



Fourth National Report to the Convention on Biological Diversity



Biodiversity is life
Biodiversity is our life





Fourth National Report
**(Biodiversity National Assessment and
Programme of Action 2020)**



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Ministry of Environment and Forests
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Government of the People's Republic of Bangladesh

MESSAGE

I am very pleased with the publication of Biodiversity National Assessment and Programme of Action 2020 prepared by the Department of Environment. The report assesses the status of biodiversity of Bangladesh indicating a shrinking trend that makes us awaken for immediate actions. The situation analysis also indicates the need for an appropriate programme of actions so that ecosystem services, as outlined in the Millennium Ecosystem Assessment (MEA), are afforded greater protection and managed sustainably.

There is enough evidence that biodiversity is threatened worldwide. According to the 2009 update of the International Union for Conservation of Nature's (IUCN) Red List of Threatened Species, 875 plants and animals are already extinct, or extinct in the wild, and an additional 17,291 are known to face a high risk of extinction in the wild. This is only the tip of an iceberg. Species are disappearing at a rate 100 to 1,000 times higher than normal and the threat like global climate change will significantly accelerate biodiversity loss. The imminent peril of so many species is an ominous signal for the future of our own species.

Healthy and diverse species population are key indicators of how well we are managing our country and, ultimately, our own health and well-being. Maintaining the richness in diversity is very important as biodiversity and ecosystems support the people with both food supply and livelihoods. A sustainable ecosystem also works as a shield in protecting people from natural disasters. Furthermore, the cultural, aesthetic and spiritual value of the natural world is a wonder beyond price. Biodiversity loss means disappearance of our life support systems. Let us make our all-out effort that will enable us to protect biodiversity.

The Government of Bangladesh strongly believes that there is no alternative to conserve biodiversity for ensuring well-being of the people. We have already undertaken various measures to protect the ecosystem and the diversity of its biological components.

I hope the document will concurrently help communicate information on biodiversity and related action plans to global partners and guide the government for implementing its actions for the betterment of the local and global community.

I wish the report would go a long way in terms of its implementation

(Dr. Hasan Mahmud, MP)
State Minister



Secretary
Ministry of Environment & Forests
Government of the People's Republic of Bangladesh

MESSAGE

This is indeed a great pleasure for us to see the publication of the document: Biodiversity National Assessment and Programme of Action 2020. Dissemination of the document is going to be a milestone event in the 2010 : International Year of Biodiversity. The document covers the overall aspects of biodiversity conservation in Bangladesh and thus it would be a very useful document not only to decision makers but also to the academicians and students who may use it as an education material.

Being bio-rich a country, Bangladesh has to adopt adequate measures to halt further degradation of our precious biological resources. The report offers a clear indication for the way ahead of us towards conservation and sustainable use of biodiversity. The report contains a situation analysis of biological resources that exist in different ecosystems of the country.

It is widely acknowledged that the current status of biodiversity in Bangladesh is under stress. Population pressure, urbanization and over-dependence of our population on ecosystems and its services are the main elements of the stress.

Biological resources will always serve as the basis for securing lives and livelihoods for millions of people by providing different ecosystem services in this agrarian country.

The report assesses the future program of action under nine thematic areas, which are planned to be achieved by 2020. I strongly believe that implementation of these activities will pave the way to institutionalize biodiversity conservation and sustainable use in various levels of our development agenda.

(Mihir Kanti Majumder, PhD)
Secretary



Director General
Department of Environment
Government of the People's Republic of Bangladesh

PREFACE

Biodiversity National Assessment and Programme of Action 2020 is a unique document published in 2010: the International Year of Biodiversity. The report has the message that biodiversity conservation is very crucial in ensuring socio-economic sustainability of Bangladesh. It also indicates that we are still lagging behind undertaking adequate measures to halt the degradation and disappearance of biological diversity.

The report presents the status and trends of biodiversity in various ecosystems of the country, and then examines the threats that the habitats, ecosystems and floral and faunal species are facing. The report also assesses the present status of implementation of National Biodiversity Strategy and Action Plan (NBSAP) and progress made so far towards 2010 Biodiversity Targets. The report recognizes the dynamic pressures on biodiversity like population pressure, conversion of forests, wetlands and lands under agro-ecosystems into settlements, commercial and industrial agglomerations, are seriously undermining the sustenance of biological resources of the country.

The Department of Environment took various initiatives, such as, formulating legislative frameworks, implemented projects on wetlands biodiversity conservation, media campaigns to raise public awareness in order to reduce the threats on biological resources. Yet, the present situation of biodiversity gives strong signals that we need concerted efforts to protect the remaining biological resources. We have to ensure that the benefits arising from the use of biodiversity are equitably shared by different sections of the community.

I am happy to inform that the Department of Environment has ensured the participation of the representatives of indigenous communities, non-government organizations, government agencies, faculty members of relevant departments of the universities and other eminent persons in developing this report.

Without active participation of the people from all walks of life, biodiversity conservation would be an unattainable task by the government or any individual organization. On behalf of the Department of Environment, we always welcome collaboration of nature loving people in our every initiative. We expect that Biodiversity Program of Action 2020 will meet with obvious success utilizing our innovations, traditional knowledge and full-hearted endeavor.

(Dr. Zafar Ahmed Khan)
Director General

ACKNOWLEDGEMENTS

Biodiversity National Assessment and Programme of Action 2020 have been developed to fulfill the commitment of Bangladesh towards implementation of the Convention on Biological Diversity (CBD). The report serves as the Fourth National Report to the CBD. The report encompasses the endeavours Bangladesh has so far made in terms of implementation of the objectives, the three pillars of the convention, (1) the conservation of biological diversity; (2) the sustainable use of the components of biological diversity and (3) the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. The information contained in the report is an aggregation of contribution made by various agencies and relevant experts. The document is an outcome of the consultative process involving a range of stakeholder.

Development of this important piece of work would never have been possible without active participation of renowned individuals and experts dealing with biodiversity issues. On behalf of the Department of Environment, Ministry of Environment and Forests, Government of the People's Republic of Bangladesh I would like to thank the distinguished individuals, researchers, authors, experts, representatives of various ministries, agencies, research organizations and universities as well as the representatives of the NGOs and the private sectors who have actively participated in the process of developing the report. Without their valuable contribution to the report it would have never taken a shape. On behalf of the Department of Environment, I recognize the respected Secretary, Ministry of Environment and Forests and the Chairperson of the National Technical Committee on Biodiversity (NTCB), Dr. Mihir Kanti Majumder for his dynamic leadership and guidance throughout the whole process of finalizing the national report. I am thankful to the NTCB members for their presence in the meetings and kind support provided with updated information. I am very grateful to the Deputy Secretary of the Ministry, Dr. Munjurul Hannan Khan and Senior Assistant Secretary, Ms. Zakia Sultana for their effort to organize the NTCB meetings obtaining valuable input from the members. Representatives of the Indigenous and Local Communities, Various NGOs and NTCB members participated in the stakeholder meetings and national consultation, taking trouble to come to Dhaka from the distant areas of the country, I am indebted to them for their spontaneous support in the development of the report.

I acknowledge Dr. Paul Thompson of Flood Hazard Research Centre and Professor Dr. Md. Anwarul Islam of the University of Dhaka for their substantial inputs to enrich the report. Professor Dr. Imdadul Hoque of the University of Dhaka and his colleagues of the Department of Botany helped not only with various updated information, but they offered the support to host a review committee meeting in their premise. I am thankful for their invaluable cooperation. Professor Dr. Md. Rashed-un-Nabi of Chittagong University; Professor Dr. Mostafa Feeroz of Jahangirnagar University, Bob Winterbottom of IRG/IPAC Project; Elisabeth Fahrni Mansur of BCDP, Director General of Bangladesh Fisheries Research Institute, Dr. M.G. Hussain; Christina Greenwood of WTB; Mr. Mokhlesur Rahman of CNRS; Sarder Nasir Uddin of Bangladesh National Herbarium; Dr. SMA Rashid of CARINAM; Dr. M.W. Baksha of Bangladesh Forest Research Institute; Dr. Hasib Irfanullah of Practical Action and Free-launch Consultant, Ms. Farzana Islam Antara, to name a few of the long list of individuals, without whose invaluable contributions, the report could never be so well-run and enriched.

Mr. Mamunul Hoque Khan of UNDP Bangladesh deserves our hearty appreciation for his technical input and guidance in coming up with a meaningful national report looking at long-term visions of biodiversity conservation in Bangladesh. Our gratitude is also due to Global Environment Facility (GEF) for extending the assistance to carry out the study. Last but not least, I acknowledge the engagement of Dr. Istiak Sobhan and Dr. Sheikh Tawhidul Islam along with the members of the Review Committee who supported the process of developing the report with their valuable time and effort.

Finally, I wish broader participation and engagement of all the government and non-government organizations, development partners, local and indigenous communities in our endeavours to implement Biodiversity Program of Actions 2020.



