



**Bangladesh**

**National Action Programme (NAP)  
for Combating Desertification**

**Department of Environment  
Ministry of Environment and Forest  
Government of the Peoples Republic of Bangladesh  
August 2005**

# **National Action Programme (NAP) for Combating Desertification in Bangladesh**

**Department of Environment  
Ministry of Environment and Forest  
Government of the Peoples Republic of Bangladesh  
and  
IUCN – The World Conservation Union  
Bangladesh Country Office**

**August 2005**

# Table of Contents

	<b>Page No.</b>
<b>Chapter One: Introduction</b>	01
1.1 Background of UNCCD	02
1.2 Objectives of UNCCD	03
1.3 Bangladesh Context	04
1.4 UNCCD approach for preparation of NAP	06
1.5 The planning process for development of NAP	07
<b>Chapter Two: Country profile</b>	09
2.1 Physical features	10
2.2 Socio-economic characteristics	24
<b>Chapter Three: Land degradation and desertification</b>	26
3.1 Land degradation and deforestation	27
3.2 State of land degradation in Bangladesh	29
3.3 Causes of land degradation	31
3.4 Droughts in Bangladesh	34
3.5 The response to the land degradation and drought	38
3.6 The cost of land degradation	38
3.7 State of deforestation in Bangladesh	40
3.7 The cause of deforestation	40
<b>Chapter Four: Existing policy and legislative framework</b>	43
4.1 Policy framework	43
4.2 Legal arrangements	47
4.3 Role of stakeholders	50
<b>Chapter Five: Development projects and programme</b>	52
5.1 Community development programme	53
5.2 Income generation programme	53
5.3 Capacity building programme	54
5.4 Afforestation programme	54
5.5 Others	56

	<b>Page No.</b>
5.6 Indigenous knowledge to combat desertification	57
<b>Chapter Six: The National Action Programme</b>	
6.1 Goal	60
6.2 Guiding principle	60
6.3 Setting the priority	60
6.4 Programme of Actions	61
6.5 Financial arrangements	67
6.6 Monitoring and evaluation	67
<b>Chapter Seven: Conclusion</b>	69
<b>References</b>	71

## List of tables

	Page No	
2.1	Physiographic Regions of Bangladesh	10
2.2	Inundation land type	24
2.3	Demographic data sheet	25
3.1	Different types of land degradation and their extent in Bangladesh	29
3.2	Extent of dry zone in Bangladesh	29
3.3	Land degradation due to shifting cultivation	32
3.4	Summery of drought severity areas in Bangladesh by crop season	35
3.5	Summary of estimates of the cost of land degradation in Bangladesh	39

## List of figures

	Page No	
2.1	Physiographic units of Bangladesh	11
2.2	Bio-ecological zones of Bangladesh	12
2.3	General soil types of Bangladesh	14
2.4	Location of Bangladesh in South Asia Monsoon region	21
2.5	Flood prone areas of Bangladesh	23
3.1	The land degradation spiral	27
3.2	Changes in the land use pattern between 1983/84 and 1996/97	30
3.3	Rabi drought prone areas of Bangladesh	36
3.4	Kharif drought prone areas of Bangladesh	37

# Acronyms

AEZ	Agro Ecological Zones
BARC	Bangladesh Agricultural Research Council
BCAS	Bangladesh Center for Advance Studies
BMDA	Barind Multi-purpose Development Authority
BNH	Bangladesh National Herbarium
BWDB	Bangladesh Water Development Board
CBR	Crude Birth Rate
CCD	Convention to Combat Desertification
CDR	Crude Death Rate
CEGIS	Center for Geographic Information System
CEP	Community Empowerment Programme
COP	Conference of Parties
CPR	Contraceptive Prevalence Rate
DAE	Department of Agricultural Extension
DG	Director General
DoE	Department of Environment
FAO	Food and Agriculture Organization
FD	Forest Department
GBM	Ganges - Brahmaputra-Meghna
GoB	Government of Bangladesh
GOs	Government Organizations
HYV	High Yielding Variety
INCD	Intergovernmental Negotiating Committee
IUCN	The World Conservation Union
NAP	National Action Programme
NEMAP	National Environment Management Action Plan
NEP	National Environment Policy
PACD	Plan of Action to Combat Desertification
SEMP	Sustainable Environment Management Programme
SPARSO	Space Research and Remote Sensing Organization
TFR	Total Fertility Rate
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification

UNCED	United nations Conference on Environment and Development
UNCOD	United Nations Conference on Desertification
UNEP	United Nations Environment Programme
WARPO	Water Resources Planning Organization
WRI	World Resources Institute
WSIP	Water Sector Improvement Project

## Executive summary

Bangladesh is a signatory to the United Nations Convention to Combat Desertification (UNCCD). It was signed in January 1996 and after ratifying the convention the country became a party to it. The Convention came into force in 1997. Among many environmental issues facing Bangladesh, land degradation due to aridity and loss of crops due to droughts have caused considerable economic losses and human suffering than any other problem in Bangladesh.

Desertification means land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities, leading to reduction or loss of the biological or economic productivity and complexity of rain fed cropland, irrigated cropland, or range, pasture, forest and woodlands. Bangladesh comprises of the floodplains of the Jamuna, the Padma, the Meghna and some of the smaller rivers. The Madhupur Tract, the Barind Tract, and the Akhaura Terrace stand slightly above floodplain level and the Hills lie to the East and the North. According to the criteria set by the Convention to Combat Desertification (CCD) for defining a dry region (the ratio of annual rainfall to potential evapotranspiration (ET<sub>p</sub>) may be a maximum of 0.65), no region within Bangladesh can be termed as dry region. However, Bangladesh does experience long spells of dry weather and moderate to severe droughts are spread over a region of 5.46 million ha. The western northwestern part of the country is generally considered as the drier region. The total precipitation in the dry regions is low but the rainfall often occurs in sudden heavy storms, which sometimes lead to flooding and soil erosion. During the 7-month dry season in some regions, the evapotranspiration exceeds the amount of rainfall by a factor of 2.0. Between 1960 and 1991, droughts occurred in Bangladesh 19 times. Very severe droughts hit the country in 1951, 1961, 1975, 1979, 1981, 1982, 1984, and 1989. Past droughts have typically affected about 47 percent area of the country and 53 percent of the population.

The estimates of the extent of land degradation in Bangladesh are that over 6.0 million ha falls below the minimum threshold for sustainable cultivation. In drier parts of Bangladesh, low soil fertility is recognized to be at the root of the land degradation spiral leading to desertification. Land degradation in Bangladesh may be considered as temporary or permanent lowering of the productive capacity of land. Natural processes that lead to land degradation in Bangladesh can be considered part of the ongoing land formation process. The important driving forces of land degradation in Bangladesh are:

- (i) Improper Cultivation in Terrace Land, Floodplains and Piedmont Plains;
- (ii) Low Efficient Irrigation System;
- (iii) Imbalanced Fertilizer Use;

- (iv) Formation of plough pan;
- (v) Improper use of Pesticides;
- (vi) Over Exploitation of Biomass from Agricultural Fields;
- (vii) Unplanned rural infrastructure (Road Embankment, *FCD/I*) causing water logging;
- (viii) Development of brickfields in good agricultural land and destruction of biomass;
- (ix) Industrial development without consideration of land use priority;
- (x) Mining of Sand and Gravels from Agricultural Land;
- (xi) Land Ownership and Tenure;
- (xii) River Bank Erosion and accretions;
- (xiii) Sandy Over-wash on Agricultural Land; and
- (xiv) Salinity intrusion
- (xv) Over grazing
- (xvi) Major reduction in dry season river flow.

Main issues related to desertification in Bangladesh includes:

- (i) Deterioration of the natural resources adversely affecting the socio-economic condition and livelihood support systems;
- (ii) Reduction of irrigation potential;
- (iii) Diminishing of the food security base of human beings and livestock;
- (iv) Scarcity of drinking water, depletion of ground water, interference with spacing of tube well, including hand tube well, shallow and deep tube well;
- (v) Health and nutrition status of the population, arsenic contamination in ground water, contamination due to disposal of waste and inadequate sanitation;
- (vi) Reduced availability of biomass for fuel;
- (vii) Loss of bio-diversity; and
- (viii) Impoverishment, indebtedness and distress sale of assets of production.

National Action Programme (NAP) identifies the factors contributing to the process of desertification in Bangladesh and suggests measures and strategy, using an integrated and coordinated bottom-up approach to combat desertification and mitigate the effects of drought.

The main programme areas proposed to address desertification are clustered under the following eight broad themes.

- Theme 1. Understanding the desertification scenario
- Theme 2. Promotion of awareness and capacity building
- Theme 3. Institutional Arrangements
- Theme 4. Reclamation and rehabilitation of degraded land to promote sustainable utilizations of land resources
- Theme 5. Land degradation/desertification mitigation and Poverty Alleviation Strategies
- Theme 6. Promotion of active participation of communities in land management programmes
- Theme 7. Judicious location of construction sites and physical infrastructure.
- Theme 8. Research and technology development

National Coordination Committee on Desertification will oversee the implementation of NAP. The implementation of NAP would require inter-agency cooperation for joint programming, planning and implementation. A number of government organizations and NGOs are working in areas related to desertification. However, there is need to strengthen their capacity to enable them to participate in the implementation of NAP.

The funding sources for the implementation of NAP activities have been suggested as Governments own fund, Global Mechanism of UNCCD, and other international donor agencies such as UNEP, UNDP, GEF, FAO, IFAD and WFP.

The Monitoring and Reporting system (M&R), through the implementation mechanism of the NAP, will work as a reporting organ liaising with the UNCCD Secretariat.

Conceptually, the Monitoring and Reporting will involve:

- Collection of information about the status of desertification in Bangladesh and implementation of NAP activities by different implementing institutions and organizations and
- Reporting periodically on the Convention issues to implementing bodies and the public in general

The Monitoring and Reporting (M&R) System will report periodically about its findings in the different areas in a regular basis. Additionally, the M&R System will report regularly to the public through the different communications media of Bangladesh (newspapers, radio, TV and others).

# **Chapter One: Introduction**

## 1.1 BACKGROUND OF UNCCD

Desertification has been a subject of global concern since long. It is estimated that over 250 million peoples are affected directly and with over one billion people are at a risk. Desertification results from complex interactions among physical, chemical, biological, socioeconomic and political problems that were local, national and global in nature. Realizing this, the international community recognized it as a major economic, social and environmental problem.

The formal expression of global concern on desertification starts in late seventies. Initially in 1977, a United Nations Conference on Desertification (UNCOD)<sup>1</sup> was convened in Nairobi, Kenya, which came up with the United Nations Plan of Action to Combat Desertification (PACD). However, the implementation of PACD is far from satisfactory. Assessments made in 1984, 1987 and 1989 by UNEP indicated that desertification continued to spread. Also, the UN Commission for Sustainable Development Report 1988 observed that desertification had become one of the most serious environmental and socio-economic problems of the world. The World Atlas of Desertification indicates that over the preceding 20 years, the problem of land degradation had continued to worsen<sup>2</sup> (UNEP 1992 b). The UN Conference on Environment and Development (UNCED)<sup>3</sup> also highlighted the problem of desertification and recommended that the United Nations General Assembly should establish an Intergovernmental Negotiating Committee (INCD) to prepare a Convention to Combat Desertification in those countries experiencing serious drought and/or desertification, particularly in Africa.

As a follow up action, a committee was established in early 1993 and developed the text of the Convention. The Convention was opened for signature on 14-15 October 1994<sup>4</sup>. The UNCCD entered into force on 26 December 1996, 90 days after the fiftieth instrument of Ratification or Accession was deposited. Over 191 countries were Parties as at September 2004. The Conference of the Parties (COP) is the supreme governing body of the Convention<sup>5</sup>.

---

<sup>1</sup> UNCOD was an outcome of extensive studies and consultations undertaken at the global, regional and local level involving scientist, policy and decision makers and experts from R&D institutions and other organizations from all over the world (UNEP, 1991).

<sup>2</sup> In the past, dry-lands recovered easily following long droughts and dry periods. Under modern conditions, however, they tend to lose their biological and economic productivity quickly unless they are managed in a sustainable manner.

<sup>3</sup> also known as the Earth Summit held in Rio de Janeiro, Brazil in June 1992

<sup>4</sup> It held five preparatory sessions before adopting the Convention on 17th June 1994 in Paris.

<sup>5</sup> COP held its first session in October 1997 in Rome, Italy; the second in December 1998 in Dakar, Senegal; the third in November 1999 in Recife, Brazil; the fourth in December 2000 in Bonn, Germany; and the fifth in October 2001 in Geneva, Switzerland

## **1. 2 OBJECTIVES OF UNCCD**

The Convention aims to promote effective action through innovative local programmes and supportive international partnerships. The treaty acknowledges that the struggle to protect dry-lands will be a long one - there will be no quick fix. This is because the causes of desertification are many and complex, ranging from international trade patterns to unsustainable land management practices.

### *Article 2 Objectives*

*"1. The objective of this Convention is to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification, particularly in Africa, through effective action at all levels, supported by international cooperation and partnership arrangements, in the framework of an integrated approach which is consistent with Agenda 21, with a view to contributing to the achievement of sustainable development in affected areas."*

*"2. Achieving this objective will involve long-term integrated strategies that focus simultaneously, in affected areas, on improved productivity of land, and the rehabilitation, conservation and sustainable management of land and water resources, leading to improved living conditions, in particular at the community level."*

### ***Obligations under the Convention***

There are four principal categories of obligation under the terms of the UNCCD and its regional implementation annexes:

- The common obligation of all Parties, including those unaffected by desertification, are spelled out mainly in articles 3, 4, 12, 14, 16, 17, 18, 19 and 20. They relate principally to international cooperation in implementing the CCD at all levels, particularly in the areas of the collection, analysis and exchange of information, research, technology transfer, capacity building and awareness building, the promotion of an integrated approach in developing national strategies to combat desertification, and assistance in ensuring that adequate financial resources are available for programmes to combat desertification and mitigate the effects of drought.
- Country Parties affected by desertification in Africa, Asia, Latin America and the Caribbean, and the Northern Mediterranean undertake to prepare national action programmes and to cooperate at the regional and sub-regional levels.

#### **Part II - Article 5 of the UNCCD: Obligations of the Affected Developing Country Parties**

- Give due priority to combating desertification and mitigating the effects of drought.
- Establish strategies and priorities within the framework of sustainable development.
- Address underlying causes of desertification and particularly to the socio-economic factors contributing to the desertification process.
- Promote awareness and facilitate the participation of local populations, particularly the women and youth, non-governmental organisations, in efforts to combat desertification and mitigate the effects of drought.
- Provide an enabling environment by strengthening the relevant existing legislation, enacting new laws, where they do not exist, and establish long-term policies and action programmes.

#### **Part III Section 1, Articles 9 & 10 National Action Programmes**

All affected developing country Parties shall prepare a National Action Programme, utilising and building to the extent possible, on existing relevant plans and programmes and sub-regional and regional action programmes, as the central element of strategy to combat desertification and drought.

- Other affected country Parties have the option of preparing action programmes following Convention guidelines, or more generally of establishing strategies and priorities for combating desertification.
- Developed country Parties have, under article 6, article 20 and other articles, specific obligations to support affected countries (particularly but not exclusively affected developing countries) by providing financial resources and by facilitating access to appropriate technology, knowledge and know-how.
- Parties are obligated (article 26) to report on measures they have taken to implement the Convention. Parties which have prepared National Action Programmes are obliged under article 10 to provide regular progress reports on their implementation.

#### ***Article 6: Obligations of Developed country parties***

- Providing substantial financial resources
- Promote the mobilization of new and additional funding
- Promote and facilitate to appropriate technology and know how

### **1.3 BANGLADESH CONTEXT**

The Government of Bangladesh (GoB) signed the convention (UNCCD) in 1994 and ratified in January 1996. By ratifying the convention the country became a party to it. The Convention came into force in 1997. Among many environmental issues facing Bangladesh, land degradation due to aridity and loss of crops due to droughts are important one. These cause considerable economic losses and human suffering than any other problem in Bangladesh. Gradually the desertification process is extending.

According to the criteria set by the Convention to Combat Desertification (CCD) for defining a dry region (the ratio of annual rainfall to potential evapotranspiration (ETo) may be a maximum of 0.65), no region within Bangladesh can be termed as dry region. However, Bangladesh does experience long spells of dry weather and moderate to severe droughts are spread over a region of 5.46 million ha. Between 1960 and 1991, droughts occurred in Bangladesh 19 times. Very severe droughts hit the country in 1951, 1961, 1975, 1979, 1981, 1982, 1984, and 1989. Past droughts have typically affected about 47 percent area of the country and 53 percent of the population. An analysis of the relative effects of flood and drought on rice production between 1969-70 and 1983-84 shows that drought is more devastating than floods to aggregate production.

**Article 4 of the Annex II, Regional Implementation Annex for Asia**

*National action programmes*

1. In preparing and implementing national action programmes, the affected country Parties of the region, consistent with their respective circumstances and policies, may, *inter alia*, as appropriate:

- (a) Designate appropriate bodies responsible for the preparation, coordination and implementation of their action programmes;
- (b) Involve affected populations, including local communities, in the elaboration, coordination and implementation of their action programmes through locally driven consultative process, with the cooperation of local authorities and relevant national and non- governmental organizations;
- (c) Survey the state of the environment in affected areas to assess the causes and consequences of desertification and to determine priority areas for action;
- (d) Evaluate, with the participation of affected populations, past and current programmes for combating desertification and mitigating the effects of drought, in order to design a strategy and elaborate activities in their action programmes;
- (e) Prepare technical and financial programmes based on the information derived from the activities in subparagraphs (a) to (d);
- (f) Develop and utilize procedures and benchmarks for evaluating implementation of their action programmes;
- (g) Promote the integrated management of drainage basins, the conservation of soil resources, and the enhancement and efficient use of water resources;
- (h) Strengthen and/or establish information, evaluation and follow up and early warning systems in regions prone to desertification and drought, taking account of climatological, meteorological, hydrological, biological and other relevant factors; and
- (i) Formulate in a spirit of partnership, where international cooperation, including financial and technical resources, is involved, appropriate arrangements supporting their action programmes.

