

1.1 GENERAL BACKGROUND OF THE REPORT

The Bangladesh State of Environment (SoE) Report has been prepared as a response to the recommendations provided in Agenda 21 at the Earth Summit. The objective of the SoE report is to identify the key environmental issues that act as barriers to attain sustainable development, and provide guidelines for environmental planning, policy setting, and provided options that can be undertaken to offset any negative environmental trends. Five environmental issues have been identified on a priority basis as points of national concern. These have been critically evaluated by using the methodology of the Organization for Economic Cooperation and Development (OECD), known as a Pressure-State-Impact-Response (P-S-I-R) framework analysis. The pressures and driving forces responsible for modifying the original state of the resource base and its current status have been critically evaluated. The present conditions of the key issues, along with their subsequent impacts are shown in the report. It also highlights different policies and measures that have been pursued to reduce the pressures on environment, and/or to mitigate the impacts. In order to alleviate further deterioration of present environmental conditions, several appropriate and necessary responses, both in the area of policy and programs, have been proposed. These will enhance and modify environmental conditions in a positive manner, as well as improve the quality of life in Bangladesh.

The United Nations Environment Program (UNEP) initiated the preparation of national and regional SoE reports in May 1999. The present State of Environment Report on Bangladesh has been prepared during the period 1999 to 2001 by the Department of Environment (DoE) under the Ministry of Environment and Forest, Government of Bangladesh, in collaboration with Bangladesh Centre for Advanced Studies (BCAS), a renowned research organization of Bangladesh working in the field of environment and development. The South Asian Cooperative Environment Program (SACEP) and UNEP have provided technical support and reviewed the document, while Norwegian Agency for Development and Cooperation (NORAD) funded for the entire activity. It is also to be noted here that the data and comments regarding the key environmental issues presented in the chapter three of the report have been reviewed by groups of national experts. The findings of the report will be presented at the Earth Summit in 2002.

1.1.1 Methods and Tools

The preparation procedure for the Bangladesh State of Environment Report started in July 1999, through a four-day training workshop that was organized on methods for SoE data collection and reporting. The training was jointly organized by the DoE in association with BCAS, SACEP, and UNEP.

In order to identify key environmental issues two major criteria were kept in mind, which are: (i) severity of the present degradation, and anticipated future trends that have critical implications for attaining sustainable development and quality of life; and (ii) priority, ability and willingness of the country to minimize the degradation processes, and to take protection measures against them. Based on these two criteria five environmental issues have been selected for critical evaluation using the P-S-I-R framework, which cover various important subjects relating to the

Potential Key Issue	Impacts
Land degradation	Ecology and quality of life
Water Pollution & Scarcity	Ecology and quality of life
Air pollution	Environment and health
Biodiversity	Ecology, development and quality of life
Natural disaster	Environment, development and quality of life

terrestrial and aquatic environment of Bangladesh, and air quality. The identified key issues are land degradation, water pollution and scarcity, air pollution, biodiversity, and natural disasters.

In the framework, pressures are defined as any fundamental, natural, and manmade forces that influence the state of the environment. State refers to the prevailing conditions of the environment resulting from the pressures, which may lead to various impacts, that can affect human health and well being, as well as socio-economic conditions of the society, and adversely influence the prevailing ecological balance. Responses refer to attempts to mitigate the impacts through the formulation, enactment, and enforcement of necessary laws and regulations by the government, through their relevant agencies. It is to be noted that the evaluation process has also made an attempt to identify gaps, and recommend appropriate options to arrest further deterioration and enhance environmental quality.

The relevant data and information in this report have been collected from different government and non-

government organizations, published documents such as statistical yearbooks, annual reports, project reports (both published and unpublished) and informal communications. Several meetings were conducted with relevant departments, organizational heads, and relevant personnel for collection these data. The data may vary to some extent due to different sources of information.

1.1.2 Format of the Report

The Bangladesh State of Environment report has been prepared based on the format provided by UNEP, and is composed in four Chapters. Chapter one is an executive summary that depicts the status of the key environmental issues of the country. A national overview is given in Chapter two, which includes the natural and ecological resource base of the country, and major environmental concerns in the development context. Chapter three addresses the five key environmental issues based on Pressure-State-Impact-Response (P-S-I-R) analytical framework. For each issue gaps and future options were identified to attain sustainable development by enhancing the environmental resource base. Chapter four is a conclusion with recommendations for immediate actions in the arenas of policy, research, and action.

