BANGLADESH
CAPACITY DEVELOPMENT ACTION PLAN
FOR SUSTAINABLE ENVIRONMENTAL GOVERNANCE

UNDP Bangladesh

GEF

IUCN The World Conservation Union

Bangladesh
Capacity Development Action Plan
for
Sustainable Environmental Governance

MINISTRY OF ENVIRONMENT AND FORESTS
Government of the People's Republic of Bangladesh
December 2007

Ministry of Environment and Forests (MoEF)
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MESSAGE

Bangladesh is a signatory to a number of Multilateral Environmental Agreements including United Nations Framework Convention on Climate Change, Convention on Biological Diversity and United Nations Convention to Combat Desertification. Bangladesh is committed not only to implementing the obligations under these global initiatives, but also to promoting sustainable development approaches in the country's development process. However, the country's capacities at individual, institutional and systemic levels to implement these Conventions are limited. Keeping these in mind the Ministry of Environment and Forests undertook the National Capacity Self-Assessment (NCSA) Project to assess the capacity needs and prepare a capacity development action plan on sustainable environmental governance.

Recently published Fourth Assessment Report of Intergovernmental Panel on Climate Change (IPCC) has established unequivocally that the phenomenon of global worming is a reality now. This is manifested in climate change and climate variability. Average world temperature has already increased by around 0.7°C due to green house gas emission since the beginning of the industrial revolution. The effects of climate change on agriculture, food security, human health, fisheries, water and other natural resources are disquieting. Bangladesh apprehends the emergence of a huge number of environmental refugees due to sea level rise in the coastal areas of the country. Moreover, losses of biodiversity and land degradation are also happening due to climate change and other factors. We need to take a synergistic approach to ensure sustainable environmental governance. In this perspective, capacity need assessment and capacity development action plan are expected to support the planners and decision makers to integrate measures for meeting these emerging challenges into the development plans and programmes.

The NCSA document has been prepared through an extensive consultative process. I am happy to note that I had the opportunity to attend both the mid-term as well as the final workshops. It was heartening to note the progress of activities under the NCSA. I would request all stakeholders including the ministries, divisions, departments, agencies concerned, NGOs and private sectors to play a proactive role in implementing the capacity development action plan outlined in this document. I look forward to establishing a centre of excellence under the title of "International Climate Change Institute" as proposed in the action plan. I would also request all the leading national training institutes including the Bangladesh Public Administration Training Centre to come forward to participate in capacity building of the officials for effectively participating in the global negotiations.

Finally, I thank all involved in this noble and focused initiative and request them to make their best efforts to utilize the document for our national, regional and global benefits.

Dr. C. S. Karim
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FOREWORD

The Ministry of Environment and Forests administered a Project on National Capacity Self-Assessment (NCSA) for Global Environmental Management with the technical support of The World Conservation Union (IUCN), Bangladesh Country Office during July 2006 – December 2007. This was carried out with technical and financial support of the Global Environment Facility (GEF) and the United Nations Development Programme (UNDP), Bangladesh. I am happy to note that a Capacity Development Action Plan (CDAP) for Sustainable Environmental Governance in Bangladesh has come out successfully. I would like to thank GEF, UNDP and IUCN for their all support to implement the project.

The CDAP has been prepared to address the climate change, biodiversity and land degradation issues at local, regional and national levels. It is done through an extensive consultation process. The ministries/divisions, departments/agencies concerned, research organizations, academics from the universities, civil society representatives, NGO workers, development partners, experts, environmental practioners, local government representatives, communities, media and other relevant stakeholders were involved in this process. I would like to thank all stakeholders who directly and indirectly contributed to finalizing this document.

The CDAP is a living document. It may be updated time to time keeping pace with the emerging need of the changing situation. The document has been prepared within a short span of time. The data and information were collected from different departments/agencies/ resource persons through a consultative process. Some of these are not published documents. Therefore, despite all efforts, references/sources some of these data and information could not be mentioned in the report. I regret such inconvenience and I would request the readers to further search the available data and information and department concerned while referring this document.

An attempt has been made to take stock of existing capacity building measures undertaken within the different projects/programmes/actions of the Government and Non-government Organizations. I am confident that this document would help the policy makers in different sectors prioritize their development programmes and projects integrating the climate change, biodiversity loss, land degradation and other cross-cutting issues for sustainable environmental governance. The Development Partners may also prioritize their projects based on CDAP.

A.H.M. Rezaul Kabir, ndc
Secretary
Ministry of Environment and Forests

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I am grateful to C.S. Karim, Adviser, Ministry of Environment & Forests, Agriculture and Fisheries & Livestock for his effective leadership towards successful implementation of the NCSA project. I thank A.H.M. Rezaul Kabir, ndc, Secretary, MoEF for his active support and S.M. Jahrul Islam as well as Jafar Ahmed Chowdhury who had carried the responsibilities of the Secretary, MoEF as his predecessor also deserve our gratitude for their support to the project. The National Project Directors played a key role towards successful implementation of the NCSA project. The names of Mohammad Qamar Munir and Tariq-ul-Islam (Joint Secretaries to the Government) must also be mentioned in this regard. I am also grateful to Manoj Basnyat, Country Director and M. Aminul Islam, Sustainable Development Adviser of UNDP for all their support in implementing the NCSA project.

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I am especially indebted to all members of the Project Steering Committee, Strategic Technical Committee, Thematic Group members, and all those who participated in the inception, mid-term and final workshops with their enthusiasm and meticulous attention to this document. I must not forget the hard work of NCSA team, particularly team leader Monowar Islam and his associates, namely: Haseeb Md. Irfanullah, Remeen Firoz, Ahana Adrika, M. Mahbubur Rahman Masum, Shamim Ara Begum and other colleagues in IUCN, particularly Raquibul Amin and Md. Zahid Hossain in making a success of this noble initiative.

Ainun Nishat, PhD
Country Representative
IUCN Bangladesh Country Office

LIST OF ABBREVIATIONS

ABS	:	Access and Benefit Sharing
ABSP	:	Agricultural Biotechnology Support Project
AEZ	:	Agro-Ecological Zone
AF	:	Adaptation Fund
AGBM	:	Ad Hoc Group on Berlin Mandate
AIGAs	:	Alternative Income Generating Activities
AIA	:	Advanced Informed Agreement
ADB	:	Asian Development Bank
ALGAS	:	Asia's Least Cost GHG Abatement Strategy
AnGR	:	Animal Genetic Resource
ARAC	:	Adaptation Research Advisory Committee
AQMP	:	Air Quality Management Project
BADC	:	Bangladesh Agricultural Development Corporation
BANSDOC	:	Bangladesh National Scientific and Technical Documentation Centre
BARC	:	Bangladesh Agricultural Research Council
BARI	:	Bangladesh Agriculture Research Institute
BAU	:	Bangladesh Agriculture University
BB	:	Bangladesh Bank
BBCH	:	Bangladesh Biosafety Clearing House
BCAS	:	Bangladesh Centre for Advanced Studies
BCC	:	Biosafety Core Committee
BCSIR	:	Bangladesh Council of Scientific and Industrial Research
BEMP	:	Bangladesh Environmental Management Project
BFRI	:	Bangladesh Forest Research Institute, Bangladesh Fisheries Research Institute
BHC	:	Benzene Hexachloride
BIADP	:	The Barind Integrated Area Development Project
BIDS	:	Bangladesh Institute for Development Studies
BIWTA	:	Bangladesh Inland Water Transport Authority
BIWTC	:	Bangladesh Inland Water Transport Corporation
BJRI	:	Bangladesh Jute Research Institute

BLRI : Bangladesh Livestock Research Institute
BMD : Bangladesh Meteorological Department
BMDA : Barind Multipurpose Development Authority
BPATC : Bangladesh Public Administration Training Center
BRDB : Bangladesh Rural Development Board
BRRI : Bangladesh Rice Research Institute
BRTA : Bangladesh Road Transport Authority
BRTC : Bangladesh Road Transport Corporation
BUET : Bangladesh University of Engineering and Technology
BUP : Bangladesh Unnayan Parishad
BSRI : Bangladesh Sugarcane research Institute, Bangladesh Seed Research Institute
BSTI : Bangladesh Standard Testing Institute
BTRI : Bangladesh Tea Research Institute
BWDB : Bangladesh Water Development Board
CBD : Convention on Biological Diversity
CBO : Community Based Organization
CCI&E : Chief Controller of Imports & Exports
CDAP : Capacity Development Action Plan
CDM : Clean Development Mechanism
CDMP : Comprehensive Disaster Management Programme
CER : Certified Emission Reduction
CEGIS : Center for Environmental and Geographic Information Services
CFC : Chlorofluro Carbon
CGIAR : Consultation Group on International Agricultural Research Centres
CHT : Chittagong Hill Tracts
CITES : Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS : Convention on Migratory Species of Wild Animals
COP : Conference of the Parties
CP/ CPB : Cartagena Protocol/ Cartagena Protocol on Biosafety
CSR : Corporate Social Responsibility
CU : Chittagong University
CWBMP : Coastal and Wetland Biodiversity Management Project
DAE : Department of Agricultural Extension
DCC : Dhaka City Corporation
DDT : Dichloro-Diphenyl-Trichloroethane
DEM : Digital Elevation Model
DESA : Dhaka Electric Supply Authority
DFID : Department for International Development

DLRS : Directorate of Land Records and Survey
DMB : Disaster Management Bureau
DNA : Designated National Authority
DoE : Department of Environment
DoF : Department of Fisheries
DoL : Department of Livestock
DPHE : Department of Public Health and Engineering
DSS : Department of Social Services
DU : University of Dhaka
ECA : Environmental Conservation Act, Ecologically Critical Areas
ECBI : European Capacity Building Initiate
EIA : Environmental Impact Assessment
EPI : Expanded Programme of Immunization
ERD : Economic Relations Division
EWU : East West University
FAP : Flood Action Plan
FAO : Food and Agriculture Organization
FAR : Fourth Assessment Report (AR 4 to IPCC)
FBC : Field Level Biosafety Committee
FBCCI : Federation of Bangladesh Chamber of Commerce & Industries
FD : Forest Department
FEJB : Forum of Environmental Journalists of Bangladesh
FFWC : Flood Forecasting and Warning Center
FRMP : Forest Resource Management Project
FSP : Forestry Sector Project
GB : Grameen Bank
GBM : Ganges, Brahmaputra and Meghna
GCM : General Circulation Model
GDP : Gross Domestic Product
GEF : Global Environment Facility
GHG : Green House Gas
GIS : Geographic Information System
GMO : Genetically Modified Organism
GNP : Gross National Product
GO : Government Organization
GoB : Government of Bangladesh
GoN : Government of Netherlands
GSB : Geological Survey of Bangladesh

HDI : Human Development Index
HYV : High Yielding Variety
IA : Impact Assessment
IBC : Institutional Biosafety Committee
ICTP : International Conventions, Treaties and Protocols
ICZMP : Integrated Coastal Zone Management Project
IFST : Institute of Food and Sugar Technology
IIED : International Institute of Environment and Development
IMED : Implementation Monitoring and Evaluation Division
IMF : International Monetary Fund
INC : Initial National Communication
IPCC : Intergovernmental Panel on Climate Change
IPR : Intellectual Property Rights
IPSU : Institution and Policy Support Unit
IRR : Internal Rate of Return
IUB : Independent University of Bangladesh
IUCN : The World Conservation Union
IWM : Institute of Water Modeling
KP : Kyoto Protocol
KU : Khulna University
LACC : Livelihood Adaptation to Climate Change
LDC : Least Developed Countries
LDCF : Least Developed Countries Fund
LEAP : Long-range Energy Alternatives Planning
LG : Local Government
LGD : Local Government Division
LGED : Local Government Engineering Department
LEG : LDC Expert Group
LMOs : Living Modified Organisms
MAA : Material Acquisition Agreement
MEA : Multilateral Environmental Agreement
MoA : Ministry of Agriculture
MoC : Ministry of Commerce, Ministry of Communication
MoEd : Ministry of Education
MoEs : Ministry of Establishment
MoEF : Ministry of Environment and Forests
MoEMR : Ministry of Energy and Mineral Resource
MoFA : Ministry of Foreign Affairs

MoFL : Ministry of Fisheries and Livestock
MoI : Ministry of Information, Ministry of Industry
MoL : Ministry of Land
MoLJPA : Ministry of Law, Justice and Parliamentary Affairs
MoP : Meeting of the Parties
MoSICT : Ministry of Science and Information & Communication Technology
MOU : Memorandum of Understanding
MoSW : Ministry of Social Welfare
MoWR : Ministry of Water Resource
MP : Member of Parliament
MTA : Material Transfer Agreement
MW : Mega Watt
NAEM : National Academy for Education and Management
NAP : National Action Programme (for combating desertification)
NAPA : National Adaptation Programmes of Action
NARS : National Agriculture Research System
NatCom : National Communication under UNFCCC
NBSAP : National Biodiversity Strategy and Action Plan
NCB : National Biosafety Committee
NBF : National Biosafety Framework
NCSA : National Capacity Self-Assessment
NEMAP : National Environmental Management Action Plan
NGO : Non-Government Organization
NHA : National Housing Authority
NILG : National Institute of Local Government
NSU : North South University
ODS : Ozone Depleting Substances
OECD : Organization for Economic Co-operation and Development
PA : Protected Area
PCB : Polychlorinated Biphenyls
PDB : Power Development Board
PEI : Priority Environmental Issue
PGR : Plant Genetic Resource
PGRFA : Plant Genetic Resource for Food and Agriculture
PKSF : Palli Karma Shahayak Foundation
PPM : Parts per Million
PPP : Purchasing Power Parity
PSC : Project Steering Committee

POPs : Persistent Organic Pollutants
RCs : Rio Conventions (UNFCCC, CBD, UNCCD)
REB : Rural Electrification Board
RHD : Road and Highways Department
RO : Research Organisation
RRI : River Research Institute
RU : Rajshahi University
RVCC : Reducing Vulnerability to Climate Change
SABP : South Asia Biosafety Programme
SAR : Second Assessment Report (IPCC Report)
SEMP : Sustainable Environment Management Programme
SBSTA : Subsidiary Body for Scientific and Technological Advice
SCCF : Special Climate Change Fund
SHS : Solar Home System
SLM : Sustainable land Management
SoB : Survey of Bangladesh
SPARRSO : Space Research and Remote Sensing Organization
SPM : Summary for Policymakers
SRDI : Soil Resource Development Institute
SRMC : SARRC Regional Meteorological Centre
STC : Strategic Technical Committee
TAR : Third Assessment Report (IPCC Report)
TG : Thematic Group
ToR : Terms of Reference
TPP : Technical Project Proposal
UGC : University Grant Commission
UNCCD : United Nations Convention to Combat Desertification
UNCED : United Nations Conference on Environment and Development
UNDP : United Nations Development Programme
UNEP : United Nations Environment Programme
UNFCCC : United Nations Framework Convention on Climate Change
UP : Upazilla Parishad / Union Parishad
WARPO : Water Resources Planning Organization
WC : Waste Concern
WG : Working Group
WHO : World Health Organization
WMO : World Meteorological Organization
WSSD : World Summit on Sustainable Development
WTO : World Trade Organization

EXECUTIVE SUMMARY

Introduction

Bangladesh is a signatory to a number of Multilateral Environmental Agreements (MEAs) including the Rio Conventions (RCs), i.e. United Nations Framework Convention on Climate Change (UNFCCC), Convention on Biological Diversity (CBD) and United Nations Convention to Combat Desertification (UNCCD). However, the country's capacities at individual, institutional and systemic levels to implement these Conventions are limited. Against this backdrop, Bangladesh undertook the National Capacity Self-Assessment (NCSA) initiative to assess the capacity needs and prepare a capacity development action plan for sustainable environmental governance. The project was implemented by the Ministry of Environment and Forests (MoEF) with the technical support of The World Conservation Union (IUCN), Bangladesh Country Office and financial support of the Global Environment Facility (GEF)/United Nations Development Programme (UNDP), Bangladesh.

2. Objectives

The overall objectives of the NCSA were to identify priority environmental issues within the thematic areas of climate change, biodiversity and land degradation; to make a synergy among these Conventions; to explore related capacity needs within and across the three thematic areas; to strengthen national procedures to negotiate and implement the global environmental conventions; to integrate national data collection and reporting for various conventions; to propose a comprehensive capacity development action plan; to formulate an integrated institutional framework to coordinate and monitor the implementation of the action plan; and to link country action to the broader global environmental management and sustainable development framework.

3. Methodology

The Bangladesh NCSA, prepared through an extensive consultation process, is a living document. The ministries/divisions, Government department/agencies concerned, research organizations, academics from the universities, civil society representatives, NGO workers, development partners, experts, environmental practioners, local government representatives, communities, press as well as electronic media and other relevant stakeholders were involved in this process.

4. Organisation of NCSA Report

The NCSA Report has been divided into seven major chapters: (1) Introduction, (2) Climate Change, (3) Biodiversity, (4) Land degradation, (5) Synergies among the Rio Conventions, (6) Capacity Development Action Plan, and (7) Monitoring and Evaluation. Each thematic chapter (Chapter 2-5) has four basic sections, i.e. Obligations under major Conventions, Current Situation and Stocktaking, Priority Environmental Issues, Capacity Needs (Individual, Institutional & Systemic). Relevant information has been appended at the end of the report as annexure.

5. Climate Change

Climate Change is now a scientifically established fact. According to Human Development Report 2007/08, "Global warming is already happening. World temperatures have increased by around 0.7°C since the advent of the industrial era and the rate of increase is quickening". It is considered to be one of the most serious threats to the world's environment – with its potential negative effect on food security, agriculture, human health, fisheries, biodiversity, water, economic activities and other natural resources. The Priority Environmental Issues (PEIs) identified under this thematic area are: temperature rise; sea level rise in the coastal areas of Bangladesh; high intensity of rainfall; increased natural disasters (cyclone and storm surges); frequent and prolonged floods; scarcity of freshwater due to less rain and higher evapo-transpiration in the dry season; drainage congestion due to higher water levels in the confluence with the rise of sea level; widespread drought in the northern region; and wider salinity intrusion in the coastal zone.

6. Biodiversity

Biodiversity is essential to sustainable socio-economic development. Through agriculture, forestry, livestock and fisheries - biodiversity provides food and fiber; medicine and timber and contributes significantly to national economies and employment (NBSAP, 2006). In Bangladesh, biodiversity is being threatened due to heavy pressure on the ecosystem. The identified PEIs

under this thematic area are: habitat degradation, i.e. change in land use and cropping patterns, conversion of agricultural lands, introduction of the HYVs, urbanization, expansion of road networks, unplanned embankments and other anthropogenic factors that have caused immense damage to all habitats in ecosystems; over-exploitation of resources, i.e. unregulated fishing, illicit felling of trees, and indiscriminate harvesting of medicinal plants and Non-Timber Forest Products, hunting and trafficking; environmental pollution: pollution of air, soil and water; water pollution exacerbated by chemical fertilizers, insecticides, industrial effluents etc; and introduction of invasive alien species of plants and animals.

7. Land Degradation

Land is being degraded all over the world due to huge population pressure. According to the Global Assessment of Human-Induced Soil Degradation (GLASOD), a total area of 1.9 billion ha is affected by soil degradation globally, of which 850 million ha is within the Asia-Pacific Region (WRI/UNEP/UNDP/World Bank, 1996). The identified PEIs under this thematic area in Bangladesh are: population pressure and land use change, soil salinity, river bank erosion, topsoil loss and landslide, pollution from brickfields, waterlogged soil and drainage congestion, intensive cultivation, agrochemicals, soil compaction, drought, acidification and decline of organic matter, unplanned and over-exploitation of underground water for irrigation causing depletion of ground water table; irresponsible mining of sand, gravels, coal etc. from forest and agricultural lands; conversion of agricultural lands and natural forests into other unsustainable economic uses; discharge of untreated industrial effluents; inadequate scientific and institutional capacities in land management; temperature variation and its effect on production of grains.

8. Synergies Among the Rio Conventions

In the NCSA process, synergies among the Rio Conventions were done with a view to mainstreaming/interfacing capacity needs and action plans within these Conventions, namely UNFCCC, CBD and UNCCD. The identified PEIs under synergy/cross-cutting thematic area are: building capacity to implement RCs, broadening the knowledge of scientific and modern technology; promotion of education, training and public awareness; inventories, monitoring and systematic observations; poverty eradication; sustainable development and environmental security; research and impact assessment; information, knowledge and data management; report and monitoring; planning, policy development and reform of legal frameworks; public participation; international cooperation; and utilization of funds within the limited resources.

9. Current Situation and Stocktaking

The Government of Bangladesh (GoB) submitted the Initial National Communication (INC) to UNFCCC in October 2002. The INC includes national circumstances, environmental mitigation issue, GHG inventory, vulnerability, adaptation to climate change and a strategy towards climate change response. The Second National Communication is currently under preparation. The National Adaptation Programmes of Action (NAPA) for Bangladesh was prepared by the GoB in 2005. In order to participate in CDM process, the GoB also set up a two tier Designated National Authority (DNA) on 13 October 2003. The Climate Change Cell was established in the Department of Environment in 2004.

Bangladesh is endowed with rich biological diversity. Nonetheless, a complete inventory of its total biological diversity is yet to be computed. As per Article 6 of the CBD, the GoB prepared

the National Biodiversity Strategy and Action Plan (NBSAP) in July 2005. A total of 16 strategies have been identified in the NBSAP to conserve biodiversity in Bangladesh. In addition to that GoB has also addressed the biodiversity issues under the National Environmental Management Action Plan (NEMAP) and National Conservation Strategy (NCS).

With a view to combating land degradation and attaining sustainable land management, the Government approved Land Use Policy 2001. Consistent with Article 10 of the UNCCD, Bangladesh developed the National Action Programme (NAP) for Combating Desertification in August 2005. The overall strategy of NAP emphasized integrated and coordinated bottom-up approaches to combat land degradation and mitigate the effects of drought. It also identified the factors contributing to the process of desertification in Bangladesh and suggested measures and strategies to tackle the problem. Bangladesh submitted comprehensive National Reports for two consecutive years (2001 and 2002) and the Third National Report on 'Implementation of the UNCCD' was submitted in July 2006.

10. Capacity Development Needs

Capacity development needs in all thematic areas have been identified at individual, institutional and systemic levels. At the individual level, capacity building refers to the process of changing attitudes and behaviours, mostly imparting knowledge and developing skills through training. Capacity building at the institutional level focuses on overall organizational reform, performance and functioning capabilities, as well as the ability of an organization to adapt to change. At the systemic level capacity building is concerned with the creation of an enabling environment, i.e. the overall policy, economic, regulatory, and accountability frameworks within which institutions and individuals operate.

11. Capacity Development Action Plan (CDAP)

Based on obligations under different Conventions, identified PEIs, and capacity development needs, a comprehensive Capacity Development Action Plan (CDAP) has been developed through the NCSA. The CDAP for each thematic area has been furnished with an output, one or more activities under that output, nature of capacity (individual/institutional/systemic), timeframe (short-/medium-/long-term) and potential implementing agencies. The implementing agencies mentioned in the CDAP are not exhaustive. Additional implementing agencies could be included during the project development and implementation stages as per demand of the situation. With a view to ensuring the sustainable environmental governance, a package of 15 actions has been identified for climate change thematic area, 16 actions for biodiversity, 17 for land degradation and 11 for synergies among the RCs. Twenty-seven actions have also been identified to address the sectoral issues. In the final national workshop, the participants identified the following priority actions to draw the attention of the policy-makers.

Group A: Climate Change

Priority	Priority Actions (Based on Output)	Serial Number of the Table
1st	Community Based Adaptation Programme	6.1.1
2nd	Climate Resilient Adaptation Programme	6.1.2
3rd	Efficiency in the Energy Sector	6.1.3
4th	Energy efficiency in the Transportation Sector	6.1.4
5th	Promotion and expansion of Clean Development Mechanism (CDM)	6.1.5
6th	Promotion of carbon sinks in the Forestry Sector	6.1.6
7th	Mitigation and Waste Management	6.1.7

Group B: Biodiversity

Priority	Priority Actions (Based on Output)	Serial Number of the Table
1st	Legal framework for sustainable management of biodiversity developed	6.2.1.1
2nd	Address threats to biodiversity	6.2.3.3
3rd	Protect the components of biodiversity	6.2.3.1
4th	Sustainable Management of Plant Genetic Resources (PGR)	6.2.1.2
5th	Sustainable Conservation and management of Animal Genetic Resources (AnGR) enhanced	6.2.1.3
6th	National Programmes on Germplasm	6.2.1.4

Group C: Land Degradation

Priority	Priority Actions (Based on Output)	Serial Number of the Table
1st	Integration of SLM into national development plans and policies	6.3.1
2nd	Effective implementation of land use policy through integrating the existing relevant agencies	6.3.2
3rd	Effective policy intervention to minimize top soil loss, land slide in hilly areas, soil compaction and decline in soil moisture and micro-nutrient levels	6.3.13
4th	Effective flood control policies to minimize the impact of riverbank erosion	6.3.12
5th	Effective policy measures to manage waterlogging and drainage congestion	6.3.15

Group D: Synergy		
Priority	Priority Actions (Based on Output)	Serial Number of the Table
1st	Trained and skilled manpower for sustainable environmental governance in place	6.4.1
2nd	Integrated ecosystems management facilitated	6.4.8
3rd	Effective Participation in the Conference of the Parties (CoP) and Subsidiary Bodies Meeting	6.4.10
4th	Promotion of education, training and public awareness	6.4.11
5th	Inter-linkages among national policies and their implementation	6.4.5
6th	Financial resource mobilization facilitated	6.4.2

12. Monitoring and Evaluation

Implementation monitoring is one of the significant aspects of a plan, policy and programme under any development initiatives. In the past, in absence of such monitoring, the people and the nation have been deprived of the sustained outcomes of such good initiatives. Based on the recommendations of the stakeholders, a "Sustainable Development Monitoring Council (SDMC)" has been suggested to ensure the implementation monitoring of the NCSA. Representatives from ministries, divisions, departments, agencies concerned, research organizations, leading training institutes, NGOs, civil society, and private sectors have been included in the Council. While the size of the SDMC would be large and it will not be possible for it to meet every month, there might be a small professional/expert body to provide technical advice to the SDMC. So it has been suggested that a small body by the name of "Sustainable Development Board (SDB)" be formed. The GoB has steadily been trying to decentralize its administrative powers to the division, district and upazila levels. Hence, it has been suggested that local environmental governance system be enhanced through committees at the division, district and upazila levels.

13. Leveraging Partnership

Leveraging resources is one of the key instruments to implement the CDAP prepared under NCSA. Resource leveraging provides a framework for mobilization of resources needed to implement the NCSA. The framework provides a set of guidelines on how existing financial sources can be utilized and new funds raised so that implementation of the NCSA is financially sustainable. The financial mechanism not only indicates the ways of raising funds, but it also deals with the implementation responsibilities of different sectors so that Bangladesh becomes self-reliant in capacity development for sustainable environmental conservation and management. The mechanism also provides a guiding structure to aid donors in prioritizing their support towards capacity development efforts in Bangladesh.

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Chapter 1

INTRODUCTION

1.1 Background

Bangladesh is a signatory to a number of Multilateral Environmental Agreements (MEAs) including the Rio Conventions on biological diversity, climate change and desertification. However, the country's capacities at individual, institutional and systemic levels to implement these conventions are limited. It is considered appropriate to build capacity of the country while the Rio Conventions are in different stages of implementation. There is also a felt-need to enhance the technical capacity of the country to take part in the global negotiations and link decisions taken at the global level to the ones at the country level.

Capacity building has also become a top priority to the Global Environment Facility (GEF), MEAs and the international community as a whole. The World Summit on Sustainable Development (WSSD) and the Second GEF Assembly reaffirmed the primacy of capacity building of developing countries. The GEF Secretariat, in consultation with the Implementing and Executing Agencies, has developed a strategic framework that focuses solely on capacity building of developing countries for global environmental management.

The primary objective of the National Capacity Self-Assessment (NCSA) is to identify country level capacity building needs and priorities for national, regional and global environmental management. Bangladesh participated in this assessment, recognizing that the NCSA has also been used to enhance synergies among the activities related to the Rio Conventions. Against this backdrop, Bangladesh developed a proposal and received funding for PDF-A development from GEF/UNDP. The present NCSA Project is the outcome of the PDF-A phase. The project was implemented by the Ministry of Environment and Forests (MoEF) with the technical support of The World Conservation Union (IUCN), Bangladesh Country Office.

With a view to increasing capacity in Bangladesh for national and global environmental management, the NCSA Project was approved by the GEF on 12 November 2004 for a period of 16 months. The PRODOC was signed between the Government of Bangladesh (Economic Relations Division and MoEF) and UNDP on 29 December 2005. The Ministry of Environment and Forests approved the Technical Project Proposal (TPP) on 18 September 2005 for implementation of the project commencing from February 2006. Subsequently, the project was extended upto 31 December 2007.

The overall aim of NCSA was to provide Bangladesh with the opportunity to identify major capacity needs in order to effectively address cross-cutting national, regional and global environmental issues. This enabling activity was to conduct a country-driven self-assessment and develop a strategy and action plan for capacity building in the environmental sector. This project enabled the country to develop a plan of action to achieve global environmental management objectives in the context of the three conventions relevant to NCSA: United Nations Framework Convention on Climate Change (UNFCCC), Convention on Biological Diversity (CBD) and United Nations Convention to Combat Desertification (UNCCD). The focus of this project was on identifying the critical capacity constraints on implementation of the MEAs; formulating strategic plans on how to develop national capacity for addressing the thematic issues as well as issues that cut across focal areas; increasing the awareness on various issues with regard to national capacity for the MEAs; and linking the past and ongoing activities for the MEAs with overall national development policies.

1.2 Concept of Capacity Building[1]

The term "capacity building" is used in many different contexts. Over the past few years, experts from many countries have been trying to reach a consensus regarding a common definition of the term and there is now unified understanding that "capacity building" can be taken as "the actions needed to enhance the ability of individuals, institutions and systems to make and implement decisions and perform functions in an effective, efficient and sustainable manner".

At the individual level, capacity building refers to the process of changing attitudes and behaviours, most frequently through imparting knowledge and developing skills through training. However, it also involves learning-by-doing, participation, ownership, and processes associated with increasing performance through changes in management, motivation, morale and levels of accountability and responsibility.

Capacity building at the institutional level focuses on overall organizational performance and functioning capabilities, as well as the ability of an organization to adapt to change. It aims to

[1]GEF – A Guide for Self-assessment of Country Capacity Needs for Global Environmental Management, 2007

develop the institution as an integrated system, including its constituent individuals and groups, as well as its external relationships and processes. In addition to improvements in physical assets, such as infrastructure, institutional capacity building involves clarification of missions, structures, responsibilities, accountabilities and reporting lines, changes in procedures and communications and changes in the deployment of human resources.

At the systemic level capacity building is concerned with the creation of "enabling environments", i.e. the overall policy, economic, regulatory, and accountability frameworks within which institutions and individuals operate. Relationships and processes between institutions, both formal and informal, as well as their mandates, are important elements of capacity building at the systemic level.

Capacity building can occur at local, national or global levels and amongst any individual or group of stakeholders, entities or institutions, as well as the overall systems level. Interactions between the different levels are also important to overall capacity. Capacity is relevant to both the short term (for example, the ability to address an immediate problem) and the long term (the ability to create an enabling environment for particular changes to occur). Capacity may imply "action", or "inaction", depending on the result desired. Capacity building does not always involve the creation of new capacity, but often the redeployment or release of latent capacities.

1.3 Goal and Objectives

The NCSA process in Bangladesh attempts to provide the country with the opportunities to take the lead in articulating its own capacity needs and priorities with respect to the global environment management, taking into account the three main global conventions. The broad objective is to identify, through a country-driven consultative process, priorities and needs for capacity building to protect the national and the global environment. The specific objectives to be accomplished through the NCSA include:

- To identify, confirm or review priority issues for action within the thematic areas of biodiversity, climate change and desertification/land degradation;
- To explore related capacity needs within and across the three thematic areas;
- To strengthen the national strategy to negotiate and implement the global environmental conventions;
- To integrate national data collection and reporting for various conventions;
- To propose a unified capacity building strategy and action plans for future external funding and assistance;
- To formulate an integrated institutional framework to coordinate and monitor the implementation of the strategy and action plans;
- To retain and utilize the existing capacities;
- To create fruitful partnerships and linkages with the institutional framework;
- To link country actions to the broader international environmental management and sustainable development framework.

Inaugural Session of NCSA Inception Workshop © IUCN Bangladesh / M.R. Masum

1.4 Methodology

1.4.1 NCSA preparation process

The Bangladesh National Capacity Self-Assessment (NCSA) is a living document which has been prepared through an extensive consultative process. The relevant ministries/divisions, Government department/agencies, research organizations, academics from the universities, civil society, NGOs, development partners, experts, environmental practioners, media other stakeholders and above all community have been involved in this process. Both the top-down and bottom-up approaches have been followed during the preparation of NCSA. The ministries/divisions concerned have also been consulted to take a stock of the completed, on-going and up-coming projects, programme, study and actions relevant to NCSA.

Concluding Session of NCSA Mid-Term Workshop © IUCN Bangladesh / M.R. Masum

Through the aforementioned method, a draft NCSA report was prepared and placed at the Mid-term National Workshop held on 17-18 April 2007. This timely initiative aided in the revision and refinement of the NCSA document. A peer group was also formed to scrutinize the lapses and gaps of the capacity needs under the Rio Conventions. In addition, Project Steering Committee (PSC) and Strategic Technical Committee (STC) were also set up to oversee the activities of the NCSA from time to time and provide feedback to the project team.

The key policy-makers, particularly the Ministers/State Ministers/ Advisers of the ministries concerned have been involved to ensure political commitment to the NCSA process. The final draft of the NCSA document was presented at the Final National Workshop on 28 October 2007 for vetting by the participants. The final version was placed to the PSC on 28 October 2007 for approval. The GEF 'Guide for Self-Assessment of Country Capacity Needs for Global Environmental Management' was followed in formulating the document. Figure 1.1 shows the road map for the preparation of the document.

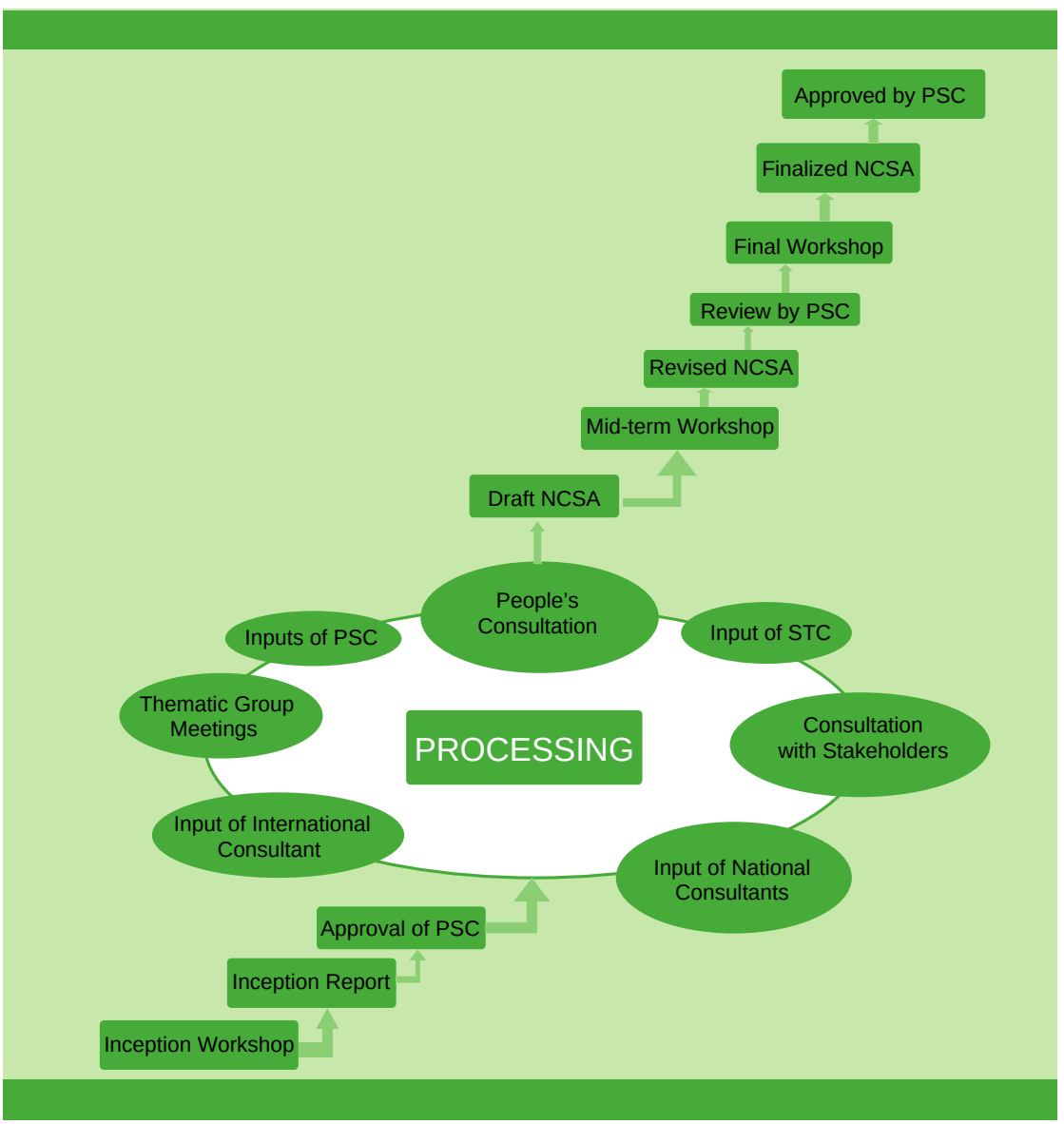

Fig. 1.1. Road Map of NCSA

1.4.2 Operational principles

In accordance with the GEF broad guidelines, the following operational principles were applied during the preparation of Bangladesh NCSA:

a) Ensure national ownership, leadership and political commitment;

b) Ensure multi-stakeholder consultations and decision-making;

c) Base on capacity building efforts in self-needs assessment;

d) Adopt a holistic approach to capacity building;

e) Integrate capacity building in wider sustainable development efforts;

f) Promote partnerships;

g) Combine programmatic and project-based approaches;

h) Combine process as well as product-based approaches;

i) Promote regional approaches.

1.4.3 NCSA preparation strategy

Bangladesh NCSA is a country-driven process facilitated by the participation of multiple stakeholders. The main strategies for Bangladesh NCSA were as follows:

a. Optimal utilization of dormant capacity;

b. Use of provisions and obligations of the Rio Conventions;

c. Comprehensive stakeholder participation;

d. Long-term approach within the sustainable development context

e. Designating a Focal Point in every vital sector

f. Avoiding duplication and promoting coordinated efforts in a synergistic way

g. Expert evaluation;

h. External feedback and sharing of experience;

i. Development of activity matrix.

1.4.4 The nine steps of NCSA

The steps that were followed for the preparation of NCSA in Bangladesh were as follows:

Step 1: Planning the NCSA process;

Step 2: Creating and maintaining effective high-level support;

Step 3: Stocktaking;

Step 4: Preparing for thematic assessment;

Step 5: Preparing for the cross-cutting assessment;

Step 6: Drafting the National Capacity Development Action Plan;

Step 7: Drafting the NCSA Report;

Step 8: Obtaining high-level approval of the action plan;

Step 9: Implementation monitoring of the action plan.

Concluding Session of NCSA Final National Workshop © IUCN Bangladesh / M.R. Masum

1.5 Organization of the NCSA Report

The NCSA Report has been prepared based on input received from nine thematic group reports, nine focus group meetings, three National Consultants' Reports, suggestions from the Interministerial Consultations through written communication and public opinions received through the newspapers.

The NCSA report has been divided into seven major chapters i.e. (1) Introduction, (2) Climate Change, (3) Biodiversity, (4) Land Degradation, (5) Synergy, (6) Capacity Development Action Plan, and (7) Monitoring and Evaluation.

Each thematic chapter (Chapters 2 to 5) has four basic sections. After portraying the background of a convention, the important 'Obligations' or commitments of a signatory country to a convention are listed, often in the context of Bangladesh. It is then followed by an analysis of 'Current Situation and Stocktaking' of Bangladesh in terms of convention implementation. The 'Priority Environmental Issues' under a particular theme are then listed to identify important environmental concerns. Finally, the chapter ends with 'Identifying Capacity Development Needs' at individual, institutional and systemic levels.

Chapter 6 on 'Capacity Development Action Plan' (CDAP) summarizes the possible outputs and tentative major activities that could be undertaken by GOs, NGOs or private agencies to overcome the capacity needs identified through the NCSA process under four major themes.

Finally, Chapter 7 proposes the formulation of an institutional mechanism to implement the CDAP in an effective and sustainable manner.

1.6 Profile of Bangladesh

1.6.1 Environmental profile of Bangladesh

Boundary and topography

Bangladesh is a deltaic country bounded on the west, north, and east by India. The country shares a common border with Myanmar in the south-eastern part. In the south, Bangladesh has a 700 km-long coastline along the Bay of Bengal. The total area of the country is 147,570 sq. km. Except for patches of the hilly areas in the south-east and north-east and high lands in the northern and north-western regions, the country basically consists of low, flat and fertile lands. The Topography of Bangladesh is extremely flat, with local relief ranging between 1 and 2 meters. At least 20% of the area of the country consists of low lying tidal plains, with elevations of less than 3 meters above sea level (DoE, 2001). Floodplains constitute 80% of the lands, hills about 12% and terraces or uplifted blocks, about 8% of the total area.

Rivers and wetlands

Bangladesh has around 700 rivers with a total length of 22,155 km (DoE, 2001). Among them, 54 rivers originate in India, which all eventually flow into the Bay of Bengal. These include the three mighty rivers; the Ganges, the Brahmaputra (Jamuna) and the Meghna (GBM), which together constitute the largest river network in the world. These rivers carry a total of approximately 1174 billion cubic meters of water per year, 90% of which flows into Bangladesh from upper catchments area (Islam, 2003). The rivers also carry about 2.0 billion tons of sediment annually to the Bay of Bengal. Wetlands and marshes belonging to topographically depressed areas, known as haors, baors and beels, mostly are located in the north-eastern region.

Climate, rainfall, temperature and sea level rise

Bangladesh generally enjoys a sub-tropical monsoon climate. The annual rainfall varies from 1,400 mm to 4,500 mm. About 80% of the annual total rainfall of the country occurs during the monsoon. The highest rainfall is recorded in Chittagong (southeast) and north-eastern part of Sylhet while the lowest occurs in the northern and western parts of the country. However, climate scenario may change significantly in future as envisaged in Table 1.1.

Table 1.1: Future climate scenarios used for preparation of NAPA for Bangladesh

Year	Temperature change (°C) Mean (standard deviation)			Precipitation change (%) Mean (standard deviation)		
	Annual	Dec to Feb	Jun to Aug	Annual	Dec to Feb	Jun to Aug
2030	1.0	1.1	0.8	5	-2	6
2050	1.4	1.6	1.1	6	-5	8
2100	2.4	2.7	1.9	10	-10	12

Source: Adopted from Agarwala et al., IPCC TAR Report

There is an increasing trend of sea level rise at about 4.0 mm/year at Hiron Point, 6.0 mm/year at Meghna Estuary and 7.8 mm/year near Cox's Bazar (MoEF, 2005).

Biodiversity

Bangladesh is endowed with rich and diverse genetic resources of flora and fauna because of its bio-climatic environment and its location at the complex interface of the Himayalan and the

Southeast Asian bio-geographic regions. The estimated number of flowering plant species of Bangladesh is about 5,000. In the past centuries, this wealth of diversity was much greater, but at present, 129 species including 37 mammals, 21 reptiles, 69 birds and 2 amphibians are on the IUCN Red List of endangered species (IUCN Bangladesh, 2000). About 30 plant species are listed as threatened or endangered (Khan et al., 2001).

Forests in Bangladesh

Although the FD claims that the current forest land is about 17% of the total land area of Bangladesh, the actual forest cover is yet to be ascertained. According to 'Forest and other Land Uses of Bangladesh' report prepared by FAO in collaboration with FD and published by SPARRSO in 2007, the present canopy coverage is around 7.29% excluding village forests. In fact, Bangladesh has achieved a remarkable progress in 'Participatory Afforestation Programme' in the forms of woodlot garden and strip garden along road side and on dam. The country produces timber, bamboo and cane as major forest products. The Sundarbans, the largest mangrove forest in the world and a UNESCO declared World Heritage Site, is located in the south-western part of the country. It is the abode to the 'Royal Bengal Tiger', deer, monkeys, wild boars and crocodiles. A few hundred species and sub-species of birds, including many migratory and seasonal birds, are also found in the country.

1.6.2 Socio-economic indicators of Bangladesh

Since independence in 1971, Bangladesh has made remarkable progress in food production (from 18.75 million to the present 27.80 million metric tons), export of Readymade Garments (from US$ 624 million in 1990, to US$ 7,901 million - 75% of total export), GDP, Expanded Programme of Immunization (EPI - 98%), Safe drinking water (96.3%), Primary School Enrolment (86%), Reduction of population growth rate (from 3.00% to the present 1.48%), poverty reduction (76% to 40%) and Budget of Annual Development Programme (BDT 5,103 crores in FY 1990-91 to 21,500 crores in FY 2006-07) (MoF, 2006).

The country has also gradually climbed to the rank of 140 (out of 177 countries) in terms of Human Development Index (HDI) from 147 (out of 173 countries) from 1990 to 2006. The key socio-economic indicators are given in Table 1.2.

Table 1.2: Key socio-economic indicators of Bangladesh

Particulars of key indicators	1990 / 91	2006
GDP growth rate (in %)	3.30	6.63
Per capita GDP (US $)	208	482
GDP Per Capita in PPP (US $)	872	1870
Literacy rate (in %)	35.3	62.66
Life expectancy (in Years)	51.8	64.9
Safe drinking water user (%) 2004	-	96.3
Sanitary latrine user (in %)	-	52.6
Foreign exchange reserves (in million US $)	520	3,484
Workers remittances (in million US $)	761	4,802
Foreign Direct Investment (FDI) (in million US $)	354	845

Source: Bangladesh Economic Review 2006, Human Development Report 1993 & 2006

However, the socio-economic stability of the country has not been accompanied with sustainable environmental conservation and management of its natural resources. This may be attributed to several factors including population pressure, absence of good governance and proper implementation of environment conservation act and rules. As a result, Bangladesh has remained an LDC with a per capita GNP below US $ 500 over the past three decades.

