human health.

16.2 Environmental concerns

The generally inadequate state of human health in Bangladesh is the result of inextricable linkages between over population, poor nutritional status, and inadequate potable water and sanitation provisions. Key specific issues in this respect are the following :

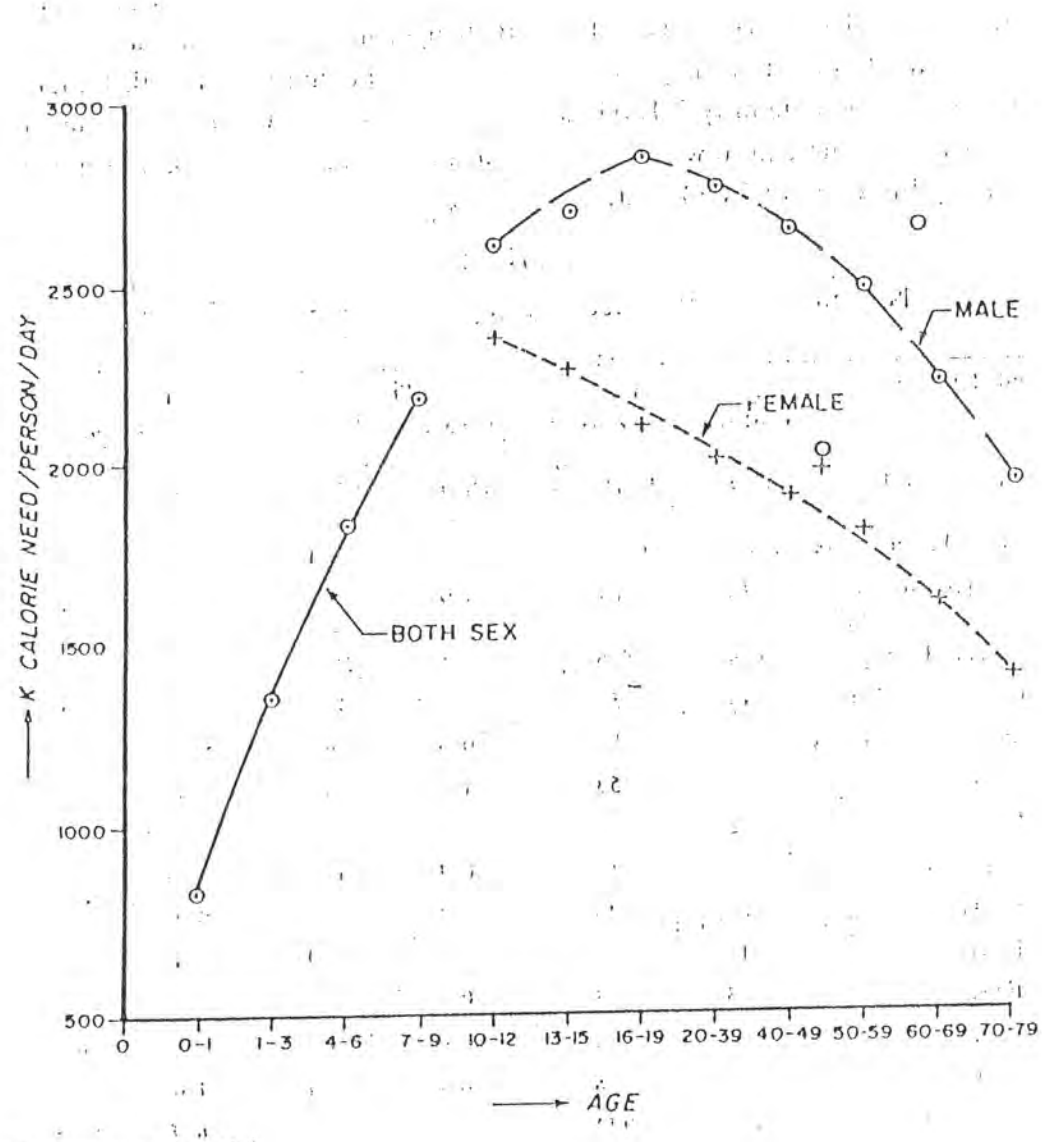
* Human health in Bangladesh is affected by a number of interlinking issues such as overcrowding, poor sewerage and sanitation provisions and the presence of polluted surface waters. Improved water supply and sanitation infrastructure will contribute greatly to a decline in many diseases.

* There is a low level of environmental health awareness amongst the rural and the urban poor and homeless population.

* Despite 80% of rural households having access to tubewell water, many people continue to rely on contaminated surface waters and are therefore vulnerable to waterborne disease.

* Protein calorific intake is extremely low in rural areas and has declined since 1960. This contributes to high infant mortality rate and low level of disease resistance amongst the population in general.

FIGURE : CALORIE NEED OF BANGLADESHI



(Bhuiyan et al-1987)

* Low literacy rates greatly impede the dissemination of information on environmental health

* Upland urban development (particularly in traditionally rural areas) has resulted inadequate sewerage and sanitation provisions.

* In most towns the disposal of human and industrial waste is inadequate

* In urban areas, the rate of population increase outstrips attempts to improvement provisions for water supply and sanitation.

* High population densities in rural areas leads to encroachment and degradation of natural habitats, and over -exploitation natural resources.

* Increased level of vehicular pollution in larger urban areas.

* Inadequacies in the institutional framework for population control (such as absence of birth/death registration and the non-integration of health and family planning services) means that it is difficult to monitor the success of specific interventions.

Certain amount of details of two of the issues are given below :

16.3 Unsanitary Living Conditions

Dhaka is the only city with a modern underground sewerage pipeline system connecting major parts of the city and leading to a sewage treatment plant on the outskirt of the city. However, this only deals with domestic waste of 18 per cent of households in Dhaka city. Most of other cities have open drains which empty into nearby canals or rivers with little or no treatment. Industrial wastes are similarly disposed of into the nearest canal or river, as was mentioned earlier.

Urban infrastructure facilities are becoming expensive as they are pushed to their limits due to the high density of the population. Supply of services can not meet the demand which is continually growing, leading to a decreased quality of life in urban centres. Better housing needs to be developed, as well as better transportation, water, sanitation and hygiene. Poor and middle income families are forced to live in the high density fringe settlements that do not have piped water, sewerage, proper drainage and garbage removal facilities. The number of slums and squatter settlements is also increasing, and density within them is now estimated to be 162,000 people per square kilometre. Environmental hazards imposed in these slums are a threat to the cities which they surround. Some settlements are on land fill sites which further increase the probability of environment related diseases.

An important health aspect is the widespread prevalence of water borne diahrrial diseases due to the lack of clean drinking water in all the city areas. Although much of the drinking water supply in the towns comes from underground reservoirs and is fairly clean, most of the city's population, especially the poorest living in the slums, are dependent on polluted open water bodies which are sources of infection. Diarrhoea is the major cause of mortality in some slums and yet could be prevented if proper drinking water, sanitation and drainage facilities were in place. However, as mentioned above, such infrastructure requirements are at their operating limit due the increasing population growth and density. In addition to these sanitation problems are the unregulated commercial and industrial companies which dump their untreated garbage and solid waste into wetlands and rivers that are upstream and near to human settlements. The poor, again bear the brunt of the health impacts associated with such practices.

The government is increasingly concerned with the presently unsustainable urban development patterns, and the need for integrated planning to ensure an environmentally sustainable urban development into the twentieth century.

Most of the increase in the projected doubling of the urban population over the next 10-15 years

will take place in the poorest areas of the cities. The consequences for sanitation and health will be enormous. Already there are serious shortfalls in basic infrastructure, developed land, services and shelter. The projected rapid further population growth will lead to critical shortages in roads, drainage, solid waste collection, transport water and sanitation facilities.

PART -III

RESPONSE

CHAPTER 17

ENVIRONMENTAL TECHNOLOGY

17.1 Introduction

The concept of environmental technology in Bangladesh environmental management context is a relatively new one. The general public in general are environment friendly in their daily actions and towards resource utilisation and conservation. Due to resource constraint, alternate means of resource use and curbing pollution and environmental degradation need for environmental technology is becoming important in recent times.

17. 2 Existing Trends in Environmental Technology:

Existing technologies in the industrial and other fields are not environment friendly and as such are contributing to environmental pollution and degradation in many ways. Some of the important aspects of this scenario are as follows:

* Most of the industrial development in Bangladesh took place in the fifties and sixties when the question of environment friendly technology was not such a burning issue.

* Major industries are owned by the govt. sector. Govt. owned industries are mostly running at losses and more over in developing countries like Bangladesh govt. sector industrial units usually suffer from the wrong idea that they need not give importance to pollution related issues and introduction of environmental technologies.

* Introduction of environmental technologies are considered costly.

* There is serious lack of information, knowledge and data regarding environmental technology and their availability.

* Existing institutions and laws related to the management of environment have not attained any considerable success in persuing the industrial units both in the govt. and private sector in introducing environment friendly technology.

17. 3 Current Responses to Introduce Environmental Technology

Certain efforts have been made recently in developing and adopting environmental technology which can reduce or obstruct the rate of environmental degradation or pollution.

Some of those include:

* Development and use of fuel efficient stoves, particularly for rural areas. The wide scale use is presently in the process.

* Introduction of use of natural dyes (e.g. turmeric) in the textile dyeing industries in lieu of chemical dyes.

* Development and wide use of low cost two pit system, and three pitcher system sanitary latrines for rural Bangladesh in particular.

* Mechanised country boats instead of man driven country boat. The same engine may be used for irrigation and other purposes. This has been developed with indigenous technology.

* Introduction of special Tara pump which may be used to extract water particularly for safe

drinking purposes, where ground water table is at a level non-reachable to most of the regular hand pumps.

* Lowcost biogas plant (floating dome type) using mainly cowdung, but also using natural compost and human excreta.

* Handloom is widely used and encouraged which does not consume any but human energy and highly efficient.

* Introduction of environment friendly integrated pest management.

* Rickshaw as a transport medium is extensively used (which is pollution free and no energy is required other than human energy) and new models have been developed which can reduce the labour of the rickshaw puller and provides better efficiency.

* Local environmental firm have been working towards installing cost effective and locally suitable effluent treatment plants.

* Moreover use of local indigenous methods of agriculture, aquaculture, silviculture are widely encouraged and new environment friendly technological innovations are very much appreciated and widely introduced.

Overall the country is very responsive to transfer and development of environment friendly technology.

CHAPTER 18

ENVIRONMENTAL MANAGEMENT POLICIES, INSTITUTIONSAND MONITORING MECHANISMS

18.1 Introduction

The institutional framework on environmental management in Bangladesh is composed of the formal and informal institutions; the constitution of the country, the laws, the govt., private and non-government organisations and agencies; their policies, commitments and activities and the educational institutions and systems which help to educate and create awareness regarding the environment.

18.2 Policies

Environmental management as a conscious and well determined policy and action is of very recent origin in Bangladesh. The administrative agencies, laws, in this field started emerging in the mid 70s, in a very rudimentary and conceptual manner.

By now the constitution of the country, a number of existing laws, and some laws under formulation, some govt. policies and activities and policies of a number of NGOs are showing signs of establishing a trend of improvement in the field of environmental management. The policies, institutions and monitoring mechanisms for environmental management are enumerated below :

The Constitution :

The constitution of Bangladesh does not explicitly recognise the right to environment as a fundamental right. However, every citizen has the right to have protection from "action detrimental to life, liberty, body, reputation or property " (Article 31). Moreover Article 32, states, "No person shall be deprived of life or personal liberty save in accordance with law".

Principles on State Policy:

The Principles on State Policy as enunciated in the constitution aim at "Promotion of a condition in which respect for the dignity and worth of the human person shall be guaranteed" (Article -11). It also identifies one of the Primary duties of the state as "raising the level of nutrition and improvement of public health (Article 18(1)).

Policy of the Democratic Government :

The establishment of a democratic government after many years in 1991 has set in motion a natural and spontaneous process of accountability and public participation in all socio-political, economic and development initiatives of many institutions.

The issues which affect the people are reflected in all policies of the state through their representatives. The peoples perspectives are being increasingly focussed in the Five Year Development Plans, Annual Development Plans (ADPs), and the day today Policies of the Govt. An Intensive process of consultation now takes place before formulation of the annual budgets also. The finance Minister's budget speech for 1993-94, and 1994-95 mentioned environment and environmental priorities very clearly and prominently.

The Prime Minister has a personal commitment to improve the state of environment. In all the international, regional and national fora she has been relentlessly advocating the case for concerted action for environmental improvement. In the national context her government has taken up environmental improvement as a challenge. To quote her own words :

"To face this challenge, we have initiated an integrated approach. We have brought poverty alleviation, conservation of environment, and population control within the ambit of the same policy framework. For combating environmental degradation, we have taken up tree plantation programme on a national scale. This programme has been interwined with poverty alleviation. Social Forestry Programme is an outstanding example in this context. If we can carry this programme through to the end, then not only would the environment be preserved, poverty would also greatly diminish."

18.3 Institutional setup to Deal with Environmental Issues

Important institutions which are engaged in the management and monitoring of environment are the following:

Ministry of Environment and Forest :

The Institutional setup of the Government of Bangladesh for dealing with the overall environmental issues has undergone a remarkable change in recent years. A new ministry, namely Ministry of Environment and Forest was created in August, 1989 to look after the overall problems of environment and ecology and monitor all related activities in the different sectors. The manpower of the Ministry has recently been expanded including creation of a planning cell to deal with development planning. The main activities of the Ministry of Environment and Forest relate to the following :

- Environment and ecology;
- Matters relating to environmental pollution control;
- All matters related to conservation and development of existing forests, wildlife, biodiversity;
- Afforestation and regeneration of forest;
- Botanical Gardens, herbariums;
- Research and raining related to environment and forests;
- Liaison with international organizations and matters relating to treaties and agreements with other countries and world bodies relating to environment and forests.
- All laws related to environment and forests.

Department of Environment :

The Department of Environment is the field level organizaion dealing with environment. Previously it used to deal only with environmental pollution. Recently it's mandate of work has been widened to include all problems of environmental management in the country. The Department is directly responsible for certain environmental management activities while it also coordinates and monitors activities related to environmental management and improvement in all related sectors. The manpower of the Department of Environment has recently been increased and it is now in a better position to perform the assigned functions.It is expected that within the next five years the Department shall have administrative and technical capabilities to monitor and regulate major environmental activities in the important locations of the country.

Presently the major activities of the Department of Environment include the following :

- implementation of the environment pollution control legislation;
- monitoring of environmental quality standards;
- monitoring of all types of anti pollution activities specially in industries, rivers and other ecologically sensitive areas;
- coordinating and monitoring the related activities of all government and non-government organizations.

Department of Forest

The department of Forest is also an important organization dealing with conservation and development of the forests which has great bearing on the environment and ecology. Presently the Department is engaged in implementing a few important afforestation schemes throughout the country and in the coastal areas. The government is considering a proposal to create a new Department of Social Forestry to ensure large scale participation of the people in afforestation activities.

Planning Commission :

The Planning Commission, Ministry of Planning, coordinates the environmental aspects of development projects. In the project proforma for development projects there are items for explaining the probable environmental impact of such projects. There is also a separate wing in the Planning Commission that deals with environmental projects. The Planning Commission is taking steps to strengthen its capability to deal with the environmental aspects of development activities.

Other Government Organizations :

In addition to the above, activities of the following government organizations are related to environmental issues in various ways :

- Ministry of Irrigation, flood control and water development
- Master Plan Organization
- Flood Plan Co-ordination Organization
- Ministry of Agriculture
- Ministry of Fisheries and Livestocks
- Department of Fisheries
- Ministry of Culture
- Directorate of Archaeology
- Ministry of Works
- Public Works Department
- Capital City Improvement Authority
- Municipal Corporations/Municipalities
- Housing and Settlement Directorate
- Water and Sewage Authorities
- Department of Public health engineering
- Ministry of Industries
- Investment Board
- Industrial Corporation like BCIC, BSFIC, BSEC
- Ministry of health and population control
- Directorate of health
- Ministry of Ports, shipping and Inland Water Transport
- Bangladesh Agriculture Development Corporation
- Ministry of Labour and Manpower
- Directorate of Labour
- Directorate of Inspection of Factories, Shops and Establishment
- Ministry of local Government, rural development and cooperatives
- Ministry of Energy and Mineral resources
- Bangladesh Road Transport Authority
- Bangladesh Police
- Department of agricultural Extension
- Directorate of Livestock
- Bangladesh Inland Water Transport Authority
- Ministry of Land
- Bangladesh Oil, Natural Gas and Mineral Corporation

The level of understanding and awareness regarding environment even in the above government organizations is not yet substantive and the required amount of cooperation and coordination among them for appropriate environmental management is lacking. However, with the increase in the scope of activities of the Ministry of Environment and Forest and Department of Environment, the effectiveness of environmental management and coordination, are likely to improve.

18.4 Environmental Legislation

In Bangladesh the laws relating to environment, pollution, conservation may be broadly grouped into the following categories :

Conservation of Natural Resources - the laws under this category relate to conservation of natural resources like the forests, animals and birds, fisheries and other varieties of flora and fauna. Laws relating to protection of cultural and natural heritage may also be included in this category.

Protection of Environmental Health - these Laws relate to protection of health and sanitation including water supply, drainage, food, sewerage, urban planning, etc. in order to avoid health hazards . This category also includes occupational health.

Control of Environment Pollution - these laws relate to control, prevention and abetment of pollution of air, water and soil that may be harmful to health and living conditions of the people or to the growth or development of all kinds of flora and fauna. These Laws provide for the environmental impact assessment and monitoring of environment pollution and measures for their control and abatement.