2. Consistent with article 10 of the Convention, the overall strategy of national action programmes shall emphasize integrated local development programmes for affected areas, based on participatory mechanisms and on the integration of strategies for poverty eradication into efforts to combat desertification and mitigate the effects of drought. Sectoral measures in the action programmes shall be grouped in priority fields which take account of the broad diversity of affected areas in the region referred to in article 2 (a).

#### **1.4 UNCCD APPROACH FOR PREPARATION OF NAP**

Countries affected by desertification are implementing the Convention by developing and carrying out national, sub-regional, and regional action programmes. Criteria for 'preparing these programmes are detailed in the treaty's - five "regional implementation annexes": Africa (considered a priority because that is where desertification is most severe), Asia, Latin America and the Caribbean, the Northern Mediterranean, and Central and Eastern Europe. Drawing on past lessons, the Convention states that these programmes must adopt a democratic, bottom-up approach. They should emphasize popular participation and the creation of an "enabling environment" designed to allow local people to help themselves to reverse land degradation. Of course, governments remain responsible for creating this enabling environment. They must make politically sensitive changes, such as decentralizing authority, improving land-tenure systems, and empowering women, farmers, and pastoralists. They should also permit non-governmental organizations to play a strong role in preparing and implementing the action programmes. In contrast to many past efforts, these action programmes are to be fully integrated into other national policies for sustainable development. They should be flexible and modified as circumstances change.

The Convention's action programmes are being developed through consultations among affected countries, donors, and intergovernmental and non-governmental organizations. This process will improve coordination and channel development assistance to where it can be most effective. It will also produce partnership agreements that spell out the respective contributions of both affected and donor states and of international organizations. Developed countries are expected to encourage the mobilization of substantial funding for the action programmes. They should also promote access to appropriate technologies, knowledge, and know-how. The need for coordination among donors and recipients is stressed because each programme's various activities need to be complementary and mutually reinforcing.

The Convention opens an important new phase in the battle against desertification, but it is just a beginning. In particular, governments are regularly reviewing the action programmes. They also focus on awareness-raising, education, and training, both in developing and developed countries. Desertification can only be reversed through profound changes in local and international behavior. Step by step, these changes will ultimately lead to sustainable land use and food security for a growing world population. Combating desertification, then, is really just part of a much broader objective: the sustainable development of countries affected by drought and desertification.

The Convention will be implemented through action programmes. At the national level, the programme will address the underlying causes of desertification and drought and identify measures of preventing and reversing it. National programmes will be complemented by sub-regional and regional programmes, particularly when trans-boundary resources such as lakes and rivers are involved. Action programmes are detailed in the five regional implementation annexes to the Convention -- Africa, Asia, Latin America and the Caribbean, the Northern Mediterranean, and Central and Eastern Europe.

Desertification is land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities. Desertification affects about one sixth of the world's population, 70 per cent of all dry-lands, amounting to 3.6 billion hectares, and one quarter of the total land area of the world. The most obvious impact of desertification, in addition to widespread poverty, is the degradation of 3.3 billion hectares of the total area of rangeland, constituting 73 per cent of the rangeland with a low potential for human and animal carrying capacity; decline in soil fertility and soil structure on about 47 per cent of the dry-land areas constituting marginal rain fed cropland; and the degradation of irrigated cropland, amounting to 30 per cent of the dry-land areas with a high population density and agricultural potential.

### **1.5 THE PLANNING PROCESS FOR DEVELOPMENT OF NAP**

The National Action Programme (NAP) for Combating Desertification is a national document owned by the people. Its development has been based on a participatory process involving many stakeholders. The first step in this endeavour was obviously determining the methodology for development of the NAP. This was accomplished through the Inception Workshop. The participants at this Workshop, which included representatives of government agencies, NGOs, research organizations, the media, donors, and experts, suggested the adoption of a combined approach of both 'bottom up' and 'top down' planning processes. The 'bottom-up' approach was to be achieved through multi-stakeholders consultation at which representatives of grass-roots and local organizations could participate effectively while the 'top-down' approach was to be achieved through a number of thematic consultations.

Ideas and proposals were generated through multi-stakeholder consultation. Discussions of the thematic consultations came up with the status of status of land degradation/desertification, causes of degradation, threats and actions needed. Participants in the workshops identified the trend and status of land degradation/desertification, causes behind them, issues and actions for

combating the desertification/land degradation in specific region as well as at the national level in general.

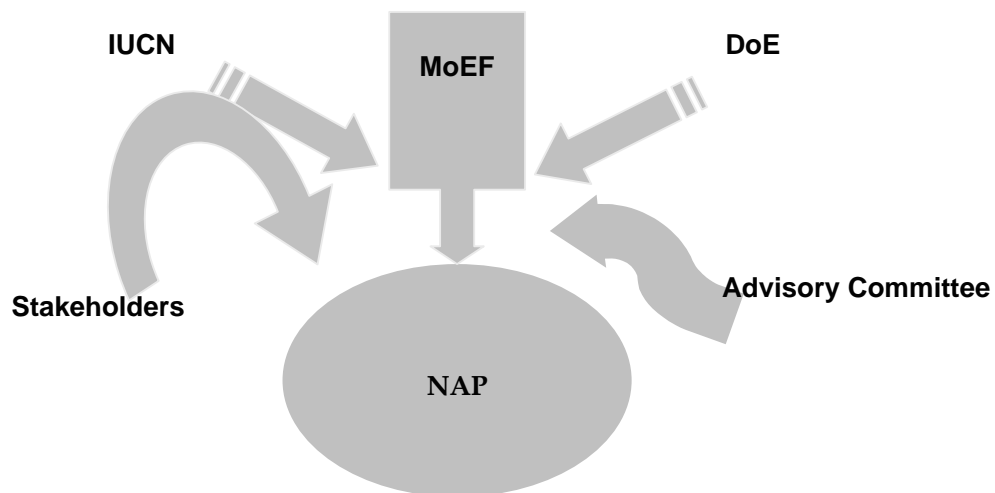
### 1.5.1 ADVISORY COMMITTEE

While preparing the NAP, an Advisory Committee was set up under the chairmanship of Director General (DG), Department of Environment (DoE) involving representatives of the following organizations and experts;

- Bangladesh Metrological Department
- Space Research and Remote Sensing Organization (SPARRSO)
- Bangladesh Agricultural Research Council (BARC)
- Department of Agricultural Extension (DAE)
- Bangladesh Water Development Board (BWDB)
- Forest Department (FD)
- Bangladesh Center for Advance Studies (BCAS)
- Department of Zoology, Dhaka / Rajshahi University
- Department of Botany, Dhaka / Rajshahi University
- Department of Geography and Environmental Science, Dhaka / Rajshahi University
- Barind Multi-purpose Development Authority (BMDA), Rajshahi
- Water Resources Planning Organization (WARPO)
- Center for Geographic Information System (CEGIS)
- Bangladesh National Herbarium (BNH)
- Planning Commission
- IUCN - The World Conservation Union , Bangladesh Country Office
- Environmental Expert, SEMP s

It has been decided that the committee will meet periodically and be responsible for the following:

- provide overall guidance for the preparation of the NAP
- review the draft NAP and prepare a prioritized set of recommendations.
- finalize the NAP document



## **Chapter Two: Country Profile**

## 2.1 PHYSICAL FEATURES

### 2.1.1 Physiography

Bangladesh occupies a unique geographic location -- spanning a relatively short stretch of land between the mighty Himalayan mountain chain and the open ocean. It is virtually the only drainage outlet for a vast river basin complex made up of the Ganges, Brahmaputra and Meghna rivers and their network of tributaries. These rivers, which cause almost regular and serious floods over much of the country during the summer monsoons, are reduced seriously during the dry winter months. If basin-wide collaboration could be mobilized to generate a higher dry weather flow and control the same during the monsoon, the benefits to millions of people could be immeasurable.

Three broad physiographic regions are discernible -- floodplains occupy about 80 per cent, terraces (slightly uplifted fault blocks) about 8 per cent, and hills about 12 per cent of the land area. Each of these regions exhibits its own geo-morphological characteristics, which make convenient a further sub-division into 19 generalized physiographic units as follows:

*Table 2.1: Physiographic Regions of Bangladesh*

<i>Unit</i>	<i>Physiographic Unit</i>	<i>Area sq. km</i>	<i>% of Country</i>
1	Old Himalyan Piedmont Plain	4008	2.77
2	Tista Floodplain	10304	7.11
3	Karatoya-Bangali Floodplain	2572	1.78
4	Lower Atrai Basin	851	0.59
5	Lower Punarbhaba Flood Plain	129	0.09
6	Brahmaputra Flood Plain	16344	11.28
7	Ganges River Floodplain	24508	16.92
8	Ganges Tidal Floodplain	17066	11.78
9	Gopalganj Khulna Beels	2247	1.55
10	Arial Beel	144	0.10
11	Meghna River Floodplain	2464	1.70
12	Meghna Estuarine Floodplain	17011	11.74
13	Surma Kushiya Floodplain	9195	6.35
14	Northern and Eastern Piedmont Plains	4038	2.79
15	Chittagong Coastal Plains	3720	2.57
16	Jinjiradwip(St. Martin's Coral Island)	8	0.01
17	Barind Tract	7727	5.33
18	Madhupur Tract	4244	2.93
19	Northern and Eastern Hills	18172	12.54
20	Akhaura Terrace	113	0.08
	Total	144865	100.00

Source: after FAO (1988)

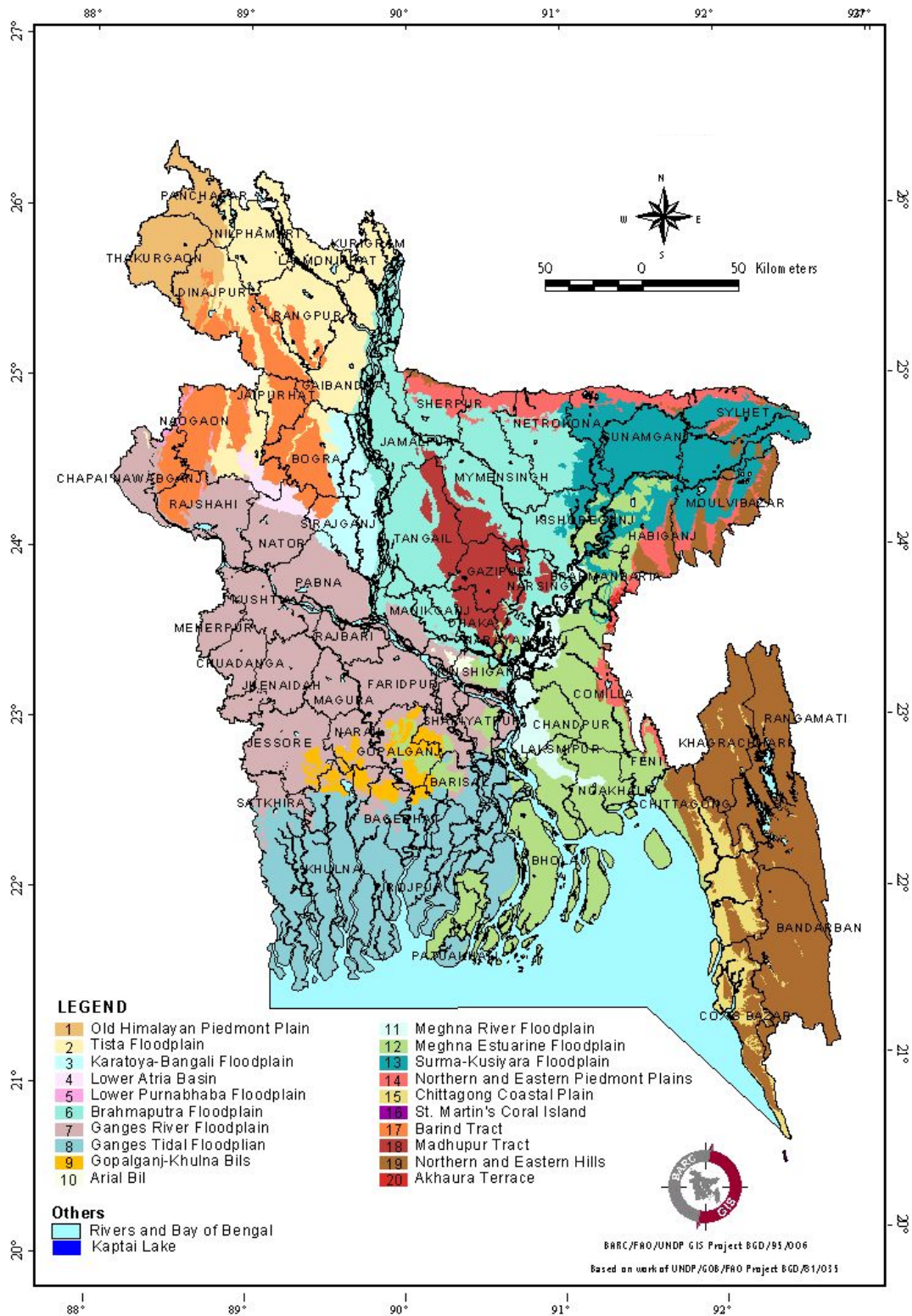
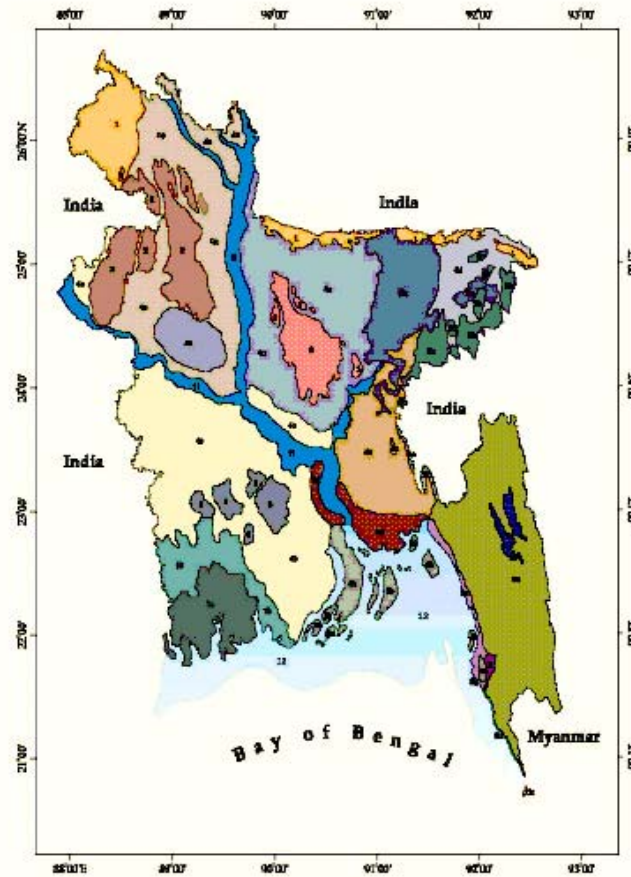


Figure 2.1 Physiographic units of Bangladesh

## Bio-ecological Zones of Bangladesh



- |                                   |                                   |
|-----------------------------------|-----------------------------------|
| 1. Himalayan Plateau Plain        | 7a. Sunderbans                    |
| 2. Barind Tract                   | 7b. Chittagong Sunderbans         |
| 3. Madhupur Bul Tract             | 8a. Coastal Plains                |
| 4a. Teesta Floodplain             | 8b. Offshore Islands              |
| 4b. Ganges Floodplain             | 8c. Morital Jijira Coral Island   |
| 4c. Brahmaputra-Jamuna Floodplain | 8d. Meghna Estuarine Floodplain   |
| 4d. Surma-Kushiyara Floodplain    | 8e. Sandy Beach/Sand Dunes        |
| 4a. Meghna Floodplain             | 8f. Chittagong Hills and the CHTs |
| 5a. Haor Basin                    | 8g. Sythet Hills                  |
| 8b. Chotan Bani                   | 8c. Lalmai-Tipesh Hills           |
| 8c. Kaptai Lake                   | 10. Salma Tidal Floodplain        |
| 8. Gopalganj/Walra Peat Lands     | 11. Major Rivers                  |
|                                   | 12. Coastal and Marine Wetlands   |



**IUCN**  
The World Conservation Union

Figure 2.2 Bio-ecological zones of Bangladesh

### 2.1.2 Geology and soils

The soil resource of Bangladesh could be divided into three major groups: floodplain, hill and terrace soils. The soils of the two terraces covering 8 per cent of the total area are diverse, ranging from deep, reddish brown friable well drained clay loams to grey, poorly drained silty top soils over clay on level highlands. The hilly areas spreading over 12 percent of the total land surface have mainly loamy soils of shallow depth, not suited for the cultivation of shallow-rooted crops because of the poor water-holding capacity. Figure 2.3 represents the highly generalized soil map of Bangladesh showing the overall distribution of 17 principal soil types of floodplain, hill and terrace soils. In many areas soil resources are being degraded due to improper use of land, fertilizer, irrigation, intensive cropping and some other activities.