1.6.3 Institutional arrangement for environmental management

This section of the chapter provides an overview of the institutional setting of Bangladesh regarding global environmental management. A brief picture of relevant organizations involved in the environmental management is as follows.

Ministry of Environment and Forests

The Ministry of Environment and Forests (MoEF), established in 1989 is responsible for the formulation and amendment of policies and strategies designed for effective management and conservation of natural resources and the environment, framing of legislative enactment, administrative and organizational restructuring, formulation and coordination of projects and programs, and fund-raising. MoEF is the national focal point of all MEAs. Forest Department (FD), Department of Environment (DoE), Bangladesh Forest Research Institute (BFRI) and Bangladesh National Herbarium (BNH) function under this ministry.

Forest Department

The Forest Department (FD) works towards ensuring natural sustainability and biodiversity conservation through social forestry, forest management, afforestation, reforestation, protected area management etc. The notable mandates of FD are: creation of a social safety net against activities such as illegal tree felling, plantation of trees in suitable sites such as fallow lands and roadside and so on. It is one of the oldest departments of the Government. Under FD, the National Botanical Garden was established in 1961 with a total area of 208 acres at Mirpur in Dhaka and serves as the main organization engaged in plant collection, conservation and gene pool production.

Department of Environment

The Department of Environment (DoE) deals specifically with the environmental issues, including both brown and green ones. Air pollution, surface water pollution from industrial waste and use of chemical pesticides, brick fields, ground water contamination, soil degradation and erosion, solid waste disposal, including the disposal of plastic bags and bottles, loss of biodiversity, threat of climate change and sea-level rise, natural disasters etc. are some of the areas where its programmes and projects are targeted.

Bangladesh Forest Research Institute

The Bangladesh Forest Research Institute (BFRI) was established in 1955 as a Forest Research Laboratory, with the headquarters in Chittagong. BFRI has 11 research divisions under its Forest Management Branch, 6 divisions under its Forest Product Branch and 2 Common Service Divisions. It has 21 field stations with a total area of 1072 ha. Guided by its policy, BFRI bears the obligation to provide research support to the FD, Bangladesh Forest Industries Development Corporation (BFIDC), end-users and other stakeholders in carrying out forestry activities. BFRI aims at maintaining sustainable productivity of forestland and forest industries without depleting the resources, along with minimizing the gap between the demand and supply of forest products.

Bangladesh National Herbarium

The Bangladesh National Herbarium (BNH) is the only national institution engaged in collection and maintaining an inventory of plants. BNH collects indigenous plant species from all over the country. It plays an important role in research, identification and documentation of medicinal plants, plant genetic research and thus facilitates the conservation of biodiversity.

Soil Resources Development Institute

The objectives of Soil Resources Development Institute (SRDI) are to record soil and land resources and to investigate soil-related problems for agricultural research and development. The functions of SRDI include soil survey of the entire country on the basis of aerial photo interpretation and field and laboratory investigation of soils; detailed and semi-detailed soil surveys of development project areas and research farms for various beneficiary agencies; soil surveys for locating areas of problematic soils; moisture characterization of soil tracts of the country. It is also responsible for preparation of various maps and reports based on the surveys.

Bangladesh Institute of Nuclear Agriculture

The Bangladesh Institute of Nuclear Agriculture (BINA) conducts research adopting nuclear techniques for the purpose of ensuring a stable and productive agriculture through development of new varieties of crops, scientific management of land and water, development of appropriate technology to improve quality and quantity of crops, and improvement of the methods for control of diseases and insect and pest management. BINA has a farm at its headquarters in Mymensingh and five sub-stations which are located at Ishurdi, Rangpur, Jamalpur, Comilla and Magura.

Disaster Management Bureau

The Disaster Management Bureau (DMB) – technical arm to the Ministry of Food and Disaster Management – is a technical organ of the Government to overview and coordinate all activities related to disaster management from national down to the grassroots level. It provides professional support to the high level Inter-ministerial Committee, district and upazila level authorities relating to disaster management.

Bangladesh Water Development Board

The Bangladesh Water Development Board (BWDB) is the principal agency of the government for managing water resources of the country. It has also the responsibility for accomplishing the tasks of executing flood control, drainage and irrigation projects to boost up productivity in agriculture and fisheries. The reform programmes were undertaken by the GoB for transformation of BWDB through the enactment of the Bangladesh Water Development Board Act, 2000 that requires the BWDB's functions to be guided by the National Water Policy and National Water Management Plan. The top management of BWDB is now vested in a policy and oversight Governing Council with thirteen members headed by the Minister of Water Resources.

Water Resources Planning Organization

The Water Resources Planning Organization (WARPO) is an agency of the Government under the Ministry of Water Resources. WARPO has been a key organization of the Government dealing with nationwide water resources planning and management since 1992 and thus functioning as an apex body in the water sector. WARPO, a multi-disciplinary organization, acts as a 'clearing house' for all water sector projects undertaken by any agency involved in the water sector.

Thematic Session of NCSA Mid-Term Workshop © IUCN Bangladesh / M.R. Masum

Bangladesh Meteorological Department

The Bangladesh Meteorological Department (BMD), under the Ministry of Defense, is the authorized government organization for all meteorological activities in the country. It maintains a network of surface and upper air observatories, radar and satellite stations, agro-meteorological observatories, geomagnetic and seismological observatories and meteorological telecommunication system. The Department has its headquarters in Dhaka and has two regional centres which are Storm Warning Centre (SWC), Dhaka and Meteorological & Geo-Physical Centre (M & GC), Chittagong.

Ministry of Agriculture (MoA)

The Ministry of Agriculture is the central body of the government in the agriculture sector coordinating and supervising the activities of the agricultural institutes and directorates all over the country.

Department of Agricultural Extension

The Department of Agricultural Extension (DAE) is one of the largest public sector agricultural extension providers in Bangladesh. Restructured in 1982 with the merging of six allied departments, it is responsible for carrying out agricultural extension services at the grassroots level throughout the country. Its main functions are:

- to motivate and help farmers in adopting improved production practices;
- to provide farmers with the latest results of research and farm techniques for their socio-economic betterment;
- to help develop self-reliance and cooperation by training local leadership for organized group action;
- to provide channels of service and information from the MoA and its different departments to the farm people;
- to provide an effective linkage between the research institutes and the farmers;
- to serve as liaison agency between farmers and other organizations

National Agriculture Research System in Bangladesh

The National Agricultural Research System (NARS) of Bangladesh consists of 10 research institutes under the umbrella of Bangladesh Agricultural Research Council (BARC). Out of 10

research institutes six belong to MoA, two to the Ministry of Fisheries and Livestock (MoFL), one to the Ministry of Commerce and one to the Ministry of Environment and Forests. In addition, the NARS also comprises universities that have a casual working relationship with BARC and other related organizations. BARC is coordinating agricultural research activities of various institutes and organizations located in Bangladesh. The ten research institutes under the NARS, along with their functions are shown in Table 1.3.

Table 1.3: Research institutes under NARS

1	Bangladesh Agricultural Research Institute	BARI	Basic, applied and adaptive research on cereals (except rice), pulses, oilseeds, vegetables, horticultural crops, etc.
2	Bangladesh Forest Research Institute	BFRI	Aims at maintaining sustainable productivity of forestland and forest industries without resource depletion
3	Bangladesh Institute of Nuclear Agriculture	BINA	Application of nuclear technology to agriculture
4	Bangladesh Jute Research Institute	BJRI	Basic, applied and adaptive research on jute production and utilization
5	Bangladesh Livestock Research Institute	BLRI	Basic and applied research on cattle, sheep, goats, poultry etc.
6	Bangladesh Rice Research Institute	BRRI	Basic, applied and adaptive research on rice
7	Bangladesh Tea Research Institute	BTRI	Providing scientific and technical support to 158 tea gardens of the country
8	Bangladesh Sugarcane Research Institute	BSRI	Providing scientific and technical support to sugar industries of the country
9	Bangladesh Fisheries Research Institute	BFRI	Research, study and documentation of the status of freshwater and marine fisheries
10	Soil Resources Development Institute	SRDI	Research for development of soil resources

Apart from above organizations, other ministries/divisions like Ministry of Land, Ministry of Fisheries and Livestocks, Ministry of Water Resources, Ministry of Industries, Ministry of Power, Ministry Energy and Mineral Resources etc. are also involved with overall environmental management and cross-cutting environmental issues.

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Chapter **2**

CLIMATE CHANGE

2.1 Introduction

2.1.1 Significance

Climate Change is now a scientifically established fact. According to Human Development Report 2007/08, "Global warming is already happening. World temperatures have increased by around 0.7°C since the advent of the industrial era and the rate of increase is quickening". It is considered to be one of the most serious threats to the world's environment – because of its potential negative effects on food security, agriculture, human health, fisheries, biodiversity, water, economic activities and other natural resources. The prime reasons for the mounting temperature are industrialization, the burning of fossil fuels such as coal & oil and deforestation. These activities have increased the amount of Green House Gases (GHGs) – especially carbon dioxide, methane and nitrous oxides – in the atmosphere. Increased release of these gases is detrimental to the life support system on the earth. The global warming is also apprehended to lead to a higher intensity of rainfall, increased natural disasters (floods and cyclones), more frequent and prolonged droughts and a sea level rise along the coastal areas of low lying countries like Bangladesh. It has already been ascertained that climatic variability is going to

affect the global endeavor to achieve the Millennium Development Goals (MDGs) in the coming years (Table 2.1).

Table 2.1: Impacts of climate change on Millennium Development Goals

MDGs	Climate Risks
Goal 1: Eradicate extreme hunger and poverty	Changes in natural systems and infrastructure will: ■ Reduce the livelihood assets of poor people ■ Alter the path and rate of national economic growth ■ Undermine regional food security
Goal 2: Achieve universal primary education	Climate change could lead to a reduction in the ability of children to participate in full-time education by causing: ■ Destruction of infrastructure (such as schools) ■ Loss of livelihood assets (increasing the need for children to engage in income-earning activities) ■ Displacement and migration of families
Goal 3: Promote gender equality	Depletion of natural resources, reduced agricultural productivity and increased climate-related disasters could: ■ Place additional burdens on women's health ■ Limit women's time to participate in decision-making and income-generating activities ■ Reduce the livelihood assets of women
Goals 4, 5, and 6: Reduce child mortality, improve maternal health and combat HIV/AIDS, malaria and other diseases	Increased child mortality, reduced maternal health and the undermining of the nutritional health needed by individuals to combat HIV/AIDS are expected to occur as a result of climate change-induced: ■ Extreme weather events ■ Increase in prevalence of certain vector-borne and water-borne diseases ■ Heat-related mortality ■ Declining food security ■ Decreased availability of potable water
Goal 7: Ensure environmental sustainability	Climate change will have a direct impact on environmental sustainability because it: ■ Causes fundamental alterations in ecosystem relationships ■ Changes the quality and quantity of natural resources ■ Reduces ecosystem productivity

Source: United Nations Development Programme (2007): Climate Change and MDGs - www.undp.org/climatechange

2.1.2 IPCC Fourth Assessment Report

IPCC Fourth Assessment Report (FAR) was released on 2nd February 2007 based on the outcomes of three distinct working groups (WG-I: Physical Science Basis; WG II: Impacts,

Adaptation and Vulnerability; WG III: Mitigation). Referring to the 1400 page summary for policy -makers (SPM), IPCC Chairperson Rajendra Pachauri said that "global warming will affect much of life on earth in this century" and he further added that there was "a huge public appetite" for information on climate change. "Poor people are the most vulnerable and will be the worst hit by the impacts of climate change," the IPCC's Chairperson said.

The FAR described that the global atmospheric concentration of carbon dioxide increased from a pre-industrial value of about 280 ppm (parts per million) to 379 ppm in 2005. The annual carbon dioxide concentration growth rate was higher during the decade (1995-2005 average: 1.9 ppm per year), than it had been since the beginning of continuous direct atmospheric measurements (1960-2005 average 1.4 ppm per year) although year-to-year variability in growth rates was also observed.

The updated 100 year linear trend (1906 to 2005) of 0.74°C is therefore higher than the corresponding trend for 1901 to 2000 given the TAR of 0.6°C. The linear warming trend over the last 50 years (0.13°C per decade) is nearly twice that for the last 100 years. The total temperature increase from 1850-1899 to 2001-2005 is 0.76°C.

Empirical evidence collected since 1961 shows that the average temperature of the global oceans has increased upto the depths of at least 3,000 m and that the oceans have been absorbing more than 80% of the heat added to the climate system. Such warming has caused the seawater to expand, contributing to the sea level rise. Table 2.2 shows the observed rate of sea level rise and estimated contributions from different sources.

Table 2.2: Observed rate of sea level rise and estimated contributions from different sources

	Rate of sea level rise (mm per year)	
Source of sea level rise	1961-2003	1993-2003
Thermal expansion	0.42±0.12	1.6±0.5
Glaciers and ice caps	0.50±0.18	0.77±0.22
Greenland Ice Sheet	0.05±0.12	0.21±0.07
Antarctic Ice Sheet	0.14±0.41	0.21±0.35
Sum of individual climate contributions to sea level rise	1.1±0.5	2.8±0.7
Observed total sea level rise	1.8±0.5	3.1±0.7
Difference (Observed minus sum of estimated climate contributions)	0.7±0.7	0.3±1.0

Source: modified from SPM IPCC, 2007

New data since the TAR show that losses from the ice sheets of Greenland and Antarctica have most likely contributed to sea level rise over the period of 1993 to 2003. The global sea level rose at an average rate of 1.8 mm per year during 1961-2003. The rate was faster during 1993-2003: about 3.1 mm per year.

The warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea levels. Figure 2.1 shows the changes in temperature, sea level rise and snow cover globally.

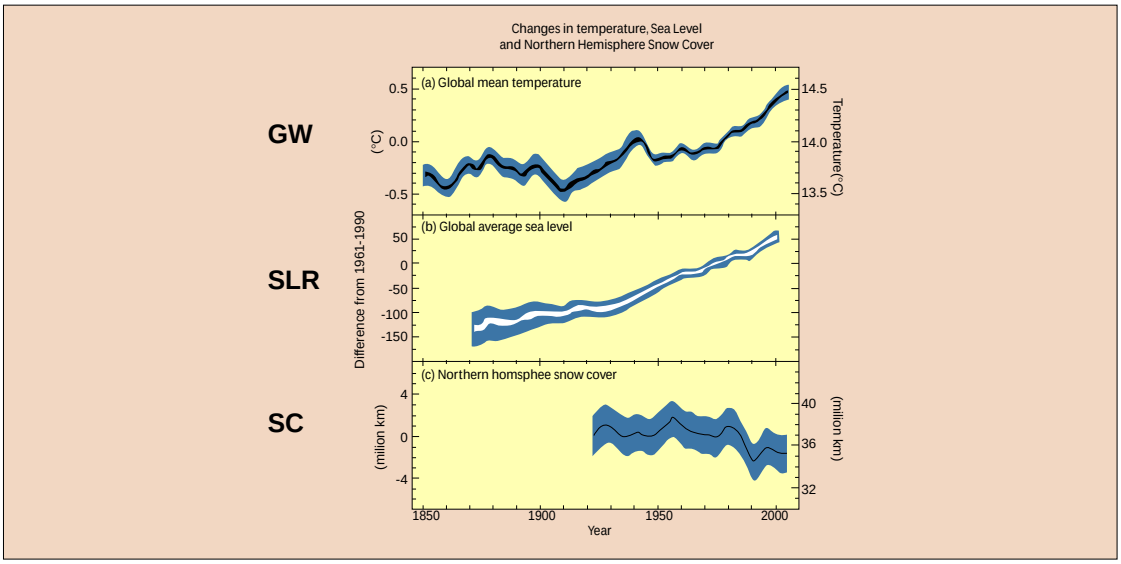

Fig. 2.1. Changes in temperature (GW, Global Warming), Sea Level Rise (SLR) and Snow Cover (SC)

(Source: IPCC Fourth Assessment Report,2007)

For the next two decades, a rise in the warming by about 0.2°C per decade is projected for a range of SRES (IPCC Special Report on Emission Scenarios). Even if the concentration of all greenhouse gases and aerosols had been kept constant at year 2000, a further warming of about 0.1°C per decade would be expected. Figure 2.2 shows the global temperature change during 1860-2000.

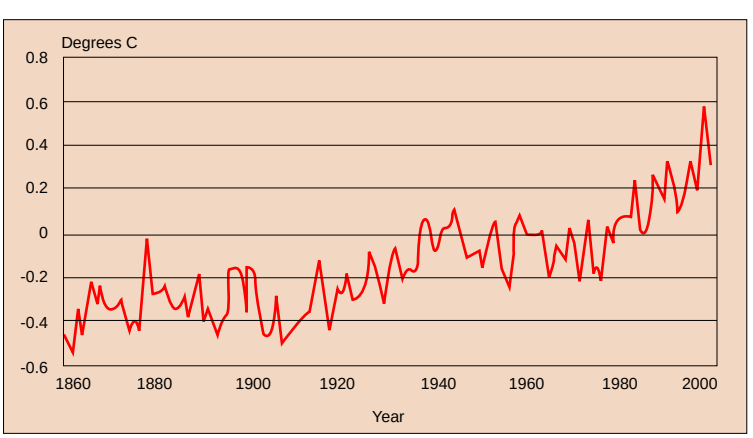

Fig. 2.2. Global temperature change (1860-2000)

(Source: IPCC Fourth Assessment Report,2007)

The Figure 2.3 demonstrates the increase in the mean temperature on the global and northern hemisphere scales. However, these patterns do not match the mean temperature of Bangladesh and its capital city Dhaka, where temperature shows anomalous patterns particularly since the early 1980's. On the other hand, the mean temperatures in different seasons have shown clear increase over the last 55 years, except in the pre-monsoon period (Fig. 2.4).

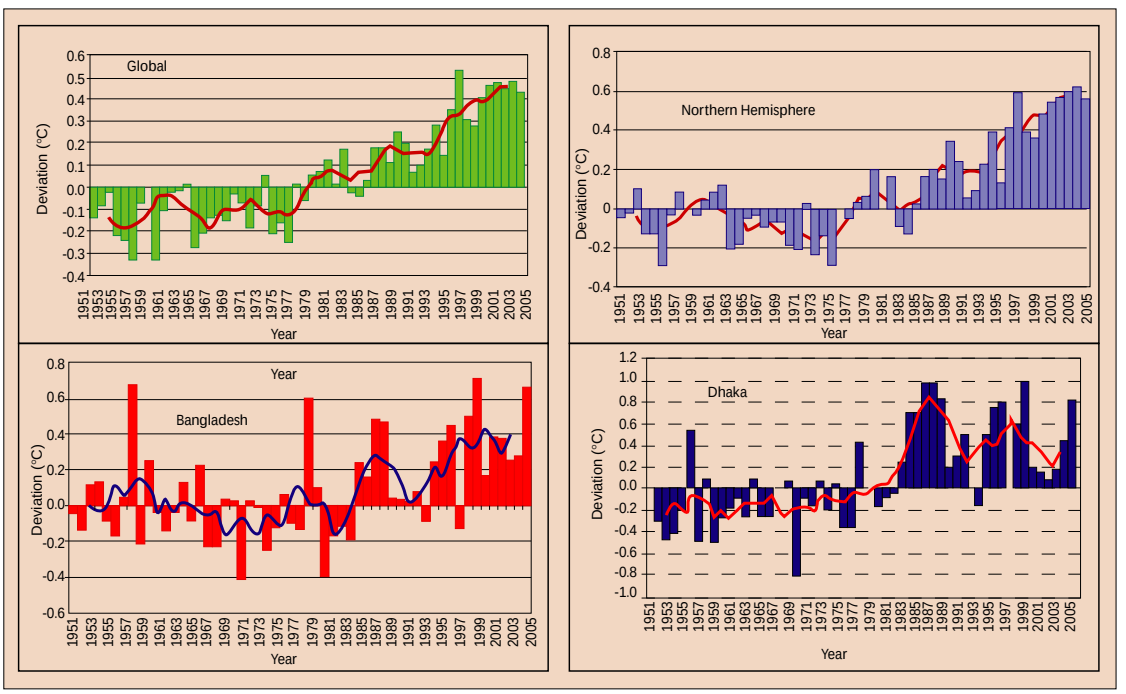

Fig. 2.3. Comparison of yearly mean temperature anomaly, 1951-2005
(Source: Bangladesh Meteorological Department, 2007)

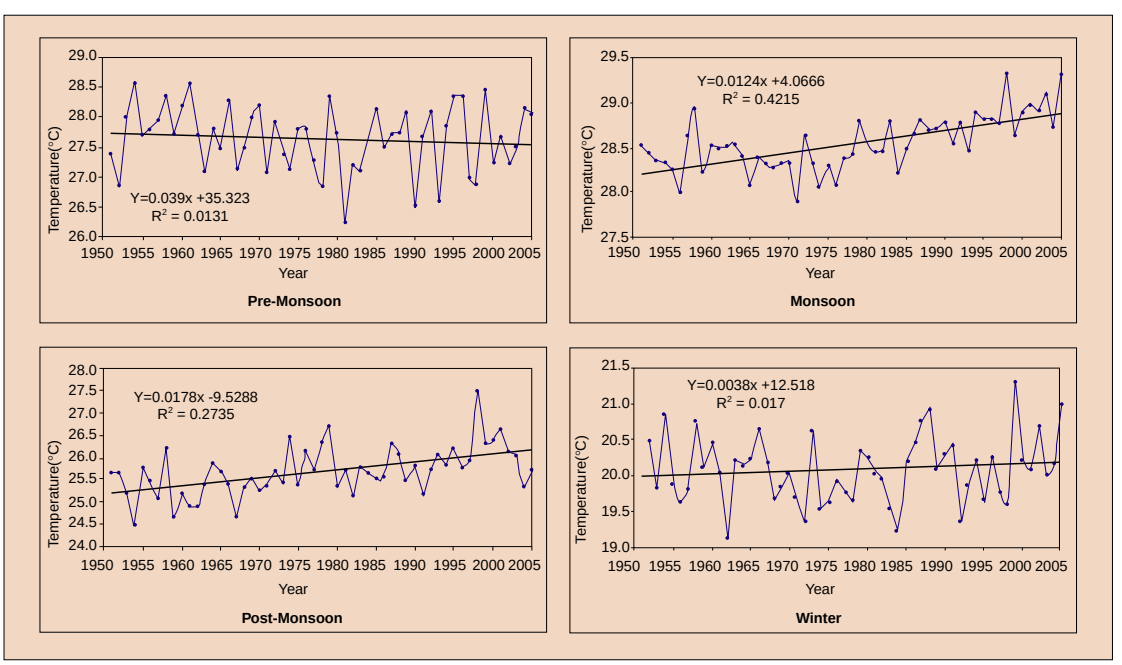

Fig. 2.4. Seasonal variation of mean temperature in Bangladesh during 1950-2005
(Source: Bangladesh Meteorological Department, 2007)

2.1.3 History of 'United Nations Framework Convention on Climate Change' (UNFCCC)

Growing public concern on environmental issues pushed the international community to reach an unprecedented agreement on the need to protect the global environment during the 1990s. Scientific assessment of climate change, its impacts, adaptation and vulnerability has played an important role in the framing of a convention on climate change and established different scientific groups under the associated convention and protocol. Recognizing the needs of policy-makers for authoritative and up-to-date scientific information, the World Meteorological Organization (WMO) and the UN Environment Programme (UNEP) established the Intergovernmental Panel on Climate Change (IPCC) in 1988. Following a proposal by the Government of Malta, the issue of Climate Change was taken up by the UN General Assembly in 1988 and resolution 43/53 of 6 December 1988 on the "Protection of the Global Climate for Present and Future Generation of Mankind" was adopted. With a view to reducing the adverse effects of climate change, the United Nations Framework Convention on Climate Change (UNFCCC) was finalized and adopted on 9 May 1992 in New York, USA. The Convention was opened for signature at the UN Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil, on 4 June 1992 and came into force on 21 March 1994. Today 189 governments are Parties to the Convention. Bangladesh signed the Convention on 9 June 1992 and ratified it on 16 April 1994.

2.1.4 Objectives of UNFCCC

The "ultimate objective" of the UNFCCC is "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (Article 2, UNFCCC). Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner. The Framework Convention does not specify such "level of GHG concentration" and "dangerous anthropogenic interference", along with the timeframe for stabilization, is also not clearly articulated. Initially, reduction of GHGs was mainly a voluntary commitment on the part of the signatories. In the third Conference of Parties (COP 3) held in Kyoto in 1997, GHG emission reduction became legally binding.

2.1.5 History of 'Kyoto Protocol' (KP)

The Conference of the Parties to the UNFCCC at its Third Session (COP3) in Kyoto, Japan agreed to a protocol known as the 'Kyoto Protocol (KP)'. This protocol is the first legally binding agreement to reduce emission of GHGs not controlled by other protocols including Montreal Protocol on Ozone Depleting Substances (ODS). The protocol has agreed to reduce on average 5.0% of greenhouse gases of Annex I country parties relative to 1990 level by 2008 to 2012 referred to as the first commitment period. Article 3.2 of the Protocol also states that each Party included in Annex I shall, by the years 2005, have made demonstrable progress in fulfilling its commitments under this Protocol. The Non-Annex I countries will have opportunities to emissions reduction trade with the Annex I countries under the CDM of the Protocol.

After a long period of negotiations from 1997 to 2004, the Kyoto Protocol came into force on 16 February 2005. The Protocol came into force upon fulfillment of the double-trigger provision, i.e. a) at least 55 countries must ratify it and b) the ratifying Annex I countries must cover 55% of their total emissions. It is to be noted that the present shape of the Kyoto Protocol is not entirely

effective as a number of compromises have already been made, and one of the major world emitters has withdrawn its support from Kyoto commitment. Increasing emission trends of Annex I country parties show a lack of their commitment. The GHG inventory of Annex I countries, excluding countries in economic transition, showed that their emission has increased 8.4% by 2002 compared to 1990 levels. The chronological development of the Convention and Protocol is given in Box 2.1.

Box 2.1: History of UNFCCC and Kyoto Protocol

May 1992	UNFCCC was adopted to address global climate change
June 1992	Bangladesh signed the UNFCCC
April 1994	Bangladesh ratified the UNFCCC
March 1995	UNFCCC came into force
December 1997	Kyoto Protocol was adopted at the CoP3 to the UNFCCC held in Kyoto, Japan
October 2001	Bangladesh ratified the Kyoto Protocol
October 2003	Designated National Authority (DNA) was established in Bangladesh
February 2005	Kyoto Protocol came into force

2.2 Obligations under UNFCCC

2.2.1 Principles of the UNFCCC

- The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof. This principle does not preclude developing countries and fast growing economies from taking any measure in combating climate change.
- The specific needs and special circumstances of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change, and of those Parties, especially developing country Parties, that would have to bear a disproportionate or abnormal burden under the Convention, should be given full consideration. The special circumstances of developing Parties are defined under Articles 4.8 and 4.9.
- The Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures, taking into account that policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost. To achieve this, such policies and measures should take into account different socio-economic contexts, be comprehensive, cover all relevant sources, sinks and reservoirs of greenhouse gases and adaptation, and comprise all economic sectors. Efforts to address climate change may be made cooperatively by interested Parties.

- The Parties have a right to, and should, promote sustainable development. Policies and measures to protect the climate system against human-induced change should be appropriate for the specific conditions of each Party and should be integrated with national development programmes, taking into account that economic development is essential for adopting measures to address climate change. This principle is leading the concept of mainstreaming, widely talked inside and outside the convention, climate change into development activities.
- The Parties should cooperate to promote a supportive and open international economic system that would lead to sustainable economic growth and development in all Parties, particularly developing country Parties, thus enabling them better to address the problems of climate change. Measures taken to combat climate change, including unilateral ones, should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade.

2.2.2 Key obligations under UNFCCC and KP

The UNFCCC and Kyoto Protocol (KP) have recognized both mitigation and adaptation as response measures to the problem of anthropogenic climate change (Fig. 2.5). Reduction of greenhouse gases, known as "mitigation" is the key measure to address the root causes of human induced climate change where scientific knowledge and technologies of the developed world dominate. Activities related to coping with adverse effects of climate change, including variability and extreme events, is known as "adaptation". Adaptation is context specific and therefore no unified approach or technology can be formulated and applied. This is gradually being accepted both by scientific and negotiating communities. The IPCC Forth Assessment Report has come up with explicit evidence of climate change impacts and adaptation options to convince policy–and decision–makers globally.

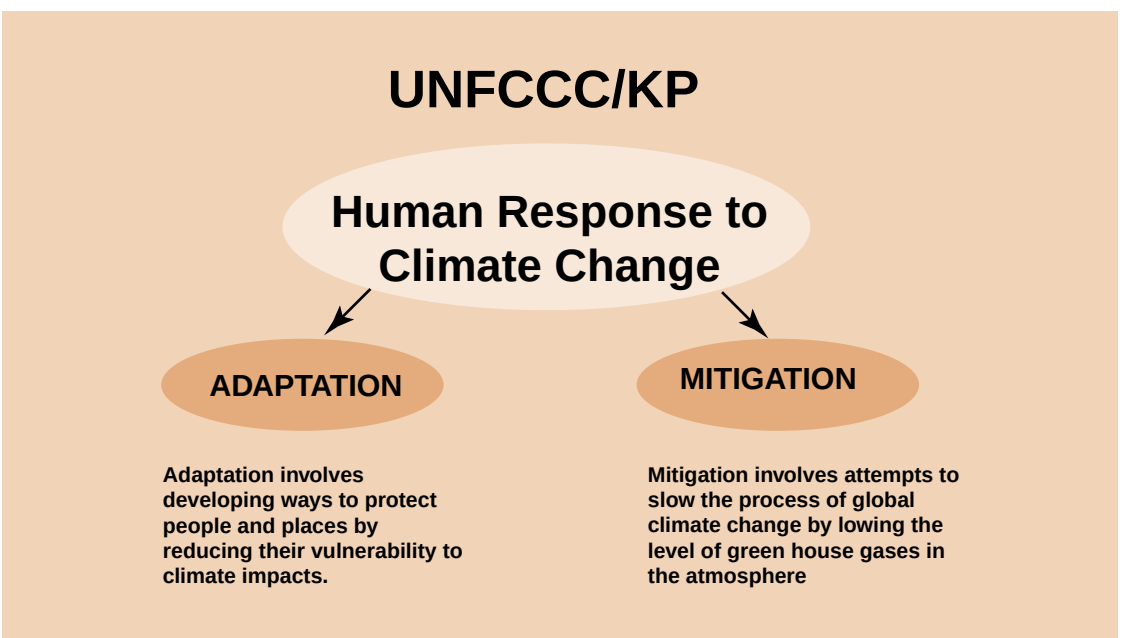

Fig. 2.5. Human Response to Climate Change

Under Article 4 of the Convention, both developed and developing countries have agreed to take measures to limit emissions and promote adaptation to future climate change impacts; submit information on their national climate change programmes and inventories; promote technology transfer; cooperate on scientific and technical research; and promote public awareness, education, and training. The Protocol also reiterates the need to provide "new and additional" financial resources to meet the "agreed full costs" incurred by developing countries in carrying out these commitments.

2.2.3 Specific obligations/commitments – Mitigation

The specific obligations / commitments under the UNFCCC are specifically mentioned in Article 4. These are as follows:

1. Each Party included in Annex I, in achieving its quantified emission limitation and reduction commitments under Article 3, in order to promote sustainable development, shall:
   - (a) Implement and/or further elaborate policies and measures in accordance with its national circumstances, such as:
     - (i) Enhancement of energy efficiency in relevant sectors of the national economy;
     - (ii) Protection and enhancement of sinks and reservoirs of greenhouse gases not controlled by the Montreal Protocol, taking into account its commitments under relevant international environmental agreements; promotion of sustainable forest management practices, afforestation and reforestation;
     - (iii) Promotion of sustainable forms of agriculture in light of climate change considerations;
     - (iv) Research on, and promotion, development and increased use of, new and renewable forms of energy, of carbon dioxide sequestration technologies and of advanced and innovative environmentally sound technologies;
     - (v) Progressive reduction or phasing out of market imperfections, fiscal incentives, tax and duty exemptions and subsidies in all greenhouse gas emitting sectors that run counter to the objective of the Convention and application of market instruments;
     - (vi) Encouragement to appropriate reforms in relevant sectors aimed at promoting policies and measures which limit or reduce emissions of greenhouse gases not controlled by the Montreal Protocol;
     - (vii) Measures to limit and/or reduce emissions of greenhouse gases not controlled by the Montreal Protocol in the transport sector;
     - (viii) Limitation and/or reduction of methane emissions through recovery and use in waste management, as well as in the production, transport and distribution of energy;
   - (b) Cooperate with other such Parties to enhance the individual and combined effectiveness of their policies and measures adopted under this Article, pursuant to Article 4, paragraph 2(e) (i), of the Convention. To this end, these Parties shall take steps to share their experience and exchange information on such policies and measures, including developing ways of improving their comparability, transparency

and effectiveness. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall, at its first session or as soon as practicable thereafter, consider ways to facilitate such cooperation, taking into account all relevant information.

2. The Parties included in Annex I shall pursue limitation or reduction of emissions of greenhouse gases not controlled by the Montreal Protocol from aviation and marine bunker fuels, working through the International Civil Aviation Organization and the International Maritime Organization, respectively.

3. The Parties included in Annex I shall strive to implement policies and measures under this Article in such a way as to minimize adverse effects, including the adverse effects of climate change, effects on international trade, and social, environmental and economic impacts on other Parties, especially developing country Parties and in particular those identified in Article 4, paragraphs 8 and 9, of the Convention, taking into account Article 3 of the Convention. The Conference of the Parties serving as the meeting of the Parties to this Protocol may take further action, as appropriate, to promote the implementation of the provisions of this paragraph.

4. The Conference of the Parties serving as the meeting of the Parties to this Protocol, if it decides that it would be beneficial to coordinate any of the policies and measures in paragraph 1(a) above, taking into account different national circumstances and potential effects, shall consider ways and means to elaborate the coordination of such policies and measures.

Under the Kyoto Protocol (KP), the Annex I country parties committed to reduce their greenhouse gases 5.0 percent below 1990 level by 2008 to 2012.

2.2.4 Nairobi Programme of Work – Adaptation

Nairobi Programme of Work on Impacts, Vulnerability and Adaptation to Climate Change

The COP, by its decision 1/CP.10, requested the Subsidiary Body for Scientific and Technological Advice (SBSTA) to develop a structured five-year programme of work on the scientific, technical and socio-economic aspects of impacts of, and vulnerability and adaptation to, climate change, which would address the following issues: method and tools, data and observations, climate modeling, scenarios and downscaling, climate related risks and extreme events, adaptation planning and practices, research, technologies for adaptation and economic diversification into sustainable development in the context of the terms of reference of the SBSTA as referred to in Article 9 of the Convention and to hold an in-session workshop during SBSTA 22 to facilitate the development of this five-year programme of work. Subsequently COP 11 through decision 2 CP/11 adopted the five year programme of work developed by SBSTA addressing issues of vulnerability, impacts and adaptation to climate change.

The programme of work comprises two thematic areas, each with several action-oriented sub-themes (Report of SBSTA 25):

a) Impacts and vulnerability

   i) Promoting development and dissemination of methodologies and tools for impact and vulnerability assessments, such as rapid assessments and bottom-up approaches, including as may apply to sustainable development;

ii) Improving collection, management, exchange, access to and use of observational data and other relevant information on current and historical climate and its impacts, and promoting improvement of observations, including the monitoring of climate variability;

iii) Promoting the development of, access to, and use of information and data on projected climate change;

iv) Promoting the understanding of impacts of, and vulnerability to, climate change, current and future climate variability and extreme events, and the implications of sustainable development;

v) Promoting the availability of information on the socio-economic aspects of climate change and improving the integration of socio-economic information into impact and vulnerability assessments;

b) Adaptation planning, measures and actions:

i) Promoting the development and dissemination of methods and tools for assessment and improvement of adaptation planning, measures and actions, and integration with sustainable development;

ii) Collecting, analyzing and disseminating information on past, and current practical adaptation actions and measures, including adaptation projects, short- and long-term adaptation strategies, and local and indigenous knowledge;

iii) Promoting research on adaptation options and the development and diffusion of technologies, know-how, and practices of adaptation, particularly addressing identified adaptation priorities and building on lessons learned from current adaptation projects and strategies;

iv) Facilitating communication and cooperation among and between Parties and relevant organizations, business, civil society, and decision makers and other stakeholders;

v) Promoting understanding and the development and dissemination of measures, methodologies and tools including for economic diversification aimed at increasing economic resilience and reducing reliance on vulnerable economic sectors, especially for relevant categories of countries listed in Article 4, paragraph 8, of the Convention.

Bangladesh can benefit from the activities to be undertaken in the following areas: methods and tools, data and observations, climate modelling, scenarios and downscaling, climate related risks and extreme events, socio-economic information, adaptation planning and practices, research and technologies for adaptation. Since SBSTA Nairobi work programme is an agreed list of activities under the process of UNFCCC, Bangladesh may approach bilateral or multilateral sources of funding for the implementation of these programmes.

2.2.5 Other obligations

The following obligations are also vested in the signatories to the UNFCCC.

- Article 3(3): Adopting measures to prevent and minimize the factors responsible for climate change;

- Article 3(4): Adopting appropriate policies to integrate UNFCCC obligations with national development programmes;
- Article 4: Periodic national inventories of GHG emission; programme for the control of climate change; incorporate suitable policies for the control of climate change in national plans;
  - Periodic report on mitigation measures;
  - Formulation and implementation of programmes for control of climate change;
  - Incorporation of suitable policies for the control of climate change in national plans including education and training policies to enhance public awareness vis-a-vis climate change;
  - Developing appropriate integrated plans for coastal zone management;
- Article 5: Research and systematic observation to strengthen national scientific and technical research capacities;
  - Undertaking research and impact assessment on the social, economic and environmental policies;
- Article 6: Strengthening capacities within the means of the signatories keeping harmony and consistency with their national law and regulations;
- Article 7: Conference of parties for periodic examination of the obligations of the signatories, and preparing guidelines for inventories of GHG;
- Article 12: Communication and mechanism of implementation to be brought to the attention of COPs;
- Article 13: Multilateral consultative process for resolving issues arising out of implementation of the provisions of UNFCCC.

2.2.6 Key decisions

The First Session of the COP to UNFCCC established the Ad Hoc Group on Berlin Mandate (AGBM) to carry out a process that would enable it to take appropriate action beyond the year 2000, including the strengthening of the commitments of the Annex I Parties through a protocol or other legal instrument (http://unfccc.int/cop4/resource/cop1.html). Ministerial Declaration of the Second Session of the COP to UNFCCC confirmed the findings of the IPCC Second Assessment Report (SAR) and called for "legally binding" commitments and the US announced its support for a legally binding protocol or other legal instruments. The Third Session of the UNFCCC adopted the legally binding instrument "Kyoto Protocol (KP)" with aims of curbing and reducing the GHG emissions.

The Kyoto Protocol on Climate Change (COP3)

The Kyoto Protocol to the UNFCCC was adopted by COP 3, in December 1997 in Kyoto, Japan, after intensive negotiations (unfccc.int). Most industrialized nations and some central European economies in transition (all defined as Annex B countries) agreed to legally binding reductions in greenhouse gas emissions of an average of 5.0% below 1990 levels between the years 2008-2012, defined as the first emissions budget period. The United States would be required to reduce its total emissions by an average of 7% below 1990 levels. However, the US Government did not send the Protocol to Congress for ratification and eventually rejected the Protocol in 2001.

In order to achieve reduction targets the Protocol also established Three Flexible Mechanisms i.e. a) Joint Implementation, b) Emissions Trading, and c) Clean Development Mechanism (CDM). Bangladesh is eligible to participate in the CDM to help Annex I countries to meet their commitment and promote sustainable development of Bangladesh.

Buenos Aires Plan of Action (COP 4)

The COP 4 took place in Buenos Aires, Argentina in November 1998 (unfccc.int). It was expected that the remaining issues unresolved in Kyoto (COP 3) would be finalized at this meeting. However, the complexity and difficulty in reaching a consensus proved insurmountable, and instead the parties adopted a 2-year "Plan of Action" to advance efforts and to devise mechanisms for implementing the Kyoto Protocol, to be completed by 2000. The Plan contains the Parties' resolution to demonstrate substantial progress on a) the financial mechanism; b) the development and transfer of technology; c) the implementation of FCCC Articles 4.8 and 4.9, as well as Protocol Articles 2.3 and 3.14 etc.

Marrakech Accords (COP 7)

At the COP 7 meeting in Marrakech, Morocco held during 29 October–10 November 2001, negotiators in effect completed the work of the Buenos Aires Plan of Action, finalizing most of the operational details and setting the stage for nations to ratify the Protocol (http://unfccc.int/cop7/). The completed package of decisions is known as the Marrakech Accords. The United States delegation continued to act as observers, declining to participate in active negotiations. A target date for bringing the Protocol into force was put forward to the World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa, August-September 2002.

The Conference of the Parties also established two funds under the convention i.e. a) Special Climate Change Fund (SCCF), and b) Least Developed Countries Fund (LDCF) to prepare national strategies for facilitating adaptation to climate change. An LDC Expert Group (LEG) and their Terms of References was also adopted in COP 7. The COP also established Adaptation Fund (AF) under the Kyoto Protocol (See Chapter 7).

The Special Climate Change Fund was established to finance developing country activities in (1) adaptation, (2) technology transfer, (3) key sectors (energy, transport, industry, agriculture, forestry and waste management), and (4) economic diversification for countries with economies dependent on the fossil fuel sector. The Least Developed Country Fund was established to support preparation and implementation of National Adaptation Programmes of Action (NAPA)– a prioritized list of 'urgent and immediate' adaptation projects, identifying those priority activities "whose further delay could increase vulnerability, or lead to increased costs at a later stage" (Decision 28/CP.7). The operational modalities and procedures have been finalized and one project for Bhutan has also been approved under this fund.

The Adaptation Fund is intended to fund concrete adaptation projects and programmes in developing countries that are particularly vulnerable to the adverse effects of climate change. The funding is provided by a 2% levy on proceeds from CDM projects (excluding those undertaken in LDCs), and "other sources". The total scale of the Adaptation Fund will therefore depend on the volume of Certified Emission Reductions (CERs) purchased through the CDM and the market value of those CERs.

Montreal Package Decision (COP 11)

The 11th Conference of the Parties (COP) to the UNFCCC was also the first Meeting of the Parties (MOP) to the Kyoto Protocol since their initial meeting in Kyoto in 1997 (http://unfccc.int/meetings/cop_11/). It was, therefore, one of the largest inter-governmental conferences on climate change ever held. The event marked the entry into force of the Kyoto Protocol.

The Kyoto process triggered by Article 3.9 of the Protocol led to the constitution of an Ad Hoc Working Group on further commitments for Annex I Parties under the Kyoto Protocol and the group is in charge of negotiating post-2012 commitments for developed countries. In Montreal, parties set no deadline for these negotiations, specifying only that they conclude in time to "ensure…no gap" between commitment periods.

Decision 1/CP.11 "Consideration of commitments for subsequent periods for Parties included in Annex I to the Convention under Article 3, paragraph 9, of the Kyoto Protocol" is a formal start to discuss future commitment. Decision 1/CP.11 "Dialogue on long-term cooperative action to address climate change by enhancing implementation of the Convention" is a non-binding setting to share experiences and analyze strategic approaches for long-term cooperative action to address climate change. Another stream of discussion is going on under "Gleneagles Plan of Action" where climate change has been recognized as one of the important elements along with energy.

Progress in Nairobi (COP 12)

Government negotiators at the United Nations Climate Change Conference in Nairobi continued two processes launched in Montreal in 2006 to consider next steps in the international climate effort, and agreed in the final hours to open another track to review the Kyoto Protocol (unfccc.int/files/meetings/cop_12/). In two weeks of talks, parties also agreed on modest steps on adaptation, debated approaches to reducing deforestation and accelerating technology transfer, and heard proposals from South Africa and Brazil on ways to promote stronger action by developing countries.

Despite the lack of progress on future commitment and long-term cooperation, the Parties agreed upon the principles and modalities of the Adaptation Fund under the Kyoto Protocol. The Parties also agreed that "the Adaptation Fund should operate under the authority and guidance of and be accountable to the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol". It also decided that "membership of the governing body of the Adaptation Fund shall be from Parties to the Kyoto Protocol, following a one-country-one vote rule and have a majority of Parties not included in Annex I to the convention". The eligibility criteria and priority areas–finalized in 26th Subsidiary Bodies Meeting held in Bonn, Germany in May 2007–would be placed in COP 13 to be held in Bali, Indonesia. This has enabled the most vulnerable countries to have access to funds for implementing concrete adaptation projects which are needed urgently.

Progress in Bali (COP 13)

The Thirteenth Session of the Conference of the Parties (CoP 13) to the UNFCCC and also serving as Third Meeting of the Parties (COP/MOP3) was held in the Bali International Convention Centre (BICC), Bali, Indonesia during 3 to 15 December 2007. Sharing the final report of the two-track processes initiated in the Montreal, Canada and setting up a road map for negotiating post Kyoto Protocol response regime were key agenda for this conference. Other

important issues include finalizing the governance structure of Adaptation Fund, technology transfer, dialogue on long term cooperative action to address climate change.

The Bali Action Plan recognized that deep cuts in global emissions will be required to achieve the ultimate objective of the Convention and emphasizing the urgency to address climate change as indicated in the FAR of the IPCC. It decides to launch a comprehensive process to enable the full, effective and sustained implementation of the Convention through long-term cooperative action, now, up to and beyond 2012, in order to reach an agreed outcome and adopt a decision at its fifteenth session. It established an Ad Hoc Working Group on Long-term Cooperative Action under the Convention.