Mohammed Solaiman Haider
Deputy Director (Technical)
Department of Environment
&
Project Director

2010 Biodiversity Target National Assessment Project

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Acronyms and Abbreviations

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ABS	Access and Benefit Sharing
BARC	Bangladesh Agriculture Research Council
BARI	Bangladesh Agriculture Research Institute
BCAS	Bangladesh Centre for Advance Studies
BCH	Biosafety Clearing House
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
BFRI	Bangladesh Fisheries Research Institute
BFRI	Bangladesh Forest Research Institute
BRRI	Bangladesh Rice Research Institute
CBD	Convention on Biological Diversity
CBRMP	Community Based Resource Management Project
CDMP	Comprehensive Disaster Management Programme
CEGIS	Centre for Environmental and Geographic Information Services
CITES	Convention of International Trade in Endangered Species of Fauna and Flora
CNRS	Centre for Natural Resource Studies
CWBMP	Coastal and Wetland Biodiversity Management Project
DFID	Department for International Development
DoE	Department of Environment
ECA	Ecologically Critical Area
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organization of the United Nations
FCD/I	Flood Control Drainage and Irrigation
FD	Forest Department
GDP	Gross Domestic Product
GMO	Genetically Modified Organism
GoB	Government of Bangladesh
HYV	High Yielding Variety
IAS	Invasive Alien Species
ICZM	Integrated Coastal Zone Management
IPAC	Integrated Protected Area Co-management Program
IPR	Intellectual Property Right
IUCN	International Union for Conservation of Nature
LGED	Local Government Engineering Department
MACH	Management of Aquatic Ecosystems through Community Husbandry
MoEF	Ministry of Environment and Forests
NACOM	Nature Conservation Management
NAPA	National Adaptation Programme of Action
NBF	National Biosafety Framework of Bangladesh
NBSAP	National Biodiversity Strategy and Action Plan
NCS	National Conservation Strategy
NCSIP-I	National Conservation Strategy Implementation Project-I
NFA	National Forest Assessment
N/GOs	Non-Government & Government Organizations
NRM	Natural Resources Management
NSAPR	National Strategy for Accelerated Poverty Reduction
NTCB	National Technical Committee on Biodiversity
NTFP	Non-Timber Forest Products
NWMP	National Water Management Plan
PA	Protected Area
REDD+	Reducing Emissions from Deforestation and Forest Degradation
SBCP	Sundarbans Biodiversity Conservation Project
SEMP	Sustainable Environment Management Programme
SPARSSO	Bangladesh Space Research and Remote Sensing Organization
UNESCO	United Nations Educational, Scientific and Cultural Organization
VFI	Village Forest Inventory
WTB	Wildlife Trust of Bangladesh

EXECUTIVE SUMMARY

Bangladesh is a party to the Convention on Biological Diversity (CBD). The country has been implementing various activities to comply with the provisions under the convention as well as its commitment towards conservation and sustainable use of natural resources. This national report has been developed as a part of the country's commitment towards global community to compliment the objectives of the CBD. This report aims to (i) portray the status, trends and threats of biodiversity; (ii) stocktake the country's accomplishments in terms of implementation and mainstreaming of the National Biodiversity Strategy and Action Plan; (iii) review the status of NBSAP mainstreaming and gaps; (iv) assess the progress towards 2010 biodiversity targets; and finally, (v) identify policy and programmatic interventions to achieve a strong biodiversity constituency to facilitate and ensure sustainable use of biodiversity resources. This will target the gaps and challenges that still remain in different areas/sectors, which need to be addressed to attain the targets laid out in different focal areas. Reflecting on the above mentioned aims, information was gathered from various secondary sources, consultation workshops and individual input of the relevant experts to develop the report.

Introducing the country position in the regional context, the first chapter of the report focuses mainly on the richness of flora and fauna inhabiting different ecosystems of Bangladesh. Climatic variables like temperature, rainfall, physiographic variations in soil and different hydrological conditions play vital roles in the dynamics of the country's diverse ecosystems. Bangladesh possesses rich species diversity particularly for angiosperms and avi-fauna. It has been revealed that out of 3,611 species of angiosperm, 2,623 species belong to 158 families of dicotyledons, and 988 species belong to 41 families of monocotyledons. The distribution and diversity of this flora and fauna are discussed for different ecosystems, i.e. (i) forest, (ii) wetland, (iii) coastal and marine, (iv) agro-ecosystems and (v) homesteads. The document also argues how the rich biodiversity of this land with moderate tropical climate makes it soothing for human habitation. Bangladesh possesses a rich history of agricultural practices going back over many centuries. It is evident that the farmers of this low-lying floodplain-dominated agrarian country were highly innovative in developing numerous cultivars using wild genetic resources. Presence of more than 10,000 rice varieties in the country is a clear example of our vast wealth of genetic resources. This diversity is also true for Banana and many other vegetable species. In the wild, the genetic diversity among the aquatic macrophytes is also found to be very high. The diversity of wild mammals was once high, and the country is still of high global significance for Hoolock Gibbon and Bengal Tiger. Plenty of food, medicine and other ecological services are supplied by the diverse ecosystems of this land, and this has always helped to the resilience of human communities against different natural calamities.

Bangladesh has, so far, 19 nationally designated protected areas comprising approximately 2,458 km², which is 1.66 percent of land area of the country. These include ten national parks, eight wildlife sanctuaries and one game reserve. In addition to *in-situ* conservation areas, there are seven *ex-situ* conservation areas under the management of the Forest Department: Botanical Gardens, Eco-parks and Safari Parks. The Department of Environment has designated nine Ecologically Critical Areas (ECAs) in the country to protect the fragile ecosystems. Very recently (in September 2009) four rivers, namely, the Buriganga, Sitalakhya, Turag and Balu which surround the Capital City Dhaka have been declared by the Department of Environment as ECA. There are also many water bodies managed by local communities that incorporate fish sanctuaries.

The trends of biodiversity in various ecosystems were analyzed based on the available information. Case studies were picked up to show the changes in forest cover and type. The changes in the coastal mangroves and deciduous forest ecosystems were analyzed. From the case studies and analysis it is clear that the rate of degradation is continuing in various ecosystems including Moist Deciduous and Mangrove Forests.

The report highlights the major threats or drivers of biodiversity loss, identified as:

- Change of landuse
- Erosion in genetic resources
- Fragmentation and loss of habitat
- Invasive alien species
- Pollution
- Change in hydrological regime
- Climate change
- Economic systems and policies that fail to value environment and its resources
- Inequality of ownership, management and flow of benefits from both the use and conservation of biological resources
- Lack of knowledge and awareness
- Legal and institutional systems that promote unsustainable exploitation

Executive Summary

The threats of climate change induced hazards such as floods, cyclones, droughts and extremities in climatic variables are discussed in order to illustrate how biodiversity could be threatened as an impact of global warming.

Bangladesh developed its National Biodiversity Strategy and Action Plan (NBSAP) during 2003-2004. NBSAP identified 16 strategies under which 128 action programmes were chalked-out. In the second chapter, a synthesis of the accomplishments and implementation status of the action plan under NBSAP has been furnished. Among these key strategies and action plans some specific programs have been implemented and some are proposed and underway with a view to conserve biodiversity. Some of these support programmes and project activities, both completed and ongoing, include: Sustainable Environment Management Program (SEMP), Community Based Fisheries Management (CBFM 1 & 2), Coastal and Wetland Biodiversity Management Project (CWBMP), Coastal Aforestation Programme, Nishorgo Support Project (Co-management of Protected Areas), Management of Aquatic Ecosystems through Community Husbandry (MACH), Integrated Protected Area Project (IPAC), etc.

The issues relating to sectoral and cross-sectoral integration or mainstreaming of biodiversity are presented in chapter three. It highlights that enhancing human capacity is very important for different sectors in order to conserve biodiversity of the country. The policy instruments of the government on climate change, like National Adaptation Programme of Action (NAPA) and Bangladesh Climate Change Strategy and Action Plan (BCCSAP) contain components that have specific relations with biodiversity conservation. A relationship between biodiversity/ecosystem issues embedded into the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) and activities of thematic groups and sub-groups of NBSAP has been established and presented in a matrix.

Chapter four assesses the progress so far made by Bangladesh towards achieving its 2010 targets. The progress attained on each target under seven focal areas has been summarized in a matrix.

The final chapter, at the end, presents Biodiversity Program of Action (BPA) 2020. Biodiversity conservation and sustainability of Bangladesh are synonymous and need to be taken into account by the policy makers. For long-term economic and social well-being, there is no alternative to manage and conserve biodiversity in Bangladesh. Keeping this view in mind, development of this fourth National Report followed a process of comprehensive consultations with national level experts from various institutions and organizations to deliver their opinions on immediate, urgent and long-term activities to be undertaken to conserve biodiversity.

It was found that the Action Plan as identified in NBSAP has to be updated with present understanding of the problems and solutions thereof. Therefore, it is a compelling necessity to design future program of actions to carry forward biodiversity conservation efforts until the end of the next decade. This Fourth National Report identifies short and long term programmes to be undertaken on nine focal areas of biodiversity conservation in Bangladesh. These focal areas of biodiversity conservation are divided into various project activities. Duration of implementation has been assessed for the proposed projects along with estimated cost. The consultation process came up with 74 projects under nine focal areas. The total requirement of resources or implementation costs is estimated at Taka 25,235 million, equivalent to US dollar 360.5 million. These programs and projects cover the important ecosystems and habitats distributed all over the country, and are proposed for the period up to 2020. The program of action indicates a time frame to act upon and finally implementation mechanisms have been stated. The focal areas upon which the biodiversity programme of actions 2020 (BPA 2020) has been built are:

- Focal Area 1: Coastal and Marine Ecosystems Conservation
- Focal Area 2: Wetlands including Riverine Ecosystems and Fisheries Biodiversity Conservation
- Focal Area 3: Agro-ecosystem and Agricultural Biodiversity Conservation
- Focal Area 4: Hilly Ecosystems and Landscapes Conservation
- Focal Area 5: Forest Biodiversity and Conservation of Wildlife
- Focal Area 6: Biodiversity Conservation in the face of Climate Change
- Focal Area 7: Poverty Reduction through Fair and Equitable Sharing of Benefits
- Focal Area 8: Impact Assessment, Impact Management and Monitoring
- Focal Area 9: Knowledge Management, Communication, Education and Public Awareness

It is desirable that all-out efforts will be made by the concerned agencies of the government towards implementing BPA 2020 of Bangladesh. Government, development partners, NGOs and local communities should come forward for materializing BPA 2020 to achieve the dream for securing Bangladesh as a mega-biodiverse nation in 2020.