Main Environmental Legislation

The main sectoral environmental laws in Bangladesh are :

1. The Environment Pollution Control Ordinance, 1977.
2. Territorial Waters and Maritime Zones Act, 1974.
3. Pesticide Ordinance of 1971 and 1983 and Pesticide Rules, 1985.
4. Petroleum Act, 1934.
5. Factories Act, 1965 and Factory Rules 1979.
6. Motor Vehicle Ordinance, 1939 ((modified upto 1983).
7. Mines Act, 1927.
8. Dangerous Drugs Act, 1930 and Dangerous Drug Control Order, 1982.
9. Forest Act, 1927 (amended in 1989)
10. Local Government Ordinance, 1982 (Upazila Parishad and Upazila Administration Reorganization).
11. Pourashava Ordinance, 1977.
12. Water Supply and Sewerage Authority Ordinance, 1963 (amended in 1989).
13. The Boilers Act, 1963.
14. Agriculture and Sanitary Improvement act, 1920.
15. Water Hyacinth Act, 1939.
16. Tanks Improvement Act, 1939
17. Embankment and Drainage act, 1952.
18. Opium Act, 1978.
19. Dangerous Drugs Act, 1930 (amended in 1988)
20. Chittagong Hill Tracts Regulation Act, 1990.
21. The Town Improvement Act, 1953.
22. Labour Laws (amended upto 1987)
23. The Municipal Ordinance, 1983
24. The Explosives Substances Act, 1908 (modified upto May 1983)
25. The Explosives Act, 1884
26. Poisons Act, 1919.
27. The Factories Rules, 1979

28. Bengal Irrigation Act, 1876.
29. Local Government Ordinance (Union Parishads), 1983.
30. Bengal Irrigation Act, 1876.
29. Local Government Ordinance (Union Parishads), 1983.
30. Bengal Irrigation Act, 1876.
31. Bangladesh Water and Power Developments Boards Ordinance, 1972.
32. Wildlife (Preservation) Order, 1973.
33. East Bengal Conservation and Protection of Fisheries Act, 1950 (amended in 1982)
34. The Bangladesh Fisheries Development Corporation Ordinance, 1973.
35. Marine Fisheries Ordinance, 1983.
36. Shops and Establishment Act, 1965.
37. Bangladesh Pure Food Ordinance, 1953
38. The Bangladesh Penal Code, 1860 (as amended from time to time).
39. Antiquities (Amended) Ordinance, 1976.
40. Antiquities Act, 1968.
41. The Tea Plantation Labour Ordinance, 1962 and Rules of 1977.
42. The Forest (Amended) Ordinance, 1989.
43. Merchant Shipping (Amended) Ordinance, 1988.
44. The Inland Shipping (Amended) Ordinance, 1989.
45. The Dhaka Municipal Corporation Ordinance, 1983.

Table - 1: Legislation Status in Respect of Various Environmental Aspects:

Present legislation		Status	Comments/Recommendations
1.General/consti-tuional provisions and responsibilities	-	No. constitutional provision	constitutional provisions would be helpful
2. Environmental Impact Assessment (EIA)	No legislation	EIA are being done on selected Projects	EIA to be made mandatory under a legislation
3. Air pollution control	1) Environment Pollution Control Ordinance 1977 2) Factories Act 1965 3) Bengal Motor Vehicles Act 1939	Rarely used and inadequate	Updated separate air pollution/clean air act required
4. Water pollution	1) Environment Pollution	Rarely used inadequate	Updating required
Control	Control Ordinance 1977 2) Factories Act 1965		proposed draft Environment Protection Ordinance 1991 might be a partial answer
5. Noise Pollution Contro	1) Bengal Motor Vehicles Act 1939 2) Factories Act 1965 3) Environment Pollution Control Ordinance 1977	Inadequate rarely used	Scientic standard to noise level to be fixed and legislation to be modified accordingly
6. Land use and Planning	1) Local Government (Upazila Parishad and Upazila Administration Reorganization) Ordinance 1982 2) Pourashava Ordinance 1977 3) Town Improvement Act, 1953	Inadequate	National land use plan and national industrial siting plan required zoning system (commercial, residential, industrial etc.) to be made mandatory under legal provision.
7. Management of toxic/hazardous substances	1) Pesticide Ordinance 1971 (Amended in 1980 and 1983) 2) Environment Pollution Control Ordinance 1977	Inadequate	Proposed environment protection ordinance should have enough provisions, Pourashava and local government ordinances to be modified accordingly.

8. Solid wastes management	1) Pourashava Ordinance 1977 2) Environment Pollution Control Ordinance 1977	No Specific legislation inadequate	Present legislation to be updated.
9. Forest conservation	1) Forest Act 1927 (modified upto 1973)	Still inadequate	Provisions for both protection and development of forest should be amply incorporated
10. Wildlife conservation	1) Wildlife (Preservation) Order 1973 2) Rules to regulate hunting and shooting	Wildlife preserved not so properly, cases of extinction reported	Strong organization with adequate powers required.
11. Costal resources management	1) Environmental Pollution Control Ordinance 1977 2) Territorial water and Marine Zones Act 1974 3) Factories Act 1965 4) The Town Improvement Act 1953 5) Marine Pollution Control Law (Proposed)	Costal resources degradation noticed, Deforestation, water logging, increased salinity increasing , legislations inadequate	Comprehensive ordinance required, Provisions needed to cover all spheres of coastal environment
12. Mineral resources development and management	1) Mines Act, 1923 2) Petroleum Act, 1934	Rarely used	Provisions for EIA to be included and also restoration of mine land.
13.Radiation control	No legislation	A legislation has been adopted	Legislation should be complemented.
14. Cultural environment	1) Antiquities Act 1968 2) Antiquities (Amendment) Ordinance 1976	Not fully adequate	Needs further upgrading
15. Management of water resources	1) Environment Pollution Control Ordinance 1977	Inadequate	Comprehensive legislation required
16. Conservation o bio-diversity	1) Forest Act 1927 (modified upto 1973) 2) Environment Pollution Control Ordinance 1977 3) Wildlife (Preservation) Order 1973 4) Rules to regulate hunting and shooting and fishing	Inadequate rarely used	Related laws, ordinance need upgrading
17. Soil conservation	1) Forest Act 1927 2) Bangladesh Water and Power Development Boards Ordinance 1972	Present legislation do not provide sufficient coverage	Enough provisions/new legislation required for controlled pesticide and chemical fertilizer use, covering of soil, control of soil erosion etc.
18. Marine pollution	1) EPC Ordinance 1977 2) Territorial Water and Marine Zones Act 1974	A modified marine pollution control ordinance as been drafted	Proposed ordinance to be promulgated soon.
19. Occupational health and safety	1) Factories Act 1965 2) The Factory Rules 1979	Inadequate	Sufficient provisions. Needs further upgradation and implmentation to curb pollution from factores and improve shopfloor environment.

Table - 2: Agencies for Actions in Respect to Environmental Legislation

Implementing Agencies	Legislation No.
1. Ministry of Environment and Forest	1,3,6,9,32,24,2,25,42
2. Department of Environment	1.6,3,2,24,25
3. Department of Forest	9,32,42
4. Ministry of Irrigation, Flood Control and Water Development Board	17, 31
5. Bangladesh Water Development Board	17, 31
6. Master Plan Organization	17
7. Flood Plan Co-ordination Organization	17
8. Ministry of Agriculture	14, 1,3,30
9. Ministry of Fisheries	33,34,35
10. Department of Fisheries	33
11. Ministry of Culture	39, 40
12. Directorate of Archaeology	39,40
13. Ministry of Works	21,39, 40
14. Public Works Department	21,39,40
15. Capital City Improvement Authority	21, 16
16. Municipal Corporations Authority	21,23,15,16, 1,28,36,37
17. Housing and Settlement Directorate	21
18. Water and Sewerage Authorities	12,1
19. Department of Public Health Engineering	12, 1
20. Ministry of Industries	31,1
21. Investment Board	13,1
22. Industrial Corporation like BCIC, BSFIC, BSEC	13.1
23. Ministry of Health and Population Control	18, 19, 26, 27
24. Directorate of Health	18,19,26,27
25. Ministry of Ports , Shipping and Inland Water Transport	2,35,43,44
26. Bangladesh Agricultural Development Corporation	30
27. Ministry of Labour and Manpower	22,5,27,24, 25, 41
28. Directorate of Labour	22,1,41
29. Directorate of Inspection of factories, Shops and Establishments	22,5,27,13,24,25, 1
30. Ministry of Local Government, Rural Development and Co-opeatives	10,11,19,1,23,36,37,45
31. Ministry of Energy and Mineral Resources	7,4
32. Bangladesh Road Transport Authority	6,1,28
33. Bangladesh Police	6,1,28, 36

Envrionmental laws in Bangladesh lack any specific and positive bias towards furthering development objectives. They are mostly regulatory in nature and have become outdated with the passage of time. Another important aspect of environmental laws in Bangladesh is the people's ignorance about them which makes their application and implementation difficult. Moreover, lack of education, social consciousness etc. has created an environment which is not conducive to implementation of laws related to environmental issues.

18.5 Major Current and Planned Activities in the Environmental Field in Bangladesh

1. Creation of the Ministry of Environment & Forest:

The Government created a new Ministry, namely Ministry of Environment and Forest in 1989 by

incorporating the Forest Division of the Ministry of Agriculture and Department of Environment from the Ministry of Local Government. The major agencies under this Ministry are the Department of Forest, Bangladesh Forest Industries Corporation, the Department of Environment, Bangladesh Forest Research Institute and Institute of Forestry, Chittagong University. Creations of this Ministry has been a major step in the process of institutionalisation of Government efforts in environmental management and development in this country.

2. Upgradation of Department of Environment :

Since its inclusion in the Ministry of Environment & Forest, the Department of Environment has been upgraded and expanded. 98 new posts have been added to the existing manpower of 70. Another 44 posts have been added under the development set-up. In principle the Government has agreed to expand the manpower of the department to a total of 360 within the next five years.

3. Formation of National Environment Committee/Executive Committee:

The Government has formed a National Committee on Environment which is chaired by the Prime Minister. Senior representatives of important and relevant Govt., Non-Government , Private, Educational and Research Organisations and NGO's have been included in this committee. The Committee is expected to give an overall sense of direction to policy, planning and management of environment and related issues.

An executive committee has also been formed to co-ordinate, monitor and evaluate activities in the environment sector. The committee is headed by Minister of Environment and Forest. Senior level representatives of all relevant agencies at the implementation level are members of the executive committee.

4. Environment Policy

The Government has adopted the Environment policy. The Environment policy has the following objectives : (i) Sustain the ecological balance and attain development of the country through protection and betterment of the environment (ii) Protect the country from natural disasters (iii) Identify and regulate all activities that pollute and degrade the environment, (iv) Ensure environmentally sound development in all sectors, (v) Ensure sustainable, long-term and environmentally sound utilization of all national resources, (vi) Associate, to the extent possible, actively with all international initiatives in the field of environment.

The policy identifies important policy goals for the major sectors including Agriculture, Industry, Health & Sanitation, Energy, Water Development, Flood Control and Irrigation, Land, Forest, Wild life and bio-diversity, Fisheries and Livestock, Food, Costal and Marine Environment, Transport and Communication, Housing and Urbanisation, Population, Education and Public awareness, Science Technology and Research.

Along with the policy the government has also formulated guidelines for the action plan for all corresponding sectors as mentioned above. The action plan guidelines identifies areas for immediate action for environmental improvement.

5. National Conservation Strategy (NCS):

The Government has finalised the National Conservation Strategy for Bangladesh which is now awaiting approval. This document has identified the strategies in all relevant sectors for sustainable development and resources use.

6. National Environment Management Action Plan (NEMAP):

The Ministry of Environment and Forest has taken the initiative to formulate the National Environmental Management Action Plan. This document will identify priority areas for action and prepare project concept papers for consideration of the government and the donors. The document is likely to be finalised by September, 1994. An intensive and extensive process of pro-active consultation with the people at the grassroots and all other levels has been adopted in the formulation of this action plan.

7. New Environmental Law:

A new umbrella legislation to take care of the basic issues in environmental protection and management is under finalisation. Compared to other previous laws, this law takes care of not only the control aspects but also the development aspects of environmental management. It will also provide the legal framework for implementation of E.I.A.'s and Environmental Quality Standard (EQS).

8. Ban on Felling in High Forests:

In order to protect bio-diversity and the genepool, the Government has banned clear felling in the natural high forests. This Ban will continue upto the year of 2000 when the situation will be reappraised.

9. Formulation of Forestry Master Plan :

Preparation of the draft Forestry Master Plan is complete and now awaiting Government approval. The plan has proposed policy and implementation goals for the year 2000 and beyond covering a period of 20 years. The plan gives due importance to the environmental aspects of forest management and development.

10. Ban on use of fuelwood for brick burning :

The Govt. has framed a law to ban the use of fuel wood for brick manufacture. This is expected to reduce the current trend of fast depletion of forest resources.

11. Updating the Forest Act -1929:

The penal and regulatory provisions of the forest act 1929 have been updated and made rigorous. Number of offences under the Forest Act have substantially been reduced after these amendments.

12. Implementation of Massive Afforestation Projects:

Afforestation has been identified as a major instrument to improve the overall ecological balance in the country. Massive afforestation programmes are being taken under the Thana Afforestation and Nursery Project, Forest Resources Management Project and other projects. The government has prepared a port folio of projects having thirteen major components of afforestation under the Global Environmental Facility (GEF) initiative. Another Five projects are being considered under the US government initiative in Forestry sector. A special project for management and improvement of watershed areas are being considered by the Islamic Development Bank. Japan Govt. has agreed to finance a development project for improvement of the mangrove forests and coastal ecosystems.

13. Coastal Area Afforestation :

Special emphasis is being given on the afforestation in newly accreted coastal areas. So far about two hundred fifty thousand acres have been planted. With in the next 7 years another 80,000 acres of newly accreted land will be planted with different types of mangrove varieties.

14. Social Forestry :

The concept of Social forestry is being emphasised to integrated the people, various target groups and NGO's in afforestation, specially in the rural areas and marginal lands. Social Forestry assumes great importance in view of the fact that govt. forests are being lost at the rate of average 14,000 hectors every years.

15. Ban on Export of Frog:

The Government has put a ban on export of Frog legs. This will help protection of Bio-diversity. Frogs also work as natural agents for control of insects.

16. Integrated Development of Sundarban Resources:

A comprehensive study is being carried to ensure integrated development of Sundarban resources. The study project will be completed by mid 1995 and would provide guide lines for sustainable management of the Sundarbans and utilisation of its resources.

17. Coastal Green Belt :

Cyclones, tidal bores and floods cause serious damage to the coastal area and its resources regularly. Steps are now being taken to establish a coastal green belt to save the coastal area and its resources against the natural disasters with the help from ADB.

18. Plantation on Coastal Embankments :

The Ministry of Irrigation has undertaken a scheme for plantation in the embankments of the Water Development Board. The NGO's will be largely involved in this Project to be financed by IDA.

19. Identification of Polluting Industries :

The Department of Environment has carried out a survey of all major industries in the country and identified about 905 industries as polluters. Action is being taken to ensure that anti -pollution measures are incorporated in these existing industries.

20. Shifting of Hazaribag Tannery Complexes:

The Ministry of Industry has taken an initiative with ADB assistance to relocate the Hazaribag Tannery Complexes. Proper arrangements for pollution control will be installed at the new sites.

21. Industrial and Import Policy Provisions for Environment :

The New Industrial Policy - 1991 , for the first time recognises the need for environmental protection in Industrial Development. Specific policy goals have been identified to see that industrial Development takes place with no further damage to the environment. In the same manner the present import policy prohibits import of any hazardous waste for any purpose including use as industrial raw materials.

22. National Tree Plantation Drive:

The national tree plantation drive taken since in 1992 is a big success. All formal and informal agencies and organisations are involved in tree plantation, as a social movement. This special drive is expected to continue to ensure sustainable tree plantation throughout the country.

23. Creation of Deptt. of Social Forestry:

The Government is now examining a proposal to create a new Department of Social Forestry to coordinate and emphasize afforestation in the rural areas by involving the people, different target groups and NGO.

24. Tree Plantation Component in All Projects Where Relevant :

Tree plantation has been made a compulsory component of all development Projects where feasible. This will go a long way to help the cause of sustained afforestation.

25. Environmental Screening of Projects :

Under the existing Govt. procedure , all Govt. development schemes need to be screened by Ministry of Environment & Forest/Department of Environment to ensure that development schemes are free from any damaging impact on the environment. This Govt. procedure is being followed with very favourable results.

26. Environmental Quality Standards :

The Department of Environment has formulated draft Environmental Quality standards for air water and soil. These are now being examined by the Govt. and will be adopted soon.

27. Training on Environment, EIA:

The Department of Environment has conducted member of training courses on Environmental Management with Ford Foundation and ADB help.

28. Role of NGOs in Environment :

NGOs in Bangladesh are fast emerging as an effective "Third sector " in the development process along with the Government and the Private Sectors. about 13,00 NGOs are enlisted to work in different development fields in the country. They have extended their activities to about 335 thana and cover about 15.2 percent of total target-group households of which most are rural based. Though environment, conservation and sustainable development do not specifically featire in their policy documents or work programmes, the majority of the NGO activities have a direct bearing on the improvement of the envrionment, resources conservation and sustainable development. NGOs are implementing development schemes in agriculture, forestry, agro-forestry, fisheries, population control, rural works programme, health and nutrition, water and sanitation, non-agricultural income and employment generation activities and rural credit for poverty alleviation with commendable success. The NGOs with their extensive grass-roots experience, proven efficiency and administrative and financial flexibility are achieving success in organizing the rural poor and improving the quality of life thorugh multi-sectoral development activities.