1.2 OVERVIEW OF KEY ENVIRONMENTAL ISSUES

A summary of the evaluation of the five key environmental issues is presented below.

1.2.1 Land Degradation

Poverty with rapid population growth, absence of a proper land use policy, and other driving forces compel people in Bangladesh to over-exploit natural resources like land, which forms a major focus for human economic activities. The functional capabilities of the soil have deteriorated due to unbalanced use of agrochemicals, unplanned land use, encroachment on forest areas for agriculture and settlements, ineffective implementation of existing laws and guidelines, and improper disposal of hazardous industrial effluents. In addition, urban sprawling and infrastructure development have reduced the availability of land. Natural events such as cyclones and floods cause land loss, and also decrease the functional capabilities of soil. Soil degradation in the coastal area results from unplanned

land use, and due to intrusion of saline water. The extent of land degradation varies according to region, season, and year due to the diverse nature of the driving forces and causes.

Land degradation in the Chittagong Hill Tracts (CHT) is occurring mainly due to rapid changes in demography, traditional shifting cultivation practices (*Jhum*), development of roadways and other physical infrastructure. The Madhupur forest area has been denuded due to deforestation, which has been accelerated by many other factors such as its closeness to the capital city and improved road communication leading to displacement of population, urbanization and industrialization in that area. Land degradation in the Barind Tract is caused mainly due to over exploitation of biomass from agricultural lands, and cultivation of HYV rice through groundwater irrigation. The process has been aggravated by irregular rainfall and insignificant water flow of the rivers that normally play a vital role in replenishing soil fertility and recharge groundwater.

Degradation of soil quality in the floodplains is mainly attributed to improper use of fertilizers and pesticides to boost agricultural production. Gradual siltation in the floodplains also contributes towards degradation of land. Dispersed industrial growth, and uncontrolled discharge of untreated effluents in the nearby floodplain deteriorate the quality of land and soil. Land degradation in the coastal areas of Bangladesh is mainly due to cyclones and storm surges inundating the land. Shrimp cultivation occurs round the year in these areas, which is ultimately increasing the salinity and degrading soil as well. Intrusion of saline water in the dry season is attributed to the low flow in the river system.

Erosion of topsoil in the hill districts has increased, and 17 per cent of the soil resources have deteriorated between 1964 and 1985. It was found that in the mixed forest-covered land, the topsoil erosion rate is 2.7 to 7.2 tons per hectare per annum. On the other hand, in the deforested hill slopes erosion goes up to 120 tons per hectare per annum. A study in Khagrachari, Rangamati, and Bandarban areas on topsoil erosion showed that it ranges from 100 to 120 tons per hectare annually.

The concentration of organic materials present indicates the quality of soil and this has deteriorated significantly in the Barind Tract, Madhupur Tract, Himalayan Foothill areas, the floodplains of *Tista*, *Karatoya*, and *Bangali*, and in the hilly Northeast

region. Moderate deterioration of organic materials has been observed in the medium highlands of the rivers *Tista*, the *Jamuna*, and in the *Ganges* floodplain.

The Soil Resources Development Institute (SRDI) has analyzed soil samples, and found that nitrogen deficiency is common all over the country. The Sylhet *Haor* areas, *Surma-Kushiyara* floodplain, Northeast hilly area, and Madhupur Tract have a noticeable and intense deficiency of phosphorus. A deficiency in other chemical substances has also been noticed in other parts of the country.

Bangladesh is experiencing a decline or stagnation in the yield of many crops. At present, there is meager HYV rice cultivation in the coastal areas. The environment is also unsuitable for cultivation of any other grain during dry period, except wheat where the temperature permits, and early sowing is possible. This is because both dry period *Boro* and wheat are cultivated in the winter season when salinity also reaches to its maximum, and renders most of the coastal land unsuitable for their production.