The governance structure of the Adaptation Fund (AF), function of the Adaptation Fund Board (AFB) and broad principle to access fund had been agreed in Bali and this was a major success. Immediate key tasks before the AFB are a) develop strategic priorities, policies and guidelines, and recommend their adoption to the COP/MoP and b) develop and decide on specific operational policies and guidelines, including programming guidance and administrative and financial management guidelines. In terms of access to fund, key element of the decision is provision of direct access to the Adaptation Fund by Governments.

2.3 Current Situation and Stocktaking

UNFCCC acknowledged the dire necessity to address adverse impacts of climate change as a common concern of humankind through mitigation and/or adaptation measures. Adaptation will become increasingly difficult and costly and some adverse impacts such as the loss of rare species or the melting of glaciers cannot be reversed by adaptation measures at all. This section has collated the status of implementation of some obligations under the Convention and Protocol. Article 4 of the Convention has stated a number of commitments for both Annex-I and Non-annex I country parties. The Kyoto Protocol created opportunities to participate in CDM projects. Article 6 under the Convention also allows parties to implement activities on education, awareness raising and training. Subsequent decisions under the Convention and Kyoto Protocol also brought the Government of Bangladesh under several obligations, both binding and voluntary. The key commitments and obligations which have been addressed in Bangladesh are given in Table 2.3.

Table 2.3: Key commitments and obligations under the UNFCCC and KP

Commitment under UNFCCC / KP	Status of Implementation in Bangladesh	Involved Agencies
Preparation and submission of the National Communication	Submitted in October 2002	DoE , MoEF has involved a consulting house for preparing this National Document which was later on reviewed by a technical team engaged by the Government
National Adaptation Programmes of Action (NAPA)	Submitted in 2005 as response to the decision of COP7	MoEF involved all relevant agencies and institutes to prepare this national document
Establishment of Designated National Authority (DNA) to support CDM Projects in Bangladesh	DNA was established in 2003	MoEF involved research institutes working on CDM

2.3.1 National Communication to UNFCCC

The Government of Bangladesh had prepared and submitted the Initial National Communication (INC) in October 2002. The National Communication includes national circumstances, mitigation, GHG inventory, vulnerability, adaptation to climate change and a strategic response to climate change. The Second National Communication is under preparation.

2.3.2 National Adaptation Programmes of Action (NAPA)

The National Adaptation Programmes of Action (NAPA) for Bangladesh has been prepared by the MoEF as a response to the decision of the COP 7 of the UNFCCC. The preparation process was followed by the generic guiding principles outlined in the annotated guideline prepared by the LDC Expert Group (LEG). Involvement of different stakeholders was an integral part of the preparation process for assessing impacts, vulnerabilities, adaptation measures, observing the urgency and immediacy principle of the NAPA. Policy-makers of Government, local Government (Union Parishad) representatives (Chairman and Members), scientific community, members of the various research institutes, researchers, academics, teachers (ranging from primary to tertiary levels), lawyers, doctors, ethnic groups, media, NGO and CBO representatives and indigenous women contributed to the development of the NAPA for Bangladesh. The six Sectoral Working Groups of NAPA were:

a) Agriculture, Fisheries and Livestock coordinated by Bangladesh Agricultural Research Council (BARC)
b) Forestry, Biodiversity and Land-use coordinated by IUCN Bangladesh
c) Water, Coastal Zone, Natural Disaster and Health coordinated by Water Resources Planning organization (WARPO)
d) Livelihood, Gender, Local Governance and Food Security coordinated by Bangladesh Institute for Development Studies (BIDS)
e) Industry and Infrastructure coordinated by Department of Environment (DoE)
f) Policies and Institutes coordinated by Bangladesh Centre for Advanced Studies (BCAS)

The NAPA for Bangladesh has identified 15 priority activities including general awareness raising, technical capacity building and implementation of projects in different vulnerable areas, with a budget of US$ 73.70 million (Annex 2.1).

2.3.3 Designated National Authority (DNA)

In order to participate in the Kyoto Protocol, Clean Development Mechanism (CDM) process for generating Certified Emission Reduction (CER), the Government set up a two tier DNA (Fig. 2.6) on 13 October 2003. The lower tier which is known as National CDM Committee – operational body of the DNA – is headed by the Secretary, MoEF. It performs all CDM related activities including preliminary approval of CDM projects. The upper tier, known as the CDM Board, is headed by the Principal Secretary to the Hon'ble Prime Minister and does the final endorsement of the approved projects. The main task of the DNA is to approve CDM projects, which can eventually be registered by the CDM Executive Board of the UNFCCC. The Bangladesh DNA has approved 4 projects till date (Table 2.4). The DoE provides the DNA with necessary secretarial support.

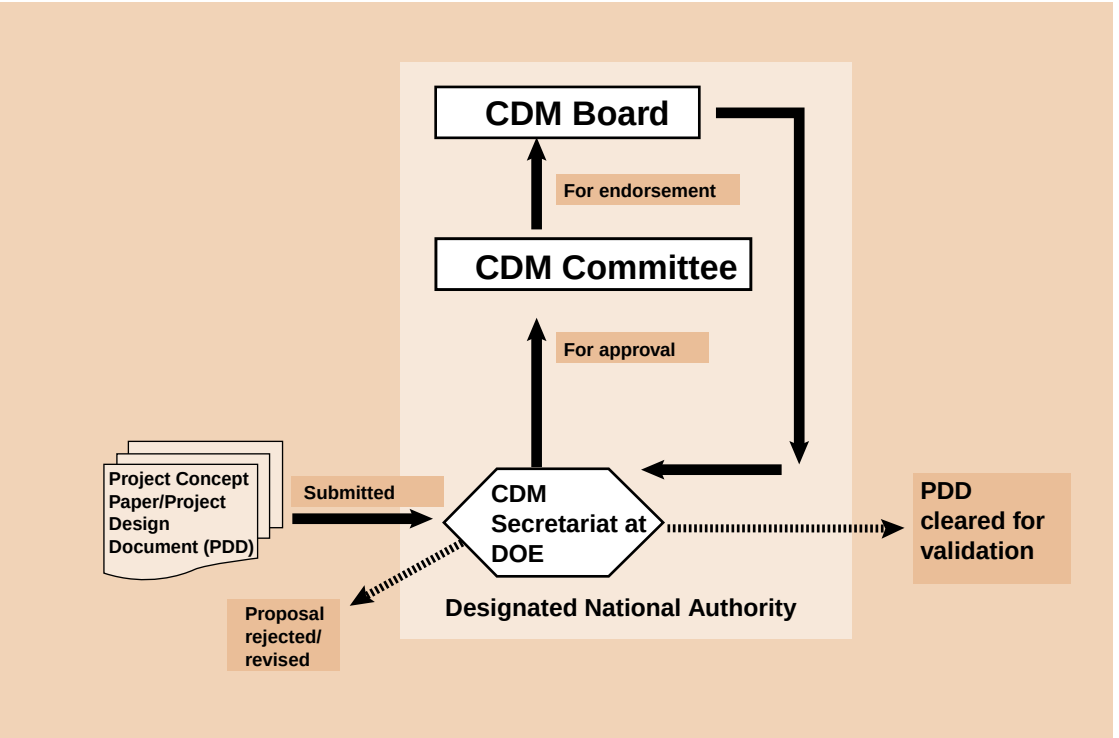

Fig. 2.6. Structure of Designated National Authority (DNA) for Bangladesh for approval of CDM Projects (Sinha, 2006)

2.3.4 Current status of CDM projects in Bangladesh

The CDM was devised to help Annex I (developed) countries meet their GHG emission reduction targets in a cost-effective manner by allowing them to acquire CERs from abatement projects in Non-Annex I (developing countries). Apart from having global benefits, CDM projects should also promote sustainable development in Non-Annex I countries.

According to Article 12 of the Kyoto Protocol, the "purpose of the Clean Development Mechanism shall be to assist Parties not included in Annex I in achieving sustainable development, and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3".

Highly innovative in nature, CDM has the potential to meet the needs of both developing and industrialized countries. It can help raise Non-Annex I countries' capital needs for the financing of technology transfer for clean, energy efficient economic development and for addressing environmental issues such as loss of biodiversity, while also providing a lower cost, more flexible alternatives to meet emission reduction targets.

The CDM aims to direct private sector investment into emission reduction projects in developing countries while promoting sustainable development in these counties. In return, the developed countries are to receive credits against their Kyoto targets. CDM projects that reduce emissions of green house gases will create CERs, which can then be used by Annex I parties (and their private entities) in greenhouse gas reduction projects as well as to facilitate the transfer of new technologies that reduce GHG emissions in non-Annex-I countries. The CDM project portfolio of Bangladesh is shown in Table 2.4.

Table 2.4: Summary of the current CDM project portfolio

Sl. No.	Name	Estimated Emission Reduction Tons of CO_2e/Yr.
1	**Registered Projects (2)**	
	■ Landfill Gas Extraction and Utilization at Matuail Landfill Site, Dhaka	80,000
	■ Composting of Organic Waste in Dhaka (700 tons/day)	89,259
2	**Under Validation (2)**	
	■ 30,000 Solar Home Systems in Non-Grid Areas	10,000
	■ Promotion of 1,00,000 Compact Fluorescent Lamps in Rural Areas	5,000
3	**Project Being Submitted for DNA Approval (3)**	
	■ Bundled Co-composting Projects in Eight Secondary Towns of Bangladesh	13,500
	■ Landfill Gas Extraction and Utilization at Raufabad Landill Site, Chittagong	25,000
	■ Composting of Organic Waste in Chittagong (200 tons/day)	17,250
4	**Projects in Pin Stage (1)**	
	■ Industrial Co-generation Project at Monno Fabrics (11 MW)	8,000
	Total Emission Reduction from 8 Projects	248,000

Source: Ministry of Environment and Forests & Waste Concern (Sinha, 2006)

Apart from the aforementioned projects, the following projects are also being conceptualized:

- Bundled Efficient Brick Kiln Project (Fuel Switching/ Energy Efficiency)
- Poultry Waste Management Project (Waste Sector)
- Use of SPV Pumps for Irrigation (Fuel Switch)

The global scenario of CDM markets is appended in Table 2.5. The current status Bangladesh of relating to CDM projects needs to be strengthened in order to capture the global CDM market.

Table 2.5: Current status in Carbon Market

Country	Number of Projects (small and large)	Average Annual Reduction of CO2e
India	255	23,143,655
Brazil	104	16,944,256
China	93	69,281,041
Mexico	88	6,211,614
Bangladesh	2	169,259
Nepal	1	93,883
Bhutan	1	524

Source: Thematic Assessment Report on Mitigation (Sinha, 2006)

2.3.5 Climate Change Cell

The Climate Change Cell was established at the Department of Environment (DoE) in 2004 under the Comprehensive Disaster Management Program (CDMP) of the Government. It was set up as a response to the recognition that Bangladesh is particularly vulnerable to the effects of climate change and that the scale and frequency of climate-related disasters is likely to increase. The Cell provides the central focus for the Government's climate change related work, operating as a unit of DoE. Its objective is to enable the management for ascertaining the long term climate risks and uncertainties as an integral part of national development planning. This will also contribute to capacity building of Bangladesh's disaster management system, risk reduction and improvements in response and recovery operations. The Cell has been involved with the preparation of bibliography on different studies related to climate change. The four main areas of focus are namely:

- Building the capacity of the Government to coordinate and integrate the climate change issues;
- Strengthening existing knowledge and availability of information on impact prediction and adaptation to climate change;
- Awareness raising, advocacy and coordination with partners across Government, NGOs, civil society, private sector and development partners;
- Improving the capacity to adapt livelihoods to climate change in the agriculture sector.

2.3.6 Projects/Programmes/Actions (completed & on-going)

The Government of Bangladesh (GoB) has undertaken some significant actions to address the climate change issues. GoB and NGOs have also completed a number of projects, programmes and studies to understand the impact and vulnerability of climate change and adaptation strategies and some of them are mentioned below in the light of mitigation and adaptation.

2.3.6.1 Mitigation

- Bangladesh Climate Change Study by DoE;
- Asia Least Cost Greenhouse Gas Abatement Strategy, ALGAS (Bangladesh Chapter);

- Climate Change in Asia: Bangladesh by DoE;
- Institutional Strengthening for the Phase-out of Ozone Depleting Substances (Phase-I and Phase-II) by DoE;
- Conversion to CFC-free Technology in the Manufacture of Aerosol Products by DoE;
- National Action Plan for Bangladesh on Control and Prevention of Air Pollution and Its Transboundary Effects by DoE;
- Air Quality Monitoring Project (AQMP) by DoE;
- Implementation of a National Program for Recovery and Recycling of Refrigeration by DoE;
- Restricting the use of old and dilapidated vehicles and three wheelers with two-stroke engines and initiating a project on the use of Compressed Natural Gas (CNG) in the vehicles instead of gasoline to reduce the vehicular emission of CO^2 and other harmful airborne particles and air pollution;
- The Ministry of Communication took step for a total ban on plying of two-stroke three wheelers in Dhaka City from January 2003, followed by the introduction of CNG-run auto-rickshaws;
- The plying of buses, minibuses, microbuses, and taxis older than 20 years and trucks, mini-trucks, tank lorries and vans older than 25 years has been banned in Dhaka City since 1 January 2002;
- The ban on the use, production and marketing of polyethylene shopping bags since 2002 is considered as a historic step in this regard;
- The Environment Conservation Rules, 1997 has been amended and under the amended rules, use of the Catalytic Converter and Diesel Particulate Filter for Petrol and Diesel driven vehicles respectively has been made mandatory;

2.3.6.2 Adaptation

- Vulnerability and Adaptation to Climate Change Study by DoE;
- Coastal and Wetland Biodiversity Management (CWBMP) in Cox's Bazar and Hakaluki Haor by DoE;
- Twenty-five studies under the Flood Action Plan (FAP) after the disastrous floods of 1987 and 1988;
- Forestry Resources Management Project by FD;
- Strengthening of the monitoring and warning systems of the weather-caused disastrous events, such as, tropical cyclones and floods in the institutions concerned;
- Construction of riverbank and coastal embankments to protect vulnerable areas from monsoon flooding;
- Construction of more than 2000 cyclone shelters for safety of the vulnerable population during cyclonic storms and associated surges;
- Steps to solve the transboundary water issues with India and signing of a bilateral treaty with India on the sharing of Ganges water;

- Inclusion of climate change issues and other environmental concerns in the curricula of the general and specialized education system of the country;
- Conducting awareness campaign, in cooperation with the civil society and the NGO community, among the general masses through the print and electronic media, leaflets, posters, rallies, seminars, symposium, observance of various environment related days and discussion meetings on various environmental issues including climate change;
- Continuous drive towards roadside plantations and plantations on fallow lands. The FD has raised artificial mangroves in the coastal zone in an area of 113 thousand hectares. Besides, there is a program for plantation in the coastal zone aiming at the environmental and ecological conservation and income generation of the poor people living in those areas;
- Reducing Vulnerability to Climate Change (RVCC) is a community-based project funded by CIDA and implemented by CARE Bangladesh in the southwestern region of Bangladesh. It has produced valuable knowledge and information about community-based adaptation to climate change and these results will be integrated into the future work;
- The contribution of BARI and some universities relating to the development of salt tolerant species;
- National Environment Management Action Plan (NEMAP) addressed assessment and identification of needs and priorities for sustainable environment management;
- Integrated Coastal Zone Management Program (ICZMP) deals with sustainable development of the coastal zone of Bangladesh and developed a coastal zone policy, coastal development strategy and a process to develop priority investment plans accommodating climate change concerns;
- Livelihood Adaptation to Climate Change (LACC) in Drought Prone Areas was jointly implemented by the UN Food and Agriculture Organization (FAO) and the Department of Agriculture Extension (DAE), under Climate Change Cell, DoE. The project tried to address the needs of farmers and agricultural crops in drought prone and drought affected areas of Bangladesh with regard to risk management and adaptation in related livelihoods;
- Adaptation Research by Climate Change Cell on the following:
  a. Adaptive Crop Agriculture including innovative Farming Practices in the Haor Basin
  b. Adaptive Crop Agriculture including innovative Farming Practices in the Coastal Zone of Bangladesh
  c. Climate Change and Health Impacts
  d. Crop Insurance as a Risk Management Strategy in Bangladesh
  e. Climate Change, Gender and vulnerable Groups in Bangladesh
- An Adaptation Research Advisory Committee (ARAC) has been formed with senior researchers and experts to oversee the whole Adaptation Research Activities at the field level and guide them to get tangible deliverables for the farmers, researchers, academics and policy-makers.

2.3.7 Post 2012 Climate Change Regime

Bangladesh has participated in a number of international and regional meetings where 'Beyond 2012' issue has been discussed. Representatives of the government in different international meetings and negotiations have urged for deeper cut of greenhouse gases and more activities geared towards adaptation. Crediting period must be extended beyond 2012 for effective implementation of the targets. However, it is well understood that adaptation measures must be implemented soon. In this respect, a committee has been formed and entrusted to prepare discussion papers on the subject. Bangladesh has expressed its concerns in the negotiations at the COP 13 held in Bali in December 2007.

Before that Bangladesh Centre for Advanced Studies (BCAS), International Institute of Environment and Development (IIED) and European Capacity Building Initiate (ECBI) organized a training session in Bangladesh for South and South-east Asian negotiators where a number of burning issues were discussed.

2.3.8 Existing capacity of Government and Non-Government Organizations

As mentioned earlier, GoB, autonomous bodies (public and private universities) and NGOs played a pivotal role in complying with the commitments under the Convention and Protocol. A summary of their existing capacities is given in Tables 2.6 and 2.7.

Table 2.6: Summary of technical capacity of other GOs

Organization	Area of Technical Capacity	Involvement
Bangladesh Agricultural Research Council (BARC)	▪ Modeling of impacts, vulnerability and adaptation of agriculture to climate change ▪ Modeling done on major crops (DESAT)	▪ US Climate Change Country Study and NAPA ▪ BARC is also involved in other modeling exercise
Bangladesh University of Engineering and Technology (BUET)	▪ GHG Inventory ▪ Future Scenario Development and Mitigation Strategies (LEAP)	▪ US Climate Change Study (ALGAS) ▪ Establishment of DNA
Centre for Environment and Geographic Information Services (CEGIS)	▪ Modeling of Water Resources ▪ Salinity Intrusion ▪ Impacts on livelihoods	▪ NAPA ▪ CDMP ▪ EIA, SIA, EMP
Water Resource Planning Organization (WARPO)	▪ Policy and Planning ▪ Impact Assessment (IA)	▪ NAPA ▪ IA of CC on Coastal Zone of Bangladesh
Bangladesh Institute of Development Studies (BIDS)	▪ Economic assessment of impacts and adaptation ▪ Livelihood impacts ▪ GHG and Mitigation strategies (MARKEL)	▪ ADB Study ▪ ALGAS ▪ US Climate Change Study ▪ NAPA

Table 2.7: Summary of technical capacity of NGOs and research organizations

Organization	Area of Technical Capacity	Involvement
Bangladesh Centre for Advanced Studies (BCAS)	▪ Climate Change Scenario Generation using General Circulation Model (GCM) ▪ Design and Development of CDM Projects ▪ Community Based Adaptation Projects	▪ National studies on climate change impacts and adaptation ▪ CBA Workshop
Bangladesh Unnayan Parishad (BUP)	▪ Water Policy ▪ Vulnerability and Adaptation Assessment ▪ Scenario Development using RCM and GCM	▪ US Climate Change Study ▪ ALGAS ▪ NAPA
Institute of Water Modeling (IWM)	▪ Modeling of Water Resources ▪ Salinity Intrusion	▪ Modeling of Water Resources Programme
Waste Concern	▪ Design and Development of CDM Projects ▪ New Methodology Development for CDM	▪ Establishment of DNA
IUCN	▪ Policy, Planning, Programming, Reporting	▪ NAPA ▪ NatCom ▪ NBSAP ▪ NCSA
ICDDR'B	▪ Capacity of international standard in health	▪ Research on climate change & health issues
NIPSOM	▪ Capacity of international standard in health	▪ Research on climate change and health issues
CNRS	▪ Community participation	▪ Working for CC and adaptation research and LDRRF
FEJB	▪ Public awareness, media sensitization	▪ WSSD Workshops ▪ NAPA Workshops
Deptt. of Environment Sc. and Management, NSU	▪ Climate change negotiations ▪ Economic assessments of impacts & adaptation	▪ Micro-insurance campaign

Apart from above organizations, there are other public and private entities like SPARRSO, BMD, SRMC, BCSIR, and other earth, environment & life sciences school of public & private universities have their own capacity on environmental management.

2.4 Priority Environmental Issues

Climate is an important determinant of geographical distribution, species composition and productivity of any ecosystem. Changes in the climatic regimes, therefore, can modify the patterns and productivity irreversibly, affecting traditional livelihoods, forest-based industries, and soil and water resources. The scientists apprehended that in the event of global average temperatures rise, sea level rise would also be intensified, inundating a portion of the Sundarbans in Bangladesh and leading to primary and secondary impacts on such as loss of biodiversity and degradation of land mass. As a result, the national as well as global forests will be adversely affected by climate change, reducing carbon sinks, soil fertility and precipitation and increasing the incidence of pests, forest fires and natural disasters.

2.4.1 PEIs identified in NAPA regional workshops

The priority environmental issues (PEIs) as identified during the NAPA regional workshops held in the four major divisions of the country have been short-listed in Table 2.8.

Table 2.8: PEIs as identified during the NAPA regional workshops

PEIs	Chittagong	Rajshahi	Khulna	Sylhet
Climate related health disorders				
Cyclone/ Tidal bore				
Drainage congestion/ Waterlogging				
Declining aquatic flora and fauna (nalkhagra, hijal, etc.)				
Drought/dryness/lack of rainfall in dry season				
Deforestation/ Deterioration of forest resources				
Drought/dryness/shortage of surface water in dry season				
Excessive rainfall/ variability of rainfall				
Excessive fog				
Flash flood/ riverine flood				
Irregular rainfall/ excessive rainfall at a time				
Lack of safe drinking water				
Lowering of ground water table				
River bank/ coastal erosion				
Salinity intrusion				
Shortage of surface water/dried up water bodies				
Sedimentation of rivers and canals				
Variability of seasons i.e. severity of winter and summer/ Hot wind				

2.4.2 PEIs identified in the Thematic Group Meetings of NCSA

Climate Change induced PEIs are:

- Increased natural disasters (cyclones and storm surges);
- Sea level rise in the coastal areas of Bangladesh;
- Temperature rise and its impact on agricultural output, human health, infrastructures and energy consumption;
- High intensity of rainfall causing flash floods;
- Frequent and prolonged floods;
- Scarcity of freshwater due to less rain and higher evapo-transpiration in the dry season;
- Drainage congestion due to higher water levels in the confluence with the rise of sea level;
- Widespread drought in the northern region;
- Wider salinity intrusion into the surface, ground and soil in the coastal zone;

The identified PEIs through various thematic group meetings of NCSA have been summarized in the following sections.

2.4.2.1 Mitigation

- Inadequate efficiency in utilization of wood;
- System loss in energy sector;
- Inefficiency in transport and power sector;
- Pollution from brick kilns

2.4.2.2 Clean Development Mechanism (CDM)

- Limited knowledge of private and public sectors about CDM opportunities
- Inadequate knowledge in Government machinery about the investments in CDM Projects
- Lack of inter-ministerial coordination and conflicts within government policies
- CDM project requires bundling approach. Lack of identification of the right institution for bundling of the projects is in some instances a big barrier to the implementation of the projects
- CER can differ across projects and regions. For instance, hydro-power generation projects will have CER of only about 5-10% and might not be feasible
- Except waste projects (landfill gas for power and composting), maximum 30% of the investment can be covered by CERs. There is need for local financing to match rest 70% of investment
- With the current interest rate of commercial banks many projects seem difficult to realize or IRR becomes not very attractive
- The current CDM mechanisms are not favourable to developing countries because of existing mode of trade in emissions and it is not viewed as a win-win situation

2.4.2.3 Adaptation

- Adaptation to climate change is a growing concern, but it is still receiving less attention in the national and international policy arena than efforts to mitigate the changing climate. This is of particular relevance to a developing country like Bangladesh, which contributes little to increasing atmospheric concentrations of greenhouse gases, and yet suffers disproportionately from the affects of climate change due to its location in one of the most vulnerable parts of the world and its low capacity to cope with climate change
- Although there is evidence of increasing international commitment to adaptation, lack of associated funding and lack of linkages with relevant work on poverty remain as problem areas
- Bangladesh cannot harness a lot of opportunities for funding because of its poor skills to design projects properly
- Shortage of manpower or experts is a major impediment to adaptation
- Poor and weak infrastructure of the country renders it unable to adapt with climate induced natural calamities
- Vulnerable community's housing system is an added drawback due to poverty
- Sustainability and continuity of good programmes/projects becomes an issue
- Inadequate or insufficient community-based adaptation measures
- The inherent un-replicability of adaptation projects is another challenge. Each project needs to be site/community-specific and many are likely to be small-scale. If they are to enhance local adaptive capability, the international institutions, particularly donors, need to be more responsive and flexible to these realities
- The level of research on adaptation to climate change – both at national and international levels–has been relatively poor to date, particularly when compared to the level of research efforts invested in mitigation. It has only seriously been on the agenda for the last 4-5 years

2.4.2.4 Post 2012 Climate Change Regime

In Sir Nicholas Stern's report on 'Economics of Climate Change' (2007), it has been computed that devoting 1% of the current world GDP to climate change mitigation and adaptation measures could actually save about 20 times of the cost that will have to be incurred in future to do the same. He further says that the developed or industrialized nations are responsible for accelerating climate change phenomenon because of their large volume of emissions. Before the 1990s, they contributed over 80% of the global emissions and LDCs, as the worst victims of climate change, lack the capacity to overcome its impacts. The relevant PEIs are:

- Scientific prediction and validation baseline information on climate change is still lacking in Bangladesh;
- Negotiation skill is still lacking among the policy-makers in Bangladesh;
- Visionary/long–term plans/policy on climate change regime is non-existent in Bangladesh;
- Till date the emission level has increased to 22-23% by the developed countries;
- Large emitters are yet to provoke to commitment to the Kyoto Protocol;

The impacts of climate change are already visible in Bangladesh. Recently occurred (15 November 2007) cyclone 'Sidr' caused huge loss of lives, property, infrastructure, including cattle.

A family rests next to their devastated house in Taful village of Bagerhat district on 17 November 2007 two days after being hit by cyclone 'Sidr' © BD News 24

2.5 Identifying Capacity Development Needs

The Ministry of Environment and Forests (MoEF) is the Focal Point of the UNFCCC and the Department of Environment (DoE), as a technical wing of the MoEF, carries out the activities related to the Convention and the Protocol. The MoEF and the DoE closely work with other government departments, NGOs and research institutes in Bangladesh to implement the obligations under the Convention and the Protocol. Therefore, capacity development of the both GOs and NGOs is important in meeting the country's commitments.

COPs and MOPs to the Convention and the Protocol are being attended by the MoEF focal points from the very beginning of the landmark events. However, there is a lack of 'institutional memory' due to frequent transfer/posting of officials of the MoEF to other ministries. Existing government policy does not permit the retention of institutional memory by absorbing focal points in specific ministries and agencies. Hence, they are often unable to effectively participate in international negotiations. It is worth mentioning that Bangladesh leaded the LDC group for two consecutive years in the climate change negotiations. The Climate Change Cell in DoE is now providing support to negotiators through studies, position papers, creation of knowledge base and training for awareness among the government officials.

In the international negotiations, involvement of representatives from the NGOs became common in Bangladesh without financial commitment from the government. This increases the capacity of the negotiating team and shows good working relationship between GOs and NGOs. However, through NCSA process, a number of capacity development needs were identified, as summarized in this section.

2.5.1 Mitigation

Individual level

- Individual capacity to be enhanced in the Government departments concerned with special priority to DoE, BMD, SPARRSO, for monitoring the sea level rise, temperature rise etc.

- Sensitization of the policy-makers and all relevant ministries such as MoEF, MoL, MoA and MoFL is crucial
- Individual capacity of the Government officials concerned needs to be enhanced in terms of understanding the negotiation processes of international conventions as well as protocols
- Initiatives to organize different forums with relevant experts to strengthen individual capacity in terms of adaptation, mitigation and negotiation
- The young professionals need to develop their expertise in environmental issues
- Different funding sources should be made accessible to the young professionals/ personnel to help them to pursue higher education/training on climate change
- Utilization of the existing individual capacity is very important
- There is need for training programmes and awareness creation campaigns for relevant industries, industrialists, and chambers (FBCCI)
- Awareness levels amongst judiciary officers and banks, especially Bangladesh Bank need to be enhanced

Institutional level

- The capacity of the Climate Change Cell of DoE has to be improved. The Cell should have a permanent institutional set-up for carrying out long term climate change related activities. Experts/academics need to be involved in the process;
- The capacity of the other Government bodies, research organizations, the private sector, NGOs and academic are also needed to be strengthened
- Institutional capacity of the media to cover climatic issues and related events needs to be developed ;
- Initiatives should to be taken to strengthen the capacity of the public and private universities ;
- A win-win situation is to be created to develop a partnership and linkage between the public and private sectors, NGOs and academics;
- Strengthening of the disaster monitoring and early warning systems in BMD, DMB and other concerned agencies;
- Digital Elevation Model (DEM) may be introduced for monitoring accurate water levels in the sensitive spots ;
- Strengthening of the coastal environmental monitoring system in Bangladesh;
- Emphasis is to be given to technical support, tools (software) for use by the research centers;
- Sector-specific emission coefficient is necessary for preparation of a comprehensive national GHG inventory. Forestry, Agriculture and Waste Sectors are key sectors for Bangladesh in this regard;
- Detailed study on GHG mitigation mechanisms and policy options as well as strengthening the GHG monitoring system in Bangladesh;

- Research on the improvement of the design criteria and development of the suitable technology adaptive to the changed scenarios due to climate change;
- Initiation of research and development of renewable forms of energy, carbon dioxide sequestration technologies and innovative environmentally sound technologies;
- Advanced knowledge and technology for methane recovery and collection from aerobic composting;
- Promotion of sustainable forms of forestry and agriculture in light of climate change;
- Corporate Social Responsibility (CSR) opportunities need to be harnessed properly;
- Civil society and private sector cooperation needs to be developed;
- Networks of Government agencies relevant to climate change need to be strengthened for dissemination of existing knowledge;
- Development of skill and knowledge amongst the private and public sectors to bring in CDM investments into the country, including carbon trading;
- Need for project identification and preparation of good CDM proposals;
- Prior to negotiation or any other meeting, briefing sessions could be organized for the delegates, facilitated by experts and also debriefing sessions could be organized after participation in any international meeting for sharing knowledge;
- Focal points to be identified for separate conventions/protocols in the concerned ministries/ departments;
- Research on climate change impacts, vulnerability and adaptation have to be initiated and sustained in the following areas;
  - Study of climate change impacts on agriculture, crop production, livestock and human health;
  - Study of the impacts of climate change on existing sewerage and drainage systems and urban water supply schemes;
  - Study on impacts of climate change on existing flood control, irrigation and drainage projects;
  - Study on ecosystem management, biodiversity and wildlife conservation and protection;
  - Study of the changes of agro-ecological zones, droughts and floods in Bangladesh in the changed scenario;
  - Study of tropical cyclones using numerical models.

Systemic level

- Policy to be changed in the schedule of the training institutes concerned for the different professionals/ service cadres such as civil service, teachers, engineers, police, and custom officials for incorporation of climate change modules in all courses provided by BPATC, NAEM, Academy for Planning and Development etc.
- Policy should be taken to select the Bangladesh delegation based on knowledge and relevancy of the key officials for the CoPs as well as SBSTA meetings of the convention/protocol;

- Integrated coastal zone development programme, keeping in mind the sea level rise;
- Water management improvement programmes considering probable climate change impacts;
- Progressive reduction or phasing out of market imperfections, fiscal incentives, tax and duty exemptions and subsidies in all GHG emitting sectors;
- Policy and institutional set-up for one point delivery system of CDM project to attract investors from private and public sectors;
- Internalization of climate change impacts and sound understanding is also needed within the system of GoB;
- Measures to limit and/or reduce emissions of GHGs not controlled by the Montreal Protocol in the transport sector;

2.5.2 Clean Development Mechanism (CDM)[1]

The CDM is, by and large, an unfamiliar concept for many of the prospective CDM project developers. It is expected that more and more CDM projects will be developed with enhanced awareness and capacity. It is, however, worth pointing out that in the context of Bangladesh at the present time, CDM in the energy sector suffers from the following three shortcomings:

1. The potential for renewable energy technologies other than PV has been identified to be low;
2. Not only is the total energy consumption very low, but also all large energy consuming industries are in the public sector, and it is here that the greatest potential lies;
3. The small-scale nature of many energy consuming activities in the private sector implies that these have to be bundled to have a reasonable size project.

Renewable Energy Potential – Several studies have revealed that renewable energy technology potential is low in Bangladesh. This statement, however, must be immediately qualified by adding that these studies have been neither extensive nor rigorous. As the costs of renewable technologies come down, the potentials will certainly rise. Moreover, CDM is concerned with individual projects and not the total potential. Thus, even if there is only 300 MW of wind potential; twenty 15-MW CDM projects can be developed. The PV dissemination program is doing fairly well, and total installed capacity stands at over 3 MW.

CDM Potential in the Forestry Sector – There is a lot of opportunities to capture CDM market in the Forestry Sector of Bangladesh. But the Forest Department are not well equipped to capture CDM market due to inadequate knowledge and inadequate institutional capability. Special thrust may be given on this aspect.

CDM Potential in the Public Sector – The low energy consumption certainly limits the potential, but in a developing country like Bangladesh, energy consumption is continuously increasing (> 6% per year). This implies that the future consumption will be significantly higher. Most of this increased consumption is expected to occur in the private sector. As is well-known, developing country entrepreneurs routinely opt for the cheapest technology. These inexpensive technologies have a common feature: they are energy inefficient, and can consume 50% to 100% more energy compared to the state-of-the-art or advanced technologies. If entrepreneurs desiring to set up new industries can be targeted so that they opt for cleaner technologies, then considerable

[1]Based on Thematic Assessment Report on CDM, Sinha (2006)

sustainable development can be achieved and many CDM projects can be implemented. There are several ways to make new industrial efforts to take cognizance of CDM. It can be achieved through lending institutions that provide loans or through utilities that give connection for electricity and gas. The easiest, however, is through the DoE whose certification is required to set-up and operate any energy-consuming industrial activity. Since the DNA is located in the DoE, this is an ideal match. The promotional role of the DNA can be suitably fulfilled by providing advice to new industrial ventures as to how they can take advantage of the opportunities arising out of the CDM.

Bundling of Small-scale Projects for Private Sector CDM Projects – The bundling of small-scale projects can be done for Bangladesh, because many potential CDM projects in the private sector are small-scale activities. BCAS and Waste Concern are working with the concept. Meanwhile, the CDM Executive Board has provided some guidelines and models for bundling small-scale projects in Bangladesh.

Despite the limitations discussed above, there exists potential for CDM projects as evidenced by the on-going efforts. One thing is certain, and that is: the potential of many CDM technologies has not been assessed in any systematic manner. Moreover, when newer technologies, which increase the efficiency of utilization, become available in the future, the existing potential will naturally increase. The important issue is that the existing potential is not being harnessed. If CDM is correctly applied, at least a dozen projects can be formulated immediately.

Data Deficiency for Defining Baseline – Several projects have found that most industrial establishments do not maintain data properly. Also, because of widespread pilferage of electricity and gas, many of the industrial establishments do not want to reveal their actual energy consumption and output. In several cases, the specifications of the energy consuming equipment could not be provided. On top of all this, policy confusion from the Government's side creates a very difficult situation for establishing baseline. Thus establishing baseline for CDM projects proved to be very difficult and frustrating.

Management Deficiency in Private Sector Establishments – A Japanese team is now investigating the opportunities for cogeneration especially highlighted the management deficiencies in the private sector industrial establishments. They found that most industrial units were operating on an informal management structure, and would not be able to comply well with the monitoring and verification requirement of the CDM. The changes that would be required in these establishments would increase the transaction cost during operation period significantly.

Low Level of Awareness in the Private Sector – The lack of awareness of CDM in the private sector has been pointed out by all studies and projects dealing with CDM. The Japanese team, which visited a number of private sector industrial establishments, found it extremely frustrating that they had to first offer a lesson on CDM before they could even mention cogeneration. In general, Bangladeshi entrepreneurs are 'first-cost' sensitive. Energy efficiency, energy management and cleaner production are of little significance to Bangladeshi industrialists because energy prices are low, and in many cases they do not pay for their full consumption. Therefore, unless effective CDM awareness among the private sector industrialists can be achieved, not many will come forward because the benefits of the CDM process is not readily apparent to them. Entrepreneurs are also extremely 'risk-averse'. CDM projects, despite the CER subsidy, remain risky. Bangladeshi private sector is only likely to be interested if low interest

credit is made available. This would thus require the even-more-risk-averse lending institutions to change their outlook and fund CDM projects. A two-pronged capacity building effort has to be pursued vigorously. A partnership needs to be forged between the NGOs, which can supply the CDM expertise, and the DNA, which in Bangladesh has been entrusted with the promotional role. For this, adequate funding from bilateral, multilateral and other international climate change organizations can be mobilized.

Importance of Capacity Development in Relevant Government Departments – As mentioned in several places in this document, the public sectors are important players in the CDM process in Bangladesh. A limited number of very sketchy capacity building efforts have been undertaken for this group. The most telling example is that many members of the DNA (those representing other ministries and government agencies) have not received any training despite repeated requests from them.

2.5.3 Adaptation

The Ministry of Finance and Planning of Bangladesh is the most vital institution in preparing national development plans and policies, like in any other country. The Planning Cell of each ministry also plays a major role in formulating programmes and projects and therefore building their capacity will help integrate climate change in the development agenda. It is also necessary to build capacities of these ministries to understand the implications of climate change for sustainable development. Therefore, rigorous persuasion is needed to motivate such ministries for mainstreaming adaptation into their respective development programmes.

More interaction among the development partners might ensure security of investment by introducing a screening mechanism that conforms to the development programmes/projects and reduces the gap between funding agencies. At the national level, decentralization of planning and involvement of local government and people in planning and implementation is also important. Involvement of local level stakeholders (NGOs, CBOs) in participatory planning, need assessment and monitoring activities will build confidence of the local community. Local leaders/MPs/elite can also play an important role in this regard.

In the Report on the seminar on 'development and transfer of technologies for adaptation to climate change', Note by the Secretariat (FCCC/SBSTA/2005/8, dated 16 September 2005, Paragraph 76 (g)) addressing links with other processes states that "The EGTT could contribute directly to the Programme of Work (PoW) on adaptation in the area of technologies for adaptation and in related subject areas. Possible areas of work on technologies for adaptation should be further discussed".

This is particularly important since it is noted in the same Paragraph (76) of the report that:

(a) Technologies for adaptation: Further work is needed to address issues relating to cross-sectoral implications of these technologies, to deal with these technologies as opposed to technologies to address climate vulnerability, and to strengthen the work on specific activities for these technologies such as information development, awareness raising, planning, designing, implementation and monitoring;

(b) Endogenous technologies for adaptation: It was noted that many local technologies for adaptation to climate change are available within the developing countries. The need is, therefore, to promote their deployment and diffusion and, in many cases, this relates to the scarcity of financial resources;

(c) Financing: Further work is needed to enhance the prospects for financing these technologies, including better definition and preparation of adaptation projects and on engaging the insurance industry. These aspects could be addressed at the follow-up workshop on innovative options for financing technology transfer;

(d) Compendium/guide on technologies: A compendium/guide on technologies for adaptation may be necessary to further promote dissemination of information on these technologies. Additional outreach efforts are needed to increase awareness and reach all stakeholders, including farmers and local communities.

The CD needs further assessed by the thematic group of NCSA are given below.

Individual level

- Specialized training in negotiation skills and capacity building amongst key officers of related agencies;
- Vulnerable community needs awareness campaigns;

Institutional level

- NGOs and CBOs also need to incorporate capacity development plans and programmes;
- Adequate adaptation measures are not mainstreamed with other sectoral development agenda;
- Networking or maintaining a roster of specialists of the three Conventions should be in practice and sharing of information between departments/agencies facilitated
- Training assigned at Academy for Planning and Development on adaptation to climate change;
- Modernization of early warning systems for natural calamities;
- Alternative focal points within ministries in order to ensure continuity of institutional memory;

Systemic level

- Modules for policy-makers and educationists for capacity building training in environmental issues;
- Integration and mainstreaming of climate change considerations into development projects;
- Paradigm shift i.e. shifting from traditional planning to climate resilient national planning process;

2.5.4 Post 2012 Climate Change Regime

Individual level

- Policy-makers at all relevant ministries such as MoEF, MoL, MoA and MoFL need to be aware of post 2012 climate change consequences;
- Individual capacity of the Government officials concerned in terms of understanding the negotiation processes of international conventions needs to be developed;
- Young professionals need to be included in the education/skill development process;
- Special training for vulnerable communities needs to be conducted;

Institutional level

- Experts/academics are to be involved in the climate change planning process;
- Climate change issues need to be internalized within the system of GoB;
- Continuity of the institutional memory has to be maintained and mechanism for this has to be developed;
- Capacity of the public and private universities has to be developed, linking them with policy decisions;
- Partnerships and linkages between the public and private sectors, NGOs and academics should be ensured;
- Establishment of a professional network has to be initiated

Systemic level

- GHG inventory and monitoring system in Bangladesh has to be developed and coastal environmental monitoring system introduced;
- Designated focal points for separate conventions/protocols in the ministries/ departments concerned are needed;
- Mechanism for capacity retention and enhancement of the existing departments and institutions in the GOs and NGOs needs to be developed. Network of institutions may help in this regard.

Post 2012 climate change regime needs may also be developed based on the outline of "Gleneagles Plan of Action" particularly in the following areas:

- Transforming the way we use energy i.e. promoting energy efficient buildings, appliances, surface transport, aviation, industry;
- Powering a cleaner future i.e. cleaner fossil fuels, renewable energy, electricity grids etc;
- Promoting research and development ;
- Financing the transition to cleaner energy;
- Managing the impact of climate change i.e. monitoring and data interpretation, risk management;
- Tackling illegal logging;

2.5.5 Non-Kyoto Market Mechanisms

Bangladesh may explore the potential partnership on Non-Kyoto Market Mechanisms such as Methane to Market, Carbon Sequestration Partnership Programme and Asia-Pacific Partnership Programme.

2.5.6 Potential sectors for CDM in Bangladesh[2]

Following areas are probable avenues for carrying out CDM projects:

i. Methane recovery from landfill with or without electricity generation
ii. Composting of urban solid waste
iii. Biogas from a wide variety of wastes
iv. Solar home systems in off grid areas

[2] This Section is based on Thematic Report on CDM, Sinha (2006)

v. Efficient lamps to replace incandescent light bulbs

vi. Efficient brick manufacturing

vii. Sugar cogeneration

These options are discussed below. It should be emphasized that these are near term opportunities. With increase in the carbon price and /or breakthrough in new technologies like solar cells, fuel cells, biomass gasification, etc., newer options will emerge.

i. Methane recovery from landfill

Of these seven categories, recovery of landfill gas holds the highest potential. The outskirts of all major cities are becoming severely environmentally hazardous due to open and haphazard dumping of urban solid wastes. The recovery of landfill gas has been shown to be financially profitable because the CDM financing amounts to more than 150% of the investment. If a portion of the benefits of the CDM project can be channeled to convert these dumps into sanitary landfills, the country will benefit tremendously because the municipal corporations simply do not have the money to upgrade the exiting landfills.

ii. Composting of urban solid waste

Composting of urban solid waste has also been shown to be viable CDM project. The output from the composting plants is a saleable product and along with the prevention of landfill gas emission, which would otherwise have occurred, this is a potentially good CDM project.

iii. Biogas from a wide variety of wastes

Biogas can be derived from a wide variety of wastes, such as (a) poultry droppings, (b) tannery waste, (c) effluent from food processing industries, (d) human excreta, and (e) sewage, to replace fossil fuel directly or after electricity generation. Biogas production from the five categories of waste mentioned above can not only give the business enterprises an alternative fuel to replace their present fossil fuel use, but also handle their aggravating environmental concerns.

iv. Solar home systems in off grid areas

Of all the renewable energy options for Bangladesh, solar photovoltaics has been identified by various independent sources as the most potential area. The prospects for wind, mini/micro hydro-plant based biomass technologies have been shown to have limited prospects. In case of wind and hydro projects, it is important to add that the potential has not been mapped to the extent that would justify outright dismissal of these. It must always be remembered that in all countries of the world there will be some prospects for these technologies. The prospect for plant-based biomass (husk, straw) is also limited because these products have preset uses. Moreover, removing these free or cheap sources of fuel from the rural poor may have other consequences like loss of soil quality and deforestation. Solar Home Systems (SHS) can have a tremendous potential because even in the best case scenario in the next 20 years, 20% of the area of Bangladesh will remain outside the grid. Due to increasing prosperity and widespread availability of electronic entertainment (television, radio, music systems) and advances in communications (mobile telephone) there is increasing demand for electricity all across Bangladesh. It must be appreciated that 20% of the households indicate nearly 5 million homes, 20% of that is a million homes. The present SHS dissemination program has achieved only 50,000 or so units.

v. Efficient lamps to replace incandescent light bulbs

The prospect of efficient lighting comes about from the fact that nearly 25% of the total demand for electricity in the country is for lighting. This is easy to appreciate because the combined demand for the households and commercial sectors is more than the industrial sector and even in the industrial sector, there is a considerable amount of lighting load. The lighting demand is huge during the evening or peak hours. Nearly 20% of the highest peaks during the year are managed by load shedding. The rural consumption for lighting is predominantly based on using incandescent light bulbs. Through a suitably designed dissemination program, the use of CFLs can reduce emissions significantly and in the process reduce the peak demand. An innovatively designed CDM project can certainly have a positive impact in this sector.

vi. Efficient brick manufacturing

In the production of bricks in Bangladesh, coal is the major input and the inefficient technologies are used. Over 90% of the bricks are manufactured in this way and brickfields contribute more than 10% of the total GHG emission from the energy sector. The use of efficient technology, retrofitting the exiting technology and fuel switching from coal to natural gas can have a big impact on GHG emission.

vii. Sugar cogeneration

Sugar cogeneration is a commonly practiced GHG emission option. The 20 sugar mills in the country can be potential candidates for this technology. The only drawback is that all these mills are public sector entities and are losing concerns. If these challenges can be met, CDM projects can be implemented in this sub-sector, against the backdrop of enabling policies of the GoB to buy electricity from co-generators.