NGOs complement Government sponsored development activities in many sectors. Such collaboration is sometimes hampered by policy constriants. The present Government is trying to alleviate these constraints specially through the NGO Bureau, in order to jointly promote sustainable development activities that benefit the poor and enhance environmental stability. NGOs have demonstrated an ability to respond to natural disasters, like flood, cyclone, tidal surge, tornadoes, etc. with relative speed and effectiveness and this remain a necessary intervention, given the vulneability of the country to such natural disasters.

CHAPTER 20
REGIONAL, SUB-REGIONAL AND GLOBAL RESPONSES

20.1 Introduction

Environmental problems do not confine them within any geographical boundary. What may start as a local problem would ultimately transcend into national, regional and global horizons. No single nation can effectively control, manage and conserve the total aspect of environment without regional, sub-regional and in the final perspective, global initiatives and coordinated actions. Environment, as it is understood today embraces the entire human development process. Economic, social and political issues are all finally turned into human development issues related to the environment. It is therefore essential that regional, sub-regional and international efforts and resources are needed to be pooled together to provide a strong foundation for solution of environmental problems. Today all development activities are closely linked with environmental considerations. Developing countries like Bangladesh, unfortunately suffer from scarcity of both developmental and environmental resources. So a country like Bangladesh has no option but to seek and ensure collaboration from regional, sub-regional and global institutions and agencies.

20.2 Need for Regional , Sub Regional and Global Responses

Environmental pollution emanating from one politicogeographic location will be carried by wind and water across national boundaries. Therefore, even though the agents causing the ecological perturbation, whether anthropological or natural, may be localized in one particular nation, the environmental impact in varying degree will have local, national, regional and global implications. Incase of major environmental disasters like floods, cyclones earthquakes, etc. no advance limitation measure is possible, but post-disaster amelioration of human suffering usually brings all mankind together. But repeated incidence of environmental problems, natural calamities and other issues like sea level rise, climate change and different types of regional issues has made it essential that a sustainable approach to solution of these problems are sought in regional, sub-regional and global responses.

20.3 The Bangladesh Scenario

Bangladesh is facing a number of specific problems which can not be solved unless regional, sub-regional and global cooperation are forthcoming.

20.3.1 Global Issues

Global warming might affect Bangladesh in three principal ways: (i) by raising sea levels; (ii) by increasing rainfall; and (iii) by increasing the frequency of tropical cyclones.

Sea Level Rise

The Intergovernmental Panel on Climate Change predicts a rise in mean sea level of 8 to 30 centimeters by the year 2030 and 30-110 centimeters by the year 2100, although scientific opinion is still divided on whether such changes will occur. It has been estimated that a 100 centimeter rise in sea level in the Bay of Bengal would result in 12-18 per cent of land area of Bangladesh being lost to the sea, including most of the Sunderbans. It is also suggested that the area subject to normal seasonal flooding would increase by 17 per cent as higher sea levels would slow drainage of floodwater (and the existing seasonal flooding would be likely to become deeper and more prolonged). Another important effect is a drastic increase in salinity of both soils and groundwater in affected areas.
These estimates must nevertheless be treated with caution because the Bangladesh delta is highly dynamic.

Climate Change

Predications regarding the possible effects of global warming on Bangladesh's climate are even more uncertain. However, the predictions for 2030 made by four General Circulation Models all suggest that there might be increased precipitation, with estimates ranging between 5 and 100 per cent increases in rainfall. Increases of these magnitudes, if they were to occur, would have significant implications for agriculture, flooding, river sediment loads and flood protection works.

Tropical Cyclones

An increased frequency, and perhaps severity, of tropical cyclones is also predicted, and this would have serious implications for coastal areas independently of any rise in sea level. The magnitude of impact of cyclones is now exacerbated in the coastal belt because of the extreme underdevelopment of these areas: extreme poverty, crowding, exposure and insecurity of tenure etc. which increases the vulnerability of the affected population and reduces its level of preparedness.

Although it is difficult to predict the timing and magnitude of all these global changes including sea level rise, climate change etc., it is anticipated that one of the most serious consequence for Bangladesh would be the reduction of an already minimal land person ratio and consequently exacerbating pressure on the remaining natural resources. Were the land area to be further reduced by around 30 per cent, from 30 to 40 per cent of the population would be displaced; and the land-person ratio, would further rise. Hence the whole socio-economic structure of Bangladesh would necessitate major adaptations. For example, this could entail a much more drastic change of direction from a natural resource-based to an entirely manufacturing-based economy, and from a mostly rural to an essentially urban society.

Although Bangladesh hardly contributes to the overall process of global warming, it is a strong advocate for addressing and reducing the greenhouse effect on an international scale. It is also in favour of an international agreement for assistance to vulnerable countries like Bangladesh to take necessary preparations and adopt measures to survive a sea level rise, increased flooding and more frequent storm surges.

20.4 Regional Issues

20.4.1 Upstream Deforestation and Water Regulation

If and until the sea level rise occurs, Bangladesh, being the downstream and delta portion of a huge watershed, is naturally vulnerable to the water quality and quantity that flows into it from upstream neighbors. The vulnerability is multiplied by the low terrain of the delta on the one hand, and by salt water encroachment on the other.

Notwithstanding the fertilizing benefits of moderate regular flooding, the overwhelming floods of the Ganges, the Brahmaputra and the Meghna rivers, which occur with increased frequency causes enormous loss.

Although still a point of controversy, one of the causes of these floods could be traced to Nepal and Assam where the river systems originate. The stripling of mountain sides of trees in order to grow crops and harvest fuelwood has been an increasing practice there. Stripped of trees, the Himalayas can no longer absorb monsoon rains, hence floods carry water surges south, causing extreme erosion of these banks; carried by the water are tones of rich alluvial silt that build up the river banks, plug up irritation works, and of course fertilize the delta. However, the benefits of this fertilizing effect do not outweigh the harmful effects of the floods. Furthermore, the velocity of the floods means that much siltation is washed out to sea where it is associated with the problems of nutrient-loading and eutrophication.

The other most severe upstream activity aggravating the flooding, as well as the drought in the dry

season, is the Farakkha and several other Barrages in India. During the dry season, they divert water from the upstream of the rivers to irrigate the land and keep silt from building up in the different portion of India, thus leaving the Bangladesh portion of the rivers low when Bangladesh needs water most. If it were to deviate waters also in the wet season, Bangladesh's flooding problems could be somewhat alleviated. The low flow of the rivers is also the major cause of inland intrusion of sea water.

20.4.2 Pollution in the Bay of Bengal

In the port cities of the Bay of Bengal, nearly 1,000 ships and 40-50 oil tankers are handled annually, causing severe pollution of the water in the coastal reaches and the marine environment.

Petroleum-based crude oil from abroad is handled mainly in Chittagong Port, where the only Bangladesh refinery is located. Approximately 1.2 million tons of crude oil are handled through Chittagong every year. Refining of some 5 million tons of crude oil occurs in Singapore with the product delivered from the Singapore refinery to Chittagong storage facilities. Due to draught restrictions in the harbour, large tankers o 100,000 DWT carrying crude or refined products transfer the contents to small tankers of 19,000 DWT which are able to transit over the bar at the harbor entrance. At all these "international" transfer points, spillage takes place.

The estimate of crude spillage at Chittagong is about 6,000 metric tons per year, while about 240,000 gallons per year of bilge water is also dumped. Moreover, there is always a possibility of accidental oil spillage from oil tankers through which the ecosystem of the Sundarbans could suffer irreversible damage. The threat of an oil spill to other marine and coastal resources of the delta has not been estimated but can be expected to be severe, even if the spill is small and localized.

20.4.3 Socio-political Issues having environmental dimension

There are a serves of environmental issues in South Asia which are either source of socio political stress or its consequences. While a decreasing land-man ratio is causing environmental degradation within the national boundaries of each of the South Asian countries, this spills over into political tension and conflict between or among the countries of the region. This, in turn, affects the environmental quality as well as economic well being of the people. These environmental degradations are often the product of various policies adopted by the states of the region to serve self-interests. Conversely, environmental degradation within one state often induces the people or the government of that state to take a set of measures which deteriorates the bilateral or multilateral relations in the region. The need to produce more within limited resources not only causes the adoption of unsustainable production practices, limited resources are often the source of competing claim and counter-claim between or among the countries of the region which in turn affect the politics as well as security of the region.

The countries of the South Asian region share the Himalayan drainage ecosystem. The political boundaries in the region have been drawn on the basis of ethnic, religious, cultural and other related factors but the unified characteristics of the ecosystem have remained largely ignored. The countries of the region have undertaken different development programmes within that limited part of the ecosystem-each contained within their own political boundaries, irrespective of other considerations.

There are a number of key issues which stem from environmental degradation in the region:

Energy: Absence or scarcity of energy is one of the predominant factors in most of the environmental concerns in South Asia which interacts closely with the socio-economic and political situation and so influences stability or security.

Population, Resource and Production Axis: Although the countries are rich resources, the population explosion and decreasing land-man ratio is demanding quadruple production from the

same land. In town, this demands the expansion of irrigation, so creating pressure on water resources. Demand for land is also causing the forests to diminish at a rapid rate. Technological backwardness and absence of alternative energy create further pressure on the forest and water resources. Competing claims on water resources is one of the greatest sources of tension among the countries of the region, but deforestation in the upper reaches and its transboundary impacts on the downstream areas in favour of flood, siltation, salinity etc. are also reasons for tension between neighbouring states.

On the other hand, need to produce more food through intense irrigation and fertilizer use has resulted in water-logging, soil salinity, diminishing return from the land etc. in many areas of the region. Similarly, fuel-scarcity has compelled people to use the biomass, crop residues etc. for domestic as well as industrial energy consumption. Therefore, little organic nutrients can go into the land. This factor is seriously affecting the fertility of huge tracts of agricultural land to the grave detriment of the stability of agro-based economy of the region, dislocating thousands of people from their homestead.

Single Dominant State: Disparity between India and other states of the region in every aspect viz, area, population, economy, defence etc. often gives rise to mistrust about each other which complicates the handling of common issues including solution of common environmental problems.

Vulnerability of Smaller States: Vulnerability of the weaker states in geography, economy, polity often narrows down the policy choices available to them in their handling of contentious issues with the stronger partner in the region.

Transboundary Migration: Environmental decline in the region (both man-made and natural) often results in shrinking economic opportunities within states, causing demographic displacement within or across the national borders, a political cause of tensions between neighours.

Internal Strife: Environmental stress in the region often induce a sub-national group to shift its allegiance from the centre to the periphery, increasing the possibilities of political disorder, civil strife and socio economic suffering.

Group Interests: Environmental issues are often manipulated politically to serve narrow group-interests which jeopardizes the domestic power balance, contributing to political instability and in turn limiting the capacity of the states to address the environmental issues in an adequate an timely manner.

Biodiversity : As a tropical humid climate covering mountains, plains and semi-arid regions, South Asia offers habitats for a wide range of plant and animal species. Many of these plant species have significant established or political/commercial value, drawing increasing attention by the northern industrial concerns. Population pressure and indiscriminate exploitation threaten many species.

20.5 Regional Cooperation in the Field of Environment

Inadequate national policies and historical conflicts today dominate the geo-political and consequently overall environmental policy realities in the South Asian Region. In South Asia, the history of regional cooperation in the field of resource management or in any other area is not significant. Two decades ago, South Asia was described by Peter Lyon as "a region without regionalism." Most regional cooperation in South Asia at both official and unofficial levels till recent past has been exclusively bilateral, rather than multilateral in character and has been confined largely to various forms of economic, educational and cultural cooperation, with economic interchanges predominating. Specific initiatives to solve major environmental and ecological problems were absent.

Ecosystemic approaches or recognition of large river-basins or watershed based joint management has been lacking, for example. The World's largest mangrove forest, the Sundarbans is divided

between the coastal areas of West Bengal, India and Bangladesh. Despite a common administrative legacy, there has yet not been any significant initiative for joint management practices of this global heritage and reservoir of one of the worlds largest animal species and biodiversity. Again, the mountains of the Himalayas being shared by Indian, Nepal, Pakistan and Bhutan, all neighbouring countries but they have not yet initiated a coordinated mountain management system.

20.5.1 NEW MOMENTUM IN THE EIGHTIES: The South Asian Association for Regional Cooperation (SAARC).

There has been a new momentum in the eighties after the launching of the South Asian Association for Regional Cooperation (SAARC) in May 1980. The member countries of this regional forum are Bangladesh, Bhutan, India, Sri-Lanka, Maldives, Nepal and Pakistan. A collective bid to protect the environment was first discussed at the third SAARC summit in Kathmandu in November 1987. Accordingly the Group of Experts meeting in July 1988 identified the specific areas of national priorities requiring action and of common areas of regional cooperation. Environmental concerns were placed in the top of the 1988 SAARC summit agenda in Islamabad and the 1990 summit in Male declared the year 1992 as the 'SAARC year of Environment'. In pursuance of the recommendation of the First Meeting of the Committee on Environment (Dhaka, 17-19 February, 1992), the Special Session of the Committee on Environment was held in Islamabad (1-3 November, 1992) to evolve specific programmes, activities and modalities to implement the thirteen recommendations identified by the Committee at its First Meeting in Dhaka and submit them to the 17th Session of the Standing Committee (Dhaka, 7-9 December, 1992). The Seventeenth Session considered the Report of the Special Session of the Committee on Environment and noted that the Special Session had prepared concrete modalities and programme activities on the thirteen recommendations identified by the First Meeting.

The Committee on Environment was subsequently designated as the Technical Committee on Environment which had its first meeting in Islamabad during 13-15 December, 1993. The Islamabad meeting made substantial progress in some areas including examination of the recommendations of the regional study on "Greenhouse Effect and its Impact on the Region". It also made some recommendations for better and timely coordination among member countries for preparation of action programmes in some priorities areas.

20.5.2 SAARC RECOMMENDATION FOR GLOBAL COOPERATION

In addition to its effort to institutionalize initiatives for environmental improvement within the region through better cooperation among the member countries. The first meeting of the SAARC Technical Committee on Environment also makes some recommendations for global cooperation.

1. **Monitoring Climate Change:** It is essential to establish a global system of acquiring and maintaining data and information on numerous atmospheric, terrestrial, and ocean parameters, including the role of oceans acting as sinks for carbon dioxide and process relevant to climate change. Developing countries should be fully involved in this effort. Such data/information should be freely available to all countries.

2. **Natural Disasters:** Several categories of natural disaster, including but not limited to cyclones and storm surges, are likely to become more frequent and/or more destructive as a consequence of climate change. Global action is necessary for the establishment and development of capabilities in Management Information Systems in combating such natural disaster. Adequate assistance is also necessary from the global community for special projects for disaster preparedness and management. Additionally, the global community should establish an emergency fund for tackling natural disasters linked to climate change.

3. **Sea Level Rise:** The global community, and in particular developed countries, keeping in view their commitments under the United Nations Framework Convention on Climate Change, should assist SAARC member states in monitoring the effects of sea level rise at a regional level, and in establishing scenarios at more localized levels. In this, priority should be given to countries

which are more vulnerable to the effects of sea level rise. Coastal protection projects in SAARC Member States should be financed adequately by the global community.

4. **Forests:** Forests are important natural resources in their own right, besides comprising important sinks for carbon dioxide helping to mitigate climate change impacts, and maintaining rich biological diversity resources, which may facilitate the development of adaptation strategies for climate change impacts, in particular in agriculture. The SAARC member states call for global action for large scale afforestation and urge the early ratification and implementation of the United Nations Convention on Biological Diversity.

5. **Awareness:** The global community should launch concerted and effective campaigns worldwide to generate and heighten public awareness about the problem of climate change. Such increased and informed awareness will facilitate the adoption of policies for abatement and adaptation, and lead to greater direct public involvement in such efforts.

6. **Technology Transfers:** The United Nations Framework Convention on Climate Change casts a clear duty on developed countries to transfer technologies bearing on adaptation and abatement strategies to developing countries. Norms for such technology transfer should be evolved in the appropriate global fora with the full participation of developing countries. These must not be restrictive and should allow for transfer of appropriate, including "state of the art" technologies. Further, the "full incremental costs" of abatement and adaptation strategies must be defined to include the costs of such technology transfer, without restriction on the depth to which technology is transferred.

7. **Transnational Corporations:** The global community should seriously consider the formulation of a code of conduct on technologies employed by transnational corporations in host countries, in particular with respect to the environmental dimensions of such activities.

8. **Finances:** The SAARC Member States call upon the global community, and the particular the developed countries, to fulfil their commitments under the United Nations Framework Convention on Climate Change, and provide adequate new and additional funding for adaptation and abetment measures in developing countries. In particular, adequate funds must be provided countries. In particular, adequate funds must be provided to the poor and vulnerable countries in adopting protective measures, as well as to facilitate the transfer to, and adoption by them, of appropriate technologies for such purposes.

20.6 South Asia Co-operative Environment Programme (SACEP)

The idea of having regional co-operation among the South Asian Countries relating to environmental issues was discussed at an Inter-Governmental Expert group Meeting held in Bangalore, 10-15 March 1980. Subsequent to this, another high Level Meeting of Officials was held in Colombo, 18-21 February 1981, where Focal Points for various Priority Subject Area were designated. South Asia Co-operative Environment Programme (SACEP) became a Legal Entity on 7 January, 1982 when the minimum required number of member countries ratified the Articles of Association of SACEP. The members of this forum are Afghanistan, Bangladesh, Bhutan, India, Islamic Republic of Iran, Maldives, Nepal and Pakistan. The scheme of things were so designed that the Focal Points will play an important role in the formulation and operation of the Regional Programmes in the respective Subject Areas.