Real and effective ways to minimize land degradation problems should be based on multi-sectored, multi-layered, yet integrated approaches. The most important policy measure required for addressing land degradation is an integrated land use policy with respect to agriculture, industry and environment. Noting the importance of such an instrument, the Government of Bangladesh has already made some progress in this direction. A Draft Land Use Policy has been prepared, which is under discussion for government approval. This policy also highlights other uses of land for different social and cultural purposes. Certified land ownership is one of the important aspects of the land use policy aimed at reducing ownership-related problems and crime. In order to implement the land use policy successfully, it emphasizes mass awareness programs for the general population and government administration.

Very recently the government has approved the Agricultural Policy of 1999. It also started Integrated Pest Management (IPM) from 1981, which have already been through several phases of research and extension. IPM has an immense contribution to reduce the use of pesticides for crop production. Results show that it has the potential to increase crop production directly, and yet contaminate soil very little. Considering these benefits, the Government initiated the National Integrated Pest Management

Policy in 2000. Another concept that is emerging to combat land degradation is called Integrated Plant Nutrient System (IPNS), which involves application of external nutrients based on the soil supplying capacity and the crop need.

1.2.2 Water Pollution and Scarcity

The environment, economic growth and development of Bangladesh are all highly influenced by water - its regional and seasonal availability, and the quality of surface and groundwater. Spatial and seasonal availability of surface and groundwater is highly responsive to the monsoon climate and physiography of the country. Availability also depends on upstream withdrawal for consumptive and non-consumptive uses. In terms of quality, the surface water of the country is unprotected from untreated industrial effluents and municipal wastewater, runoff pollution from chemical fertilizers and pesticides and oil, and lube spillage in the coastal area from the operation of sea and river ports and ship breakage. Water quality also depends on effluent types and discharge quantity from different type of industries, the type of agrochemicals used in agriculture and seasonal water flow, and dilution by the river system.

The concerns over water quality relate not just to the water itself, but also to the danger of diffusion of toxic substances into other ecosystems. The aquatic environment for living organisms can be affected and bioaccumulation of harmful substances in the water-dependent food chain can occur. A variation of inland surface water quality is noticed due to seasonal variation of river flow, operation of industrial units, and use of agrochemicals. Overall, inland surface water quality in the monsoon season is within tolerable limit with respect to the standard set by the Department of Environment. However, quality degrades in the dry season. The salinity intrusion in the Southern region and pollution problems in industrial areas are significant. In particular, water quality around Dhaka is so poor that water from the surrounding rivers can no longer be considered as a supply source for human consumption.

Among the polluted areas, the worst problems are in the River *Buriganga*, where the most significant source of pollution appears to be from tanneries in the Hazaribagh area. In the dry season the Dissolved Oxygen (DO) level in the river becomes very low or zero, so it becomes toxic. The seasonal variation of water quality in the

Buriganga is linked with seasonal variation of water flow and the operation of tanneries. The second most polluted river is the *Sitalakhya*, flowing on the east of Dhaka. The major polluters of this river are Ghorashal Urea Fertilizer Factory, and an oil terminal situated on the bank of the river. Industrial units at Narayanganj and Demra are also the sources of pollution. Monitoring data of DoE demonstrated that the concentration of DO in the river *Sitalakhya* beside the fertilizer factory varies between 2.1 to 2.9 mg/l during low tide. Water of the river *Balu* is badly contaminated by urban and industrial wastes from Tongi and the effluent flowing out through the *Begurbari Khal*, most of which emanates from the Tejgaon industrial area in Dhaka. In the rivers *Balu* and *Turag*, water quality in the dry season becomes worse, with DO concentrations becoming almost zero.

The arsenic concentration in the groundwater is a major problem in Bangladesh now. High levels of arsenic cause serious human health problems if imbibed for a long time (from 5 to 15 years); including skin ailments, damage to internal organs, skin and lung cancers, and eventual death. The recent major studies carried out on arsenic reveal that among 30,000 tubewells studied, 2,000 of them exceeded the national standard of 0.05 mg/l for drinking purposes (the WHO guideline is 0.01 mg/l). The problem is acute in tubewells abstracting groundwater from 10 m to 100 m depths in the Southeast, South Central (the northern part only), and Southwest regions, and occurs to a lesser extent in the eastern part of the Northeast region, and the very southern fringe of the North Central and Northwest (along the river *Ganges*). The most seriously affected districts are in and around Chandpur. It has been estimated that more than 20 million people drink water exceeding the national standard for arsenic levels.

