

**MANUAL ON
ENVIRONMENTAL AWARENESS TRAINING**

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MODULE -1.

Session-1: Introduction to Environment

- To make participants familiar with the topic

Concept of environment

The world Commission on Environment and Development defined Environment as 'where we all live'. Alternatively, the environment is the resource capital of a country. In other words environment is the totality of the natural and human surroundings and includes: Biophysical and Socio-Economic components.

Session-2: Global Environment (Issues and Policies)

- To brief participants on the global environment, inform participants of the historical consequences of environmental due to development activities, and inform participants of the Global environmental policies

Definition

Ecosystem: In the ecological terms, community refers to a system of living organisms. This living systems and the non-living, or abiotic, components of the environment plus the ecological process that take place there make up an ecosystem. The non-living parts of an ecosystem includes such things as soil, amount of rainfall, and sunlight. Some ecosystems are not self-sufficient but depend on neighboring communities for such inputs as organic food materials; an example might be a small stream ecosystem. Examples of ecosystems include a meadow, a stream, a forest, a lake, or any other clearly defined part of the landscape.

Biodiversity: The term 'biodiversity' is indeed commonly used to describe the number, variety and variability of living organisms, including the genetic variability within species and populations, of their interaction and the ecological processes which they influence or perform.

Global warming (Green house effect):Raising of temperature to the earth's atmosphere. It is universally agreed that this is due to the disturbance of the delicate balance between the components of the biosphere-land, sea and the atmosphere by man's activity.

Historical Background of Global Environment

The developed countries began to think of the environment and man's ability to cause it damage since the fifties of this century. Early warning of the adverse environmental impacts of human activities were given by Rachel Carson in her book "Silent Spring" as well as some other prominent persons. They described the example of degradation of the environment from human activities including toxic industrial wastes and pesticides as well as other air and water pollutants which had caused widespread havoc in places like Love Canal and Los Angeles. At the same time, the continuously growing use of non-renewable resources such as fossil fuels, metals and other minerals as well as the growing human population raised fears of the possibility of exhausting the earth's store of such resources. These fears were articulated in the works of the Club of Rome and published in their book "Limit to Growth". The culmination of these efforts and the widespread realization of the adverse environmental impacts of human activity particularly from industrial and urban wastes led to the first major world conference of the Human Environment in Stockholm in 1972.

A particular characteristics of the concern for environmental issues during the sixties-eighties was that it was very largely confined to the developed countries, while developing countries were much more concerned about with their own development needs and perhaps felt that the environmental problems were associated with highly industrialized countries only. This type of thinking began to change during eighties. At the international level, this manifested itself in the formation of the World Commission on Environment and Development (WCED) by the United Nations in the mid-eighty. This commission published a report called "Our Common Future" which proposed the concept of "Sustainable Development" as a global goal which was defined as allowing development for the present generation without jeopardizing the right of future generations; in other words, the environment or natural resources should not be over exploited. Following this report, the issue and concept of Sustainable Development has been adopted by the

United Nations as well as most countries including both developed as well as the developing ones and this, in turn, led to the convening of the United Nations Conference on Environment and Development (UNCED) or unofficially the “Earth Summit” in Rio de Janeiro, Brazil in June 1992. Over 110 heads of States or Governments attending this World Conference, they officially signed four documents which had been prepared and agreed in advance through the PrepCom process namely:

- (i) The Rio declaration,
- (ii) Agenda 21,
- (iii) The Framework Convention on Climate, and
- (iv) The Biodiversity Treaty.

This UN Conference has put the Environmental imprint on the development agenda both globally and nationally. Actually the UNCED was the beginning of a series of four global meetings at the heads of Government or Summit level. These are:

1. Earth Summit on Environment and Development held in Rio in June 1992;
2. Population Summit on Population and Development held in Cairo 1994;
3. World Social Summit on Poverty, Employment and Social Integration held in Copenhagen in March 1995; and
4. Fourth World Conference on Women (Equality, Peace and Women Development) held in Beijing in September 1995.

Funding Mechanisms

Through the debates on the Climate Convention, the Biological Diversity Convention and Agenda 21, there had been a running debate on the need for additional funding over and above the existing aid which has been a demand of the both South and North. The resulting compromise has been the creation of a hybrid entity called the Global Environmental Facility (GEF) jointly organized by the World Bank, UNEP and UNDP with the Bank acting as the Secretariat. GEF can only pay for “incremental cost for global benefits”. The main areas of its operation have been very limited so far. For example, at present it funds projects limited to one of the following four areas only:

- Global Climate Change
- Biodiversity
- International Waters
- Ozone layer depletion.

There is a growing trend in the development of regional economic integration. The ASEAN has already emerged as a successful mechanism facilitating for rapid economic growth. In South Asia, SAPTA (South Asian Preferential Trade Agreement) is just in the infancy. An initiative has also been began by the Indian Ocean States. Thus regional trading packages are becoming more integrated and are sub-sets of emerging global governance.

Global Environmental Issues and affect on Bangladesh

1. Global warming (Green house effect): Temperature raise, Ozone depletion, UV trapping etc. Burning of fossil fuel, industrial growth, energy production which increased ~5% temperature in the earth. As a result Climate Change.

2. Loss of Biodiversity: Caused by trade, Habitat loss etc.

3. Pollution: Caused by developmental work, industrialization, all kind of waste etc.

Affect on Bangladesh:

(a) The sea level rise ->Water level increase->coastal area inundation, (b) Increase in temperature, (c) Climate change, intensification of climate related natural disasters, (d) Increased salinity in fresh water, (e) Destruction of resources (land, water, biodiversity), and (f) Imbalance of Ecosystems.

For global interest it is important to protect Sundarbans, Forest and Wetlands of Bangladesh.

Session-3: Environmental Profile and Resources of Bangladesh

- To inform participants of the different component of resources, show the distribution of different resources of Bangladesh and explain their usefulness for sustainable development

Component of Environmental Resources:

1. Perpetual

Direct solar energy, winds, tides, ocean water etc. Which are virtually inexhaustible.

2. Renewable

Fresh air, fresh water, fertile soil, plants, and animals etc. These types of resources are called renewable energy, because they are replenished through natural process. But many a time a renewable resource may be converted into a non-renewable one due to pollution. Environmental degradation starts whenever the highest use rate exceeds the natural replacement rate.

3. Non-renewable

Fossil fuels like coal, oil, natural gas etc., metallic minerals like iron, copper etc. And non metallic minerals like clay, sand, phosphate etc. These types of resources may be completely used or economically depleted. Some of them may be recycled or reused.

Natural resources management is very important, because we are rapidly exhausting, our non-renewable resources, degrading the potentially renewable resources and even threatening the perpetual resources. It demands immediate attention especially in the third world countries, where only scarce resources are available for an enormous size of population.

Environmental Profile and Resources of Bangladesh

Bangladesh is located between 20°34' & 26°88' North and 80°1' & 92°41' East covering about 143,998 km area. The international river network systems makes this country the largest delta in the world. The environmental profile of Bangladesh are given below.

Rivers: As a consequence of being at the lower end of the delta of three major river systems (the Ganges, the Brahmaputra and the Meghna), Bangladesh is criss-crossed with over 200 rivers. The average total annual flow of all rivers and streams has been estimated at 38,000 cubic meters per second (Huq & Rahman, 1994 in Env. And Dev. In Bangladesh). The major river systems are:

1. The Ganges-Padma River system
2. The Brahmaputra-Jamuna
3. The Meghna System
4. The Chittagong region rivers

Physiography: The main physiographic regions of the country are: Hills, Pleistocene Upland, Piedmont Plain, Flood Plain, Deltic Plain, Coastal Plain, Tidal Plain, Inland Marshes.

Climate: Bangladesh has a humid, warm, tropical climate which is fairly uniform throughout the country. Maximum temperatures range between 20-40°C and minimum temperatures just above 0 °C. Rainfall ranges from 55" (1400 mm) to 140" (3500 mm) on average annually and is a critical risk factor in agricultural production.

Agriculture: Water and agriculture are intimately connected. The rainfall, soils, temperature, and water availability of Bangladesh make it ideal for agricultural production. Agriculture is the mainstay of the country's economy providing about 50% of the Gross Domestic Product (GDP). About 35 million acres are cultivated, of which 60% is in crop production (Huq & Rahman, 1994 in Env. And Dev. In Bangladesh).

Forests: Once very rich in tropical forests, Bangladesh is now losing its forest resources at a very rapid rate. The main forest types of Bangladesh are:

1. Hill forest (Chittagong hill tracts),
2. Moist Deciduous (Modhupur Tract),
3. Tidal forest (Mangrove),
4. Open Deciduous and
5. Village forest.

Ecosystem of Bangladesh

Broadly there are two types of ecosystems available in our country. Each of these ecosystems again are divided into different categories.

A. Terrestrial Ecosystem

Most of Bangladesh terrain is alluvial plain with hilly areas on its northern and eastern boundaries. The land mass is crisscrossed with innumerable rivers and canals. Although most of the plain land has been converted into crop fields yet the land may be divided into several divisions whose micro-environment, vegetation and fauna is somewhat different from each other. Some of these are as follows:

Different Terrestrial Eco-systems in Bangladesh:

1. Alluvial plains.
2. Hilly areas with evergreen forests in the Chittagong Hill Tracts, Greater Sylhet, Netrokona and Sherpur.
3. Mangrove forests of the Sundarbans, Chokoria and Teknaf.
4. Deciduous forests of Sal and other mixed species in high land (9-18 m above mean seal level) of the Madhupur Tracts and Gazipur-Narsingdi.
5. The uplands of the Barind Tract (20-23 m above mean sea level) is greatly denuded of tree cover at present.
6. Undulating terrain in Tentulia-Panchagar with acid soil.
7. Coastal island and the coral reef in the St. Martin's Island.
8. Chars in the river beds.
9. Recently accredit poldered Land in the coastal region in the south.

B. Aquatic ecosystems

Eco-system include marine, estuarine, flowing and standing freshwater bodies containing different plant and animal communities in addition to the floating planktonic organisms (Task Force, 1991).