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Chapter 3

BIODIVERSITY

3.1 Introduction

Biological resources are vital to human's survival, economic prosperity and social development. There is a growing recognition that biological diversity is a global asset of tremendous value to both present and future generations. At the same time, the threat to species and ecosystems has never been as great as it is today. Species extinction caused by human intervention is continuing at an alarming rate. The world community is now conscious about the intrinsic value of biological diversity and of the ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic values of biological diversity and its components.

The term 'biological diversity' means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (Article 2, CBD). The term 'ecosystem' means a dynamic complex of plant, animal and microorganism communities and their non-living environment interacting as a functional unit (Article 2, CBD). The shortest definition was offered by the Global Biodiversity Strategy (WRI, IUCN, UNEP, FAO and UNESCO, 1992) which regards biodiversity as the totality of

genes, species and ecosystems in a region. Figure 3.1 is a representation of biodiversity based on its components and their interactions (Di Castri and Younes, 1996).

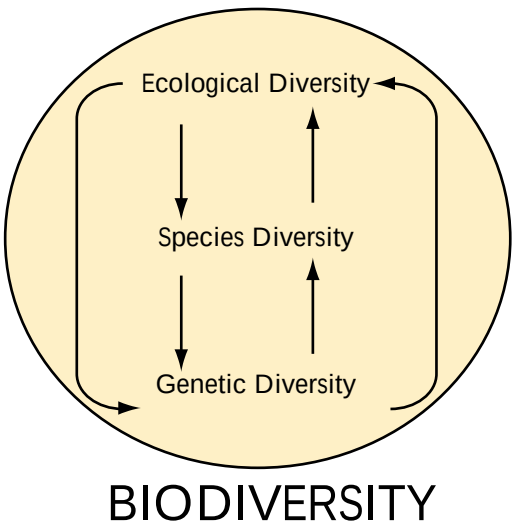


Fig. 3.1. Complex interaction of biodiversity in a greater ecosystem (Source: Das,2006)

3.1.1 Significance of biodiversity

Biodiversity is an essential resource-base for ecosystem services, socio-economic development and livelihood security. Through agriculture, forestry, livestock and fisheries – biodiversity provides food and fiber; medicine and timber and contributes significantly to national economies and employment. Ecosystems provide essential services including nutrient cycling, air and water purification, flood and drought mitigation, and soil recuperation. These services cannot always be measured in terms of money alone (WRI, 2002 in Das, 2006). Nonetheless, the direct economic benefits of biodiversity have sometimes been estimated and run into trillions of dollars per year (Constanza et al., 1997 in Das, 2006). While recognition of the values of the goods and services that biodiversity offers – both direct and indirect – is increasing, the relationship between the role of biodiversity in environmental sustainability, poverty reduction and sustainable development needs closer attention, understanding and action.

3.1.2 Convention on Biological Diversity

The Convention on Biological Diversity (CBD) is the key international instrument for addressing the biodiversity issues. The convention was finalized in Nairobi, Kenya in May 1992 and opened for signature at the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil on 5 June 1992. It came into force on 29 December 1993. Bangladesh signed this document on 5 June 1992 and ratified the same on 20 March 1994. The CBD provides a comprehensive and holistic approach to the conservation of biological diversity, sustainable use of natural resources, fair and equitable sharing of benefits deriving from the use of genetic resources. So far 189 countries have ratified the convention. This convention has a total of 42 Articles.

3.1.3 Objectives of the CBD

"The objectives of this Convention are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources…" (Article 1, CBD). All the contracting parties are supposed to follow the requirements stated in the Articles of CBD. Initially six thematic areas and nine cross-cutting issues were identified in the CBD (Glowka et al., 1994). At the moment there are seven thematic programmes and 17 cross-cutting issues (www.cbd.int) as listed below:

Thematic Programmes

1. Agricultural Biodiversity
2. Dry and Sub-humid Lands Biodiversity
3. Forest Biodiversity
4. Inland Waters Biodiversity
5. Island Biodiversity
6. Marine and Coastal Biodiversity
7. Mountain Biodiversity

Cross-cutting Issues

1. 2010 Biodiversity Target
2. Access to Genetic Resources and Benefit-sharing
3. Traditional Knowledge, Innovations and Practices
4. Biological Diversity and Tourism
5. Climate Change and Biological Diversity
6. Economics, Trade and Incentive Measures
7. Ecosystem Approach
8. Global Strategy for Plant Conservation
9. Global Taxonomy Initiative
10. Identification, Monitoring, Indicators and Assessments
11. Impact Assessment
12. Invasive Alien Species
13. Liability and Redress - Article 14(2)
14. Protected Areas
15. Communication, Education and Public Awareness
16. Sustainable Use of Biodiversity
17. Technology Transfer and Cooperation

3.2 Obligations under the CBD

The CBD is a comprehensive agreement covering a very large number of issues and effective implementation of this convention would require technical, financial and institutional support. The CBD provides an important framework for the conservation and sound management of natural resources. As a signatory to this Convention, the Government of Bangladesh agrees to:

- To ensure "appropriate access" to genetic resources and "the fair and equitable sharing of benefits" arising out of the utilization of genetic resources (Article 1).
- To develop national strategies, plans or programs for the conservation and sustainable use of the nation's biological diversity and integrate with other relevant sectors of the nation (Article 6).
- To identify the components of biodiversity, processes that may adversely affect biodiversity, establish a data base and put in place a good and effective monitoring system (Article 7).
- To ensure in-situ and ex-situ conservation of the biodiversity components of the country of origin and establish protected areas in all the original ecosystems and put in place a good management systems for these protected areas (Article 8).
- To adopt measures for ex-situ conservation of genetic resources of the country of origin and to put in place a good and effective system for its management and regulations (Article 9).
- To adopt sustainable use of the biodiversity components and integrate them into the decision making processes (Article 10).
- To adopt measures for economic and social incentives for biodiversity conservation (Article 11).
- To put in place education, training and research programs especially for the identification of the components of biodiversity with the focus on effective biodiversity conservation (Article 12).
- To put in place a state run public awareness program for the conservation of biodiversity (Article 13).
- To make the "Impact Assessment" obligatory through EIA and SIA with the focus on minimizing the adverse impact of any development activities or human intervention on the biodiversity of the country (Article 14).
- To develop rules and regulations to allow lawful access to the genetic resources of the country, lawful exchange of scientific information among the contracting parties and safe as well as lawful handling of biotechnology and distribution of its benefits within the country (Articles 15, 16, 17 & 19). Article 15 (i) affirms "sovereign rights of states over their natural resources" and provides that "the authority to determine access to genetic resources rests with the national governments" and is "subject to national legislation".
- To promote international cooperation in scientific and technical aspects related to biodiversity (Article 18).
- To provide financial support to the Conservation of Biodiversity and develop mechanisms there for (Articles 20 & 21).
- To abide by the decisions and obligations of COPs (Article 23).
- To submit reports to the CBD Secretariat, as when required, as per format provided by the Secretariat (Article 26).

In the Bangladesh NCSA, three specific areas were identified under the broad thematic area of biodiversity conservation to address the country's priority issues, and these are: i) Bioprospecting

and ABS issues, ii) Cartagena Protocol on Biosafety and Transboundary Movement of GMOs, and iii) CBD 2010 Countdown. Bangladesh's obligations under these three issues are briefly narrated in the following sections.

3.2.1 Bioprospecting and ABS issues

The term 'Bioprospecting' means value addition of biological components. It also signifies the search for plant and animal species from which medicinal drugs and other commercially valuable compounds can be obtained (Razzaque, 2006).

Plant genetic resources are the key components of any agricultural production system. Without them, no natural, evolutionary adjustment of the ecosystem and biotic condition would be possible. Agricultural science would not have the basic materials for their introduction, domestication and improvement programmes. Yet, predominant patterns of agricultural growth have eroded biodiversity in agro-ecosystem including plant genetic resources, livestock, insects and soil organisms. This erosion has caused economic losses, jeopardizing productivity and food security, and leading to broader social cost. The genetic resources of actual or potential value to food and agriculture are also being lost at an alarming rate due to habitat destruction, land degradation, over-exploitation of water resources, industrial, agricultural, forestry practices and urban expansion. Hence scientific management of these invaluable resources has assumed greater significance over time.

The following elements/conditions are being considered important to access in the ecosystem:

(i) Access to Plant Genetic Resources (PGRs), and Animal Genetic Resources (AnGRs) among organizations/ universities within the Bangladesh.

(ii) Access to national institutes/organization/universities falling outside Bangladesh including private sectors and companies.

(iii) Access to non-nationals.

(iv) (a) Access to Consultation Group on International Agricultural Research Centre (CGIAR), (b) access to multilateral basis, and (c) cooperation.

The essential areas/elements to be addressed by the authority concerned are the following :

(i) Joint exploration, sharing of collected materials, Material Acquisition Agreement (MAA), custodianship/ownership.

(ii) Exchange of germplasm, international trials and nurseries.

(iii) Sanitary and phytosanitary measures.

(iv) Multilateral exchange and use.

3.2.2 Cartagena Protocol on Biosafety and Transboundary Movement of GMOs

The Cartagena Protocol on Biosafety (CPB) was adopted on 29 January 2000 in Montreal. Right from the outset of biosafety negotiation, the US had led a sustained and aggressive campaign to keep Genetically Modified Organisms (GMOs) from being regulated by an international UN regime. At the final stages of the negotiations, the US garnered the support of other countries from the South – Argentina, Chile and Uruguay. Together with Canada and Australia they formed the formidable 'Miami Group' that is largely blamed for scuttling the scheduled conclusion and adoption of the Protocol in Cartagena (Columbia) in February 1999. It took all the diplomatic acumen of the Chair of the meeting, against the backdrop of the aborted Seattle meeting of the

WTO, to resuscitate the negotiations which finally led to its adoption in 2000 in Montreal. It is called the Cartagena Protocol on Biosafety to honor Colombia, which hosted the Extraordinary Conference of the Parties in Cartagena in 1999. The consensus protocol document is predictably weak and its domain considerably weakened – despite the efforts of the developing world – organized as 'The Like Minded Group', and, the European Union. Nonetheless, it is possible to salvage some key beneficial provisions out of this protocol.

CPB provides a framework for addressing environmental impacts of bioengineered products (referred to as Living Modified Organisms or "LMOs" / Genetically Modified Organisms or "GMOs") that cross international borders.

Bangladesh ratified the CPB on 5 February 2004, which came into force on 5 May 2004. The Government of Bangladesh has put emphasis on positive development of biotechnology in the policy regime. Harvesting the beneficial aspects of modern biotechnology is very crucial for the overall development of a country like Bangladesh, but at the same time, the essence of the 'precautionary approach' to mitigate the possible adverse or harmful effects of GMOs on the biodiversity, environment and human health must be realized.

Mandates and obligations under Cartegana Protocol for conservation of biodiversity in Bangladesh

Being a party to the CBD, Bangladesh is committed internationally to implementation of the obligations under the convention and the protocol. Under the CPB, Bangladesh's mandates and obligations for conservation of biodiversity, precisely, are as follows:

- **Assessment and Management of Risks:** Any development of GMOs be done in a manner that prevents or reduces risks to biodiversity and human health [Article 2(2)]
- **Extent of Risk Management:** Measures based on risk assessment shall be imposed to the extent necessary to prevent adverse effects of GMOs on the conservation and the sustainable use of biodiversity (and human health). [Article 16(2)]
- **Duration of observation:** As part of risk management, any development of GMOs must undergo an appropriate period of observation that is commensurate with its life-cycle or generation time before it is put to its intended use. [Article 16(4)]
- **Risk assessment modalities:** Risk assessment has to be carried out in accordance with Annex III of the protocol. This Annex sets out the general principles, methodology and points to consider in carrying out the risk assessment.
- **Obligation for Advanced Informed Agreement (AIA):** To make decisions on the import of GMOs intended for introduction into the environment based on a scientific risk assessment and within 270 days of notification of intent to export. GMOs intended for direct introduction into the environment are subject to the more stringent AIA procedure.
- **Commodity Requirements / Biosafety Clearinghouse:** The agreement requires governments to provide the Biosafety Clearinghouse with information concerning any final decisions on the domestic use of any GMO commodity within 15 days of making a decision.
- **Development of the National Biosafety Framework (NBF):** The prime objective of CPB is to provide the basis of establishing regulatory regime by each party to ensure safe transfer, handling, transit, transboundary movement, development, field trial and commercial release of GMOs.

- **Adherence to the precautionary principle:** This principle is clearly embedded in the protocol. The objective of risk assessment as set out in Annex III is 'to identify and evaluate the potential adverse effects of living modified organisms on the conservation and sustainable use of biological diversity in the likely potential receiving environment.'

Paragraph 4 of Annex III of the Protocol states that "Lack of scientific knowledge or scientific consensus should not necessarily be interpreted as indicating a particular level of risk, an absence of risk, or an acceptable level of risk". This clearly suggests that where there is a lack of clear scientific knowledge or there is no clear scientific consensus, it is yet permissible to conclude that risk may exist. This could shape the nature of research and development methodologies. The Boxes 3.1 and 3.2 summarize the scopes of CPB.

Box 3.1: Basics of the Cartagena Protocol: What it does.

- The Protocol establishes an internet-based "Biosafety Clearing-House" to help countries exchange scientific, technical, environmental and legal information about LMOs.
- It creates an advance informed agreement (AIA) procedure that in effect requires exporters to seek consent from importers before the first shipment of LMOs meant to be introduced into the environment (such as seeds for planting, fish for release, and microorganisms for bioremediation).
- It requires bulk shipments of LMO commodities, such as corn or soybeans that are intended to be used as food, feed or for processing, to be accompanied by documentation stating that such shipments "may contain" LMOs and are "not intended for intentional introduction into the environment."
- The Protocol establishes a process for considering more precise identification of LMO commodities in international trade.
- The Protocol includes a "savings clause" that makes clear the Parties' intent that the agreement does not alter the rights and obligations of governments under the WTO or other existing international agreements.
- It assists developing countries in building their capacity for managing modern biotechnology.

Source: National Biosafety Framework, DoE (2006)

Box 3.2: Basics of the Cartagena Protocol: What it does not do.

- The Protocol does not address food safety issues. Food safety is addressed by experts in other international fora.
- It does not require segregation of bulk shipments of commodities that may contain LMOs.
- It does not change rights and obligations of the parties under the WTO or other international agreements in any way.
- It does not subject shipments of bulk commodities to the Protocol's AIA procedure, which would have significantly disrupted trade in bulk commodities and would have jeopardized food access, without commensurate benefit to the environment.
- It does not require detailed identification requirements for bulk commodity shipments. (Any such requirements will be subject to a further negotiation to be concluded no later than two years after the Protocol enters into force).
- The Protocol does not require consumer product labeling. The mandate of the Protocol was to address potential risks to biodiversity that may be presented by LMOs. Issues related to consumer preference were not part of this negotiation. The Protocol's requirement for documentation identifying bulk commodity shipments as "may contain LMOs", and as "not intended for direct introduction into the environment" will be accomplished through shipping documentation.

Source: National Biosafety Framework, DoE (2006)

3.2.3 CBD 2010 Countdown

3.2.3.1 Goals and sub-targets to achieve CBD 2010 targets

COP 04 adopted the Strategic Plan for the Convention on Biological Diversity (Decision VI/26). In its mission statement, Parties committed themselves to a more effective and coherent implementation of the three objectives of the Convention, to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on earth (www.cbd.int/decisions, November 2007).

The COP 07 (Decision VII/30) adopted a framework towards the 2010 goals and targets. This framework included seven focal areas. Eleven goals have been set under these focal areas and each goal has one or more targets. These are in Annexure II of Decision VII/30 where the Parties decided to establish goals and sub-targets for each of the identified focal areas to clarify the 2010 global biodiversity target and promote coherence among the programmes of work of the Convention (www.cbd.int/2010-target, November 2007). These are reproduced below:

Focal Area: Protect the components of biodiversity

Goal 1. Promote the conservation of the biological diversity of ecosystems, habitats and biomes

Target 1.1: At least 10% of each of the world's ecological regions effectively conserved

Target 1.2: Areas of particular importance to biodiversity protected

Goal 2. Promote the conservation of species diversity

Target 2.1: Restore, maintain, or reduce the decline of populations of species of selected taxonomic groups

Target 2.2: Status of threatened species improved

Goal 3. Promote the conservation of genetic diversity

Target 3.1: Genetic diversity of crops, livestock, and of harvested species of trees, fish and wildlife and other valuable species conserved, and associated indigenous and local knowledge maintained

Focal Area: Promote sustainable use

Goal 4. Promote sustainable use and consumption

Target 4.1: Biodiversity-based products derived from sources that are sustainably managed, and Production areas managed consistent with the conservation of biodiversity

Target 4.2: Unsustainable consumption of biological resources, or that impacts upon biodiversity, reduced

Target 4.3: No species of wild flora or fauna endangered by international trade

Focal Area: Address threats to biodiversity

Goal 5. Pressures from habitat loss, land use change and degradation, and unsustainable water use, reduced

Target 5.1: Rate of loss and degradation of natural habitats decreased

Goal 6. Control threats from invasive alien species

Target 6.1: Pathways for major potential alien invasive species controlled

Target 6.2: Management plans in place for major alien species that threaten ecosystems, habitats or species

Goal 7. Address challenges to biodiversity from climate change, and pollution

Target 7.1: Maintain and enhance resilience of the components of biodiversity to adapt to climate change

Target 7.2: Reduce pollution and its impacts on biodiversity

Focal Area: Maintain goods and services from biodiversity to support human well-being

Goal 8. Maintain capacity of ecosystems to deliver goods and services and support livelihoods

Target 8.1: Capacity of ecosystems to deliver goods and services be maintained

Target 8.2: biological resources that support sustainable livelihoods, local food security and health care, especially of poor people be maintained

Focal Area: Protect traditional knowledge, innovations and practices

Goal 9. Maintain socio-cultural diversity of indigenous and local communities

Target 9.1: Protect traditional knowledge, innovations and practices

Target 9.2: Protect the rights of indigenous and local communities over their traditional knowledge, innovations and practices, including their rights to benefit sharing

Focal Area: Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources

Goal 10. Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources

Target 10.1: All transfers of genetic resources be in line with the Convention on Biological Diversity, the International Treaty on Plant Genetic Resources for Food and Agriculture and other applicable agreements

Target 10.2: Benefits arising from the commercial and other utilization of genetic resources be shared with the countries providing such resources

Focal Area: Ensure provision of adequate resources

Goal 11. Parties have improved financial, human, scientific, technical and technological capacity to implement the Convention

Target 11.1: New and additional financial resources are transferred to developing country Parties, to allow for the effective implementation of their commitments under the Convention, in accordance with Article 20

Target 11.2: Technology is transferred to developing country Parties, to allow for the effective implementation of their commitments under the Convention, in accordance with its Article 20, paragraph 4

3.2.3.2 Capacity building constraints on achieving CBD 2010 targets

The following are the capacity building constraints in conserving the biological diversity in Bangladesh (Thematic Report on CBD 2010 Targets):

- Poor understanding and awareness among the stakeholders; inadequate networking and poor information sharing system on the CBD issues;
- Overall low priority to environmental issues including the CBD in the national policy-making organs.
- Absence of integrated policy framework to protect and conserve biodiversity; sectoral and issue-based policies vested with different sectoral agencies work at cross-cutting area;
- Poor policy implementation and inadequate enforcement of regulatory framework, often because of weak political and social commitments;
- Inadequate budgetary, technical manpower and know-how to implement the CBD obligations;
- Inadequate capacity to implement CBD 2010 targets and sub-targets due to gaps in information and knowledge

3.3 Current situation and stocktaking

3.3.1 Biodiversity in Bangladesh

Species diversity

Despite its small area, Bangladesh is endowed with superb biological diversity in terms of floral and faunal species diversity. The Tables 3.1 and 3.2 summarize the number of species recorded under different major taxonomic plant and animal groups from Bangladesh. Nonetheless, many species are still unrecorded as indicated by the estimated number of floral species in Table 3.1. Such number will be very high for animals of the lower groups.

Table 3.1: Recorded and estimated number of plant species of different plant groups

Categories	Recorded (approx. no.)	Estimated
Algae	3,600	6,000
Bryophytes	290	400
Pteridophytes	200	250
Gymnosperms	5	5
Angiosperms	3,000	5,000

Source: Hassan (2003) in NBSAP (2006)

Table 3.2: Number of animal species belonging to the major taxonomic groups

Major taxonomic group		Number of species
Monera (Eubacteria, etc.)		166
Protista (Protozoan, Viruses, etc.)		341
Animalia: Invertebrates	Poriferans	7
	Cnidarians	68
	Platyhelmiths	23
	Nematodes	105
	Annelid	62
	Arthropods	1547
	Molluscs	347
	Echinoderms	6
Animalia: Vertebrates	Fishes	735
	Amphibians	23
	Reptiles	136
	Birds	778
	Mammals	125
Total Species		4,469

Source: Rashid (2003, 2004) in NBSAP (2006)

Threatened species

Through a comprehensive expert assessment in the late 1990's, IUCN Bangladesh prepared the Red Books (five volumes) of threatened vertebrates of Bangladesh, for the first time in the country in 2000 (IUCN Bangladesh, 2000). According to that assessment, the number of threatened mammals, amphibians, reptiles, fishes and birds are 43, 8, 63, 58 and 47, respectively (Table 3.3).

Table 3.3: List of extinct and some of the threatened species

Extinct species	Threatened species (Bangla and Scientific names)
■ Marsh Crocodile (Crocodylus palustris)	■ Humped Featherback (Chital; Notopterus chitala)
■ Common Peafowl (Pavo cristatus)	■ Olive Barb (Sarpunti; Puntius sarana)
■ Pink-headed Duck (Rhodonessa caryophyllacea)	■ Tor Mahseer (Mahashol; Tor tor)
■ Wolf (Canis lupus)	■ Gangetic Goonch (Baghair; Bagarius yarrellii)
■ Hog Deer (Axis porcinus)	■ Gangetic Gharial (Ghorial; Gravialis gangeticus)
■ Swamp Deer (Cervus duvauceli)	■ Reticulated Python (Ajagar; Phython reticulata)
■ Nilgai (Boselaphus tragocamelus)	■ Great Hornbill (Raj Dhonesh; Buceros bicornis)
■ Wild Buffalo (Bubalus bubalis)	■ Pallas's Fish Eagle (Kura; Haliateetus leucogaster)
■ Banteng (Bos banteng)	■ Hoolock Gibbon (Ulluk; Hylobates hoolock)
■ Gaur (Bos gaurus)	■ Asiatic Wild Dog (Dhole; Cuon alpinus)
■ Asiatic Two-horned Rhinoceros (Didermoceros sumatrensis)	■ Bengal Tiger (Bagh; Panthera tigris)
■ Javan Rhinoceros (Rhinoceros sondaicus)	■ Bear (Bhalluk; Ursus malayanus)
■ One-horned Rhinoceros (Rhinoceros unicornis)	■ Ganges River Dolphin (Shushuk; Platanista gangetica)
	■ Asian Elephant (Hati; Elephas maximus)

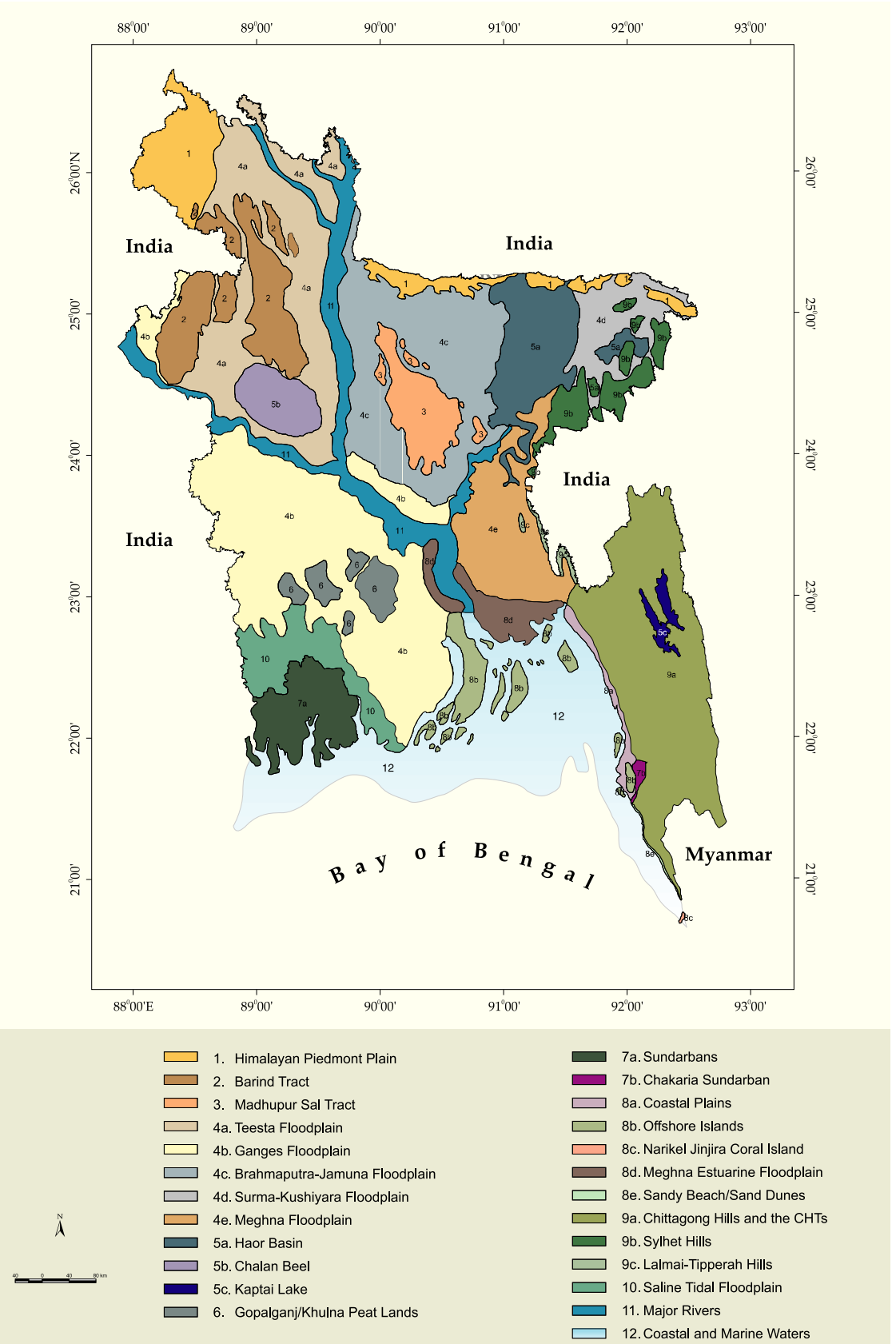
Source: IUCN Bangladesh, 2000

Bangladesh National Herbarium, on the other hand, published the first volume of a Red Data Book of vascular plants in 2001 (Khan et al., 2001). Out of the 106 species listed in this book, one is Critically Endangered (CR), one Endangered (EN), two Vulnerable (VU), three Lower Risk (LR), 25 Data Deficient (DD) and 74 are interestingly designated as Not Evaluated (NE).

Genetic Diversity

Broad genetic variation occurs among both wild and domesticated plants and animals. With its diverse agro-ecosystems, Bangladesh is also rich in such genetic resources. Local communities have selected and conserved genetic variations in plants and animals in the various agro-ecological zones from time immemorial. In recent times, there have been systematic efforts in conserving domesticated biodiversity by academic and research organizations, governmental and non-governmental agencies, which have added up large germplasm collections of plant and animal origin.

The greatest genetic diversity in Bangladesh has been seen in rice (Oryza sativa). Six thousand varieties of rice are known to have existed in the country (Khan, 1997 in NBSAP, 2006). Other domesticated plants in Bangladesh range from rice and millets to tubers (e.g. sweet potato, taro, yam), legumes, oil seeds, vegetables, fruits, spices and fiber (cotton and jute) (Hassan, 2003; Haque, 2003; Hossain, 2004; Yusuf, 2003 in NBSAP 2006). On the contrary, domesticated animal biodiversity of the country is largely limited to livestock with high diversity in cattle and chicken. Dogs, cats and ornamental fish contribute to the diversity only to a limited scale. Other than these, there are domesticated pigs in the tribal settlements in the Hill Tracts. A number of fish species are cultured throughout the country. The livestock population in Bangladesh is around 164 million dominated by poultry (chickens 60%, ducks 18%) and also consisting of cattle 13%, goats 8%, sheep 1% and buffalo 0.4%. (Kamaruddin, 2003 in NBSAP, 2006).



Map 3.1. Bio-ecological Zones of Bangladesh (Nishat et al., 2002)

Ecosystem Diversity

A wide range of ecosystems is found in Bangladesh. These include tropical rain forests, mangrov forests, floodplains and charlands, freshwater and coastal wetlands. Nonetheless, the ecosystems of Bangladesh can be divided into four broad categories, namely 1) coastal and marine ecosystem, 2) inland freshwater ecosystem, 3) terrestrial forest ecosystem and 4) man-made ecosystem (Daniels, 2003 in NBSAP, 2006). From a novel perspective of synergizing biodiversity and ecology, Nishat et al. (2002) divided Bangladesh into 12 broad bio-ecological zones, with several sub-zones as shown in Map 3.1.

Ecosystem conservation

There are 19 Protected Areas (PAs) and 5 Eco-Parks in Bangladesh, covering 2301.17 sq km (Nishorgo Support Project – A Visitors' Guide, 2006) and representing 1.6% of the country's surface area, and 10% of its forested area. The Forest Department has the mandate for management of these protected areas. The Bangladesh Wildlife (Preservation) (Amendment) Act, 1974, recognizes three categories of PAs, viz. National Parks, Wildlife Sanctuaries and Game Reserves. A list of PAs and Eco-Parks is appended at Annex 3.1. Moreover, the Government of Bangladesh has declared 8 areas as ecologically critical to preserve their biodiversity (Table 3.4).

Table 3.4: List of Ecologically Critical Areas (ECA) of Bangladesh

Sl.	ECA	District	Area (ha)
1	Strip of 10 km outside the Sundarbans Reserved Forest	Khulna, Bagerhat, Satkhira	762,034
2	Sea Front of Cox's Bazar and Teknaf	Cox's Bazar	10,465
3	St Martin's Island	Cox's Bazar	590
4	Sonadia Island	Cox's Bazar	4,916
5	Hakaluki Haor	Moulvibazar	18,383
6	Tanguar Haor	Sunamganj	9,727
7	Marjat Baor	Jhenaidaha	200
8	Gulshan Lake	Dhaka city	20

Source: NBSAP (2006)

3.3.2 Bioprospecting and ABS issues

Current position of Bangladesh in ABS of natural resources

- There is no specific agency responsible to serve as a 'national contact point' for accessing genetic resources.
- There is no specific law or act for biodiversity protection and conservation.
- A draft on "Plant Variety and Farmers Right Protection Act" has been prepared by the Ministry of Agriculture (MOA). The provisions of the Act include creation of a 'gene fund'. Among

other sources gene fund will also come from sharing of benefit from the utilization of genetic resources.

- Draft 'Biodiversity and Community Knowledge Conservation Act 1998' has been prepared.
- Draft 'Medicinal Plants Protection Act 2005' has been prepared and now is under review.
- Bangladesh has already prepared "National Biodiversity Strategy and Action Plan" (NBSAP) to fulfill its commitment as per Article 6 of the CBD. NBSAP needs to be implemented immediately to harvest its outcome.
- Germplasm exchange is made based on mutual trust and on reciprocal basis.
- No standard 'Material Transfer Agreement' is available.
- Three ex situ genebanks with medium term storage facilities have been established in Bangladesh. Genebanks are located at the (1) Bangladesh Agricultural Research Institute, Joydebpur, Gazipur, (2) Bangladesh Rice Research Institute, Joydebpur, Gazipur, and (3) Bangladesh Jute Research Institute, Sher-E-Bangla Nagar, Dhaka. About 6,249 accession of rice, 5,631 accession of jute and 565 accession of wheat, 1,750 accession of pulses, 604 accession of oilseeds, 3,522 accession of vegetables, 158 accession of spices have been stored in BARI genebank. Moreover, a field genebank is maintained by the Bangladesh Sugarcane Research Institute with about 1,362 sugarcane germplasm entries (Razzaque, 2006).
- Bangladesh Forest Research Institute (BFRI) and Bangladesh Council of Scientific and Industrial Research (BCSIR) are also maintaining germplasm of medicinal importance in their nurseries.
- On-farm conservation and documentation of local varieties of rice in the coastal areas is done by BRRI.
- Genetic finger-printing of 157 varieties of major crops: A study completed under Seed Industry Development Project of MoA. The project was coordinated by Bangladesh Agricultural Research Council (BARC).
- Stocktaking activities are under way through a FAO project on Plant Genetic Resources for Food and Agriculture (PGRFA) on 20 priority areas. The stocktaking activities concentrate on
  - (a) State of diversity;
  - (b) State of in situ management;
  - (c) State of ex situ management;
  - (d) State of use;
  - (e) State of national programme, training needs and legislation;
  - (f) Monitoring and early warning system; and
  - (g) Promoting public awareness.
- A compilation of medicinal plants of Bangladesh has been done by the Ministry of Health and Family Welfare;
- The Ministry of Chittagong Hill Tracts Affairs – in collaboration with Bangladesh National Herbarium – prepared a document upon traditional knowledge on medicinal plants of the Hill Tracts in 2006 and waiting to be published.

3.3.3 Biosafety

The current situation and stocktaking activities undertaken in Bangladesh in response to the issue of biosafety including risk assessment and risk management are as follows:

- Bangladesh formulated Biosafety Guidelines in 1999, which was updated in 2006;
- Bangladesh also developed the National Biosafety Framework (NBF) in 2006;
- Establishment of Biosafety Clearing House is under way for effective implementation of NBF;
- Preparation of National Biosafety Rules is under process;
- Workshop and training on Risk Assessment and Risk Management on GMOs with participation of various stakeholders have been organized by DoE, BARC, South Asia Biosafety Programme (SABP) and Agricultural Biotechnological Support Project (ABSP). Biotechnologists of the country are more or less familiar with the issues of biosafety because of the activities like workshop and training sponsored by various agencies as mentioned above;
- Survey conducted on existing capacity of biotechnology and biosafety under the NBF; and
- Survey conducted on existing regulations with relevance to biosafety and biotechnology.

3.3.4 CBD 2010 Countdown

Goals and targets for 2010 vis-à-vis Bangladesh situation

In the Section 3.2.3, the seven focal areas, 11 goals and 21 targets under CBD 2010 have been listed. In the present section, Bangladesh's compliance or position is analyzed under each focal area.

Focal Area I: Protect the components of biodiversity

Complete inventory of flora and fauna of Bangladesh is yet to be done. Sporadic works are now being compiled in an encyclopedia by the Asiatic Society of Bangladesh.

With respect to the conservation of agricultural biodiversity, a few genebanks have been put in place (Section 3.3.2). Regarding the conservation of fish diversity, some community efforts are being taken mostly through project-based activities.

The taxonomic identification of the species is poor, basically because of the serious shortage of competent taxonomists. Except the Red Data Book of Animals prepared by IUCN Bangladesh (2000), no substantial works have been done to identify threatened fauna. A good, comprehensive and updated listing of the endangered or threatened species of flora and fauna of Bangladesh is yet to be tabled. In view of the requirements for the proper implementation of CBD, The Red Book on Vascular Plants by Bangladesh National Herbarium (Khan et al., 2001) has its own limitation and needs to be updated. In case of livestock, conservation and improvement of Red Chittagong Cattle and indigenous goat and chicken of Bangladesh have been undertaken through on-station (ex situ) and farmer participatory (in situ) project-based programme.

Effective conservation involves legal and operational aspects. Bangladesh has three acts, namely the Forest Act 1927, the Wildlife Conservation Act 1974 and the Bangladesh Environment Conservation Act 1995. The conservation related policies include Forest Policy 1994, Environment Policy 1992, Livestock Policy 1998, and Fisheries Policy 1998.

Roughly 10% of the area of Bangladesh is Reserved Forest. Out of that about 10% area has been declared as "Protected". The list of Protected Areas (PAs) is given in Annex 3.1. The total area of all these are only 10% of the Reserved Forest. Thus 1% of the country is under conservation effectively, which is not adequate.

Some other patches of Reserved Forest areas have been notified as Eco-Parks, but they have no additional conservation legal backup than that of the Reserved Forest. A proposal was prepared to revise the Wildlife Act in 2005 incorporating legal backups towards the "Safari Parks" and "Eco-Parks", but it is yet to be finalized.

Although some of the biodiversity hot spots have been identified and declared as ECAs (Ecologically Critical Areas), no effective operational arrangement has been put in place for their proper management. The two projects, namely 'Conservation of Biodiversity, Marine Park Establishment and Ecotourism Development Project' on St. Martin's Island and 'Coastal and Wetland Biodiversity Management Project' (CWBMP) are working in St. Martin's Island and sea front of Cox's Bazar and Teknaf, Sonadia Island and Hakaluki Haor ECAs towards the conservation. Community Based Sustainable Management of Tanguar Haor Programme (Tanguar Haor Project) has been undertaken by MoEF in association with IUCN Bangladesh. Since these activities are project-based, in most of cases, their sustainability is not ensured.

Focal Area II: Promote sustainable use

Under this focal area, the first requirement is to identify the production areas of biodiversity-based products. Management of these areas prohibiting unsustainable harvest or consumption comes next. Some measures have been taken under the UNDP / GEF-funded projects (e.g. SEMP, NBSAP and CWBMP) towards the establishment and strengthening of institutional, administrative and legislative arrangement for the development of integrated management of coastal and wetland ecosystems. This may have some impact on sustainable management of a small ecosystem. But these are project-based. Nothing comprehensive has been done as yet in this connection.

A view of Chittagong Hill Tracts

© IUCN Bangladesh / S.R. Biswas

Being a signatory to CITES, the international trades of endangered species are well-regulated by the Government through the FD under the provisions of prevailing Acts and Rules, especially under those of the Wildlife Act. Bangladesh has to come up with more vigorous programme in this Focal Area. The program needs to include WTO, trade policy, export-import policy, bio-safety guideline and intellectual property rights etc.

Focal Area III: Address threats to biodiversity

The National Land Use Policy 2001 has the provisions of restriction on converting forest land to other purpose. The Environment Conservation Act 1995 (Amendments 2000, 2002) (ECA) and The Town Improvement Act 1953 have also prohibition on collecting soil by cutting the hills. If these provisions were properly applied, the rate of land degradation would reduce.

The MoEF has formed a technical committee with representatives from GOs and NGOs to a prepare thematic report on alien invasive species. The questionnaire received from the CBD Secretariat will be used. The committee is working on that. In fact no organized program to identify the alien species in Bangladesh has yet been launched. However, of many, the following species are known to be alien in the country (DoE, 2006):

Flora: Tectona grandis, Gmelina arborea, Syzgium grande, Dalbergia sissoo, Switenia macrophylla, Acacia auriculiformis, Acacia mangium, Cassia siamea, Luecacia leucocephala, Eucalyptus camaldulensis, Eichhornia crassipes, etc.

Fauna: Trichogaster pectoralis, Carassisus auratus, Tilapia mossambica, Lebistes reticulates, Cyprinus carpio, Ctenopharyngodon idellus, Hypopthalmichthys molitrix, Oreochromis niloticus, Puntius gonionotus, Aristichthys nobilis, Mylopharyngodon piceus, Clarias grandis, Pangasius sutchi, P. giganticus, etc.

The GoB is yet to undertake any program towards the adaptation of climate change in terms of biodiversity. However, some of the NGOs, especially the IUCN Bangladesh and BCAS are working on climate change, particularly the awareness raising aspects of the changing climatic regime.

The ECA has the provisions to act against pollutions. But the implementation of the Act is very weak and the net effect is not yet perceivable. Along with the industrial pollution of the river water there is a serious pollution from agricultural fields due to excessive use of fertilizer and insecticide, especially in the tea garden areas. The Government does not have the manpower and institutional network to act on these in time. These indicate that in this focal area the progress achieved by Bangladesh is very low.

Focal Area IV: Maintain goods and services from biodiversity to support human well-being

There is no legal instrument on maintaining the capacity of an ecosystem. The Land Use Policy 2001 has the prohibitions on land use change. The Forest Policy 1994 has the provisions for sustainable and integrated management. These may be put in use towards the sustainable use of biodiversity. Recently, some of the protected areas and wetlands have been put under co-management program undertaken by Nishorgo Support Project and Tanguar Haor Project. These are looking for sustainable management. Although sustainability is often discussed almost at all levels, the field actions of putting that in real world situation is yet to be experienced. This needs to be addressed seriously.

Focal Area V: Protect traditional knowledge, innovations and practices

The GoB is very careful towards the rights and privileges of the indigenous people. The Peace Treaty signed by the Government in 1997 in connection with Chittagong Hill Tracts is an official acceptance of the rights and privileges of the indigenous people. The Government has been respectful to the claim of the indigenous people of Modhupur even on reserved forest land. Some of the NGOs are working on the 'traditional knowledge' with donor funding, while the Ministry of Cultural Affairs is active on this issue. The real progress in the collection and collation of the indigenous knowledge is reasonable. Several government (e.g. BFRI, BCSIR and BNH) and non-government agencies (e.g. UBINIG, BARCIK, SHED) have been documenting traditional knowledge in CHT and other areas of the country. The achievement under this focal area is satisfactory.

Focal Area VI: Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources

This aspect comes under the purview of biosafety. The GoB has finalized National Biosafety Framework (2006). Prior to that the Government prepared the Biosafety Guidelines in 1999 which was revised in 2006. Until and unless the Biosafety Rules are framed, nothing effective will surface on this issue.

Tanguar Haor: The second Ramsar site of Bangladesh © Sirajul Hossain

Focal Area VII: Ensure provision of adequate resources

The financial assistance received on the issues of CBD from development partners is inconspicuous. The same is the position on technology transfer issue. Under the existing constraints, the achievement in this focal area is not satisfactory.

Indicators

The Parties will get a clear picture to evaluate the activities with respect to implementation of CBD if they set the goals as stated above. For the purpose of assessment, the setting-up of indicators is essential. The Conference of the Parties decided to develop a framework for the evaluation of achievements and/or progress in the implementation of CBD in achieving the 2010 Biodiversity Targets. This framework includes the focal areas discussed above.

In case of forests and forestry, the indicators may be absolute area of each forest type or its contribution as natural resource stock in the country or both. For protection status of different forest types, PAs under different forest types may be used as indicator. For example, Newton and Kapos (2003) suggested the following as indicators for sustainable forest management.

- Forest area by type and successional stage relative to land area.
- Protected forest area by type and successional stage and protection category relative to total forest area.
- Degree of fragmentation of forest types.
- Rate of conversion of forest cover by forest type to other uses.
- Area and percentage of forest affected by anthropogenic and natural disturbances.
- Complexity and heterogeneity of forest structure.
- Number of forest dependent species.
- Conservation status of forest dependent species.

The Parties are required to identify indicators for evaluating the achievements of the country. The indicators should be identified or developed in such way so that -

1. The same indicators may be used at the global, regional, national and local levels as tools for the implementation of the Convention and of national biodiversity strategies and action plans, where so desired by Parties;
2. The indicators relate to one or more of the various Programs of Work of the Convention;
3. The indicators should take into consideration relevant Millennium Development Goals and indicators developed by other relevant international processes; and
4. Existing data sets are used.

The Annexure I of the decision VII/30 has suggested the following (Table 3.5) in connection with the indicators.

Table 3.5: Provisional indicators for assessing progress towards the 2010 Biodiversity Target

A: Focal area	B: Indicator for immediate testing	C: Possible indicators for development by SBSTTA or Working Groups
Status and trends of the components of biological diversity	Trends in extent of selected biomes, ecosystems and habitats	
	Trends in abundance and distribution of selected species	

A: Focal area	B: Indicator for immediate testing	C: Possible indicators for development by SBSTTA or Working Groups
		Change in status of threatened species (Red List indicator under development)
		Trends in genetic diversity of domesticated animals, cultivated plants, and fish species of major socioeconomic importance
	Coverage of protected areas	
Sustainable use		Area of forest, agricultural and aquaculture ecosystems under sustainable management
		Proportion of products derived from sustainable sources
Threats to biodiversity	Nitrogen deposition	
		Numbers and cost of alien invasions
Ecosystem integrity and ecosystem goods and services	Marine trophic index	Application to freshwater and possibly other ecosystems
		Connectivity/fragmentation of ecosystems
		Incidence of human-induced ecosystem failure
		Health and well-being of people living in biodiversity-based-resource dependent communities
	Water quality in aquatic ecosystems	
		Biodiversity used in food and medicine
Status of traditional knowledge, innovations and practices	Status and trends of linguistic diversity and numbers of speakers of indigenous languages	Further indicators to be identified by WG-8j
Status of access and benefit-sharing		Indicator to be identified by WG-ABS
Status of resource transfers	Official development assistance provided in support of the Convention (OECD-DAC-Statistics Committee)	
		Indicator for technology transfer

Source: <http://www.cbd.int/decisions/default.aspx?m=COP-07&id=7767>, November 2007

Status and trends of the components of biological diversity in selected biomes; ecosystems and habitats; the abundance and distribution of selected species; change in status of threatened species; trends in genetic diversity of domesticated animals, cultivated plants, and major fish species, protected areas, sustainable use area of forest, agricultural and aquaculture ecosystems under sustainable management, proportion of products derived from sustainable sources are the targets to be evaluated through the indicators. The following aspects may also be borne in mind while identifying the indicators.