Overview of Biodiversity Status, Trends and Threats

1.1 Introduction

Bangladesh is situated in the “oriental region”, between the Indo-Himalayas and Indo-Chinese subregions. The country has a total area of 147,570 km², of which about 80 percent comprises one of the largest deltaic plains in the world, formed in the confluence of the Ganges, the Brahmaputra (Jamuna), and the Meghna rivers. The remaining 20 percent of the land area is comprised of the undulating, forested Hill Tracts. Distinct physiographic characteristics, variations in hydrological and climatological conditions, and difference in the soil properties in Bangladesh contribute in developing diverse forms of ecosystems enriched with great diversity of flora and fauna.

Diversity of ecosystems and its rich floral and faunal resources have made Bangladesh and its ecosystems resilient to natural calamities. The rich biodiversity of this land with moderate tropical climate makes it soothing for the human habitation. As an agrarian society, Bangladesh and its population heavily depends on the genetic resources of crop varieties. The history of its rich agricultural practices goes back to many centuries and farmers were highly innovative to create many cultivars using wild genetic resources. Presence of 10,000 plus rice varieties is a clear example of our vast wealth of genetic resources. Bangladesh is also one of the oldest producers of cotton and its rich and diverse collection of medicinal plants attracts attentions throughout the history.

Nevertheless, the richness of species diversity, health of ecosystems and habitats has been declined in recent decades for a number of reasons, which are mentioned in the following sections.

1.2 State of Biodiversity in Bangladesh

1.2.1 Ecosystem Diversity

Within a relatively small geographic boundary, Bangladesh enjoys a diverse array of ecosystems. Being a low-lying deltaic country, seasonal variation in water availability is the major factor, which generates different ecological scenarios of Bangladesh. Temperature, rainfall, physiographic variations in soil and different hydrological conditions play vital roles in the country's diverse ecosystems.

The ecosystems of Bangladesh could be categorised into two major groups, i.e. (i) land based and (ii) aquatic. The land-based ecosystems include forest and hill ecosystems, agro-ecosystems and homestead

Overview of Biodiversity Status, Trends and Threats

ecosystems; while seasonal and perennial wetlands, rivers, lakes, coastal mangroves, coastal mudflats and chars, and marine ecosystems fall into the aquatic category.

Each of the ecosystems has many sub-units with distinct characteristics as well. IUCN Bangladesh in 2002 classified the country into twenty five bio-ecological zones (Figure 1.1), some of which are constituted of one or more than one type of ecosystems mentioned above.

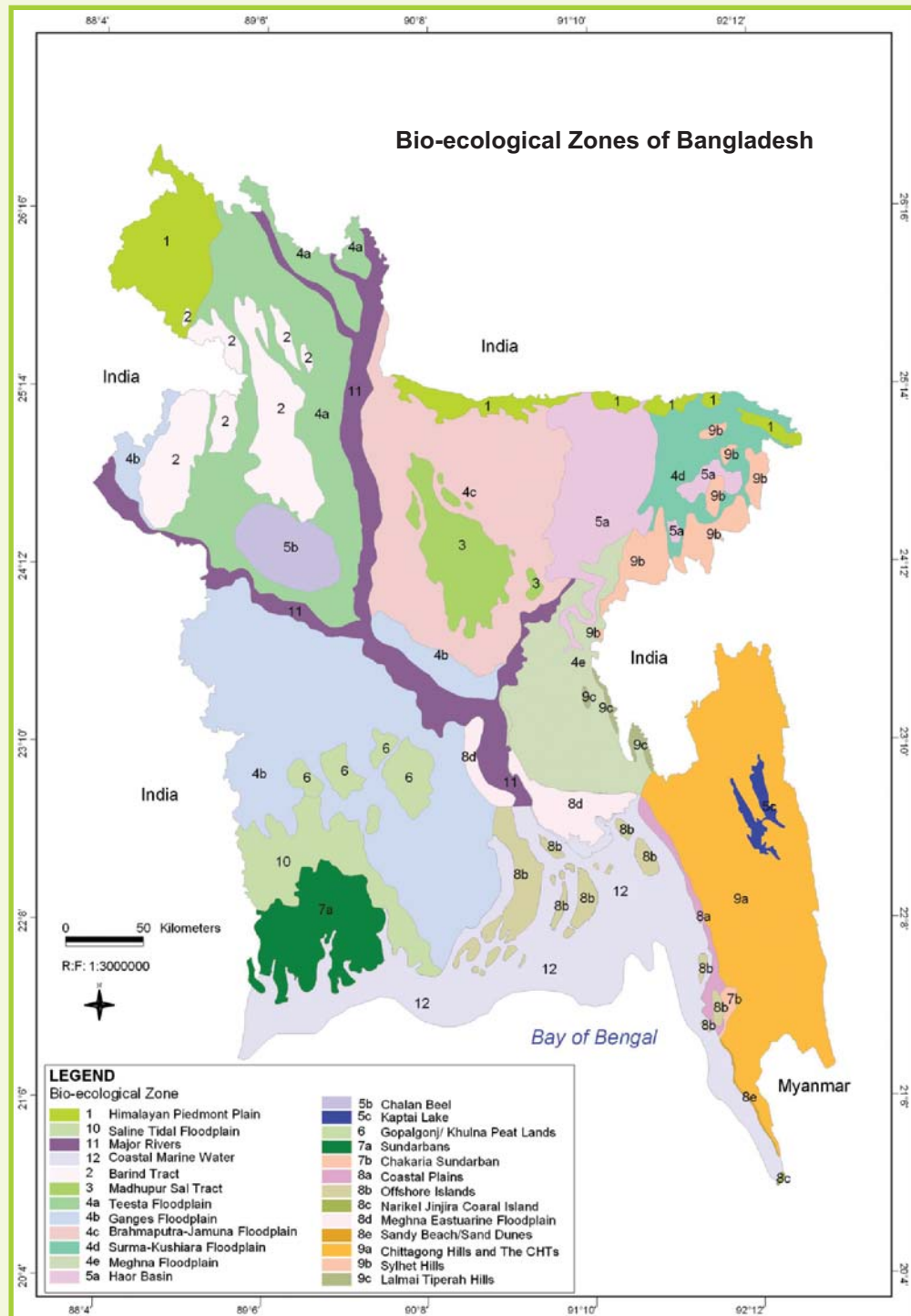


Figure 1.1. Bio-ecological Zones of Bangladesh (Source: IUCN Bangladesh 2002)

Overview of Biodiversity Status, Trends and Threats

The following sections describe the present status of various ecosystems of the country.

1.2.1.1 Forest Ecosystem

Tropical Evergreen and Semi-evergreen Hill Forest

Remnants of tropical evergreen and semi evergreen forests extend over the eastern parts of the country lying within the divisions of Chittagong and Sylhet, totalling an area of 6,70,000 hectares which is 4.54% of total landmass of the country and 44% of national forest land. Depending on topography, soil and climate these areas are categorized as: (i) tropical wet evergreen forests and (ii) tropical semi-evergreen forests. The difference between evergreen and semi-evergreen forests are minor and the difference primarily developed due to the presence of few deciduous species in the top canopy layer. In evergreen forest, all the forest layers remain green throughout the year, however, in semi-evergreen forest the top canopy layer drop their leaves in certain period of the year and become deciduous.



Plate 1: Asiatic Elephant roaming in evergreen forest ecosystems of Bangladesh.

The hill forests comprise of numerous plant as well as animal species; an estimated 2,259 species of angiosperm were reported from Chittagong region alone. The top canopy of these forests range from 30 to 50 meter in height and usually comprises various species of Garjan (*Dipterocarpus* sp.), Chapalish (*Artocarpus chaplasha*), Civit (*Swintonia floribunda*), Telsur (*Hopea odorata*), Buddah Narikel (*Pterygota alata*) etc. The second storey ranges between 15 and 25 meter in height and the tree species are Jam (*Syzygium* sp.), Rata (*Amoora wallichii*), Tali (*Palaquium polyanthrum*), Kamdeb (*Callophyllum polyanthum*), Uriam (*Mangifera sylvatica*), Jarul (*Legarstromia speciosa*), Nageshwar (*Mesua ferrea*), Raktan (*Lophopetalum wightianum*), Gamar (*Gmelina arborea*) etc. The third storey ranges from 1 to 15 meter and comprises saplings of species of upper two canopies as well as *Vitex glabrata*, *Saraca indica*, *Molletus philippensis*, *Macaranga* sp., *Castanopsis indica*, *Cordia myxa* etc. Bamboos, canes, climbers and fern also grow as undergrowth in these forests.



Plate 2: Ulotchondal (*Gloriosa superba*) a useful medicinal plant.