#### 2.1.2.1 Floodplain Soils

The floodplain soils are alluvial deposits ranging from sandy soils deposited on higher ridges, silty clay loams on the lower ridges, silty clays and clays in the depressions occupying 80 per cent of the country's land area. Fresh alluvium is extensively deposited closer to the rivers, while the older deposits further away from the river are conducive to plant growth. There are 12 general soil types under the floodplain soils. These are: (1a) Calcareous Alluvium (non-saline), (1b) Calcareous Alluvium (seasonally saline), (2) Non-calcareous Alluvium, (3) Calcareous Grey Floodplain Soils, (4) Calcareous Dark Grey Floodplain Soils, (5a) Non-calcareous Grey Floodplain Soils (non-saline), (5b) Non-calcareous Grey Floodplain Soils (seasonally saline), (6) Non-calcareous Brown Floodplain Soils, (7) Non-calcareous Dark Grey Floodplain Soils, (8) Non-calcareous Dark Grey Floodplain Soils and Peat, (9) Black Terai Soils, (10) Acid Basin Clays, (11) Acid Sulphate Soils, (12) Grey Piedmont Soils,

#### 2.1.2.2 Terrace Soils

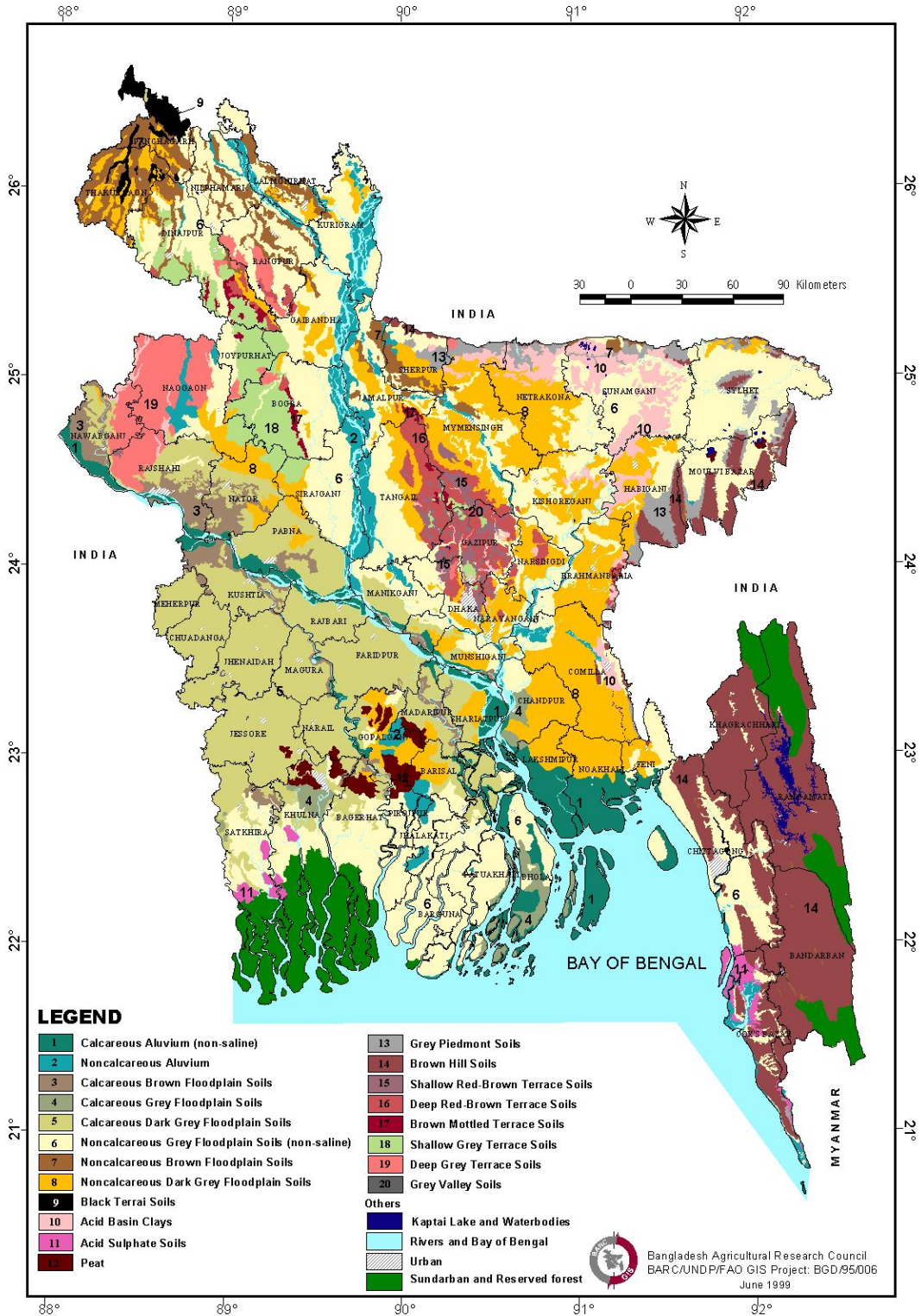
Terrace soils are usually found at Barind Tracts (level Barind Tract, High Barind Tract and Northeastern Barind Tract) and Madhupur tracts.

##### *Barind Tract*

The Barind Tract<sup>6</sup> is located in the centre and west of Rajshahi Division covering an area of 7,728 km<sup>2</sup>. It occupies one-fourth of the entire Rajshahi Division. The Barind Tract represents a series of uplifted blocks of Madhupur Clay. It has a low content of weatherable sand minerals. The greater part of the tract is almost level and is crossed by only a few minor rivers. The little Jamuna and Atrai flood plains occupy fault troughs which divide the tract into three main blocks. The western side of the western block has been tilted up to the west and subsequently dissected by valleys. Most of the land is poorly drained and is shallowly flooded by rain water in the rainy season. A transitional area in the south is more deeply flooded. Better drained soils occur near the northern

---

<sup>6</sup> Locally known as *Barendro Bhumi*



S

Figure 2.3 General soil types of Bangladesh

and eastern edges. Except in the West, the difference in elevation between the Barind Tract and adjoining floodplains is small. Alluvium has shallowly buried fringes of the Barind Tract within the Tista, Little Jamuna, Atrai and Mahananda floodplains. Agro-ecologically the Barind Tract is divided into three regions -- Level Barind Tract, High Barind Tract and Northeastern Barind Tract.

#### Level Barind Tract

The Level Barind Tract occupies about 65 per cent of the entire Barind Tract. Its boundaries with other Barind Tract regions are transitional. Located in Dinajpur, Gaibanda, Jaipurhat, Bogra, Nogaon, Natore and Sirajganj districts, this tract covers an area of 5,049 km<sup>2</sup>. Two subregions depending upon the depth of flooding have been recognized -- Highland and Medium Highland; Medium Lowland and Lowland. Although the landscape appears flat, there are slight differences in elevation between the higher parts on which villages are located and the slight depressions lying between them. Relief is locally irregular near the entrance of river channels, with shallow gullies cutting back into the adjoining plain land. In the West, elevations gradually increase as this region merges with the High Barind Tract. The region is seasonally flooded within field bunds. The whole of the level landscape is poorly drained in the rainy season.

The Grey Terrace soils are characteristic of the Barind Tract. The predominant soils have a grey, silty, puddled topsoil and plough-pan. All soils become very dry in the surface layer during the dry season.

The mean annual rainfall is highest in the northeast (2,000 mm) and lowest in the southwest (1,300 to 1,500 mm). Very small amounts of surface water are available in rivers and tanks for dry season irrigation. Transplanted *aman* is the major *khari* crop. It is widely preceded by broadcast or transplanted *aus* in the East and North. Non-irrigated land generally remains fallow in the dry season. Early rabi crops are grown where irrigation is available.

#### High Barind Tract

The High Barind Tract was previously termed the Dissected Barind Tract. It includes the western part of the Barind Tract where the underlying Madhupur Clay has been uplifted and cut into deep valleys. It occupies about 20 per cent of the Barind Tract. The western and southern boundaries of the region are sharp, but the eastern boundary is transitional. The High Barind Tract is located in Rajshahi, Nawabganj and Nogaon districts and covers an area of 1,600 km<sup>2</sup>. Virtually all the land stands above normal flooding level. Terracing of sloping land during the past two centuries to hold rainwater on the soil surface for paddy cultivation has greatly reduced the rate of run-off. Despite the sloping relief, this region has predominantly poorly drained grey

soils with silty topsoil similar to those occurring on the Level Barind Tract. The region lies in the driest part of the country and is semi-arid in character. The mean annual rainfall is about 1,350 mm.

Limited surface water supplies are available in tanks. Groundwater supplies are generally poor in the more hilly western part. The predominant land use is transplanted *aman* grown as a single crop during the rainy season. The rest of the year is arid and basically crop less. Development prospects are more restricted than on the Level Barind Tract.

#### Northeastern Barind Tract

The Northeastern Barind Tract occupies about 15 per cent of the Tract in several discontinuous areas on the northern and eastern margins. The boundaries with adjoining floodplain regions are mainly sharp, but are transitional with those of the adjoining areas of the Level Barind Tract. The region is located in Dinajpur, Rangpur, Gaibanda, Jaipurhat and Bogra districts and covers an area of 1,079 km<sup>2</sup>. This is the only part of the Barind Tract which has red soils similar to those of the Madhupur Tract. Three sub-regions have been recognized, separating areas with different proportions of well-drained, moderately well-drained and poorly drained soils. Most of this region is better drained than the adjoining land on the Level Barind Tract and in floodplain regions. The region is shallowly flooded in the rainy season. A few valleys are seasonally deeply flooded and their lower parts remain wet or submerged throughout the dry season. The mean annual rainfall is highest in the northeast (about 2,000 mm) and decreases to around 1,800 mm in western and southern areas.

Surface water supplies are limited to those in tanks and a few *beels*. Groundwater is readily available in the major area in the northeast and is widely exploited by dug wells and tube wells. Field crops include sugarcane, *aus* rice, mustard, black gram (*mashkalai*); with irrigation, potatoes, vegetables, wheat are grown in addition to rain fed *aus* paddy.

Evidence of desertification is noticeable in the dry and bare soil conditions on the Barind Tract during the prolonged dry season. The Barind Tract is considered as an ecologically fragile zone with extremely low vegetation cover. It has practically no tree cover except in the homesteads. Its organic matter content of the soils is very low. During high summer temperatures, the moisture-holding capacity of the silty top soils especially when paddled for paddy cultivation is low. Puddling of soils for paddy cultivation in the Kharif season leaves the topsoil dry and hard or powdery in the dry season and therefore, bare even of weed growth. Powdery topsoil is blown away during the dry season.

Breaking up the existing plough-pan in Grey Terrace and Valley Soils to allow deeper rooting could destroy their bearing capacity when wet, turning them into a bottomless quagmire in the rainy season and a hard, solid mass in the dry season. Low moisture holding capacity, low organic matter content and low natural fertility of the major soils limit the development potential of the Barind Tract for maximizing crop production.

The abstraction of groundwater for irrigation is already drawing down dry season water levels in some areas below the operational level of dug wells and DTWs used to provide domestic water. This problem is likely to aggravate as tube well irrigation extends and becomes more intensive. In an effort to attain food self-sufficiency in the dry land of the Barind Tract, attempts to substitute dry-land crops for paddy cultivation could destabilize the Barind soils.

#### Madhupur Tract

The Madhupur Tract extends over the districts of Dhaka, Gazipur, Narsingdi, Narayanganj, Tangail, Jamalpur, Mymensingh and Kishoreganj covering an area of 4,244 km<sup>2</sup>. The boundaries between this region and adjoining regions generally are sharp. However, they are transitional in the Southwest and parts of the Southeast where floodplain sediments have buried the dissected edges of the Madhupur Tract, leaving small hillocks of red soils as 'islands' surrounded by floodplain soils. Three kinds of valley systems dissect this tract, giving rise to significant differences in relief and soils. The following 6 sub-regions are recognized:

##### *Level terrace with deep, well drained soils*

These are level upland areas with deep, mainly well drained and moderately well drained, red and brown soils. There are few or no valleys.

##### *Dissected terrace with deep, well drained soils*

Closely dissected upland areas with deep well drained red soils on level upland sites, and deep, broad valleys with mainly grey and dark grey heavy clays.

##### *Dissected terrace with shallow soils and narrow valleys*

Closely dissected areas with shallow, moderately well to poorly drained, mainly brown soils on gently undulating uplands, and mainly grey silty soils in narrow, shallow valleys.

Climatic conditions are relatively uniform over the Madhupur Tract. Mean annual rainfall increases from around 2,000 mm in the south to more than 2,300 mm in the North. Eleven general soil types occur in the region.

Only limited amounts of surface water are available in rivers and beels, and these are almost fully exploited. Rivers in the south are tidal in dry season, but they are not saline. Groundwater is generally available.

Upland areas are mainly under poor coppice sal forest or scrub grassland. Cultivated upland soils grow poor crops of aus, mesta, groundnut, mustard and mashkalai. Valleys are used for transplanted aus followed by transplanted aman. With irrigation, HYV boro is followed by transplanted aman.

In the level terrace mainly rain fed aus followed by mashkalai or mustard are grown with jackfruit trees on field boundaries. Sugarcane, kharif groundnut and mesta are locally important. With irrigation, wheat, potato, and rabi vegetables are the main crops. Sal forests cover part of the area. The lowest valley sites remain under water, providing irrigation water which is also used for fisheries.

The Madhupur Tract has complex relief and soil patterns. The broken relief makes it difficult to provide irrigation channels. Upland soils and Grey Valley Soils have low moisture holding capacity and low natural fertility. Red soils are strongly phosphate fixing and appear to be deficient in potash, zinc and sulphur. Grey Terrace and Valley Soils have low structural stability in the silty topsoil and subsoil. Breaking up the plough pan would cause loss of bearing capacity when the soils are wet. The sloping soils on upland edges are vulnerable to erosion. Deep flooding in broad valleys and flash floods in valleys are common. All the cultivated upland soils are already depleted in organic matter and fertility due to continued cultivation without adequate return of organic matter and nutrients to the soils.

These constraints limit the potentials for agricultural development and render the Madhupur Tract an ecologically vulnerable region. Over 70 per cent of the sal forest area is either degraded or encroached. The present land use in the forest area is detrimental to ecological stability. It encourages destruction of the forest cover resulting in serious ecological imbalance. The imperative is to go for an environmentally sound integrated land use planning for sustained development of the entire Madhupur Tract.

### **2.1.2.3 Hilly soils**

These include a wide range of soils developed over consolidated and unconsolidated sandstones, siltstones and shales which underlie the Northern and Eastern Hills (and their outliers in neighbouring physiographic units). They are mainly excessively to moderately well drained, strong brown or yellow-brown, friable, sandy loams to sandy clay loams occurring on steep slopes.

The majority are deep over soft or fragmented rock, but shallow soils over hard rock or ironpan (laterite) occur locally. On the level or rounded summits of some low hills there are redder soils overlying a strongly red-mottled sub-stratum.

Almost all hill soils are strongly to extremely acid, moderately to rapidly permeable and low in moisture holding capacity. Organic matter contents are moderate (locally high) under old forest, but generally are low in soils that have been repeatedly used for shifting (jhum) cultivation.

The agricultural potential of most hill soils is severely limited by the steep slopes on which they occur, aggravated by the heavy monsoon rainfall and depleted soil fertility resulting from repeated jhum cultivation. They are best suited for tree crops or forest production. Terracing for the cultivation of field crops would be impractical on most soils because of the lack of suitable materials for making retaining walls and the risk of introducing landslip erosion.

#### **2.1.2.4 Char land**

In Bangladesh newly accreted land in the form of mid-channel bar in the braided river course are called char lands. The soils of these char lands have predominance of sand deposits. The Brahmaputra-Jamuna course in Bangladesh has length of about 266 km and an average width of 11 to 13 km. The char areas in this river course are virtually conglomerations of sandy islands and some of these islands are quite big and has habitation and are cultivated.

The region has an irregular relief of broad and narrow ridges and depressions, interrupted by cut-off channels and active channels. Both the outline and relief of char formations are subjected to change each flood season due to bank erosion by shifting channels and to depositions of irregular thickness of new alluvium. Local differences in elevation ranges from 2 to 5 meters. In recent FAP studies such char areas have been grouped as active flood plain areas.

#### *Coastal areas*

The coastal ecosystem of Bangladesh consists of the complex delta of the Ganges-Brahmaputra-Meghna (GBM) river systems. The systems while flowing through Bangladesh on its way to Bay of Bengal, carry an estimated annual sediment load of 1.5 - 1.8 billion tons. These sediments are subjected to coastal dynamic processes generated mainly by river flow, tide and wind actions, leading to accretion and erosion in the coastal area.

The coastal morphology of Bangladesh is characterized by:

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

The entire coast is about 710 km long and can be broadly divided into three distinct physical regions: the eastern, central and western regions. The soils in the eastern and central parts are grey to silty clay loam, and in the western region the soils are grey to dark grey silty clay to clay. They are saline.

### **2.1.3 Climate**

The climate of Bangladesh is sub-tropical and is greatly influenced by the presence of the Himalayan mountain range and the Tibet plateau in the north and the Bay of Bengal in the south. There are three seasons in a year: summer, monsoon and winter. The rainfall is either monsoonal, inter-monsoonal or cyclonic in origin. The mean annual rainfall varies from as low as 1,500 mm in western region to as high as 5,000 mm in the eastern region. The summer covers the period from March to June. The average temperature during the summer months is 27.8°C. The maximum summer temperature ranges between 33°C and 35°C although occasionally it rises up to 40°C or more. Weather remains hot and humid throughout the summer season. Cyclones and tornadoes are also quite common during this period with average rainfall of 762 mm. Cyclones are often very destructive, sometimes moving at speeds of over 150 km per hour and creating storm surges as high as 9 m in the coastal belt causing colossal loss of life and property.

The monsoon season is spread over the months of June to October. Humid air blowing from southwest brings torrential rains. During the rainy season the rainfall varies from 1,270 mm to 3,988 mm. Humidity level remains over 80 per cent. The sky remains mostly cloudy. Eighty per cent of the rainfall occurs during the monsoon months.

The winter season is spread over the months of November to February of the following year. Average temperature is 17.80C while minimum temperature is 7.20C. The minimum temperature

can, however, have wide variation. In 1905 the minimum temperature recorded in Dinajpur was 1.10C (Hasan, 1985) and in 1990 1.50C (BMD Weather Bulletin). There are hardly any rains during the winter months, but when they occur, usually less than 10 mm. The weather remains dry and the sky is clear. Early morning fog and mist is a common phenomenon.

In the middle of October and November, the monsoon wind changes its course. Low pressures develop in the Bay of Bengal and cyclones, at times with hurricane wind speed, build up and travel towards north and strike the Bangladesh coast.

Although in area Bangladesh is a small country, the climate variation is quite well marked. According to Rashid (1977) Bangladesh may be broadly divided into seven climatic zones: (i) Northern part of northern zone, (ii) Northwestern zone, (iii) Western dry zone, (iv) Southwestern zone, (v) South central zone, (vi) Northern zone, and (vii) Southeastern zone (Fig. 4).

In recent years, due to global warming, Bangladesh environment is under threat. Besides the regular disasters like drought, flooding, norwester, tornado, cyclone and tidal surge, Bangladesh is also susceptible to sea-level rise and large scale inundation of its low lying land due to global warming.