Different Aquatic Eco-systems in Bangladesh:

1. The Bay of Bengal within Bangladesh territory
2. Estuarine zone of the river systems
3. Freshwater zone of the river systems
4. Beels - swampy land in the dead channel of former rivers
5. Haors - tectonic depressions in the greater Sylhet and Mymensingh
6. Baors or oxbow lakes in the moribund rivers
7. Ponds
8. Borrow pits
9. Lakes

Session-4: Current Environmental Status of Bangladesh (Issues, Problems and Policies)

- To inform participants of the necessary issues that directly effect Bangladesh and that should be considered when developing projects, inform participants of the current environmental strategy and policies of Bangladesh

Introduction: The most immediate issues that comes to mind in looking at the environmental problems of Bangladesh are its high population and small land mass. With a population of 108 million Bangladesh is one of the world's most densely populated country (750 persons per sq. km.). Poverty, malnutrition, poor health, and sanitation facilities are the nation's upmost concern. In addition, natural calamities like floods, cyclones and drought further aggravate the situation and make this nation vulnerable to environmental degradation. The environment we live in is polluted and degraded by human and other technological and development activities. The resources of a country can sustain only a certain size of population. The population of Bangladesh is increasing at a pace faster than the production rate of most of the essential commodities. The over-exploitation of resources is accelerating depletion of important resources such as water, soils, forests and fisheries.

The areas of environmental concern based on Environmental Research group (ERG) survey (BRAC head office) are discussed in this section:

1. RAPID POPULATION GROWTH

In 1992, Bangladesh's population was approximately 119.3 million, growing at a rate of 2.7 percent a year. By the year 2025, the population will have doubled, placing even more strain on nature and natural resources. Rapid population growth is therefore a major threat to both the human population and the natural environment, since it places pressure on agriculture, industries, fisheries, forests, and urban environments.

Agriculture:

Two thirds or 9,038.4 million hectares of Bangladesh is cultivable and every year the land is renewed by the annual floods. However, since the population is increasing, an increase in food production must occur. Intensive and extensive cultivation increases cropland in the short term, however there is a cost to the environment. Presently, these types of cultivation practices has resulted in a decline per capita of cultivable lands in Bangladesh. Due to ever increasing gap between supply and demand of fuel wood, nearly 80% of agricultural waste and cowdung are being use as domestic use which otherwise should have been recycled as organic manure. As a result dependency on chemical fertilizer have been increasing which is degrading the soil quality.

Extensive Agriculture: Extensive agriculture uses both marginal and forested lands to increase the amount of area under cultivation. Marginal lands are not suitable for cultivation since erosion and a decrease in soil fertility occurs. Using forested lands for cultivation results in erosion, siltation, flooding of river basins, changes in micro-climate, and loss of habitat. Therefore, even with the increase in acreage the amount of food produced does not necessarily increase, sometimes it will even decrease do to environmental degradation.

Intensive Agriculture: Intensive agriculture involves the use of chemical fertilizers, pesticides, irrigation, and high yielding plants. A decline in land productivity caused by intensive cropping,

through indiscriminate use of fertilizers, continued use of irrigation and total removal of bio-mass from agricultural fields can result. Fertilizers and pesticides are used inefficiently and indiscriminately with minimal or no supervision. Pesticides and chemicals pollute water ways, poison the environment and reduce the genetic diversity in the plant population by using high yielding non-native plant species. Irrigation can also result in water logging of the soil and salinity.

Forestry: The increase in population has forced larger numbers of rural poor to use the forests unsustainably for fuel-wood, bamboo, fodder, game meat, medicines, herbs and roof materials.

Fisheries: Fishing is a major source of employment and protein. Fisheries production has increased at a rate of 2 percent a year. However, on a per capita basis, fish production has declined by 35 percent between 1973 to 1985, a result of the population outstripping fish production.

Urban Environment: With the increase in the population many people will not be able to find productive work in rural areas. They will presumably migrate to urban areas seeking employment which are already beyond the absorption capacity in terms of social services, shelter and infrastructures. The rural poor that migrate are concentrated in the slum areas of the city. In Dhaka alone there are 1,265 slums containing 50 percent of the urban population. The lack of clean water and waste disposal in slums areas impairs the health of both the environment and humans. This results in disease and the reduction of resource base available to people.

Industry: In order to provide the growing population with productive employment opportunities an increase in industrial production will occur. Industrialization consumes raw materials i.e., energy and minerals, resulting in a reduction of the natural resource base and an increase in pollution.

2. NATURAL DISASTERS

Natural events are only classified as hazards if they result in an unanticipated threat to human life and can cause serious damage to goods and the human environment. Natural disasters like floods and cyclones may also lead to environmental degradation.

Flood: Ganges-Brahmaputra-Meghna basin, southern Asia's most flood prone river system. Human induced changes to the topography such as construction of roads, flood embankments, storage reservoirs, diversion structures, and over grazing increase the chances of irregular flooding. Other factors which have been found to increase the chances of irregular flooding in Bangladesh are:

- Poor management of agricultural land leading to increased soil erosion
- Increased area, due to urbanization of impervious land and the speed of runoff, thus increasing both magnitude and frequency of floods
- Congested river network system
- Rainfall in up-country and in-country
- Snow melt in the Himalayas and glacial displacement
- River siltation, landslides, and lateral contraction
- Tidal and wind effects on slowing down the river outflows (back water effect)
- excessive rainfall associated with tropical cyclones
- Sea-level rise
- International lending policies which fail to thoroughly deal with environmental hazards
- Governments which cannot keep pace with hazards their people face

The 1988 flood resulted in 60 percent of Bangladesh to be covered by water. Consequently, 2, 370 lives were lost, 172, 000 livestock were killed and 12.8 million houses were either destroyed or damaged.

The outcomes of flooding other than loss of human lives and livestock are:

- Shortage of fuel for cooking and boiling for purification
- Putrefaction of corpses and carcasses in flood water due to lack of fuel and dry land
- Spread of water borne diseases
- General deterioration of health and hygienic living conditions

Controls have been developed over the years to mitigate the adverse effects caused by floods and the following are some examples:

- Building embankments
- Building dams and reservoirs in the up-stream
- Dredging, deepening and training of rivers including straightening
- Re-forestation projects
- Raising the levels of roads and highways with sufficient openings
- Excavation of old river beds/beels/ponds/haors/baors
- Building flood by-passes and new ponds

Improving communication systems and evacuation routes are also important. The most appropriate way of reducing flood hazards in Bangladesh consists of avoiding and reducing settlement within active flood plains. Also by raising living spaces above the conceivable flood level the destruction of homes can be avoided. In addition, flood and damage reduction could be achieved by proper land use management in the entire watershed.

Cyclones: Cyclones in Bangladesh occur from April to May (pre-monsoon) and September to December (post-monsoon). Between April 29 to 30, 1991 a severe cyclonic storm of hurricane intensity lasting only 5 hours affected the south eastern part of Bangladesh causing damage to Cox's Bazar, Chittagong, Noakhali, Bhola and Patuakhali regions. In total 10, 798, 275 Bangladesh citizens were effected, 138, 882 died and 139, 058 were injured. The effects of the cyclone was devastating causing flooding, crop loss, destruction of homes, loss of livestock, and the loss of human lives.

In the near future, the global warming and rising sea levels associated with increasing atmospheric concentrations of CO₂ levels, will most certainly increase the disaster threat from tropical cyclones. This will occur by an increase of both their energy potential and the catastrophe potential of storm surges in low-lying coastal areas.

Summation of the environmental implications of major types of hazards in Bangladesh are given below:

TYPE OF DISASTER	VULNERABILITY	MAJOR IMPLICATIONS
Cyclones	Whole of Bangladesh	Destruction of flora and fauna, loss of lives, damage of human settlements and crops
Floods	1/5 of the total area is flooded	Erosion of land and river banks, soil water logging, crop damages, spread of disease, destruction of settlements,
Storm Surges	Coastal zones and up to 16 to 24 km inland	Life and crop damages, high risk for human settlement, erosion of land and river banks, soil water logging

3. LAND DEGRADATION:

The land and soil of Bangladesh is undergoing a number of changes, most of those are potentially harmful. As for example, soil erosion, salinization, water logging, sedimentation, and other problems tending to either diminish or destroy the biological potential is known as desertification process. This process has been detected in the Barind Tract, hill areas, polder areas, coastal areas and in many patches of lands in Bangladesh due to unwise land use practices.

Soil erosion: The most visibly devastating land degradation in Bangladesh is river bank erosion, often triggered by floods caused in turn by upstream defoliation. Soil erosion due to loss of forests, leading to the heavy sedimentation of rivers and degradation of land, is particularly acute in the Chittagong Hill tracts. The 'slash and burn' cultivation practices of the hill people - a traditional tribal method of agriculture. The soil erosion caused by this shifting cultivation is

continuously depositing silt in the river beds, on arable land and in the 67,000 hectare Kaptai Lake. Ironically, many of the 25000 families displaced by the Kaptai Lake Hydro-electric project which created the lake later moved to steeper slopes where the soil is even more susceptible to erosion. Their shifting cultivation is contributing to the gradual silting of the lake, threatening the longer term viability of the hydro-electric project (Report of the Task Forces, 1991).

Destruction by river encroachment renders a large population land less and homeless each year in the Brahmaputra-Jamuna and Ganges flood plain areas, which consists of one of the most densely settled rural habitats in the world, ranging between 1500 to 2000 population per square mile (Haque and Zaman, 1989).

Soil nutrients: The use of chemicals fertilizer, pesticides is reducing organic matter as well as soil fertility.

Land use: Changes in land use particularly from agriculture to industry or housing have an effect on environment and overall productivity.

4. INDUSTRIAL POLLUTION

Now a days, the world's economy is continuously moving from an essentially agricultural base to more and more dependence on a mineral and industrial base. Manufacturing has an impact on natural resources though the entire cycle of raw materials exploration, extraction, transformation into products, energy consumption, waste generation and even the use and the final disposal by consumers.

Types of Industries in Bangladesh:

- Food, beverage and tobacco
- Jute, textile and petroleum
- Coal, rubber and products
- Paper and printing

- Engineering industry and machinery
- Metallic and mineral products
- Handicraft and others

Types of industrial effluent:

- Non-specific, bio-degradable organic materials (tanneries, textiles, food products, pulp and paper).
- Refractory, xeno-biotic compounds (textiles, in the form of synthetic dyes and organic chemical industries such as in Chittagong).
- Nitrogen compounds (from the urea fertilizer industry, tanneries).
- Pollutant susceptible to bio-accumulation in the food chain (certain heavy metals from organic chemical industries, textiles industries).

Impacts:

With the expanding population resulting in increased industrialization, more pollution will result, causing serious health effects to humans and the natural environment.