1. Threats to biodiversity
2. Nitrogen deposition
3. Numbers and cost of alien species invasions
4. Ecosystem integrity and ecosystem goods and services
5. Marine Tropic Index Application to freshwater and possibly other ecosystems
6. Connectivity/fragmentation of ecosystems
7. Incidence of human-induced ecosystem failure
8. Health and well-being of people living in biodiversity-based-resource dependent communities
9. Water quality in aquatic ecosystems
10. Biodiversity used in food and medicine
11. Status of traditional knowledge, innovations and practices
12. Status and trends of linguistic diversity and numbers of speakers of indigenous languages
13. Status of access and benefit-sharing Indicator to be identified by WG-ABS
14. Status of resource transfers Official development assistance provided in support of the Convention (OECD-DAC-Statistics Committee) Indicator for technology transfer

Indicators are required to be identified for each of the focal areas. However, Bangladesh is yet to set the indicators as required.

Protected Areas

COP 07 has also given a Program of Work on Protected Areas. (A list of Protected Areas is given in Annex 3.1). Some of the salient features of this are as under:

1. Direct action for planning, selecting, establishing, strengthening, and managing protected area systems and sites. This has five goals.
2. Governance, participation, equity and benefit sharing with two goals.
3. Enabling activities with five goals.
4. Standards, assessment and monitoring with four goals.

List of on-going projects and programmes under CBD relating to CBD 2010 target

The following projects and programmes undertaken by Bangladesh are expected to mitigate the biodiversity loss.

- Biodiversity Conservation and Development of Natural Environment by FD

- Establishment of Eco-park at Modhutila by FD
- Biodiversity Conservation in the Sundarbans Reserved Forests by FD
- Afforestation in the Denuded Hill Areas of Ramgarh-Shitakunda (1st Phase) by FD
- Establishment of Botanical Garden & Eco-Park at Shitakunda, Chittagong by FD
- Development of Dulahazra Safari Park and Cox's Bazar by FD
- Natural Environment/Biodiversity Conservation & Development at Bashkhali, Chittagong (2nd Phase) by FD
- Nishorgo Support Project by FD
- Kuakata Eco-Park at Kolapara Upazila at Patuakhali by FD
- Coastal Char Afforestation by FD
- Coastal and Wetland Biodiversity Management at Cox's Bazar and Hakaluki Haor by MoEF
- Afforestation Programme of Ecological Balance in unit-2 area of Barind Project by BMDA
- Barind Environmental Balance Restoration through Afforestation Project by BMDA
- Characterization, Conservation and Improvement of Chittagong Red Cattle of Bangladesh Project by BAU
- Community Based Resource Management (CBRM) Project of LGRD
- Management of Aquatic Resources through Community Husbandry (MACH) Project of MoFL
- Community Based Fisheries Management (CBFM) -2 Project of DoF
- Forth Fisheries Project by MoFL
- Encyclopedia of Flora and Fauna of Bangladesh Project by the Asiatic Society of Bangladesh.

CBD and NBSAP

As per the Article 6 of the CBD, the MoEF implemented a project and developed the National Biodiversity Strategy and Action Plan (NBSAP) in July 2005 with the financial support from GEF/UNDP. The NBSAP is the overriding national document to set the trend for future biodiversity related activities. This has been prepared through extensive consultations with the stakeholders following both top-down and bottom-up approaches. The bottom-up approach was used at six regional workshops arranged in six administrative divisions of the country. Following the top-down approach, five thematic areas were identified that include: species conservation; ecosystem management; legal, regulatory and policy issues; education, training and awareness building; linkage and institutional issues. Under this important document, 16 strategies (Annex 3.2) have been identified to conserve the biological diversity in Bangladesh. The Government has approved this document, but is yet to implement it.

3.4 Priority Environmental Issues

Major challenges to biodiversity conservation in Bangladesh

Bangladesh faces some challenges in implementing the CBD and promoting sustainable development in the country. The most prominent challenges are:

- Meeting the increasing demand for biological resources caused by population growth and increased consumption, while considering the long-term consequences of our actions;
- Increasing our capacity to document and understand biodiversity, its value, and threats to it;
- Limited support for strengthening and for widening survey and inventory work.
- Building adequate expertise and experience in biodiversity conservation planning;
- Improving policies, legislation, guidelines, and fiscal measures for regulating the use of biodiversity;
- Inadequate policy and regulatory regime (MTA, benefit sharing mechanism, funding mechanism).
- Delay in formalizing draft acts related to PGRFA.
- Assessing the achievement and reorganize the gaps and constraints in order to develop strategy for conservation and sustainable utilization of PGR:
- Unplanned conversion of agricultural land to non-agricultural uses.
- Revenue-oriented forests management by the Government;
- Promoting trade rules and practices that foster sustainable use of biodiversity;
- Alarming rate of forest degradation;
- Degradation of aquatic ecosystem;
- Loss of indigenous species;
- No formal market for local varieties and diversity rich product.
- Promotion and commercialization activities of under-utilized local crop varieties and biodiversity-rich products through seed production and distribution.
- Uncontrolled introduction of alien invasive species, and GMOs/LMOs without considering the consequences for native species;
- Adopting incentives to promote more sustainable forms of biodiversity use;
- Inadequate incentive to farmers.
- Livelihood and conservation are not linked in the programme of activities.
- Livelihood supporting species have not been identified with special care and their conservation activities are not promoted.
- Securing adequate financial resources for conservation and sustainable use, from both national and international sources;
- Making better use of appropriate technology;
- Focused approach to conservation of biodiversity and its utilization are lacking.
- Lack of regional approach to in situ conservation of genetic resources.

- Inadequate trained manpower.
- Improving education and public awareness about the value of biodiversity;
- Ensuring larger participation and involvement of institutions, organizations, NGOs, women organizations and farming communities and active multi-stakeholders platform in national endeavours.
- Building political support for the changes necessary to ensure biodiversity conservation and sustainable use;
- Inadequate monitoring activities
- Inventory making and proper documentation; patenting of indigenous knowledge, process and techniques.
- Further exploration and collection of plant genetic resources from different agro-ecological zones (AEZs).
- The value addition of germplasm enhancement work (traditional breeding and biotechnology).
- Need to evaluate, regenerate and conserve most of the agro-biological resources under on-farm condition.
- Inter-institutional cooperation needs to be strengthened and coordinated.
- Traditional breeding, participatory breeding and bioprospecting through biotechnology need to be strengthened.
- Expanding and improving education and training.

3.4.1 Bioprospecting and ABS issues

- The formulation of regulation on access to biological resources including regulation of transgenics and GMOs/ LMOs.
- The development of Material Transfer Agreement (MTA). A prior informed consent and mutually agreed terms to be clearly defined in the MTA.
- Facilities for post entry quarantine of trangenics along with review of the Plant Quarantine Act 1978 to harmonize with biosafety related policy/act/guidelines/rules.
- Institutional capacity building and human resource development.
- Transparency and equity: Formulation of 'Plant Variety Protection and Farmers Rights Act' and 'Biodiversity and Community Knowledge Protection Act'.
- Appropriate financial support and mechanism
- Scarcity of documents on sui generies and transfer of indigenous knowledge;
- Absence of initiative for conservation of indigenous plant varieties including endemic species;
- Inadequate genebank;
- Issue of balanced cultivation of indigenous variety and high yielding variety;
- Biosafety, sanitary and phytosanitary issues: Development of biosafety framework taking into account the Cartegena Protocol on Biosafety, national policies, regulatory regime, risk assessment management and risk communication, mechanism of public participation, awareness education and mass communication, and monitoring and enforcement.

The ex situ measures for benefit sharing include reaching a broad agreement/accord; signing of Memorandum of Understanding (MOU), obtaining prior consent, defining the mutually agreed terms, signing of MTA and benefit sharing agreement. The post facto steps would be to establish the ownership over genetic material used, to establish that a benefit is considered from commercial use of the product/derivatives using the genetic resources.

3.4.2 Biosafety

Bangladesh is lagging behind in meeting the challenges of biosafety, in reducing the threats arising from the application of modern biotechnology in agriculture (such as, crops, fisheries, livestock), food, medical and industrial sectors. CPB is to contribute to ensuring an adequate level of protection in the field of safe transfer, handling and use of LMOs resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity taking also into account risks to human health and specifically focusing on transboundary movements. The following are the priority issues in biosafety.

A view of the flowers in bloom of a mustard field © Mufty Munir

- Information gap (spatial and diversity context) on genetic resources available in Bangladesh. Assessment has to be focussed on plant and animal biodiversity including the wild relatives, ecotypes and landraces in various AEZs.
- Conservation of the indigenous, local and elite crop and animal varieties.
- Conservation of non-target insects, animals and plants, wild and weedy relatives.
- Environmental impacts of GMOs/LMOs need vigorous studies on food, agricultural and medicinal products
- Inadequate research, development and commercialization of GMOs resulting in insufficient understanding of importance of the Protocol.
- Evaluation and evolution of resistance towards agrochemicals used, due to the presence of transgene;
- Containment facilities and maintenance of standard specification in containment or glass houses
- Insufficient trained manpower to implement the CPB.

- Inadequate understanding concerning the objectives of CPB.
- Training and sensitizing people concerned on the issues of biosafety (biosafety concerns may arise from various uses of GMOs and genetic modifications);
- Educated / trained people from abroad should share their knowledge to educate the other people in the country.
- Understanding the clarity of risks already studied/assessed outside the country associated with the newly imported GMOs, gene-constructs and their applications.
- Biotechnological hazards are difficult to identify and hence there should be expert knowledge to handle the issues. Public health concerns: Study on the impact of GMOs on public health well before GMOs are placed into the market.
- Bangladesh needs to be more cautious about the trading of GMOs which might start before development of infrastructures.
- Information on GMOs should be provided properly e.g. the ingredients of a GMO product should be mentioned in detail on the labels of the finished product so that customers could understand it's harmful effects, if any.

3.4.3 CBD 2010 Countdown

- Inadequate knowledge among the general people about the importance of biodiversity.
- Tremendous communication gap between knowledge generators (scientists / academic) and users (general public).
- Biodiversity related protocols/agreements/issues are not well-circulated to all stakeholders, thus keeping them unaware of the biodiversity issues.
- Academic curricula in our country are comprehensive, but separate chapters on biodiversity in the curricula of different disciplines are inadequate.
- It is important to develop human and institutional capacity to make effective and sustainable use of agricultural biodiversity.
- Inadequate skills in negotiations and implementation. Sometimes skilled persons are not selected to negotiate. Proper pre-negotiation discussion is not held with experienced persons.
- Inadequate coordination among different institutions / organizations / offices.
- Efforts from the Government/NGOs are inadequate in awareness building throughout the country. A separate, well-structured programme involving all stakeholders to this effect is of paramount importance. Local leaders (social / political / religious, etc.) should be equipped with biodiversity knowledge to perform the job.
- Inadequate local / foreign fund.
- Insufficient trained manpower including taxonomists.
- Inadequate policies and fostering an environment to support the conservation of biodiversity.

3.5 Identifying Capacity Development Needs

3.5.1 Bioprospecting and ABS issues

Individual level

- Skill development for the negotiation team, particularly for MoEF, DoE, MoA, FD, DAE, MFA, BFRI, DOF, BLRI, DLS etc;
- Sensitizing civil society and community people to bioprospecting and ABS issues;
- Awareness creation amongst teachers of schools, madrasah and colleges; and
- Mass awareness campaign against biopiracy.
- Mass awareness and dispersion of knowledge, as opposed to knowledge monopoly within the scientific community;

Institutional level

- Sensitizing ministries and agencies concerned, especially the ones within NARS;
- Institutional capacity building for protecting and regulating biopiracy;
- Development of modes and mechanism for benefit sharing from commercial use of bio-resources;
- Livelihood and poverty need to be addressed together while promoting biodiversity activities;
- Special focus should be given on different ecosystems as reservoirs of biodiversity;
- Regional efforts are needed for in-situ conservation of biodiversity;
- Facilities for post-entry quarantine and testing of transgenics are needed;
- Development and dissemination of updated data base on biodiversity ;
- Indigenous knowledge may be documented and protected for future bioprospecting;
- Strengthening long-term storage facilities and facilities for field genebank (botanical garden, conservation of recalcitrant seeds and vegetatively propagated plants).
- Concerted efforts need to be initiated to preserve traditional knowledge related to PGR with special reference to crop wild relative.

Systemic level

- A special cell or unit under the MoEF or FD may be set up to implement the programme of biodiversity and for regular monitoring within existing framework;
- "National Biodiversity Act" is needed to be enacted without further delay. At the same time, National Biodiversity Rules should be framed;
- Review of Plant Quarantine Act 1978 to harmonize with biosafety and biotechnology;
- Modes and mechanisms for benefit sharing with foreign agencies may be explored;
- Blending of science and law to create a standard format for Material Transfer Agreement (MTA);
- Relevant patenting laws have to be revisited and reformulated according to the needs of bioprospecting;

- Development of a perspective plan such as Vision 2025 for bioprospecting;
- Inventory, documentation and demarcation of agro-ecological zones;
- Regional efforts are needed for in situ conservation of biodiversity for all ecological zones including the Sundarbans as freshwater mangroves. Especial focus should be on wetland and forests as reservoirs of biodiversity;
- Biodiversity hotspots must be preserved for bioprospecting;
- Creating forward linkages i.e. linkages with the market for harvesting the output of bioprospecting;

3.5.2 Biosafety

Individual level

- More trained and dedicated researchers and personnel to look into the biodiversity and biosafety issues are needed. To understand how to assess and apply risk-benefit and cost-benefit analysis is another concern to be addressed by the professionals who are working with modern biotechnology.
- Customs and Police officials need training to handle LMOs/GMOs;
- Training/capacity building for farmers to identify harmful pesticides;
- Advocacy programme for policy-makers to sensitize them on biotechnology issues;
- Business houses need to be encouraged and involved in the awareness raising campaign;
- Sensitization and training of the DAE Agricultural Officers, block supervisors, quarantine and seeds officials in the border areas and equipping them to identify harmful GMOs from the neighbouring countries;
- Train the farmers so that they can learn the effect of different kinds of agrochemicals and their impacts on human health and environment;

Institutional level

Many relevant institutes do not have clear mission, vision and objectives, as of now, regarding biodiversity, biosafety and GMO issues. They also lack logistic and required infrastructural supports for assessing and managing risks of new technology like genetic engineering and modern biotechnology. Therefore,

- Institutional capacity of MoEF, MoA, MoC, MoSICT, DAE, DoE, Chief Controller of Imports & Exports (CCI & E), BSTI and all other Ministries and Institutes who need to manage GMOs and undertake biosafety activities should be strengthened;
- Cadre training centers like BPATC and NAEM should include separate module on biosafety;
- Priority may be given to development of the institutional capacity in agro-biotechnology, FAO initiatives should be taken into consideration to interact with global networks;
- Research organizations should be careful about the fabricated and/ or manipulated data and information on the GMOs and there should be some mechanism for monitoring the GMO issues;

Systemic level

- Impracticable legislations or absence of legislations. No Biosafety Rules is in place yet.
- Public education, awareness and information level has to go a long way regarding the importance of biodiversity and biosafety. Public participation mechanism in decision-making process on GMOs is still not in practice.
- CPB needs to be incorporated into national laws and regulations of Bangladesh

3.5.3 CBD 2010 Countdown

Individual level

- Training for individuals to impart proper understanding of the importance of conservations, sustainable use of biodiversity and equal sharing of products out of local resources.
- Taxonomic capacity building, including molecular taxonomy, on all groups of plants, animals including insects, microorganisms, etc. This will help identify the organisms at genus/species level. This is very important for scientific documentation of organisms.
- The trained individuals should act as trainers to train the people around them. Thus the training benefits will be multiplied.
- Training for Ansar & VDP personnel and young people for biodiversity conservation at village level;
- Development of capacity for the para-taxonomists;
- To do something at national level, capacity at policy level is important. Therefore, policy-makers should have orientation in the areas of CBD and CPB.
- Campaigns for increasing awareness and enhancing understanding among the masses.

Institution level

- Institutional development to ensure Human Resource Development through the trickle-down effect.
- Computer-based stocktaking of existing strengths.
- Updating of websites and wide circulation of the same.
- Renewed training in biodiversity to the permanent staff, locally and internationally.
- Establishment of inter-institutional linkage at national, regional and international levels.
- Inadequate coordination among stakeholders spoils a good strategy. Clear understanding of inter-ministerial and inter-departmental coordination is necessary.
- Coordination with NGOs is important as they have linkage with the grassroots level.
- Well-managed national species/data repository with access to all relevant stakeholders.
- Maintaining of biodiversity register by the forest, fisheries, agriculture and livestock offices at the local / upazila level or in their respective departmental jurisdiction;
- Preservation of a set of paratypes of an organism at the nearest institution.
- Identification of indigenous / endemic species and make inventory for creating patent rights.
- Establishment of micro-sanctuaries in all ecological zones;

- Village level biodiversity register to be created by the Local Government Institution. To create societies/association (Samiti) to carry out biodiversity assessments and inventory making of species.
- Capacity needed to develop indicators for CBD 2010 targets.

Systemic level

- Delegation of authority to the really deserving and knowledgeable people.
- NBSAP implementation process should start as soon as possible.
- Timely preparation of national reports and wide circulation of the reports.
- The National Biodiversity Act should be formulated.
- Involving or strengthening the linkages of local administration with projects, especially for those being implemented within the ECAs.
- Linking biodiversity issues with the development projects at the time of EIA;
- Evaluatation of the intangible benefits of projects through given accounting techniques.
- Conservation measures have to be accompanied with alternative livelihood packages.

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Chapter 4

LAND DEGRADATION

4.1. Introduction

4.1.1 Significance of land

Land is the terrestrial bio-productive system consisting of soil, vegetation and different ecological and hydrological processes that operate within the system. Land is very important for the humanity's survival to obtain food, fiber, fuel and other materials. But it is being degraded all over the world due to huge population pressure and human interventions. According to the Global Assessment of Human-Induced Soil Degradation (GLASOD), a total area of 1.9 billion ha is affected by soil degradation globally, of which 850 million ha is within the Asia-Pacific Region, accounting for about 24% of the total regional land area. Thirteen per cent of arable land in the region is severely degraded, 41% is moderately degraded and 46% is lightly degraded (WRI/UNEP/UNDP/World Bank, 1996).

In Bangladesh, land degradation has become a cause for serious concern to the people. About 6.0 million ha or 40.43% of the total geographical area of Bangladesh is affected by land degradation in varying degrees (Shoaib, 2007). The physical signs of this degradation are

observed as loss of soil fertility, loss of organic matter, accumulation of pollutants, physical chemical, biological characteristics, drought, soil erosion due to surface runoff, soil acidification, river bank erosion, salinization of the soil, deforestation and removal of vegetation covers, habitat destruction and lowering of the ground-water table. In addition to that, since most of Bangladesh is less than 10m above the mean sea level, impacts of climate change on land quality are apprehended to be multifaceted. It extends from reduced productivity to loss of biodiversity and, eventually, loss of land mass itself.

4.1.2 History of 'United Nations Convention to Combat Desertification' (UNCCD)

Desertification has long been a global concern. It is a result of complex interactions among physical, chemical, biological, socio-economic and political problems that are local, national, regional and global in nature. It is estimated that currently more than 250 million people are affected directly owing to land degradation and over one billion people are at a risk (DoE, 2005). The international community has recognized the phenomenon as a major economic, social and environmental problem.

The formal expression of global concern on desertification started in the late 1970s. In 1977, the United Nations Conference on Desertification (UNCOD) was convened in Nairobi, Kenya, and the United Nations Plan of Action to Combat Desertification (PACD) was framed. Nonetheless, the implementation of PACD was far from satisfactory. UNEP's assessments of 1984, 1987 and 1989 indicated continuous spread of desertification. Furthermore, the UN Commission for Sustainable Development Report, 1988 registered desertification becoming one of the most important environmental and socio-economic problems of the world. It was further supported by The World Atlas of Desertification which indicated that over the preceding 20 years, the problem of land degradation had continued to worsen (UNEP, 1992b). The UN Conference on Environment and Development (UNCED) in 1992 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 the countries experiencing serious drought and/or desertification, particularly in Africa (www.unccd.int).

4.1.3 Objectives of UNCCD

The United Nations Convention to Combat Desertification (UNCCD) was adopted in Paris on 17 June 1994 and opened for signature there on 14-15 October 1994. It came into force on 26 December 1996. Bangladesh signed the Convention in 1994 and ratified the same on 26 January 1996.

The objectives 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. 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. The Conference of the Parties (CoP) is the apex governing body of the Convention. Over 191 countries were Parties to the UNCCD as of September 2004.

4.1.4 Definitions of 'Desertification' and 'Land Degradation'

Though desertification is not an acute problem in Bangladesh, land degradation is a matter of serious concern to the policy-makers as well as environmentalists. The terms "desertification" and "land degradation" are often used synonymously and this creates room for confusion among the non-practitioners of land management. As per Article 1(a) of the UNCCD, "desertification" means land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors including climatic variations and human activities. As per Article 1(f) of the Convention, "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 pastures, forests 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;

Hence, there is no contradiction between these two terms, if the definitions are followed. Rather, it can be said that land degradation is the primary stage of desertification.

4.2 Obligations under UNCCD

4.2.1 Obligations and commitments

The UNCCD is the only legal instrument dedicated to address the problems of land degradation in dryland areas. Implementation of the Convention is an obligation to all the country Parties, although some provisions, such as the provisions for financing and technology transfer, make a distinction between the developing and developed country Parties. The affected developing country Parties are to develop their National Action Programmes (NAPs) and follow through their implementation as per provisions of the Convention and periodically report to the CoP on the progress of implementation of UNCCD, including the NAPs.

The developed country Parties are also obliged to report periodically to the CoP on the status of implementation and as and when needed. The reporting of the organizations of the United Nations, inter-governmental organizations, multilateral financial institutions, international NGOs is not mandatory, but they are encouraged to report their activities from time to time. The regional and sub-regional level organizations are requested to provide support to the development and implementation of joint or cooperative programmes relating to the membership of those organizations and report to CoP on those activities.

National Action Programmes (Section 1, Articles 9 & 10)

- All affected country parties shall prepare a National Action Programme, utilizing and building to the extent possible, on existing relevant plans and programmes and sub-regional and regional action programmes.

National Action Programme Article 4 of the Annex II, Regional Implementation Annex for Asia

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).

Four principal categories of obligation

There are four principal categories of obligation under the terms of the UNCCD and its regional implementation annexes (DoE, 2005):

- The common obligations 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 are to prepare national action programmes and to cooperate at the regional and sub-regional levels.

- 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.

Obligations of the affected developing country parties (Article 5 of the UNCCD)

- 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 organizations, in efforts to combat desertification and mitigate the effect 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

Capacity building, education and public awareness

The Article 19 specifically recognizes the significance of sound national planning and capacity building through, inter alia: institution building, training and development of relevant local and national capacities.

4.2.2 Major decisions undertaken by UNCCD

The first session of the Conference of the Parties (CoP) to UNCCD was held in Rome, Italy in October 1997. Thereafter, the CoPs were held annually: in Dakar, Senegal in 1998; Recife, Brazil in 1999; Bonn, Germany in 2000; and Geneva, Switzerland in 2001. Later, in line with the decision of the fourth CoP, the CoP sessions were held every two years: in 2003 in Havana, Cuba (CoP 5); in 2005 in Nairobi, Kenya (CoP 6) and CoP 7 of UNCCD was held in Madrid, Spain, in September 2007.

The first session of the CoP was convened by the Interim Secretariat which established the Permanent Secretariat to conduct activities of the Convention following the decisions of the CoP (www.unccd). A Committee on Science and Technology (CST) was established as a subsidiary body of CoP to provide scientific and technological information. As per provision of the Convention, the CST met in conjunction with the CoP sessions. There was no financial mechanism in the Convention and it was decided to have the Global Mechanism as a flexible approach through voluntary contributions by donors to support the funding needs, besides the annual contributions of the member countries as per agreed assessment.

The CoP 4 in 2001 established the "Committee for the Review of the Implementation of the Convention (CRIC)" as a subsidiary body to consider reports from country Parties and observers, as well as information and advice from the CST and the Global Mechanism, and to report to the CoP (www.unccd.int). The CRIC meets every year during and between the ordinary sessions of the CoP. The first session of the CRIC was held in 2002 in Rome, the second session was held in Havana in conjunction with the CoP 5 in 2003, the third session was held in Bonn in May 2005, the fourth session was held in Nairobi in October 2005 during CoP 6, and the fifth session of CRIC was held in Buenos Aires, Argentina, in March 2007.

Box 4.1: Decisions of the CoP 4 of UNCCD

The country review of UNCCD implementation was conducted along the following thematic lines as per decision of the CoP 4, with due regard to geographic dimensions:

(i) Participatory processes involving civil society, nongovernmental organizations and community-based organizations;

(ii) Legislative and institutional frameworks or arrangements;

(iii) Resource mobilization and coordination, both domestic and international, including conclusions of partnership agreements;

(iv) Linkages and synergies with other environmental conventions and, as appropriate, with national development strategies;

(v) Measures for the rehabilitation of degraded land and for early warning systems for mitigating the effects of drought;

(vi) Drought and desertification monitoring and assessment;

(vii) Access by affected country Parties, particularly affected developing country Parties, to appropriate technology, knowledge and know-how.

Following the terms of reference of CRIC adopted at CoP 4, the first session of the CRIC reviewed implementation of the Convention by all the affected country Parties, the third session reviewed the implementation by the African Parties, and the fifth session reviewed the implementation by the rest of the affected country Parties. The mandate and functions of the CRIC, as well as its schedule of meetings, are subject to renewal at COP 7. The review process leading to the CRIC included input at sub-regional and regional levels to draw conclusions and to propose to the CoP concrete recommendations on further steps in the implementation of the Convention. The CRIC 6 was also held in conjunction with CoP 7 in September 2007.

4.2.3 Status of implementation of UNCCD

On the basis of the obligations under the UNCCD, guidelines and arrangements were provided for effective implementation of the Convention in the affected country Parties of the Asian region in the light of their specific needs. As a signatory to the UNCCD, Bangladesh is also obliged to follow the prescribed guidelines.

According to the Article 2 of the UNCCD, identification and prioritization of the relevant issues are very crucial for successful implementation of the Convention, such as, the high proportion of areas in their territories affected by, or vulnerable to, desertification and drought and the broad diversity of these areas with regard to climate, topography, land use and socio-economic systems; the heavy pressure on natural resources for livelihood; the existence of production systems, directly related to widespread

poverty, leading to land degradation and to pressure on scarce water resources; their expanding, but still insufficient, capacity and institutional frameworks to deal with national desertification and drought problems; and their need for international cooperation to pursue sustainable development objectives relating to combating desertification and mitigating the effects of drought.

In accordance with the Article 10 of the UNCCD, the purpose of NAPs is to identify the factors contributing to desertification and practical measures necessary to combat desertification and mitigate the effects of drought.

National Action Programme

In consistency with Article 10 of the Convention, Bangladesh developed its National Action Programmme (NAP) for Combating Desertification in collaboration with The World Conservation Union (IUCN), Bangladesh Country Office in August 2005. The overall strategy of NAP emphasized on an integrated and coordinated bottom-up approach to combat desertification and mitigate the effects of droughts. It also identified the factors contributing to the process of desertification in Bangladesh and proposed measures and strategies for overcoming the process.

Nonetheless, a comprehensive study at the country level on land degradation/desertification, covering all the aspects, physical to economic, is required. It is clear that the quality of land has deteriorated, and its impacts are visible (See Section 4.3). Over the last decade, crop yield has declined due to deterioration of physical and chemical properties of land and soil. It would be prudent to establish a baseline survey on which future monitoring and assessment of further deterioration or improvement could be based.

National Reports on UNCCD

Bangladesh has already submitted comprehensive reports for the two consecutive years 2001 and 2002, entitled "National Report on Implementation of United Nations Convention to Combat Desertification" respectively and the "Second National Report on Implementation of United Nations Convention to Combat Desertification". Bangladesh has also submitted Third National Report on the "Implementation of the UNCCD" in July 2006 (www.unccd.int/cop/reports/asia/).

4.3 Current Situation and Stocktaking

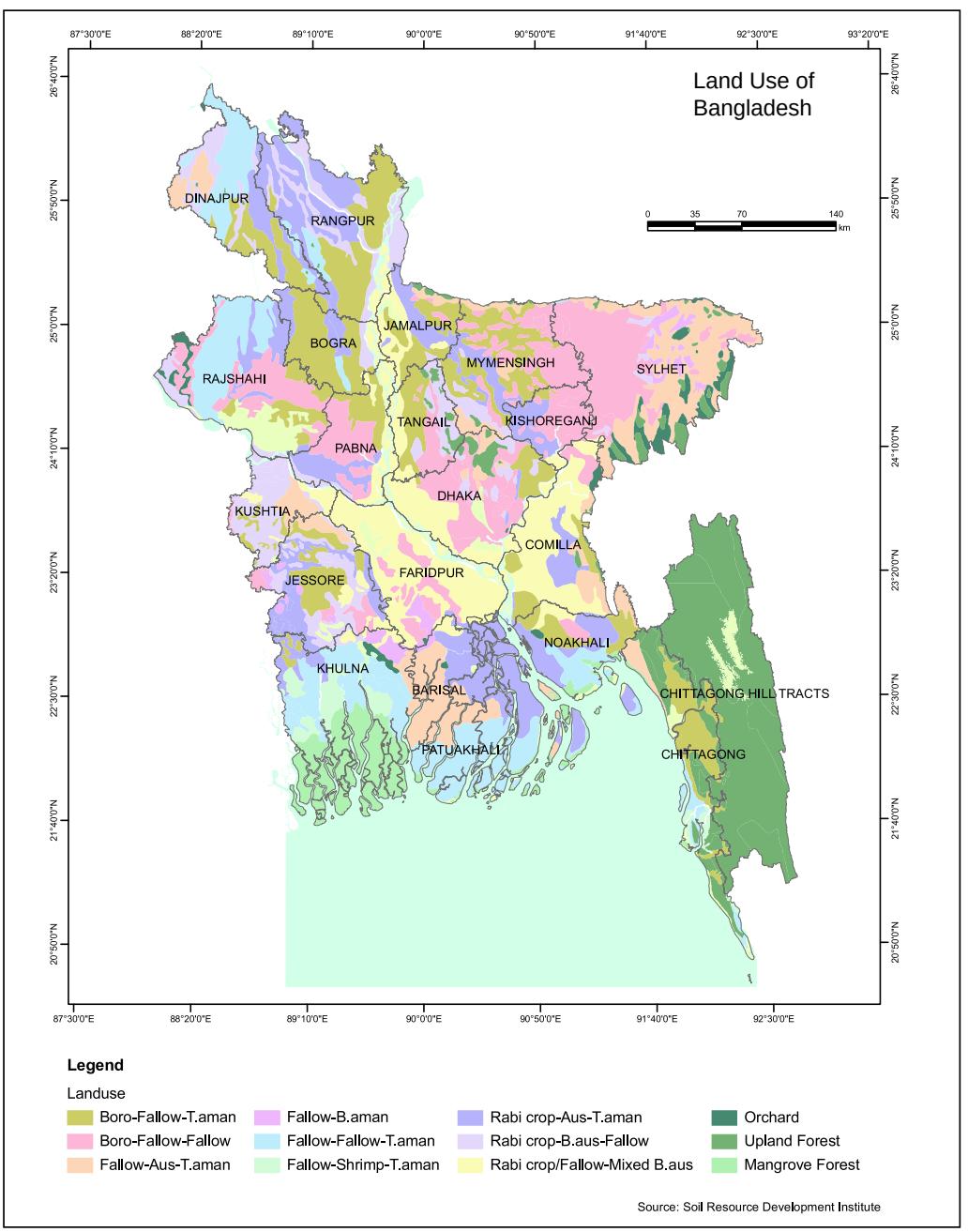
4.3.1 Current situation

Land is the prime resource of Bangladesh, a predominantly flat delta stretching from the Himalayan Piedmont Plain in the north to the coast of Bay of Bengal in the south. The landform of Bangladesh is grouped into three classes, viz Floodplains (80%), Hills (12%) and Terraces (8%) and variations in land use are spectacular in these landforms (DoE, 2001). The annual cropping is the major land use pattern in floodplains, whereas mixed evergreen and deciduous forests are dominant in the hills (Map 4.1).

Land use is a dynamic process and the changes in usage patterns are driven by agricultural and water demands, development of rural infrastructure, migration, urbanization and industrialization, to name a few. In terms of usage of lands, 17% of the total lands are forest land, 52% are cropped lands, 24% are rivers, wetlands and urban areas, 3% are fallow lands and remaining 4% are waste lands. A number of national estimates also show that 2.5% of the total land area in Bangladesh is used for industrial purposes (www.fao.org/ag).

Besides the socio-economic factors, land use is determined by the environmental factors of climate in terms of seasonal (also diurnal) variations of temperature, rainfall and humidity,

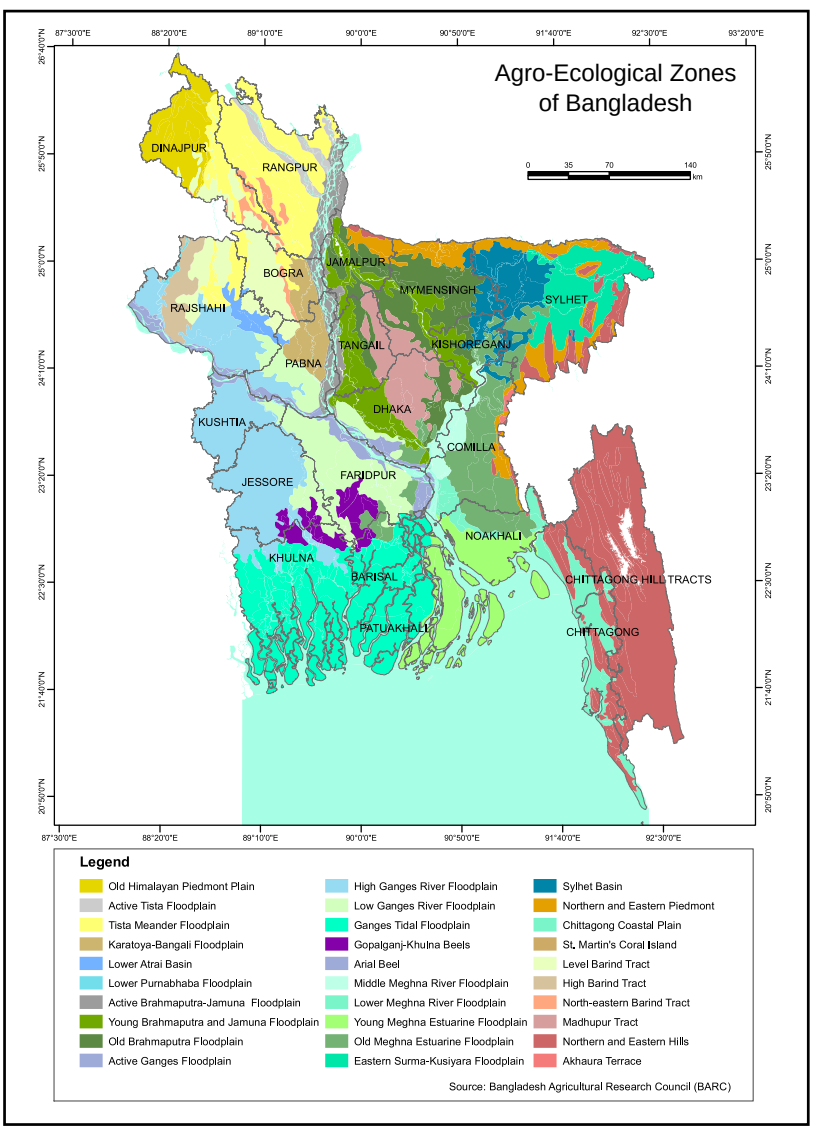
hydrology in terms of depth and duration of seasonal inundation, soil drainage, dry-season soil moisture and availability of surface or ground water for irrigation and other uses. Additional hurdles to land development and crop cultivation comprise the risks of loss of land by bank erosion or burial by fresh alluvial deposition, sudden rise and onrush of flood water and the young nature of the alluvium/soil in the active and young floodplain areas and soil and water salinity, localized extreme acidity and toxicity of acid sulphate soils, scarcity of fresh water and occasional cyclones and storm surges in the coastal lands. Topography, elevation, slope aspect, runoff and risk of soil erosion and landslide and severe dry-season doughtiness and acute shortage of water are the major factors determining the use of land in the hills, while the valleys and adjoining piedmont plains are subject to flash floods and burial of land by sand deposits.



Map 4.1. Land use of Bangladesh

The country has been divided into 30 agro-ecological zones (as shown in Map 4.2) based on four distinct characteristics such as (a) physiography, (b) soils, (c) land-levels in relation to flooding and (d) agroclimatology. An agro-ecological zone is a land resource mapping unit, defined in terms of climate, landform and soils, and/or land cover, and having a specific range of potentials and constraints for land use (FAO Soils Bulletin, 1996). These zones have been subdivided into 88 agro-ecological sub-zones and these sub-zones into 535 physiographic units, Each of the zones has specific characteristics which are related mainly to topography and soil type.

The agro-ecological zoning needs to be revisited because of flood control, drainage & irrigation (FCD I) and many other infrastructure development projects that have been implemented since the identification was done more than two decades ago. Moreover, the climatic conditions are also changing due to global warming. As a result, the inundation pattern has changed and still changing. These factors have influenced the overall land use and land cover situation. Therefore, it is important to consider the changed situation in the delineation of the agro-ecological zones.



Map 4.2. Agro-ecological zones of Bangladesh

4.3.2 Status / trend of land degradation in Bangladesh

Net cropped area (NCA) in Bangladesh was 8.08 million ha in 2000-2001(BBS, 2001). The Net Cultivable Area (NCA + Current fallow) in 1982-83 was 9.14 million ha and in 1996-97 it was 8.14 million ha only. On average, the country is losing about 38,235 ha of cultivable land to non-agricultural use. The per capita NCA was about 0.066 ha in 2000-2001. With an estimated population of 170 million in 2020, the NCA may be reduced to 7.5 million ha with a per capita NCA of 0.044 ha only. Moreover, due to high population growth, this allocation of land per capita is shrinking rapidly every year, making the resource base for agriculture, forest and wetlands more marginalized and vulnerable. This is mainly due to conversion of forest and agricultural land into urban and industrial uses, and construction of roads and embankments. Moreover, competition between forest and agriculture, and fisheries and agriculture are also responsible for some conversions. For example, Chokoria Sundarbans of the Cox's Bazar district and its adjacent areas has been completely lost due to intensive shrimp farming in the mangroves.

A dry region is delineated based on annual rainfall, dry-season net evapotranspiration and excess evapotranspiration (ETo-R), and dry-season R/ETo ratio value. In a dry area, the ratio of annual rainfall to potential evapotranspiration (ETo) may be a maximum of 0.65. According to the criteria set by the UNCCD, no region within Bangladesh can be termed as dry region. However, Bangladesh does experience long spells of dry weather, including moderate to severe droughts spread over a region of 5.46 million ha of the land area (www.sdnpbd.org/sdi/).

4.3.3 Stocktaking on sustainable land management

To combat land degradation and to attain sustainable land management and development, the Government has declared the Land Use Policy, 2001. The Government also approved a comprehensive Poverty Reduction Strategy Paper (PRSP) entitled "Unlocking the Potential: National Strategy for Accelerated Poverty Reduction" in October 2005 to address poverty with other cross-cutting issues (GED, 2005). The country has undertaken a number of programmes and projects that can significantly reverse the trend of land degradation. These programmes and projects could be sub-divided into four categories viz. 1. Community development programmes, 2. Income generation programmes, 3. Capacity building programmes, and 4. Afforestation programmes.

4.3.3.1 Community development programmes

The policy of empowering local communities through their involvement in developmental activities, including natural resource management has been strengthened through the national perspective plans. 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 successful models at the national level. Strategic linkages need to be further developed with other service providers (such as NGOs) that are institutionally equipped to provide sustained support to the target clients in meeting their social, economic and infrastructure needs.

4.3.3.2 Income generation programmes

In many of the SEMP components, there were provisions to promote Alternative Income Generating Activities (AIGAs) amongst the local community. Homestead nursery of local species,

poultry, cattle rearing, medicinal plants cultivation, pisciculture, horticulture, and handicrafts production were some of the major AIGAs under the SEMP. Issues of land degradation were not directly addressed through the programme. However, these activities consequently contributed to improvement of soil quality through large-scale plantation, protection of land from wave-actions in wetlands, waste management, and reduction of pressure on natural resources including land.

4.3.3.3 Capacity building programmes

- Water Management Improvement Project (WMIP)

  This project of BWDB and WARPO is aimed at improving the operational performance of the existing water management infrastructures/systems in Bangladesh and ensuring their sustainability through improved operation and maintenance, and appropriate institutional reforms with due regard to the rights of all water users. The project is expected to spread over some 200 existing schemes, covering about 790,000 ha of area. This project started from the second half of 2007 (english.peopledaily.com.cn/).

- 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, crop, property and an endless migration of the destitutes to the urban slums every year.

- Follow-up on Jamuna Bridge Multipurpose Project (JBMP)

  The project is expected to make a positive contribution to the reduction of economic damage 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 addresses 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).

- Sustainable Environment Management Programme (SEMP)

  This Programme addressed the priority environmental issues identified by people through NEMAP. It was the first programme approach of the GoB, consisting of 26 components executed by the MoEF in association with 21 Government/Non-Governmental agencies throughout Bangladesh. Focus areas relating to the environment were Policy and Institutions; Participatory Ecosystem Management; Community-based Environmental Sanitation; Advocacy and Awareness; and Training and Education. SEMP supported community capacities for sustainable management of environmental resources and strengthened 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 (Jilani, 1998). The Component 1.2 on "Ecosystem Management in the Barind Area" and Component 2.4 on "Capacity Building for Environmental Legislation and Policy Analysis in MoEF" focused on land degradation issues.

4.3.3.4 Afforestation programmes

The GoB has approved the Forestry Sector Master Plan (1995-2015) and promulgated the National Forest Policy 1994. Both the documents have emphasized afforestation programmes in the country with 20% coverage, as targeted in the Master Plan by 2015. To achieve this target, the FD is undertaking a plantation programmme under the ADP. The MoEF approved the social forestry rules to facilitate the Participatory Afforestation Programme. The GoB has imposed a moratorium on tree felling in 1989 to encourage forest conservation. This moratorium has been extended upto 2010. Further activities include attempts by the GoB to increase by 10% the amount of Protected Areas in reserved forest lands by 2015.

- Forest Resource Management Project (FRMP)

  Under FRMP, a separate Forestry Management Information System (MIS) has been established under FD; additional 200 ha participatory forestry development program with landless poor and destitute women was completed; about 60,000 ha forest resources expansion and mangrove plantation programme was done; forest management and conservation plans were finalized. Besides, mangrove research and professional forestry education for technology generation and human resources development are operating effectively (ADB-UNDP-GOB, 1996).

- Forestry Sector Project (FSP)

  FD implemented the FSP from 1997-98 to 2005-2006. The primary objective of the project was to increase overall tree coverage in the country; to arrest depletion of forest resources; to enhance conservation of forests in selected PAs and attain sustainable management of forest resources through local community participation. Under the FSP, plantation of 40,000 ha of Sal Forest was done during 1997-2003.

- Coastal Green Belt Project

  Under this project of FD, afforestation activities were conducted in the coastal regions of Bangladesh. Over 1,300 km of embankment plantation, 7,500 km of strip plantation, 665 ha of foreshore plantation and 28.9 million seedling raising for sales and distribution were part of the project activities.

- Coastal and Mangrove Afforestation Programme

  The main objective of this programme was to stabilize and reclaim newly accreted land. Almost 150,000 ha. of land in the coastal areas were afforested under this programme.

4.3.3.5 Other projects/programmes

- Coastal and Wetland Biodiversity Management at Cox's Bazar and Hakaluki Haor

  The threats of over exploitation of mangroves, unregulated felling for fuel wood, beach compaction by vehicles used in tourism, etc. are being addressed through land protection measures, village conservation and sustainable use of biodiversity, and integrated management plans under this project.

- Linkages between Land Degradation and Energy

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

Box 4.2: Barind Multipurpose Development Authority (BMDA)

To retain the environmental balance and to halt the desertification of the Barind Tract region, the Government in 1985 created the Barind Integrated Area Development Project (BIADP), later renamed as Barind Multipurpose Development Authority (BMDA) in Rajshahi, Naogaon and Nawabganj Districts. Before the project 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 Tract. Instead of a single crop, now multiple crops are grown with higher agro-economic productivity. This transformation to multiple cropping has resulted in more productive cropping patterns and increased cropping intensities. Construction of cross-dams, water control structures, re-excavation of canals and ponds have contributed to augmentation of surface water availability . This is reflected in satisfactory 'command area' development, ecological balance and pisciculture. Formerly, before the BMDA, good road networks were missing and the slow moving bullock cart was the main transport used for carrying goods and passengers. Construction of feeder and rural roads has enhanced the status of rural livelihoods through enhanced communication and its entailed benefits to the rural economy.

- Bangladesh Arsenic Mitigation and Water Supply Project

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

- Measures Taken to Mitigate the Effects of Drought

  In the event of drought, the Government undertakes relief measures by providing drinking water, food grains, fodder and food subsidies to special groups as well as employment through 'food-for-work programmes'. The Disaster Management Bureau (DMB) coordinates drought relief work with the 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 programme of the GoB provides employment to the population affected by drought and helps mitigate the severity of the drought, wherever it may occur.

- Drought Assessment Framework

  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 fields of BRRI and BARI.