#### 2.1.4 Hydrology

Bangladesh is situated in the monsoon region of South Asia. Though, comparatively a small country in terms of area, its population has made it 11<sup>th</sup> largest country of the world. Its location with the Bay of Bengal and Indian Ocean to the south, iced cap Himalayan range to the north has made it sensitive to the any changes in world monsoon climate. The Exhibit to the left shows location of Bangladesh in the south Asia monsoon region. The three major rivers of the region (the Ganges, the Brahmaputra and the Meghna) that drains parts or whole of the areas in China, Nepal, Bhutan, India and Bangladesh confluence within the central region of Bangladesh. Most parts of the country are the flood plains of the three great rivers and tides from the bay travel far inland and vast areas in the coast are below high tide. Coastal flood plains are also frequently affected by some killer tropical cyclones.

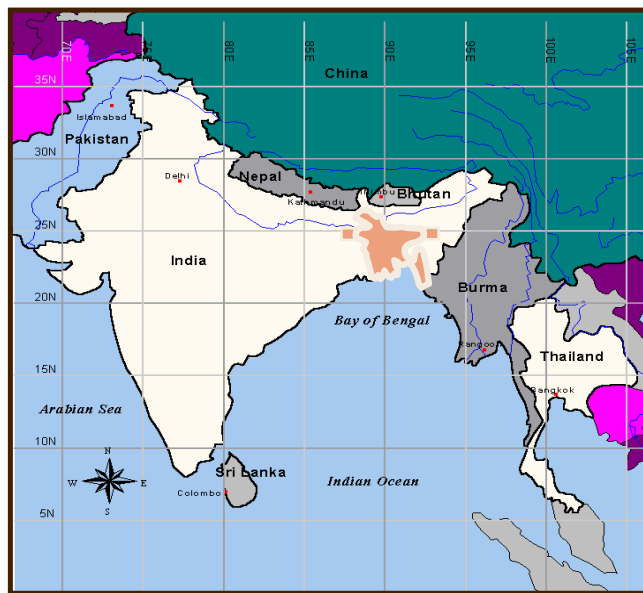


Figure 2.4 location of Bangladesh in the South Asia Monsoon Region

In addition to the three major rivers there are 54 other medium to small Cross-Boundary rivers, which enter Bangladesh through the border. There are a very large number of rivers, rivulets, distributaries and abandoned river courses that have important role for providing local drainage and water supply. Bangladesh Water Development Board has recently published a list of 318 rivers considered significant and of these 162 rivers are presently gauged.

The river flow in Bangladesh is characterised by the monsoon in the region i.e. a distinct wet and dry season. Thus both for rainfall and river flow June to September is the wet season with widespread rainfall and high river flow followed by a long dry season of eight months from October to May through December. Exhibit to the left shows the monthly flows in  $m^3/s$  for the three major rivers from June to June through January. Ganges-Kobadak Irrigation Project on the Ganges-Padma at Bheramara is already facing serious shortage of water due to diversion of Ganges water at Farakka. Similar is the case in the Teesta Irrigation Project in Rangpur due to diversion of Teesta water at Gajaldoba in India. Many smaller rivers in Bangladesh are facing similar fate due to upstream withdrawal in India. Thus in addition to rainfall, droughts in the rivers during the long dry season, the rivers are also facing man made droughts due to upstream withdrawal during the dry season.

In Bangladesh continuous days of no rainfall may range up to 113 days and days for 25 mm rain may range up to 166 days. This shows the severity of drought in Bangladesh during the dry season.

The most two important areas of environmental concern are rainy season inundation characteristics of land and frequency of occurrences of hazardous flood. Inundation characteristics provide information on whether a land is still inundated or not. If inundated, to what depth and how long the water stays on the land surface? Further, when does the level attain

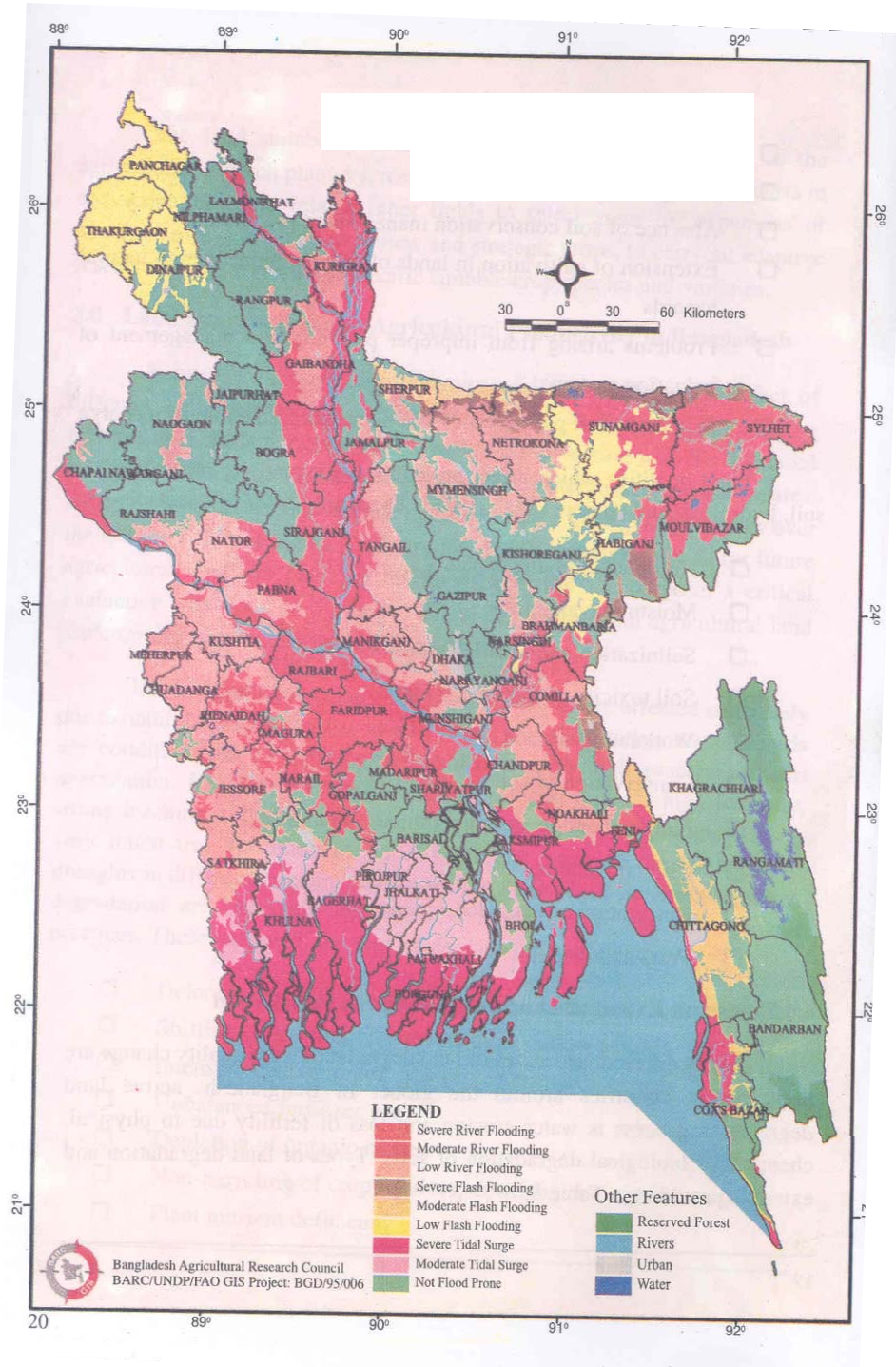


Figure 2.5 Flood prone areas of Bangladesh

the peak? All these factors have the significant bearing on the crop/cropping pattern adaptability in Bangladesh. So the topographic position of land in relation to the monsoon season inundation which, in other words called 'inundation land type' will largely decide the LUT in the country.

Taking consideration of crop availability, six inundation land types have been recognized in Bangladesh.

*Table 2.2 Inundation land type*

<i>Land Type</i>	<i>Features</i>
Highland (H)	Land which is the above normal inundation level and would normally not develop wetland conditions unless rainwater is ponded
Medium Highland - 1 (MH1)	Land which normally is inundated less than 30 cm deep
Medium Highland - 2 (MH2)	Land which normally is inundated between a depth of 30 cm and 90 cm
Medium Lowland (ML)	Land which normally is inundated to a depth between 90 cm and 180 cm
Lowland (LL)	Land which normally is inundated to a depth between 180 cm and 300 cm
Very Low Land (VLL)	Land which normally is inundated to a depth more than 300 cm

*Source: BARC 1991*

## **2.2 SOCIO- ECONOMIC CHARACTERISTICS**

### **2.2.1 Demographic features**

Bangladesh with an area of 147,570 sq. km has a population 130 million with highest population density in the world (except some island countries). Population density of Bangladesh is 867 per sq. km Population is expected to stabilize by 2050 at around 258 million. The population growth rate was 2.16 per cent in 1990 and at present it is 1.59 per cent. From 1951 to 1989 population has increased by more than 62 million.

Given the Crude Birth Rate (CBR) and Crude Death Rate (CDR) trends, it appears that low growth is too remote as yet, in spite of the fact that Contraceptive Prevalence Rate (CPR) has increased and Total Fertility Rate (TFR) has decreased significantly. In an estimate in January 1990 World Resources Institute (WRI), Washington has forecast that the population of Bangladesh may not stabilize before reaching 340 million although measures for population control are being implemented successfully.

Table 2.3: Demographic data sheet

Indicator	Number / Rates / Ratios
Total Population	130 million
Population density (Per Sq. Km.)	867 persons.
Crude Birth Rate (CBR) per 1000 live births	19.9
Crude Death Rate (CDR) per 1000 live births	4.8
Total Fertility Rate (TFR)	3.3
Maternal Mortality Rate (MMR) per 1000 live births	3.0
Infant Mortality Rate (IMR) per 1000 live births	57
Life Expectancy at Birth (National)	60.6 years
Male	60.7 years
Female	60.5 years

Source: BBS 2000

### 2.2.3 Pattern of development

Annual per capita income is around US \$444. The high density of population has contributed to the intense exploitation and in many cases over-exploitation of natural resources like forests, fisheries, land and water. Population growth has degrading effect on the availability of basic amenities/facilities of life like education, employment opportunities, and health and sanitation. There are obvious links among population, poverty, development and environment. Due to high population density and since Bangladesh is still an agricultural economy, per capita availability of resources has decreased. At the same time, there has been an increase in unemployment that further aggravates the poverty situation.

# **Chapter Three**

## **Land degradation and deforestation**

### 3.1 LAND DEGRADATION AND DEFORESTATION

Large scale degradation of land resources has been reported from all over the world (Hillel 1991). Degradation of land involves the reduction of the renewable resource potential by one or a combination of processes acting upon the land. The resource potential relates to agricultural suitability (rain fed or irrigated arable cropping, animal husbandry, forestry, inland fishery), primary productivity level, and natural biotic functions.

“Land” means the terrestrial bio-productive system that comprises soil, vegetation, other biota, and the ecological and hydrological processes that operate within the system.

“Land degradation” means reduction or loss in arid, semi-arid and dry sub-humid areas of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from landuses or from a process or combination of processes, including processes arising from human activities and habitation patterns such as:

- (i) soil erosion caused by wind and/or water;
- (ii) deterioration of the physical, chemical and biological or economic properties of the soil;
- (iii) long-term loss of natural vegetation.

“Dryland” refers to the arid (excluding the polar and sub-polar regions), semi-arid and dry sub-humid areas in which the annual precipitation to potential evapotranspiration falls within the range from 0.05 to 0.65.

“Combating desertification” includes activities which are part of the integrated development of land in arid, semi-arid, and dry sub-humid areas for sustainable development which are aimed at:

- (i) prevention and/or reduction of land degradation;
- (ii) rehabilitation of partly degraded land; and
- (iii) reclamation of desertified land.

“Drought” means the naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems.

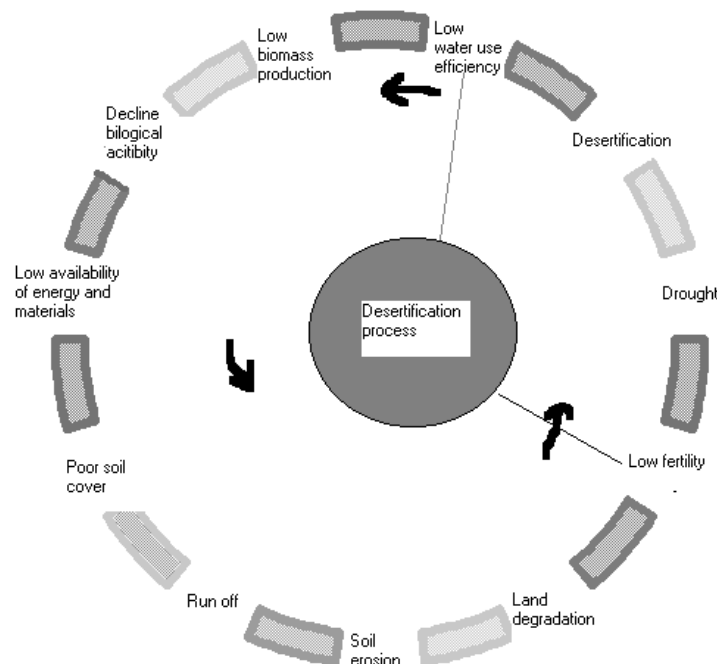


Figure 3.1 The land degradation spiral

### **The nature of land degradation**

*Desertification is defined as: "Land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities" (Chapter 12 of UNCED's Agenda '21). Desertification was earlier considered as the spread of desert-like conditions in arid or semiarid areas. It is now seen as a process of degrading or changing the land use to another category and ultimately reducing the productive potentials of land. The various elements of desertification may be quantified in terms of the causes, general extent and physical consequences of the process. According to terminology accepted by CCD, "Land degradation" means reduction or loss, in arid, semi arid and dry sub-humid areas, of the biological or economic productivity and complexity of rain fed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from land uses or from a process or combination of processes, including processes arising from human activities and habitation patterns, such as:*

- (i) soil erosion caused by wind and or water;*
- (ii) deterioration of the physical, chemical and biological or economic properties of soil; and*
- (iii) long-term loss of natural vegetation.*

Further the CCD defines "arid, semi-arid and dry sub-humid areas" as areas, other than polar and sub polar regions, in which the ratio of annual precipitation to potential evapotranspiration falls within the range of 0.05 to 0.65.

### 3.2 STATE OF LAND DEGRADATION IN BANGLADESH

Bangladesh has a total land surface of 12.31 million hectares, of which presently 7.85 million hectares are under agriculture (BARC 2001). It accommodates more than 130 million people. This amounts to an average of 27 percentile of land and 17 percentile of cultivable land per head. Moreover, due to population growth, this share of land per capita is shrinking every year making the resource base for agriculture, forest and wetlands more vulnerable and marginalized. For example, in 1983-84, there was 20.0 million ha of total cultivable land, which dropped to 17.5 million ha in 1997. On average we are losing nearly 82,000 ha of land each year. This is mainly due to conversion of land into urban, peri-urban, industrial uses, and construction of roads, embankment. Competition between forest and agriculture, fisheries and agriculture are also responsible for some conversions (e.g., Chokoria Sundarban of Cox's Bazar district and its adjacent areas).

Table 3.1 Different types of land degradation and their extent in Bangladesh

Types of land degradation	Areas (in mha) affected by different degrees of degradation				Total area (mha)
	Light	Moderate	Strong	Extreme	
1. Water erosion	0.1	0.3	1.3	-	1.7
- Bank erosion	-	1.7	-	-	1.7
2. Wind erosion	-	-	-	-	-
3. Soil fertility decline	3.8	4.2	-	-	8.0
- P deficient (for HYV rice)	5.3	3.2	-	-	8.5
- P deficient (for Upland crops)	3.1	2.5	-	-	5.6
- K deficient (for HYV rice)	4.0	3.4	-	-	7.4
- K deficient (for Upland crops)	2.1	5.4	-	-	7.5
- S deficient (for HYV rice)	4.4	3.3	-	-	7.7
- S deficient (for Upland crops)	4.1	4.6	-	-	8.7
Soil organic matter depletion	1.94	1.56	4.05	-	7.55
4. Water logging	0.69	0.008	-	-	0.7
5. Salinization	0.29	0.43	0.12	-	0.84
6. Pan formation	-	2.82	-	-	2.82
7. Acidification	-	0.06	-	-	0.06
8. Lowering of water table	-	-	-	-	-
9. Active flood plain	-	-	-	-	1.53
10. Deforestation	-	0.3	-	-	0.3
11. Barind	-	-	-	-	0.773

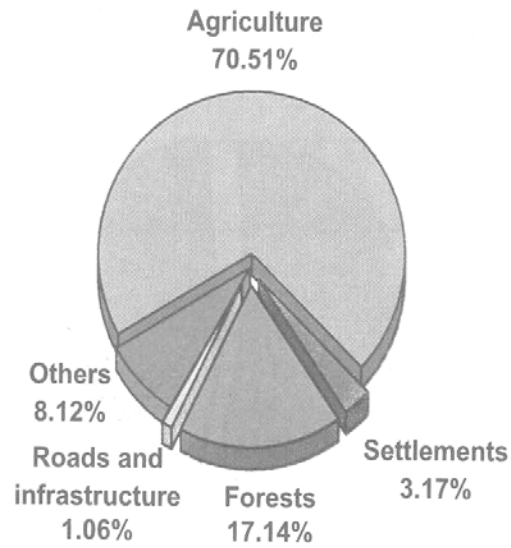
Source: BARC, 1999

More recent data on the extent of land degradation estimates that about 5 million hectares, or 33 percent, of total land acreage in Bangladesh falls below the minimum threshold for sustainable cultivation. In drier parts of Bangladesh low soil fertility is recognized to be at the root of the land degradation spiral (Zuberi, 1998):

Table 3.2 Extent of dry zone in Bangladesh

Dry Zone	No of Thanas occupied	Area covered (M ha)	Percent of total land
Moderate	64	2.015	14.37
Slight	163	4.427	31.56
Non-dry	263	7.585	54.07

Proportions of Area under Different Land Use (1983/84)



Proportions of Area under Different Land Use (1996/97)

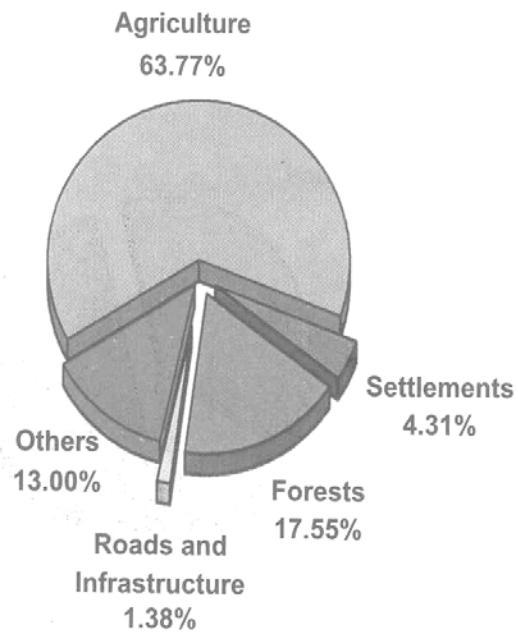


Figure 3.2 Changes in the land use pattern between 1983/84 and 1996/97

### 3.3 CAUSES OF LAND DEGRADATION

Land degradation is generally caused by two factors: (i) anthropogenic factors or by actions of human towards management of land to exploit its productive capability, and (ii) natural factors like floods, erosion, and landslides. In certain cases land degradation takes place as a consequence of the combined actions of man and nature. The driving forces and pressures, state, and impact related to land degradation, and responses to address the problems (GOB-BCAS-SACEP- NORAD- UNEP, 2001) are:

- (i) Improper cultivation in terrace land, floodplains and piedmont plains;
- (ii) Low Efficient Irrigation System;
- (iii) Imbalanced fertilizer use;
- (iv) Formation of plough pan;
- (v) Improper use of pesticides;
- (vi) Over exploitation of biomass from agricultural fields;
- (vii) Unplanned rural infrastructure (road embankment, *fcd/i*) causing water logging;
- (viii) Development of brickfields in good agricultural land and destruction of biomass;
- (ix) Industrial development without consideration of land use priority;
- (x) Mining of sand and gravels from agricultural land;
- (xi) Land ownership and tenure;
- (xii) River bank erosion and accretions;
- (xiii) Sandy over-wash on agricultural land; and
- (xiv) Salinity intrusion
- (xv) Over grazing
- (xvi) Major reduction in dry season river flow

#### 3.3.1 Anthropogenic causes

##### *Shifting Cultivation*

Shifting cultivation, locally known as *jhum*, has been a common cultivation practice by the hill people in the districts of Khagrachari, Rangamati and Bandarban for many years. As availability of land has been decreasing, the frequency of use of land under shifting cultivation is increasing leading to topsoil losses.