Environmental impacts of **industrial water** in Bangladesh include the following two stages:

- ♦ Exposure of human beings, cattle, food-stuffs etc. to contaminated waters, during transport and possible contamination of shallow drinking water aquifers.
- ♦ Environmental impact on receiving water bodies from the point of discharge downstream which induce acute or chronic responses in aquatic biota.
- ♦ their untreated effluent directly to the rivers or nearby canals causing significant water deterioration, frequent fish kills and adversely affecting the health of residents of adjoining areas.

About 19000 m³ liquid waste is discharging from Hazaribagh affected nearby area. During season 258 and rest of the year around 272 tanneries are discharging waste (Alkali, chromium, and high concentrations of coliform bacteria) to the nearby water source and river.

As a result:

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- ◆ Thousands acre of rice field has been destroyed
- ◆ Lot of fish killed
- ◆ Wastewater logging during a little rain
- ◆ Skin disease, fever, and respiratory problems (Poribesh potra, 1996)

Chromium containing tannery water from Hazaribagh ultimately inters the water of the Buriganga in entirely an untreated state. Wastage from Hazaribagh tanneries characteristics are COD (mg/l) 120-9600; Chromium (mg/l) 3-2800; NH₃-N (mg/l) 12-1970.

The nature and broad characteristics of the tannery effluent analysed by DOE in 1989 are as follows (source: env. & dev. In Bangladesh)

<u>In sample</u>	<u>Permissible limit for discharge</u>
BOD (mg/l) 120-3300	30
COD (mg/l) 187-31200	250
Chromium (mg/l) 5-40	1

Industrial gaseous emission not so serious in Bangladesh so far.

The situation in Bangladesh is still fortunate in two respects:

- The extent of industrial pollution is not so great at the present time and baseline ambient data can still be obtained.
- The magnitude of industrial development is small enough to focus on individual problem areas while at the same time practical management systems can be developed.

5. WATER POLLUTION

Most water quality problems are biological problems. Pollutants cause problems such as nutrient loading that cause algal blooms, or mining pollution causing the destruction of fisheries. Biological processes themselves may cause problems, such as the grazing of zooplankton by fish causing algal blooms. The end product of pollution and other environmental stresses is biological. Our concern is with the impact of pollution and other stresses on the resource as they affect humans, fish, birds, or

other components. we are rarely directly concerned with some particular level of a chemical in the environment except through its biological consequences.

Table 1. The exploitation of water resources and the environmental effects

(source: Conway, 1990):

{PRIVATE }Manipulation	Purposes	Environmental effects
Abstraction	Irrigation industry Domestic use Power generation	Lowered water flows: Droughts, saline incursions, impeded abstraction and navigation
Mining (sand, sediments)	Construction Industry	Raised water flows: Floods
Impoundment	Irrigation Flood control Recreation Fisheries	Lowered sediment loads: Scoring, erosion Raised sediment loads: Siltation
Rechannelling and control	Irrigation Flood control Transportation Agriculture	Pollution: Salinity, eutrophication, pesticide toxicity, heavy metals, organic pollutants, human disease
Drainage	Fisheries Harvesting Aquatic plant harvesting	Over exploitation: Over fishing, depletion of mineral resources

According to UNICEF, more than 60% of all disease (of human) in Bangladesh are water related. In Bangladesh human sewage coupled with municipal garbage, industrial effluent and agricultural run off are the major pollutants of our water bodies.

Causes of industrial pollution:

- Domestication -> return water contaminated by pathogen (e.g. bacteria)
- Agricultural -> fertilizer, pesticides
- Industrialization -> untreated effluent -> heavy metal and organic pollutants, higher temperature. Sulfur dioxide and sulfur trioxide gases which are then precipitated with the rain water as diluted sulfuric acid
- Urbanization -> discharge of solid and liquid wastes, excreta in to the water way
- Over population growth -> collection, processing, and disposal of waste
- Feecal pollution -> sanitary awareness, 8% of illness is linked to water born disease

Water scarcity -> biological purification and organic wastes reducing water supply may concentrate waste and overload natural biological processes for breakdown of nutrients/waste.

6. WATER SCARCITY:

Shortage of water supply in Bangladesh due to construction of barrage in the upper riparian region, apart from creating drought and over floods in Bangladesh, has also made heavy silt deposits particularly in the beds of rivers in the southwestern region. This is mainly because of the Farakka Barrage. At this barrage point India has been, since mid 1975, unilaterally withdrawing water flouting all international norms, conventions and laws. The obvious result is that in Bangladeshi rivers that flow down from the Ganges have been experiencing drying up. The biggest irrigation project of the country known as the Ganges-Kobadak project that was initiated and started to be operated in nearly 1960s and had no problem of water shortage until early 1970s has been having little or no water these days in the main pump house located in the Gorai river, a tributary of the Padma. Because, the lean time flow down the Farakka Barrage at

Hardinge Bridge has been reduced from 70,000 courses in 1970 to 40,000 courses in 1975 to the lowest ever 9,000 courses this year in 1995.

Production of fish, the main protein food for the common people of the country, has fallen drastically in the Padma and its tributaries. The quantity of catch of the Hilsa fish among many other varieties in these rivers in early 1970 was 1,20,000 Metric Tons; the figure fell to only about 1000 Metric Tons in recent years. One can appreciate the drastic fall due to huge decrease in water flow level during lean months. Its impact did not end there. Fishermen in thousands have become unemployed and under-employed and lost their traditional vocation for loving for themselves and families.

Still more devastating has been the rapid increase of salinity level not only in terms of ppm or microhomos measure but also intrusion of saline water deep into sweet water front up to 136 miles (The Holiday , Dhaka, 19 May 1995) inside having obvious shortages in the saline free water supply needed for drinking, domestic, and industrial uses. The historic and renowned mangrove forest of the Sundarbans on the shore of Bay of Bengal are being threatened by excess salinity level in numerous canals of the locality. The Sundari trees which constituted 50% of the trees of the Sundarbans are drying up at the top just as elsewhere in whole western region of the country, due to fall off sub-soil water level owing to reduction in water flow rate resulting also in increase of salinity.

Salinity effect on industrialization has been costly. The Khulna News Print Mills which needs 86,000 gallons of saline free water each day has to carry this huge quantity from far 35-40 miles away (GOB, Ministry of Environment, *Bangladesh Paribesh O Adhidapter*, Dhaka, 1990, p.107) at huge cost adding to production cost of the mill.

What possibly the worst of all is the process of desertification that has started to severely bite the environment and ecology of the whole South-western region of Bangladesh consisting nearly one-third of the territory and none-fourth of the people of the country living in the area. The drought that ravaged in nearly 11995 is said to be the worst; because the temperature this year

rose to the highest in known memory to 44 degrees Celsius on 24th March 1995 (The weekly Bichitra, Dhaka, 31 March 1995, pp 27-43).

Obstruction of any natural system is harmful for eco-system. Obstruction and unilateral withdrawal of water of the Ganges at the Farakka point has caused shortage of water in the downstream for which use of deep tube well has increased in Bangladesh. The cumulative effect, however, is that sub-soil water level has been falling from one year after another. This is only natural. Because, the nature has its own hydrological cycle that can, if left undisturbed, maintain balance in environment and eco--system. Any disturbance or obstruction in the natural water flow system in the rivers would only take revenge in its own way. That, what is happening in Bangladesh in its increasing intensity of droughts since after 1975, that is, soon after India started to unilaterally withdraw water from the Ganges. Drought of previous year will only tend to bring in more drought next year if the natural flow system continues to be obstructed.

Decrease in rainfall, higher co-efficient of variation of rainfall and shorter monsoon period in the already drought prone western portion of Bangladesh is likely to increase both frequency and intensity of drought stress. In all probability drought prone area will also extend towards south and south central region of Bangladesh. Increase in drought stress is likely to reduce the crop-yield, especially T. Aman, B. Aus and wheat.

Droughts are also an increasing environmental hazard in Bangladesh, particularly in recent years. The north western region and particularly the Barind Tract are acutely affected by lack of water during the month of March to May in particular. The problem is being aggravated by the decrease in both surface and ground water availability in those regions.

7. AIR POLLUTION

Air pollutants may be classified according to their physical state, that is gaseous, liquid or solid. The estimated nationwide emission of the five primary air pollutants are Carbon monoxide (CO), Particulate matter (solid & liquid aerosols suspended in the atmosphere), Sulfur dioxide (SO₂),

Hydro carbons (HC), and Nitrogen oxide (NO_x). Man-made air pollution in urban areas is often referred to as “smog”.

Cause of air pollution:

- Urbanization
- Industrialization and motor vehicles
 - ◆ sulfur dioxide
 - ◆ nitrogen oxide
 - ◆ hydrocarbons
 - ◆ carbon monoxide
 - ◆ lead

Situation in Bangladesh:

- ◆ the air pollution levels are not thought of as that bad because the meteorological conditions (high wind speeds caused by the flat land) allow the polluted air to be ventilated so there is a flushing effect.
- ◆ there is only a problem in the densely populated and industrialized pockets of Dhaka, Chittagong and Khulna.
- ◆ there is no significant effects apart from the localized health problems.
- ◆ global warming and ultimate Sea level rise can affect coastal region and low land.

Source and affect of air pollution

Factories: poisonous gasses and dust are discharged from these factories

Pulp and paper industries: emit toxic and noxious chemicals like mercaptans, chlorine and dust from lime kilns

Jute mills: these are very numerous here as jute is a major product in Bangladesh air quality is very bad; workers have health problems

Vehicle emissions/ Fuel combustion: it is difficult and costly to control or monitor these emissions in an effective way; more stringent producers to provide clearance for vehicles would be a good move to help to solve the problem; particulate matter, SO₂ & NO_x are major pollutant

Agriculture & food processing: wind erosion; dust; pesticides

Government regulations

- ◆ there are not strong enough
- ◆ are not enforced
- ◆ they need to be modified and enforced with “carrot and stick” type projects

8. ENVIRONMENTAL HEALTH HAZARDS AND SANITATION

Environmental health concerns the health of the community. One is unlikely to succeed in improving community health unless one understands it, and for public health worker this understanding must chiefly apply to the infectious diseases. For the environmental health, it is convenient to start by classifying the relevant infectious diseases (e.g. cholera, typhoid, dysentery, diarrhoea, skin or eye infections etc.) into categories which relate to the various aspects of the environment.

Categories are as follows:

- a) Water related infections
- b) Excreta related infections
- c) Refuse related infections
- d) Housing related infections

Safe Water and Sanitation

Most of health problem in our country is related to water and sanitation as well as malnutrition. Vector born disease such as malaria is related to polluted water. Sanitation related disease carried by contaminated water or food such as diarrhoea, cholera, etc. Chemical toxins, stable toxic like

Pesticides or industrial waste accumulates due to improper disposal and lack of flushing action. This kind of effluent is causing Skin disease, fever, and respiratory problems (Poribesh potra, 1996).