Most of the natural forests of this region were converted to plantations since 1871, but some remnants of native forest and old semi-natural plantations remain. At present, plantation activities are being conducted under

Overview of Biodiversity Status, Trends and Threats

development projects. Some valuable plantation species are Teak (*Tectona grandis*), Gamar (*Gmelina arborea*), Mehogani (*Swietenia spp.*), Chapalish (*Artocarpus chaplasha*), Jarul (*Legarstromia speciosa*), Koroj (*Albizzia spp.*), Chikrassi (*Chikrassia tabularis*), Pynkado (*Xylia dolabriformis*), Kadam (*Anthocephalus cadamba*), and Telsur (*Hopea odorata*).

This forest ecosystem still provides a rich wildlife habitat. Among the mammals, Asian Elephant (*Elephas maximus*) and Western Hoolock Gibbon (*Hoolock hoolock*) can be considered as flagship species for these forests. Globally threatened species of mammal, bird, reptile and amphibian found in Bangladesh are listed by ecosystem in Table 1.1. Out of 34 globally threatened species found in these forests the majority are mammals.

Table 1.1 Species of Globally Threatened Mammals, Birds, Reptiles and Amphibians Found in Different Environments in Bangladesh.

Scientific Name	English Name	Status	Forest			Wetland		Other open country	Comment
			Ever-green	Decid-uous	Man-grove	Coast & Fresh marine	Fresh water		
<i>Elephas maximus</i>	Asian Elephant	EN	X						Critically endangered in BD; SE
<i>Nycticebus bengalensis</i>	Bengal Slow Loris	VU	X						NE, SE
<i>Macaca assamensis</i>	Assamese Macaque	NT	X						Scarce NE, SE
<i>Macaca leonina</i>	Northern Pig tailed Macaque	VU	X						Common NE, SE
<i>Trachypithecus phayrei</i>	Phayre's Leaf Monkey	EN	X						NE, SE, Small isolated populations
<i>Trachypithecus pileatus</i>	Capped Langur	VU	X	X					Common
<i>Hoolock hoolock</i>	Western Hoolock Gibbon	EN	X						NE, SE, Small Isolated populations
<i>Ratufa bicolor</i>	Black Giant Squirrel	NT	X						NE, SE
<i>Caprolagus hispidus</i>	Hispid Hare	EN						X	North-centre
<i>Manis crassicaudata</i>	Thick-tailed Pangolin	NT	X						SE
<i>Manis pentadactyla</i>	Chinese Pangolin	EN	X						SE
<i>Catopuma temminckii</i>	Asian Golden Cat	NT	X						Status uncertain
<i>Panthera pardus</i>	Leopard	NT	X						? lost
<i>Panthera tigris</i>	Bengal Tiger	EN			X				Sundarbansholds about 10% of world population
<i>Pardofelis marmorate</i>	Marbled Cat	VU	X						SE
<i>Prionailurus viverrinus</i>	Fishing Cat	EN		X	X		X	X	Substantial population
<i>Neofelis nebulosa</i>	Clouded Leopard	VU	X						SE
<i>Arctictis binturong</i>	Binturong	VU	X						
<i>Viverra zibetha</i>	Large Indian Civet	NT	X	X	X			X	Widespread
<i>Cuon alpinus</i>	Dhole	EN	X						SE
<i>Aonyx cineria</i>	Oriental Small-clawed Otter	VU	X			X			
<i>Lutra lutra</i>	Eurasian Otter	NT					X		NE
<i>Lutra perspicillata</i>	Smooth-Coated Otter	VU			X	X	X		
<i>Arctonyx collaris</i>	Hog Badger	NT	X						SE
<i>Helarctos malayanus</i>	Malayan Sun Bear	VU	X						SE
<i>Melursus ursinus</i>	Sloth Bear	VU	X						Status uncertain
<i>Selenarctos thibetanus</i>	Asiatic Black Bear	VU	X						NE and SE
<i>Capricornis thar</i>	Himalayan Serow	NT	X						SE
<i>Axis porcinus</i>	Hog Deer	EN	X						1 record 2002
<i>Rusa unicolor</i>	Sambar	VU	X						SE almost extirpated
<i>Balaenoptera edeni</i>	Bryde's Whale	DD				X			
<i>Balaenoptera physalus</i>	Fin Whale	EN				X			
<i>Orcaella brevirostris</i>	Irrawaddy Dolphin	VU			X	X			Major part of world population
<i>Sousa chinensis</i>	Indo-Pacific Hump backed Dolphin	NT				X			
<i>Stenella longirostris</i>	Spinner Dolphin	DD				X			
<i>Tursiops aduncus</i>	Indo-Pacific Bottlenose Dolphin	DD				X			
<i>Neophocaena phocaenoides</i>	Finless Porpoise	VU				X			
<i>Physeter macrocephalus</i>	Sperm Whale	VU				X			One recent record
<i>Platanista gangetica</i>	Ganges River Dolphin	EN			X		X		Substantial part of world population

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Scientific Name	English Name	Status	Forest			Wetland		Other open country	Comment
			Ever-green	Decid-uous	Man-grove	Coast & Fresh marine	Fresh water		
<i>Arborophila atrogularis</i>	White-cheeked Partridge	NT	X						NE and SE rare resident
<i>Anas falcata</i>	Falcated Duck	NT					X		Rare winter visitor
<i>Anas formosa</i>	Baikal Teal	VU					X		Vagrant
<i>Aythya baeri</i>	Baer's Pochard	EN					X		World's main wintering area but major decline
<i>Aythya nyroca</i>	Ferruginous Duck	NT					X		Common winter visitor
<i>Pelargopsis amauroptera</i>	Brown-winged Kingfisher	NT			X				Sundarbans holds main population in world
<i>Columba punicea</i>	Palecap ped Pigeon	VU	X						Vagrant
<i>Heliopais personata</i>	Masked Finfoot	EN			X				World's main population
<i>Gallinago nemoricola</i>	Wood Snipe	VU	X						Vagrant
<i>Limosa limosa</i>	Black-tailed Godwit	NT				X	X		Common winter visitor
<i>Numenius arquata</i>	Eurasian Curlew	NT				X			Common winter visitor
<i>Tringa guttifer</i>	Spotted Greenshank	EN				X			Regular winter visitor
<i>Limnodromus semipalmatus</i>	Asian Dowitcher	NT				X			Rare winter visitor
<i>Eurynorhynchus pygmeus</i>	Spoon-billed Sandpiper	CR				X			World's main wintering area but major decline
<i>Rynchops albicollis</i>	Indian Skimmer	VU				X			World's main wintering area
<i>Sterna acuticauda</i>	Black-bellied Tern	NT					X		Resident, serious recent decline
<i>Haliaeetus leucoryphus</i>	Pallas's Fish Eagle	VU			X		X		Significant breeding population
<i>Ichthyophaga ichthyaetus</i>	Grey-headed Fish Eagle	NT					X		Rare but widespread resident
<i>Neophron percnopterus</i>	Egyptian Vulture	EN						X	vagrant
<i>Gyps bengalensis</i>	White-rumped Vulture	CR	X		X			X	Resident on verge of extinction from diclofenic poisoning
<i>Gyps tenuirostris</i>	Slender-billed Vulture	CR						X	Resident, may have been extirpated in last decade from diclofenic poisoning
<i>Circus macrourus</i>	Pallid Harrier	NT						X	Winter vagrant
<i>Aquila clanga</i>	Greater Spotted Eagle	VU			X	X	X		Regular winter visitor
<i>Aquila hastata</i>	Indian Spotted Eagle	VU	X					X	Rare resident
<i>Aquila heliaca</i>	Asian Imperial Eagle	VU					X		Rare winter visitor
<i>Falco cherrug</i>	Saker	EN	X						Vagrant
<i>Falco jugger</i>	Laggar Falcon	NT						X	Rare resident
<i>Falco naumanni</i>	Lesser Kestrel	VU						X	Rare passage migrant
<i>Anhinga melanogaster</i>	Oriental Darter	NT					X		Rare resident/winter
<i>Ardea insignis</i>	White-bellied Heron	CR					X		Vagrant
<i>Threskiornis melanocephalus</i>	Black-headed Ibis	NT			X	X	X		Uncommon winter visitor
<i>Mycteria leucocephala</i>	Painted Stork	NT					X		Rare visitor
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	NT					X		Vagrant
<i>Leptoptilos dubius</i>	Greater Adjutant	EN					X		Vagrant
<i>Leptoptilos javanicus</i>	Lesser Adjutant	VU			X		X		Rare resident
<i>Pitta megarhyncha</i>	Mangrove Pitta	NT			X				Important population in Sundarbans
<i>Luscinia pectardens</i>	Firethroat	NT					X		Vagrant winter visitor
<i>Graminicola bengalensis</i>	Rufous-rumped Grassbird	NT					X		Rare resident
<i>Pellorneum palustre</i>	Marsh Babbler	VU	X						Status uncertain
<i>Emberiza aureola</i>	Yellow-breasted Bunting	VU					X		Declining winter visitor
<i>Indotestudo elongata</i>	Elongated Tortoise	EN	X						NE and SE
<i>Manouria emys</i>	Asian Giant (Burmese Mountain) Tortoise	EN	X						Reported in Hilltracts
<i>Batagur baska</i>	Four-toed (River) Terrapin	CR			X				Sundarbans
<i>Batagur dhongoka</i>	Threestriped (Painted) Roofed Turtle	EN					X		Main rivers