Table 3.3 Land degradation (soil loss) due to shifting cultivation

Location	Predominant slope	Soil loss (t/ha/yr)
Khagrachari	60% area under 60% slope	10.10- 67.00
Manikchari	46% area under 40% slope	12.00 - 120.00
Ramgarh	48% area under 40% slope	7.00 - 27.00
Rangamati	53% area under 40% slope	26.00 - 68.00
Raikhali	49% area under 40% slope	53.00 - 27.00
Bandarban	58% area under 60% slope	8.00 - 107.00
Teknaf	56% area under 20% slope	-

Source : Iqbal and Karim 1992

#### ***Faulty Cultivation Practice***

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

#### ***Use of Pesticides***

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

#### ***Soil mining in Agricultural Land***

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

#### ***Irrigation***

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

degrades the soil by continuous submersion for a prolonged period. The causes of soil degradation due to continuous submersion are:

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

#### *Overexploitation of biomass*

One of the important causes of land degradation in Bangladesh is over-exploitation of biomass from the cultivation fields for fuel, fodder and thatching. Due to the short supply of organic manure, acute sulfur deficiency has occurred in many places. Organic matter is one of the main media for retention of moisture in the soil. With the loss of organic matter soils could become more susceptible to drought. The critical areas in this respect are the areas where Aus followed by transplanted Aman are grown. Another critical area is the Barind Tract, the western part of which shows symptoms of increasing aridity during the dry months, i.e., March and April.

### **3.3.2 Natural causes**

#### *Change in Coastal Morphology*

The characteristic coastal morphology of Bangladesh causes accretion in some places and erosion in other places. From a satellite study made by the Space Research and Remote Sensing Organization (SPARRSO) it is found that between 1973 and 1987, an area of about 302 km<sup>2</sup> has been accreted in the coastal region. Out of this, about 60 per cent have been accreted from the Bay of Bengal and 40 per cent by the reduction of estuarine area. This reduction in the area aggravates floods. The accretion of 302 km<sup>2</sup> is the balance of accretion and erosion. Some unstable lands have been accreted at the southeastern part of Hatia, but more valuable land has been eroded at the northern portion of the island. Erosion in Bhola and Sandwip is continuing at an alarming rate.

#### *River Bank Erosion*

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

#### *Sedimentation on Agricultural Land*

Another form of land degradation, though occurring locally, is deposition of sandy materials on agricultural land particularly in pediment areas of northern Netrokona district and in valleys of the hills in the greater Sylhet and Hill Tracts districts. This phenomenon is the result of deforestation of the hills and faulty cultivation practice in the upper catchment areas. Land

degradation by deposition of infertile soil on agricultural land also occurs by breach of embankment during floods.

### *Salinity*

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

### *Land Fragmentation*

Land tenancy laws in Bangladesh are very complicated and land records in many cases are not up-to-date, leading to protracted litigation. The existing inheritance law contributes to fragmentation of already small units. Such fragmentation reduces effective crop area and this is regarded as a kind of land degradation because total or optimal productivity of land decreases due to segmented land management.

## **3.4 DROUGHTS IN BANGLADESH**

*According to definition of CCD "drought" means the naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resources production systems.*

Drought is a "creeping phenomenon," The effects of drought accumulate slowly over a considerable period of time, and may linger for years after the termination of the event. Drought impacts are spread over a larger geographical area than are damages that result from other natural hazards. Like floods, Bangladesh is also vulnerable to recurrent droughts.

After 1971 Bangladesh has experienced droughts of major magnitude in 1973, 1978, 1979, 1981, 1982, 1989, 1992, 1994, and 1995. Although droughts are not always continuous in any area, they do occur sometimes in the low rainfall zones of the country. As listed above, Bangladesh experienced consecutive droughts in 1978-1979, 1981- 1982, and 1994-1995. The droughts of 1994-95 in the northwestern districts of Bangladesh led to a shortfall of rice production of 3.5 million tons (Paul, 1995). Two critical dry periods are distinguished (Karim et al., 1990). Rabi and pre-Kharif drought (January - May), due to:

- (i) the cumulative effect of dry days;
- (ii) higher temperatures during pre-Kharif (> 40 degrees Celsius in March-May); and
- (iii) low soil moisture availability.

This drought affects all the Rabi crops, such as HYV Boro, Aus, wheat, pulses and potatoes especially where irrigation possibilities are limited. It also affects sugarcane production. Kharif droughts in the period June/July to October, created by sub-humid and dry conditions in the highland and medium highland areas of the country (in addition to the west/northwest also the Madhupur tract is drought prone). Shortage of rainfall affects the critical reproductive stages of transplanted Aman crops in October, reducing its yield, particularly in those areas with low soil moisture holding capacity. Considering the Agro ecological Zones (AEZ) database and land resources inventory map at 1:1,000,000 scale, BARC has identified and mapped drought prone areas of Bangladesh for Rabi and Pre-Kharif seasons (WARPO- EGIS, 1996). Recently BARC has reviewed this concept and produced three different maps for Rabi, Pre-Kharif and Kharif seasons (BARC, 2001). The drought severity classes defined in the maps are slight, Moderate, severe and Very severe related to the yield losses of 15-20%, 20-35%, 35-45%, and 45-70% respectively for different crops (Karim and Iqbal, 2001). Areas (in M ha) affected by drought in different crop seasons are given in Table 6.

*Table 3.4 Summary of Drought Severity Areas in Bangladesh by Crop Season (in M ha)*

<i>Drought Class</i>	<i>Rabi</i>	<i>Pre-Kharif</i>	<i>Kharif</i>
Very Severe	0.446	0.403	0.344
Severe	1.71	1.15	0.74
Moderate	2.95	4.76	3.17
Slight	4.21	4.09	2.90
No Drought	3.17	2.09	0.68
<b>Non-T.Aman</b>			4.71

*Source: After BARC, 2001*

The northwestern part is prone to drought mainly because of rainfall variability in the pre-monsoon and the post-monsoon periods. Inadequate pre-monsoon showers, a delay in the onset of the rainy season or an early departure of the monsoon may create drought conditions in Bangladesh, and adversely affect crop output. Since it puts severe strain on the land potential, it acts as a catalyst of land degradation through reduced soil moisture and water retention, increased soil erosion, decline in soil organic contents and overexploitation of sparse vegetation. Human interventions in the form of land abuse and mismanagement have exacerbated these actions during the spells of periodic droughts. An analysis of the relative effects of flood and drought on rice production between 1969-70 and 1983-84 shows that drought is more devastating than floods to aggregate production (World Bank, 2000 a).

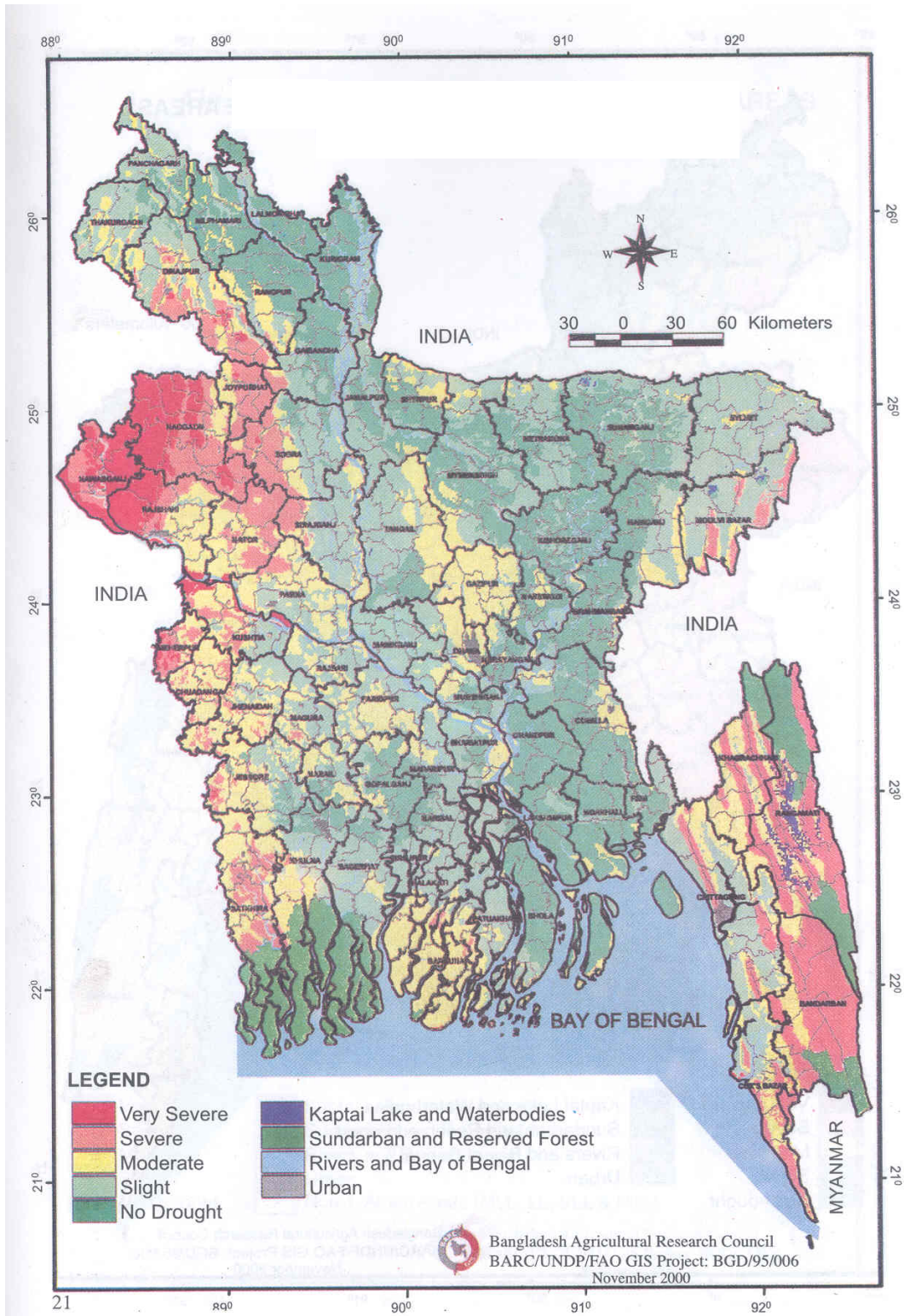


Figure 3.3 Rabi drought prone areas of Bangladesh

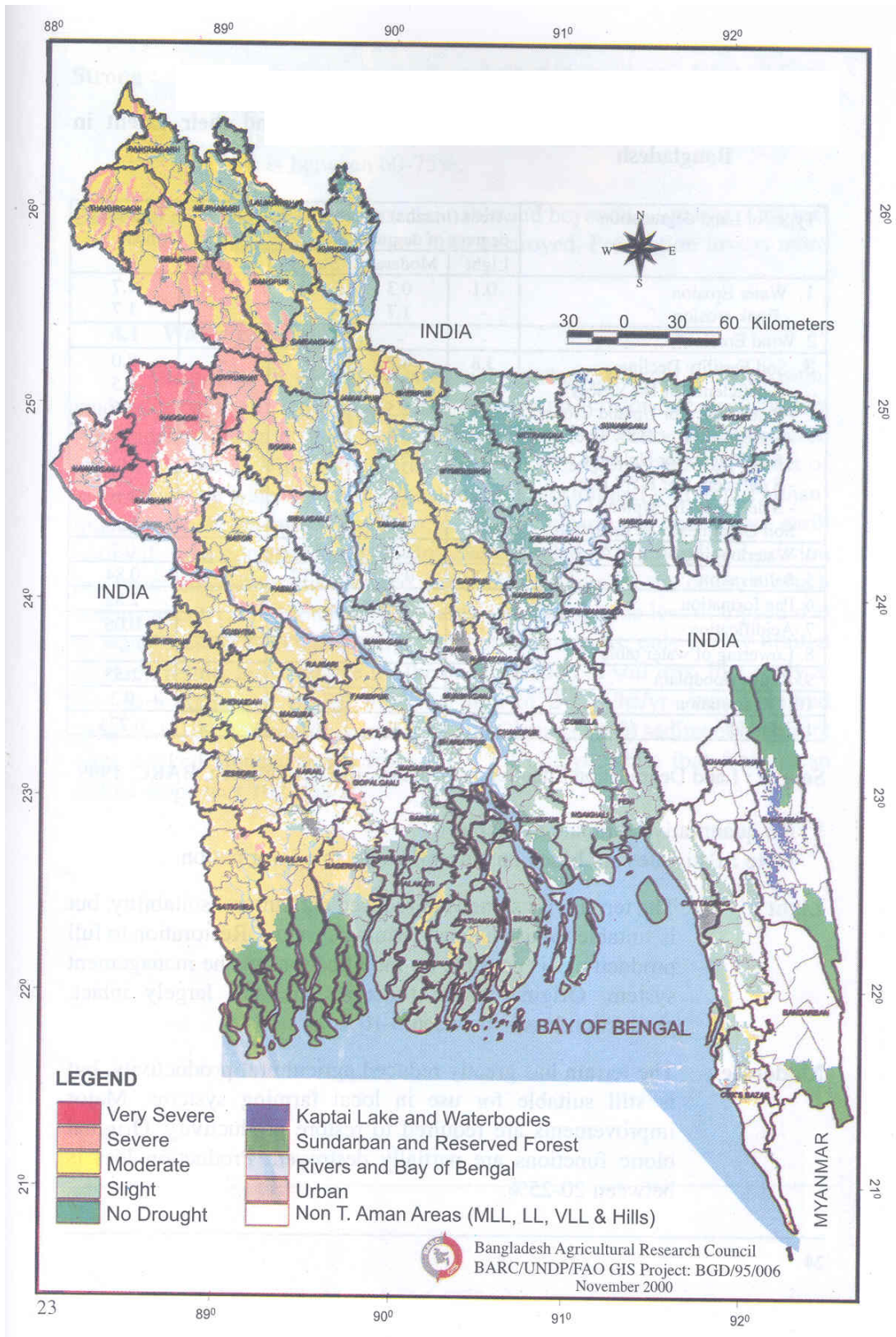


Figure 3.4 Kharif drought prone areas of Bangladesh

### **3.5 THE RESPONSE TO THE LAND DEGRADATION AND DROUGHT**

In the early 1970s and 1980s in the drought-prone areas of northern Bangladesh the agricultural development projects were developed to provide ground water irrigation through thousands of Shallow and Deep Tube Wells. Since scarcity of water was the main obstacle against intensive agriculture pumping up groundwater helped grow crops year round. Through thousands of shallow and deep tube wells, HYV paddy was introduced to hundreds of acres of marginal and sloped lands. Since land is being over used and degraded due to pressure of population, effective population control, judicious land use and sustainable agricultural practices are urgently required to mitigate droughts. The carrying capacity of the land resource in Bangladesh has been critically surpassed. Use of land for production of two or three crops a year may be limited. Because of this soil is not getting sufficient rest to recover its health. The marginal lands should not be used for agricultural purposes. Public awareness is needed to handle land degradation and to protect land from misuse and over use. Agrochemicals should be carefully used.

The problem of land degradation may be studied to develop sustainable land use. A national land use policy is urgently needed to utilize land in judicious manner. Rehabilitation programs should have effective mechanism to minimize the impact of drought. Steps are required to develop national programs for drought preparedness (similar to flood and cyclone preparedness). Early-warning schemes have to be undertaken to inform the population of drought-prone areas and introduce drought-relief measures for the affected people as part of the national planning strategy/ national program for drought preparedness (similar to flood and cyclone preparedness). Attempts are being taken to update the drought data jointly with BARC and DAE in the drought affected aman rice areas. Efforts for mitigation for such droughts are quite inadequate due to lack of fiscal resources.

Bangladesh has responded to reversing these trends of land degradation through incorporating these activities as integral components of the national development strategies and national environment planning. To combat land degradation and to attain sustainable land management and development, current government programmes have focused on field oriented activities in conjunction with the institutional capacity building.