- Environmental Monitoring Information Network by CEGIS and Ministry of Water Resources
- Impact Assessment of Indian River Linking Project by CEGIS
- Integrated Coastal Zone Management Project (ICZMP) by WARPO, Ministry of Water Resources

Many projects or approaches were undertaken for different time lengths or duration. But in true sense, land degradation, its various aspects and sustainable land management were addressed through sectoral approach. All components and issues were not adequately touched upon as deserved. Out of them, the following projects can be listed as relatively effective:

List of other completed/on-going/up-coming projects/programme/studies

- Coastal Land Use Zoning Project (CLUZ) of the Ministry of Land
- Project on Capacity Building and Resource Mobilization for Sustainable Land Management in Bangladesh by MoEF-UNDP
- Bangladesh Environmental Management Project-CIDA
- UNDP's Sustainable Environmental Management Program, Particularly Component 1.2 on "Ecosystem Management in the Barind Area" and Component 2.4 on "Capacity Building for Environmental Legislation and Policy Analysis in MoEF"
- Small Scale Water Resource Development Sector project, phase-II (Ditiyo Khodrakar Pani Sampad Unayan sector prakalpa) by MoLG, LGED
- Afforestation programme on denuded fringed lands and marginal lands
- Forestal Forestry Survey in 1960
- Land Resources Appraisal by UNDP
- The River Erosion Project, Bangladesh Water Development Board (Part of Practical Action Bangladesh's Reducing Vulnerability programme)
  - Jamuna-Meghna River Erosion Mitigation Project
  - Meghna-Dhonagoda Irrigation Project (MDIP)
  - Pabna Irrigation and Rural Development Project (PIRDP)
  - Char Development and Settlement Project III (CDSP-III)
  - Estuary Development Programme (EDP)

4.4 Priority Environmental Issues

In Bangladesh enormous pressure on limited but vital land and soil resources are exerted, which strictly limits the resilience of these resources. The landmass of Bangladesh could be broadly divided into three levels based on landscape, viz hilly, terrace and floodplain which developed in three major watersheds, viz the Ganges, the Brahmmaputra and the Meghna and minor watersheds like the Karnaphuli, Shangu and Matamuhuri. These landscapes come across as different and the types of land degradation depend on their use, position, occurrence, extent, composition or physical make-up. The major priority environmental issues concerning land degradation are briefly discussed in the following sections.

4.4.1 Population pressure and land use change

Bangladesh is one the highest populated countries with growth rate of 1.8% (Shoaib, 2007). It is projected that by the year 2020, population of Bangladesh will reach 170 million, with a density of 1,118 per sq km and per capita land allocation as low as 0.6 ha, with possible loss of cultivable land to alternative uses like housing and urbanization. The pressure of the rising number of people on finite amounts of land, water and other natural resources may become irreversible within the next few decades compounded by the effects of rising salinity, water logging, declining water tables, loss of soil fertility and high levels of erosion.

SRDI (2004) estimated 0.1% of arable land per year converted to other uses like settlements, roads, industries, brickfields and borrow pits based on interpretation of aerial photo of different

years. Industrial effluents have adverse influence on the soil health due to concentration of heavy metals like chromium (Cr), lead (Pb), cadmium (Cd) and nickel ((Ni), and these metals run the risk of being transmitted into the food chain.

Comprehensive data or information regarding the area covered by these sectors is lacking, but impacts of these sectors on land and its quality are profound. Dispersed industrial growth and uncontrolled discharges of their untreated effluents into the nearby rivers deteriorate the quality of land, soil and water. Bangladesh has the highest density of road network 7.6 km/100 sq km, as compared to India (1 km), China (2.7 km), and Pakistan (4.8 km) (Shoaib, 2007). Establishment of road networks and inadequate compliance with landscape geography and structure are resulting in permanent or temporary waterlogging and change the micro-ecosystems. The changed scenario has a bearing on choice of crops, cropping patterns, soil health and land qualities.

Land fragmentation due to the crumbling of farm families is another issue which resulted from population boom and it is estimated that the lands stood fragmented into about 12 million plots in 1990's (Shoaib, 2007) and this figure is expected to be skyrocketing in future. Pressures on limited land resources stem from multifaceted issues relevant to land degradation.

Table 4.1: A comparative statement of major cropping pattern in 70's and 2000's

Major cropping pattern in 70's	Major cropping pattern in 2000's
F-Aus/Jute-T.Aman	Rabi crops (Wheat/Chickpea/Mustard) -B.Aus -T.Aman Boro-F-T.Aman Rabi and Kharif vegetables
Rabi crops-Mixed Aus and Broadcast Aman	Boro-F-T.Aman
Rabi crops- Broadcast Aman	F-Boro Rabi crops- Boro
F-F-T.Aman	Boro-F-T.Aman F-Shrimp -T.Aman F-Sesame -T.Aman Shrimp Salt-bed
F-Mixed Aus and Broadcast Aman	Boro-F-T.Aman
F- Broadcast Aman	Boro- Broadcast Aman Boro-F-F

Source: Upazila Nirdeshika (1985-2000), Soil Resource Development Institute
F= Fallow, T. Aman= Transplanted Aman

Considerable changes in land use occurred in the last three decades (1983-2003). Most of the single cropped land was transformed to either double or triple cropped land within this period depending on the land type, water availability for irrigation (both surface and ground water).

Shallow Tube Wells (STWs) for abstraction of Ground Water (GW) were intensively used and land irrigated by STWs increased from 1.0 to 2.4 m ha within ten years (1990 and 2000) (Shoaib, 2007). This has led to the further sinking of STWs into deeper levels, which in turn has depleted the GW. About 86% of water extracted is used for agriculture. World Bank study revealed that after nearly 30 years of 'successful' and intensive tapping of groundwater, about 35 million people in Bangladesh are now facing deadly threats from arsenic poisoning (www.countercurrent.org). Land use maps of the year 1963-75 (based on Reconnaissance Soil Survey, SRDI), 1997 and 2005 based on data acquired during Upazila Nirdeshika (Semi-Detail survey) depict that most of the land under Aus or jute followed by Rabi cropped land changes to Boro–Fallow-Transplanted Aman cropping pattern. Boro is generally cultivated by using ground water. A comparative statement of land use changes in 1970's and 2000 is given in Table 4.1.

4.4.2 Soil salinization

Saline soils occur in a strip of land of a few kilometers to 180 km width along the sea coast. Reduction of freshwater flow from upper riparian areas and silting up of the Feeder Rivers enhance soil salinity in the coastal zone. Various anthropogenic activities like shrimp-culture, extension of salt-bed etc are also contributing factors in increasing soil salinity. During 1983 extension of saline area was 0.83 million ha which at present is estimated to be 1.02 million ha (SRDI, 2000). Salinity intrusion has created a major problem in Khulna and Satkhira region in the south of Bangladesh. In a study done in 2000 it was revealed that 1.1 million ha of land are losing fertility because of salinity intrusion every year. A comparative status of total saline area and area under different degrees of salinity in 1973 and 2000 is depicted in Figure 4.1. During the last three decades, about 0.17 million hectares of land was newly affected by various degrees of salinity, where substantial increase was found in strongly (8.1-16.0 dS/m) and very strongly saline (>16 dS/m) classes (Shoaib, 2007). Salt-beds and shrimp cultivation have a bearing on coastal soil degradation and changes in landscape. Production of salt becomes more profitable and that enhances transformation of agricultural lands to salt-beds, which degrades the soil and makes future use of the land for crop production very difficult. The situation is further aggravated due to tidal surges and cyclones. Bangladesh experienced one of the worst cyclone-cum-tidal surges on 15 November 2007 during finalization of this report, which has further dilapidated the land resources in the south-western regions of Bangladesh.

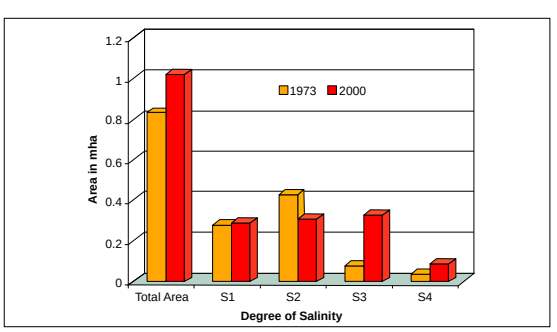
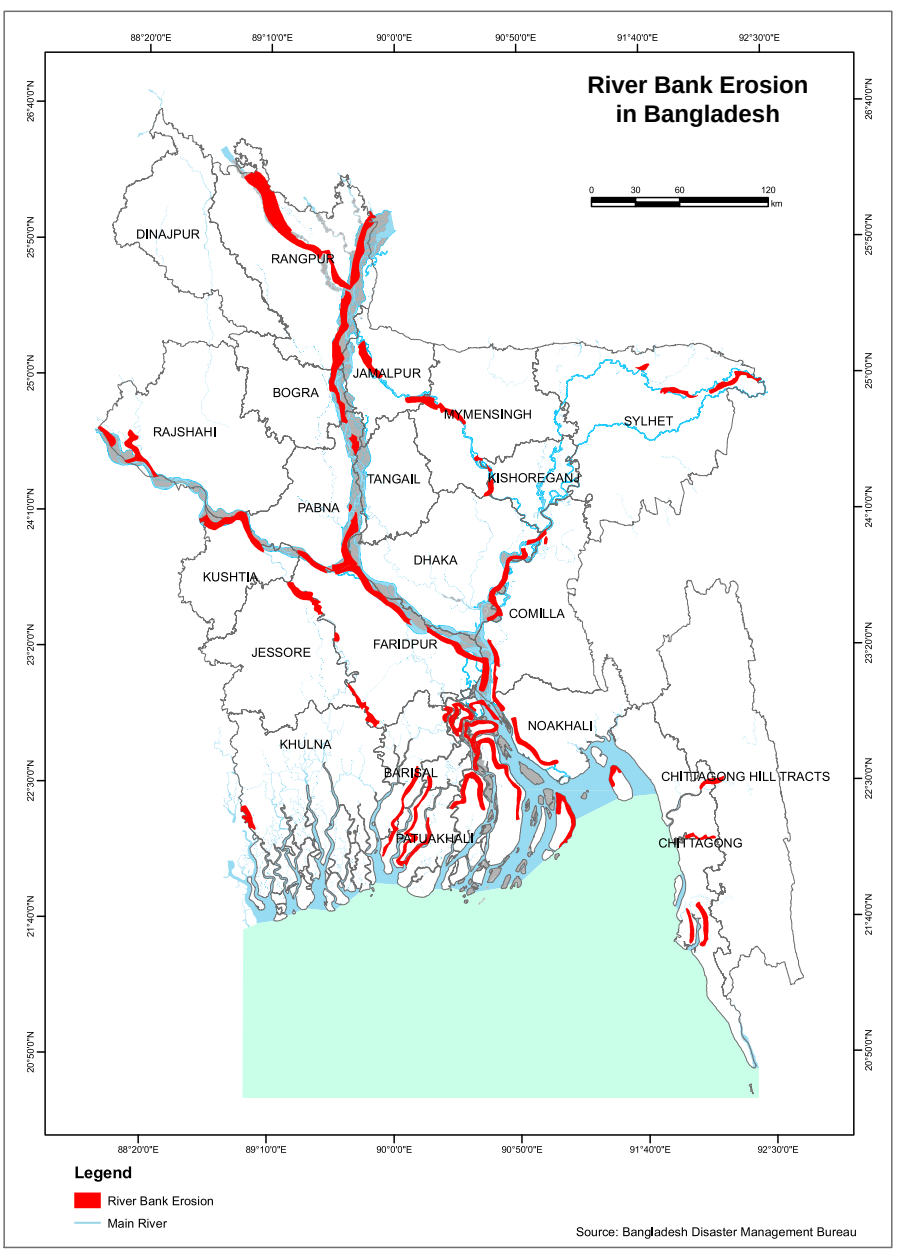


Fig. 4.1 Soil Salinity status in 1973 and 2000

Salt-beds engulfing paddy fields © J.U. Shoaib

4.4.3 River bank erosion

The river network is one of the most unique characteristics of the deltaic Bangladesh, criss-crossing the country with innumerable tributaries and branches. More than 700 rivers with a total length of 22,155 km (DoE, 2001) have become moribund because of siltation of river beds, enhanced flood and river bank erosion, restricted navigation and water flows. Among these, riverbank erosion is a major issue. It is estimated that more than 100,000 people are displaced annually due to river bank erosion (Shoaib, 2007). This results in devastating social impacts along the major rivers. For example, poverty, woman and child trafficking, imbalance in social fabrics, in addition to productive land loss and enormous sediment yield are the major consequences of river erosion. River bank erosion is very likely to undercut the existing flood embankments as well, leading to devastating damage and destruction and could affect millions of people along the rivers and even within the protected areas.



Map 4.3. River bank erosion in Bangladesh

Bangladesh Water Development Board (BWDB) estimated about 1,200 km river bank has been actively eroded and more than 500 km has been facing severe problems of erosion (Map 4.3). Between 1982 and 1992 about 1,063 and 193.0 sq km have been lost and accreted, respectively as reported by Ahsan (2006). The time gap between highly destructive floods has been narrowing with increasing projects on flood: 1954 to 1974: 20 years, 1974 to 1987 and 1988: 13-14 years, 1988 to 1998: 10 years, and 1998 to 2004: 6 years (www.countercurrent.org). Floods, on one hand, are a consequence of siltation of rivers. On the other hand, serious river bank erosion takes place due to floods causing sediment accumulation from river bank erosion.

4.4.4 Topsoil loss and landslide

Hill areas or upper riparian areas are sensitive, as any anthropogenic disturbances there will create erosion, flooding and sedimentation in the lower regions. Large scale topsoil loss and landslides occur in the hilly region of south-eastern Bangladesh. It is estimated that about 8, 700 ha of area are being eroded annually (Shoaib, 1999). This region occupies about 12% geographical area of the country. This is concentrated in CHT occupying 76% very steep to steep sloping areas. Sloping areas of this region are not used with adequate conservation measures.

Landslide in hills due to infrastructure Development © BD News 24

Improper cultivation of Hill Slopes, Terrace Land and Piedmont Plains enhances topsoil loss. Shifting cultivation on the hills, locally known as "Jhum", is a common practice among the tribal communities in the greater CHT. In the recent years, the interval between two crop-cycles in the same area has shortened drastically due to population pressures in the region. Therefore, the soil quality has been degrading rapidly. SRDI measured soil loss from different slope classes in CHT under jhum cultivation, which ranges from 36 to 45 t/ha/yr (Shoaib, 1999). It may be noted that the CHT region lies along a seismological-sensitive zone.

Deforestation and land cover changes are other main causes for natural resource degradation in CHT. Landslides are also indigent to the CHT and are mainly due to construction of roads and other unplanned infrastructures. Haque and Osman (1990 in Shoaib, 2007) estimated soil loss at

2.7-7.2 t/ha/yr and 102 t/ha/yr from well-stocked forests and clean fallow slope, respectively. The large scale deforestation is making the denuded hills vulnerable to landslides. In recent years, urbanization in these hilly areas also prompted hill-cutting, thus subjecting the surrounding areas to risks from landslides. Such landslides not only cause environmental havoc, but also cost human lives. The landslide that occurred in Chittagong in mid 2007 was a serious disaster for the poor residents settled at the foot of the hills and accounted for the loss of huge lives.

4.4.5 Brickfields

In order to meet the escalating demand of the housing and infrastructure sector, there is a huge demand for construction materials, especially bricks. In 2005, it was estimated that there were about 5,000 brickfields in the country (personal communication, DoE 2007). SRDI made an inventory of 53 brickfields with their respective size, capacity, impact on surrounding soils and agricultural/horticultural crops. Results revealed that the average size of a field is about 3.4 ha producing on average 1.4 million bricks per year. Brickfields cause the loss of a huge amount of fertile topsoil per year. It was estimated that 1 ha top soil of agricultural land up to 15 cm depth is used to manufacture 0.7 million bricks. It costs about Tk. 2.6 million in terms of nutrient (N, P, K, S, Zn) loss and Tk. 0.06 million in terms of production loss per year from to 10,000 ha agricultural land.

Aerial view of brick fields © J.U. Shoaib

4.4.6 Drainage congestion and waterlogging

Waterlogging and drainage congestion degrade the quality of land, in addition to causing other socio-economic problems. In waterlogged soil, different-chemical changes take place hampering plant growth. Waterlogging has become a serious issue in Bangladesh after construction of several dams and embankments through Flood Control Drainage & Irrigation projects. Waterlogging in Bhabadhaha Beel, Atrai-Hurasagar and Beel Dakatia/Dumuria is happening apparently because of unplanned structures impending drainage and causing permanent waterlogging. Farmers are being compelled to change their secular profession and become fishermen in those areas. In addition, seasonal or temporarily waterlogged areas restrict cropping time resulting in a decline in production and increased health hazards.

4.4.7 Intensive cultivation

Vertical expansion of cropping induces modern cultivars and options of irrigation. It was observed that ground and surface water extraction was intensified in order to increase per unit production. a number of projects came into being to facilitate irrigation, such projects are: Brahmaputra right bank embankment project, Pabna project, Dakatia and Halda project, Barisal

project, Ganges-Kobadak Kushtia project, Chenchuri and the Barnal, Salinpur-Bashukhali projects in the Khulna area, Surma-Baulai Haor and the Knowai River projects in Northeast region, River training, Chandpur riverbed stabilization project, Chilmari project, Kurigram project (www.countercurrent.org). The scenario induces monoculture throughout the year. As a result, there are : reduced residual moisture in the dry season, especially on higher ground, hence reducing cropping options; deterioration of physical properties of soil in waterlogged areas; reduced availability of soil nutrients and thus increased dependence on chemical fertilizer (Figure 4.2); increased dependence on pesticides; trend to high yield variety (HYV) monoculture, reducing agricultural diversity; reductions in agro system resilience; as a result of above, the possibility of decreasing yields; loss of formerly flooded habitats for major capture fishery species; changes in hydrological regimes of remaining habitats; increased agrochemical runoff and contamination of surface water. (www.countercurrent.org).

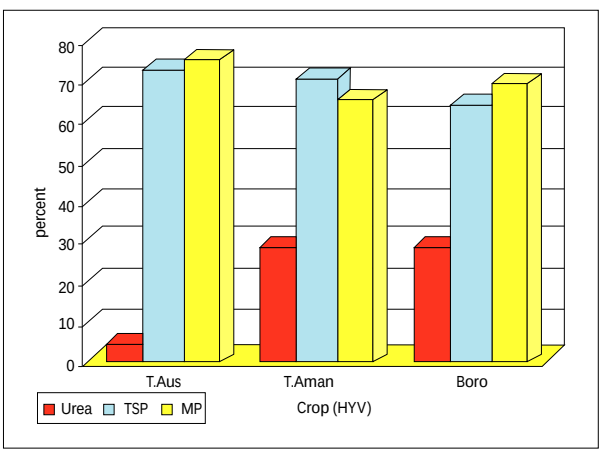


Fig. 4.2. Imbalance use of fertilizers in Bangladesh for different crops

4.4.8 Agrochemicals

Large amounts of pesticides, fungicides and herbicides are imported to keep crop production sustainable (Table 4.2). The scenario indicates that there is remarkable use of agrochemicals in agricultural production system and that poses as hazards to human health, fisheries, soil health, livestock, etc. (which are not adequately addressed till date through any policy or legislative measure). It was also reported that agrochemicals found in the market are either of low grade or not as per specification or lebels on the containers. As a result, farmers are cheated on the one hand, and misuse of foreign exchange occurs on the other hand, in addition to the overarching problem of environmental degradation. Loss of fisheries in the low lying areas, basins, ditches etc. was also reported, which leads to depletion of many local species.

Table 4.2. Import of pesticides during the last three decades

Year	Tons	Value (million Taka)
1980-81	2274.04	202.29
1990-91	5122.00	642.67
2000-01	5655.00	1207.76

Source: Handbook of Agricultural statistics,2004 (MMIS, MoA)

The consumption of chemical fertilizers in Bangladesh increased steadily from 2,698 tons of ammonium sulphate only in 1951 to 3,036,563 tons in 1998 mainly comprising urea, followed by triple super phosphate (TSP) and murate of potash (MoP) with much lesser shares of materials containing calcium (Ca) and sulphur (S) and the micronutrient zinc (Zn). However, farmers' traditional fertility management practices lagged far behind a balanced fertilization. Among the fertilizer nutrients used, N alone constituted about 71.8% while the use of P and K was limited to 11.0 and 6.8% only with the nitrogen (N), phosphorus (P) and potassium (K) ratio of 1:0.153:0.094 (Sattar, 2000).

4.4.9 Soil compaction

Soil compaction is observed in floodplain soils rich in silt and clay fractions. Practicing two transplanted rice by paddling the soil enhances pan formation below plough layer. In most cases this layer is highly reduced and hinders root penetration. Soil compaction changes soil pore size, distribution, and soil strength. Heavily compacted soils have a reduced rate of both water infiltration and drainage from the compacted layer. In addition, the exchange of gases slows down in compacted soils, causing an increase in the likelihood of aeration-related problems. Excessive soil compaction consequently impedes root growth and therefore limits the amount of soil explored by roots. This, in turn, can decrease the plant's ability to take up nutrients and water. Soil compaction in the surface layer can increase runoff, thus increasing soil and water losses as well. On soils with relatively stable structure, greater surface roughness can increase infiltration, reduce runoff, and reduce erosion up to the point that runoff begins.

4.4.10 Acidification and decline of organic matter

Time series data as acquired during Upazila Nirdeshika Survey (1985-2000) and fertility monitoring revealed that the trends of changes in pH and decline organic of matter (OM) content in top soil were significant. Average decrease in pH value ranges from 0.6-1.8 unit, where it is 18-34% for OM. Various reasons can be identified on this issue and among them nutrient mining, intensive cropping, mono-cropping, and imbalance in use of fertilizer, particularly urea are important.

4.4.11 Drought

The total precipitation in drier areas, for example western and north-western parts of Bangladesh, is low with sudden heavy downpours. In those areas evapo-transpiration exceeds the amount of rainfall by a factor of 2.0 in the dry season. Bangladesh experienced 19 severe droughts between 1960 and 1991 extended over a region of 5.46 million ha (Shoaib, 2007). Huq et al. (1996) suggested that the area affected by severe droughts will increase from 4,000 to 12,000 sq km under severe climatic change scenario and this will lead to more water consumption either from surface or ground water abstraction.

4.4.12 Transboundary water issues

Among the rivers flowing across the country, 57 originate beyond the territory of Banlgadesh – 54 in India and 3 in Myanmar (Banglapedia, 2001). Withdrawal of freshwater in the upper riparian areas of the Ganges, the Brahmaputra and the Meghna watersheds in addition to erratic climatic (rainfall) condition has a synergic relation with land use, cropping pattern, ground water availability, flood frequency, and salinity ingression in Bangladesh. Moreover, organic load coming towards Bangladesh from upper riparian areas is causing underground biophysical changes.

Low flows, sedimentation, unusual high floods are the major issues relating to the rivers flowing from or across India and from Nepal and China. In the Himalayas, the felling of trees in upland watersheds is making life worse for millions in the plains of Bangladesh causing increased frequency of floods in the early and late monsoon period, unusually heavy silt-loads in the rivers and extreme low flows in the dry season. Heavy siltation makes the channels, shallower/narrower, causing more destructive floods and increased rate of bank erosion and sedimentation.

Bangladesh has responded to the issue of reversing the trend of land degradation by incorporating many 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, the current Government programmes have focused on field-oriented activities in conjunction with the institutional capacity building.

4.4.13 Other PEIs related to land degradation

- Irresponsible mining of sand, gravels and coal from forest and agricultural lands;
- Discharge of untreated industrial effluents sludge, waste etc;
- Categorization of the rivers depending upon the pollution;
- Inadequate scientific and institutional capacities in land management;
- Temperature variations effecting the production of grains in near future, increasing vulnerability from loss of crop production; and
- Sand deposition on the fertile land.

4.5 Identifying Capacity Development Needs

4.5.1 Identification of stakeholders

Key stakeholders for sustainable land management include Government organizations as service-providers, as those responsible for administration and management of lands and as land owners. From this perspective the key stakeholders are

- Ministry of Agriculture: DAE, BARC, BARI, BRRI, BJRI, BSRI, BINA, SRDI and BMDA
- Ministry of Commerce: BTRI
- Ministry of Defence: SPARRSO, SoB, BMD
- Ministry of Energy and Mineral Resources: GSB
- Ministry of Environment and Forest: DoE, FD, BFRI, BNH
- Ministry of Fisheries and Livestock: DoF, DLS, BLRI
- Ministry of Industries
- Ministry of Local Government and Rural Development: LGED, BRDB
- Ministry of Law, Justice and Parliamentary Affairs
- Ministry of Land: DLRS
- Ministry of Planning and Finance: Planning Commission
- Ministry of Science and Information & Communication Technology
- Ministry of Water Resources: WARPO, BWDB

Most of the above organizations have field offices, and in some cases, (such as for DLRS and DAE) their functions are administered through the local administration at the division, district and upazilla levels. It is imperative that the field level officers like Divisional Commissioner, Deputy Commissioner, UNOs and other local administrators play effective roles in sustainable land management. The Departments of Geography of DU, RU and JU, the Department of Forestry and Environment of CU, and BUET, BFRI, GSB, RDA, SoB, etc. are also contributing to for sustainable land management.

Much of the current knowledge of 'best practices' in sustainable land and ecosystem management lies within the NGO community, particularly those active at the local level. Relevant NGOs such as IUCN, Arannyak Foundation and UBINIG, all have ongoing activities and practical knowledge relevant to further capacity building. Additionally, research institutions, such as BIDS, CEGIS and the Soil, Water and Environment Department of DU may be involved in any effort to promote capacity development in this thematic area.

The target group for capacity building will be policy-makers, technical experts, field level officials and NGOs concerned. Wherever possible, the project will build on the existing capacity of stakeholders – often those institutions and individuals who already have some level of capacity through previous development interventions. The selection of the NGOs for participation in project implementation will be based on a set of criteria to be decided at the initiation of the project. For awareness raising and to promote actions at the individual level, the project will focus on small landholders, including landless women and ethnic minorities. Another group of important stakeholders are the beneficiaries i.e. the individual farmers, and the community groups who are dependant on land for their livelihood. These beneficiary groups are to be targeted for capacity development.

4.5.2 Identifying capacity development needs

In terms of land degradation, the specific capacity development needs at different levels as identified through Bangladesh NCSA are listed below.

Individual level

- Levels of awareness and knowledge of land degradation issues or understanding of root causes, interactions;
- Success stories with photographs and drawings may be published in local language;
- Mid-level, junior and young professionals should be trained and adequate resources mobilized for their capacity building;
- The Government officials concerned need to be updated on the CoP decisions under UNCCD;
- There is need for training in the application of market-based instruments, environmental/natural resource economics for analysis of existing land use practice, identification of economically and financially viable land management alternatives, and GIS;
- An increased appreciation of the role of SLM in poverty reduction by decision-makers and the public at large is also necessary.

Institutional level

- Individuals tend to be ineffectively deployed, mobilized, motivated or given responsibility;
- Each institution should have database and memory and this should be transmitted to the 'young professionals' who will be working for the next 20-30 years. In case of Government agencies, such institutional memory could be built up keeping in mind that some jobs are transferable
- Dedicated officers from different institutions may be enlisted to act as the driving force in land use/ degradation related issues.
- Linking up with global and regional levels through established networks - coordination, and processes for interaction with international community
- RRI, BWDB and WARPO should synchronize their efforts to address riverbank erosion;
- Adequate organizational management has to be promoted through institutional effectiveness;
- Education institutions and research bodies should have their own think-tanks;
- Documentation of best practices and creation of 'data bank' of local knowledge regarding land degradation with user-friendly and accessible database formats should be ensured;
- Science and technology are to be effectively used in support of policy and decision-making;
- Dissemination of technology may be enhanced with provision of feedback from stakeholders.
- While considering a development project, Planning Commission, IMED and ERD need to develop a format with an in-built mechanism to evaluate the project-based on economy, environment, ecosystem, land degradation concerns to ascertain whether it can facilitate the implementation of Rio Conventions or not;
- Emphasis should be given to the community-based projects while focusing community participation for implementation of the Afforestation project;
- Water management projects should consider the different aspects of efficient and equitable use of surface water rather than ground water. BWDB needs to develop its capacity in this regard;
- Improved land assessment and land zoning capability in the Government sector is needed;
- GIS/LIS (Land Information System) should be established in all departments dealing with land management;
- The goal of polder projects was agricultural enhancement, but there is a need to rethink holistically and mainstream them into sustainable development efforts;
- in development of infrastructure such as polders, embankments etc the need for storage of surface water should be taken into consideration;
- Physical deterioration of soil compaction needs to be studied.

Systemic level

- Policies within/among agriculture, forestry, water resources, and rural development some times are contradictory with regard to sustainable land management. Such contradictions must be removed;
- Sustainable land management is not yet adequately addresses by Government institutions, policies, or annual development programs. This has to be looked into;
- Amendment of the Land Use Policy is urgent to halt land degradation;
- Good governance should be there for ground water use;
- Coordination among the national bodies regarding UNCCD is crucial. Such coordination needs to be strengthened;
- The EIA regulation needs revision together with development of operational capacity in the DoE and Ministry of Land;
- Construction of high-rise buildings both in urban and rural areas may be encouraged in order to avoid land degradation due to horizontal expansion;
- Regional level initiatives and basin management is necessary as 54 rivers originate in India;
- Land conversion should be discouraged except for Government priority programmes.
- One stop service, is needed for capacity building on sustainable land management; and
- Equitable sharing of benefits from land use should be emphasized.

Chapter 5
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Chapter 5

SYNERGIES AMONG RIO CONVENTIONS AND OTHER MEAs

5.1 Concept of Synergy

5.1.1 Definition

The term ‘synergy’ is derived from the Greek word 'synergos' which means working together. In the modern usage, synergy means the phenomenon in which two or more discrete influences or agents acting together create an effect greater than that predicted by knowing only the separate effects of the individual agents. Synergy can also mean a mutually advantageous conjunction where the whole is greater than the sum of the parts. It is a dynamic process in which an alliance is favoured over the sum of separate component actions. It also indicates the behaviour of whole systems unpredicted by the behaviour of their parts taken separately.

In the NCSA process, the term ‘synergy’ denotes the mainstreaming of the basic principles, programmes, activities and action plans undertaken by or within the three Rio Conventions, namely UNFCCC, CBD and UNCCD. It also indicates the linking and interfacing the capacity needs for developing nations within/among different Conventions under a single umbrella. Through synergies positive aspects are amplified by coordinating or linking the implementation

of two or more MEAs. In other words, synergies give multiple benefits for more than one Convention resulting from a single action or programme.

When there is synergy the cross-cutting issues in environmental management are addressed more effectively. These cross-cutting issues are common to more than one Convention; that is they "cut across" Conventions. Capacity strengths, constraints, needs and opportunities are examples of some cross-cutting issues. Therefore, if a cross-cutting need is addressed through capacity development programmes, it would benefit more than one Convention.

Another aspect of syergy is interlinkages among the different Conventions and their thematic areas. These (interlinkages) are the cause-and-effect relationships that link many of the human activities (drivers of change), including human induced climate change, land-use and land-cover change, land and water degradation. Loss of biodiversity is often the outcome of these drivers of change. In some cases, the relationship between the drivers of change and the outcome can be direct (e.g. the effect of climatic extremes on land degradation) and in others indirect and complex (e.g. the effect of climate change on intensity and frequency of disasters affecting land cover and thus land degradation, which can indirectly affect water bodies due to sediment movement). The Figure 5.1 shows the intertinkages of cause-effect relationships among these drivers.

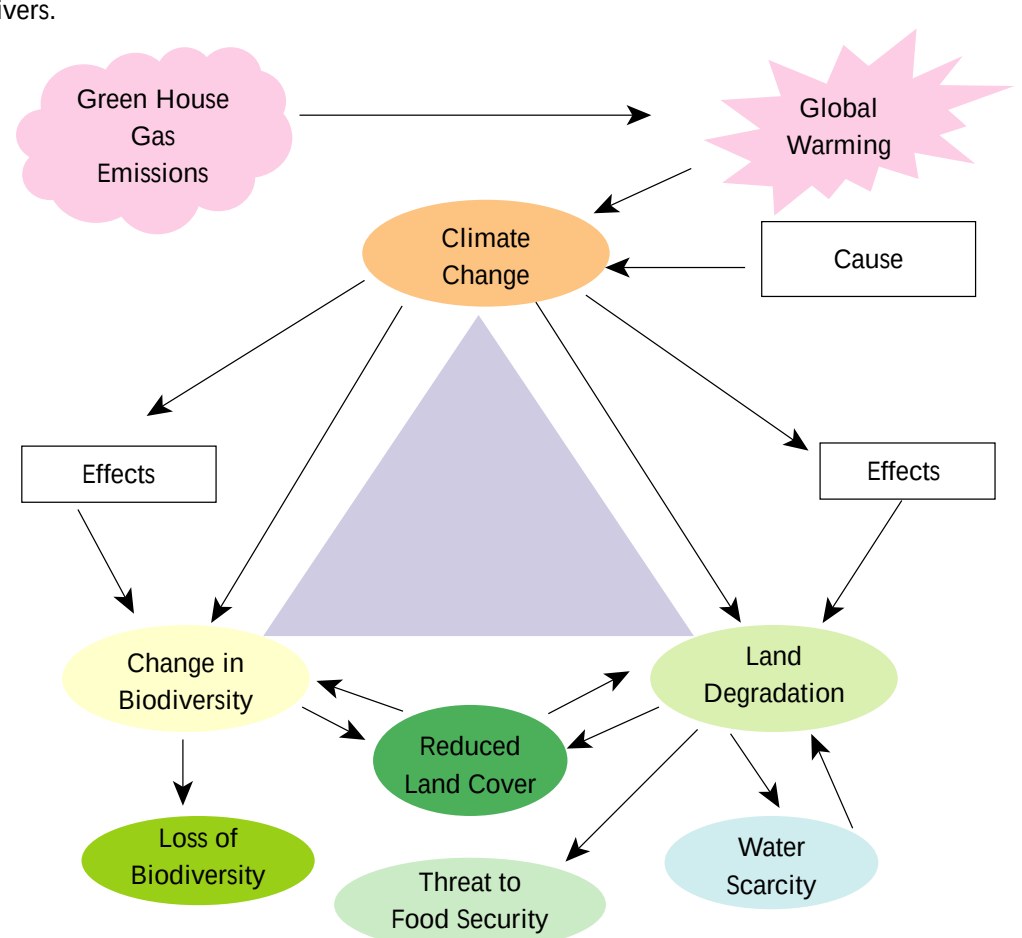

Fig. 5.1. Cause-effect relationships among different environmental drivers

5.1.2 Significance

Responding to global problems like climate change, loss of biodiversity and land degradation requires concerted efforts among various stakeholders and institutions. Moreover, close collaboration with other MEAs is also required. The increasing need for synergies between the Conventions is felt at the national, regional and global levels where Governments have only one agency to deal with all the conventions. This is so particularly in developing countries. Bangladesh is one example. In Bangladesh, MoEF has single agency i.e. DoE with limited man power, to deal with all Conventions. Issues such as capacity building, technology transfer and public education cut across not only the different sectors but also between the Conventions. Hence, closer coordination of activities among the Conventions will not only improve the effectiveness of implementation of obligations but also improve the efficiency of utilization of funds within the limited resources.

As part of the NCSA process involving multi-stakeholder participation, Bangladesh envisaged to identify capacity constraints while implementing the RCs that are at different levels of implementation. These constraints and bottlenecks should be addressed in a synergistic manner, where capacities for individuals and institutions can be centered on more than one thematic area at a time. However, the key to this is to find the commonalities and connecting threads that have significant impact on implementing the Conventions either at individual level or as a group. The consultative meeting involving all stakeholders of NCSA during the proposal development phase has identified some of the capacity needs that should be addressed synergistically with overall national development policies.

5.2 Obligations for Bangladesh under Rio Conventions

5.2.1 Common obligations for Bangladesh under three Rio Conventions

The detailed obligations for Bangladesh, under three Rio Conventions (RCs) i.e. UNFCCC, CBD and UNCCD, have been described in the Chapters 2 to 4. Common obligations and mandates for Bangladesh under three RCs are appended in the following Table 5.1.

Table 5.1: Common obligations for Bangladesh under the Rio Conventions

Common Issue	UNCCD	CBD	UNFCCC
Education, training and public awareness	Article 19: Promote awareness and facilitate participation of local community, the women and youth, NGOs to combat desertification and mitigate the effect of drought	Article 13: cooperate in developing educational and public awareness programmes with respect to conservation and sustainable use of biological diversity	Article (6): development and implementation of educational and public awareness programmes on climate change and its effects; Training of scientific, technical and managerial personnel

Common Issue	UNCCD	CBD	UNFCCC
Risk assessment	Article 4: adopt an integrated approach addressing the physical, biological and socio-economic aspects of the processes of desertification and drought	Article 14: impact assessment and minimizing adverse impacts	Article 3(3): precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects Article 4: methods for impact assessments with a view to minimizing adverse effects on the economy, on public health and on the quality of the environment
Sustainable development	Article 4: integrate strategies for poverty eradication into efforts to combat desertification and mitigate the effects of drought	Article 10: sustainable use of components of biological diversity	Article 3(4): Measures to protect the climate system against human induced change
Research and systematic observation	Article 19: strengthening training and research capacity at the national level in the field of desertification and drought	Article 12: promote and encourage research which contributes to the conservation and sustainable use of biological diversity	Article 5: research and systematic observation to strengthen national scientific and technical research capacities and capabilities
Technology transfer	Article 16: use and disseminate modern technology for data collection, transmission and assessment on land degradation	Article 16: access to and transfer of technology	Article 8: to meet the specific needs and concerns arising from the adverse effects of climate change and the impact of the implementation of response measures
Adaptation to the impacts	Article 18: adaptation and development of environmentally sound, economically viable and socially acceptable technologies relevant to combating desertification and mitigating the effect	Article 14: appropriate arrangements to ensure that the environmental consequences of its programmes and policies that are likely to have adverse impacts on biological diversity are duly taken into account	Article 4: develop and elaborate appropriate and integrated plans for coastal zone management, water resources and agriculture and for the protection and rehabilitation of areas

Common Issue	UNCCD	CBD	UNFCCC
Exchange of information	Article 16: ensure the collection, analysis and exchange of information, address the needs of local communities and those of decision makers with a view to resolving specific problems	Article 17: include exchange of results of technical, scientific and socio-economic research as well as information	Article 6: public access to information on climate change and its effects and public participation in addressing and developing responses
Regulatory framework	Article 10: incorporate long-term strategies to combat desertification and mitigate the effects of drought, emphasize implementation and be integrated with national policies for sustainable development	Article 8: regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use	Article 3(4): Adopting appropriate policies to integrate UNFCC obligations with national development programmes Article 4: periodic national inventories of GHG emission; programme for the control of climate change; incorporate suitable policies for the control of climate change in national plans

Source: Munir (2007)

5.2.2 MEAs other than three Rio Conventions

In addition to the three Rio Conventions, Bangladesh has also signed several other MEAs that date back to early 1980s. These MEAs are:

- Ramsar Convention: Convention on Wetlands of International Importance, especially Waterfowl Habitats, Ramsar (ratified in 1992)
- CITES: Convention on International Trade in Endangered Species of Wild Flora and Fauna (ratified in 1982)
- CMS: The Convention on Migratory Species of Wild Animals (ratified in 2005)
- Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal (ratified / accessed in 1993)
- Montreal Protocol on the Substances that Deplete the Ozone Layer (signed in 1994)
- Stockholm Convention on Persistent Organic Pollutants (POPs) (signed in 2001)
- World Heritage Convention 1972
- World Trade Organization 1994
- Agenda 21

Ramsar Convention

The Ramsar Convention (www.ramsar.org) aims to stop the illegitimate encroachment on and loss of wetlands by recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific and recreational values. This Convention is intricately related to the CBD relating to conservation of wetland biodiversity.

CITES

The mission of this Convention is to ensure that no species of wild fauna or flora becomes threatened with extinction or subject to unsustainable exploitation because of international trade (www.cites.org). It contains Appendix-I covering endangered species in which trade is to be rigorously controlled; Appendix-II covering species that may become endangered unless trade is regulated; Appendix-III concerning species that any party may wish to regulate and require international cooperation to control trade and Appendix-IV concerning model permits.

CMS

The CMS (www.cms.int) aims to conserve terrestrial, marine and avian migratory species throughout their range. CMS Parties strive towards strictly protecting these animals, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them. Besides establishing obligations for each State joining the Convention, CMS promotes concerted action among the Range States of many of these species. The CoP is the decision-making organ of the Convention. It establishes and keeps under review the financial regulations of the Convention, adopts the budget for each financial period and reviews the implementation of the Convention. In particular, it may review and assess the conservation status of migratory species - especially migratory water bird and marine turtle - and the progress made towards their conservation; it provides guidance, receives reports and makes recommendations to the Parties. The CoP meets at intervals of not more than three years. So far, since the Convention entered into force in 1983, the COP has held seven meetings. The next CMS Conference of the Parties (CoP9) will take place in 2008.

Basel Convention

The Convention (www.basel.int/convention) aims to reduce transboundary movement of hazardous wastes to a minimum level and ensure environmentally sound and efficient management of such wastes as close as possible to the source of generation. Bangladesh has signed the Basel Convention and attended the follow-up meetings. But it is yet to take any concrete action to stop import of wastes into Bangladesh.

Vienna Convention on Ozone Layer, the Montreal Protocol and Subsequent Amendments

The central objective of the Vienna Convention is to protect human health and the environment against adverse effects resulting from human activities that deplete the ozone layer gradually. The Montreal Protocol provides for specific obligation, including limitations and reductions on the calculated levels of consumption and production of certain ozone depleting substances like carbon and halogen based substances. The subsequent amendment of 1990, recognizing the development needs of the developing countries, made provisions for additional financial resources and access to relevant technologies.

Stockholm Convention on Persistent Organic Pollutants

Bangladesh signed the Stockholm Convention on Persistent Organic Pollutants (POPs) (www.pops.int) on 23 May 2001, after actively taking part in the negotiation process leading to the final Convention.

World Heritage Convention

The Convention Concerning the Protection of the World Cultural and Natural Heritage (the World Heritage Convention) was adopted by the UNESCO General Conference at its 17th session in Paris on 16 November 1972. The Convention came into force in 1975. The World Heritage Convention aims to promote cooperation among nations to protect heritage from around the world that is of such outstanding universal value that its conservation is important for current and future generations. It is intended that, unlike the seven wonders of the ancient world, properties on the World Heritage List will be conserved for all time.

UNCLOS

The United Nations Convention on Law of the Sea (UNCLOS), also called the Law of the Sea Convention and the Law of the Sea Treaty, is the international agreement that resulted from the third United Nations Convention [Conference] on the Law of the Sea, which took place from 1973 through 1982. The Law of the Sea Convention defines the rights and responsibilities of nations in their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. The Convention concluded in 1982 replaced four 1958 treaties. UNCLOS came into force in 1994, a year after Guyana became the 60th state to sign the treaty. To date 155 countries and the European Community have joined in the Convention.

World Trade Organization (WTO)

Bangladesh is also a signatory to Marrakesh Agreement establishing WTO (www.wto.org) in 1994. Agreement on Trade Related Aspects on Intellectual Property Rights (TRIPs) is an annex to WTO agreement. There are disagreements between some articles of CBD and TRIPs. While Articles 8(j) and 15 of CBD granted access to genetic resources, Article 27.3(b) of TRIPs gave patent rights for protection of plant varieties. Bangladesh being a signatory to both these documents needs to strike a balance between the contentious issues.

Agenda 21

Chapter 15 of Agenda 21 (www.un.org/esa/sustdev/agenda21) deals with the conservation of biological diversity. Agenda 21 has also made provisions for combating deforestation (chapter 11), combating desertification and drought (chapter 12), Sustainable Mountain Development (chapter 13), Sustainable Agriculture and Rural Development (chapter 14), Management of Biotechnology (chapter 16) etc. Bangladesh has not developed a National Agenda 21 per se. However, a number of plans and policies including NEMAP and NCS have elaborately dealt with the principles of Agenda 21.

5.3 Current Situation and Stocktaking

5.3.1 Bangladesh's efforts on Rio Conventions

Bangladesh, in the process of fulfilling the obligations of Rio Conventions, has already prepared a few reports such as Initial National Communication and National Adaptation Programme of Action (NAPA) under UNFCCC (2002). The MoEF, the focal ministry with respect to UNFCCC, formulated NAPA, in August 2005 and identified 15 possible projects that would need an amount of US$ 73.70 million, to mitigate the adverse impacts of Climate Change. Being actively involved in the process of NAPA, IUCN Bangladesh, the implementing partner of NCSA, is already in close liaison with other sectoral working groups of NAPA preparation. This will be a good opportunity for NCSA to incorporate priority areas of action under UNFCCC.

Another obligation of the signatories to the CBD is formulation of NBSAP (2006). Under CBD, enhancement of national capacity to implement NBSAP is crucial. NBSAP has emphasized capacity building initiative as one of the priority areas of intervention. During implementation of NCSA, it will definitely play a vital role to execute the capacity enhancement initiative under NBSAP. IUCN Bangladesh as an executing agency on behalf of the Ministry of Environment and Forests has thorough knowledge and understanding of the process of NBSAP preparation and that experience will facilitate the process of linking NCSA with NBSAP implementation.

Another obligation of the signatories to the UNCCD is formulation of National Action Programme (NAP). The NAP for combating desertification has also been finalized. IUCN Bangladesh was given the responsibility to prepare the NAP document. In the process of NAP development, all relevant stakeholders and priority areas of actions have already been identified. NAP preparation will also create opportunities of linking NCSA with the identified area of capacity building under NAP.

Since 1998 IPSU, MoEF is implementing SEMP component entitled 'Capacity Building for Environmental Legislation and Policy Analysis' which is very much related to NCSA implementation. During the NCSA, a close liaison with IPSU will ensure utilization of previous experiences. The website www.sdnbd.org is a comprehensive website supported by SEMP which now works as an unofficial clearing-house of environmental information of Bangladesh. While collecting information and developing portal for NCSA, the experience of developing the aforementioned website will be fully utilized.

There are several other projects supported by different donors which are working in line with UN Conventions and contributing directly and indirectly to capacity building in the environmental management in Bangladesh. During NCSA process, close liaison with the on-going environmental projects maintained to bring in the experience of the project. NCSA also acquired experience of the completed projects and experienced individuals to further strengthen the capacity building under NCSA process.

5.3.2 Bangladesh's progress on other conventions

In this section, the actions taken so far under ICTPs other than Rio Conventions have been described.