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Scientific Name	English Name	Status	Forest			Wetland		Other open country	Comment
			Ever-green	Decid-uous	Man-grove	Coast & Fresh marine	water		
<i>Batagur kachuga</i>	Red-crowned Roofed Turtle	CR					X		Ganges/Padma river
<i>Cuora amboinensis</i>	Southeast Asian Box Turtle	VU					X		SE hills
<i>Cyclemys dentata</i>	Brown Stream Terrapin	NT					X		SE
<i>Geoclemys hamiltonii</i>	Black Spotted Turtle	VU					X		Main rivers
<i>Hardella thurjii</i>	Crowned River Turtle	VU					X		Widespread but rapidly declining
<i>Melanochelys tricarinata</i>	Threokeeled Land Tortoise	VU						X	NE and SE
<i>Melanochelys trijuga</i>	Indian Black (Snail-eating) Tutle	NT					X		Widespread but uncommon
<i>Morenia petersi</i>	Indian Eyed Turtle	VU					X		Widespread but exploited
<i>Pangshura smithii</i>	Brown Roofed Turtle	NT					X		Ganges/Padma river
<i>Pangshura sylhetensis</i>	Sylhet Roofed Turtle	EN					X		Small rivers in NE andSE
<i>Nilssonina gangetica</i>	Indian Softshell Turtle	VU					X		Heavily exploited
<i>Nilssonina hurum</i>	Indian Peacock Softshell Turtl	VU					X		Widespread but heavily exploited
<i>Nilssonina nigricans</i>	Black Softshell Turtle	Extinct in wild					X		Only found in Bostami pond, Chittagong
<i>Chitra indica</i>	Indian Narrow-headed Softshell Turtle	EN					X		Rivers
<i>Pelochelys cantorii</i>	Asian Giant (Frog-faced) Softshell Turtle	EN			X	X	X		Large rivers into estuary and Sundarbans
<i>Caretta caretta</i>	Loggerhead Turtle	EN				X			Vagrant, no recent nesting
<i>Chelonia mydas</i>	Green Turtle	EN			X	X			Nests St. Martin's Island
<i>Eretmochelys imbricata</i>	Hawksbill Turtle	CR				X			Vagrant
<i>Lepidochelys olivacea</i>	Olive Ridley Turtle	VU			X	X			Nests on St. Martin's Island and chars off Sundarbans
<i>Dermochelys coriacea</i>	Leatherback Turtle	CR			X	X			Vagrant
<i>Python molurus</i>	Asiatic (Indian) Rock Python	NT	X		X		X	X	
<i>Gavialis gangeticus</i>	Gharial (Fish-eating Crocodile)	CR					X		Virtually extirpated, Padma / Ganges
<i>Occidozyga borealis</i>	Northern Frog	VU	X						SE (hills)
Total species		106	34	5	20	2 4	41	12	

*Status: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; DD = Data Deficient; NT = Near Threatened

*Cross marks indicate presence of the species in an ecosystem, X = main/significant population, x = subsidiary population/occurs

*Global threat status is taken from IUCN 2010. IUCN Red List of Threatened Species. Version 2010.1. <www.iucnredlist.org>, Downloaded on 22 March 2010.

*Sources for distribution and comments include the relevant volumes of:

Siddiqui, K.U., Islam, M.A., Kabir, S.M.H., Ahmad, M., Ahmed, A.T.A., Rahman, A.K.A., Haque, E.U., Ahmed, Z.U., Begum, Z.N.T., Hassan, M.A. Khondker, M., & Rahman, M.M. (eds.) (2008-9) Encyclopedia of flora and fauna of Bangladesh. Dhaka: Asiatic Society of Bangladesh.

- * IUCN Bangladesh. (2000). Red Book of Threatened Wildlife of Bangladesh. IUCN The World Conservation Union, Dhaka
- * Sequence follows that of Siddiqui et al. Scientific names follow IUCN RED LIST
- * English names follow Siddiqui et al. with alternate names from IUCN RED LIST also given.

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Moist Deciduous Forest (Sal Forest)

The central and northern districts of Bangladesh covering an area of 1,20,000 (FAO 2007) hectares, about 0.81% of total land area of the country and 7.8% of the country's forest land, are bestowed with Tropical Moist Deciduous Forests. A recent forest inventory (FAO 2007) estimated that 3.75 million cubic meter of wood remain in the Sal forests. There are three different belts of deciduous forests in the country, the largest belt is known as "Madhupur Garh" with very distinct land feature comprised of ridges and gentle depressions. The elevated lands contained the forest trees and almost all the depressions are used as cultivable land for paddy. The second belt of deciduous forest lies along the foothills of the Garo hills of India and the configuration of this belt is somewhat different from Madhupur Garh with irregular distribution of broken hills.



Plate 3: Moist Deciduous Forest in Bhawal National Park.

The third belt is located in the north-western part of the country and differs again with forest intermingled with settlements and fragmented into smaller patches. Sal (*Shorea robusta*) is the main species in these forests with 70 to 100 percent upper canopy coverage. Other associated tree species are Koroi (*Albizia procera*), Azuli (*Dillenia pentagyna*), Sonalu (*Cassia fistula*), Bohera (*Terminalia belerica*), Haritaki (*Terminalia chebula*), Kanchan (*Bauhinia acuminata*), Jarul (*Lagerstroemia speciosa*), Jam (*Syzygium* spp.), Kaika (*Adina cardifolia*), Amlaki (*Phyllanthus emblica*), Palash (*Butea frondosa*), *Bhuhinia* sp., and *Zizyphus rugosa*. The undergrowth of this forest is limited, but some important species are: *Holarrhena antidysenterica*, *Glycosmis arborea*, *Randia* sp., *Clerodendron viscosum*, *Elephantopus scaber*, *Oplismenus compositus* and *Pennisetum setosum*. The common climbers are *Spatholobus roxburghii*, *Dioscorea pentaphylla* and *Scindapsus officinalis*.

Once these forests were very rich in faunal diversity. Indian rhinoceros used to live here in the last century. Only five species of globally threatened wildlife species presently occur in these heavily degraded and fragmented forests



Plate- 5 : Gangetic River Dolphin (*Platanista gangetica*) in the Sundarbans Mangrove Forest



Plate 4: Sundarbans Mangrove Forest of Bangladesh.

Mangrove Forest

The largest single tract of natural mangrove forest in the world is the Sundarbans. It consists of a total of 6,01,700 hectare which is 4.07% of total land area of the country and contains 40% of total forest land. Sundarbans harbours 334 species of trees, shrubs, herbs and epiphytes and about 400 species of wild animals. Bengal Tiger is the magnificent animal of the

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Sundarbans. Four cetacean species have been identified in the mangrove channels, including the endangered Ganges River Dolphin and Irrawaddy Dolphin. 1,39,700 hectares of forest land of Sundarbans is declared as World Heritage Site where three wildlife sanctuaries viz. Sundarbans East, Sundarbans West and Sundarbans South are located. The forest inventory of 1998 reported that 12.26 million cubic meter of timber was standing.

Sundri is the most important tree species in the Sundarbans, which is distributed over 73% of the reserve. Besides Sundri, the other prominent species are: Gewa (*Excoecaria agallocha*), Baen (*Avicinnia officinalis*), Passur (*Xylocarpus mekongensis*), Keora (*Sonneratia apetala*), Goran (*Ceriops decandra*), and Hental (*Phoenix paludosa*). The Sundarban also offers high value non-timber forest products like Golpata (*Nypa fruticans*), honey, wax, fish, and crabs.

Sundarbans is a unique habitat for a number of wildlife species. Among them, the most important mammalian species is Bengal Tiger (*Panthera tigris tigris*). Other important wildlife species are listed in Table 1.1. As many as 20 globally threatened species inhabit the Sundarbans, including major populations of several threatened birds. One of the world's most endangered turtle species *Batagur baska* is found in the Sundarbans. Moreover, the coast of Sundarbans is a breeding ground for threatened marine turtles (Olive Ridley Turtle, and Green Turtle).



Plate 6: Rare dolphins off the coast of Sundarbans.

Nearly 6,000 Irrawaddy Dolphins, which are related to orcas or killer whales, were recently found living in freshwater regions of Sundarbans mangrove forest and the adjacent waters of the Bay of Bengal. A significant sign for a vulnerable species found only in small numbers elsewhere in the world. However, the newly discovered population is already threatened by climate change and fishing nets. Prior to this study the largest known populations of Irrawaddy Dolphins numbered in the low hundreds or less. This discovery gives a great hope for the survival of this threatened species and conservation of this habitat needs to be prioritized. The Irrawaddy Dolphin grows up to 8 feet (2.5 meters) in length and frequents large rivers, estuaries, and freshwater lagoons in south and Southeast Asia. In 2008, they were listed as vulnerable in the International Union of Conservation of Nature's Red List based on declines in known populations.

Fresh Water Swamp Forests

Fresh water swamp forest consists of flood-tolerant evergreen trees. A fully developed stand exhibits a closed canopy with mature trees standing ten to twelve meters tall. *Barringtonia acutangula* (hijal) and *Pongamia pinnata* (korocho) occur in varying proportions to form this vegetation type. *Crataeva nurvala* (barun), *Trewia nudiflora* (gotagamar, panidumur) are frequently present, while *Salix tetrasperma* (bias, panihijal) is rarely observed.



Plate 7: Haor, the most important wetland of the country.