Since its inception SACEP has played a vital role in improving the state of cooperation and collaboration among the member states for a better understanding of the state of environment in region and exchange knowledge, data, information and experience for improvement in the relevant field. It has completed a number of important projects in the areas of Environmental Legislation, Conservation of Corals, Mangroves and Island Ecosystems. Environmental Impact Assessment and Cost/Benefit Analysis, Decertification etc.

Currently it has undertaken a programme to implement 14 project concepts which cover the

following key areas of activity:

i) Capacity Building and Awareness Raising;
ii) Systematic Information Exchange and Intra-Regional Technology Transfer;
iii) Environmental Management for Training and Institutional Development for Training;
iv) Regional Co-operation in Management Plans for Montane Ecosystem/Watersheds and Coastal Resources;
v) Wildlife and Wildlife Habitat Conservation in the Region.

Bangladesh is a member of both SAARC and SACEP. It is actively participating in all the environmental related programmes and activities of these regional organizations.

20.7 United Nation's Environment Programme (UNEP)

The United Nations Environment Programme has always recognized the special problems of Asia Pacific Region in the field of sustainable development. A basic requirement for achieving the goal of sustainable development is scientific environmental assessment. The United Nation's Environment Programme (UNEP) has been urged by the United Nations General Assembly and other bodies to play an active role in enabling all countries, particularly developing countries, to enhance the capability for scientific environmental assessment. UNEP, in response, has modified the emphasis of its Environment Assessment Subprogramme with a view to strengthening national and regional organizations to build their capabilities for environmental assessment for sustainable development. Besides environmental assessment and reporting, the Subprogramme emphasizes adequate data management, harmonization and dissemination. Based on an assessment of the data and information capacities in the Region for environmental assessment, regional and national institutions will be assisted in obtaining the required hardware and software, in cooperation with international and bilateral aid agencies as well as vendors. Assistance will also be provided to the establishment and/or strengthening of environmental agencies for evolving integrated digital databases. Such collaboration in envisaged initially with 16 countries viz., Bangladesh, Bhutan, Cambodia, People's Republic of China, Fiji, India, Indonesia, Lao P.D.R., Maldives, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand, Viet Nam and Western Samoa. It is envisaged that other national environmental agencies in the Regional will eventually be included in this activity.

20.8 UNEP Regional Seas Programme

UNEP has promoted the development a number of regional seas programmes in the Asian and Pacific region with a view to promoting and enhancing the conservation of the coastal and marine environment of ocean resources. The first phase of the programme consisted of the development of action plans for the regional seas programmes incorporating, where applicable, the development of umbrella conventions and specific protocols, while the second phase is the co-operative implementation of action plans by the countries concerned. Coordinating bodies for these action plans are COBSEA for the East Asian Seas region, SPREP for the South Pacific, and SACEP for the South Asian Seas region.

All the member countries of SACEP have already endorsed the need for an early adoption of the action plan. There is a consensus among the SACEP members that an evolutionary approach for the South Asian Regional Seas Programme through the actual implementation of specific programmes including those considered to be priority ones, by the member countries be adopted. There is also an emphasis that the proposed activities on oil spilt contingency planning should be addressed in greater depth. Steps are being taken by SACEP member countries including Bangladesh to ensure that the South Asian Seas Regional Programme really becomes operative in addressing the relevant issues in this region.

20.9 ESCAP and Environmental Cooperation in the Region.

ESCAP has been playing a very dominant role in identifying the major environmental problems in the region, investigating into their causes, assessing the depth of the problems and coming up with

pragmatic recommendations and collaborative action oriented programmes for their mitigation. Human resources development, capacity building, institutional strengthening etc. in the region have been priority areas which got attention from ESCAP. The countries of the region including Bangladesh are being immensely benefitted by ESCAP's deep involvement in the environmental concerns and its environment related programmes and activities.

20.10 ESCAP - Coastal Environmental Management Plans

In the 1980s, the ESCAP secretariat initiated the preparation of a series of coastal environmental management plans for maritime countries in the region. Studies for the plans carried out in various countries, including Bangladesh, Pakistan, Sri Lanka, Thailand and Tonga, were able to identify the effects of industrial, urban and agricultural development on the marine environment, over-exploitation and damaging practices in harvesting the resources, the socio-economic problems of the coastal population, as well as institutional shortcomings in the management of coastal zones. The studies not only identified the problems but also proposed measures to mitigate them, focusing on investment projects (those suitable for investment by funding institutions) and creating awareness of the benefits of environmentally sound and sustainable development.

20.11 ICIMOD and Regional Environmental Cooperation

International Centre for Integrated Mountain Development (ICIMOD) was established in December 1983 against the background of a sharply growing concern about the alarming deterioration of the mountain environment and resource base, and the concomitant impoverishment of mountain populations. The member countries of this organizations are: Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal and Pakistan. The primary objectives of the Centre were defined in its Statues as "to help promote the development of an economically and environmentally sound mountain ecosystem and to improve the living standards of mountain populations of the Hindu Kush-Himalayan area". In pursuance of these objectives, ICIMOD was to function as a multidiciplinary documentation centre, as a focal point for applied and problem-solving research activities, as a focal point for training, and as a consultative centre for expert services.

Taking stock now -- two decades after the alarm was first raised and one decade after ICIMOD's establishment -- it must be concluded that, from the overall point of view, nature has lost and continues to lose in this struggle: the clearing of forests and felling of trees exceed regeneration; steep hills are encroached and fields are cropped too intensively, resulting in decline in soil fertility and in soil erosion and landslides; the depletion of plant cover in turn causes accelerated water runoff and flooding during the rainy season and the drying up of springs during the dry season. The number of off-farm employment and income opportunities created is far too few, and the pressure of population on limited natural resources continues to rise. As a result of these trends, for large parts of the Kndu Kush-Himalayan Region, the deterioration in the quality of life of the population and in the production potential and soundness of natural resources and the environment continues.

Fortunately, there are also some areas where, as result of successful research and extension efforts, the productivity of traditional farming systems has been sufficiently enhanced to feed the present population while, at the same time, sustaining such potential for the future. Furthermore, there are other areas in which additional income-earning opportunities have been developed, and still others in which a complete revamp of production systems, based on comparative advantage, has been undertaken, leading to greatly enhanced income earning and population carrying capacities. What is needed is that these positive trends, which are an exception now, will become the general rule in the future. In pursuing this objective, ICIMOD has been closely examining so-called success stories in order to determine what preconditions need to be net to ensure successful replication.

Bangladesh has been very closely associated with the activities of ICIMOD specially in areas of devising a sustainable management plan for resource use in the hill areas of the country and also in watershed management. Representative from Bangladesh have attended a number of

workshops/seminars/study tours arranged by ICIMOD. A number of experts have also visited Bangladesh to advise the Ministry of Special Affairs which is the nodal Ministry in coordinating relevant activities with ICIMOD. The hill districts of Bangladesh including those in the Chittagong area have faced serious depletion of forest resources, biological diversity due to unsustainable patterns of resource use by the local people and also due to the failure of related government agencies in implementing sustainable resource use plans and programmes. It is hoped that close association with ICIMOD would help Bangladesh in the conservation and development of its hill areas and watershed ecosystems.

20.12 Global Responses

Bangladesh has been fortunate since its creation in 1972 in receiving a lot of attention from the international community in solving its development related problems, in facing the problems due to natural hazards and also in its current effort to integrate environmental concern in overall development strategy. Almost all the important donor agencies, friendly countries and other non-government development agencies in the international arena have shown considerable interest in the overall development and improvement of the state of environmental management of Bangladesh. Some of these important initiatives are described below:

20.12.1 Bilateral and Multilateral Agencies

In the recent past, the World Bank has been taking greater interest in environmental matters. The Bank is currently concentrating in the following areas for priority attention:

a. Deforestation in the hill forests, interior plains and coastal zones;
b. Energy efficiency and pressures on biomass fuels;
c. Flood control (pronounced effects on unprotected areas, stream-bed rises and water logging) and effects on fisheries, soil nutrients, transport;
d. Dry season water shortages, leading to improper groundwater management and increasing salinity;
e. Water management;
f. Institutional and legislative weakness for resolving conflicting demands on resource use and management.

The IDA strategy will encompass institutional development, water management, and forest and energy management elements. Institutional development will focus on improving the regulatory situation, staff training, performance incentives, institutional co-ordination and enhancing local government capacity for resource management. The water management element has quality control, dry season management and flood control as priorities, as well as facilitating riparian cooperation where possible. The forest and energy management will consist of "participatory agroforestry"' multipurpose management of the Sunderbans and sustainable energy supplies. World Bank is presently conducting EIA for the Jamuna Multipurpose Bridge and has agreed to do an EIA for Third Chittagong Water Supply and Sewerage Project.

The ADB began integrating environmental concerns into its programming from the mid-1980s. It has prepared an environmental and natural resources briefing profile for Bangladesh in which it examines: (a) the status and trends in use of the natural resources, (b) the environmental policy organization and legislation, and (c) opportunities for Bank assistance. The ADB's strategy is to assist in reduction of pollution through technical assistance grants and environmental oriented projects such as agroforestry, coastal rehabilitation, water and sanitation infrastructure. ADB has undertaken a three-year technical assistance project to strengthen the technical capabilities of the Department of Environment (DOE). It is financing another project which will enable DOE to have its own building along with lab equipment and other logistics. Two projects - one for training in EIA and another for a loan for industrial pollution control - are in the pipeline.

The UNDP has taken the lead in coordinating environmental programmes of the UN agencies. The World Food Programme as well as the FAO attempt to incorporate environmental concerns in their

programmes. The Economic and Social Commission for Asia and the Pacific (ESCAP) has recently produced a report entitled 'Coastal Environmental Management Plan for Bangladesh'. The UNEP has been active in marine and coastal environment problems, where a South Asian Seas Action Plan is under consideration.

Multilateral agencies have concentrated on urban infrastructure to combat pollution and health problems arising from urban growth and on the forestry sector. Past success in forestry has encouraged the ADB and the IDA to extend projects in social forestry and mangrove replantation respectively. The Forest Department would need to be strengthened for the success of social forestry programmes.

Increasingly, environmental concerns are being addressed by bilateral development partners. In projects taken up under bilateral assistance, every attempt is made to carry out EIAs. For instance, France, Japan, UK and the USA are investigating major flood control measures and are involved in Flood Action Plan.

In some cases, clear recommendations to incorporate environmental components in development projects are available. In respect to Japanese OECF loans, guidelines have been provided in the form of a check-list of environmental concerns that should be addressed in specific scots. This is particularly valuable in infrastructure projects. US development assistance in areas such as agricultural production, population control, employment creation, agroforestry and small scale entrepreneurship attempt to incorporate environmental components. The USAID commissioned an environmental profile of Bangladesh in 1980, and a team carried out a natural resources assessment in April 1989. The United Kingdom has been instrumental in a forest inventory of the Sundarbans.

Other development partners, including the Nordic countries, the Netherlands and Canada, have shown commitment to incorporate environmental concerns in planning their projects in Bangladesh. They have traditionally operated in diverse fields such as rural development, inland fisheries, health, water management and energy - all of which have important environmental impact. However, each country has its own perception of environmental issues, and its own priorities. The Netherlands carried out a very useful environmental inventory of Bangladesh in 1980. DANIDA, too, has recently drafted a strategy. CIDA has carried out an environmental profile, while NORAD has requested the IUCN to study the environmental impact of their projects in Bangladesh.

A. recent trend in the policies of several bilateral development partners is to channelize environmental activity through non-governmental organizations. This is a useful policy, considering the need to encourage greater public participation in an issue which is of common concern. Many of these activities focal on creating public awareness through meetings, seminars, and workshops. At other times, studies of specific problems are commissioned. By their very nature, such initiatives are outside the realm of governmental activities. A vital need in such cases is proper planning and follow-up programmes. There is no doubt that such an approach can be cost-effective and useful, if designed properly and executed faithfully.

It is yet too early to assess the impact of bilateral and multilateral programmes in relation to the environment. That there is increasing awareness that environmental concerns have to be addressed is a very hopeful sign. The form and manner in which such concerns will be addressed is gradually emerging, despite the uncertainties and complexities surrounding the subject. It is apparent that there is need for much greater coordination; at the same time, it is important that clear standards be developed. Furthermore, it is perhaps necessary of both the development partner as well as the recipient to be certain that assistance for environmental concerns does not divert resources that would otherwise be available for socio-economic development. Without development, no meaningful attention to environmental concerns is possible.

Gaps in Efforts

While donor involvement in environment related areas is expanding, several important areas are yet

to be incorporated into programmes. Major gaps in effort as well as necessity for greater intervention include some major environmental issues. Areas needing immediate attention are a complete integration of family planning with poverty alleviation, participation of women in development, and sanitation and health improvements. Massive literacy enhancement efforts need to be included in poverty alleviation and participation of women in development. Regional watershed management and groundwater salinity are also issues that need increased effort from the donor community. Another key issue that needs attention is the unclear status and pattern of land ownership, particularly with regard to newly accreted land, and to the low level of year round land utilization, which is combined with increasing landlessness, and serious land conflicts, especially along the coast. The destruction of inland capture fisheries is also a growing issue that needs increased attention. Finally the needs in Government institution strengthening far exceeds present support.

There is also a need to incorporate environmental concerns in an appropriate form in areas such as debt re-structuring, design and implementation of structural adjustment programmes, multilateral trading arrangements including those for favorable terms of trade for countries like Bangladesh, etc. It is also vital that decisions taken in the international fora be followed up by the organizations with specific plans and programmes.

20.12.2 INTERNATIONAL AGREEMENTS

Bangladesh has taken part in numerous international negotiations from which have emerged treaties, conventions, agreements or protocols. This participation is based on the recognition that only through involvement of all countries will the global community be able to take appropriate measures to protect an common heritage. However, there are limitations to the country's participation in and subsequent implementation of, any agreement reached with the international community.

In the process of engaging in any international negotiation, it is vital that a country assess its requirements. For a country such as Bangladesh, the expertise and manpower that are necessary to prepare the guidelines for such negotiations are frequently not available. Appropriate scientific information is often lacking. Participation in meetings, often at far-away locations, is difficult due to budgetary limitations. Even if an international agreement is signed, there are several follow-up steps required. For instance, any implications for or conflict with domestic legislation have to be examined. Programmes to implement the agreement have to be drawn up. And, where applicable, specific proposals are to be put up to the body set up under the agreement, for funding or support. Resources and expertise for these post-signing stages are rarely available. As a consequence, the agreement is hardly implemented in its entirety; and , this is despite the best of intentions.

The UNEP has brought out a list of 152 agreements on environment-related topics. Many of these are out-dated, or not operational. Several relate to specific areas or regions, not covering Bangladesh. However, there all some which have relevance in the context of the country. These are currently being examined, with a view to determining which among them may be adhered to.

In future negotiations, the world community would benefit if the specific concerns of countries such as Bangladesh could be given due attention. Some considerations are being highlighted for particular attention:

a. Developing countries, particularly LDCs, should be helped to develop rapidly. Only through development can a country effectively address its environmental concerns.
b. Industrialized countries should develop and transfer to the developing countries, on confessional and preferential terms, environmentally-sound technology.
c. Industrialized countries should assist developing countries, particularly the LDCs, with resources needed to meet incremental costs associated with changes required to incorporate environmental concerns.
d. Resources provided for environmental protection should be additional to that provided for development.

Signed Agreements

Bangladesh has already signed a number of important international agreements including:

Convention on International Trade in Endangered Species of wild Fauna and (18.2.1982.

Treaty Banning Nuclear Weapon Tests in the Atmosphere, in outer Space and Under Water., 13.3.1985.

Treaty on Principles Governing the Activities of States in the Exploration and use of the outer Space including the Moon and other Celestial Bodies, 14.1.1986.

International Convention for the Prevention of Pollution of the Sea by Oil (as amended on 11 April 1962 and 21 October 1969), 28.12.1981.

Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxic Weapons, and on their Destruction, 13.3.1985.

Convention Concerning the Protection of the World Cultural and Natural Heritage, 3.11.1983.

Convention on the Prohibition of Military or Any other Hostile use of Environmental Modification Techniques, 3.10.1979.

Convention on Early Notification of a Nuclear Accident, 7.2.1988.

Vienna Conception for the Protection of the Ozone Layer, 31.5.1990.
Agreement on the Network of Aquaculture Centres in Asia and the Pacific (NACA), 14.4.1990.

Convention on Psychotropic Substances, 18.9.1990.

Treaty on Non-Proliferation of Nuclear Weapons, 23.8.1979.

International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990, 30.11.1990.

International Plant Protection Convention, 1.9.1978.

Plant Protection Agreement for the South East Asia and Pacific Region (as amended), 4.12.1974.

International Convention Relating to Intervention on the High Seas in Ceases of Oil Pollution Casualties, 4.2.1982.

United Nations Convention on the Law of the Sea, 10.12.1982.

Montreal Protocol on Substances that Deplete the Ozone Layer., 31.5.1990.