Ramsar Convention: Under this Convention, the Sundarbans mangrove forest of southern Bangladesh and Tanguar Haor of Sunamganj District have been declared as Ramsar sites in Bangladesh.

CITES: The MoEF is the designated management authority for CITES. The Wildlife Advisory Board under the Wildlife Conservation Act 1974 now acts as the Scientific Committee. But any significant action has not yet been taken under this Convention except organizing some training workshops and NGO activities.

CMS: Bangladesh accessed this Convention in 2005. But any significant action has not yet been taken under this Convention.

Montreal Protocol: Bangladesh has already prepared an inventory of Ozone Depleting Substances (ODS) and completed the country phase-out plan under the Montreal Protocol in 1994. The plan suggested three concrete actions, viz.

- ACI, the aerosol manufacturing plant, is to phase out ODS as the propellant in the insecticide. This work is underway under a US grant.
- Establishment of an Ozone Cell in the DoE to monitor the phasing out plan and to develop the technical capability of the Government to undertake the follow-up actions. That cell is established and related activities are going on.
- Training for small ODS emission sources is yet to be implemented.

Basel Convention: In Bangladesh, ADB had financed a study project on 'Regulatory Framework on Import of Hazardous and Toxic Materials' and its report was published in 1997. In 1994, the DoE, with WHO funding, organized a training programme and workshop on 'Toxic Chemicals and Hazardous Wastes' and 'Risk Assessment and Management'. Before that, another WHO consultant had prepared a position paper on the use of toxic chemicals and disposal of toxic and hazardous waste in Bangladesh.

POPs: At the moment DoE has been implementing a project on PoPs. Bangladesh has cancelled the registration of all POPs pesticides; in fact all authorizations for chlorinated hydrocarbons for pesticide use have been withdrawn. In addition to this, the Government has listed fifteen pesticides as being banned, namely: BHC, Chlordane, DDT, Dieldrin, Dicrotophos, Disulfoton, Endrin, Ethyl Parathion, Isobenzene, Methyl Parathion, Methyl Bromide, Mercury Compound, Methoxychlor, Posmet, Phospamidan, Monocrophos and Kalthane. The last POPs pesticide in use, Heptachlor, was banned in 1996. The production of DDT was discontinued in the 1991. There are no data on possible stockpiles of POPs. No major stockpiles of the pesticide POPs are expected to be in the countryside, as the pesticide legislation requires importers, manufacturers and distributors to take back outdated pesticides.

PCBs are banned under the Pesticide Rules of 1985, the main legal instrument for restricting hazardous chemicals. However, there is still a large quantity of transformers and capacitors containing PCBs in use. There are some PCBs stored in the maintenance facilities of power distributors waiting to be re-used. There exists no legislation on dioxins and furans in Bangladesh. The main legal vehicle, which would be relevant to the issue of releases of dioxins and furans, is The Environment Conservation Act of 1995 and its Amendment of 2000. This legislation gives a mandate to the overall quality of air and water, but does not explicitly mention dioxins and furans.

UNCLOS

The United Nations Convention on Law of the Sea (UNCLOS), is very important for Bangladesh to protect the sea resources within the legal jurisdiction of its sea boundary. The GoB is yet to take initiative to implement its mandates on the Convention.

5.3.3 On-going and completed projects and programmes addressing more than one Convention

Project names and donors are given below.

- Sustainable Environmental Management Programme (UNDP)
- Bangladesh Environmental Management Project (CIDA)
- Bangladesh Rural Electrification and Renewable Energy Development (WB/GEF)
- Regional Climate Predictions for National Vulnerability Assessments (DFID)
- Impact of Climate and Sea Level Change in part of the Indian Sub-continent (DFID)
- Dialogue on Water and Climate (the Netherlands Government, IUCN)
- Promotion of Renewable Energy, Energy Efficiency and Greenhouse Gas Abatement (ADB, BCAS)
- National Water Management Plan Project (GoB, GoN, WARPO)
- Integrated Coastal Zone Management Programme (GoN, DFID)
- Offshore Islands Renewable Energy Development (UNDP-GEF)
- Comprehensive Disaster Management Programme (DFID-UNDP)
- Reducing Vulnerability to Climate Change Project (Canada Climate Change Development Fund)

5.3.4 Synergies among RCs related policies in Bangladesh

Table 5.2 summarizes some relevant policies and action plans, to synergize with three Rio Conventions.

Table 5.2: Policy synergies among the three Rio Conventions

Policies	UNFCCC	CBD	UNCCD
National Environmental Management Action Plan, 1992	Maintenance of the ecological balance and protection of the country against natural disasters	Promoting better management of scarce resources and reversing present trends of environmental degradation	Identification and control of all types of activities related to pollution and degradation of environment
National Environment Policy, 1992	Removal of environmental adverse impact in the case of water resource and flood control	Enforcement of research, exchange of knowledge and experience and conservation of wildlife and biodiversity	Prevention of land degradation, fertility conservation and increase

Policies	UNFCCC	CBD	UNCCD
National Forest Policy, 1994	Climate change and watershed management	Forest policy has clear mandate regarding the enhancement of biodiversity	Increasing forest cover to 20 percent of the total land area by 2015 to maintain the ecological balance and to attain self sufficiency in forest produce
National Water Policy, 1999	Joint activities with associated countries for development, collection and distribution of water resources on international rivers for increasing water flow in dry season reducing flood intensity during rainy season	Water resources development with conservation of fisheries, forests and other aquatic animals	Ensuring water availability from all sources for meeting demand during dry season and finding out deficient areas based on land characteristics
National Agriculture Policy, 1999	Build up necessary arrangements for natural disaster mitigation	Conservation of the diversity of different crops	Building irrigation facility for crop production and inspiring farmers for using supplementary irrigation and adopting appropriate measures during drought
Land Use Policy, 2001	Forestation for natural balance	Conservation of tea, rubber and fruit trees, fish farming and increasing forest area and use of agricultural land	Preventing environmental pollution through forestation in suitable area and ensuring preservation of present forest area
Arsenic Mitigation Policy, 2004	Impact of arsenic on agricultural environment to be assessed and addressed	Assessment of the level of arsenic in soil, agriculture and livestock, identification of arsenic affected patients and population at risk	Arsenic contaminated aquifers have to be regularly monitored both horizontally and vertically within short distance
Coastal Zone Policy, 2005	Institutional framework for monitoring climate change and adaptive measures to climate change for coastal zone and resources	Steps to stop those activities which have adverse effects on bio-diversity and mitigation measures to minimize those effects	Reduction of vulnerability to natural disasters (e.g. drainage congestion, land erosion, drought) would be an integral aspect of the national strategies for poverty reduction

Source: Munir (2007)

5.4 Priority Environmental Issues

5.4.1 Common issues

Bangladesh is frequently identified as a poverty-ridden, resource-scarce and overpopulated country that faces natural calamities repeatedly. The major environmental disasters faced by the country are floods, cyclones and tidal surges, droughts, water-logging, deforestation, land erosion, especially riverbank erosion, and water pollution, especially arsenic contamination.

Floods: Bangladesh is a land of perennial floods. About 20% of the country is annually flooded which is considered benign as it maintains soil fertility, floodplain fish propagation and biodiversity. However, the devastating floods, which inundate about 37% of the lands every 10 years or so, severely affect the marginalized populations in coastal areas, depressions and other ecologically vulnerable zones. Floods assume particularly devastating character when the inflow of upstream waters and the monsoon rainfalls coincide, on the one hand, and peaks in the three major rivers – Ganges, Brahmaputra and Meghna – occur at short intervals, on the other. Among other natural disasters, cyclones and tidal surges have been responsible for huge numbers of human deaths and immediate destruction of houses, crops and cattle.

Droughts: Droughts are also commonly occurring phenomena that affect the north-western region at regular intervals. There has been a trend toward both intensification as well as narrower drought occurrence cycles. Apart from crop loss, a drought has other long-term implications. The soil dries up and the water level goes down drastically, making lands arid and unfit for cultivation. Shallow tube wells become inoperative and deep tube wells have to be sunk deeper and deeper as the water level falls. Another deadly impact of indiscriminate ground water extraction has been manifested in the countrywide arsenic contamination which has, to date, reportedly affected most of the districts of Bangladesh.

But more severe impact of chronic drought conditions is aridity and desertification as observed to be setting-in in the Barind Tract, that is, the south-western part of Rangpur, southern Dinajpur, north-western Bogra, and northern and south-western Rajshahi. Evidence of desertification is quite apparent in the dry and bare soil conditions in the above regions. With very little vegetation cover, the Barind Tract is an ecologically fragile zone, where organic content of the soil is very low. Soil, animals and human population alike suffer from nutritional deficiencies there.

Land degradation: Land degradation occurs in the form of loss of (i) soil quality through salinity intrusion, fertility decline, nutrient deficiency, and (ii) top soil through erosion. Much of the land degradation is human induced through destruction of forest and vegetation cover and due to farm activities in sloping and undulated lands. However, other forms of land degradation, namely salinization and aridity also are observed due to climate change and withdrawal of water upstream from the transboundary rivers. Soil fertility, especially micro-nutrient deficiency, also occurs because of unscrupulous use of chemical fertilizers for higher yields.

Riverbank erosion: Riverbank erosion is a major environmental hazard causing a net loss of 8,700 ha of valuable agricultural lands as well as homesteads, affecting about 100,000 people annually, which again results in mass pauperization and rural-urban migration.

Degradation of forests and loss of forestland: Although claimed otherwise, the actual forest cover in the country may not exceed 8%. The annual deforestation rate is about 3.3 compared to 0.6% in South Asia. There has occurred massive deforestation in the country's reserve forests – in the sal forests of Dhaka, Mymensigh, Tangail, Dinajpur and Rajshahi as well as in the reserve forests in the Chittagong Hill Tracts. While population pressure is conveniently cited as a major cause of deforestation, greediness and profit-seeking mentality of influential persons are no less, if not more, responsible for over-exploitation of these natural resources in the reserve forests as well as in the Sundarbans. A new form of encroachment on the forests has also occurred through the clearing of mangrove forests in the coastal areas for shrimp culture. In the process, the Chokoria Sundarbans has almost been destroyed.

Loss of biodiversity: Loss of forestland entails loss of biodiversity. Bangladesh has lost about 10% of its mammalian fauna, 3% of avifauna and 4% of the reptiles in the last 100 years. The major causes behind the extinction of various species are loss or destruction of habitat, commercial exploitation, changes in hydrological regime and increased aridity.

Loss of wetlands: The total wetlands e.g. haor, baor, beel and floodplains stood at a total of 6.3 million ha in the past. However, the area of the floodplains declined to 2.8 million ha in the year 2000. The major contributing factors have been flood control, drainage and irrigation (FCDI) and other infrastructure projects, expansion of human habitat, national policy of designating wetlands as wastelands and converting them into farmland to ensure more food grain production, over-felling of wetland trees, over-grazing and over-fishing, and modern chemical-based farm practices.

5.4.2 Bangladesh and trans-boundary/global environmental issues

There are other factors beyond the borders of Bangladesh building into unavoidable conditions and threats, which eventually stand in the way of environmental safety and sustainable development. Prominent among them is global warming leading to possible sea level rise, possible ozone layer depletion and its consequences, extreme climate variability, and drastic decline in the flow of water in the trans-boundary rivers as a result of withdrawal of upstream waters resulting in the desertification of the northern districts of Bangladesh.

Predictions have been made of a 9 cm rise in the sea level along the Bangladesh coasts by 2010 and a 45 cm rise by 2070. While a 9 cm rise may be adapted to by the people, the projected 45 cm rise will lead to submergence of 11% of lands and endangering at least 5% population). Several second round impacts are expected to follow, including out-migration of the coastal people exerting further pressure on urban areas, accentuated competition for agricultural lands and aggravation of biomass shortage in the coastal area, compounded with loss of biodiversity.

In addition to the above, a number of cross-cutting PEI have been identified in the NCSA process to respond to the global problems like climate change, loss of biodiversity and land degradation. The cross-cutting issues among RCs are as follows:

- Capacity building
- Education, training and public awareness
- Technology transfer
- Information, knowledge and data management

- Undertaking research and impact assessment
- Inventories, monitoring and systematic observations
- Poverty eradication, sustainable development and environmental security
- Reporting and monitoring
- Planning, policy development and reform of legal frameworks
- Public participation
- International cooperation
- Utilization of fund within the limited resources

5.4.3 Cross-cutting issues in the Action Plans

In response to RCs, Bangladesh has already formulated the three following documents (Fig. 5.2), which have been discussed in the previous chapters.

- National Biodiversity Strategy and Action Plan (NBSAP): NBSAP has emphasized capacity building initiative as one of the priority areas of intervention. During implementation of NCSA, it will definitely play a vital role in executing the capacity enhancement activities under NBSAP as well as Rio Conventions.
- National Adaptation Programme of Action (NAPA): One of the obligations of the signatories to the UNFCC is formulation of NAPA to mitigate the adverse impacts of Climate Change.
- National Action Programme (NAP): the National Action Programme for combating desertification has also been finalized. This will create opportunities of linking NCSA with NAP in the identified area of capacity building under NAP.

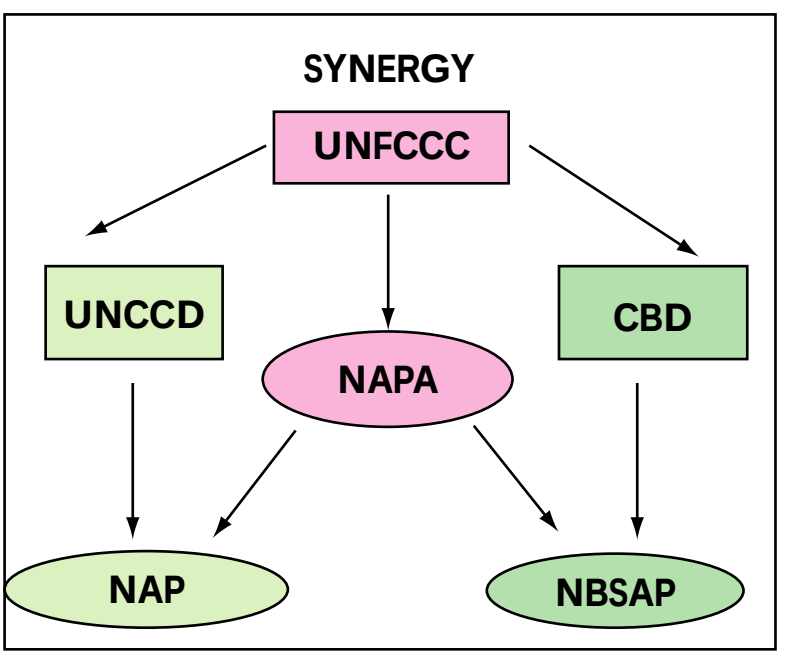

Fig. 5.2. Synergy among Rio Conventions and related Action Plans

The cross-cutting issues identified in these three documents are:

- Sustainable development
- Poverty eradication and environmental security
- Afforestation and reforestation
- Land degradation and biodiversity conservation
- Natural disaster management
- Watershed management using basin–wide approach
- Integrated approach of activities among the Conventions
- Improvement of the efficiency of fund utilization

5.5 Identifying Capacity Development Needs

A positive development in Bangladesh, like in many other countries in Asia, is that over the last few years the environmental awareness has increased to some extent, although not proportionately to the needs. Nonetheless, the institutional and policy shortcomings continue to be the major causes of overall failure in the achievement of sustainable development. Among them is poor environmental governance, weak vertical and horizontal coordination among different decision-making bodies and agencies of the Governments, and inadequate and improper enforcement of the policies that can help promote sustainable development.

The capacity need assessment conducted under the theme of synergizing Rio Conventions has identified 10 major needs in capacity building. The specific needs at individual, institutional and systemic levels under each of them are listed below. This section is primarily based on the Thematic Assessment Report authored by Munir (2007).

1. Need of financial resources

Institutional level

- Minimization of fund constraints and improvement in resource management
- Support for strengthening and for widening survey and inventory work

Systemic level

- Ensuring adequate local and foreign fund
- Identification of sources
- Sufficient incentive to the farmers
- Effective monitoring activities

2. Need of trained and skilled manpower

Individual level

- Need of trained personnel with understanding of cross-cutting issues of MEAs
- Need of skills in negotiations in international fora of MEAs

Institutional level

- Sometimes skilled persons are not selected to negotiate at COPs

3. Need of inter-agency coordination

Institutional level

- Coordination among the MEA implementing agencies
- Coordination among different institutions/organizations/officers

Systemic level

- Central coordination at the government level

4. Communication gap and low level of awareness

Individual level

- Promotion and expansion of environmental education among the communities
- Minimization of communication gap between knowledge generators (scientists/ academics) and users (general public)

Institutional level

- Adequate efforts of GOs or NGOs for environmental awareness building throughout the country

5. Limitations in national policies

Institutional level

- Since continuity of the institutional memory is inevitable, a mechanism has to be developed to keep the institutional memory within the government system.
- System to be evolved to retain individuals acquired knowledge, training and capacity

Systemic level

- Ensure policy and regulatory regime on MTA, benefit sharing mechanism
- Analyzing policies and fostering an environment to support the conservation of biodiversity, land management and climatic change adaptation programme
- Synergizing national policies keeping in view the priority environmental issues

6. Knowledge gap/ inadequate information regarding MEAs

Individual level

- Minimization of knowledge gap among the officials concerned to implement the Government policies, acts and rules
- Need of adequate knowledge among the general people about the importance of Rio Conventions
- Sensitization to mass on the priority environmental issues

Institutional level

- Need of prioritization on knowledge gap among the Government agencies concerned
- Ensure the administrative measure to prevent the erosion of institutional knowledge
- Updated database/data acquisition through appropriate institutions
- Apathy or lack of concern to local knowledge-base data documentation on environmental issues
- Absence of designated/authorized institutions as well as research or studies to generate knowledge base on micro-climatic variations within the localities, with especial emphasis on biodiversity, agro-production and spread of diseases

7. Limited participation from the stakeholders, especially communities, in planning and implementation

Institutional level

- Inadequate involvement of local community/ stakeholders (institutions, NGOs, etc.) in implementing projects concerning Rio Conventions through national endeavour

Systemic level

- Lack of national programme with strong multi-stakeholder involvement

8. Critical ecosystems not addressed

Institutional level

- Hill-cutting in the Chittagong and Sylhet regions creates destabilization in the ecosystem
- Water-logging in south-western part of Bangladesh need to be addressed with due importance, as a cross-cutting issue

9. Policy intervention and implementation

Systemic level

- Proper implementation of the existing policies
- Adequate political support, commitments and will to ensure sustainable development
- Political stability need to be sustained

10. Need to control the effects of population growth

Institutional level

- Controlling imbalance growth rate of human population particularly in the rural and slum area of Bangladesh
- Adequate thrust on the linkage between environment and population (livelihood, poverty, food security) as an important aspect of development projects towards achieving sustainable development

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Chapter **6**

CAPACITY DEVELOPMENT ACTION PLAN (CDAP)

Based on the obligations under different Conventions, identified Priority Environmental Issues (PIEs) and capacity development needs, a comprehensive Capacity Development Action Plan (CDAP) has been developed theme-wise. Each thematic area has been furnished with one or more outputs, one or more activities under each output, nature of capacity (i.e. individual, institutional and systemic), timeframe (i.e. short-term (1-3 years), medium-term (1-5 years) and long-term (1-10 years)) and potential implementing agencies. The implementing agencies mentioned in the CDAP are not exhaustive. More implementing agencies may be included during the project/programme development stage as per demand of the situation and scope of work. With a view to ensuring the sustainable environmental governance, 15 actions have been identified for climate change thematic area, 16 actions for biodiversity, 17 for land degradation and 12 for synergies among the RCs. Twenty-seven actions have also been identified to address the sectoral issues. In the final national workshop of NCSA, the participants have also prioritized some actions to draw the attention of the policy-makers.

6.1 CDAP under Climate Change Thematic Area

The inadequate human capacity and technology to monitor dynamics of anthropogenic emissions, and limited research and development programme on climate change are key factors constraining adaptation to and mitigation of climate change in Bangladesh. Existence of a national environment policy largely focusing on environment conservation, the implementation of the NAPA and good will of international community to address climate change provided opportunity to address climate change issues.

Action may be taken to improve monitoring of the dynamics of emissions and develop local emission factors. Studies should also be conducted on extreme weather events, vulnerability and impact assessment of climate change, and results documented as well as disseminated. Adequate emphasis may be given to developing adaptation and mitigation programme drawing from the NAPA and a regulatory framework for implementation of such programme. To ensure effective implementation of such programme, human resource and facilities in relevant line ministries, particularly the DoE, BMD, SPARRSO, BUET and other agencies concerned, including private sectors, should be strengthened in terms of technologies and skills to monitor dynamics of emissions in Bangladesh. Implementation of the above interventions is expected to contribute to the expansion of the knowledge base on climate change and strengthened institutional capacity to formulate and implement programme on monitoring, adaptation and mitigation of climate change. Some models of CDAP on adaptation, mitigation and CDM are given below.

Table 6.1.1: Community Based Adaptation Programme

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Enhanced education, awareness and training system promoted	1.1 Inclusion of climate change related issues in primary/secondary curricula	Sys	S/M	Board of Education Relevant Ministries
	1.2 Education, training and awareness rising programmes for development organizations working at community level and their CBOs	Ins	S	NGO Bureau / DOE
	1.3 Awareness programmes regarding the outbreak and treatment of diseases triggered by climate change	Ind	M	Ministry of Health, DPHE
2. Improved health, hygiene, housing and sanitation facilitated	2.1 Establishment of mobile clinics under Government supervision	Ins	M	Ministry of Health, DPHE
	2.2 Increased number of cyclone shelters, with storage facilities for food, essentials and livestock	Ins	M/L	LGED, DPHE, DMB
	2.3 Ensuring water availability through setting up deep tube wells and rain water harvesting	Ins	M	LGED/DPHE
	2.4 Sustainable housing programme for the community people keeping in mind devastating cyclones / storms	Ins	M/L	NHA

CD: Capacity Development, CDAP: CD Action Plan; Nature of CD: Ind: Individual Capacity, Ins: Institutional Capacity, Sys: Systemic Capacity
Time Frame: L: Long term (1-10 years), M: Medium term (1-5 years), S: Short term (1-3 years)

Output	Activity	Nature of CD	Time Frame	Implementing Agency
3.Livelihoods and Alternative Income Generating Activities promoted	3.1 Collection and preservation of indigenous/local varieties of seeds that are salt tolerant or less water intensive and drought resistant	Ind/Ins	M	DAE
	3.2 Diversification of crops for better adaptation, including cultivation of medicinal plants and temperature tolerant varieties such as wheat/vegetables	Ind/Ins	S/M	DAE/ BADC / BRRI / NGOs
	3.3 Provision of micro-credit to the affected, coupled with technical know-how for developing their traditional occupations	Ind	S	BRDB / NGOs / PKSF / DoE
	3.4 Carrying out pilot and demonstration projects on adaptation to climate change to show effectiveness of community based adaptation project and livelihood improvement	Ins	M	DoE
	3.5 CD for CBOs for retention of indigenous knowledge	Ins	M	NGO Bureau
	3.6 Expansion of floating garden in water-logged areas for year-round crop production	Ins	M	NGOs

Table 6.1.2: Climate Resilient Adaptation Programme

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Climate resilient adaptation programme in place	1.1 Designation of alternative focal points for Rio Conventions in all ministries / agencies	Ind	S	MoEF
	1.2 Specialized training in negotiation skills for key officials	Ins	M	MoEF
	1.3 Mainstreaming climate resilient development planning for all projects/programmes	Ins	L	Planning Commission

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Climate resilient adaptation programme in place	1.4 Networking and information sharing amongst agencies/departments	Ins	S	MoEF / DoE
	1.5 Module for policy-makers on environmental issues	Ins	M	BPATC
	1.6 Promoting the transfer of technologies for adaptation	Ins	M	DoE
	1.7 CD for the Dept. of Health and its professionals to handle vector borne diseases due to climate change	Ins	M	Department of Health
	1.8 Develop project to identify and assess the technology needs for different sectors	Ins	S	DoE
	1.9 Preparation and development of Digital Elevation Mapping (DEM)	Ins	M	BMD / BWDB/ SoB
	1.10 Development of Climate Risk Reduction Action Plans	Ins	S	DoE
	1.11 Initiating dialogue with high level policy-makers in the ministries with special thrust on the MoEF, Ministry of Water Resources, Ministry of Finance and Planning etc to demonstrate importance of climate change adaptation and linkage with development efforts	Ind	S	MoEF, FD, MoWR
	1.12 CD of the concerned officials for systematic observation of climatic variation and regular monitoring	Ins/Sys	M/L	DoE/ BMD/ SPARRSO/ FFWC
	1.13 Modeling in particular relation to general circulation models and their down scaling to regional and national levels for better impacts assessment. Existing institutes having experience and involved in the modeling exercise can be a starting point	Ins	M	DoE/ BMD/ SPARRSO / BUET / CEGIS / BARC/ IWM
	1.14 Capacity building for planning departments of the sectoral ministries can be initiated for integrating adaptation to climate change	Ins	M	MoEF/ Planning Division/ All Ministries
	1.15 Establishment of an International Climate Change Centre in Bangladesh	Ins	M	MoEF/ Planning Commission/MoFA

Output	Activity	Nature of CD	Time Frame	Implementing Agency
2. Sustainable agricultural crops promoted and practiced	2.1 Promotion and replication of saline tolerant variety in the coastal area of Bangladesh	Ins	M	DAE
	2.2 Introduction of crop insurance in the climate risk areas of the country	Sys	S	Ministry of Commerce/ DAE
	2.3 Sensitization of public and private insurance companies to introduce crop insurance in the climate risk areas of the country	Sys	S	MoC/ Sadaran Bima Corporation/DAE
3. Sustainable infra-structure constructed to cope with CC	3.1 Construction of roads, rails, tele-communication, gas line, airport and other service sectors keeping in mind the adverse impacts of CC	Ind	M	MoC, T&T, RHD, MoEMR

Table 6.1.3: Efficiency in the Energy Sector

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Reduced GHG emissions through efficient use of energy in the energy-intensive sectors	1.1 Replacement of fluorescent lamps and incandescent bulbs with electronic ballast, reflectors and compact bulbs	Ins	L	PDB/DESA/ PetroBangla /Private sectors (PS)
	1.2 Use of high-efficiency motors in industries	Ins	M	MoI, MoEMR, PS
	1.3 Replacement of old refrigerators with new high energy-efficient models	Ind	S	DoE, PS
2..Waste products from industries used for combustion in co-generation processes	2.1 Converting wood waste to bio-gas	Ins	S	MoEMR
	2.2 Recovering heat from high-temperature waste sources to steam	Ins	M	MoEMR, BPDB

Output	Activity	Nature of CD	Time Frame	Implementing Agency
3. Improved cooking stoves used in rural areas	3.1 Promotion and expansion of efficient stoves in rural homes, schools, hospitals, hostels, police barracks etc	Ind/Ins	M	BCSIR/ LGED / NGOs / PS
4. Small-scale photovoltaic plants or other renewable energy options installed in remote areas	4.1 Installation of solar panels	Ins	S	BCSIR/ LGED / NGOs / PS
	4.2 Construction of small run-off-river hydro power plant	Ins	S	BCSIR/REB/ GB/ PS
	4.3 Establishment of wind turbines in suitable areas	Ins	L	BPDB/DESA/ REB/ GB/ PS
5.Promotion and expansion of more bio-gas plants in the rural areas	5.1 Use of human waste in bio-gas plants	Ins / Ind	S/M	BCSIR/ LGED / PS REB/ GB
	5.2 Use of waste from livestock and poultry firms in bio-gas plants			
6. Efficient energy production system in place	6.1 Replacement of old technology of BPDB with new and modern technology	Ins	M	BPDB
	6.2 Trained manpower to operate / adapt to the new technology	Ins	M	BPDB

Table 6.1.4: Energy efficiency in the Transportation Sector

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1.Compressed Natural Gas (CNG) used	1.1 Conversion of car/bus engines to CNG as the principal source of fuel instead of gasoline/petroleum products	Ind	S	PetroBangla

Output	Activity	Nature of CD	Time Frame	Implementing Agency
2. Number of vehicles emitting GHGs reduced	2.1 Increasing vehicular sales taxes, fuel taxes and road charges	Ins	S	BRTA /MoEF
	2.2 Stimulating car pooling through subsidies in the transport sector	Ins	S/M	BRTA/BRTC
3. More energy efficient new vehicles imported	3.1 Levying stringent trade regulations, tariffs aimed at fuel efficiency and domestic fuel taxes	Sys	M/L	BRTA / DoE
4. Efficient inland water transport management in place	4.1 Efficient use of fuel 4.2 Efficient disposal of waste and garbage	Ins	M	BRTA / DoE

Table 6.1.5: Promotion and expansion of Clean Development Mechanism (CDM)

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Promotion and expansion of CDM	1.1 Skill development in private sector regarding CDM investments with special emphasis on Chambers, etc	Ind	M	MoEF, DoE, DMCC, WC
	1.2 Training in design and proposal writing for CDM projects	Ind	S	MoEF, DoE, DMCC, WC
	1.3 Awareness campaigns among relevant industries/chambers, civil servants, judiciary, banks, clubs etc	Ind	S	MoEF, DoE, DMCC, WC, FBCCI
	1.4 CD of the concerned departments for development of sector specific CDM Project. Capacity building to prepare good CDM proposals	Ins	M	MoEF, DoE, DMCC, WC
	1.5 Capacity building of the members of the Designated National Authority on CDM modalities and procedures, and how it functions	Ins	S	MoEF, DoE, DMCC, WC, FBCCI

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	1.6 Co-generation – Formulation of policy to buy electricity from co-generators is required	Sys	S	MoEF / Power Division
	1.7 Reducing interest rate of bank loan for CDM projects approved by the DNA	Sys	S	BB, Finance Division
	1.8 Inclusion of carbon trading (buying & selling of CER) into share markets	Sys	S	BB, Finance Division, SEC
	1.9 Production of documentaries on the process of probable CDM projects to demonstrate to the potential investors	Ins	S	MoEF, DoE, DMCC, WC, FBCCI

Table 6.1.6: Promotion of carbon sinks in the Forestry Sector

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Carbon sinks expanded through massive afforestation programme	1.1 Reducing the rate of deforestation	Ins	S/M	FD
	1.2 Conserving and expanding protected forest areas	Ind	S	FD
	1.3 Encourage intercropping and agro-forestry	Ins	M	FD
	1.4 Introduce urban forestry practices in fallow lands / roof tops/ graveyards	Ins	M	FD/ DAE / DCC
2. Increased efficiency of wood use and better utilization of wood	2.1 Improving technical efficiency of wood recovery through improved harvesting and milling techniques to reduce waste	Ins	M	Timber Merchants, BFRI
	2.2 Increasing the merchantable uses of wood from existing harvests	Ins	S/M	Timber Merchants, BFRI
3. Expansion and Replication of existing Participatory Afforestation Programme (PAP)	3.1 PAP in the nude hills of Chittagong, Rangamati, Khagrachiri, Bandarban and Sylhet districts	Ins	M	FD/District Admin/ NGOs
	3.2 PAP in the coastal areas of Bangladesh – (roads, rails and dams)	Ins	M	FD/RHD / LGED/ BWDB / NGOs

Table 6.1.7: Mitigation and Waste Management

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Methane generated from landfill sites recovered and used to produce energy	1.1 Safe handling and collection of methane from landfill sites for generation of power	Ins	M/L	PDB/ Municipal Corporation/ WC
2. Quantity of landfill waste reduced through source reduction, recycling etc	2.1 Sorting of waste at source and recycling of wastes such as glass/paper/ plastic	Ins	S/M	Municipal Corporation/ Waste Concern
3. Sustainable waste management in major cities established	3.1 Establishment of incineration plants in major cities of Bangladesh to produce power from the municipal waste	Ins	M	PDB/ DESA/ DCC/WC
	3.2 Institutional capacity building of PDB/ DESA/ DCC for establishment of incineration plants in major cities of Bangladesh to produce power from the municipal waste	Ins	S	PDB/ DESA/ DCC/ WC
	3.3 Technology need assessment for incineration plants in major cities of Bangladesh to produce power from the municipal waste	Ins	S	PDB/ DESA/ DCC/ WC

Table 6.1.8: Mitigation through the Agriculture Sector

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Anaerobic fermentation/ production of methane from flooded rice field reduced	1.1 Construction of small-scale digesters for gas recovery and use in rural areas	Ins	M	BRDB
	1.2 Conversion of lagoons for trapping methane by placing impermeable layer	Ins	M	BRDB
2. Biomass crops used as substitute for fuel	2.1 Encouraging plantation of biomass crops (woody crops/corn) in fallow lands	Ins	S/M	DAE / LGs /NGOs

Table 6.1.9: National inventories of anthropogenic emissions by sources

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Develop, periodically update, publish and make available to the Conference of the Parties, in accordance with Article 12, national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol (Article 4.1(a))	1.1 Initiating a programme to develop country specific emission coefficient for different sectors (agriculture, forestry, waste, etc.) including through the enhancement of systematic observation and monitoring networks	Ins	S/M	DoE and RO
	1.2 Linking international research institutes working on emission coefficient	Ins	M	DoE, BUET
	1.3 Establishing National GHG Emission Database along with sector specific emission coefficient	Ins	S	DoE and RO
	1.4 Modelling, in particular related to general circulation models and their down scaling to regional and national levels for better impacts, vulnerability and adaptation assessment	Ind	S	DoE, BCAS, BUP, BUET, BMD, SPARRSO, IWM, CEGIS

Table 6.1.10: Integration of climate change considerations into social economic and environmental policies

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Integration of climate change considerations into social, economic and environmental policies and actions, and formulation and use of appropriate methods, e.g. environmental impact assessment (EIA), to minimize adverse social, economic and environmental impacts of projects or activities undertaken to mitigate or adapt to climate change (Article 4.1(f))	1.1 Dialogue and persuasion with ministry of planning, finance and sectoral ministry by the climate change focal point	Sys	S/M	MoEF and Others
	1.2 Preparing policy document to facilitate discussion and persuasion	Sys	S	MoEF and Others
	1.3 Preparing tools and methods for integrating climate change in national and sectoral development plans	Sys/Ins	S/M	BCAS, WARPO, CEGIS, BUET
	1.4 Engaging local government institutes in decentralized planning	Sys/Ins	S/M	LGRD, LGED
	1.5 Screening of national and sectoral development portfolio	Sys/Ins	S	BCAS, CEGIS, BUET, BIDS
	1.6 Downscaling climate change model for different regions (coastal, drought prone, flood prone etc.)	Ins	S/M	DoE, BUET, BCAS, CEGIS
	1.7 Providing training to planning cell in each ministry	Ins/Ind	S	DoE and other
	1.8 Demonstration of adaptation project to build confidence and scale up	Ins	S/M	Sectoral Ministry and Agency
	1.9 Capacity building for Seasonal Forecast and Application	Ins	M	BMD
	1.10 Carrying out pilot and demonstration projects on adaptation to climate change to show effectiveness of community based adaptation project and livelihood improvement	Ins	S/M	UNDP SGP Programme through NGO
	1.11 Discussion with bilateral and multilateral development partners for resources allocation for incorporation climate change	Sys/Ins	S/M	Ministry of Finance and MoEF
	1.12 Link sectoral ministries to international climate change funds	Sys/Ins	S/M	MoEF

Table 6.1.11: Formulation and implementation of national programmes to reduce GHG emissions

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Formulation, including regular update, and implementation of national programmes to mitigate climate change by addressing GHG emissions and removals and to facilitate adequate adaptation to climate change (Article 4.1 (b))	1.1 Developing policy and operational modalities for single point service for CDM project	Sys	S	DoE, BCAS, WC
	1.2 Creating a CDM-friendly environment in the government, research and academic institutes for facilitating CDM project development activities in Bangladesh	Ins	S/M	DoE, BCAS, WC, BUET
	1.3 Capacity development training in modalities and procedure for developing CDM project	Ind	S	DOE, BCAS, WC, BUET
	1.4 Development of baseline for different sectors and activities	Ins	S/M	DoE, BUET and other agencies
	1.5 Capacity building for management of operation data of potential public sectors such as sugar mill where cogeneration potential is high	Ins	S/M	DoE and RO
	1.6 Awareness / promotion of private sector on CDM potential	Ins	S	WC, BCAS, DoE

Table 6.1.12: Promotion and transfer of technologies to reduce GHG emission and carbon sink

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Promotion of, and cooperation in, the development, application and diffusion, including transfer of technologies, practices, and process that control, reduce or prevent GHG emissions (Article 4.1(c))	1.1 Formulation and enactment of policy on renewable energy to support different types of renewable energy technologies in Bangladesh	Sys	S/M	Power Cell, DoE
	1.2 Encourage private sector to invest more on renewable energy application	Ins	S/M	Power Cell, DoE

Output	Activity	Nature of CD	Time Frame	Implementing Agency
2. Promotion of sustainable management, conservation and enhancement of sinks and reservoirs of all GHG gases (Article 4.1(d))	2.1 Promotion of afforestation programme in Bangladesh	Ins	S/M	FD, MoEF
	2.2 Capacity Building for data collection, analysis and preparing national GHG inventory and monitoring	Ins	M	DoE

Table 6.1.13: Non-Kyoto Market Mechanism

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Capacities of UNFCCC focal point and DNA of Bangladesh on non-Kyoto market mechanisms built	1.1 Effective policy measures to understand and partner methane to market initiatives	Sys	S	MoEF / DoE
	1.2 Sensitizing policy-makers to avoiding deforestation and being a party to other global non-Kyoto initiatives such as carbon sequestration partnership programme	Ins	M	MoEF / DoE
	1.3 Building capacities of climate change delegation of Bangladesh on other partnership initiatives at the regional level such as Asia Pacific Partnership Programme on mitigation of climate change	Sys / Ins	S	MoEF / DoE
2. Capacity of Bangladesh built on developing an Asia Emissions Trading System (AETS) as a shock-absorber in the post 2012 Kyoto architecture	2.1 Dialogue with potential partners in the region to set up an AETS forum	Sys	S	MoEF / DoE
	2.2 Building capacity of UNFCCC focal points in Bangladesh and other key policy-makers considering European Union Emission Trading System (EUETS) as a case study/model	Ins	M	MoEF / DoE
	2.3 Organizing a regional consultation forum to discuss/deliberate further on formation of AETS with other like-minded countries	Sys	L	MoEF/ DoE

Table 6.1.14: CDAP for Post 2012 climate regime

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Future plan, programme contributing to the Post 2012 climate regime	1.1 Awareness campaigns for relevant ministries	Ins	S	MoEF, DoE
	1.2 Integrated coastal zone development programme in respect of climate change keeping in mind sea level rise	Ins	M	MoL, MoEF, DoE
	1.3 Research on climate change impacts, vulnerability and adaptation	Ins	M	MoL, MoEF, DoE
	1.4 Research on the improvement of the design criteria and development of the suitable technology adaptive to the changed scenario due to climate change	Ins	M	RHD, MoEF, DoE
	1.5 Development of public-private partnerships	Ins	S	MoEF, DoE
	1.6 Networking amongst Government agencies regarding climate change issues	Ins	S	MoEF, DoE
	1.7 Provision of opportunities for young professionals to learn about climate change	Ins	S	MoEF, DoE
	1.8 Institutional memory retention through internalizing climate change considerations within GoB system	Ins	S	MoEF, DoE
	1.9 Capacity enhancement of public and private universities through training	Ins	S	MoEF, DoE
	1.10 Creation of linkages and partnerships between private sector, NGOs, academicians etc	Ins	S	MoEF, DoE
	1.11 Technical support and tools made available to research centers	Ins	S	MoEF, DoE
	1.12 Establishment of GHG emissions monitoring system	Ins	S	MoEF, DoE
	1.13 Designation of focal points within the ministries	Ins	S	MoEF, DoE

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	1.14 Development of module for civil service, teachers, police, customs officials etc	Ins	S	MoEF, DoE
	1.15 Strengthening of the disaster monitoring and early warning system	Ins	S	MoEF, DoE
	1.16 Coalition of LDCs (Asia and African) for better bargaining power to extract more resources	Ins	S	MoEF, DoE
	1.17 Climate Change Cell at DOE to develop a forum through e-mail service where individuals can share experience	Ins	S	MoEF, DoE
	1.18 Different funding possibilities for the younger professional/ concerned personnel to pursue higher education regarding climate change	Ins	M	MoEF, ERD

Table 6.1.15: Studies for Sustainable Environmental Governance

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Sustainable Environmental Governance ensured based on the findings of the studies	1.1 Detailed study of GHG mitigation mechanisms and policy options 1.2 Study of climate change impacts on agriculture, crop production and human health 1.3 Study of the impact of climate change on existing sewerage and drainage systems and urban water supply schemes 1.4 Study of impact of climate change on existing flood control, irrigation and drainage project 1.5 Study of ecosystem management, biodiversity and wildlife conservation and protection 1.6 Study of the change of agro-ecological zones, droughts and floods in Bangladesh at the changed scenario 1.7 Study of tropical cyclones using numerical models 1.8 Study of climate change-induced human displacements and their livelihoods 1.9 Study of incentive-based adaptation mechanism 1.10 Economic valuation of impacts and adaptation needs	Sys	S/M	MoEF / DoE / DMB / BMD

6.2 CDAP under Biodiversity Thematic Area

CD on Bioprospecting and ABS

One of the first steps towards a successful national biodiversity strategy is to conduct surveys to find out what biodiversity exists, its value and importance, and what is endangered. On the basis of these survey results, the Government of Bangladesh can set measurable targets for conservation and sustainable use. National strategies and programmes need to be developed or adapted to meet these targets. A set of (Bonn) guidelines was developed for effective implementation of ABS regime globally.

Sustainable use

Promoting the sustainable use of biodiversity in Bangladesh is a growing importance for maintaining biodiversity in the years and decades to come. Under the CBD, the "ecosystem approach to the conservation and sustainable use of biodiversity" is being used as a framework for action, in which all the goods and services provided by the biodiversity in ecosystems are considered. The Convention is promoting activities to ensure that everyone benefits from such goods and services in an equitable way. However, there are gaps in knowledge and information as far as sustainable use of the biological resources in Bangladesh is concerned.

Traditional knowledge & sharing the benefits of genetic resources

The CBD recognizes the close and traditional dependence of indigenous and local communities on biological resources and the need to ensure that these communities share the benefits that arises from the use of their traditional knowledge and practices relating to the conservation and sustainable use of biodiversity. An important part of the biodiversity debate involves access to and sharing of the benefits arising out of the commercial and other utilization of genetic materials, such as pharmaceutical products. Most of the world's biodiversity is found in developing countries, which consider it a resource for fueling their economic and social development. Historically, plant genetic resources were collected for commercial use outside their region of origin or as inputs in plant breeding. Foreign bioprospectors have searched for natural substances to develop new commercial products, such as drugs. Often, the products would be sold and protected by patents or other intellectual property rights, without fair benefits to the source countries. This issue is also of concern to the people and Government of Bangladesh.