There is a seasonally moveable salinity interface in the coastal area and estuaries, with the threshold limit for agriculture (2dS/m) moving inland in May in the southern part of Bhola and other southern islands. There are also salinity issues in the Southwest region, attributed to reduced dry season flows into the area from the *Ganges* system. During the 1990s dry season, salinity levels in the Khulna area rose, for which one of the likely causes was also postulated to be the decrease in dry season surface flow from the *Ganges*. Surface water scarcity is observed in the Sundarbans, Chittagong,

Noakhali, and Dhaka regions, where the ecological and environmental demands for surface water are higher than the supply.

Notwithstanding the large number of rules and regulations to protect water from industrial effluents and other pollution, and the policies for enabling the environment through dry season augmentation of water concerns for the future still prevail. These are regarding proper implementation of national policies, due to the lack of institutional capability and awareness to properly address the policy objectives and goals. The emerging issue of climate change and its adverse impacts on water resources needs proper consideration for planning. Earlier analysis of climate change scenarios showed that water scarcity in the dry season would be aggravated and low water flow in the river system would allow saline water intrusion to progress further inland. Climate change induced adverse impacts on agriculture will put further stress on the country in attaining food sufficiency in the future.

1.2.3 Air Pollution

Air pollution is one of a variety of manmade environmental disasters that are currently taking place all over the world. In Bangladesh, as in other parts of the world, air pollution has recently been receiving priority among environmental issues. Exposure to air pollution is the main environmental threat to human health in many towns and cities. Particulate pollution on its own, or in combination with sulfur dioxide, leads to an enormous burden of ill health; causing at least 500,000 premature deaths, and 45 million new cases of chronic bronchitis each year. The ambient atmospheric conditions have progressively deteriorated due to the unprecedented growth in numbers of passenger vehicles, two-stroke engine vehicles and continuous industrial and residential development.

The ambient air quality of the country is clean in general. However, in urban areas air quality has deteriorated due to human activities. There are two major sources of air pollution in Bangladesh, vehicular emissions and industrial emissions, which are mainly concentrated in the cities. There are also numerous brick-making kilns working seasonally (in dry season) all over Bangladesh which is the other source of air pollution. Almost all of these kilns use coal and wood as their source of energy, resulting in the emission of oxides of sulfur, and volatile organic compounds. In addition

to these usual sources of fuel, spent or used rubber wheels of vehicles are also burnt. These emit black toxic gases that are hazardous to health. Such practices retard the mechanisms for a natural rate of purification of the atmosphere.

Urban air quality monitoring data revealed that the concentration of suspended particulate matter in Dhaka and Chittagong exceeds the threshold limit set by the Department of Environment. A study on the values for average suspended air particulate mass in rural and urban areas of Bangladesh and average elemental carbon in the fine fraction of airborne particulate matter (APM) in urban areas, showed that the concentration of suspended particles in ambient air is many times higher than normal. It also revealed that the PM 2.5 masses and chemical concentrations are lower in most cases compared to the corresponding PM 2.5- PM 10 values. The ratio of PM 2.5 to PM 10, and the amount of black carbon in the APM are reduced during the high rainfall (HRF) period in both rural and urban sites by about 25 per cent and 20 per cent, respectively. In the urban areas, it was found that concentration of SO₂ also exceed the threshold limit quite often in Dhaka. Air quality in Khulna and Bogra is relatively better.

An emerging issue of great concern in the cities and towns is the high concentration of lead in the air from vehicular exhausts. Different studies have shown that the lead concentration has crossed the tolerable limit for human. A study conducted by the Bangladesh Atomic Energy Commission revealed that about 50 tons of lead is emitted annually (with seasonal variation) and the emission reaches its highest level in the dry season.

The Department of Environment and other concerned agencies and organizations, have identified the two-stroke engines used in auto-rickshaws, tempos, mini trucks, and motorcycles as major polluters. Among the polluting vehicles, the two-stroke auto-rickshaws (also called baby-taxis) have been identified as the worst polluters. As present, there are about 35,000 baby taxis among more than 200,000 motor vehicles that ply in Dhaka city alone. The two-stroke petrol engines are less fuel-efficient and emit about 30-100 times more unburned hydrocarbons and carbon monoxide than four-stroke engines; and diesel engines emit 13 times more smoke than non-diesel four-stroke engines. Until mid 1999 all these vehicles used leaded petrol, which was the main culprit responsible for polluting Dhaka's air.