PART IV :

CHALLENGES AND OPPORTUNITIES

CHAPTER 21

FOLLOW-UP OF AGENDA 21. CHALLENGES TO SUSTAINABLE DEVELOPMENT: CONCEPT, POLICIES AND ISSUES WITH REGIONAL AND SUB-REGIONAL FOCUS

21.1 Introduction

The United Nations Conference on Environment and Development (UNCED) which was held in Rio in June, 1992 produced five formal documents. It marshalled political commitment to these arrangements at the highest level. The outcome of the UNCED are:

a. Rio Declaration on Environment and Development;
b. Agenda 21 - a programme outline for future action on environment and development;
c. The United Nations Framework Convention on Climate Change;
d. The Convention on Biological Diversity; and
e. A Statement of Principles for management, conservation and sustainable development of forests.

21.2 Follow-up of UNCED and Role of CSD

The UNCED marks the beginning of a new era of international cooperation in development and environmental management. The Conference was unprecedented in the scope of its work, in the level of participation, in the scale of governmental and non-governmental involvement and the extent of public impact. The purpose of the Rio Conference was to elevate the environment as a priority, and to promote greater integration of environmental goals and economic aspirations. Expectations were high. Inevitably, some expectations could not be met. Yet many hopes were fulfilled. The conference also achieved success in raising awareness to the need for integrating environmental concerns in the development process towards achieving sustainable development. The Commission on Sustainable Development (CSD) has since been established which will report to the UN Economic and Social Council.

The charter of responsibilities of the Commission among others, are:

a. to monitor progress in implementation of Agenda 21;

b. to consider information and reports provided by the governments;

c. to review progress in the implementation of the commitments on the provision of financial resources and technology transfer, and adequacy of fund and mechanism of funding to achieve the objectives; and

d. to consider progress in implementation of other environmental agreements.

Agenda 21 - the blue print for sustainable development is not a legally binding instrument, but the nations are committed to implement the same. What culminated in agreement through a process of intergovernmental consultation was merely an indicative plan of actions - the Agenda 21, but implementation of which is to be pursued through concrete actions by the states, regional and international organizations involving all actors in a society.

Following approval of the UNGA the Commission on Sustainable Development has since been established which had its first meeting in June, 1993 and it undertook to oversee the implementation of Agenda 21 in a structured manner. The commission suggested that the Chapters of Agenda 21 be clustered and taken up for consideration on a multi-year basis:

For yearly review : first comprehensive review in 1994
Critical elements of Sustainability, Chapters 2-5.

Financial resources and mechanisms, Chapter 33.

Education, science, transfer of environmentally sound technologies, cooperation and capacity-building, Chapters 16, 34-37.

Decision making structures, Chapters 8, 38-40.
Roles of major groups, Chapters 23-32.

For review in the first year (i.e. 1994)

Health, human settlement and fresh water, Chapters 6, 7, 18 and 21.

For review in the 2nd year (1995)

Land, desertification, forestry and biodiversity, Chapters 10 - 15.

For review in the 3rd year (1996)

Atmosphere, oceans and all kinds of seas, Chapters 9 and 17.

Toxic chemicals and hazardous wastes, Chapters 19, 20 and 22.

It was also decided that an overall review will be made in 1997.

The review by CSD is based on the reports obtained from the national governments. In Agenda 21 special emphasis has been laid on formulation of national Agenda 21 or national action plans for implementation of Agenda 21. This is evident from the following paragraph:

> "38.38. Furthermore, States could consider the preparation of national reports. In this context, the organs of the United Nations system should, upon request, assist countries, in particular developing countries. Countries could also consider the preparation of national action plans for the implementation of Agenda 21."

As with other conventions, a separate mechanism for ensuring implementation including periodic reporting is built-in the Framework Convention on Climate Change (FCCC) and Convention on Biological Diversity (CBD).

It appears that collection, collation and analyses of information and data for the purpose of monitoring the progress of implementation for a global overview of the state of environment and development at particular points of time and to report to the ECOSOC and the UNGA, constitute a important elements of the functions of CSD. Accuracy of information and data and timely response by national governments are equally important in the whole gamut of things. Thus the importance of national reporting cannot be over-emphasized.

Since environment encompasses all the sectors of development and influences the development process directly or indirectly, multidisciplinary approach is needed in the implementation of various plans, programmes etc. generated subsequent to the UNCED. This in turn is dependent on a number of issues, like capacity building, legal and institutional strengthening, adequate and timely flow of funds, technology transfer, awareness and last but not the lest continued political

commitment and leadership. Some of these issues would be discussed from Bangladesh perspective in her efforts to translate the UNCED commitments to action. Countries of the South generally face similar problems in the implementation of Rio commitments, although there may be differences in specific implementation areas.

21.3 Follow-up of Agenda 21

Agenda 21 is perhaps the most remarkable achievement of the UNCED. It contain the essence of the whole UNCED process and its final outcome. It is an evolving programme for cooperative action which integrates issues of environment and sustainable development for the present and coming 21st century. It is the agenda for mankind as a whole whether in the North or South, rich or poor, developed or developing to ensure the future and sustainable existence of the globe and all that man has so far achieved.

The implementation of Agenda 21 presupposes drawing up of a National Agenda 21 and develop policies, strategies, plans and programmes for action. Agenda 21 has 115 programme areas covering all aspects of environment and development, most of which being inter-sectoral and cross-sectoral in nature. It is very difficult to set the programmes into actions and make the players in different government machineries act simultaneously due mainly to perception gap and their priority attachment.

The main document prepared by the UNCED secretariat and debated during the Prepcoms was called Agenda 21 which consisted of 40 chapters in four sections coming to a total of over 800 pages of text. Some of the most significant issues raised are the following:

- International cooperation to accelerate sustainable development in Development Countries (Section I, Chapter 2).
- Poverty (Section I, Chapter 3).
- Consumption Patterns (Section I, Chapter 4).
- Demographic Dynamics and sustainability (Section I, Chapter 5).
- Protection and Promotion of Human Health (Section I, Chapter 6).
- Promoting sustainable Human Settlements (Section I, Chapter 7).
- Policy-making for Sustainable Development (Section I, Chapter 8).
- Protecting the Atmosphere (Section II, Chapter 9).
- Land Resource Use (Section II, Chapter 10).
- Conservation and Rational use of Forests (Section II, Chapter 11).
- Halting the Spread of Deserts (Section II, Chapter 12).
- Protecting Mountain Ecosystems (Section II, Chapter 13).
- Meeting Agricultural Needs Without Destroying the Land (Section II, Chapter 14).
- Sustaining Biological Diversity (Section II, Chapter 15).
- Environmentally Sound Management of Biotechnology (Section II, Chapter 16).
- Safeguarding the Ocean's Resources (Section II, Chapter 17). Protection and Management of Freshwater Resources (Section II, Chapter 18).
- Safe Use of Toxic Chemicals (Section II, Chapter 19).
- Managing Hazardous Wastes (Section II, Chapter 20).
- Seeking Solutions to Solid Waste Problems (Section II, Chapter 21).
- Management of Radioactive Wastes (Section II, Chapter 22).
- Action for Women: Sustainable and Equitable Development (Section III, Chapter 24).
- Social Partners for Sustainable Development (Section III, Chapter 25-32). These include Youth (Chapter 25), Indigenous People (Chapter 26), NGOs (Chapter 27), Local Authorities (Chapter 28), Workers and Trade Unions (Chapter 29), Business and Industry (Chapter 30), Scientific and Technological Community (Chapter 31) and Farmers (Chapter 32).
- Financial Resources and Mechanisms (Section IV, Chapter 33).
- Making Environmentally Sound Technology (Section IV, Chapter 34).
- Science for Sustainable Development (Section IV, Chapter 35).
- Promoting Environmental Awareness (Section IV, Chapter 36).

- Building National Capacity for Sustainable Development (Section IV, Chapter 37).
- Strengthening Institutions for Sustainable Development (Section IV, Chapter 38).
- International Legal Instruments and Mechanisms (Section IV, Chapter 39).
- Bridging the Data Gap (Section IV, Chapter 40).

Each of the chapters lists the major issues being faced in implementing action programmes by international and regional organizations, governments, NGOs and other communities and groups. In some cases, cost estimates for proposed actions are also included.

21.4 Sustainable Development as a concept

The holding of the United Nations Conference on Environment and Development (UNCED) and all the efforts which resulted in drawing-up the agenda 21 are singularly aimed to met the challenges to sustainable development. The world commission on environment and development describes sustainable development as follows:

> "to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs. The concept of sustainable development does not imply limits - not absolute limits but limitations imposed by the present state of technology and social organization on environmental resources and by the ability of the biosphere to absorb the effects of Human activities. Sustainable Development requires meeting the basic needs of all and extending to all the opportunity to fulfil their aspiration for better life".

Sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional changes are made consistent with future as well as present needs. In the context of Bangladesh sustainable development focuses on the relationship between economic growth and environmental conservation; it involves planning and implementing an integrated programme of environmental management for sustainable development. The programme involves (i) the rehabilitation of environmental damage, (ii) the development of environmentally sound methods for both rural and urban development, with a focus on conflict resolution, (iii) the preservation of biodiversity and (iv) the establishment of tools for environmental management, such as environmental impact assessment (EIA), monitoring and pollution control.

21.5 Challenges to Sustainable Development

The world as whole and specially developing countries of the South Asian Region and various sub-regions within this region face some formidable challenges to sustainable development. Most of these challenges can be viewed from a Southern perspective. Some important issues are stated below very briefly:

Economic Disparity

As has been highlighted in the Human Development Report 1992 of UNDP, the richest billion people in the world have 150 times the income of the poorest billion and over 80 times the trade volume. Moreover, market barriers cost developing countries $500 billion a year, or nearly 10 times the volume of foreign aid they receive. This disparity is not only in income but also in all the opportunities. The bottom one billion of the world's poor, get only 1.4 % of the world income, less than 1% of the world trade, and only 0.2% of the world's commercial credits unless such gross economic disparities are addressed, sustainable development problems in the developing world including the south Asia Region can hardly be solved.

Population Versus Consumption

Global population growth rate have slowed, but 97 million people are still being added every year, the bulk in the poor South. At any level of development, increase in population means increased energy use, resource consumption and environmental stress. If energy consumption and emission

of greenhouse gas is considered alone, it would appear that in developing countries it will increase in the future. Nevertheless, most Southern countries will continue to have much low level of energy consumption compared to the North for many decades to come. From a recent analysis it has been observed that present consumption pattern of the North is more likely to affect climate change than population increase in the South. It is thus essential that both problems of population increase in the developing countries including the South Asia Region and wasteful consumption pattern of the South should be addressed concurrently.

Poverty

Poverty is closely associated with population growth leading to increasing environmental stress in poor countries. Indeed poverty is a major underlying cause of environmental degradation. Recent estimates by UN agencies indicate that more than one billion people live in absolute poverty in developing countries. The Human Development Report 1992 highlighted that many of the most deprived people live in the most ecologically vulnerable areas of the world. Some 80% of the poor in Latin America, 60% of the poor in Asia and 50% of the poor in Africa live on arid, infertile land, on slopes, and in urban slums and squatter settlements. Poverty grows and the environment suffers as people exploit the ecosystems to survive. Only 27% of ODA is allocated to those developing countries, where 72% of the poor people live and less than 10% of aid is earmarked for basic human needs, like education, primary health care, family planning and nutrition.

It is the human being as the pivot around which the environment and development should revolve. To achieve sustainable development, it is needless to say that poverty as the biggest polluter in the South should be eliminated. For elimination of absolute poverty that affects more than 1.1 billion people in the world today, priority should be given on this sector in the allocation of ODA. In this area the country of South Asia Region should not wait and depend for flow of resources from the develop countries. They should themselves undertake priority plans and programmes for alleviation of poverty. This is an area where very close cooperation can be developed among the countries of this region. The Government of Bangladesh has undertaken a substantial programme of providing the basic necessities of life to the people including food, shelter, education, health care etc. In this respect the Dal-Bhat programme or the programme of providing rice and pulses to the common people is the bottom line programme of the present government.

Participation

The Human Development Report of 1993 focuses on the issue of participation. Studies show that the poor, women and rural dwellers are excluded from participation in practically all development activities that are needed to be taken for sustainable development. Almost all the countries in South Asia Region follow a top down policy of planning for development where participation from the common people is almost nil. Such programmes in most cases do not reflect the actual requirements of the people and fail to ensure their participation in the implementation of these programmes.

The government of Bangladesh has now started a people based and bottom up policy of planning for economy development. This process is now being followed to prepare the 20 year perspective plan for development. A pro-active and pro-people process of extensive consultation with the people was follow in formulating the draft National Environmental Management Action Plan (NEMAP). Another very important initiative to enlist mass participation by the people is the ongoing movement to transform social forestry activities into a sustainable social movement. Over the last three years tree plantation activities in Bangladesh have been able to ensure active and spontaneous participation by the people at all levels including the people at the very grassroot level in the villages. The countries of South East Asia can learn from the experience of Bangladesh in this respect and a really people based philosophy and plan of action can be developed to ensure people's participation at all levels for sustainable development.

Natural Resources

Human requirements are currently placing natural resources under severe stress. It is estimated that demands on natural resources could easily be doubled in the next two decades if population and per capita income grow at their projected rates.
According to preliminary findings of FAO, the rate of deforestation in the tropics averaged about 1% per year during the 1980s. The reason may be accredited to excessive dependence of the developing countries' economy in the tropics on their renewable natural resources.

Agrarian character of the economy in the South and over population have resulted in shrinkage of the forest cover for bringing more land under crop cultivation and for meeting housing needs. It is in fact very difficult on the part of national governments in the South to make a quick shift from this pattern of development in absence of alternative arrangement compromising the interest of teeming millions. On the other hand most of these resources flow to the North and a lot of that meet the high consumption and wasteful life-style of its people.

Natural resources are yet to be valued properly taking into account the ecological service value it renders which however is not marketable. For example, lumber as a forest product is a marketable commodity and has therefore a value. But forests in themselves are not valued for their ecological functions, as carbon sinks or as a source of biodiversity. Unless a mechanism is developed for realization of such unaccounted for value from end-users, management of the forests in future would be very difficult.

The countries of the South Asia Region should adopt a common strategy to ensure better utilisation of their natural resources, help each other in such efforts, exchange knowledge, data, information and experience in arresting the process of resource depletion and augmentation of the resources.

Environmental Problems

It is no denying of the fact that environment of this planet is under serious stress due mainly to anthropogenic interference which took place in the last two or three decades. As it appears now a disproportionate 25% of the world's population in the industrialized countries is consuming 80% of its energy and producing 75% of its pollutants apart from their excessive level of per capita natural resources consumption.

In developing countries, however, pressure on the environment comes from lack of choices imposed by poverty and over dependence on natural resources to an extent beyond sustainable limit.

Since, environmental problems transcend national boundaries, the South as well shares the ill effects of pollution from North. Sea level rise, climate change and depletion of stratospheric ozone, marine pollution etc. are some of such examples. A common strategy and collaborating plan of action therefore needs to be devised and adopted by the countries of the South Asia Region to face the impact of global environmental problem.

Technology and Industrialization

Technology transfer from industrialized countries to developing countries is indeed a pre-requisite for industrial development. But transfer of inappropriate northern technologies has progressively destroyed the more ecological indigenous production systems in the South, besides destroying natural resources. The prospect of transfer of environmentally sound technologies to the South on acceptable terms is still bleak. The efforts of the South to develop appropriate and environment friendly technologies are also not getting positive response from the North, which is again frustrating.

In this context it is essential that the South Asia Regional Countries pool their expertise and resource together and use their centres of excellence in different fields to develop less costly, and

environment friendly technologies to augment their process of sustainable industrial development.

Institutional Issue

In order to achieve the goal of sustainable development, recognition must be given to the interaction between economic, social and environmental trends. Appropriate institutions are to be built up and mechanisms developed both nationally and internationally which can coordinate policy and programme needs and requirements in order to integrate environmental considerations into planning and decision-making processes. International and Regional institutions can play a key role in strengthening up national institutions. This will inter-alia, strengthen national capacity in reporting progress. But progress in this direction is not very significant.

It has however been established from the interactions among the South Asian Countries in the regional fora like SAARC, SACEP, ICIMOD that in many fields, a number of countries have developed a lot of expertise and institutional capabilities which can be very profitable shared by other regional countries. This process of interaction and exchange of facilities need to be speeded up and further strengthened.

Out Flow of Resources from South to North

Despite political independence, the third world countries are trapped in a vastly unequal international economic order. The division of labour - raw material production in the South and industrial production in the North is continuing as in the case of world trade - selling cheaply to and buying expensively from the North. This has resulted in continuous outflow of resources from South to North. Over and above, the intrinsic value of natural resources in the context of ecological crisis is yet to be accounted for and reflected in the transfer of resources. The countries of South Asia Region must taken common strategies to effectively arrest outflow of their resource to developed countries. This can be done by establishment of regional cooperation in production, trade and industrial development. The idea of setting up of a common market in this region can also be a very effective tool for mutual strengthening of the present status of development and reduced the flow of resources from this poor countries to the developed countries.

Awareness and Prioritization of Actions

A quick shift from traditional development model to sustainable development model warrants environmental awareness at all levels in the government - from policy level to execution level. Inadequate representation of governments from developing nations in the preparatory process of UNCED as well as in the negotiating process of the conventions has had a negative impact in generating awareness in different disciplines in government.

Further, appropriate actions to increase the environmental knowledge base are either absent or too inadequate. As a result proper appreciation of needs and requirements for sustainable development is often lacking. Unless this is ensured the progress of implementation of UNCED commitment would suffer serious setback in absence of priority attention. Since countries of this region share a number of common environmental problems and a lot of commonalities in the status of education and awareness they can set up common action plans for cooperation in this vital area which would enhance peoples involvement in sustainable development.

Regional Institutions

Implementation of the commitments having regional dimensions will call for either creation of new institutions or strengthening the existing ones with extended responsibilities. The regional institutions like SAARC, SACEP, ICIMOD at various committee levels have been mandated to address some of the issues. But it appears that these are not gaining momentum due mainly to fund constraints.