GOB (1992) reported that less than 1% of households use sanitary latrines while less than 5% have fixed places for defecation in the rural areas. In cities and towns, less than a quarter of the population uses latrines, septic tanks or sewer connections. About 28,000 tons of human excreta are produced every day, of which approximately 11,000 tons remain uncared for, thus creating health risks in the community. Common diseases affecting the general population include diarrhoea, typhoid, cholera, tuberculosis, worms, measles, malaria, and many other vector-borne diseases.

Lack of safe drinking water is the major cause for most of these diseases. Fifty three percent of rural households in our country get drinking water from tubewells while 39.7% rely on ponds and shallow wells, and the remaining 7.3% rely on rivers (GOB, 1992).

ICDDR-B study shares that about 80 percent of diseases and 28% percent of the child health is caused by water borne diseases.

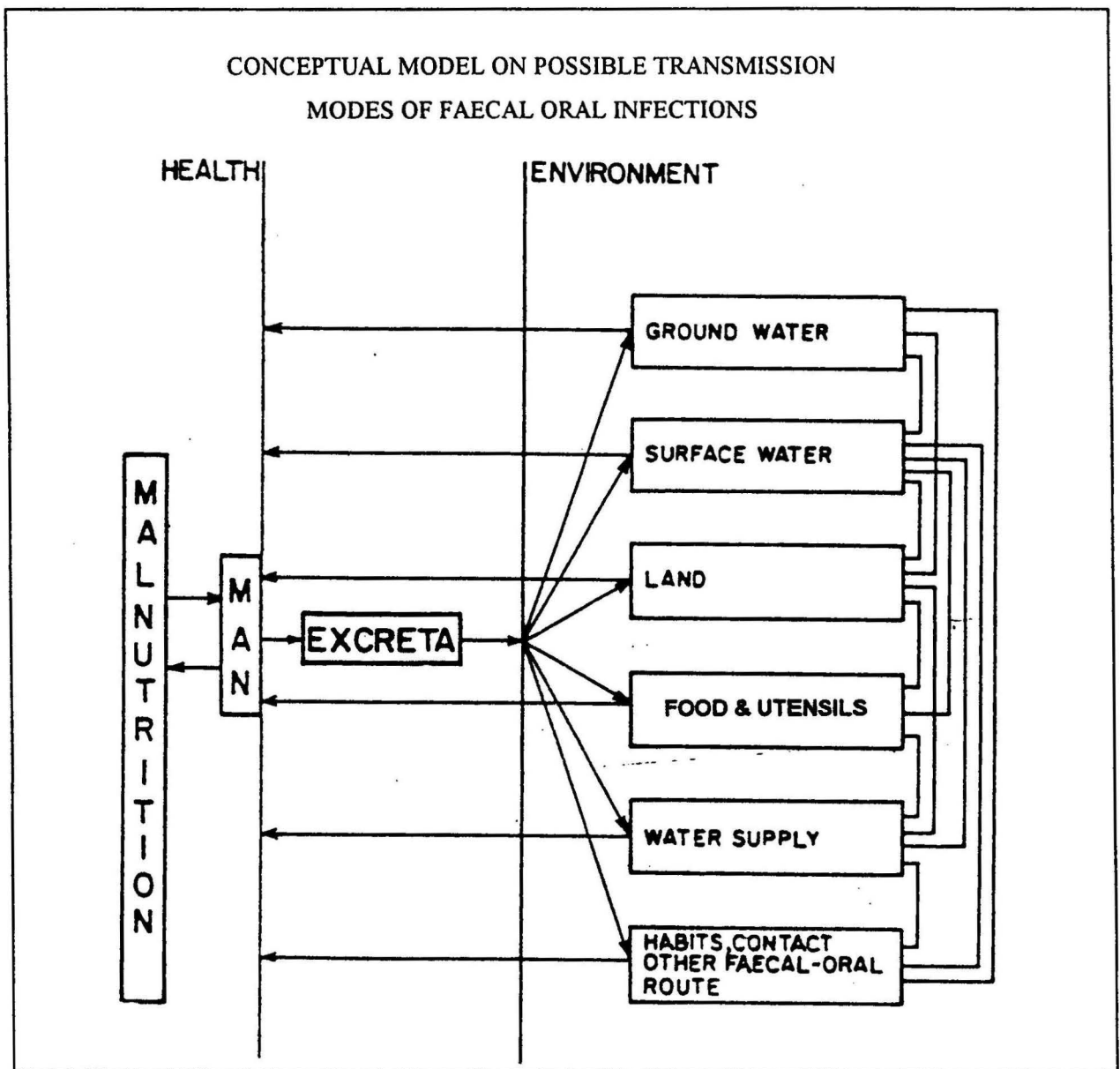
Table 1: Profile of Human Deprivation in Bangladesh (Source: UNDP, 1990.)

{PRIVATE }	Millions
Population without access to health services	60
Population without access to safe water	59
Population without access to sanitation	103
Malnourished children	11
Illiterate adults	41
Out-of-school children	11
Population below poverty line	94

Above table has shown the human deprivation in Bangladesh. The dimension of the problem is so vast that immediate solution is imminent. If only one sanitary latrine per 6 persons is targeted, the nation would require 13 million units.

Many researchers have developed transmission models and shown parallel multiple transmission models in environments. In figure, a framework of common faecal-oral transmission modes is shown from Hoque & Hoque (1995).

Figure (Source: Hoque & Hoque, 1995).



Government Efforts and NGO Initiative in Tackling Sanitation and Health Hazards in Bangladesh

Government Efforts

Piped water systems are now partially available in 57 out of 62 district towns and 7 upazila headquarters. 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 experimental within some parts of the country, with support from CIDA, UNDP and IDA. Preliminary results are promising (GOB, 1992).

In response to the formidable challenge of overcoming various obstacles to development, the government is formulating an environmental strategy for sustainable development. The strategy spans over ten to fifteen years, and is developed as Phase I: Water Supply Projects and Phase II: Sanitation and Sewerage Projects (GOB, 1992).

NGO Initiatives

Some of the sanitation technology has been successfully developed and implemented by leading NGO's such as Oxfam, MCC, Concern, RDRS, Caritas, BRAC, Proshika and VERC. In addition about 200 NGOs are working in various sanitation projects. By 1990, about 228 NGOs successfully established 68 Village Sanitation Centers and 2170 tubewells for safe drinking water. Many NGOs are working towards developing approaches and methods to promote popular participation in improving water and sanitation status in the rural regions. One such attempt is the project: "Alternative Low-Cost Latrines to Expedite The Water and Sanitation Equation" (Ali, 1992).

The objective of this project is to:

- To construct hygienic latrine and safe water supply system together with increasing the awareness on sanitation and hygiene in the integrated development areas,
- To increase the latrine users rate by providing alternative low-cost sanitary technology,
- To strengthen the NGO's role in promoting safe water and sanitation program of the country.

According to Hoque & Hoque (1995), environmental health issues of the country exist primarily at two levels: (1) Health effects from biological pathogens, and (2) Convenience, efficiency, aesthetics and acceptance of the controlling measures. Isolation and disposal of human sewage, provision of safe water and hygiene awareness campaign are usual recommendations to control the health effects. Multi-dimensional research should be addressed for further definition of environmental risk factors for major health problems and development of appropriate techniques, technology and methods of communication.

Suggestions

1. Pollution from organic, sewage, and domestic wastes should be treated before discharge.
2. Proper attention should be given to excreta and waste management system.
3. Excreta treatment plant should be established in a broad scale.
4. Proper attention should be given to the slump area on promoting the use of latrine and drinking water facilities.
5. Awareness building or information network should be adequate for all stages of citizens.
6. Socio-economic constrains, water and sanitation facilities should be carefully examine before any policy formulation.

9. LOSS OF BIODIVERSITY

Biodiversity: Diversity is a concept which refers to the range of variation or differences among some set of entities; biological diversity thus refers to variety within the living world. The term 'biodiversity' is indeed commonly used to describe the number, variety and variability of living organisms, including the genetic variability within species and populations, of their interaction and the ecological processes which they influence or perform. The species, either individually or through their complex interactions within ecosystems, provide the basis by which they succeed or fail, then conservation initiatives can be evaluated.

The significant of bio-diversity: It is an ecological imperative that human depend on plants and on other animals for the basic requirements of existence. It takes million of years to create a species, we

don't know what lies where, which is important for what purpose. As for example, medicine for AIDS may be found from a plant or animal.

Biodiversity features in Bangladesh: Estimates of wildlife of Bangladesh range from a total of 840 to 932 species (Rahman 1994). The International Union for Conservation of Nature and Natural Resources (IUCN) has enlisted 25 species of Bangladesh in its Red Data Book as endangered species. Approximately 18 species are extinct and 77 to 136 species are threatened (Task Force Report, 1991; Rahman, 1995).

Plants, Birds and Mammals: Approximately 5,000 species of flowering plants, 750 species of birds of which more than 150 species are of waterfowl, 125 of mammals, 124 of reptiles, and 19 of amphibians. These estimates include many species that are threatened. Of the known vertebrates, 50 are nearly extinct and 33 are seriously threatened. Nearly 250 species of birds are in danger as the forest in which they live are rapidly being depleted (GOB, 1992). Loss of plant diversity is not well recorded, but 27 vascular plants are known to be threatened. Sixty-eight protein rich woody leguminous species have been reported in the hill forests. The number of medicinal plants have been reported to be more than 500.

Diversity of Rice Gene Pool: About 10,000 traditional varieties of rice as well as local varieties of legumes, fruits, and vegetables exist in Bangladesh; more than 60 percent of the rice planted is from that gene pool (GOB, 1992). However, the growing use of modern HYVs which exhibit higher vulnerability to pests and diseases, has increased concern about the conservation of the original diversity of the gene pool, and of its protection from the potential danger of commercialized conservation.

Aquatic Diversity: About 231 species of wildlife are known to occur in the wetland, mangroves and coastal water of Bangladesh (Sarker & Hussain, 1990). About 174 birds, and 12 species of aquatic mammals occur in wetlands and mangrove areas.

Bangladesh's abundant fish population represents one of the country's most diverse biological resources. More than 500 species of fish constitute a vital resource for the economy and diet of

the millions of rural poor providing 80 percent of the protein to the rice based diet. This aquatic diversity is highly threatened as its habitat is being destroyed by agricultural encroachment, river training, flood management activities, and groundwater development as well as by over fishing. This also impacts on coastal and marine species which spend part of their life cycle inland (GOB, 1992).