In 1985-86 the Bangladesh Petroleum Corporation started a project to use Compressed Natural Gas (CNG) in vehicles instead of gasoline. The primary objective of this project was to reduce vehicular emissions, as combustion of CNG produces less pollution than gasoline. In response to public pressure and concern regarding air pollution by lead, in July 1999 the GoB executed the decision to provide only unleaded gasoline in the country. However, measurements on lead levels in ambient air after introduction of unleaded gasoline are still not available.

The country does have a reasonably good number of laws and regulations to address air pollution. But there are several additional measures that could be stringently enforced to reduce emissions from vehicles with two-stroke engines, which are the major polluters. Research has shown that it is possible to do this by about two thirds through the use of low-smoke lubricants, and proper inspection and maintenance. Therefore, facilitating this should be an urgent priority in order to improve the quality of air in urban areas.

1.2.4 Biodiversity

Biological resources and diversity form the basis of both the ecology and economy of Bangladesh. The country's agriculture, fisheries and livestock, along with a number of other sectors are heavily dependent, directly or indirectly on biological resources.

Bangladesh possesses good terrestrial and aquatic environment that provide habitat for a large number of plants and animals. The delta is rich in fish and aquatic resources and other biodiversity. Rivers and other inland water bodies provide habitats for 266 indigenous fish species (belonging to 55 families) and 150 species of birds. The inland water bodies are also the habitat of 56 species of prawns. More than 20 species of freshwater molluscs have been identified.

The marine water bodies are also remarkable in biodiversity, harboring 442 species of fish and at least 36 species of marine shrimps. About 336 species of molluscs, representing 151 genera have been identified from the Bay of Bengal. In addition, several species of crabs and 31 species of turtles and tortoises, of which 24 live in freshwater are found in Bangladesh.

In addition, the IUCN Bangladesh Red Data Book (2000) has described 22 amphibians, 126 reptiles, 628 birds in total (388 resident and 240 migratory) 110 inland mammals, as well as 3 species of marine mammals in Bangladesh. There are numerous invertebrates in the country that are yet to be identified. Bangladesh supports approximately 5000 species of angiosperms, among which 300 species are being cultivated. Currently the list of medicinal plants are being revised by the Bangladesh National Herbarium and the number is expected to exceed 500 species. There are 224 species of timber yielding plants and 130 fiber plants found among the flora of Bangladesh.

The Sundarbans support a very rich and diverse fish fauna of 400 species, over 270 species of birds and over 300 species of plants. It is an important staging and wintering area for migratory shore birds, gulls and terns. The Sundarbans comprise the largest remaining tract of habitat for the rare Royal Bengal Tiger (*Panthera tigris*). St. Martin's Island is an important nesting area for marine turtles and a wintering area for migratory shore birds.

The depletion of biodiversity is the result of various kinds of human development interventions that impinge on it through destruction and degradation of land, forest and aquatic habitats. These activities are in the sectors of agriculture, forestry, fisheries, urbanization, industry, transport, tourism, energy, chemicals and minerals etc. Deforestation and destruction of natural reserve forests in the CHT has been further intensified by development activities such as dams, highways, road construction and other infrastructure development.

In the fisheries sector, shrimp cultivation has become a major concern from the past decade. It has caused serious environmental damage that has harmed fish and other aquatic biodiversity significantly. The physical loss and modification of aquatic habitats for fish, prawn, turtle and other aquatic organisms are said to be the major factors involved in overall fish varieties depletion. Such shrinkage has been the result of thousands of physical structures and drainage systems that have been constructed in Bangladesh in an effort to control floods, cyclones and other natural calamities. These structures have disrupted the natural flow of waters in closed rivers, diverted rivers and have dried up water bodies.

According to the Red List of IUCN, there are 54 species of inland fishes, 8 amphibians, 58 reptiles,

41 resident birds and 40 mammals, which are threatened throughout the country. Among the marine and migratory species of animals 4 fishes, 5 reptiles, 6 birds and 3 mammals are threatened. The Red Data Book on plants, which is still under preparation at Bangladesh National Herbarium, already lists 96 seed-bearing plant species that are threatened.