These trees mostly produce their seeds in the monsoon period and they disperse them through water; seedlings grow in great quantities. In addition, woody shrubs such as *Phyllanthus reticulatus* (chitki), *Ficus heterophylla*, *Rosa involucrata*, and *Asclepias* climbers are found.

Swamp forest is adapted to monsoon flooding for three to four months, to depths of 0.5 to 2.5 meters. Much of the area, which currently remains under monsoon paddy would once have been occupied by swamp forest as well as Redlands and other aquatic vegetation. Remnant swamp forest patches are now restricted to areas sloping away from village highland down towards the haors,

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helping to protect homesteads from wave erosion, and some recently replanted areas. These patches vary from a few plants to several hectares of more than a thousand trees. Depending on local conditions, particularly the extent of human disturbance, the luxuriance of the vegetation varies, from sparse low trees with undergrowth grasses, as at Rangchi and Rupnagar in Tangua Haor, to dense closed canopy with poor undergrowth, as was at Pashua Beel in Gurmar Haor, Tahirpur, Sunamganj District.

1.2.1.2 State of Wetlands Ecosystem

According to Ramsar Convention, wetlands are areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres. Bangladesh is a land of water and wetlands. Wetlands constitute more than fifty percent territory of the total country and play significant role in social and economic livelihood of the population.

Types of Wetlands

Wetlands can be of different types based on their hydrological and ecological attributes (Table 1.2). The wetlands in Bangladesh encompass a wide variety of ecosystems including: the main rivers (Ganges, Brahmaputra and Meghna) and their 700-plus tributaries and distributaries; some 6,300 beels (permanent and seasonal shallow lakes in floodplain depressions); at least 47 major haors (deeply flooded depressions in the north-east), baors (oxbow lakes); vast areas of seasonally flooded land; the extensive mudflats and coastal chars of the estuaries of the rivers; mangrove forests; intertidal zones along the eastern coast; reservoirs; and fish ponds and tanks. They occupy about half the land area of the country in the monsoon season.

Table 1.2: Wetlands Areas by Types

Types of wetlands	Area in Hectares
Open water wetlands	
Rivers	749,700
Estuarine and mangrove forest	610,200
Beels and haors	114,200
Inundable floodplains	548,6600
Kaptai lake	68,800
Closed water wetlands	
Ponds	146,900
Baors (oxbow lake)	5,500
Brackish water farms	108,000
Total	7289,900

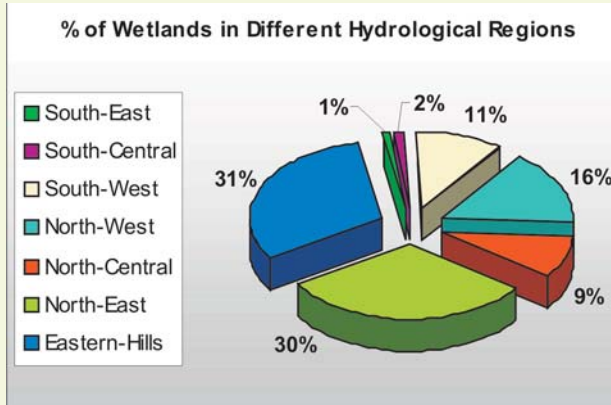
(Source: Akonda 1989 and Khan 1994, Asian Wetland Bureau)

There is no recent assessment of wetland area in Bangladesh. However, National Water Resources Database (NWRD, 1997) has estimated about 172,087 hectares of permanent wetlands (excluding rivers and estuary) in the country. The database also revealed that 21% of the country is deeply flooded (more than 90 cm) and 35% experiences shallow inundation during monsoon. National Water Management Plan (NWMP) has divided the country into eight hydrological zones based on their characteristics. Hydrological zone wise areas of permanent wetlands are provided in Table 1.3. In Figure 1.2, a map is presented to show the spatial distribution location of permanent wetlands of the country.

Table 1.3: Wetland areas in Different Hydrological Regions

Hydrological Regions	Area in 1997 (ha)
South -East	1,255
South -Central	2,604
South -West	18,400
North -West	27,016
North -Central	15,940
North -East	53,180
Eastern -Hills	53,692
Total	172,087

(Source: NWRD, 1997)



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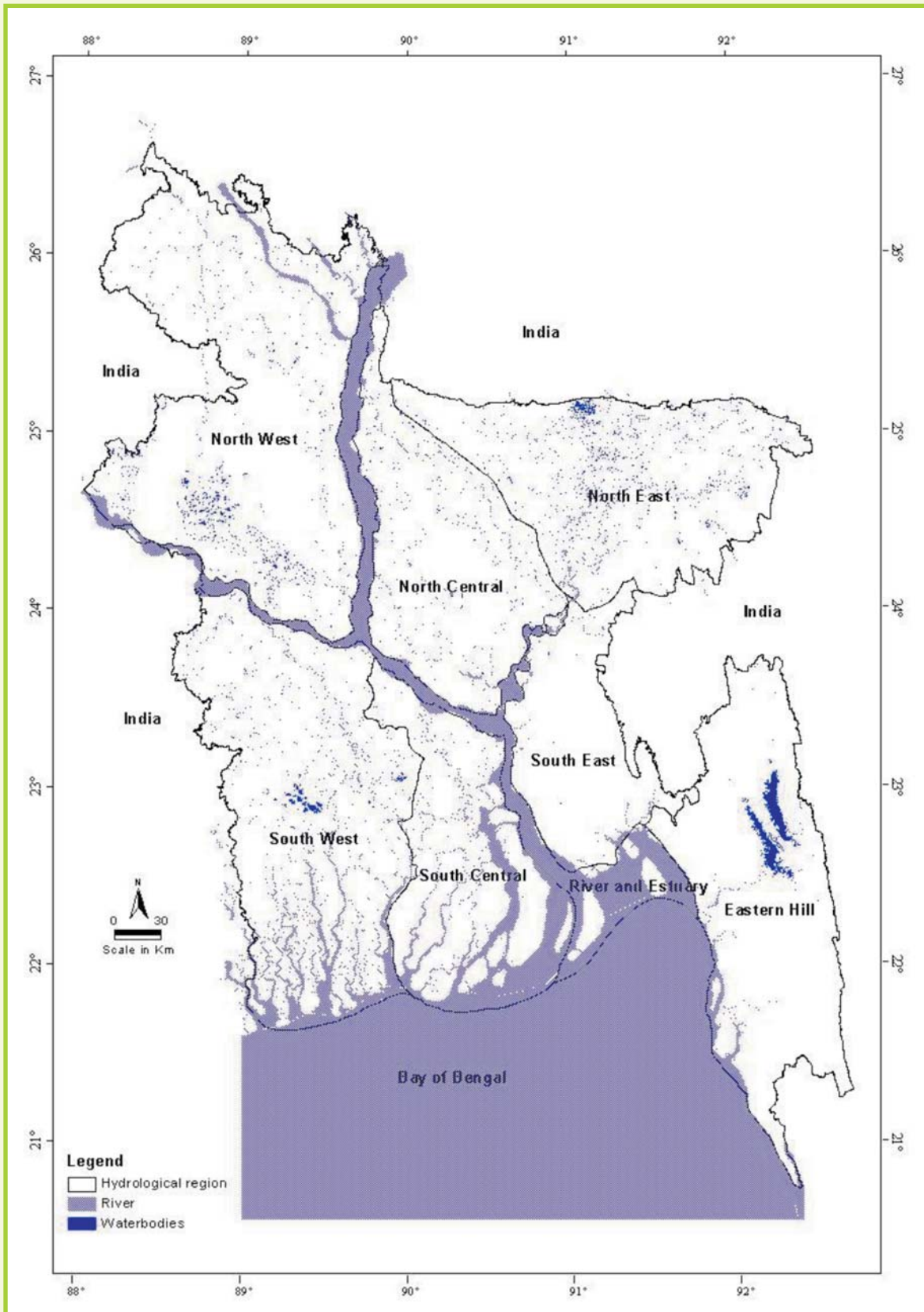


Figure 1.2. Spatial Distribution and Location of Permanent Wetlands of the Country with Hydrological Boundaries Overlaid.

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Species richness in the freshwater wetlands

Wetlands of Bangladesh are particularly rich in biodiversity, the number of aquatic macrophytes reaches more than 200 species. Moreover, approximately 150 species of birds are found to be fully or partially wetland dependent. For wetland dependent mammal, reptile and amphibian species, more than 80 species in 37 families are thought to have existed in the country. A total of 251 species of freshwater fishes and many more estuarine fish species also inhabit these wetland habitats. As Table 1.1 shows this ecosystem hosts the greatest diversity (41 species) of globally threatened species of any ecosystem, in the faunal groups considered. The Haor Basin of Sylhet and eastern Mymensingh has special biological significance. This area is recognized as wetland ecosystem of international importance, especially for waterfowl habitats. These wetlands provide habitat for about 125 species of resident and migratory water birds as well as a diversity of aquatic and terrestrial plants, aquatic invertebrates, fish, mammals, amphibians and reptiles. In the winter several of the haors support internationally important concentrations of waterbirds including 100,000-200,000 ducks, and provide refuge for many other species rarely found elsewhere in the country. Not only the haors but also the main river system provide vital habitat for a diverse fauna of freshwater turtles, the majority of which are now globally threatened.