Endangered and Threatened Species: Bangladesh have already lost Swamp Deer and the Gaur, and as per Red Data Book of the International Union for the Conservation of Nature and Natural Resources (IUCN), 25 species are endangered, prominent among them Python, Gharial, Crocodiles, White-winged Wood Duck, Horn Bill, Peafowl, Asian Elephant, Bengal Tiger, Clouded Leopard, Black Panther, Bull Frog, Monitor Lizard, Hoolock, Ganges River Dolphin, Susuk, valuable venomous snakes and even some species of rodents (Sewitz, 1989). There are at least 25 species of turtles and tortoises in Bangladesh, 10 percent of world's total which are now being threatening due to increasingly large numbers of export trades (Das, 1990).

Major Issues Affecting the Environment and Biodiversity in Bangladesh

The major cause of rapid decline in the wildlife resources in Bangladesh is its habitat proturbation. About 96 percent of the natural habitat of Bangladesh has now been altered. Factors affecting the loss of biological diversity include deforestation, forest conversion, agricultural and industrial pollution, irrigation, flood control developments, shifting land use and the over exploitation of biological resources (GOB, 1992).

I. Upstream Deforestation and Water Regulation

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. This vulnerability is multiplied by the low terrain of the delta on the one hand, and by salt water encroachment on the other. One of the causes of increased frequency of inevitable floods that destroys crops, shatter the existing bio-diversity, and put millions of life at risk, could be traced to Nepal and Assam where the river systems originate. Stripped of trees, the Himalayas can no longer absorb the

monsoon rains, hence floods carry water surges south, causing extreme erosion of these banks; carried by the water are tons of rich alluvial silt that build up the river banks, plug up irrigation works, and fertilize the delta. However, for Bangladesh case, the benefits of fertilizing effect in this process do not outweigh the harmful effects of the floods. Furthermore, the velocity of the floods takes much of the siltation to the sea where it is associated with the problems of nutrient-loading and eutrophication (GOB, 1992).

II. Pollution in the Bay of Bengal

In the port cities of 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 (GOB, 1992). 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.

The bio-diversity and the marine water quality of BD's coastal zone is threatened by the following major sources:

- Untreated sewage and industrial effluents disposed directly into the rivers and coastal waters from coastal cities/pots,
- Pesticides used in agricultural production.
- Anthropogenic interferences in the catchments of major rivers, including Ganges, resulting in, among others, reduction of fresh water flow and sediments; and increase of salinity,
- Discharge of oil into the coastal waters from ships and on shore ship breaking industries,
- conversion of mangroves for aquaculture and construction of coastal embankments,
- expansion of private freshwater pond cultivation. (This would alter habitat, disrupt spawning behavior and block critical migration paths of fish),
- Unplanned expansion of shrimp farm resulting in increased salinity and land degradation and exploitation of wild shrimp fry causing destruction of bio-diversity,
- Increasing fishing efforts in the off shore fishing grounds,
- Uncontrolled use of some fishing gears, such as, Behundi nets (Setbags), causing adverse effects on the bio-diversity,
- Destruction of Mangroves caused by illegal cutting of trees for fuel wood, timber,

- Resource management practice having short-term profit seeking motive and absence or deficiency of property and user right,
- Lack of knowledge among the administrator regarding enforcement of environmental legislation; poor or no institutional coordination, and lack of meaningful impact assessment procedure and their enforcement capability; and
- natural hazards, such as, cyclones, floods etc.

III. Deforestation/ Habitat loss

The contribution of the forestry sector to GDP is about 4 percent and employs 2 percent of the manpower directly and indirectly. The total forest area is estimated as only 14 percent of the land area. However, the actual tree cover is only 9 percent. Over cutting by timber merchants, increased fuel-wood consumption linked to population growth, and land clearing for agriculture have been the principal causes of deforestation. In the Sal forests near Tangail, forest cover reduced from 20,000 acres in 1970 to 1,000 acres in 1990, due to illegal felling. In the 25 years, the volume of commercial species in the Sundarbans, the sundari and gewa, has declined by 40 and 45 percent, respectively. The estimated annual rate of deforestation during 1981-85 is 8,000 ha. Area annually deforested as a percentage of forest area in the country is 0.8% (Rao, 1992).

Wildlife expert say that habitat loss is the primary threat to most of the world's rare animals and plants but, for some, species trade can be even more devastating than human encroachment (The daily Financial Indicator, 01.01.96).

RECENT RESPONSE TO ENVIRONMENT/DEVELOPMENT ISSUES:

Bangladesh's Global Environmental Commitments

Under the arena of global conventions the government of Bangladesh signed a number of international treaties, each having a number of commitments and consequent implications. For example, the law of the Sea, Montreal Protocol (To reduce Ozone depleting substance), Ramsar Convention on Wetlands Conservation, Climate change convention, Diversity convention, Basle convention on transboundary transport of pollutants, and Convention of International Trade in Endangered Species of Flora and Fauna (CITES).

The Strategy for Sustainable Development

Principles and Goals: The major challenge facing Bangladesh is to meet the basic human needs while sustaining the very limited resource base upon which these needs depend. The Government recognizes that the major impediment to achieving economic growth, poverty alleviation, and self-sufficiency is a vicious cycle of overpopulation, extreme poverty and illiteracy, and environmental degradation as well as natural resources destruction.; and furthermore, that these factors combine to aggravate the scale of constant socio-economic set-backs imposed by recurring natural disasters, often of exceptional magnitude (GOB, 1992).

In response to the formidable challenge of overcoming these obstacles to development, the government is formulating an environmental strategy for sustainable development. The strategy would focus on the key cross-sectoral impediments to environmentally sustainable development and converts them into proactive integrated approaches. These integrated approaches would be the focal points from which all sectoral sub-strategies would then be derived.

Proposed strategy would center on three focal points:

- (1) **Disaster Management**, including global warming;
- (2) **Population Stabilization/ Poverty Alleviation**, which incorporates economic growth; and
- (3) **Environmental Management for Sustainable Development**, which encompasses regional watershed management. This element focuses on the relationship between economic growth and environmental conservation; it involves planning and implementing an integrated program of

environmental management for sustainable development. The programs 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 bio-diversity and (iv) the establishment of tools for environmental management, such as Environmental Impact Assessment (EIA), monitoring and pollution control.

Institutionalization of environment

Bangladesh has Institutionalized environment by forming the Ministry of Environment and Forest (MOEF) in 1990 and upgrading the Department of Environment (DOE) under a Director General. Though there is some slow movement in the right direction, this is not commensurate with the rapid demands of the global and national environmental agenda. However, there are institutions and individuals who have the quality to undertake world class research, advocacy, policy formulation.

Environmental Planning

The Ministry of Environment and Forest (MOEF) on behalf of the Government of Bangladesh undertaken National Environmental Management Action Plan (NEMAP) in 1994. The main-aim of NEMAP is to promote better management of scarce resources and reverse present trends of environmental degradation's.

All the conventions are essentially intergovernmental in nature and represent the government views. Hence, the multi-sectoral character of the implications of the commitments to these conventions is obvious. There is a greater requirement for inter-sectional integration and coordination. Further, there is a need for raising awareness of the policy planners and the public at large.

Limitations:

Achievement towards conservation of the natural environment is not mentionworthy. Failure may be attributed to: (1) Lack of public awareness, (2) Lack of environmental education and research, (3)

LACK OF EFFECTIVE LEGISLATION, (4) Lack of sound conservation policy, (5) Institutional weakness in implementing the policy, (6) Insufficient resource allocation for conservation, (7) Lack of trained man power etc. (B.D. Observer, 7.10.94)

Conclusion

Two relatively more successful examples in the area of Bangladesh's contribution to global environmental governance are the NEMAP and the Steering Committees on Climate Change issues. In these process, NGO's and Government both worked closely together. One of the reasons for the weakness of the lack of existing institutions is the lack of continued leadership both in the Ministry of Environment and Forest and Department of Environment.

Environment is a very demanding area which needs high technical and negotiation skills and capacity to coordinate with other institutions -national and global.

Bangladesh being environmentally vulnerable for a set of exogenous reasons, can claim a moral position to take a leadership role in global environmental governance.

In conclusion, Bangladesh is in the very early stage of playing an important role in global environmental diplomacy. It is not too late to initiate this with a major thrust. Some capacities with the NGO's and academic institutions. There are enough high quality people within the Government and NGO's who can advance the position of the country in the global arena under the emerging framework of global governance. The leading NGO's such as Grameen Bank and BRAC have become models worldwide for poverty alleviation and bottom-up development. These are being replicate by many. Bangladesh should make these as its proud contribution to the global governance milieu.

Holistic Environment

The earth and its biosphere form a grand synthesis of complex interactive systems with organic and inorganic inputs. The world is the way humanity has organized its occupancy of the earth: an

expression of imagination and purpose materialized through exploitation, invention, labor, and violence.

Environment may be defined as the totality of man's surroundings. It is a variegated pattern of biological and physical entities. The earth's land-masses, water bodies, atmosphere, and biological communities are increasingly seen by scientists as parts of a unified system or of an integrated whole. This unified system of the earth is referred to as 'holistic environment'. The dynamics of environmental components, use pattern and activities are shown in figure 1. Therefore, it is necessary to consider all environmental component and possibilities for sustainable development.

MODULE -2

Environmental Impact Assessment (EIA):

- To inform participants the necessity of performing an Environmental Impact Assessment (EIA) on development projects, why an EIA is necessary for the long term sustainability of development programs at BRAC and to know the present status of EIA practitioners in Bangladesh

It is well recognized that the development activities of the past had been in wrong direction because the environmental issues were not given due attention or the damages were noticed at a much later stage when it was irreversible. This led to the concept of Environmental Impact Assessment.

A developing country like Bangladesh is confronted with multi-economic problems such as overpopulation, extreme poverty, illiteracy and natural resource depletion and environmental degradation. Therefore environmental management is difficult and needs careful analysis to achieve sustainable environmental condition.

BRAC is a private non profit organization which has been operation in Bangladesh since 1972. It implements a numbers of multi-sectional program to achieve its goals of poverty alleviation and empowerment of the poor. BRAC's programs activities which are particularly directed towards poverty alleviation, incorporating the concept of EIA will be a very effective tool to make all these programs environment friendly and long term sustainable.

WHAT IS EIA AND WHY WE NEED TO DO EIA?