### **3.6 THE COST OF LAND DEGRADATION**

About 6.0 M ha, or 43% of the total geographical area is affected by various forms and degree of degradation. About one fourth of the total cultivable land is affected by drought in every year with different intensity. The recovery of such land depends upon its resilience, which, however, may be lost completely if the land is not treated in time with care.

Frequent droughts, through its short-lived but recurrent stress, can aggravate the adverse impact and, if not checked properly, can interfere with the natural capacity of land to recover and advance the process of desertification. Agricultural intensification and the increase in irrigated area have led to a number of environmental problems i.e., loss of bio-diversity through the conversion of forest land into agricultural land; abandonment of many indigenous crop varieties in favour of HYV 's leading to irreversible loss of the country's genetic resources; depletion of soil nutrients and organic matter due to intensive cropping; and deprivation of soil from organic content due to use of crop residue as fuel.

*Table 3.5 Summary of estimates of the cost of land degradation in Bangladesh*

Nature of degradation	Physical quantity of lost output In mt/yr	Taka equivalent / yr (million)	Cost(million) US\$/yr	Remarks
Water erosion	Cereal production loss = 1.06	6613.84	140.72	
	Nutrient loss = 1.44	25576.46	544.18	
Fertility decline	Cereal production loss = 4.27	26641.48	566.84	
	Addl. Inputs = 1.22	21668.88	461.04	
Salanization	Total production loss = 4.42	27577.25	586.75	
Acidification	Total production loss = 0.09	561.51	11.95	
Lowering of water table	-	-		Not assessed
Water logging	-	-		Not assessed

*Source: BARC 1999*

Other environmental degradation includes loss of wetland habitats through abstraction and drainage resulting in depletion of aquatic fauna and flora and reduction in water availability to the rural population, increased use of agro-chemicals raising the pollution potentials of surface and ground water.

Issues from desertification process are:

- (i) Deterioration of the natural resources adversely affecting the socio-economic condition and livelihood support systems;
- (ii) Reduction of irrigation potential;
- (iii) Diminishing of the food security base of human beings and livestock;
- (iv) Scarcity of drinking water extraction and depletion of ground water, interference with spacing of tube well, including hand tube well, shallow and deep tube well;
- (v) Health and nutrition status of the population, arsenic contamination in ground water, contamination due to disposal of waste and inadequate sanitation;
- (vi) Reduced availability of biomass for fuel;
- (vii) Loss of bio-diversity; and
- (viii) Impoverishment, indebtedness and distress sale of assets of production.

### **3.7 STATE OF DEFORESTATION IN BANGLADESH**

According to FAO (2001) 10.20% of the total land of the country is under forest coverage. Among the forest area, 46.89% is under forest plantations and remaining are natural forest and barren forestland. Out of this Forest Department manages 9.5% and 55% are under the jurisdiction of the district administration (Das and Siddiqi 1985). Like other tropical forests, the forests of Bangladesh are brimming with life. But the human activities are increasingly in conflicts with the forest existence. As a results the forests area of Bangladesh are decreasing day by day. According to Forest Department, forest area of Bangladesh is 16% of its total area but according to Food and Agricultural Organization (FAO) (2001) Bangladesh has a total 1334000 ha forest area i.e., 10% of its total area. Estimated annual rate of deforestation during 1981-85 was 8000 ha but during 1990-95 annual rate of deforestation was 8800 ha (FAO 1999). From this figure we can imagine how devastating fashion deforestation is going on in Bangladesh. At the same time population of Bangladesh are increasing at an alarming rate.

There has been an overall depletion in forest resources in all the major forests in the last three decades. According to the Forestry Master Plan of 1993, the actual forest cover of the country is about 6% - much less that 17.4% of the land that has been designated as forest lands. Annual deforestation rate in Bangladesh could be as high as 3% whereas the same in South Asia is about 0.6%. Increased demand for forest products, partial implementation and lack of monitoring of various forest management plans, and institutional constraints faced by the Forest Department (FD) due to shortage of manpower and resources, and encroachment into forest lands are among the root causes behind this continual decline of forest cover.

### **3.8 THE CAUSE OF DEFORESTATION**

The forests of Bangladesh face a whole range of issues ranging from overexploitation to the lack of people's involvement in forest management. Followings are the main causes of deforestation in Bangladesh:

#### **3.8.1 Human pressure**

Forest land is being cleared and hills are being destroyed through cutting and leveling in Chittagong and CHT areas. The cleared up land is either used for real estate development or for mining purposes from earth and/or stones are mined. This is an irreversible form of damage that must be prevented immediately.

#### **3.8.2 Deposition of course sand**

The soils eroded from the hills are usually deposited in the downstream areas. Burial of agricultural croplands by sandy over washes of the hills, breach of embankments etc. is a

common phenomenon in areas adjoining to the active river channels and hill stream in Bangladesh. This is also seen in the floodplain of the rivers Jamuna, Brahmaputra, Tista and Meghna.

### **3.8.3 Salinity intrusion**

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

### **3.8.4 *Jhum* cultivation**

Forestlands adjoining human settlements all over the country are subject to encroachments for agriculture. This encroachment is more prominent in the Bhawal and Modhupur forests. The Forest Department has estimated that an area of about 76,000 ha of forest lands are under encroachment. Many of such encroachments have subsequently been settled with the encroachers by the land administration authorities without the knowledge of the Forest Department. Actual area of such land is not known, but several disputes are pending in the courts. Because of uncertainty on the ownership of the land, the encroachers only exploit the land without nourishing it for sustained outputs. Shifting cultivation is still one of the most urgent issues in the forestry sector. Past efforts in containing shifting cultivation have yielded encouraging results. These were through rehabilitation of shifting cultivators in settled villages by awarding land for permanent cultivation, planting of trees as cash crop, and by providing community services in the settled villages. But such small-scale efforts cannot solve the problem as a whole.

### **3.8.5 Monoculture**

Practicing monoculture for a long time causes depletion of nutrients in soil and cause land degradation. Cultivation of the same crop in the same piece of land continuously results in soil infertility. Rotation of crops is a good natural process to retain nutrients in the soil.

### **3.8.6 Land use change**

Due to rapid increase in population, forest lands are encroached illegally. Up to 1989, 76,596 ha of forest lands have been encroached upon in different forest areas. Insufficient demarcation of the boundaries of national forests has made the situation worse. About 54,668 ha of forestlands have already been transferred to other organizations for non-forest purposes between 1960 and 1989, contrary to the provisions of the Forest Policy of 1979. In addition, district administrations have leased out established forest plantations in the coastal belt to private individuals for shrimp

culture. Even when there is sufficient land outside the forests, forest lands are grabbed through manipulation by unscrupulous persons.

### **3.8.7 Land use conflicts**

Demand land is increasing day by day for housing the increasing population, construction of government complexes in Thanas, industries, brick fields, roads and highways, flood protection embankments, defence installations, and educational institutions. Often good agricultural land and forest lands are taken up for such non-agricultural and non-forest purposes. About 3000 ha out of about 7500 ha of mangrove forest of Chakharia Sunderban reserve in Cox's Bazar district have been allotted to a large number of shrimp farmers. The shrimp growers cleared the area of trees to construct embankments and internal canals for shrimp ponds. These have affected the ecology of the area and the food chain and shelter of the shrimp. Shrimp production is low in comparison with other producing countries and it is feared that the production will shrink further due to the loss of the mangrove vegetation.

Forestlands adjoining human settlements all over the country are subject to encroachments for agriculture. This encroachment is more prominent in the Bhawal and Modhupur forests. The Forest Department has estimated that an area of about 76,000 ha of forestlands is under encroachment. Many of such encroachments have subsequently been settled with the encroachers by the land administration authorities without the knowledge of the Forest Department. Actual area of such land is not known, but several disputes are pending in the courts. Because of uncertainty on the ownership of the land, the encroachers only exploit the land without nourishing it for sustained outputs.

The other causes of the land use related problems originate due to the lack of inter agency coordination and lack of public awareness. Lack of information - an easily accessible land data bank - is responsible for many land ownership related litigations that sometimes go on for years, leaving the land from being used for any productive purpose.

## **Chapter Four**

### **Existing policy and legislative framework**

#### **4.1 POLICY FRAMEWORK**

In view of the various adverse impacts on environment, the Government of Bangladesh has attached special importance to its protection and improvement. Thus the policy-makers are concerned about environmental issues in general including desertification. These concerns are reflected in different policy initiatives of the government. With this commitment of enhancing productive forces of nature, Bangladesh is party to many multilateral environment agreements including the UNCCD. Bangladesh is committed to fulfill the obligations provided under these agreements. Though the national policies does not directly provide provisions to deal with the issue of desertification but address through the issues viz. land degradation, soil erosion, deforestation etc.

##### **4.1.1 The National Environment Policy, 1992. (NEP)**

The government in 1992 adopted the National Environmental Policy, appended with an implementation program. Considering the necessity to address existing problems along with issues concerning to improvement of environment in an integrated manner Government prepared an environment policy. This policy embraces 15 development sectors including agriculture, Industry, health & sanitation, energy, water, land, forest, fisheries & livestock, coastal & marine environment and others. The sectors relevant to land degradation, soil erosions and other related causes of desertification are mentioned below:

- The policy states that techniques should be adopted to prevent land erosion, to preserve and increase soil fertility, and expand activities for conservation and environmentally sound management-accreted land.
- Land use systems compatible with various eco-systems is encouraged under the policy and steps should be taken to prevent spread of salinity and alkalinity on land.
- Sustainable, long term, environmentally sound and scientific exploitation and management of the underground and surface water resources is to be ensured.
- Conservation, expansion and development of forest need to be ensured to sustain the ecological balance and meet the socio-economic needs and realities.
- Shrinkage and depletion of forestland and resources should be stopped.

##### **4.1.2 National Water Policy, 1999**

The promulgation of National Water Policy in 1999 was a response to the long felt needs for government directives and guidelines for the management, regulation and utilization of the water resources of the country. The key objectives of the policy are to ensure the availability of water to all elements of the society and to accelerate the development of sustainable public and private water systems. The policy states that activities should be initiated to improve efficiency of

resource utilization through conjunctive use of all forms of surface water and groundwater for irrigation and urban water supply. The policy also put emphasis on full consideration to environmental protection, restoration and enhancement measures consistent with the National Environment Management Action Plan (NEMAP).

#### **4.1.3 National Land Use Policy, 2001**

The Land-Use Policy aims to ensure land use in harmony with the natural environment. The policy introduced a 'zoning' system in order to ensure the best use of land in different parts of the country according to their local geological differences to logically control the unplanned expansion of residential, industrial and commercial constructions; The main areas of land use in our country are agriculture, housing, forests, rivers, irrigation and sewerage canals, ponds, railways, commercial and industrial establishments, tea estates, rubber fields, horticulture gardens, the coastal belt, sandy riverbeds and char areas.

#### **4.1.4 National Forest Policy, 1994**

The Government of Bangladesh has promulgated the National Forest Policy, 1994 and approved the Forestry Sector Master plan (1995-2015). Both the documents have emphasized the afforestation program in the country with 20% coverage and increase the protected areas by 10% of the reserve forest land targeted in the Master plan by 2015 through the co-ordinated efforts of GO-NGOs and active participation of the people. One of the key objectives of the policy is to conserve soil and water resources and strengthening agriculture sector with the expansion of agro-forestry. The Forestry Master Plan incorporates various programmes for enhancing the involvement of rural population in forest sector activities. Its objectives include preserving existing values, conserving plants and animal variety and ensuring maximum benefits to local people.

#### **4.1.5. National Agriculture Policy, 1999**

In spite of some opportunities and constraints, the overall objective of National Agriculture Policy is to make the nation self-sufficient in food through increasing production of all crops including cereals and ensure a dependable food security system for all. It aims to ensure inter-alia, sustainable agricultural production system, preservation and development of land productivity and preservation of crop diversity. The policy also aims to develop contingency management system to combat natural. The policy provides that soil erosion in Madhupur Tract, Barind Tract and the piedmont area is to be checked through thana wise programs.

#### **4.1.6 Coastal Zone Policy, 2005**

The coast of Bangladesh is known as a zone of vulnerabilities as well as enormous opportunities. It is prone to natural disasters. The natural and man-made hazards have adversely affected the lives and livelihoods in the zone and slowed down the pace of social and economic developments in this region. The Government has recently formulated the Coastal Zone Policy that would provide a general guidance to all concerned for the management and development of the coastal zone in a manner so that the coastal people are able to pursue their life and livelihoods within secure and conducive environment.

#### **4.1.7 The Wetland Policy (Draft)**

To address the issues of wetland degradation and utilization of its resources in a sustainable manner there is a need of good policy guidelines. With the help of IUCN Bangladesh Country Office the Government of Bangladesh drafted a wetland policy in 1998. The draft wetland policy address the issues related to wetland protection and utilization of its resources in equitable manner. The draft policy puts special emphases on the conservation of wetlands.

#### **4.1.8 National Environment Management Action Plan 1992**

The formulation of the National Environment Management Action Plan (NEMAP) in 1992 was the major policy document used by the Government for environmental activities in the country. With the formulation of the NEAP, the government's strategy now recognized the inseparable links between environmental degradation, poverty, and population growth and the implications for natural resource management. The Action Plan was drawn with the people's perception from the grassroots level. Under this management plan specific actions were identified to implement by the designated institutes in 15 different sectors. The Plan aims to protect land against degradation by soil erosion, desertification and other effects of ecological imbalance, conserve ecosystems and genetic resources. Soil conservation and watershed management is one of the major components of the Plan. The Plan also emphasizes to halt further degradation of the land system and desertification process. The Plan provides that special integrated land conservation projects will be implemented to arrest desertification in the northern part of the country.

#### **4.1.9 National Biodiversity Strategy and Action Plan**

The National Biodiversity Strategy and Action Plan (NBSAP) has been drafted in the year 2004. NBSAP put due priority on the conservation of biological resources of Bangladesh. Among the several conservation measures, afforestation in the degraded forest areas and restoration of the degraded ecosystems have been identified as the priority actions that need to be implemented soon. The NBSAP also discussed a bit about the desertification and ecosystem degradation

scenario in the Northern part of the country and put emphasis on the massive afforestation programme involving the local community.

## **4.2 LEGAL ARRANGEMENTS**

In general, the environmental law involves conservation of natural resources for their better use by the present day society as well as by the future generations. It also governs the inter relationship between natural resources and other living organisms. The national legislations can be categorized to cover sectors and issues like pollution and conservation, land use and administration, agriculture and agro-chemical, water resources, fisheries, forestry and others. The contents and objects of the national environmental laws suggests that they were enacted to address mainly two aspects of environmental conservation i.e. resources management and pollution control. None of the legal provisions of these legislations directly address the issue of desertification. These laws hardly provide provisions addressing the desertification issues.

### **4.2.1 Constitutional provisions**

The Constitution of the People's Republic of Bangladesh enshrines the 'right to life and personal liberty' (Article 31) as fundamental right of life. Under the Supreme Court it was determined that 'right to life' enshrined as a fundamental rights includes 'right to healthy environment'. Article 15 of the Constitution of Bangladesh asserts that

"It shall be a fundamental responsibility of the state to attain, through planned economic growth, a constant increase of productive forces and a steady improvement in the material and cultural standard of living of the people."

### **4.2.2 The Environment Conservation Act (ECA) of 1995 (amended in 2002) and the Environmental Conservation Rules (ECR) of 1997**

- The Environmental Conservation Act is the single major national law, which deals with specific purpose of protection of environment and conservation of nature. The law is designed to conserve the environment, improve environmental standards and control and mitigate environmental pollution.
- The Act was enacted for the conservation, improvement of quality standard and control and mitigation of the pollution of the environment.
- The Act addresses the quantitative and qualitative improvement of different components of environment and prevention of degradation of their standard. The components of environment, for the purpose of this law would be water, air, land and physical properties and the inter-relationship, which exists among and between them and human beings, other living beings, plants and micro- organism.

- Section 5 of the ECA offers scopes for *in situ* conservation by empowering the Government to declare areas as Ecologically Critical Area and take measures to protect the ecology of those areas. It is provided that if the Government is satisfied that the ecosystem of that area has reached or threatened to reach a 'critical state' then the area will declare as an ecologically critical area.
- If any area declared as ecologically critical area then a ban would be imposed in general terms on some activities that include felling or extracting trees and forest, any activity that may threaten the habitat of flora and fauna; activities likely to destroy or alter the natural characteristics of soil and water; establishment of industries that may pollute soil, water, air and/or create noise pollution and other activities that may be harmful for the fish and other aquatic life.
- The ECA along with the Environmental Conservation Rules (ECR), made under it in 1997, have the potentials to succeed in protecting the biological wealth of the country from detrimental effects of industrial wastes and emissions.

#### **4.2.3 The Forest Act, 1927**

The Forest Act aims to consolidate the laws relating to forests, and duty leviable on timber and other forest-produce. The law was mainly enacted to generate revenues from the forest products. The Act empowers the Government to declare portions of its forest as Reserved or Protected and by doing that it may take measures for *in situ* conservation of biodiversity. Any acts or omission detrimental to the natural resources of reserved and protected forests are prohibited and are punishable offences. Among them, the more serious ones include making fresh clearing of forest lands, removing timbers, setting fires, felling or otherwise damaging trees, clearing or breaking up any land for cultivation or any other purpose.

The Act was amended in 2000 to provide provisions to establish social forestry involving local community participation in the management regime. Following the Act, a social forestry rules is under preparation by the Forest Department. It is feared that unless conservation guidelines including those concerning alternative livelihood are framed properly, the community might be moved more by the needs for overexploitation of forest resources.

#### **4.2.4 Ground Water Management Ordinance, 1985**

The Ground Water Management Ordinance was endorsed by the Government to manage the ground water resources for agricultural production. It vests with the Thana Parishad the responsibility of deciding whether installing deep tube well, shallow tube well and deep set hand-pumped tube wells will give rise to adverse effects affecting the surroundings. Judgmental

error in this respect may result into lowering the volume of ground water affecting biodiversity therein.

#### **4.2.5 Bangladesh Wildlife (Preservation) Act, 1974**

The wildlife law provides for the protection of wildlife as well as the habitats. The Act defines various protected areas in the form of game reserve, national park and wildlife sanctuary and aims at preserving wildlife of those protected areas. The wildlife sanctuary regime also requires undisturbed breeding ground for the protection of wildlife as well as all natural resources in the sanctuary.