Availability of Resources

According to preliminary estimation, the need for additional fund for implementation of Agenda 21 alone is about US $125 billion. The current ODA level is too inadequate to meet the needs. The pledges which were made in Rio by some of the donors are yet to be fulfilled.

Apart from various international and regional funding institutions, establishment of GEF has been a positive step but with poor replenishment. The issues like "incremental costs" and "global benefits" are some of the controversial issues which are still awaiting an acceptable definition and solution. The countries of South Asia Region have a lot to learn from the very little progress in the implementation of many decisions and agreement which promised flow of resources, technology and other inputs for economic and environmental development of poor nations. The flow of finances to this region since the UNCED is hardly worth mentionable. Experience of most of these countries regarding financial help from GEF upto date is also not at all encouraging. It is therefore essential that these countries work out a plan of creating a common pool of resources for addressing their priority problems in environment and development.

21.6 Bangladesh Scenario

Bangladesh is a country of South Asia having an area of about 144,036 Sq kms and a population of 118 million. It's economy is predominantly agrarian. The country is short of mineral and energy resources. 64% of people are illiterate and nearly 60% of the population are functionally landless. With about US $220 per capita annual income (1991), the country is one of the poorest in the world. Therefore, the central objectives in the plans of economic development pursued by the democratic government are poverty alleviation and employment generation through human resource development. The deteriorating environment the shrinking resource bases and ever multiplying problems are imposing increasing premium on our development efforts.

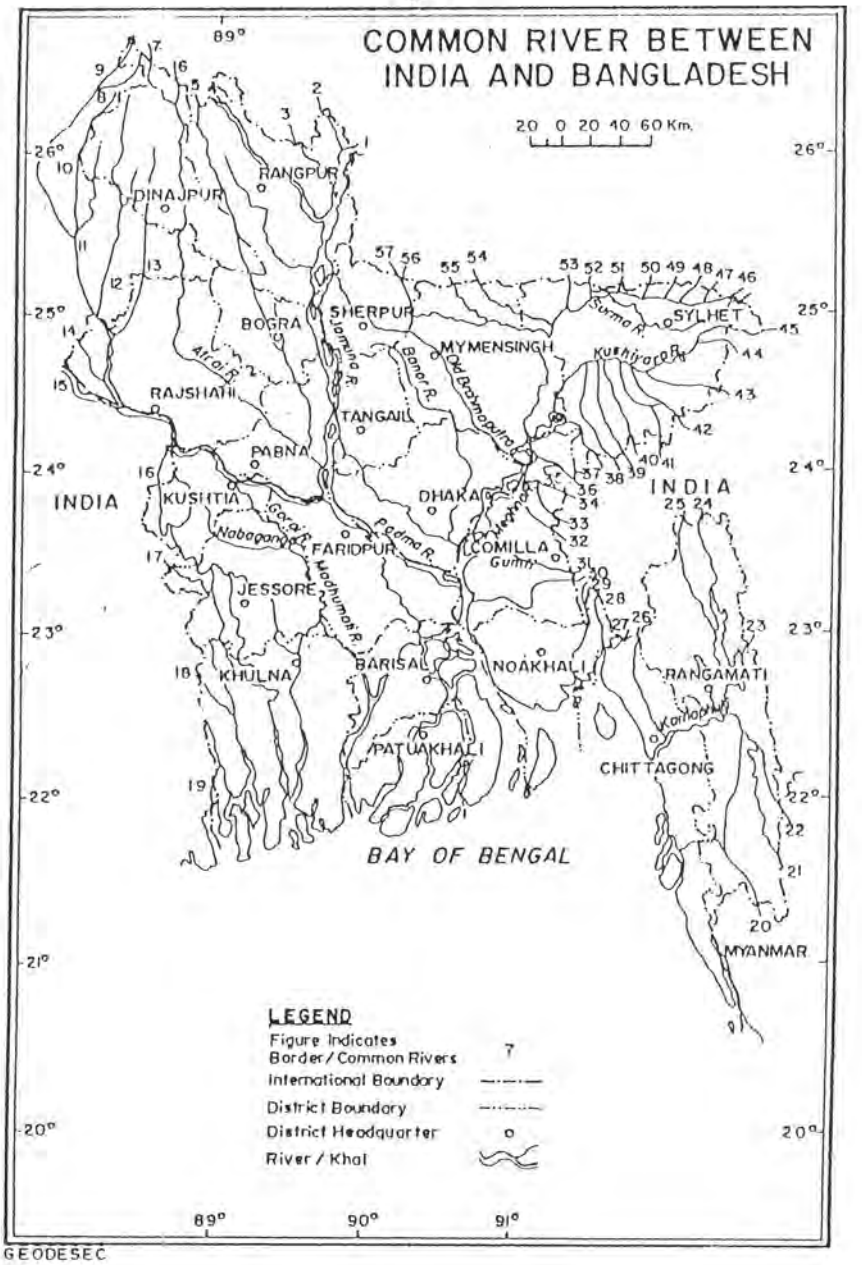
21.6.1 Problems of Sustainable Water Management in Bangladesh

There are 57 rivers big or small which enter Bangladesh from across the borders of which, 54 rivers enter from India. The Ganges is one of the largest international rivers. It's catchment basin spreads over China, India, Nepal and Bangladesh. About 40 million 'inhabitants' of the entire South-West and about 50% of North-West region of Bangladesh are directly or indirectly dependent on the Ganges for their principal source of fresh water.

The economy of Bangladesh is agrarian, which is critically dependent on the water of the rivers. Besides, river water is vital for domestic and municipal water supply, industry, fishery, forestry, navigation, and above all ecology and environment of Bangladesh. Therefore, sustainable water management is perhaps nowhere more important than in Bangladesh. But due to unilateral withdrawal of the dry season flows of the Ganges by India at Farakka barrage, the already fragile ecological balance in the South-West region of Bangladesh is under severe stress, besides its adverse impact on the economy. The impacts among others are:

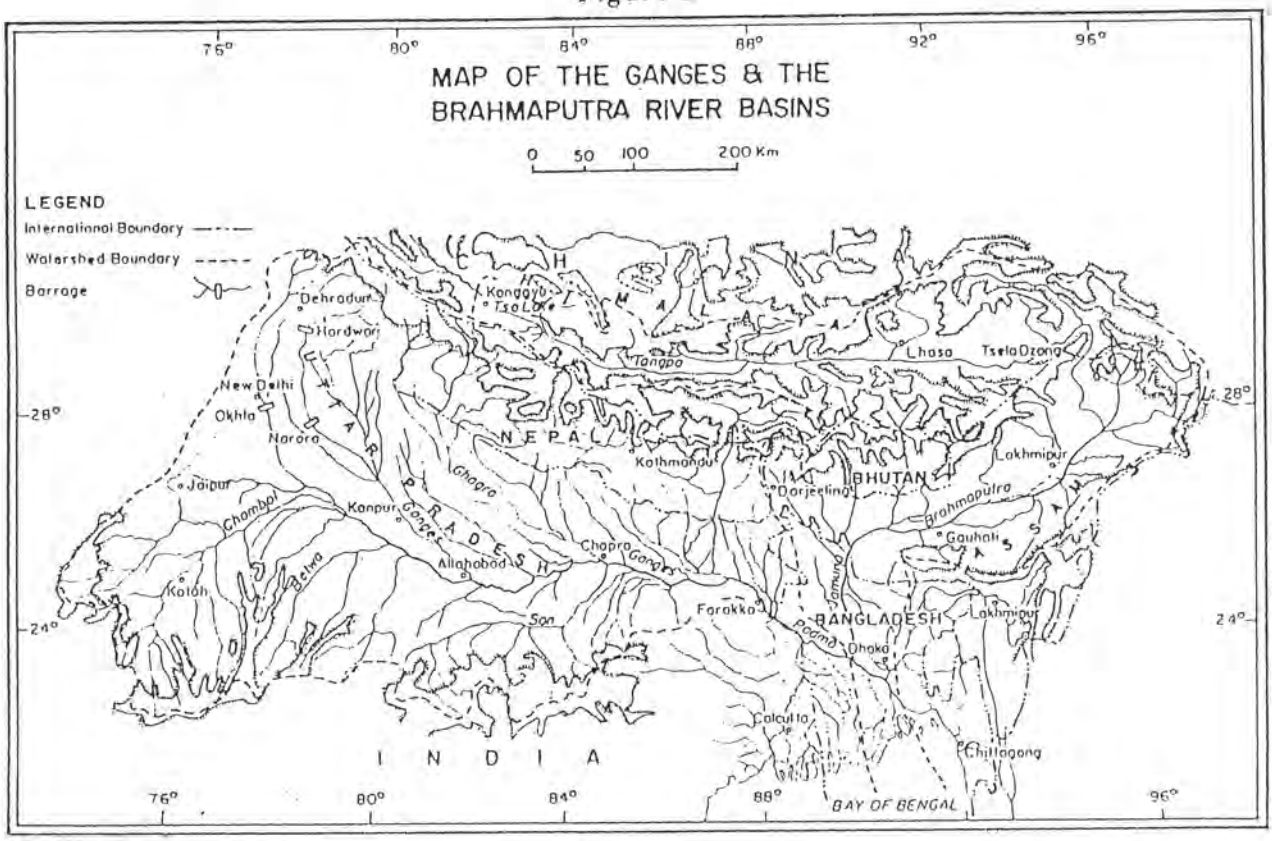
- Inland intrusion of salinity and increase in estuarine salinity;
- Loss of spawning ground or habitat of fresh water fishes resulting in reduction of capture fishery;
- Direct and indirect loss of agricultural production;
- Degradation of the World's largest mangrove formation mainly due to change in the salinity regime;
- Degradation of the quality of ground water and lowering of the ground water table;
- Disruption in inland navigation;
- Adverse impact on public health;
- Land degradation and threatened desertification;
- Loss of biodiversity and degradation of environment.

Figure


COMMON RIVER BETWEEN
INDIA AND BANGLADESH
20 0 20 40 60 Km.
89°
90°
91°
26°
25°
24°
23°
22°
21°
20°
RANGPUR
DINAJPUR
BOGRA
SHERPUR
MYMENSINGH
SYLHET
RAJSHAHI
TANGAIL
PABNA
KUSHTIA
DHAKA
FARIDPUR
COMILLA
JESSORE
KHULNA
BARISAL
NOAKHALI
RANGAMATI
CHITTAGONG
PATUAKHALI
BAY OF BENGAL
INDIA
INDIA
MYANMAR
Jamuna R.
Atrai R.
Baner R.
Old Brahmaputra
Surma R.
Kushiyara R.
Gorai R.
Nabaganga R.
Padma R.
Madhumati R.
Gumti
Karnafuli
LEGEND
Figure Indicates Border / Common Rivers
International Boundary
District Boundary
District Headquarter
River / Khal
GEODESEC

MAP OF THE GANGES & THE BRAHMAPUTRA RIVER BASIS

Figure _



21.6.2 Vulnerability of Bangladesh to Sea Level Rise and other Climate Change

On an investigation conducted very recently, following IPCC common methodology, it appears that Sea Level Rise and other Climate Change (SLRCC) factors will have severe impacts on Bangladesh, on its population, economy, infrastructure, agriculture, industry, and ecosystem. A 100 cm rise in sea level in Bay of Bengal could result in loss of 12-18% of the land area of Bangladesh to the sea. The impact of inundation will affect drainage of the flood water and the area under seasonal flooding would increase 17%, the existing seasonal flooding would become deeper and more prolonged. Other likely effects would include inward intrusion of salinity in surface as well as in ground water, disruption of estuarine and coastal aquaculture, more devastating cyclones with induced tidal waves. The impact of inundation would likely to turn 20 million people ecological refugees.

On the other hand, the impacts of drought are expected to be intensified in the drought prone areas, particularly in the North-West of Bangladesh. In other words, the morphological changes that may emerge due to SLRCC may be transmitted through the whole country and may affect the agrarian economy of the country severely.

21.6.3 Ozone Depleting Substance (ODS)

A recently conducted Reconnaissance Survey of ODS in Bangladesh reveals that an average total annual consumption of ODS in Bangladesh is 206.3 MT which is met entirely through import. Thus per capita consumption of ODS is only 1.75 gm. Indeed, Bangladesh does not produce any ODS. The study also made projections on likely use of ODS in the future both on total as well as per capita consumption under a low, medium and high growth rate scenario, showing that even under a high growth scenario, the per capita consumption of ODS in next two decades is likely to remain below the recommended level under the Montreal protocol. Nevertheless, as part of its international duties to do its best to reduce and phaseout the use of ODS the Government has since ratified the Viena Convention on the Protection of Ozone Layer and the Montreal Protocol including its London Amendment on phasing out of ODS, and planning to implement various recommended strategies for an ultimate phase out of the use of ODS in Bangladesh.

21.6.4 Follow-up of Agenda 21 and Bangladesh

As indicated earlier the concept of sustainable development pre- supposes a shift from the existing paradigm to development through innovative formulation and use of prices policies, economic instruments like environmental accounting, development of environmentally sound technologies, free access to international markets and a range of regulatory measures. All these measures call for fundamental changes in the attitude of those concerned in decision making for hastening the process of integration of environment and development.

The ability of a country to make the transition to sustainable development is dependent to a large extent on its endogenous institutional and professional capacity. A country-driven participatory process and a sustained commitment to building endogenous human, technological and institutional capacity are indispensable prerequisites for sustainable development.

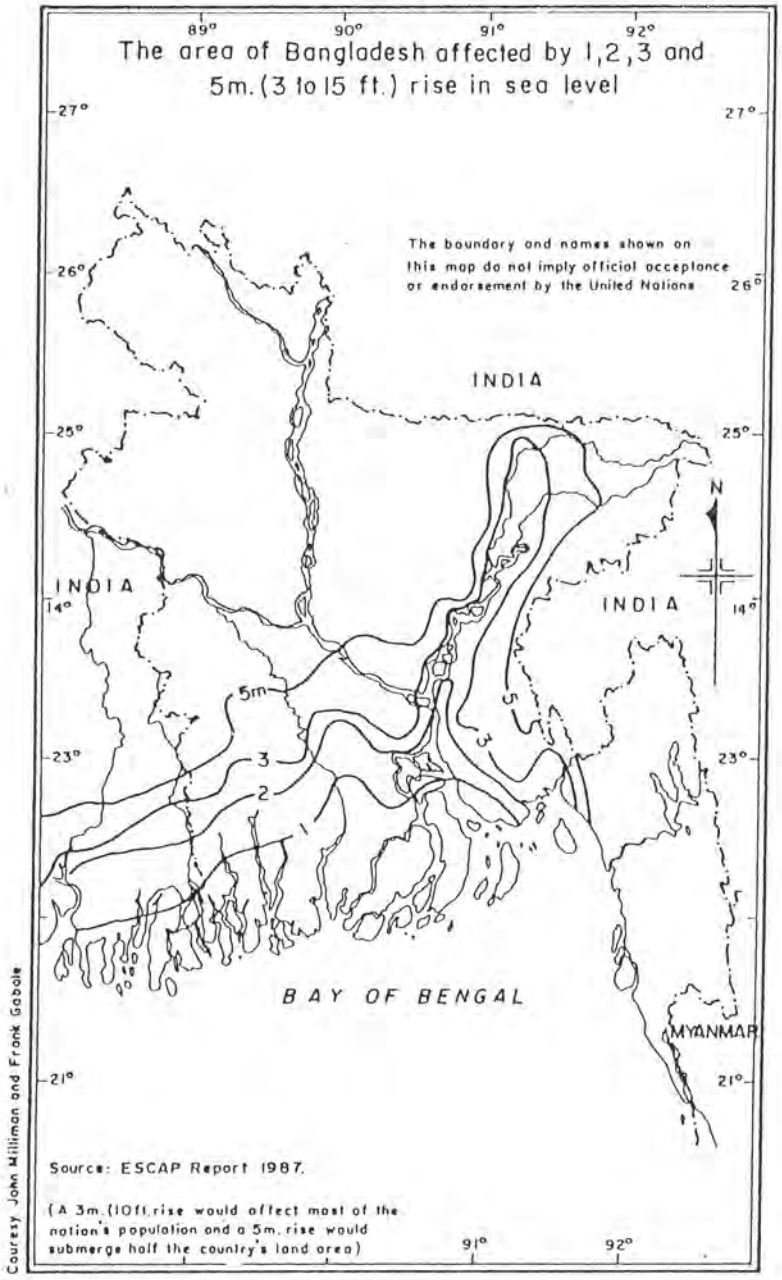
In Bangladesh Ministry of Environment and Forest is the focal point for the CSD. At this stage, it would be appropriate to deal with the experience of Bangladesh in preparing and submitting the report to the Commission on Sustainable Development. It may be mentioned that Bangladesh has not been able to report on implementation of Agenda 21 at national level.

A national plan or a national Agenda 21 was seen as prerequisite for its implementation. In spite of best efforts a National Agenda 21 in Bangladesh could not be drawn.

The CSD met for the second time and took stock of the implementation of Agenda 21 in May 1994. This session allowed the CSD to evaluate as to why Bangladesh have failed to take any action as yet for its implementation and identify the elements common to most of the developing countries.

THE AREA OF BANGLADESH AFFECTED

Figure _



Immediately after returning from Rio Bangladesh decided that the high powered National Environment Committee headed by the Hon'ble Prime Minister, created as per provisions of the National Environment Policy of 1992, would, among others, look after the implementation of Agenda 21. Environment was high on the political agenda of the government. That was the time when Bangladesh was preparing a National Environmental Management Action Plan (NEMAP) and endeavored to integrate environmental issues into various other activities including planning process.