EIA as we know it today originated in 1969 with the National Environmental Policy Act (NEPA) in the United States. Environmental impact assessment is a tool and formal study process used to predict the environmental consequences of development projects. In other word, EIA is a formal process used to assess or predict the environmental consequences of an existing or proposed development project and to delineate any environmental protection measures which must be

integrated into the project plan to ensure that the project will be economic-cum-environmental in concept and this can be expected to contribute to sustainable national economic development.

In such study it focuses on problems, conflicts or natural resources constraints that could affect the viability of a project. Having predicting potential problems the EIA identifies possible measures to minimize the problems and outlines and ways to improve the projects.

Like economic analysis and engineering feasibility studies, EIA is a management tool for officials and managers who must make important decisions about major development projects.

The EIA study attempts to answer the following questions:

- what will happen as result of the project
- what will be extent of the changes
- do the changes matter
- what can be done about them
- how can decision makers be informed of what needs to be done.

Since the assessments are done at the planning or feasibility stage, the room for necessary changes and alternative use of site, process or appropriate remedial measures and cost-benefit aspects can be made available at the planning level, rather later stage which may end up with unviable or costly project and more importantly an environmental damaging project.

The three most important and sequential elements are involved in EIA exercises are identification, prediction and evaluation.

- IDENTIFICATION

- Description of the existing environmental system
- Determination of the components of the project

- PREDICTION

- Identification of the environmental modification that may be significant
- Forecasting of the quantity and or spatial dimension of change in the environment identified
- Estimation of the probability that the impact will occur

- EVALUATION

- Determination of the incidence of cost and benefit to user group affected by the project
- Specification and comparison of trade-off (cost or effects being balanced) between various alternatives.

Under each of the above elements different methods of assessments are suitable for this purpose; such as identification

- Checklist method
- Scaling and measurement

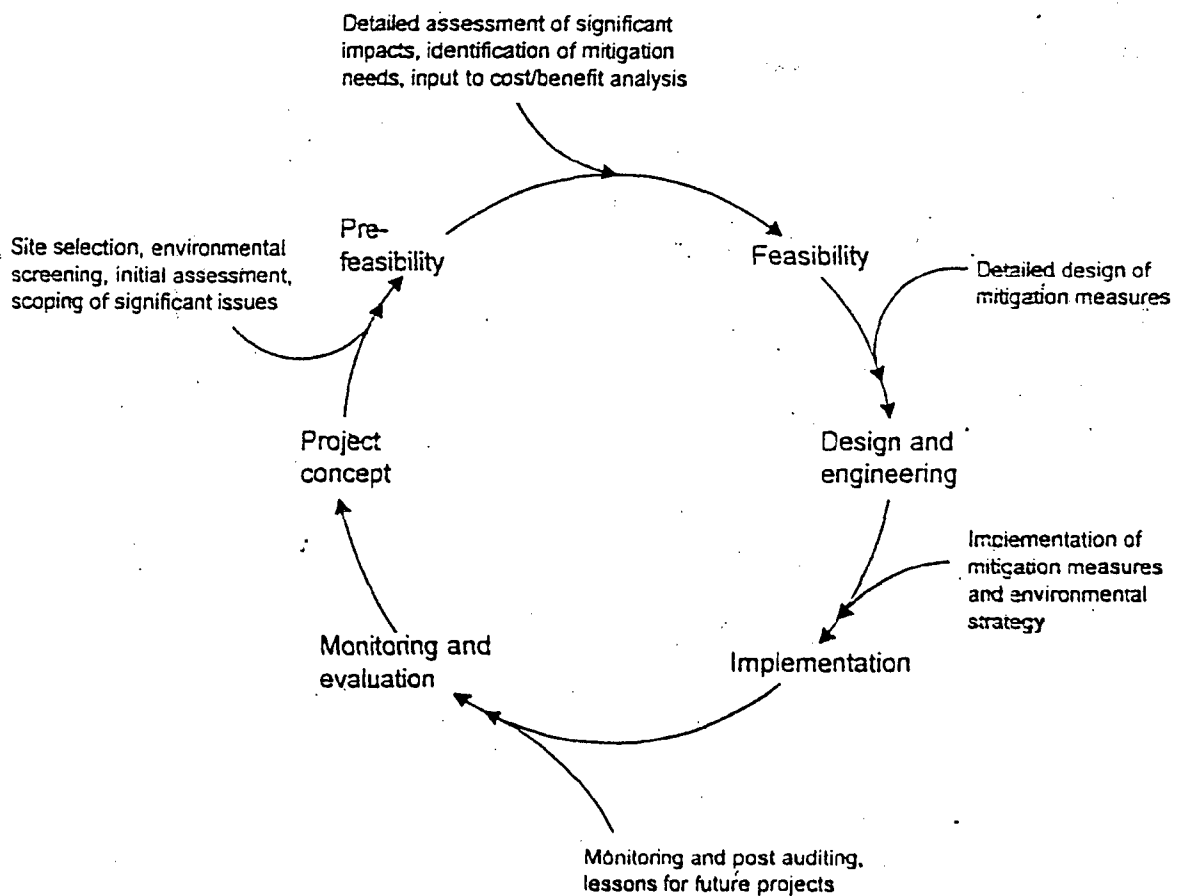
- METHODOLOGY

A number of techniques have been developed for the presentation of environmental impacts results to decision -makers and the general public. These techniques can be denoted as below:

1. adhoc
2. checklist
3. matrices
4. overlays
5. networks
6. Cost-benefit analysis
7. simulation modeling workshops

EIA AND THE PROJECT CYCLE:

EIA has a definite place within the project cycle of a well planned development project. The project cycle describes the major stages occurring during the development and implementation of a project beginning with project concept. The cycle continues from feasibility study and design through implementation, to monitoring and evaluation stages which ultimately provide information for the next project concept. EIA starts just after the project concept is presented. The results of EIA are then integrated within all steps of the cycle.



Source: United Nations Environment Programme, 1988

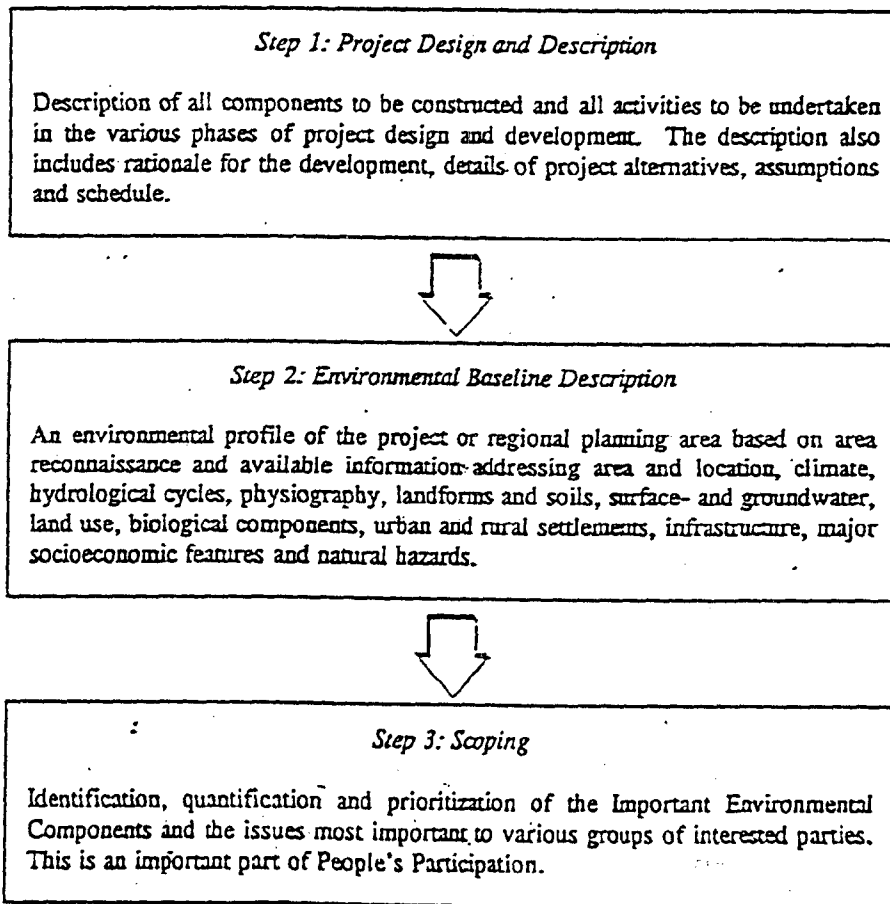
PROCEDURAL STEPS IN EIA:

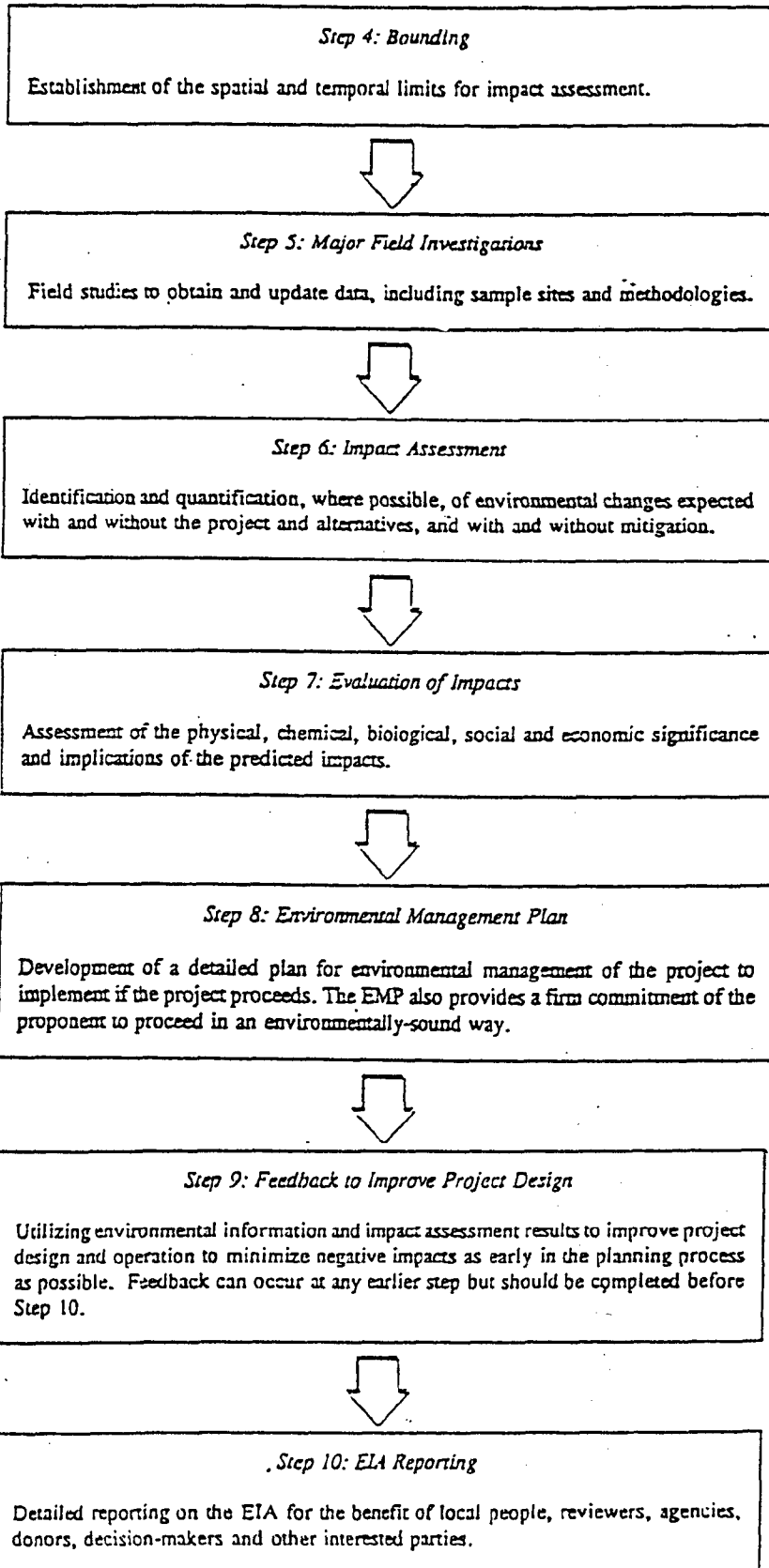
The activities involved in conducting EIA of a proposed project are diverse and intensive efforts including field surveying are needed to prepare successful EIAs. The steps for conducting EIA have been adopted by the Bangladesh Flood Plan Coordination Organization (FPCO) of the Ministry of Irrigation, Water Development and Flood Control. Although the original concept for developing the procedural steps of EIA was for the water sector, yet the idea is similarly applicable for other development programs.

The process of EIA is complicated through a series of steps. It is important to note that although there are ten steps to be accomplished in EIA, people's participation should occur during the entire EIA process.

A set of 10 steps has been recommended as standard EIA procedure in the EIA Guidelines (FPCO 1992a). These are outlined below and detailed in

the following sections. All steps are intended to be followed against a background of full and effective people's participation.





NEEDS OF EIA IN DEVELOPMENT PLANNING:

The main objectives of EIA are to identify environmental impacts of proposed plan, programs and projects, thereby :

Assisting decision makers and their constituents in making informed decisions on projects development and resource allocation;

providing where possible quantitative environmental information so that potential impacts can be avoided in project and program design;

providing a basis of development of management measures to avoid or reduce negative impacts; and providing an environmental management plan (EMP) for the project that will help promote sustainable development.

EIA is not intended to disrupt nor impede development but should enhance development by ensuring that projects are constructed and operated in an environmentally sound mannered do not negatively affect the functioning of essential environmental processes nor the long term sustainability of resource conservation and human well being.

EIA is planning tool which is to be used together with the project feasibility study to ensure that the project plan is the optimal Economic-cum-Environmental plan, that is the plan is environmentally as well as economically sound and thus represents the best approach to planning for development projects in order that continuing development will be sustainable. A project plan which is optimal from both environmental and economic perspectives will have a higher benefit/cost ratio than a plan which is not responsive to environmental needs especially so when long term as well as short term effects are considered.

NEED OF EIA IN BRAC PLANNING PROCESS:

Poverty is regarded as one of the important source of environmental degradation. Therefore, nay development program must find ways to ensure the preservation and protection of the environment. The majority of BRAC's development interventions involve economic interventions aimed at the land less poor. RDP activities contain a substantial measure of natural resource conservation, optimal resource utilization and restoration of degraded environment. Several of BRAC's rural development and income generation programs, therefore, have direct and indirect bearing on the utilization, management and conservation of natural resource base. Since, EIA is a planning tool to make a project sustainable and environment friendly by eliminating all negative or adverse impacts, the incorporation of EIA in all BRAC's programs activities will ensure long term sustainable development. A project plan which is optimal from both environmental and economic perspectives will have a higher benefit/cost ratio than a plan which is not responsive to environmental needs, especially so when long term as well as short term effects are considered.

EIA IN BANGLADESH:

In Bangladesh, Environmental concern is comparatively new phenomenon. Late eighties and early nineties DOE and funding agencies by various Aid Agencies have initiated the process of conducting EIA's in the country for various projects of significant impact.

Since the environmental awareness has been growing gradually among mass people, EIA is becoming an integral part of different development projects. The followings are some example of this kind of initiative :

World Bank has included an EIA for Third Chittagong WASA project and revised the TOR. Rapid EIAs have been carried out for Hatiya-Sandwip cross-dam project, two cement factories. Messers Elias Brothers Pvt. Ltd. At Rangadia, Chittagong, and Confidence cement factory at Sitakunda, Chittagong; follow-up studies has been carried out for Jamuna Multipurpose Bridge,

as an additional part Feasibility Study. Moreover proposed and under construction Karnnaphuli Fertilizer Plant (KAFKO) at Chittagong has committed to conduct an EIA and already conducted an IEE in August 1991. An IEE has been carried out for coal mining project at Barapukuria. Proposed Dhaka Paper Mills at Katchpur conducted a limited IEE and so has the Apex Textiles at Gazipur.

MODULE -3

Environmental Management Plan (EMP)

- To inform participants of the necessity of developing an EMP for the sustainable management of development projects, inform participants of the different components and functions that comprise an EMP for the sustainable development of projects

An EMP is a plan to undertake an array of follow-up activities that provides for the sound environmental management of a project so that adverse environmental impacts are minimized and mitigate, beneficial environmental effects are maximized, and sustainable development is ensured.

An environmental management plan should be developed to deal with all follow-up activities during project construction implementation, maintenance and (if required) abandonment. The main components of EMP are as follows:

- Mitigation & Enhancement
 - Compensation
 - Monitoring
 - Peoples' participation
 - Disaster Management plan (Contingency Planning)
 - Description of residual impacts
 - Description of institutional arrangement for implementation of the EMP
 - Reporting & accountability framework
 - Budget estimate for EMP implementation.
-
- **Mitigation & Enhancement :**

Mitigation & Enhancement measures should be identified, fully described and evaluated for all severe impacts and for all other grades of impacts where the costs of such mitigation are in appropriate proportion of the effects in reducing impacts.

- **Compensation plan :**

Compensation measures should be developed in all cases where significant residual impacts remain after implementation of practical mitigatory actions. As for example, resettlement of displaced people requiring major social & infrastructural programs.

- **Environmental Monitoring :**

Environmental monitoring is an essential part of the EMP. Establishment of environment monitoring programs should be undertaken by the operational & maintenance agencies on the basis of expected severity of impacts and doubles as to the efficacy of proposed mitigation measures, proposals for monitoring should be drawn up for review and approval by the project review committee.

- **Disaster Management Plan :**

The EIA should contain a full accounting of all hazards within the project area and assess how these would be affected by project development went and implementation.

- **Institutional Support :**

The EMP should outline the institutional arrangements made to carry out the mitigation, enhancement, monitoring and other components of ongoing environmental management.

- **Reporting and Accountability Framework :**

This section describes the required contents of reports when the study should be completed and who is responsible for completing all relevant activities of EMP and finally to whom the report must be submitted.

- **People's Participation :**

Active participation of local people in the entire project cycle, i.e. program identification. Study appraisal, planning & implementation should be employed as the very to achieving along term Sustainability. People's participation should be developed as a bottom-up planning places is which weal people are fully involved in shaping their own future, rather than being objects in a top-down planning approach.

MODULE -4

Session 1: Need for environmental awareness

- To increase participants knowledge on how environmental awareness will help in protecting the fragile environmental resources of our country

People aided by technology, change the environment in many ways to suit their growing needs. They build houses for shelter, convert forests and grasslands to agricultural lands and industrial areas, plough the land to plant crops and use natural resources for energy. They do not often think how these changes will affect themselves and other living things that share the environment Worldwide there is a loss of natural habitats and severe pollution which are serious threats to humans and all living creatures. Through environmental awareness people will begin to understand the importance of protecting our fragile environmental resources.

Environmental awareness must begin with a knowledge and concern for environmental issues. These issues can appear in different sizes, in different geographical boundaries and socio-economic conditions. There are issues which are universal in nature, while some problems are specific to different countries and locations. Therefore, environmental awareness relates to all local, national, regional, and global problems.

Environmental awareness is fundamental for it initiates:

- action to control environmental pollution and resource depletion
- protection of nature and natural resource bases
- the understanding of sustainable development
- improvement of the quality of life

Environmental education is directly related to environmental improvement and it is therefore necessary to urgently move towards developing environmental education programs. These programs should incorporate the following:

- importance of mobilization and empowerment
- importance of seeking cooperation and involvement with key actors

- refraining from activities which adversely affect the environment
- comprehension of what the environment is and the reasons for preserving and protecting it
- a concern for all materials and concepts which constitute the environment
- taking positive steps to protect and preserve the environment

Environmental awareness, if properly understood, constitutes a comprehensive lifelong understanding, and response to changes in a dynamic world. It prepares the individual for life, through an appreciation of the major problems of the twentieth century. It provides skills and attributes needed to play a productive role towards improving life and protecting the environment. Through adoption of a holistic approach, environmental awareness can change the world we live in by mobilizing people to take action to preserve the environment.

Session 2: Role of BRAC in Environmental Awareness and Environmental Education

- To inform participants on how BRAC is helping to raise environmental consciousness through its country wide network and educational programs

The ERG under BRAC has developed an internal environmental training program for senior and junior level (head office) staff members. After the training program, the manual and modules will be incorporated into the Training Divisions training manual. The ERG will still be involved in training, but will focus on environmental education and awareness programs as well as serving as a resource center. The Training Division will be responsible in training the regional and area office staff members. The regional and area office staff (PO's and PA's) will then be required to provide training to their beneficiaries.