#### **4.2.6 Bangladesh Petroleum Act, 1974**

The Petroleum Act of 1974 was enacted to consolidate and amend the law relating trade, production and refining of petroleum and other inflammable substance. Under section 6 of the Act, prospecting for petroleum has to be carried out in a manner that does not interfere with navigation, fishing, conservation of resources of the sea and sea-bed and that takes into account factors connected with the ecology and the environment. It does not define the factors and the management elements a company should establish and maintain to discharge its obligations.

#### **4.2.7 The Brick Burning (Control) Act, 1989 (amended 1992, 2001):**

The Act adopted by the parliament to control brick burning activities. The Act would prevail over all other inconsistent laws concerning brick burning activities. The use of fuel wood in brickfields is prohibited under this Act. However, the latest definition of fuel wood apparently excludes any plant species other than woods utilizable as fuel and this could spell the destruction of local habitats.

#### **4.2.8 The Building construction Act, 1952 (amended in 60, 66, 72, 87, 90)**

This Act provides for the prevention of haphazard construction of buildings and excavation of tanks and cutting and razing of hills without authorization. It allows cutting and razing of hills if the authorized officer is satisfied, among other things, that such acts shall not cause any serious damage to the hill or any silting of or obstruction to any drain, stream or river. In doing so, the Act disregards the fact that cutting and razing of any hill would invariably damage the ecosystem, natural habitats and topsoil and deplete the biodiversity.

Apart from the above mentioned legislation there are other existing laws which provide provisions indirectly related to desertification issue. viz Playgrounds, Open Space, Parks and Natural Water Bodies of All Municipalities and Civic Centre of the Country Including the Metropolis, Divisional Headquarters and Municipal Areas of the District Headquarters

Conservation Act, 2000, and Wetlands Conservation, Re-establishment and Filling Control Act 2004 (draft).

The Government should take all appropriate measures to ensure the conservation and where necessary the regeneration of soils for living systems by taking effective measures to prevail soil erosion to combat desertification.

### **4.3 ROLE OF STAKEHOLDERS**

#### **4.3.1 Nongovernmental Organizations (NGOs)**

Now a days land degradation/desertification and its impact has been considered as an emerging issue in Bangladesh. Bangladesh stands exposed to serious socio-ecological and economic risks to be generated because of climate change. Through the present experience or threat that different sectors like, agriculture, fisheries, forest, flora, faunal biodiversity, have been facing now a days, it is apprehended that the country's vulnerability to land degradation/desertification has increased and is likely to be compounded in the future with increasing changes in the global climate. Regarding Non-governmental Organizations, several are NGOs engaged in programmes that address issues of desertification in the country. Apart from the direct programme, Non-governmental organizations also conduct workshops on environmental awareness, soil management, water management, livestock management, crop production and energy efficient stoves in the different areas of operation.

Active participation and involvement of NGOs in implementing various development programmes through the public sector is really remarkable. NGOs are concern with the rural poor means that they often maintain a field presence in remote locations. Therefore, the communication with the grassroots is achieved. NGO is characterized by a work ethic conducive to generating sustainable processes and impacts.

In case of land degradation rural communities are in the most vulnerable place. Land degradation threat for Bangladesh is integrally linked to the country's sustainable development. As NGOs activities involve active participation of rural poor, therefore, NGOs are also trying to incorporate activities related the impact of land degradation/desertification and combating the threat of it. NGOs working in the field of soil conservation, forestry, water management, combats land degradation, desertification and drought condition.

#### **4.3.2 Government Organizations (GOs)**

The GoB attaches great importance to climate change issues including desertification/land degradation and is committed to fight against its adverse impacts. Many initiatives are being

undertaken by the Government Organizations (GOs) and agencies to reverse the degradation trends into a constructive and fruitful one.

The main concern is to reverse the impact of desertification as a threat of climate change is being the current emerging need and priority of the country. Different projects and programmes (e.g., SEMP, projects of BMDA etc.) are being implemented through GOs, which involve the local community and local Government officials. The projects implemented by the Government also improvise active participation of local community which would expected to be address the various threats of desertification on landuse, forestry, agriculture, fisheries.

**The concerned organizations are:**

*Ministry of Environment and Forest*

*Ministry of Agriculture*

*Ministry of Water Resources*

*Department of Environment (DoE)*

*Department of Fisheries (DoF)*

*Bangladesh Metrological Department*

*Space Research and Remote Sensing Organization (SPARRSO)*

*Soil Resources Development Institute (SRDI)*

*Department of Agricultural Extension (DAE)*

*Bangladesh Water Development Board (BWDB)*

*Department of Zoology, University of Rajshahi*

*Department of Botany, University of Rajshahi*

*Department of Zoology, University of Dhaka*

*Department of Botany, University of Dhaka*

*Department of Geography and Environmental Science, University of Rajshahi*

*Barind Multi-purpose Development Authority (BMDA), Rajshahi*

*Planning Commission*

*Water Resources Planning Organization (WARPO)*

*Bangladesh National Herbarium (BNH)*

*Local Government Rural Development (LGRD)/ Local Government Engineering Department (LGED)*

*Bangladesh Agricultural Research Council (BARC)*

*Bangladesh Rice Research Institute (BRRI)*

## **Chapter Five**

### **Development projects and programme**

The country has engaged a number of programmes and projects that can significantly contribute to the fight against desertification. These programmes and projects are sub-divided into four categories viz. Community development programme, Income generation programme, Capacity building programme, and Afforestation programmes.

## **5.1 COMMUNITY DEVELOPMENT PROGRAMME**

The policy of empowerment of village communities and their involvement in developmental activities including natural resource management has been strengthened through the national perspective plan. A host of subjects such as agriculture, land improvement, implementation of land reforms, land consolidation and soil conservation, water management and watershed development, animal husbandry, firewood and fodder, social forestry has been included. The UNDP supported Community Empowerment program (CEPs) supports, through several projects, the Government of Bangladesh's poverty alleviation efforts. The different CEP projects are pursued as pilot schemes with an underlying long-term objective of replicating a successful model at the national level. Strategic linkages will be developed with other service providers that are institutionally appropriately placed to provide sustainable support to the target clients in meeting their social, economic and infrastructure needs.

### **5.1.1 Sustainable Environment Management Programme (SEMP)**

SEMP, as the follow-up implementation of NEMAP, addresses the major environmental priorities identified by people through NEMAP. It is the first program approach initiative of the country office as well as the Government of Bangladesh, consisting of 26 components being executed by the Ministry of Environment and Forest and<sup>17</sup> was implemented by 21 government/non-government agencies throughout Bangladesh. Focus areas relating to the environment are Policy and Institutions; Participatory Eco-System Management; Community-based Environmental Sanitation; Advocacy and Awareness; and Training and Education. SEMP will support community capacities for sustainable management of environmental resources and strengthen the capacity of the public sector to develop new framework for policy development in support of enhanced community participation, protection of the environment, and sustainable management of the country's environment and natural resources. SEMP will benefit grassroots level people, particularly women, in eco-specific intervention areas (Jilani, 1998).

## **5.2 INCOME GENERATION PROGRAMME**

Under the SEMP components, there are alternative income generation activities, which have been carried out by the local community people. Homestead nursery, poultry, cattle rearing, medicinal plants cultivation, fishing, pisciculture, horticulture, solar paneling and handicraft production are some of the major income generating activities under SEMP.

### **5.3 CAPACITY BUILDING PROGRAMME**

#### **5.3.1 Water Sector Improvement Project (WSIP)**

The project is aimed to improve the performance of the water management systems in Bangladesh and ensure their sustainability through improved operation and maintenance, and appropriate institutional reforms.

#### **5.3.2 Follow-up on River Bank Protection Project (RBPP)**

This project aims to reduce vulnerability of the poor by more extensive implementation of river training techniques developed under RBPP to mitigate against further river bank erosion which leads to disastrous loss of land, crops and property every year (World Bank, 2000 c).

#### **5.3.3 Follow-up on Jamuna Bridge Multipurpose Project (JBMP)**

The project is expected to make a positive contribution to the reduction of economic damages caused by erosion in the project areas by preventing the loss of about 7,800 ha of riparian land, including about 1,500 ha of urban area in Sirajganj and protect about 1,000 people from loss of livelihood, displacement and impoverishment. By preventing, perennial flow into the Bangali River from the Brahmaputra River, the project would prevent potential incremental flood damage to crops, property and infrastructure over an area of nearly 300,000 ha populated by more than two million people (World Bank, 2000 c).

### **5.4 AFFORESTATION PROGRAMMES**

The Government of Bangladesh has approved the Forestry Sector Master Plan (1995-2015) and promulgated the National Forest Policy 1994. Both the documents have emphasized the afforestation program in the country with a 20% coverage of Bangladesh targeted in the Master Plan by 2015. To achieve this target, the FD is undertaking a plantation program under the ADP. With regards to the number of FD projects to be implemented, the MoEF approves the afforestation and social forestry programs proposed by the FD. The GoB has imposed a moratorium on tree felling in 1989 to encourage forest conservation. This moratorium is extended to 2005. Further activities include attempts by the GoB to increase by 10% the amount of protected areas in reserved forest lands by 2015 Under the Forestry Sector Project (FSP) plantation of 40,000 ha of Sal Forest are planned during 1997- 2003.

#### **5.4.1 Forest Resource Management Project (FRMP)**

Under FRMP, the following could be achieved in the next three years: Forestry Management Information System (MIS) to additional four Forest Divisions established; additional 200 ha participatory forestry development program with landless poor and destitute women completed; about 60,000 ha forest resources expansion and mangrove plantation programs established; forest

management and conservation plans finalized; mangrove research and professional forestry education for technology generation and human resources development operating effectively (ADB-UNDP-GOB, 1996).

#### **5.4.2 Forestry Sector Project (FSP)**

Forest Department of Bangladesh is implementing the Forestry sector project (FSP) that cover 62 district of Bangladesh. The project period is from 1997-98 to 2005-2006. The primary objective of the project was to increase overall tree resource base of the country; to arrest depletion of forest resources; to enhance conservation of forests in selected protected areas and attain sustainable management of forest resources through local community participation.

#### **5.4.3 Coastal Green Belt Project**

FD in Bangladesh has completed the Coastal Green Belt Project. Under this project, afforestation activities have been conducted in the coastal regions of Bangladesh. The FD successfully implemented the project. Under this project, over 1300 km of embankment plantations, 7500 km of strip plantations, 665 ha of foreshore plantations and 28.9 million seedlings for sales and distribution were a part of the project activities.

#### **5.4.4 Biodiversity Strategies and Action Plans (BSAP) Project**

The BSAP will focus mainly on building an unifying framework to guide and coordinate various biodiversity related programs and projects that are now under implementation at design stage, identifying national priorities. The said BSAP will reflect national aspirations and will built on existing national strategies and plan. This project will step forward more to meet the national obligations to the CBD.

### **Barind Multipurpose Development Authority (BMDA)**

To retain the environmental balance and to check the desertification of the Barind region, the government in 1985 had taken the Barind Integrated Area Development Project (BIADP) later renamed as Barind Multipurpose Development Authority (BMDA) in Rajshahi, Naogaon and Nawabganj districts. Before the project activities started in the region, Barind Tract was the most unfavorable agricultural section of the country with rain fed local T. Aman as the dominant crop. The ensured supply of DTW irrigation has fundamentally changed the agricultural scenario in the Barind. In place of single crop, now multiple crops are grown with higher agro-economic productivity. This transformation to multiple cropping has resulted in productive cropping patterns and increased cropping intensities. Construction of cross-dams, water control structures, re-excavation of canals and ponds have contributed to improve surface water augmentation. This is reflected in satisfactory command area development, ecological balance and pisciculture. Due to the lack of good road network, the slow moving bullock cart was the main transport used for carrying goods and passengers. Construction of feeder and rural roads has changed the status of rural livelihood through uplift of rural economy by BMDA.

## **5.5 OTHERS**

### **5.5.1 Linkage of Land Degradation to Energy**

The Energy Perspective Plan has established a linkage between the process of land degradation and energy consumption pattern, particularly the biomass fuel. This plan emphasizes the need for switching over the use of biomass fuel to clean energy, which is likely to contribute to increase the green cover and minimize the loss of nutrient rich soil.

### **5.5.2 Bangladesh Arsenic Mitigation and Water Supply Project (BAMWSP)**

Bangladesh Arsenic Mitigation and Water Supply Project (BAMWSP) aims at alleviating the adverse impacts of arsenic contamination of drinking water. The components of BAMWSP include on-site mitigation by the installation of deep tube wells and improved understanding of the arsenic problem through study of detailed hydrology characterization in the affected areas.

### **5.5.3 Measures Taken to Mitigate the Effects of Drought**

In the event of drought the Government undertake relief measures by providing drinking water, food grains fodder, food subsidies to special groups and employment through food-for-work-program. The Disaster Management Bureau coordinates drought relief works with local governments. The activities of the Bureau also comprise human resource development, research case studies, database and information services, and documentation on disaster management. Rural Works program of the GOB provides employment to the population affected by drought and helps to mitigate the severity of the drought wherever it may occur.

### **5.5.4 Drought Assessment framework (DRAS)**

CEGIS has developed DRAS for quick assessment of water scarcity and irrigation management in any part of the country. At present, DRAS model validation work is going on in the research field of BRRI and BARI.

## **5.6 INDIGENOUS KNOWLEDGE TO COMBAT DESERTIFICATION**

The indigenous knowledge of the local population regarding land management may be encouraged as these are generally environment friendly. In Sal Forest Region of the Madhupur Tract, tree species like mango, Mahogany and Jackfruit grow in upland *chalias* around homestead where lower slopes (*baid*) are used for growing paddy. Sometimes gentle slopes and *chalias* are used for growing vegetables, maize etc. (NEMAP, 1995). This practice increases moisture retention, improves soil fertility and crop yield; and reduces surface runoff and thus halts soil erosion. Home garden system provides healthy ecosystem for humans, animals, birds, livestock, and miscellaneous flora and fauna. Homestead bamboos are planted because these develop rapidly and are good soil binders. Use of homestead ash is done to supplement potassium in the soil and to keep insects away from crops. Banyan trees are considered as a symbol of preservation of ecosystem because through its extensive root systems it holds large chunk of soil and provides shelter and food for birds and other wild animals. Khari development is encouraged in the Barind area to make storage of water by making embankment in some segments of a drainage/ irrigation channel. Trees and shrubs are planted to reduce further evaporation (Zuberi, 1998). Pond digging is done to facilitate judicious use of storage water for domestic and agricultural purposes. People of the entire village or community decide where to dig the pond and entire operation and digging and maintenance thereafter are being done on a cooperative basis. In the past, such ponds were also used as storage of rainwater. These days they don't get sufficient water in the dry season as ground water recedes further below. The dry areas are now looking for suitable alternative cash crops like cotton, maize, sunflower, melon.

The practice of agro-silviculture creates a favorable environmental condition that reduces evapotranspiration and produces fuel wood, timber and fodder. Many indigenous systems are practiced in the hilly regions to facilitate various local problems related to watershed management and utilization of natural resources. Use of bamboo in earth dam construction; use of brushwood and waste woody material for soil conservation; harvesting of forest product by skidding; and production of various useful tools and implements are good examples of application of the indigenous system in the Hill Tract region.

**Chapter Six**  
**The National Action Programme in Bangladesh**

## 6.1 GOAL

To prepare ourselves for combating desertification in Bangladesh

## 6.2 GUIDING PRINCIPLE

The principles form the basic guidelines for the implementation strategy. These principles are based on the following facts and assumptions:

- ∅ NAP programmes and projects emphasize popular participation, or are "people - led", to promote their ownership among communities and enhance their execution and sustainability.
- ∅ NAP provides an enabling environment allowing communities to help themselves achieve their stated goals.
- ∅ It is essential to adopt an integrated approach in the NAP to facilitate the full integration of CCD activities within other national policies for sustainable development. Adoption of this approach also conforms to its increasing usage by governments.
- ∅ The implementation of the NAP emphasizes building of partnerships between the various stakeholders and government.
- ∅ The implementation of NAP programmes and projects is based on self - initiative and on the learning - by - doing approach. The experience accumulated is carefully documented and fed back into subsequent stages of programme / project implementation.

## 6.3 SETTING THE PRIORITY

In the context of preparation of our National Action Programme, it is desirable to pay more attention to those issues and measures that are identified as weak or fair. In this context, the following issues require greater attention:

- Assessment of the current desertification scenario and documentation of the process
- Development of the monitoring system
- Establishment of the first benchmark
- Interventions at the pilot scale
- Raising awareness and capacity building programmes among the community regarding land degradation/desertification
- Involvement of local community in implementation of the programmes
- Greater integration of existing programmes and activities and a more coordinated approach, particularly at the local level.
- Incorporate income generation programme along with addressing desertification programmes
- Initiate rehabilitation/restoration of the degraded lands

- Use impact indicators. Improvement of quality of life central to the issue so that people's lives are improved and sustained and the local communities are empowered to take decisions, and implement programmes relating to their livelihood.
- Since there is large gap between fund requirements and availability, assistance on a grant/loan on concessional terms would be sought from the international community.

#### **6.4 POROGRAMME OF ACTIONS**

##### **Theme 1. Understanding the desertification scenario**

###### ***Objectives:***

1. Establishment of the first benchmark.

###### ***Outputs:***

1. In depth understanding of the desertification scenario in Bangladesh.

###### ***Activities:***

1. Assessment of the current desertification scenario.
2. Documentation of the desertification process in Bangladesh.
3. Development of the monitoring system.
4. Development of indicators.

###### ***Institutional framework for implementation:***

Implementation of this programme will be coordinated by DoE and involve relevant research organizations as well as intergovernmental and private agencies. The Ministry of Environment and Forests, Ministry of Agriculture, Ministry of Land and Co-operatives will house and facilitate implementation of this programme.

###### ***Time frame:***

Short term (1 - 2 years)

##### **Theme 2. Promotion of Awareness and Capacity Building**

###### ***Objectives:***

1. To stimulate awareness among communities on issues of combating desertification.
2. To increase the local capacity of handling land degradation/desertification problems.
3. To facilitate the co-ordination of activities on combating desertification and mitigating the effects of drought.