1.2.1.3 Homestead ecosystem

In Bangladesh, about 20% of the total land is covered with settlement, much of which is covered with trees. According to National Forest and Tree Resources Assessment 2005-07, the area of rural settlement with tree cover stands at 2.767 million hectares of which about 45% of lands have over 10% tree cover. Homestead vegetation is a very important plant community, not only for its plant resources but also as wildlife refuge. The community includes two types of



Plate 8: Typical homesteads with associated vegetation.

plant: those cultivated for their economic value, and those that are self-propagating. Plants of the first category can be found all over the country, and composition within this type is more or less uniform. The composition within the second type is more interesting, in that it reflects the composition of nearby natural communities, including communities and species that have otherwise vanished locally, and contains some strong clues as to local vegetation composition in times past.

According to National Forest and Tree Resources Assessment (2005-07), the average gross and commercial volume of timber produced by homestead ecosystem is about 36.1 m³ and 28.2 m³ per hectare respectively. The value of commercial volume per hectare of homestead ecosystem is comparable to that of forest area (29.7 m³ per hectare).

Homestead ecosystem is also very important for providing shelter to wildlife. With dwindling forest cover this importance is becoming far more significant. Most of the small mammals and birds still exist in the country are completely dependent on this ecosystem, including agricultural land for their existence. Although only 12 species of globally threatened wildlife in Table 1.1 occur in this habitat of open country not comprising of forests or wetlands, of particular note are two critically endangered species - White-rumped Vulture (*Gyps bengalensis*) and Slender-billed Vulture (*Gyps tenuirostris*). Both species are on the brink of extinction having suffered a sharp decline in population resulting from veterinary use of the anti-inflammatory drug diclofenac. Bangladesh has not yet banned its use and replaced it with the safe alternative meloxicam, unlike the neighbouring range states of India, Nepal and Pakistan.

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1.2.1.4 Coastal and Marine Ecosystem

The coastline of Bangladesh is 714 km long and can be broadly divided into three regions: the eastern region (Pacific type), the active delta of the central region, and the stable deltaic western region (Atlantic type). The Bay of Bengal occupies an area of about 2.2 million sq. km and the average depth is 2,600m with a maximum depth of 5,258m. Bangladesh is situated at the head of the Bay of Bengal. The coast is characterized by a vast network of rivers (24,000 km in length) covering an area of 9,380 square kilometres, a large number of islands between channels, a submarine canyon (Swatch of No Ground), the funnel shaped part of the northern Bay of Bengal, huge amount of sediment transportation (annually about 2.4×10^9 m tons), low relief (1.2-4.5 m above mean sea level) and tropical cyclones. The area of the sea that makes up the Bangladesh Exclusive Economic Zone (EEZ) is estimated to be about 1,25,000 sq km. and spreads up to 200 nautical miles from the coastline.

The width of the continental shelf off the coast of Bangladesh varies considerably. It is less than 100 km off the south coast between Hiron Point and the Swatch of No Ground and more than 250 km off the coast of Cox's Bazar. Sediments are fine seaward and westward with the thickest accumulation of mud near the submarine canyon, the Swatch of No Ground. The shallow part (less than 20 m) of the continental shelf off the coast of Chittagong and Teknaf is covered by sand and the intertidal areas show well-developed sandy beaches. The shallower part of southern continental shelf off the coast of the Sundarbans, Patuakhali and Noakhali is covered by silt and clay; and extensive muddy tidal flats have developed along the shoreline. Some of the shoals and sand ridges present on this part of the continental shelf show an elongation pattern pointed towards the Swatch of No Ground.

Surface hydrology of the Bay of Bengal is basically determined by the monsoon winds and to some extent by the hydrological characteristics of the open part of the Indian Ocean. Fresh water from the rivers largely influences the coastal northern part of the Bay. The coast as a whole falls under the tracks of the cyclone forming over the Bay of Bengal and suffers almost annually from severe cyclone storms.

The coast of Bangladesh can be broadly divided into three distinct ecological regions (adopted from Hossain, 2004):

1. **The western region** covering the coastline from the Tetulia River west to the inter-national border at the Harbanga River. The western region includes the Sundarbans, the world's largest patch of naturally occurring mangroves. The mangrove forest further stretches west into India.
2. **The central region** is situated from Tetulia River east to the Big Feni river estuary, including the mouth of the Meghna River. Most of the combined flow of the GBM (Ganges- Brahmaputra-Meghna) system is discharged through this low-lying area. The lower Meghna river estuary is highly influenced by tidal interactions and consequential backwater effect. Heavy sediment inputs from the river result in a morphologically dynamic coastal zone.

Table 1.4: Area of the Continental Shelf of Bangladesh (Saetre, 1981).

Depth Zone (m)	Area (km ²)
Up to 10	24000
10 - 24	8400
25 - 49	4800
50 - 74	5580
75 - 99	13410
100 - 199	10250
TOTAL	66440

3. **The eastern region** extends from Big Feni River east to Badar Mokam, the southern tip of the main land. This part is more or less unbroken, characterized by muddy flat and sandy beaches, with a degraded natural mangrove forest in the estuarine zone of the Matamuhuri River. The Karnafulli, Sangu, Matamuhuri, Bakkhali and Naf Rivers discharge fresh water through the plains.

The continental shelf of Bangladesh covers an area of 66,440 km², of which 37,000 km² are no deeper than 50 m (Table 1.4).

Overview of Biodiversity Status, Trends and Threats

The occurrence of coastal and marine species

The species diversity of coastal-marine ecosystems is controlled by the physico-chemical properties of seawater. Water discharges from the surrounding river catchments carry huge influx of sediments full of nutrients to the Bay, particularly along the near shore region. This has turned the Bay into a fertile marine fishing ground. The near-shore up-welling zone not only has a high yield of nutrients, but also is a high primary production area for the phytoplankton and related zooplankton zones. Although fisheries resources remain scattered in the Bay, but important fishing grounds with high productivity are concentrated in some places. Four fishing grounds have been identified so far (Figure 1.3). Of the three fishing grounds, the South Patches are the most productive one, with an estimated standing stock of 11.4-16.0 m ton per sq km.

The biological resources of the Bay of Bengal not only comprise of fishes but also include crustaceans, elasmobranchs, cetaceans, and highly significant habitats for wintering shorebirds. The coastal and pelagic waters of Bangladesh host a large diversity of cetaceans (dolphins, whales and porpoise), including eight globally threatened species (Table 1.1). The highly productive tip of the Swatch of No Ground has been identified as a cetacean hotspot with a relatively high abundance of at least four small and one large cetacean species. The estuarine and coastal waters of Bangladesh have recently been discovered to host the world's largest population of the vulnerable Irrawaddy Dolphins (*Orcaella brevirostris*). Out of 24 globally threatened species listed for this ecosystem in Table 1.1, eight are birds. Critically endangered two species: the Spoon-billed Sandpiper (*Eurynorhynchus pygmeus*) which has rapidly fallen to a world population of only about 250 pairs - the larger part of its population winter in the mudflats of the Bangladesh coast as well as neighbouring Myanmar; while about half of the world population of the vulnerable Indian Skimmer (*Rynchops albicollis*)



Plate 9 : Batagur in nature



Plate 10 : Batagur in captivity

Batagur baska commonly known as estuarine or river terrapin is critically endangered species known to be found only in the Sundarbans mangrove ecosystem in Bangladesh. Batagur is known to play an important role in the dispersal and germination of *Sonneratia* sp., as its seeds have to pass through the digestive tract for germination. CARINAM is conducting a survey to ascertain the status of this species.

winters in the coastal areas of the country.

The intricate canal system of tidal waterways in the estuaries of Bangladesh is rich in different aquatic species and the resource is exploited by small-scale or subsistence fishers. The estuaries and mangroves are the nursery grounds for the development of post-larvae of several marine shrimps where they feed and grow to juveniles before returning to deep waters of the sea for maturity and breeding. *Macrobrachium rosenbergii*, the freshwater giant prawn, as an adult inhabits freshwater but returns to the brackish-waters of the estuaries to