Bangladesh signed the Biodiversity Convention at Rio in 1992 and ratified it in 1994. A focus on biodiversity has been emphasized in the Forest and Environment Policy. However, a separate policy on biodiversity is yet to be formulated and until then various departments of the government are responsible for conservation of biodiversity. The Bangladesh National Biodiversity Strategy and Action Plan is under preparation as a part of the World Convention on Biological Diversity.

There is a great potential in Bangladesh for biodiversity based sustainable development. In spite of the threatened wild fauna and flora, there are nearly 10,000 species of plants, animals and microbial organisms - a good percentage of which are found in superabundance. A wise and sustainable yield and harvest methodology, and management plan need to be formulated and applied at the field level. So that these biological resources are not over-exploited, and the economy of the country prospers.

1.2.5 Natural Disasters

Bangladesh is a disaster-prone country, the geographical setting and various other anthropogenic activities make the country vulnerable to natural disasters. Almost every year one or more severe natural disasters upset people's lives in some part of the country. Flood is a recurring phenomenon in the country, which brings untold sufferings to millions of people, and results in human deaths, loss of livestock, spread of diseases and hunger, damaged standing crops, destroyed physical and economic infrastructures, damaged fish and shrimp ponds and hatcheries, etc. Cyclone and storm surges occur frequently and cause significant destruction in the coastal areas of the country. Nor'westers and tornadoes also frequently hit different places of Bangladesh. Tropical cyclones and tornadoes have serious and adverse impacts on the economy, as well as on the whole environment, they uproot trees, telephone,

telegraph and electricity lines, destroy bridges, culverts and houses, kill people and domestic animals. Although this country with a monsoon climate usually has enough rain, but often droughts make a negative impact on the agriculture and economy of Bangladesh. The northwestern part of the country is vulnerable to drought. Disastrous land erosion events mainly take place along the banks of the major river systems of the country, i. e., the *Brahmaputra-Jamuna*, the *Ganges-Padma*, the Lower *Meghna*, and other rivers.

Natural disasters cannot be prevented, but the damage can be mitigated with adequate planning and adaptation. The impacts of these disasters vary with their type and magnitude. They also critically depend on institutional strength and response by the different agencies that usually take measures to mitigate and eventually overcome the losses, such as the government, NGOs and other civil service organizations.

The effects of natural disasters may be in direct loss of life and certainly damage to physical property. Thus, the situation necessitates huge resource requirements for disaster management, including mitigation, recovery and preparedness. Otherwise, the consequences of these natural hazards and the resulting environmental degradation, will continue to pose a serious threat to the economic development of the country. Effective disaster management calls for a reliable and timely disaster warning and dissemination system. A timely and accurate alert system regarding impending disasters will help reduce the loss of life and property.

In modern times a whole cascade of risk minimization activities have been identified to address crucial elements of disaster management, which include its prevention, mitigation, preparedness, response, recovery, and development. In order to design these appropriate institutional and functional arrangements for disaster management, the government of Bangladesh has taken initiatives to frame a disaster management policy. Along with the policy, a well planned, carefully designed and action-oriented detailed plan for disaster management is also in the process of preparation. This is of paramount importance to Bangladesh, both at national and local levels, for a coordinated and effective effort to cope with the disaster situation.

There are various Government and community-based organizations working in the field of disaster

management and mitigation. But the mechanisms to promote and maintain institutional networking should be enhanced and funds to sustain such programs need to be ensured. Capacity-building activities of various institutions and agencies for mitigation, preparedness, implementation of relief and rehabilitation programs should be strengthened. The capacity building for grassroots and national level monitoring needs to be enhanced at the same time.

1.3 CONCLUSION

The status of the five key environmental issues, viz., land degradation, water pollution and scarcity, air pollution, biodiversity and natural disasters indicates that the environmental condition of the resource base is deteriorating, despite several policy measures undertaken by the different branches of the Government of Bangladesh. Rapid population growth, improper use of land, poor resource management and uncontrolled discharge of pollutants from industries and vehicles are major causes of degradation. There are many underlying reasons that have been identified, including lack of institutional capabilities, untrained human resources, lack of awareness, low community participation in resource management and a paucity of research for enabling policy makers to take proper environmental decisions. Addressing these deficiencies will enable the country in its progress towards attaining sustainable environment and development.