###### ***Outputs:***

1. Increased awareness of land degradation and desertification issues among community members.
2. Land degradation/desertification co-ordination unit created.

***Activities:***

1. Review of school curricula to include environmental issues.
2. Prepare and distribute environmental pamphlets and other materials to various academic institutions and libraries/information centres.
3. Hold periodic technical workshops for community groups, NGOs and public and private agencies.
4. Establish community fora/media for information dissemination and discussion of desertification issues as well as formulation of strategies.
5. Create a unit to co-ordinate activities and disseminate information on combating desertification and mitigating the effects of drought.
6. Mount training sessions for community groups and individuals on desertification / land degradation issues.
7. Identify an institution and upgrade it to mount and handle courses on desertification.
8. Co-ordinate research activities on land degradation/desertification.
9. Facilitate liaison between land degradation control practitioners and communities.

***Institutional framework for implementation:***

Implementation of this programme will be coordinated by DoE, Ministry of Education and involve NGOs as well as intergovernmental and private agencies. The Ministry of Environment and Forests, Ministry of Agriculture, Ministry of Education, Ministry of Land and Co-operatives will house and facilitate implementation of this programme.

***Time frame:***

Short term (1 - 2 years)

**Theme 3. Institutional Arrangements**

***Objectives:***

1. To develop an effective and properly constituted institutional framework for the implementation of the NAP.
2. To Establish an Environmental Fund for the implementation of the NAP.

***Outputs:***

1. A properly constituted institutional structure for the implementation of the NAP to combat desertification and mitigate the effects of drought and land degradation.
2. Regional committees and a central apex body dealing with desertification issues established.
3. National Environment Fund established and implemented.

***Activities:***

1. Integration of the activities of Ministry of Local Government and Engineering Department, Ministry of Environment and Forests, Ministry of Agriculture and Ministry of land to form a Land Management Division.
2. Creation of a CCD unit to co-ordinate activities for combating desertification within the Ministry of Environment and Forests.
3. Strengthening of the Department of Environment, MoEF
4. Establishment of Land degradation / desertification Steering Committee.
5. Expedite the creation of a National Environment Fund.

***Institutional framework for implementation:***

Since the responsible institutions are within the Office of the Ministry of Local Government and Engineering Department, Ministry of Environment and Forests, Ministry of Agriculture and Ministry of land, implementation of this programme must be co-ordinated by these institutions in consultation.

***Time frame:***

Short to medium -term (1 to 3 years)

**Theme 4. Reclamation and rehabilitation of degraded land to promote sustainable utilizations of land resources**

***Objective:***

To reclaim and rehabilitate degraded lands and promote sustainable utilization of land resources.

***Outputs:***

1. Degraded land reclaimed and used for production purposes.
2. Land allocation and utilization driven by its capability and sustainability.

***Activities:***

1. Apply scientific and indigenous technology to reclaim/rehabilitate degraded land.
2. Initiation of suitable afforestation programme
3. Evaluate, improve and/or strengthen existing conservation systems.
4. Develop and adopt new land management systems where applicable.
5. Prepare and implement integrated land use programmes.
6. Identify areas that are prone to land degradation/desertification as a mitigation measure

7. Maintain a balance between socio-economic integration of environmental consideration in policies, strategies and programmes in compliance with environmental standards.

***Institutional framework for implementation:***

Relevant sections in the Ministry of Local Government and Engineering Department, Ministry of Environment and Forests, Ministry of Agriculture and Ministry of land will co-ordinate and facilitate activities of NGOs and CBOs.

***Time frame***

Short to medium -term (1 to 3 years)

**Theme 5. Land degradation/desertification mitigation and Poverty Alleviation Strategies**

***Objective:***

To develop and implement strategies for drought mitigation and poverty alleviation.

***Outputs:***

1. Reduced effects of land degradation/desertification and the improvement of the socio-economic status of the people.
2. Improved water availability for domestic and agricultural purposes.
3. Food security for all communities.

***Activities:***

1. Construct earth dams and promote irrigated farming.
2. Improve and promote rainwater harvesting techniques.
3. Strengthen early warning systems
4. Promote alternative sources of livelihood.
5. Bring idle farms into utilization, especially for crop production.
6. Increase food storage capacity
7. Intensify sustainable plant production systems and appropriate technology transfer to all farmers.
8. Encourage the appropriate utilization of ground water resources.
9. Co-ordinate and facilitate the provision of clean water supply to all communities.
10. Encourage income generating projects

***Institutional framework for implementation:***

Ministry of Local Government and Engineering Department, Ministry of Environment and Forests, Ministry of Agriculture and Ministry of land.

*Time frame*

Short to medium -term (1 to 3 years)

**Theme 6. Promotion of Active Participation of Communities in Land Management Programmes**

***Objective:***

1. To improve participation of communities at grassroots level in land management programmes

***Outputs:***

1. Communities actively involved in land management programmes.

***Activities:***

1. Encourage active involvement of communities (including youth and women) in the formulation and implementation of programmes.
2. Mount continuous education campaigns for community members and groups for them to appreciate the desertification/land degradation problems.
3. Support existing environmental action groups and encourage the formation of new action groups.
4. Promote the formation of special area action groups such as river basin or land management associations.

***Institutional framework for implementation:***

Ministry of Local Government and Engineering Department, Ministry of Environment and Forests, Ministry of Agriculture and Ministry of land involving NGOs, CBO and community traditional structures will be responsible for implementation of this programme.

***Time frame:***

Short to medium-term (1 - 3 years)

**Theme 7. Proper Location of Construction Sites and Physical Infrastructure.**

***Objectives:***

1. To minimize land degradation caused by improper siting and construction of infrastructure.
2. To minimize the effects of material acquisition on land and water resources.

***Output:***

Proper siting and construction of infrastructure.

***Activities:***

1. Conduct and enforce Environmental Impact Assessment regulation and procedures before the construction of any infrastructure.
2. Monitor plant operators/operations to ensure adherence to environmental regulations and concerns.

***Institutional framework for implementation:***

Ministry of Local Government and Engineering Department, Ministry of Environment and Forests, Ministry of Agriculture and Ministry of land and other related Fovernmental agencies.

***Time frame:***

Medium-term (2 – 3 years)

**Theme 8. Research and Technology**

***Objectives:***

1. To make available applicable information and technology to combat desertification.
2. To analyze the current environmental situation in Bangladesh.
3. To provide necessary information to influence policy and decision making on desertification and drought mitigation issues.

***Outputs:***

1. Production/ publication of information on applicable technology for combating desertification.
2. Production of information kit on combating desertification.
3. Availability of information on climatic variations and improved early warning systems.

***Activities:***

1. Document previous and on-going research activities on land degradation and desertification.
2. Compile critical research areas on combating desertification.
3. Review less successful previous programmes to identify shortfall and potentials for success.
4. Document scientific and indigenous techniques to combat desertification and mitigate the effects of drought.
5. Identify indigenous plants for the rehabilitation of degraded land and determine their propagation methods.
6. Examine and document potential strategies for the restoration of wetlands.

7. Document land resources and their utilisation.
8. Encourage and fund research and technology development on desertification related issues.
9. Analyse and review institutions and regulations on strategies to combat desertification.
10. Analyse current weather records and review current warning systems.
11. Mount research on multi-purpose and fast growing tree species.
12. Review and evaluate the efficiency of existing conservation systems.

***Institutional framework for implementation:***

All sectors involved in research (i.e. BARC, BMDA, Universities, BFRI, BNH IUCN etc). The activities may be co-ordinated by the DoE, MoEF.

***Time frame:***

Medium-term (2 - 3 years)

**6.5 FINANCIAL ARRANGEMENTS**

This financing strategy provides a framework for funding of NAP implementation. The framework provides some ideas on how existing finances can be used as well as new reserves raised so that implementation of the NAP is financially sustainable. The financing strategy does not only indicate ways of raising funds, but it also deals with the implementation responsibilities of different sectors.

The external funding mechanisms available for the implementation of the projects can be considered under the following categories:

- Global Mechanism.
- International organisations such as the UNDP, UNEP, IFAD, FAO etc which could take up specific projects/programmes for assistance , which are identified in the context of the combating desertification under the UNCCD.
- Bilateral assistance:
- Multilateral assistance: ADB, World Bank.
- GEF assistance,

**6.6 MONITORING AND EVALUATION**

For the successful implementation of the Bangladesh NAP, an effective and efficient monitoring and reporting system has to be in place opportunely. This M&R system, through the implementation mechanism of the NAP, will also work as a reporting organ liaising with the UNCCD Secretariat.

Conceptually, the Monitoring and Reporting will involve:

- Collection of information about the status of desertification in Bangladesh and implementation of NAP activities by different implementing institutions and organizations and
- Reporting periodically on the Convention issues to implementing bodies and the public in general

Monitoring and Reporting will be undertaken to review

- performance on implementation
- impacts on the status of desertification/land degradation

The M&R System will report periodically about its findings in the different areas in a regular basis. Additionally, the M&R System will report regularly to the public through the different communications media of Bangladesh (newspapers, radio, TV and others).

# **Chapter Seven**

## **Conclusion**

Bangladesh, being a floodplain country with a total land area of 144440 sq km supports more than 140 million human populations. The most critical challenge of the 21st century, with this burgeoning human, would therefore be in meeting the food-fuel-fodder and water needs of the country. In order to improve the economy and general standard of living in the coming decades, energy and industrial production will have to be increased. All these can put tremendous strain on the natural resources of the country, unless very stringent measures are taken to prevent and control degradation of our land, water, air and other natural resources.

The data available on the land degradation indicate that about 46% of our total geographical area is facing some form of degradation and at present are either slight and/or moderate dry. Land degradation is acute in the North-Bengal (i.e., northern part) of the country, which mostly comprise of the arid, semi-arid and dry sub-humid regions. Land degradation and desertification is a serious problem in the country resulting in loss of productivity of soils, and natural resources such as forestry, bio-diversity, etc. It is also affecting the socio-economic and living conditions of the people particularly in the affected regions which have ramifications and impacts on the socio-economic development of the country at the macro-level. The problem of desertification is complex involving the biophysical, social, economic and political factors.

The United Nations Convention to Combat Desertification (UNCCD) provides a platform for taking up suitable measures to achieve the goals of sustainable development through the preparation and implementation of a National Action Programme (NAP) for combating desertification and mitigating the effects of drought in the country.

## References

- Alam, M. and Jilani, G. State of Environment (SoE) Reporting in Bangladesh, Bangladesh Environmental News. Volume 9, No. 1, January to March 1998
- ADB-UNDP-GOB, Forestry Sector Master Plan Bangladesh, November 1996
- BARC, Land degradation situation in Bangladesh December 1998, BARC
- BBS, Statistical Year Book of Bangladesh, Bangladesh Bureau of Statistics, Ministry of Planning, Dhaka, Bangladesh, 1997
- BEN, Seminars/ Workshops on Biodiversity Management, Bangladesh Environmental News, Volume 10 No. 2, December 1999
- Brammer, H., Agricultural Disaster Manager in Bangladesh, University Press Limited, Dhaka, 427p. 1999
- Chowdhury, M.S.U, Importance of National Resource Management for Sustainable Agricultural Development: Bangladesh Context, BARC, Monograph Series, February 1993
- Chowdhury, M.S.U. and Dasgupta, S. Status of Technology Assessment and Transfer Mechanism in Bangladesh Agriculture, BARC, Monograph Series, May 1993
- DoE, Department of Environment Brochure, BEMP, 200035. World Bank, Bangladesh Climate Change and Sustainable Development, Document of the World Bank, Report No. 21104-BD, December 19, 2000
- Dowlah, A.. Policy Note on Rice Production, World Bank Publication, 1998
- Farooque, M.K., (Ed.) Combating Desertification, Report on the National Awareness Seminar on Combating Land Degradation and Desertification of Bangladesh, April 1988
- GOB, The Fifth Five-Year Plan, Ministry of Planning, GOB, 1997
- GOB-BCAS-SACEP-NORAD-UNEP, Bangladesh State of Environment 2001, June 2001
- Hossain, M.S., The Bengal Delta: An Assessment of Desertification, Dhaka University, May, 2001)
- Huq, B.M.S., Response and remedy of desertification in Bangladesh, In A Wahab, Sachitra Bangladesh, Water Resources of Bangladesh, Special Issue, Govt. of Bangladesh, 1995, p. 126-132
- AEA- BAEC- BWDB. Implication for Characterization and Mitigation of Arsenic in Groundwater, IAEA- TC Project BGD/8/016, IAEA- BAEC- BWDB Report, September 2000]
- Jabbar, M.A. Causes and Effects of Drought/ Aridity in Bangladesh using Remote Sensing Technology, Paper Presented at the ESCAP Workshop on Remote Sensing Technology in Application to Desertification/vegetation type Mapping, Tehran, August 1990
- Jabbar, M.A., Chaudhury, M.U. and Huda, M.H. Q. Causes and Effects of Increasing Aridity in Northwest Bangladesh, Proceedings First Thematic Conference on "Remote Sensing of Arid and Semi-arid Lands", Cairo, Egypt, January 1982.36

- Jalil, S.M., Role of Forestry and Biodiversity Conservation in Combating Land Degradation and Desertification in Bangladesh, In Proceedings of the National Awareness Seminar on Combating Land Degradation Desertification in Bangladesh, Dhaka, April 1998
- Jilani, G., Sustainable Environment Management Programme (SEMP), BEN, vol. 9. 1999
- Karim, Z., and Iqbal M.A. (Ed.) Impact of Land Degradation in Bangladesh : Changing Scenario in Agricultural Land Use, BARC, Dhaka, 2001( in press).
- Karim, Z., Ibrahim. A., Iqbal, A. and Ahmed M. Drought in Bangladesh Agriculture and Irrigation Schedules for Major Crops, Bangladesh Agricultural Research Council, Dhaka, 1990
- Khisa, S. K. Farming System Approach to Participatory Land Husbandry and Watershed Management Adopting Sloping Agricultural Land Technology (SALT) in Chittagong Hill Tract, In Participatory Approaches to Integrated Watershed Management in Bangladesh, Proceeding National Workshop Bangladesh Forest Academy, Chittagong 1-5 July 1997, p. 46-53, December 1998
- Haque, M. National Action Programmes (NAPs) to Combat Desertification, Drought and Land Degradation in Bangladesh, In Proceedings of the National Awareness Seminar on Combating Land Degradation/ Desertification in Bangladesh, Dhaka, April 1998
- Mushfique A., Rainfall Climatology of the Barind Area of Bangladesh: A Comparison between 1902-74 and 1975-93, Journal of Remote Sensing and Environment, vol. 1, 1997. p.55-70.
- Haque, N. Community-Based Resource Management in Madhumati Floodplains under SEMP, BEN, Vol. 10, No. 1, July 1999
- NEMAP, National Environment Management Action Plan (NEMAP), Ministry of Environment and Forests, vol. II, Main Report, GOB, 1995
- Nuruzzaman, M. Brief Report on 4 th Conference of the Parties of the UNCCD, Bangladesh, December 2000
- Paul, B.K., Quick Response Report no. 76, Farmers' and Public Responses to the 1994-95 Drought in Bangladesh: A case Study, 1995
- Rahman, M.R., Towards Sustainable Development, Land Resources in Bangladesh, Dhaka, IUCNMoEF, 1990.
- Rasheed, K.B.S., Status of Land Resource Use and Desertification, Drought and land Degradation In Bangladesh: Obstacles and Effective Policy Options and Measures for Sustainable Use of land Resources, In Proceedings of the National Awareness Seminar on Combating Land Degradation/ Desertification in Bangladesh, Dhaka, April 1998
- Reazuddin, M., Catalytic Schemes and Innovative Approaches for Utilizing Financial in Kind and Technical Support in the Context of an Integrated Programming Framework for Sustainable Development, In Proceedings of the National Awareness Seminar on Combating Land Degradation/ Desertification in Bangladesh, Dhaka, April 1998

- SEHD, P. Gain (Ed.), Bangladesh Environment: Facing the 21 st Century, Dhaka, 1998
- Soil Survey Staff, Soil Taxonomy, US Government Printing Office, Washington D. C., 1998
- SPARRSO, Study of the Agricultural Status of The Western Barind Tract, Northwest Bangladesh Using Remote Sensing and GIS Technology, SPARRSO Annual Report, September 1996 b, p.17
- SPARRSO, Land Cover/ Land Use Map of Barind and Chalan Beel , volume-2, December 1996 a
- SPARRSO, Mapping area of land degradation at 1:50,000 scale based on 1983-84 colour infrared and black & white aerial photograph updated with SPOT HRV digital imagery SPARRSO Report, December 1993
- SPARRSO, Studies on Madhupur Forest Ecosystem Using Remote Sensing, SPARRSO Annual Report, September 1998, p.21-23
- UNDP- FAO, Land Resources Appraisal of Bangladesh for Agricultural Development, Report 2 , Agroecological Regions of Bangladesh 1988.
- UNDP, Project Digest, UNDP Project- SDNP, 2000
- UNDP, Project Digest, UNDP Project- IPM, 1999
- WARPO, National Water Management Plan Project, Draft Development Strategy, vol. 4, Annex C, Land and Water Resources, August 2000, p. 28-29.
- WARPO-EGIC, An Atlas of Selected Maps and Spatial Data in Bangladesh, June 1996,
- World Bank, Bangladesh Environment Strategy Review, Document of the World Bank, November 14, Report No. 9551-BD, 1991.
- World Bank, Bangladesh Agriculture in the 21 st Century, World Bank Publication, 2000a
- World Bank, Bangladesh Climate Change and Sustainable Development, Report No.: 21104-BD, December, 2000c
- World Bank, Bangladesh Study of Land Issues, SASRD, World Bank Dhaka Office, January 2000b
- World Bank, Staff Appraisal Report, Bangladesh Fourth Dhaka Water Supply Project, Report No.: 15144-BD, November, 1996
- World Bank, Water Resource Management In Bangladesh: Steps Towards A New National Water Plan, Bangladesh Bank Report No. 17663-BD, 1999
- Zuberi, M.I., Combating Desertification in Bangladesh: Case Studies, Lesson Learned from Experiments, Constraints, and Opportunities, In report of the National Awareness Seminar on Combating Land degradation and Desertification in Bangladesh, April 1998, p.47-56..37