But how much Bangladesh is nearer to implementation of Agenda 21 is a question worth asking. When the standard format designed by the CSD was received it appeared immediately that the structure of the reporting format was quite complicated and the amount of information sought was so vast, that it was also beyond the ability of many organizations to adhere to the time frame. The problems faced may be described as below:

- National development is usually pursued through a mid-term development plans. In case of Bangladesh such a plan is drawn for a term of 5 years. The objectives and strategies set out in the current plan book (1990-95) was conceived to back in 1989, 1990. It was not possible to revise the plan document in the mid-stream of its implementation. Necessary measures could not also be initiated for a shift to the paradigm of sustainable development while preparing for the Five Year Plan. Further, the sectoral ministries are yet to take full account of the issues to be addressed under Agenda 21.

- **Lack of coordination:** The report was to be consolidated on the basis of information provided by other sectoral ministries/agencies. The agencies were not quick in responding nor were their responses according to the format.

- Absence of national networking for timely flow of information.

- **Lack of orientation:** A reason for not getting the right response could be that other agencies lacked proper orientation or understanding of the whole thing to bring about a change.

- **Response from international organizations:** The commitment of international communities have not been manifested in full during last two years. The Agenda 21 called for assistance of United Nations agencies for its implementation. So far there has been little such assistance. Bangladesh's experience with UN agencies, particularly GEF is not entirely a happy one.

- The capacity of many concerned agencies still remain limited. That without capacity improvement it would be difficult to attain the objectives.

It appears from a recently published international survey conducted by Asahi Glass Foundation focusing on Agenda 21, that governmental regulations to conserve the environment is in progress, and awareness towards solving of environmental problems is on the increase. The foundation sent some 2550 questionnaire around the world and a total of 282 were returned, making a response rate of 11%.

Bangladesh Initiatives

In spite of having resource limitation the government of Bangladesh towards fulfillment of her commitment and drive for sustainable development have by now enunciated its Environment Policy, 1992 which indeed has brought into focus the salient points of Agenda 21. Among other issues the environment policy of Bangladesh has given special emphasis to poverty alleviation, population control protection and promotion of human health, improvement in the quality of human settlements, sustainable use of land resources, conservation and rational use of forests, protection of frazile ecosystems including the wetlands, the Sundarbans, the Coastal and Marine Ecosystems,

sustaining the reach bio-diversity of the country. The national environment policy has also emphasized on international cooperation in mitigating probable consequences of climate change, sea level rise and management of natural disasters like floods, cyclones and desertification. The policy has given due importance to improvement of institutional capabilities and development of human resources for environmental management. Regional Cooperation was emphasized in the management of common environmental problems like sharing water of common rivers, management of freshwater resources, management of watershed areas, control of pollution, and salinity in the rivers, sustainable management of forests and wetlands.

National Environmental Management Action Plan (NEMAP)

One of the most vital steps taken by Bangladesh in meeting the challenges to sustainable development has been the formulation of a Draft National Environmental Management Action Plan (NEMAP). With the help of UNDP, a unique process of pro-active consultation with the people was undertaken in preparation of this plan of action. 24 grass root level consultative forums, 5 regional workshops and a national workshop was arrange to mobilise public opinion. People of all sections/professions/shades of opinion were called to participant in this meetings. Moreover 8 consultative meetings were arranged with various professional groups including the academics, media people, lawyers, politicians, technocrats etc. One hundred thousand questionnaires were distributed among the people to solicit their opinion regarding environmental priorities, probable solutions and methodologies for ensuring their active participation in the implementation of the proposed plan of action. A massive campaign was launched in the phase Radio and Television inviting opinion of the people in the process. The response from the people at the grass roots and all other levels was massive. This whole process of pro-active consultations with the people was coordinated through a very close and cordial cooperation from the NGO community. The inputs received in this process are colossal in proportion, varied in nature and substantive in reflective the real perspective of the people for whom the plan of action is being drawn. The whole process of formulation of this important environmental document for sustainable development is expected to be completed by August 1994. In view of the pro-active and participatory methodology adopted in its formulation and also in view of the reflection of the people's perspectives and also inconsideration of the substantive nature of the inputs received from the people at large, the draft document has already generated a lot of interest among the bilateral and multilateral donor community. The other countries of South Asia Region can follow this unique experiment of Bangladesh in the formulation of a pro-people plan of action for sustainable development.

CHAPTER 22

PROSPECTS FOR THE 21ST CENTURY : A REGIONAL PERSPECTIVE

22.1 Introduction

At the fag end of the twentieth century human civilization and the existence of the globe it self stands at a threshold. That threshold is a complicated mixture of political, geo-political, economic, ethnic, social, cultural and a host of other local, national, and international factors. An environmentally sustainable future for the globe or any region within it can not be conceived in isolation of the existing realities in the international and regional perspectives.

A regional perspective for South Asia Region in respect of the prospects for the 21st Century can not therefore also be drawn without taking into consideration the challenges and opportunities which exists in the global and the regional context.

22.2 The Global Context :

Briefly assessed, the pre dominant realities in the field of environment and development in the global context are the following:

1. The world is now dominated by an unipolar power structure after the disintegration of the Soviet Union which maintained a balance of power broadly dominating all major aspects of political and economic development. In the present changed scenario the major political and economic decisions evolve from and revolve around the overall national and global interest of this single power structure. The developing countries including those in the South Asia Region no longer have any option but to follow the dictates and interest pattern of this monolithic power and economic structure. It means that both in the field of economic development and environmental management they, now, have a very limited option in respect of strategies and methodologies.

2. The International AID scenario has undergone a tremendous change due to the situation now prevailing in East European Countries which are commonly known as economies in transition. They are now getting maximum priority and preference over other countries including those in the South Asia Region in matters of development funds and assistance for environmental improvement.

3. The Earth Summit at Rio was expected to materialise the dream of bringing all nations of the world, rich and poor, north and south, east and west, to appreciate the hard reality that the UNCED might have been the last chance for them to agree to work together to achieve a better common future for mankind which is environmentally safer and socio-economically more sustainable. Whatever the UNCED achieved, these accomplishments are only in their earliest and most tentative stages. It is clear that a new phase of difficult work around the implementation of UNCED is faced by all both in the North and South. This work-in the United Nations, in national capitals, in research institutes and by community-based non-governmental organizations (NGOs)-will be much less dramatic than the media events in Rio de Janeiro but will influence the ultimate success or failure of international or regional cooperation to safeguard the future of the planet.

4. In some ways, of course, the Earth Summit was a disappointment. Many point to the weakening of the climate change convention, which was stripped of specific targets and timetables for carbon emission reduction. The biodiversity convention, while setting new parameters for the use and protection of the planet's biological resources, was undermined by the refusal of the United States to sign on. Environmentalists are disappointed that the plans for a forest convention were derailed by both some of the southern states and United Sates negotiating intransigence. In his final remarks to the conference over which he presided, even UNCED Secretary-General Maurice F. Strong lamented the lack of an overall commitment to a stronger Agenda 21 and

subsequent financing.

5. While the Rio Declaration on Environment and Development represents an important new set of guiding principles, it too falls far short of original hopes for a more comprehensive and visionary "Earth Charter" sought by Maurice Strong and several governments earlier in the UNCED planning process. Nevertheless, it is a substantial effort to define some of the key issues facing both the North and the South. Strong hopes the present Rio Declaration will "evolve towards what many of us hope will be an Earth Charter that could be finally sanctioned on the fiftieth anniversary of the United Nations in 1995".

6. The biggest stumbling block to realizing the ambitious targets for action set in Agenda 21 is the lack of sufficient funds committed to achieving global sustainability by Northern governments.

7. Japan will increase aid for such "sustainable development" from $3.1 billion over the last three years to $7-7.7 billion over the next five years. The European Community pledged $4 billion, and Germany agreed to meet the long unmet ODA target of 0.7 per cent of GNP for development aid, in this case sustainable development aid. This target will mean approximately $6.3 billion a year from Germany each year. The United States government came to the table with an underwhelming figure of approximately $175 million per year.

8. The Global Environment Facility (GEF), meanwhile, is likely to be beefed up to about twice its current $1.3 billion level by next year. It has already begun to dispense funds to combat global warming, although the final structure to the facility, jointly run by the World Bank, UNEP and UNDP has been revised to some extent with an eye towards being more open to Southern country participation. For the time being, GEF will remain the major funding mechanism specifically designed for sustainable development.

9. UNDP has announced that it will be increasing funding for environment projects from $700 million to $2 billion over the next five years. It also plans to launch a worldwide sustainable development network to facilitate the exchange of information on the environment, a Brazilian-based international sustainable development center, and a major capacity-building program in support of Agenda 21.

10. For it, the World Bank will be seeking an "Earth Increment" for environment projects in the upcoming replenishment of the International Development Association, its soft-loan window.

11. All told, however, new funding pledges for the environment were estimated at $6 to $7 billion a year-less than the $10 billion Maurice strong had realistically hoped for, and way below the $70 billion a year in additional ODA which Agenda 21 called for.

12. Perhaps one of the changes that will have the most lasting effect from the Earth Summit is the democratization of international negotiations highlighted by the increased participation of non-governmental organizations. Tens of thousands of citizens were mobilized to take part in the preparatory process, the four negotiating sessions of the UNCED Preparatory Committee, and in all of the international NGO parallel meetings that were organized by issue, area and sector.

13. The real commitment to post-UNCED success, however, rests with governments and what the political leadership of governments are willing to commit.

22.3 Delays in implementing the UNCED decisions

Maurice Strong could rightly envisage that road from Rio would be more difficult than road to Rio. The consensus forged in Rio and commitment made by the world leaders are waning day by day. The momentum of Rio is gradually being lost at the national government levels. As a result it is becoming more and more difficult to implement the commitments of Rio.

This is happening incase of most of the major agreements drawn and principles agreed upon

including the Rio Declaration Conventions on Biodiversity and Climate Change and the Forest Principles. Recent developments in Uruguay Round of GATT run counter to the enunciated principles of the Rio Declaration in terms of right to development, the responsibilities of developed countries, trade policies, eradication of poverty, etc. It is, therefore apparent that mere adoption of these principles in the national policies of the South, including those in the South Asia Region would mean little, unless the same are pursued by the North in right earnest. As with the Climate Change Convention, the contending issues of technology-transfer, intellectual property rights, funding, defining incremental costs and global benefits in the Biodiversity Convention are yet to be addressed. Incase of "Forest Principles" the developing countries who are rich in forest resources are not very responsive to these principles in absence of a compensation mechanism to forego exploitation of forest resources. Hopefully the Desertification Convention will be concluded as scheduled. But it is presumed that like all other agreements, the financial support under this agreement would remain a major impediment in the smooth implementation of the activities envisaged.

22.4 North-South Related Issues

The success of economic development and environmental improvement in the globe as a whole and particularly in the South Asia Region will continue to suffer in the present and also in the 21st Century due to the failure in resolving the fundamental differences in the points of view, strategies, action plans, and programmes between the North and South. The important issues relate to economic disparity, different perceptions in respect of population and consumption patterns, poverty, disparity in natural resources, different attitudes in respect of prioritisation of environmental problems, technology transfer, flow of financial resources from North to South, outflow of resources from South to North and selection of proper institutions and strategies for solution of economic and environmental problems.

22.5 Regional Challenges

In the contemporary world and also in the regional perspective environmental problems cannot be solved if other relevant political, social, ethnic, cultural and economic problems are also not addressed concurrently. Today South Asia faces almost all the conceivable types of development problems and environmental degradation at an alarmingly rapid rate. Besides there are many socio political and ethnic tensions among and between many member countries in the region.

In addition to the above, countries of the region face a number of common problems which are inter-alia, the following:

- Population pressure
- Unsustainable Development Strategies
- Degradation of Important Ecosystems
- Pollution of common rivers
- Unsustainable Use of freshwater resources
- Unsustainable patterns of energy consumption
- Deforestation and decline of soil fertility
- Degradation of wetlands
- Natural Calamities
- Soil Erosion, Sedimentation and Rise of Salinity
- Socio-economic problems including poverty, illiteracy lack of adequate health care, water supply, sanitation, housing and other basic facilities.
- Lack of public awareness and participation in environmental and development issues.

22.6 Collaborative plans of action by countries in the region:

The following steps could be taken to manage the shared ecosystems, common environmental problems as well as the problems emerging out of disjointed and unilateral undertaking of programmes by different member states in the South Asia Region.

- The countries of the South Asia Region must give due consideration to the solution of existing political, ethnic and other type of tensions and conflicts between and among them. This will release a tremendous amount of resource and goodwill which will strengthen cooperation for development and solution of environmental issues.

- As developing countries they should adopt a common strategy to solve economic and environmental problems. They may also consider taking a bold step of reducing non development expenditure including expenditure on defence. This will need creation of better political understanding and harmony among the states.

- Both bilateralism and multilateral approaches should be adopted to solve political, economic and environmental problems.

- The regional states should try to adopt common positions, strategies and policies while dealing with other regional organizations and also in international fora for solution of development and environment related issues.

- Cooperation in the existing regional institutions light SAARC, SACEP, ICIMOD,etc. should be strengthened.

- Emphasis should be given to the identification of priority areas where co-operative regional and global research and action program is essential. The national research and action-bases should be sufficiently strengthened for effective regional co-operation.

- More efforts should be taken for affiliation of the countries of the region to a wider network of international organizations and determination of methodology for maximizing the benefit obtained from such affiliation.

- An effective system for co-operative monitoring and abatement of cross-boundary flow of pollution should be worked out among the countries of the region and the neighboring countries concerned. Upgrading of pollution monitoring capacity, particularly along the border areas would be required.

- Regional and global data base should be developed relevant to the environment of the countries of the region. The national data bases should be upgraded to meet the international standard.

- Combined steps should be taken to seek assistance from the internal donor community in determining a legislative framework among the co-basin states of Ganges-Brahmaputra Meghna, for co-operative sustainable development of the water-resources. The assistance from the international organizations may be in the form of support for research activities in this particular field. National and Internal N.G.O.'s may also have a vital role to play in this respect.

- One of the priority areas should be to build up national and regional data-base with effective linkage with international environmental data networks. Special emphasis should be put to those classes of data and technical information which would lead to research on environmental topics requiring regional and global co-operation.

- Priority should be given to the identification of major sources of environmental degradation and hazards lying outside the boundaries of member countries and utilize the experience and knowledge of the international organizations for finding solutions.

- Flood may be identified as one of the major environmental disasters of Bangladesh and the region. The need for mitigating floods and its accompanying environmental degradation for Bangladesh and her neighbors, may form the starting incentive for UNEP sponsored regional study and research programs which may lead to a comprehensive Ganges-Brahmaputra-

Meghna basin-wide water-resources management strategy, with consequent cross-sectoral benefits.

- Urgent steps should be taken to develop regionally integrated systems for protection against natural disasters. Effective data exchange for maximizing hazard forecast lead time should be a major component of this system.

- Strategy for conservation of genetic diversity in the regional ecosystem should also be guided by national and regional priority consideration and to some extent on cost-effectiveness.

- Steps should be taken to develop a viable methodology with the help of UNEP, ESCAP and other relevant international organizations, for conservation of living resource in the Bay of Bengal and other seas of the region, both within and outside the territorial and EE waters.

- Creation of public awareness as to the problems which would in turn create pressure on the policy-makers to take any programme regarding management of shared resources should be accorded due emphasis.

- Population control and literacy programme in an institutionalized form with various rewards and incentives, attached to it must be an immediate agenda for all countries of the region.

- Creation of various small income generating projects which would reduce the dependence on land would substantially help the cause of poverty alleviation and environmental upgradation.

- It should be noted that adoption and implementation of a sustainable development strategy whereby every programme should be taken not only with consideration for all other sector of development, but there should also be considerations for renewal or regeneration of the basic materials of development.

- Environmental impact assessment (ETA) should be a must in all programmes undertaken and those projects that are considered environmentally unsound should be abandoned.

- Since the Himalayan ecosystem is vital for the stability of the environment of the region, due consideration must be given to restore the forests and land quality there. A massive reforestation programme should be undertaken. Since every country in the region is and would be affected by the degrading quality of environment, every country should proceed with whatever contribution, financial or otherwise, they can muster to restore the Himalayas. Outside assistance would be fruitful in this campaign. Moreover, research centres on the study of restoration of the Himalayas would be most effective and in shortest possible time such institutions might be established.

- Since forests are fast disappearing as a result of supplying fuel wood, search for and use of alternate energy is a must. Every country in the region should make most efforts in this regard.Necessary help, expertise and inputs should be extended to those countries with the potential of generation of hydro-electricity. Assistance should be offered by every country as well as from outside donor agencies. However, such exploitation of power should be environmentally sound which necessitates proper study and research on this.

- Apart from hydro-power, solar power could provide a considerable alternative energy source for the region. Research and assistance in this regard would be fruitful if directed towards using cheap and easy mechanisms that would interest the rural people in the region.

- Decentralization of industry and economic base from the centre or capital to other parts of the country should be encouraged which would reduce the pressure on the capital and the unhealthy growth of slums.

- Energy efficiency should be improved so that system loss is reduced. This is applicable not

only in the case of supply of electricity but also in other sectors, even to the rural stoves that are used in the open air whereby a huge amount of energy is lost.

- Due consideration should be given towards other's interests while exploiting the commons rivers. Research and assistance in assessing the required amount of water for every country would be more effective, if undertaken by experts and research centres or NGOs who are above emotional attachment or any deep-rooted bias towards any particular country. Regional Governments concerned, should be open-minded to accept the expert suggestions in this case.