Overview of Biodiversity Status, Trends and Threats

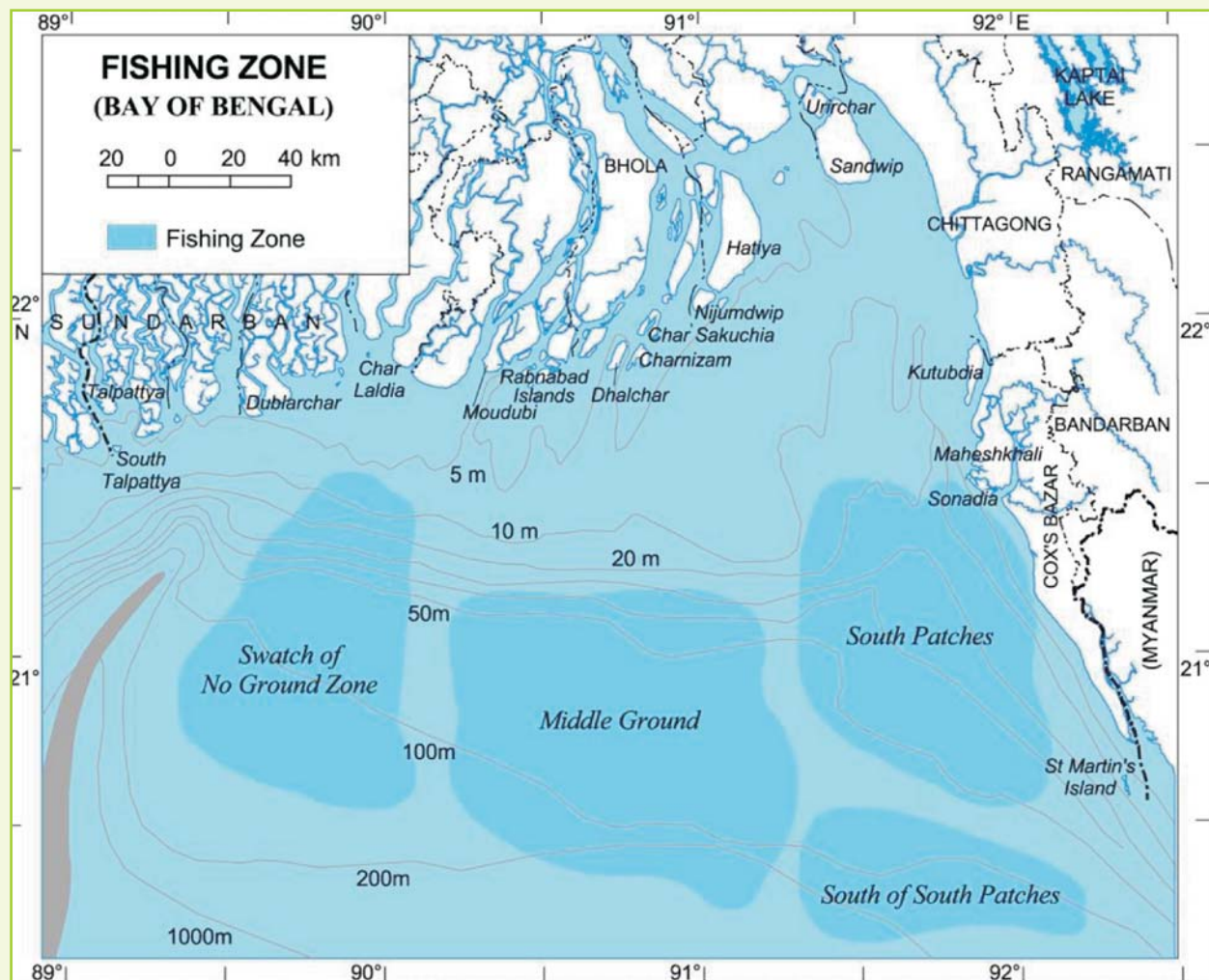


Figure 1.3: Marine Fishing Grounds in the Bangladesh Coast of Bay of Bengal (Banglapedia, 2003)

spawn. Hussain (1969) listed 475 species of fishes belonging to 133 families from the marine and estuarine waters of Bangladesh. Quddus and Shafi (1983) identified 169 species of fishes from marine and brackish-waters, of which, 148 species belonging to 59 families are bony fishes and 21 species belonging to 10 families are cartilaginous. Major fishes are sea perches (63 species under 30 families) followed by herrings and shads (21 species under 3 families), catfishes (19 species under 3 families), and flatfishes (16 species under 5 families). Hilsa alone makes up about 60% of the total catch from the sea. Sharks are represented by 10 species. About 65% of the marine fishes are of commercially important. Out of 56 species of prawns 37 are salt water and 12 are brackish water species. About 5 species of lobster occur in the Bay of Bengal but only two species, *Panulirus polyphagus* and *Scyllarus nearctus* are commonly found.

1.2.1.5 Agro-ecosystem

Bangladesh has been divided as thirty agro-ecological zones and 88 subzones (Figure 1.4) on the basis of physiography, soil properties, soil salinity, depth and duration of flooding which are relevant for land use and for the assessment of agricultural potential. The general agroecological variations of Bangladesh range from below sea level-basins to small hills. People of this land have come from various socio-ecological positions of the sub-continent as well as from other continents of the world. People over the centuries have been cultivating, preserving, and using more than 1,364 plant species coming from both endemic and exotic origins, for about 85 diverse uses.

Overview of Biodiversity Status, Trends and Threats

There are about 1,000 species of medicinal herbs. Ethnic groups, distributed in different areas, have been involved, over centuries, in collecting and preserving the highly rich biodiversity to meet their regular needs. Many varieties of rice, jute, sugarcane, cotton, linseed, mustard, cucumber, beans, gourds have also been selected and raised by the people who have been living in this area for about 8-10 thousand years. Women cultivate a fairly large number of flora in their homesteads and cultivated lands to meet family needs.

Farming Practices

Farming practices in Bangladesh are complex and diverse and are largely controlled by physical, biological, climatological and socioeconomic factors. These different environments are suitable for different crops and cropping patterns under irrigated and non-irrigated conditions. In Bangladesh more than 300 different crops are presently cultivated many of them are endemic.

Farming practices largely depend on the cropping seasons. In Bangladesh, there are two distinct cropping seasons in a year. They are Kharif (monsoon) and Rabi (winter) seasons. The major crop of Kharif season is paddy and jute, while crops grown in Rabi season are much more diverse and comprise of paddy, vegetables, wheat, pulses, oilseeds, spices, potatoes and others. Among all the crops, rice is the most dominant because of its adaptability in diverse ecological conditions prevailing in the country. There are four broad categories of rice varieties cultivated in Bangladesh, viz. *Aus* (Broadcast and Transplanted *Aus*: April-August); Broadcast *Aman* (or deep-water rice : March- November); Transplanted *Aman* (July- December) and Boro (winter rice: November- May) Rice areas have significantly increased for the last three decades at the cost of mainly pulses, oilseeds and spices.



Plate 11: Rice fields ready for harvest

Overview of Biodiversity Status, Trends and Threats

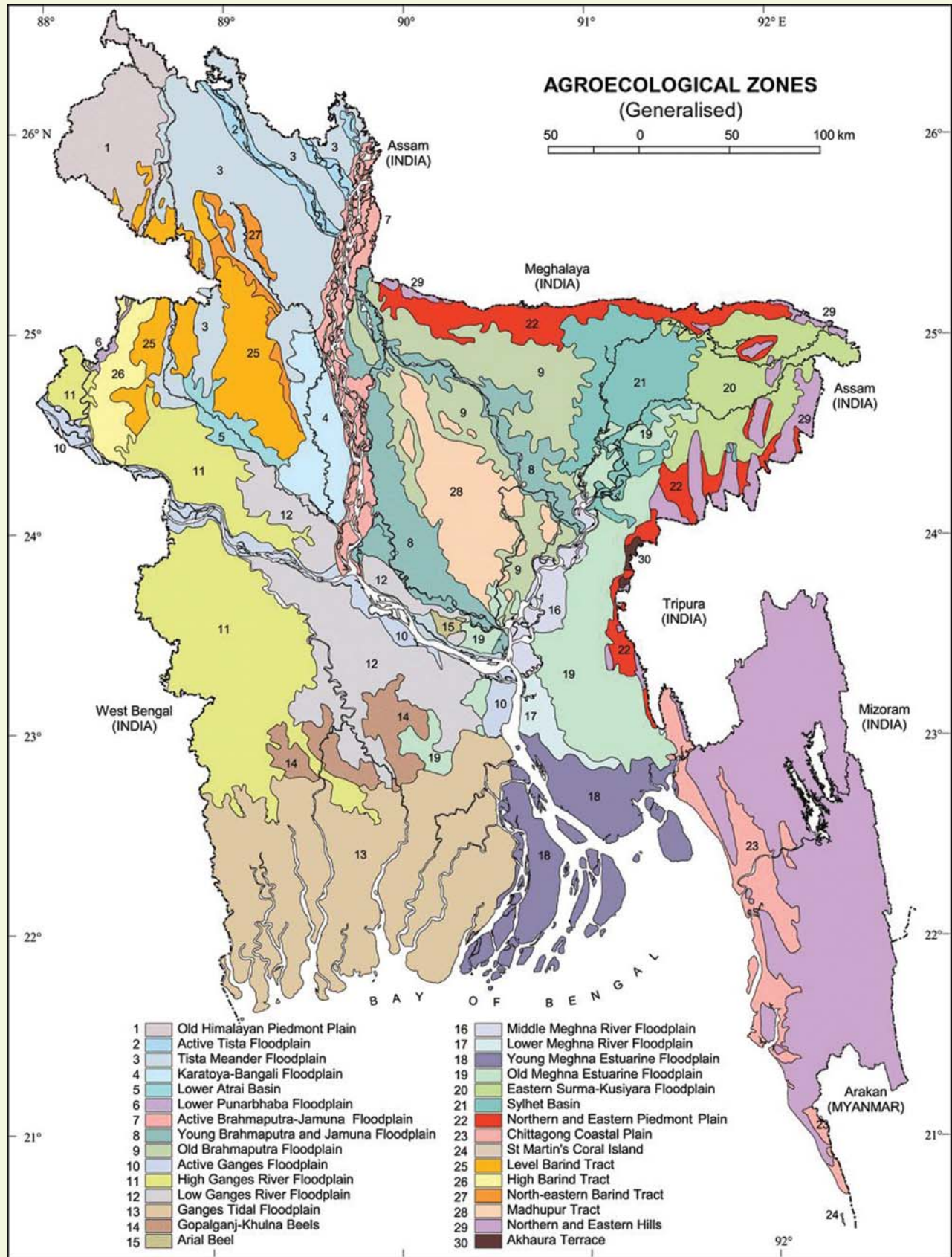


Figure 1.4 Agroecological Zones of Bangladesh.