BRAC's non-formal school program will also be implementing environmental education into its classrooms. Through the involvement of the Bangladesh Centre for Advanced Studies and BRAC, training has been provided to Non-Formal School Teachers. An environment education course and associated course materials are being made available to over 30,000 NFPE schools.

BRAC is also planning to educate the general public through poster, media, and seminar campaigns. These campaigns will highlight the importance of how everyone needs to be involved in conserving and protecting our environment.

Session 3: Monitoring of Environmental Status of BRAC operated areas

- To familiarize participants on how to maintain environmental quality and sustainability of BRAC's programs

Why do we need monitoring, which projects of BRAC should do monitoring, how and which stage of the projects. Mitigation option of ongoing projects will also be discussed in this section.

Session 4: BRAC Intervention

- To reveal BRAC's active involvement in projects related to the environment

This session will cover BRAC's activities/program those are environmentally concern
Impacts of BRAC interventions on Environment

Session 5: Impacts of BRAC Interventions on Environment

- To understand how BRAC activities are impacting the environment of Bangladesh and suggestions for environmental improvement of existing projects

This session will discuss the Initial Environmental Examination (IEE) findings of BRAC's RDP program and recommended activities for environmental improvement.

Session 6: Environment the next Step for Sustainable Development

- To inform participants on why one should consider the environment when developing programs activities for sustainable development

SUSTAINABLE DEVELOPMENT:

The purpose of development programs has always been bringing certain change in system for meeting desired human needs., basic or non-basic. It may be noted that development is a dynamic and changing concept and as such the term development should be perceived as process, interaction, and action (Hoogvelt, 1984). The term system here refers to environment - the surroundings where we, human beings, live in. Thus, environment refers to all natural resources (physical and biological) and human resources (people, socio-economic setting, quality of life, values etc.) that surround a development activity. Since human action for development and improvement of the quality of life for the present as well as for the future generations, development shall have to be sustainable.

When development is conceived without considering the environment (both physical and non-physical), the impact brings deterrent effects which threaten sustainable development as a whole. Sustainable development is not a fixed state of harmony, but a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are made consistent with future as well as present needs (UN: 1987).

Any development activity for socio-economic well-being is sure to affect either and or both natural (physical and biological) and human resources (people, socio-economic setting, quality of life values and so on). As a point of reference, a case is presented here from Bangladesh.

For agricultural land development a series of polders were constructed in 1960's in the coastal areas of Bangladesh to protect the land from salinity. When such embankment is built in, both rich and poor within the embankment area are benefited i.e., both may get increased agricultural

yield. But during late 1970's due to increase in export potential of shrimp in the international market some of these polder areas have been converted to allow the inflow of saline water needed for shrimp culture. In the process, poor land owners who cannot afford to invest in shrimp culture are then compelled to hand over their land to the richer section of the people who are engaged in shrimp culture. This coastal shrimp culture development activity, though lucrative for foreign exchange earnings, in fact have marginalized many of the poor farmers in the absence of proper Government policy to rehabilitate them or due to the absence of regulatory measures to reverse the trend. Since coastal areas are now leased widely for shrimp culture under government patronization, the richer section of the people are mostly availing the opportunity to the neglect of the poor farmers. Those small farmers who were previously engaged in agricultural activities cultivating their own land, virtually had to switch over from their profession to shrimp cultivation as day laborers. Hence, it is evident that shrimp culture activity has brought change not only in utilization of natural resources but also affected human resources with wider ramifications.

The absence of development programs also raises challenges for sustainable development. For example, if population explosion is allowed to continue uninterrupted, it will cause environmental damage arising out of imbalances between demand and supply of resources. Moreover, to integrate existing population into the development stream there is also a need to enhance their quality by raising level of education, adequate health care, upgrading skill through appropriate training etc. It is thus evident that, for material well-being, there is a need to pursue planned development efforts and this is a continuing process. In order to achieve This cannot be stopped for the sake of environmental protection. In order to achieve growth, development activities cannot be stopped but what is needed is that stress environmental intervention strategies that would ensure minimum environmental damages while maximizing development benefits.

MODULE -5

Session 1: ERG Objectives and Components

- To provide the ERG objectives to all staff levels

The objectives of the ERG are to develop and incorporate environmental dimensions into BRAC's program activities. The objectives are defined below:

1. Conduct environmental research
2. Incorporate sustainable environmental management into BRAC programs
3. Develop environmental training materials and conduct training of trainers
4. Establish environmental network and resource center
5. Monitor and evaluate BRAC's program activities

Components

I. Research

- conduct environmental research related to BRAC's program activities
 - ⇒ Bio-physical/chemical (example: toxicity analysis of BRAC waste, integrated pest management techniques)
 - ⇒ Socio-economic (example: cost-benefit analysis of environmental change, social impact on beneficiaries or environmental change)
- New approaches to environmental sustainability - Pilot Study
 - ⇒ Action Research (example: eco village, community participation, etc.)
 - ⇒ Appropriate technologies (example: improved stoves, sanitary latrines, etc.)

II. Program Management

- Incorporate environmental dimensions into ongoing BRAC programs
 - ⇒ Promote sustainable uses of natural resources and efficient use of energy
 - ⇒ Minimize the production of waste by encouraging reuse, recycling and reduction

- ⇒ identify and protect sensitive habitats and resources
- ⇒ Reduce potential for health hazards
- Develop Initial Environmental Examination (IEE) Guidelines/Checklist specific to BRAC programs and conduct IEE
- Implement new environmental programs

III. Monitoring and Evaluation

- Monitor and evaluate environmental impacts of BRAC's program activities
- ⇒ Ensure compliance with existing laws, regulations and guidelines
- ⇒ Evaluate the effectiveness of mitigation measures to minimize environmental and health hazards
- Develop indicator/monitoring criteria for environmental improvement
- Develop internal standard when needed

IV. Training

- Develop environmental training materials for BRAC staff and beneficiaries
- ⇒ Develop manuals, brochures, videos and activities specific to various programs
- Conduct training for trainers
- ⇒ General environmental education/awareness
- ⇒ Program specific environmental issues
- ⇒ Environmental friendly technologies

V. Communication

- Establish environmental resources center
- ⇒ provide environmental studies, reports, journals, books, expertise, etc.
- Establish a network between the ERG and environmental organizations
- ⇒ NGOs, UN Agencies, Government Ministries, Consultants, etc.
- Establish a network between the ERG and other BRAC Programs/ Division

- ⇒ Rural Development Program, Health and Evaluation Division, Training Division, Non Formal Primary Education, Employment & Income generation, Rural Enterprise Project, Ayesha Abed Foundation, etc.
- Publish ERG newsletter

Session 2: Priorities of ERG Activities

Objective: to provide to the staff the ERG priorities that are important in striving towards sustainable development

The following is a preliminary list of priorities established for the ERG based on our Initial Environmental Examination (IEE).

I. Research

Agricultural Program

- ◆ Investigate the failure of using alternatives to chemical such as bio-fertilizers and Integrated Pest Management techniques, and search for appropriate “environmentally friendly” techniques.
- ◆ Research and introduce more environment friendly cropping pattern (e.g. paddy in both the two kharif seasons and pulse in rabi season rather than planting maize in all time).
- ◆ Research on soil type and fertility (nutrients), suitable crop for deferent soil.

Fisheries Program

- ◆ Investigate environmental friendly alternatives for eliminating predator fish and insects. The study of Geneviève Chicoine --AKFC fellow- investigated the environmental impacts of fish culture and provided recommendations.
- ◆ Research new indigenous fish species which could be cultivated in BRAC ponds. Priority should be given to Bangladeshi endangered or extinct fish species.

- ◆ Pesticide residue analysis in fish and impacts on the environment.

Forestry Program

- ◆ Research , identify and test, in collaboration with local communities, indigenous tree species which could be appropriate for (i) road side plantation (ii) needs of the communities.

Sericulture Program

- ◆ Investigate health hazards, provide recommendations, and conduct follow up research on the success of recommended mitigation (for example: gloves for reeling and handling dyes and chemicals, etc.). *The consultant Jaques Berubé is currently investigating sericulture environmental and health hazards.*

Action oriented

- ◆ Improved stove: there are a pilot program at coastal area, it is found that this system can reduce 50% of fuel wood consumption.
- ◆ Eco-village: self sustain
- ◆ Reforestation program using indigenous species

II. Program Management

Sericulture Program

- ◆ Recycle dead worms wastage from sericulture reeling.

Health and Sanitation

- ◆ Environmental investigation of medical waste disposal of BRAC's Health Programmes.

IV. Training

General environmental education/awareness for project staff and beneficiaries. This training will involve conservation, recycling, project impacts on environment. It is a training on basic environmental issues specific to each program. A pilot training program will be implemented in

the agriculture program; based on our finding this program presented significant environmental and health hazards.

Session 3: Relationship to ERG and other BRAC Programs

- To inter-link BRAC's programs with ERG

Recently the ERG has been developed and implemented as part of BRAC's Research and Evaluation Division to fulfill the need to address pressing environmental issues in Bangladesh. However, it is important to interlink the ERG with other BRAC programs, instead of the ERG being looked upon as an entity of its own. By creating a framework to incorporate the ERG into all BRAC's present and future projects sustainable development will occur.

This will occur by:

- environmental awareness/EIA training
- including an environmental component in all project proposals
- establishing an ERG resource center
- performing EIA's on existing projects and reporting results between ERG and all concerning parties
- joint collaboration on research with other BRAC programs
- implementation of recommendations based on research findings

At present, the ERG has completed an initial environmental examination (IEE) of four BRAC programs, which include:

- agriculture
- fisheries
- forestry
- sericulture

An EIA has been performed on fish culture and recommendations have been made. Currently an investigation is occurring on sericulture environmental health hazards. When the ERG is fully integrated into BRAC's structure positive changes will undoubtedly occur for the betterment of all Bangladeshis.

Session 4: Other NGOs and research institute's Activities:

- To inform participants of the environmental projects/activities that other NGOs are conducting within Bangladesh

Several NGOs and research organizations are working on environmental issues, research and policy level. Such as:

International

- ◆ Cooperation for American Relief Everywhere (CARE)
- ◆ Rangpur Dinajpur Rural S (RDRS)

National

- ◆ Bangladesh Unnyan Parishad (BUP)
- ◆ Bangladesh Institute of Development (BIDS)
- ◆ Bangladesh Centre for Advanced Studies (BCAS)
- ◆ Bangladesh Environmental Lawyers Association (BELA)
- ◆ Bangladesh University of Engineering and Technology (BUET)
- ◆ Bangladesh Rural Advancement Committee (BRAC)
- ◆ PROSHIKA

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