Basinwide management of the Ganges, Brahmaputra and Meghna river systems for flood control measures and for sustainable harnessing of the resources should be established through an international cooperative forum like South Asian Association for Regional Cooperation (SAARC) or any other standing commission.

For mitigation damage caused by flood, forecasting system should be strengthened by climate-hydrological data exchange between the cobasin states. Cyclones hitting Bangladesh originate in the Bay of Bengal. These cyclonic storms often hit the coastal territories of India also along the coast of West Bengal, Orissa and Andhra Pradesh. Therefore, weather data exchange between Bangladesh and India should be a regular feature for early forecast of cyclones for disaster preparedness of all concerned.

A system for effective monitoring of cross-boundary flow of pollutants by water and air should be introduced as early as possible. Monitoring of marine pollution and interference in the coastal environment as a whole should be introduced for early detection and for prevention of hazards to the environment and to life support system of the coastal environment.

The following actions are recommended for maintaining genetic diversity.

- Monitoring of the endangered species and commercially important species.

- Maintenance of the natural habitat of the endangered and also the migratory species.

- Coordination and cooperation with regionwide partners to create gene pools so that maximum number of species, particularly those important as food, forage, medicine and timber are preserved without duplication.

- Countries that are vulnerable in the face of sea level rise should get more attention from other countries of the region as well as from the world. Measures at every level viz-global, regional and national should be taken to help these countries.

REFERENCES

A. Atiq Rahman, et.al, 1994, "Environmental and Development in Bangladesh, Vol. 1 & 2".

Anwar, Dr. Jamal, November 1993, "Bangladesh State of Environment".

Bangladesh Centre for Advanced Studies & Nature Conservation Movement, May 1994, "Wetlands of Bangladesh".

Department of Environment, Ministry of Environment and Forests, March 1992, " State of Environment in Bangladesh (Final Draft)".

Department of Environment, Ministry of Environment and Forests, 1993, "Environmental Education in Bangladesh-Need for all (draft)"

Department of Environment, Ministry of Environment and Forest, July 1992, "Training Manual on Environmental Management in Bangladesh".

Disaster Management Bureau, Ministry of Relief, 29th April, 1993 "Procedings of Seminar on Disaster Management"

Economic and Social Commission for Asia and the Pacific Bangkok, Thailand, 1991, "Coastal Environmental Management Plan for Bangladesh".

Economic and Social Commission For Asia and The Pacific, Ministerial-Level Conference on Environment and Development in Asia and Pacific, Preparatory Meeting of Senior officials, 10-13 October 1990, Bangkok, " Regional Co-operation in The field of Environment and Development : Note by the Secretariat".

Economic and Social Commission for Asia and the Pacific Bangkok, Thailand, "State of the Environment in Asia and the Pacific, 1990".

ESCAP/UNDP/SACEP, Report of the Intergovernmental Meeting on Capacity-building in Coastal Environmental Management in South Asian Seas Region, 17-19 May 1994, New Delhi".

Forest Department , Ministry of Environment and Forests, 1991, "Development of Forest Resources in Bangladesh".

Global Forum on Enviornment and Poverty (GFEP)/ Bangladesh Centre for Advance Studies, 1993, Proceedings of "Internationl Workshop on Environmenta and Poverty"

Government of the Peoples Republic of Bangladesh, 1991, "Report of the Task Forces on Bangladesh Development Strategies for the 1990's: Environment Policy, Volume. 4".

Huq, Md. Fazlul, February 1993, "Effect of Forest Resource Depletion on Environment and Rural Economy", Paper presented at Bangladesh Agricultural Research Council, Agroforestry Training Workshop 27 February-04 March 1993.

Huq, Md. Fazlul, September 1993, "Bangladesh Country Status Paper on Data Collection, Storage and Use Forest Sector Planning".

Huq, Md. Fazlul, November 1992, "Environmental Issues & Environmental Management in Bangladesh".

Huq, Md. Fazlul and Khan, Lopa, July 1993, "Coastal Zone Management (draft)".

Huq Dr. Mahfuzul, January 1991, "International Dimentsion in National Conservation Strategy".

International Centre for Integrated Mountain Development (ICIMOD), 1994, "Annual Report, 1993".

International Fund For Agricultural Development, June 1992, "Environmentally Sustainable Rural Poverty Alleviation".

IUCN-The World Conservation Union, November 1992, "People, Development and Environment: Complex Interlinkages in Bangladesh", Procedings of a National Symposium held in Dhaka, Bangladesh.

Khan, M. Sultan Mahmud, June 1993, "The Strategy perspective of Integrated Coastal Zone Planning and Management in Bangladesh".

Khan, Faruq Aziz, May 1993, "Living with Natural Hazards".

Ministry of Environment and Forest Govt. of The People's Republic of Bangladesh Dhaka, Bangladesh, October, 1991, " Bangladesh Country Report for United Nations Conference on Environment & Development (UNCED) Brazil, 1992".

Ministry of Environment and Forest Government of Bangladesh/International Union for Conservation of Nature and Natural Resources, December 1991, " Towards Sustainable Development: The National Conservation Strategy of Bangladesh (Second draft)".

Ministry of Environment and Forests, March 1993, "National Environmental Management Action Plan (draft)".

Pasha, Abullah Haroon, 1994, "The Earth Summit Two Years on: A Southern Perspective of National Reporting-Bangladesh Scenario".

Rahman, A. Atiq, et.al, July 1993, "Exploding the Population Myth, Consumption versus Population: Which is the Climate Bomb".

Rahman, A. Atiq and Nahid Islam, 1992 "Environmental Security Concerns and Issues in South Asia".

SAARC Technical Committee on Environment, "Report of the First Meeting", Islamabad, 13-15 December, 1993.

Sadeque, S. Zahir, 1992, "Environment and Natural Resource Management in Bangladesh".

The Global Resource Information Database (GRID) Bangkok, May 1994 "The UNEP Environment Assessment and Reporting Sub-Programme: The Decade Ahead".

World Resources Institute/ UNEP/UNDP 1994, "World Resources, 1994-1995".

BANGLADESH

APPENDIX - I.a

MAIN AREAS OF ENVIRONMENTAL CONCERN AND THEIR MAJOR PROBLEMS

1. **Mahananda Basin** : Frequently flooded, and also subject to droughts.

2. **West-Central Barind** : being desiccated through improper land-use. Low water-table and poor soils affect crop agriculture.

3. **Middle Karatoa floodplain** : affected by drying-up of Karatoa river. Double-cropping of HYV Rice has led to severe Sulphur & Zinc deficiencies.

4. **Brahmaputra-Jamuna floodplain** : entire stretch affected by Brahmaputra Right Bank embankment, which has breached 4 out of the last 5 years. The main river may be shifting westwards. Large floating population in the char-lands. Sand-deposits after floods often ruin cultivable land.

5. **Chalan Beel** : Once one of the largest permanent wetland areas of Bangladesh, now seriously degraded by FCDI projects.

6. **Atrai-Hurasagar drainage basin** : due to construction of ill-conceived embankments & regulators drainage has been impeded and water-logging has become a serious problem.

7. **South west Jessore** : this area is climatically subject to wide variations in rainfall and temperature. Due to reduced flow in the Ganges in the dry season salinity has increased and freshwater flow has decreased.

8. **Northern Khulna** : large-scale shrimp farming has increased salinity and farmer conflicts and reduced rice production.

9. **Khulna City & Mongla town** : problem area due to industrial pollution, oil spills from ships end urban congestion.

10. **Sunderban** : increased salinity, increasing amounts of ship oil, industrial chemicals etc. has led to the top-dying of several species of trees. There has also been overcuting of the Forest for industrial use.

11. **Patakhali-Bhola-Noakhali Char areas** : affected by water-logging, salinity, and diluvion.

12. **Garo Hills Piedmont** : erosion, flash floods, and loss of tree cover has led to decreasing agricultural productivity.

13. **Tangail** : affected by silting of rivers, increase in sudden flooding.

14. **Madhupur Tract** : deforestation and improper use of sloping land has led to topsoil erosion. This in turn has silted rivers all around this important watershed area.

15. **Sitalakhya River** : industrial plants at Ghorashal, Palash and Demra discharge toxic chemicals into this river leading to suspected loss of fisheries and creation of hazard for public health.

16. **Dhaka City** : industrial and traffic pollution reates serious health hazard; urban expansion is destroying class 1 agricultural land and some of the best horticultural land in the country.

17. **Haor Basin** : reduction in fish spawning areas, due to embankments cutting out fish migration routes, and to increase in boro cultivation, with consequent increase in the use of pesticides.

18. **South Sylhet** : affected by deforestation, flash floods, and soil erosion.

19. **Lalmai Range** : deforestation, erosion and soil removal have reduced productivity and may reduce future potential.

20. **Lower Meghna** : affected by floods, riverbank erosion, stagnant productivity, loss of fisheries and population pressure.

21. **Central Noakhali** : affected by water logging in the wet season due to impeded drainage and lack of irrigation supply in dry season due to saline groundwater. This has led to decreasing agricultural productivity.

22. **Sandwip** : thickly populated island being eroded rapidly. New land formations not consolidated. Frequently affected by cyclones and surges.

23. **Sitakunda Range** : affected by deforestation and sheet erosion with consequent loss of productivity. This area is major source of thatching grass and therefore urgently requires Land Use Planning.

24. **Chittagong City & Port** : industrial pollution, oil spills, and cutting down of hills leading to increasing erosion and consequent silting of rivers have degraded the environment.

25. **Chandraghona** : industrial units discharge large quantities of chemicals into Karnafuli river, destroying fisheries and posing health hazards.

26. **Hill Tract :** slash & burn cultivation (jhoom) and improper use of hill slopes by immigrants has greatly increased erosion on the hill slopes and flooding of valleys, with consequent loss of productivity. There has also been a serious decline in tree-cover.

27. **Chakaria Sunderban :** a forest area totally destroyed for use as shrimp farms. Now yields are declining and soils are becoming highly acid.

28. **Chittagong Coast-Kutubdia island :** severe bank erosion, loss of land and increase in salinity has led to environmental degradation.

29. **Cox's Bazar :** tropical moist forest with unique biodiversity is being destroyed through clear-felling and planting operations, unchecked encroachment and illicit felling of trees.

30. **Jinjira island & reef :** Coral reef being destroyed through over-exploitation of corals and molluscs.

31. **Muhuri Basin :** successful agricultural project utilizing surface water irrigation, has in turn led to excessive use of fertilizers and pesticides and likely pollution of important fishing areas in lower Big Feni river and Sandwip channel.

APPENDIX - 1.b.

List of Endangered and Threatened Wildlife in Bangladesh

English Name	Scientific name	Past status (about 50 years ago)	Present status
Amphibia			
Bull Frog	Rana tigrina	VC[1]	T[2]
Green Frog	R. hexadactyla	U[3]	T
Reptilia			
Salt water/Estuarine Crocodile	Crocodylus porosus	C[4]	E[5]
Gharial	Gavialis gangeticus	C	E
Olive Ridley Turtle	Lepidochelys olivacea	C	E
Green Turtle	Chelonia mydas	C	E
Hawksaw bill Turtle	Eretmochelys imbricata	C	E
Loggerhead Turtle	Coratta coratta	C	E
Leatherback Turtle	Dermochelys coriacea	C	E
Batagur Turtle	Batagur baska	C	E
Bostami Turtle	Trionyx nigricans	C	E
Land Tortoise	Geochelone emys	C	E
Grey Lizard	Varanus bengalensis	C	T
Monitor/Ring Lizard	V. salvator	VC	T
Yellow Lizard	V. flaviscens	C	T
Clouded/Black Lizard	Varanus nebulosa	C	T
Rock Python	Python molurus	FC[6]	E

[1] VC = Very Common; [2] T = Threatened;
[3] U = Uncertain; [4] C = Commom;
[5] E = Endangered; [6] FC = Fairly Common

cont'd

English Name	Scientific name	Past status (about 50 years ago)	Present status
King Cobra	Ophiophagus hannah	FC	E
Dogfaced Water Snake	Cerberus rhynchops	C	T
Hook-nosed Sea Snake	Enhydrina schitosa	VC	T
Annulated Sea Snake	Hydrophis cyanocintus	U	T
Banded Sea Snake	H. fasciatus	C	T
Estuarine Sea Snake	H. obscurus	C	T
Common Narrow-headed Sea Snake	Microcephalophis gracilis	C	T
Cantor's Narrow-headed Sea Snake	M. cantoris	C	T
Aves			
Little Grebe	Podiceps ruficollis	VC	T
Darter/Snakebird	Anhinga rufa	FC	T
Purple Heron	Ardea purpurea	FC	E
Grey Heron	A. cinerea	C	T
Openbill Stork	Anastomus oscitans	C	E
Lesser Adjutant	Leptoptilus javanicus	FC	E
Whitenecked Stork	Ciconia episcopus	FC	E
Glossy Ibis Ple	Plegadis falcinellus	FC	E
Spoonbill	Platalea leucorodia	FC	E
Greater Whistling Teal	Dendrocygna bicolor	C	E
Whitwinged Wood Duck	Cairna scutulata	FC	E
Comb Duck/Nukta	Sarkidiornis melanotos	FC	E

Cont'd

English Name	Scientific name	Past status (about 50 years ago)	Present status
Blackwinged Kite	Elanus caeruleus	C	E
Whitebellied Sea Eagle	Haliaeetus leucogaster	C	E
Pallas's Fishing Eagle	H. leucoryphus	FC	E
Greyheaded Fishing Eagle	Ichthyophaga ichthyatus	C	T
Whitebacked Vulture	Gyps bengalensis	VC	T
Assam Black Partridge	Francolinus francolinus	FC	E
Rain Quail	Coturnix coromendelica	C	E
Common Peafowl	Pavo cristatus	FC	E
Pheasant-tailed Jacana	Hydrophasianus chirurgus	FC	T
Pasnted Snipe	Rostratula bengalensis	FC	T
Brown Fish Owl	Bubo Zeylonensis	C	E
Great Hornbill	Buceros bicornis	C	E
Hill Myna	Gracula religiosa	C	T
Paradise Flycatcher	Terpsiphone paradisi	FC	T
Mammalia			
Slow Loris	Nycticebus coucang	FC	E
Common Macaque	Presbytis entellus	FC	E
Crabeating Macaque	Macaca fascicularis	FC	T
Hoolock Gibbon	Hylobates hoolock	C	E
Large Civet	Viverra zibethina	C	E

Cont'd

Appendix II cont'd

English Name	Scientific name	Past status (about 50 years ago)	Present status
Fishing Cat	Felis viverrina	FC	E
Jungle Cat	F. chaus	FC	T
Tiger	Panthera tigris	FC	E
Leopard	P. pardus	C	T
Clouded Leopard	Neofelis nebulosa	FC	E
Asiatic Elephant	Elephas maximus	C	E
Barking Deer	Muntiacus muntjak	C	T
Sambar	Cervus unicornis	C	T
Serow	Capricornis sumatraensis	FC	E
Hispid Hare/ Assam Rabbit	Caprolagus hispidus	C	E

BANGLADESH Appendix - 2

ENVIRONMENTAL DATA REPORT OF BANGLADESH

- Population (millions) mid. 1991 - 110.6
- GND per capita (Dollars) 1991 - 220
- Average annual growth rate (%) 1980-1991 - 1.9
- GDP 1980-91 - 4.3
- Agriculture 1980-91 (equivalent), 1991 - 2.7
- Industry 1980-91 - 4.9
- Manufacturing 1980 - 91 - 2.9
- Service etc. 1980 - 91 - 5.6

- Avg. Annual Growth rate (%) Energy production 1980-91 - 11.3
- Avg. Annual Growth rate (%) Energy consumption 1980-91 - 7.7
- Energy consumption per capita (kg of oil equivalent 1991 - 57

- Life expectancy at birth years 1990 - 51.8
- Infant mortality per 1000 live birth 1990 - 111
- Daily calorie supply as % of requirements 1988-90 - 88

- Adult literacy rate % 1990 - 35
- Combined primary and secondary enrolment ratio 1987-90 - 42
- Real GDP per capita PPP$ 1990 - 872

- Survival (Child Mortality 1991: per 1000) - 133
- Nutrition (Child Malnutrition) - 66%
- Education (Children reaching grade: 5) - 7%
- Family Planning (Average birth 1991, per women) - 1.8
- Progress for Women (Maternal death per 1000,000) - 600
- Health (Child vaccinated) - 53%

- Life expectancy at birth (years) 1990 - 51.8
- Adult literacy rate (as % of age 15) Total 1990 - 35, 47, 22
- Literacy rate (as % of age 15-19) 1990 - 46
- Mean years of schooling (25 +) Total 1990 - 2 + 3.1 + 0.9

- Educational attainment 1990 - 0.58
- Population with access to health services (%) 1987-90) - 74
- Population with access to safe water (%) 1988-90 - 78
- Population with access to sanitation (%) 1988-90 - 122
- Daily calorie supply (as % of requirements) 1988-90 - 88

- Per capita daily calorie supply as a percentage of requirements 1985 - 78
- Food staples self sufficiency ratio 1986 - 1988 - 98

- Rural population 1988 - 87
- Agricultural population 1988 - 70
- Rural population below poverty line 1988 - 86
- Average rural household size (no.) 1984-1988 - 5.6
- Dependency ratio (per cent) 1985 - 95.4

- Smallholder farmer population 1988 - 63
- Landless population 1988 - 20
- Small and artisanal fishermen population 1988 - 6.4
- Households headed by women as a percentage of rural households mid. 1980s - 16