6.2.1 CD on Bioprospecting and ABS

Table 6.2.1.1: Legal framework for sustainable management of biodiversity

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Legal framework for sustainable management of biodiversity developed	1.1 Enactment of "National Biodiversity Act" and formulation of "National Biodiversity Rules"	Sys	S	MoEF / MoA / MoFL
	1.2 Review of Quarantine Act to harmonize with biosafety and biotechnology	Sys	S	MoEF / MoA/ MoFL / MoSICT/ MoC
	1.3 Blending of science and law to create a standard format for Material Transfer Agreement (MTA)	Sys	S	MoEF / MoA / MoC/ MoFL
	1.4 Development of a perspective plan such as Vision 2025 for bioprospecting	Sys	S	MoEF / MoA MoSICT/ MoFL
	1.5 Drafting of policy and legal document (e.g. MTA, policy on PGR, Biodiversity Act, Plant Variety and Farmers Right Protection Act, Development of conceptual paper etc.)	Sys	S	MoEF / MoA/ MoSICT/ MoC/ MoFL
	1.6 Amendment of all concerned acts i.e. The Land Acquisition Act, Forest Acts in the light of conservation & management of biodiversity instead of revenue oriented management : - Ecological, economic & aesthetical values of biological resources; - Food chain of biodiversity & microorganisms; - Concept of ECA & EIA	Sys	S	MoEF / MoA / MoL

CD: Capacity Development, CDAP: CD Action Plan; Nature of CD: Ind: Individual Capacity, Ins: Institutional Capacity, Sys: Systemic Capacity
Time Frame: L: Long term (1-10 years), M: Medium term (1-5 years), S: Short term (1-3 years)

Output	Activity	Nature of CD	Time Frame	Implementing Agency
2. Creation of trust fund / gene fund/ biodiversity fund	2.1 Develop a legal framework for Trust Fund	Sys	S	MoFL / MoEF / MoA / MoFL / FBCCI / NGOs
	2.2 Preparation of Article of Association for Trust Fund			
	2.3 Developing the mechanism for collecting fund from - ■ Donation of the Government and Development Partners ■ Gate money from eco-tourism, botanical garden/ royalty / benefit from the commercialization of product by the bio-prospector of biological diversity ■ Encourage private sector access to venture capital funding and facilitate technology transfer arrangement to promote the development of value added products from biodiversity and sharing of benefit for the promotion of biodiversity conservation, utilization and capacity development activities			
	2.4 Up-front compensation, royalties on any new products to be shared with government/ private sector to establish a laboratory			

Table 6.2.1.2 Sustainable Management of Plant Genetic Resources (PGR)

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Plant Genetic Resources (PGR) managed sustainably	1.1 An assessment of genetic diversity, the rate and extent of PGR erosion and prioritization of PGR activities, based on the information gathered from such studies	Ins	M	BARC / BRRI / DAE / FRI / FD/ BNH / BARI

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	1.2 Establishment of a National Genebank for conservation, use and enhancement of biodiversity with appropriate infrastructure for conservation of orthodox and recalcitrant seeds, vegetatively propagated materials, including facilities for a Cryo-bank and a DNA-bank	Ins	M	BARC / BRRI /BJRI/ BSRI/ BARI/ DAE/ BFRI FD
	1.3 The national policy framework/legislation in pursuance of the principles of the CBD. The national framework will provide guidelines for (i) a *sui generies* system, (ii) access to and exchange of plant genetic resources, (iv) recognition of farming communities, their conservation and use of PGR, and their indigenous knowledge (Farmers' Rights) and benefit sharing, (v) adopting means to curb biopiracy, (vi) arrest genetic erosion and threat to conservation of biodiversity, (vii) protection of habitats rich in native diversity, (viii) biosafety regulation, and (ix) seed policies and other such concerns	Sys	M	MoEF/ MoA/ BARC / BRRI / DAE/ BFRI
	1.4 Building effective coordination among different stakeholders involving research bodies, public and the private sectors, NGOs, farmers organizations, etc. for achieving the above goals. BARC should strengthen its monitoring and coordination role on the PGR activities	Ins	M	MoEF/ MoA/ BARC / BRRI / DAE/ BFRI
	1.5 Human resources development and capacity building in PGR in various fields that need to be prioritized both for professional staff and technicians	Ins	M	MoEF/ MoA/ BARC / BRRI / DAE/ BFRI /BNH/ FD
	1.6 A national plan: a) to prioritize PGR activities in germplasm collection, characterization, evaluation, documentation and conservation, (b) to prepare inventories of such resources for their better utilization; and (c) to plan a national database	Sys	M	BARC / BRRI / DAE/ BFRI /BNH /FD
	1.7 Strengthening and integration of national PGR network including field genebanks	Ins	M	BARC / BRRI /BARI/ BJRI/ BSRI/ DAE

Output	Activities	Nature of CD	Time Frame	Implementing Agency
	1.8 Strengthening of national varietal improvement progrmmes and integration of such programmes with PGR activities	Ins	M	BARC / BRRI / DAE/ BFRI
	1.9 Dissemination of information and national concern on biodiversity conservation through increased public awareness (including introduction of course curricula on PGR/biodiversity in educational institutions at different levels), with participation of farming communities, NGOs and other partners	Ins	M	MoEF/ MoA/ BARC / BRRI / DAE/ BFRI/ Horticulture Department
	1.10 Development of a well-structured national plant quarantine system/policy for import and export of materials (seeds, plant propagules, in vitro cultures, genetic finger-printing, strengthening of short-and medium-term storage facilities at existing genebanks at other institutes	Ins	M	MoEF/ MoA/ MoC/ BARC / BRRI / DAE/ BFRI / Horticulture Department
	1.11 Developing monitoring and early warning system for PGRFA.	Ins	M	BARC / BRRI / DAE/ BFRI
	1.12 Building information Technology system (data base management) with special reference to information sharing on conservation and sustainable utilization of PGR	Ins	M	BARC / BRRI / DAE/ BARI/ BJRI/ BSRI/ BFRI

Table 6.2.1.3: Sustainable Management of Animal Genetic Resources (AnGR)

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Sustainable conservation & management of Animal Genetic Resources (AnGR) enhanced	1.1 Identification of keystone species and their protection	Ins	S	BLRI/ BAU / FD / DoF
	2.2 Breeding and distribution of threatened species and development of their management plan	Ins	S	BLRI / BAU / FD / DoF

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	1.3. Development of genebank and improvement of genetic resources for human benefit	Ins	M	BLRI/ BAU /BFRI
	1.4. Ecological farming of economically significant species	Ins	M	BLRI/ BAU BARC
	1.5. In situ and ex situ conservation programme for proper manipulation of biological resources	Ins	M	BLRI/ BAU /BFRI/Zoo
	1.6. Legislation for the conservation of such resources	Ins	M	MoEF/MoFL/ BLRI/ BAU
	1.7. Establishment of a Bio-energy Development Research Institute	Ins	M	MoEF/MoFL/ MoE/ BCSIR
	1.8. Community /Farmer participatory (in situ) conservation and utilization of regionally resourceful indigenous livestock species of Bangladesh	Ins	M	BLRI/ BAU

Table 6.2.1.4: National Programmes on Germplasm

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Strengthening of the national programmes on germplasm	1.1. Biochemical and molecular characterization of germplasm and its facility development	Ins	M	BARC/ BRRI/ BARI/ BJRI/ FD/ /BFRI
	1.2. Cryo preservation of germplasm	Ins	S	BARC
	1.3. Documentation of germplasm.	Ins	M	BARC
	1.5. Management of gene bank.	Ins	L	BARC
	1.6. In situ and ex situ conservation including long term seed bank, invitro bank, field repositories for tree species, root and rhizome crops, National Herbarium for cultivated plants, livestocks and fish	Ins	M	BARC/ BFRI/ BLRI/ BNH/FD/DoF / Botanical Garden

Table 6.2.1.5: Access and Benefit Sharing (ABS)

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Ensured access and benefit sharing (ABS) to the community peoples	1.1. Indigenous Knowledge may be protected and documented for the benefit of the future generation	Ins	M	MoEF / FD /MoA/DAE /DoF/MoCHT
	1.2. Institutional capacity building to protect biodiversity and prevent biopiracy	Ins	M	MoEF / MoA FD/MoC/ MoFL
	1.3. Education, training and awareness among the community people about the values of the genetic resources	Ind	S	MoEF / FD /MoA/ MoFL DoF
	1.4. Ensuring Intellectual Property Rights of the community people	Ins	S	MoEF / FD /MoA/ MoFL
	1.5. Addressing poverty and biodiversity conservation together	Ins	S	MoEF / FD/ MoA
	1.6. Alternative livelihood for the community people to reduce pressure on biological resources	Ins	S	MoEF / FD /MoA/ MoFL DoF/DAE

Table 6.2.1.6: Intra-Cross-cutting CD on Biodiversity

Output	Activities	Nature of CD	Time Frame	Implementing Agency
1. Intra-cross-cutting programme of biodiversity management	1.1. Building Geographical information system	Ins	S	MoEF / FD/SoB MoA/ DAE
	1.2. Methodologies of *in situ* conservation and on farm management.	Ins	S	MoEF / FD BARC/MoFL
	1.3. Regeneration of species conserved *ex situ*.	Ins	S	MoEF / FD BARC/MoFL
	1.4. Marker aided characterization	Ins	S	MoEF / FD BARC/MoFL
	1.5. Development and dissemination of updated data base on biodiversity	Ins	S	MoEF / FD BARC/MoFL

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	1.6. Back-up research on conservation regime and protocols.	Ins	S	MoEF / FD
	1.7. Promotion of eco-tourism activities	Ins	S	MoEF/ FD/BPC
2. Intellectual Property Rights (IPR) operationalised	2.1. CD for the officials of Patent Department, FD, Agricultural Department and other concerned agencies on IPR	Ins	S	MoA/MoEF / DAE/ FD/ BARC/BFRI/ Patent Department

6.2.2 CD on Biosafety

Proposed CDAP for biosafety at individual, institutional and systemic levels

Bangladesh has to build capacity at individual, institutional and policy levels for implementation of biosafety ensuring activities in the country. Capacity survey on biosafety and biotechnology status in the country under the 'Development of National Biosafety Framework' project revealed that capacity on biosafety at individual and institutional level are limited in terms of risk assessment, management and other aspects of modern biotechnology. UNEP-GEF, private entrepreneurs, GoB etc. sources may be the probable sources of funding in implementing biosafety related emerging activities. Proposed CD activities have been outlined below

Table 6.2.2.1 Capacity Development on Biosafety at Individual Level

Output	Activity	Time Frame	Implementing Agency
1.Training/ Advocacy/ Mainstreaming programme for policy-makers and regulators	1.1. Enhancement of understanding of GoB officials on linkage among various international treaties with biosafety protocol; negotiation skill development on bilateral, regional and international agreements related to biosafety	S	MoEF / MoA MoSICT/MoC / ERD/MoFA/ FD
2.Training for scientists /researchers/ NCB members /technical members of other biosafety committees/ officers and staff of implementing agency(ies)	2.1. Higher studies and research on biosafety and biosafety related courses (e.g. biosafety, food safety, food regulation, EIA, Risk assessment, Risk management, safe use of Genetic Engineering Techniques (gene isolation, gene-construct development, gene sequencing, insertion and gene expression etc.)	L	MoEF / MoA MoSICT/MoC / ERD/MoFA/ MoFL

Output	Activity	Time Frame	Implementing Agency
	2.2. Development of scientific methods and protocols relevant to risk assessment and management (e.g. extent and effects of gene flow, Substantial Equivalence etc.); monitoring and enforcement; safety operation of laboratory equipments; good laboratory practices; handling of GMOs and their safe disposal systems, standard documentation and auditing and accreditation procedures etc.;	S	MoEF / MoA MoSICT/MoC / ERD/MoFA/ MoFl
	2.3. Develop competency of concerned agencies i.e. MoFl, FD, DoF, DAE, DoLs etc for detection, testing and quantitative analysis of GMOs, food safety analysis and labelling aspects.	M	MoEF / MoA MoSICT/MoC / ERD/MoFA/ FD
3. Public information and education system developed	3.1. Publication of education materials (preferably in Bangla); awareness through printing and electronic media; capacity development for public notification and participation;		MoEF / MoA MoSICT/MoC / ERD/MoFA/ FD
	3.2. Publication of biosafety research data to make public confidence about risk management and also aware of the potential risk with biotech products.		

Table 6.2.2.2 Capacity Development on Biosafety at Institutional Level

Output	Activity	Time Frame	Implementing Agency
1. Strengthening of Institutional entities for handling biosafety issues	1.1. Establishment of a secretariat/cell for biosafety activities with, full functional NCB, BCC, IBCs and FBC	L	MoEF / MoA MoSICT/MoC / ERD/MoFA/ FD/MoFL
	1.2. Capacity building to implement/adopt the NBF, relevant guidelines and manuals etc at the institutional level	M	
	1.3. Strengthening of existing Biotechnology and Genetic Engineering departments/ laboratories and Government Institutions (e.g. DoE, BSTI, IFST etc.) in terms of modern equipment set-up and infrastructure development with full facility for contained use of GMOs and for their safety assessments	M	

Output	Activity	Time Frame	Implementing Agency
	1.4. Strengthening relevant government agencies such as border control (customs), quarantine and inspection facilities, and set-up data collection, management and storage facilities	M	
	1.5. Development of reference/accredited laboratories for wide range of safety analysis such as detection, testing and quantitative analysis of GMOs and GMOs products, analysis of food derived and/or processed from GMOs, Substantial Equivalence and Toxicological tests etc. and biosafety research	M	
	1.6. Establishment of inter-institutional networks for risk analysis, reporting, communication and management.	M	
	1.7. Enhancement of regional and international cooperation activities	M	
	1.8. Funding and resource management: fund raising skills, including proposal writing, project implementation training	M	
	1.9. CD for monitoring of GMO crops/ field at the field level	M	

Table 6.2.2.3 Capacity Development on Biosafety at Systemic Level

Output	Activity	Time Frame	Implementing Agency
1. Decision making system, information management system, administrative and regulatory procedures developed	1.1. Implementation of the NBF and Biosafety Guidelines. 1.2. Drafting, promulgation and enforcement of Biosafety Rules/Act. 1.3. Formulation of required/prescribed formats and manuals etc. 1.4. Development of Bangladesh Biosafety Clearing House (BBCH), network development for information on international collaboration and funding for risk assessment, management and harmonisation etc.	S	MoEF / MoA MoSICT/MoC / ERD/MoFA/ FD/MoFL

Output	Activity	Time Frame	Implementing Agency
	1.5. Harmonisation of biosafety related sectoral laws/policies; standardised formats and procedures for information exchange		
	1.6. Review of mechanisms of biosafety decisions, regulatory training (legal, policy, enforcement, inspection etc.)		
	1.7. Multidisciplinary strategic planning; Biotechnology policy, analysis of risk assessment and management and integration of socio-economic considerations		
	1.8. Enabling policies mechanism for technology transfer and		
	1.9. Analysis of Biosafety Guidelines, NBF and other relevant documents for effective coordination and implementation of biosafety activities		

6.2.3 CD on CBD 2010 Countdown

Table 6.2.3.1 Protect the components of biodiversity

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Promotion of the conservation of the biological diversity of ecosystems, habitats and biomes	1.1 Effectively conserve at least 10% of the country's ecological regions	Ins	M	MoEF/MoL/FDMoFL/ DoE/ DoF/DAE/LGs
	1.2 Protection of areas of particular importance to biodiversity	Ins	M	MoEF/MoL/FDMoFL/ DoE/ DoF/DAE/LGs
2 Conservation of species diversity promoted	2.1 Restore, maintain, or reduce the decline of populations of species of selected taxonomic groups	Ins	M	MoEF/MoA /FD/MoFL/ DoE/ DAE/
	2.2 Improve the status of threatened species	Ins	M	MoEF/MoA /FD/MoFL/
3. Conservation of genetic diversity promoted	3.1 Genetic diversity of crops, livestock, and of harvested species of trees, fish and wildlife and other valuable species conserved, and associated indigenous and local knowledge maintained	Ins	M	MoEF/MoA /FD/MoFL/ DAE/ DOF/BARC /BARI

Table 6.2.3.2: Promote sustainable use

Output	Activity	Nature of CD	Time Frame	Implementing Agency
4. Sustainable use and consumption of biological resources of the country ensured	4.1 Steps to see that biodiversity-based products derived from sources that are sustainably managed, and Production areas managed consistent with the conservation of biodiversity	Ins	M	MoEF/MoA MoFL /BARC/FD /DAE/ NGOs/CBOs
	4.2 Reducing the unsustainable consumption, of biological resources, or that impacts upon biodiversity	Ins	M	MoEF/MoA FD/DoF/DAE /MoFL/PC
	4.3 Steps to see that no species of wild flora or fauna endangered by international trade	Ins	M	MoEF/MoA /Police/ Coast Guard BNH/DAE

Table 6.2.3.3 Address threats to biodiversity

Output	Activity	Nature of CD	Time Frame	Implementing Agency
5. Pressures from habitat loss, land use change and degradation, and unsustainable water use, reduced.	5.1 Decreasing the rate of loss and degradation of natural habitats	Ins	M	MoEF/MoA /MoFL/MoL/ MoWR/FD/ DoL/DoF/ DAE/NGOs/ CBOs
6. Threats from invasive alien species controlled	6.1 Prevent the pathways for major potential alien invasive species	Ins	M	MoEF/MoA FD/NGOs /CBOs
	6.2 Management plans in place for major alien species that threaten ecosystems, habitats or species	Ins	M	MoEF/MoA FD/NGOs /CBOs
7. Challenges to biodiversity from climate change, and pollution addressed	7.1 Maintain and enhance resilience of the components of biodiversity to adapt to climate change	Ins	M	MoEF/MoA FD/DoE/ NGOs
	7.2 Reduce pollution and its impacts on biodiversity	Ins	M	MoEF/MoA DoE/FD/MoFL /NGOs/CBOs

Table 6.2.3.4: Maintain goods and services from biodiversity to support human well-being

Output	Activity	Nature of CD	Time Frame	Implementing Agency
8. Capacity of ecosystems to deliver goods and services and support livelihoods maintained	8.1 Capacity of ecosystems to deliver goods and services maintained	Ins	M	MoEF/ MoA FD/NGOs/CBOs/PC/MoFL
	8.2 Biological resources that support sustainable livelihoods, local food security and health care, especially of poor people maintained	Ins	M	MoEF/ MoA FD/NGOs/CBOs/PC/MoFL

Table 6.2.3.5: Protect traditional knowledge, innovations and practices

Output	Activity	Nature of CD	Time Frame	Implementing Agency
9. Socio-cultural diversity of indigenous and local communities protected	9.1 Protection of traditional knowledge, innovations and practices	Ins	M	MoEF/MoA/ MoCHT/MoFL NGOs/CBOs
	9.2 Protection of the rights of indigenous and local communities over their traditional knowledge, innovations and practices, including their rights to benefit sharing	Ins	M	MoEF/MoA/ MoCHT/MoFL FD/NGOs

Table 6.2.3.6: Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources

Output	Activity	Nature of CD	Time Frame	Implementing Agency
10. The fair and equitable sharing of benefits arising out of the use of genetic resources Ensured	10.1 Ensuring that all transfers of genetic resources are in line with the CBD, the International Treaty on Plant Genetic Resources for Food and Agriculture and other applicable agreements	Ins	M	MoEF/ MoA FD/NGOs/CBOs/PC/MoFL
	10.2 Benefits arising from the commercial and other utilization of genetic resources shared with the countries providing such resources	Ins	M	MoEF/MoA/ DoE/BARC/ MoFL /NGOs /CBOs/FD

Table 6.2.3.7: Ensure provision of adequate resources

Output	Activity	Nature of CD	Time Frame	Implementing Agency
11. Parties have improved financial, human, scientific, technical and technological capacity to implement the CBD	11.1 Transfer of new and additional financial resources to developing country Parties, to allow for the effective implementation of their commitments under the Convention, in accordance with Article 20	Ins	M	MoEF/ ERD/ MoC/ FD
	11.2 Technology transfer to developing country Parties, to allow for the effective implementation of their commitments under the Convention, in accordance with its Article 20, paragraph 4	Ins	M	MoEF/ ERD/ MoC/ FD

6.3 CDAP under Land Degradation Thematic Area

The land management in the country is promoted through a number of policies such as land-use policy, agricultural policy, forest policy, water policy, coastal zone policy, environment policy and fisheries policy. These policies in the case of individual owners are able to provide services through technical guidance and development projects. The Ministry of Land is the custodian of Government owned lands. Maintenance of land records, survey for revenue collection, record of rights and settlement are the major functions of this Ministry. The ministry works through the Department of Land Record and Surveys (DLRS), headed by a Director General with the responsibility for survey and settlement operations. It has three Directors to look after administration, land records and survey. The field establishment is under the Director of Land Records.

The management of land and ancillary items is conducted through the local administration at District, Upazila and Union level. The Land Use Policy of 2001 provides guidelines for protection of agricultural land, water bodies, and optimal use of other categories of land, land zoning and formulation of zoning law and for restricting or minimizing the acquisition of land for non-productive use. There are 28 policy directives that should be followed by all concerned in land management and administration. But the institutional structure to implement this policy and the needed cooperation arrangements are not functional as far as the policy implementation is concerned. The policy calls for the need for raising awareness on the issues of conservation of land and for active participation of the ministries, departments and agencies of the Government in the implementation of Policy.

The capacity development action programme needs to address the issues and constraints identified in the chapter 4 which are – agrochemicals, soil salinity, river-bank erosion, top soil loss, water logging, information and knowledge barriers, gap in policy synergy, inadequate focus on land related policies, and most of all, inadequate social consciousness. The activities of the action plan as identified for individual, institutional and systemic levels are intended to achieve the targets for sustainable land management (SLM).

Table 6.3.1: Sustainable land management (SLM)

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Integration of sustainable land management (SLM) into national development plans and policies	1.1. Amendment of the Land Use Policy to halt land degradation	Sys	S	MoLR
	1.2. Capacity development to include SLM related activities and the National Land Use Policy in the core implementation activities of the Poverty Reduction Strategy, and the Annual Development Programme to develop synergy with the objectives of poverty reduction and environmental sustainability	Ind	M	MoEF, MoA, MoL
	1.3. Identify institutional barriers for successful implementation of national environmental policies and plans, such as NAPA, NBSAP	Ins	S	MoEF
	1.4. Conduct Strategic Environmental Assessment to protect the land degradation and propose a thorough guideline for land use both in urban and rural areas	Sys	S	DoE, BARC, MoLR
	1.5. Priority should be given to river bank erosion, polder management, soil and land quality decline, surface water storage, fisheries, ground water situation, livestock, heavy metal contamination and food security during formulation of land management work plan	Sys	S	BARC, DAE, SRDI, MoLR, Planning Commission, MoEF,WDB, NGOs
	1.6. Regulatory measures to restrict the implantation of deep tube wells for high rise buildings	Sys	S	WDB, City Corporations
	1.7. Regulation on establishment of brick fields to protect the top soil	Sys	S	DoE, MoLR, DC Offices, WDB, MoC
	1.8. Regulation to be introduced on salt cultivation to prevent soil quality deterioration	Sys	S	DoE, MoC, DC Offices
	1.9. National Action Plan on coastal and marine environment should include land based activity. According to that different measures can be taken to protect river through various river basin/ river management projects	Sys	S	MoLR, DoE, MoA

CD: Capacity Development, CDAP: CD Action Plan; Nature of CD: Ind: Individual Capacity, Ins: Institutional Capacity, Sys: Systemic Capacity
Time Frame: L: Long term (1-10 years), M: Medium term (1-5 years), S: Short term (1-3 years)

Table 6.3.2: Implementation of Land Use Policy

Output	Activity	Nature of CD	Time Frame	Implementing Agency
2. Effective implementation of land use policy through integrating the existing relevant agencies	2.1. Developing GIS and remote sensing capacity in the related participating organization with adequate manpower and budgetary support.	Ins	S	CEGIS, DAE, MoEF, MoLR
	2.2. Developing capacity for baseline survey for monitoring the Land Use Policy implementation	Ind	S	MoA, MoLR, CEGIS, NGOs
	2.3.Training of staff from relevant institutions to monitor implementation of National Land Use Policy	Ind	S	MoLR, MoA
	2.4. Developing an effective institutional framework with the designation of a coordination body or unit within the Ministry of Land to function as the secretariat of the two committees charged with the review and implementation of the Policy and to ensure cooperation and coordination among the relevant stakeholders	Sys	S	MoLR, MoEF
	2.5. Capacity development of the participating organizations to carry out land related activities	Ind	S	MoEF

Table 6.3.3: Sustainable watershed management

Output	Activity	Nature of CD	Time Frame	Implementing Agency
3. Effective policy measures adopted for sustainable watershed management	3.1. Large-scale participatory afforestation programme in dry and marginal lands with indigenous drought-resistant species	Ins	L	FD, BMDA, NGOs
	3.2. Excavation and re-excavation of khas ponds in areas of extreme poor people and co-management of these ponds through community people	Ins	M	WDB, LGED, NGOs

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	3.3. Harvesting of rainwater will be done by excavation of small ditches and ponds, and use the same for supplemental irrigation	Ins	M	WDB, LGED, NGOs
	3.4 Low cost water control structures of appropriate design will be built across the re-excavated canals for conserving water so as to supplement the irrigation of rain fed paddy and for low water consuming crop cultivation. The water thus stored in the section of the canal may be leased out to groups/individuals having land on it's vicinity to cultivate fish duck and supplemental irrigation on early basis	Ins	L	WDB, LGED
	3.5. Water management projects should consider the aspects of efficient and equitable use of surface water rather than ground water through policy intervention	Sys	L	WDB, LGED
	3.6. Integration of effluent and waste management aspects to be focused in river management projects	Sys	M	WDB, DoE
	3.7. Comprehensive land zoning for conservation of biodiversity and soil fertility	Ins	S	DAE, BARC, SRDI, CGEIS
	3.8. Adaptive measures to be taken to reduce vulnerability of crop production due to temperature variation through changing in cropping pattern	Ind	M	DAE, NGOs
	3.9. Developing drought tolerant varieties of staple crops	Ins	L	BARC, BRRI, BARI, DAE
	3.10. Effective early warning and advance planning for periods of adverse climatic variation	Ins	S	BMD, DAE, FFC
	3.11. Transfer, acquisition, adaptation and development of environmentally sound and appropriate technology for sustainable land management	Ins	S	MoEF, NGOs

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	3.12. Training and technology development and use of alternative, renewable energy sources (aimed particularly at reducing dependence on wood for fuel)	Ind/Ins	S	MoEF, NGOs
	3.13. Promotion of alternative livelihoods, including training in new skills for conservation of ecosystem and sustainable land management	Ins	S	MoEF, NGOs

Table 6.3.4: Awareness raising

Output	Activity	Nature of CD	Time Frame	Implementing Agency
4. Improved awareness at all levels	4.1. Prepare a consolidated report encompassing assessment from all ministries to identify synergies and inconsistencies between Government policies and the relevance of SLM with PRS/MDGs related actions, and conduct a series of seminars and workshops involving representatives from the abovementioned ministries and institutions to share findings and look at common capacity needs and synergy issues	Ind	S	MoEF
	4.2. Develop a strategy for capacity development to follow up on UNCCD implementation and to integrate SLM into policies, legislation and plans within the related ministries	Sys	M	MoEF, MoLJ, Planning Commission
	4.3. Develop advocacy and awareness strategy – identify key target stakeholders that will include community leaders, and areas for campaign at different levels with development of campaign materials on existing knowledge and other studies	Sys	S	MoEF, NGOs
	4.4. Organize policy seminars with key policy makers, advisors and Members of Parliaments	Ind	S	MoEF

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	4.5. Conduct national level media campaign with women participation	Ind	M	MoEF, NGOs
	4.6. Develop training modules on EIA, SEA and valuation of natural resources with organization of training workshops on EIA and Strategic Environmental Assessment (SEA). SEA for senior technical officials in DoE and other concerned organizations on the issues of SLM. And organize training and demonstration of valuation of ecosystem services and use of economic instruments (such as reform of taxes, subsidies), strengthening EIA process, and progression from EIAs to SEA	Ind	M	DoE
	4.7. Organize a training workshop on valuation of ecosystem services, natural resources and on the use of economic instruments in decision-making;	Ind	M	DoE
	4.8. Illustrate the application of natural resource accounting tools in local land use planning and resource management as follow up to training by selected participants working in one area to implement a pilot project	Ind	S	DoE, NGOs
	4.9. Community organizing for developing awareness among the poor preferably the women for monitoring environmental degradation.	Ind	S	NGOs

Table 6.3.5: Negotiation at the international flora

Output	Activity	Nature of CD	Time Frame	Implementing Agency
5. Trained and skilled manpower to effectively participate in global environmental negotiations	5.1 Personnel needed to be updated to the COPs decisions under UNCCD	Ind	S	MoEF
	5.2 Skills in negotiations and implementation to be enhanced.	Ind	S	MoEF
	5.3 Conduct national level consultation prior to the participation in any negotiation process of any Convention	Ind	S	MoEF

Table 6.3.6: Information system

Output	Activity	Nature of CD	Time Frame	Implementing Agency
6. Development of knowledge/ information management systems for capacity enhancement	6.1. Revisit existing database and models on soil situation of the country.	Ins	S	SRDI, BARC, CEGIS, IWM
	6.2. Identify a lead institution to continuously update the knowledge management system and establishment of database, and conduct regular training	Ins	S	DoE, MoEF
	6.3. Application of Seasonal Dry lands Forecasting tools in dry lands management	Sys	M	SRDI, BARC, CEGIS
	6.4. Manage a comprehensive database relevant to NRM and link it to upazila level for monitoring and feed back.	Ins	M	SRDI, BARC, DAE
	6.5. Document traditional knowledge and practice to cope with the adversity of the land degradation	Ins	M	NGOs
	6.6. Build a database on various environmental parameters such as flood and rainfall for accurate prediction and forecasting	Ins	M	SRDI, BARC, CEGIS, DAE, BMD, FFC, WARPO
	6.7. Identify a few organizations with existing and potential for capacity development for knowledge management. Provide adequate hardware and software in the above organizations with training for database management. Conduct system-wide training in data collection and database management	Ins	M	MoEF
	6.8. Form watershed management Working Group	Ins	S	SRDI, BARC, CEGIS, DAE, BMD, FFC, WARPO

Table 6.3.7: Communication to UNCCD

Output	Activity	Nature of CD	Time Frame	Implementing Agency
7. Efficient reporting mechanism on land degradation in place	7.1 Frame a clear modality for the personnel to be involved with the reporting process	Ins	S	MoEF, DoE
	7.2. Maintain intra-organizational coordination for preparation of reports through a working committee	Ins	S	MoEF, DoE
	7.3. Establish a new administrative policy for continuation of institutional memory by posting/ retaining skilled person in the similar ministry at least for 4-5 years	Sys	S	MoEstablishment

Table 6.3.8: Coordination

Output	Activity	Nature of CD	Time Frame	Implementing Agency
8. Capacity building for local level coordination between institutions and advocacy on SLM through pilot field demonstration projects	8.1. Organize pilot demonstration and training on SLM on technology innovation, innovative crop diversification in the Barind Tract with provision of adequate training in institutions of other Asian countries	Ind	M	MoEF, DAE, MoLR, NGOs
	8.2. Organize pilot demonstration and training on enhanced soil conservation methods and technology innovation in selected Agro Ecological Zones (AEZ)	Ind	M	MoEF, DAE, MoLR, NGOs

Table 6.3.9: Environmental governance

Output	Activity	Nature of CD	Time Frame	Implementing Agency
9. Effective environmental governance for land resource management	9.1. Capacity building of government. officials and people's representatives at upazilla level for effective application of land use understandings	Ind	M	MoLR
	9.2. Identification of existing institutional arrangements and their shortcomings for sustainable land management	Sys	S	MoLR, DoAE

Table 6.3.10: Best technologies and practices on SLM

Output	Activity	Nature of CD	Time Frame	Implementing Agency
10. Dissemination of best practices and technologies on SLM	10.1. Developing training materials and conduct training of trainers program targeting the field staff, community leaders, women groups, and farmers on production of organic manures and conservation of biomass for soil productivity; on soil conservation and mitigation measures including agro-forestry at selected upazila level, integrated ecosystem management and community based natural resource management	Ind	M	MoEF, DAE
	10.2. Disseminating of best practice materials on SLM to farmers and community leaders by organizing media events and community workshops in selected locations, field visits to demonstration sites etc	Ind	M	MoEF, DAE

Table 6.3.11: Soil salinaity

Output	Activity	Nature of CD	Time Frame	Implementing Agency
11. Adaptive measures put in place to prevent soil salinity	11.1. Community based desiltation of the feeder rivers to reduce soil salinity in coastal areas	Ind	S	MoEF, MoWR, MoL
	11.2. Capacity building in sustainable shrimp cultivation	Ins / Ind	S	MoEF, MoFL
	11.3. Sensitizing policy-makers to sustainable salt harvesting/production methods	Sys	S	MoEF, MoA

Table 6.3.12: Riverbank erosion

Output	Activity	Nature of CD	Time Frame	Implementing Agency
12. Effective flood control policies to minimize the impact of riverbank erosion drafted	12.1. Integrating existing models and spatial data on floodplains as a part of integrated flood management	Ins, Sys	S	MoEF, MoWR, BWBD, CEGIS
	12.2. Community based check-dams and dykes construction to reduce siltation and regulate the flow of water	Ins, Ind	S	BWDB, MoWR, MoEF
	12.3. Building capacity on EIA and SIA in flood basin	Ins, Ind	S	MoEF, BWDB, MoWR

Table 6.3.13: Top soil loss, land slide, soil compaction and decline in soil moisture and micro-nutrient levels

Output	Activity	Nature of CD	Time Frame	Implementing Agency
13. Effective policy intervention to minimize top soil loss, land slide in hilly areas, soil compaction and decline in soil moisture and micro-nutrient levels	13.1. Enforce Government policies/ rules to halt hill cutting	Ins, Sys	L	MoL
	13.2. Provide alternative livelihood options to the tribal community to prevent deforestation as a result of "Jhum" cultivation	Ind, Ins	M	MoA, MoEF, MoL, DAE, Local NGOs
	13.3. Enhance afforestation in the hilly areas through effective community participation	Ins, Sys	M	MoEF, FD, Local NGOs
	13.4. Sensitize the community on the impact of land slides on lives and livelihoods	Ind, Ins	S	MoL, MoEF, Local NGOs
	13.5. Sensitize the policy makers on nutrient mining, intensive cropping, irrational use of fertilizer specially urea and mono-cropping to halt decline of organic matter and acidification of soil	Ins, Sys	M	MoEF, MoA, DAE, Local NGOs

Table 6.3.14: Brick Field

Output	Activity	Nature of CD	Time Frame	Implementing Agency
14. Effective policy intervention to minimize the impact of brick industry on environment and human health	14.1. Sensitize policy-makers to use of alternative sources of fuel in brick kilns	Ins, Sys	S	MoEF, MoE
	14.2. Build capacity of local entrepreneurs on effective designs of brick kilns to minimize heat and energy losses	Ind, Ins	S	MoEF, MoE, Local NGOs, relevant stakeholders regarding brick industries
	14.3. Encourage use of alternative brick making materials such as fly-ashes generated from the coal based thermal power plants as by-product	Ind, Ins	S	MoEF, MoE, Local NGOs, relevant stakeholders regarding brick industries

Table 6.3.15: Waterlogging and drainage congestion

Output	Activity	Nature of CD	Time Frame	Implementing Agency
15. Effective policy measures implemented to manage water logging situation and drainage congestion	15.1. Sensitize policy-makers to modern techniques and tools of preventing drainage congestion and waterlogging situation	Ins, Sys	S	MoEF, WASA, DCC. CCC, KCC, RCC and other Pourashavas
	15.2. Enforce strict actions against encroachers of land under major drains, canals, lakes and other wetlands of the country	Ins, Sys	M	MoEF, MoL, DCC, CCC, KCC, RCC and other Pourashavas
	15.3. Incentive mechanisms is to be put in place to encourage regular monitoring of urban drains, canals, lakes and other wetlands.	Ins, Sys	S	MoEF, MoL, DCC, CCC, KCC, RCC, other Pourashavas and Local NGOs

Table 6.3.16: Agro-chemicals

Output	Activity	Nature of CD	Time Frame	Implementing Agency
16. Mainstreaming Integrated Pest Management (IPM) including use of agro-chemicals in to national agricultural policy	16.1. Sensitize farmers, DAE officials and local community to the rational use of pesticides, fungicides and herbicides	Ins, Sys	S	MoEF, MoA, DAE, Local NGOs
	16.2. Sensitize policy makers to rational use of agro-chemicals in agricultural production system to minimize the impact on human health, fisheries, soil and livestock etc	Ins, Sys	S	MoEF, MoA, DAE, Local NGOs
	16.3. Building capacity for policy makers on certification of agro-chemicals as a effective measure to minimize adulteration	Ins, Sys	S	MoEF, MoA, DAE, Local NGOs,

Table 6.3.17: Transboundary water issues

Output	Activity	Nature of CD	Time Frame	Implementing Agency
17. Effective policy measure implemented to negotiate the transboundary water issues	17.1. Encourage a regional dialogue to sensitize the policy makers of neighbouring countries about the adverse impacts of river linking projects on Bangladesh	Ins	S	MoWR / MoEF
	17.2. Develop private – private partnership including media and civil society to remove the barriers on transboundary water issues	Ins	S	MoWR / MoEF
	17.3. Capacity building of the Joint River Commission to handle the transboundary issues	Ins	S	MoWR / MoEF

6.4 CDAP under Synergies Among Rio Conventions

The approach used to develop the NCSA Capacity Development Action Plan involved analyzing the proposed capacity intervention areas identified by the thematic assessment reports. The interventions were divided into synergistic and convention-specific capacity intervention areas. These capacity intervention areas were prioritized taking into account the existing opportunities, their relevance to priority environmental issues, inability to be addressed, scale and seriousness of the problem they are addressing. Seven synergistic capacity building intervention areas and a number of convention-specific intervention areas were identified as priorities to be implemented in the short, medium and long term horizons. The following are the seven synergistic CDAP areas identified.

6.4.1 Institutional strengthening

Lack of coherent and effective institutional coordination as well as limited trained manpower, physical infrastructure and facilities are the major capacity constraints limiting institutional performance in addressing cross-cutting issues on MEAs. Strong coordination between institutions and adoption of an integrated approach are fundamental in ensuring synergistic implementation of the MEAs. This can be achieved by establishing and strengthening collaboration between institutions through formation of relevant committees and networks, development of guidelines for joint actions and mainstreaming of MEAs into planning processes. In addition, intervention is also needed for strengthening of manpower in the relevant fields of institutional development through recruitment and training, as well as improvement of the available physical infrastructure and facilities to build or promote coordination at national and district and lower administrative levels.

The above-mentioned interventions will result in the establishment and strengthening of inter-institutional collaboration frameworks as well as strengthened executing institutions for the MEAs. Achieving this will require the active participation of key agencies which include MoEF, DoE, FD, BMD, WARPO, SPARRSO, NGOs, private sector and tertiary training institutions. MoEF and DoE will play the lead role in implementing the above interventions.

6.4.2 Legal, policy and enabling frameworks

Inadequate integration of MEAs issues in sectoral policies and plans as well as the weak implementation and enforcement of policies and laws for natural resource management are key constraints on sustainable utilization of these resources. The close linkages between MEAs and the national development objective (poverty eradication) provides a convergence for integration of MEAs into national development policies and plans. Furthermore, the relevancy of most natural resource management laws and policies to all the MEAs calls for a joint action in enhancing the implementation and enforcement of natural resource management laws as well as integration of MEAs into them. Accordingly, the action plan should focus on putting in place guidelines for integration of MEAs issues into national and district development plans and policies.

A review of existing laws and policies is needed to give due emphasis on and priority to integration of issues of MEAs and, where necessary, formulate new policies and laws e.g. on land management, land use, biodiversity, climate, research, employment, energy, disaster preparedness and natural resource. Furthermore, actions to promote increased public awareness of laws and policies on natural resource management should be geared up. Measures should

also be taken to promote participatory implementation and enforcement of laws and policies on natural resources through strengthening the role of local communities in monitoring natural resource management. It is expected that the above interventions will lead to stronger integration of MEAs issues into national and district legal, policy and regulatory frameworks. In addition, this will strengthen human and institutional capacity to implement and enforce laws and policies for natural resource management.

6.4.3 Public awareness and education

The complexity of information on MEAs, fewer media practitioners involved in Energy and Natural Resources (ENR) areas and inadequate integration of MEA issues into formal education curricular have contributed to the low public awareness of MEA issues. The growing mass media presents an opportunity to raise public awareness of MEAs. A number of training institutions for the Government servants exist and could be used to enhance environmental education, training and awareness. The periodic review of teaching curricula for primary, secondary and tertiary institutions would provide the opportunity to integrate MEAs issues into educational programme.

In order to strengthen public education and awareness of the MEAs, it is necessary to simplify and translate information and key documents on MEAs into the main local languages and to hold sensitization workshops for key stakeholders, particularly the policy and decision makers. Capacity to effectively undertake public awareness building on MEAs will require training programmes for mass media practitioners/ reporters as well as public education programme. Furthermore, strengthening public education on MEAs will require review of curricula, production of education/ teaching materials and orientation of teachers towards MEAs issues. Implementation of the above-mentioned interventions will go a long way in creating public education and awareness of the MEAs as well as integrating these issues into educational programme of schools and tertiary institutions.

6.4.4 Data and information collection, dissemination and monitoring

Weak policy on access to data and information exchange, low spread of Information and Communication Technology (ICT), inadequate and ill equipped monitoring stations and absence of clear monitoring indicators and improper packaging of information for policy - and - decision makers are constraints on effective collection, dissemination and monitoring of data and information related to MEAs. The existence of a conducive ICT policy that has waived taxes on equipment and technologies, existence of data collection centres and networks, specifically on Energy and Natural Resources (ENR) as well as the supportive regional data centres and networks such as the Drought Monitoring Centre and Information System should be taken advantage of to strengthen information exchange and dissemination.

In order to achieve the above, training programme in data management and ICT use is required. The capacity to network and facilitate electronic exchange of data among generators and users should be strengthened through frequent networking meetings to determine data and information needs and bridging technology gaps. In addition, capacity to collate information on natural resource management should be improved to make it easily understood, interpreted and used by policy - and - decision makers. Monitoring of ENR will require establishing and strengthening monitoring stations and networks (for example, on water, bush-fires, land degradation and markets).

The above activities are expected to strengthen information collection, analysis and exchange, and put in place frameworks and protocols for exchange of information and monitoring of natural resources that integrate MEA issues.

6.4.5 Research and technology development

Low priority given to environmental issues in the national research policy, absence of essential infrastructure and facilities, inadequate skilled manpower to undertake research, poor research-extension linkage, as well as weak mechanisms for dissemination of technologies are the main constraints affecting research and technology development relating to MEAs in Bangladesh.

In order to strengthen research related to MEAs and technology development/ transfer, a comprehensive assessment of the capacity needs of the research institutions and centers of excellence should be conducted. These institutions should be equipped with relevant facilities and trained manpower with required competences to enable them to conduct resource valuation and impact of environmental degradation studies. It is also essential to promote exchange of MEAs related research findings and technologies by establishing and strengthening research and technology networks and supporting their activities such as electronic information networks, workshops, conferences as well as journals and publications. Furthermore, actors involved in technology transfer such as NGOs, extension workers and the private sector should be equipped with skills to evaluate and market technologies. The bond between actors in technology dissemination on the one hand, and research and technology development centres on the other should be strengthened by developing an efficient feedback mechanism involving regular forum, information system and incentives that promote feedback between the two. In promoting research related to MEAs and technology transfer, existing research organizations should take the lead with NGOs, the private sector, and centres of excellences such as universities.

6.4.6 Technical and managerial capacity

The most critical constraint affecting implementation of MEAs is the limited managerial and technical capacity of the human resources in the relevant areas of MEAs. The capacity of existing training institutions is limited and not adequately equipped to provide for the diverse skills required, given the broad nature of environmental issues. However, in the recent past, the number of universities and other centres of excellence has increased. The increasing integration of environmental issues into training programme of schools and tertiary training institutions, as well as the increasing global appreciation of the linkage between natural resource degradation and poverty and the limited actions on MEAs provides an opportunity for the integration of MEAs into training programme.

While there are diverse fields and interventions required to build technical and managerial capacity, the action plan will focus on those that are relevant across the MEAs and facilitate a synergistic approach to implementation of MEAs. These include review of institutional curricula to integrate MEAs issues; preparation of training materials on MEAs basing on identified needs; training key actors in implementation of MEAs in the following fields:

- Negotiation skills, conflict resolution and management, development and analysis of gender responsive policy and law, integrated planning and assessment, monitoring and evaluation, SLM, biotechnology, ICT, ecosystem and data management, and designing incentives and entrepreneurship related to MEAs.

- In addition, training needs assessment of key actors in implementation of MEAs should be carried out to assess the training needs under each of the MEAs. The MoEF should also work hand in hand with the concerned ministries and other relevant line agencies in supporting relevant skills development in the appropriate institutions and national and Local Government levels.

6.4.7 Resource mobilization

The dismal global commitment to fund MEAs issues, the low priority accorded to MEAs issues at national and district levels, and limited capacity of institutions to prepare timely and acceptable proposals are serious constraints on resource mobilization for implementation of MEAs. This is further constrained by the stringent and very low GOB budget ceilings for the key sectors of environment, forest and agriculture. On the other hand, a number of opportunities for resource mobilization and mainstreaming of MEAs exist. These include the periodic review of national and sectoral development plans, the annual budgeting process, the decentralized finance flows for development programme, and the expanded GEF portfolio that includes land degradation and deforestation as focal areas.

In order to enhance the national capacity for mobilizing resources, action should be taken to train actors in preparation of multidisciplinary proposals, and management and sharing of information on availability and means of accessing both domestic and external resources. Furthermore, specific measures should be taken to promote partnerships with a view to mobilize resources from various actors. Such measures should include training in negotiation skills, development of guidelines for mainstreaming MEAs in both national and district development and budgeting frameworks, organizing partnership forum, increased advocacy for MEA issues and sensitization of the private sector to their role in implementation of MEAs and the possible sources of funds (e.g. carbon funds). It is expected that these measures will enhance the integration of MEAs into national development plans and improve the capacity of key actors in mobilizing resources for programmes on MEAs.

Proposed CDAP for mainstreaming biodiversity, climate change and desertification at individual, institutional and systemic levels is given the following tables.

Table 6.4.1: Trained and skilled manpower

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Trained and skilled manpower for sustainable environmental governance in place	1.1 Organize training programmes on negotiation skills on MEAs of the concerned Government officials for the sake of national interest outside the country. In this respect, the concept of 'climate diplomacy' may be introduced vis a vis 'economic diplomacy'	Ind	M	All Leading training Institutes (As per Annex – 6.1)
	1.2 Build the negotiation skills of appropriate persons (GoB and NGOs) to negotiate at COPs	Ind	M	MoEF / BRAC

CD: Capacity Development, CDAP: CD Action Plan; Nature of CD: Ind: Individual Capacity, Ins: Institutional Capacity, Sys: Systemic Capacity
Time Frame: L: Long term (1-10 years), M: Medium term (1-5 years), S: Short term (1-3 years)

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	1.3 A module can also be developed and taught in the Public Administration Training Course particularly for Deputy Secretary, Joint Secretary and higher level.	Ins	M	BPATC
	1.4 Training of biology teachers at Govt. colleges with honours/masters degree in inventory of wildlife and plant resources	Ind	M	NAEM
	1.5 Motivate BPATC to organize training programmes for Govt. officials on MEAs	Ins	M	BPATC
	1.6 NAEM may be involved in training college teachers	Ins	M	NAEM
	1.7 Motivate Police Academy for training in polices on MEAs for better implementation of environment related rules and regulations	Ins	M	Police Academy
	1.8 Motivate Customs Academy for training on MEAs for better implementation of rules and regulations related to trading of biodiversity	Ins	M	Customs Academy

Table 6.4.2: Financial resources mobilization

Output	Activity	Nature of CD	Time Frame	Implementing Agency
2. Financial resource mobilization facilitated	2.1 Develop a mechanism to raise and manage community-based funds to support local activities dealing with RC issues	Ins	S	MoEF
	2.2 Projects addressing synergies should get priority	Ind	M	MoEF
	2.3 Advocacy at the policy-level to established Government commitment on increased Government contributions (% of GDP) to the environment sector	Sys	S	MoEF/DoE

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	2.4 Modify and improve existing financial mechanisms to facilitate flow of funds	Sys	S	MoEF
	2.5 Utilization of local resources, capacity, knowledge and practices in national skill development for environmental management	Ins	S	MoEF / LG/ LGD

Table 6.4.3: Coordination

Output	Activity	Nature of CD	Time Frame	Implementing Agency
3. Coordination among stakeholders ensured	3.1 Establish and maintain a roster/ data base of the concerned officials - having environmental knowledge, individual experts and scientists within and outside of the Government (public-private sectors)	Ins	S	MoEF / DoE
	3.2 An institutional framework or an apex body may be established to ensure the sustainability of the capacity building process under NCSA project. Established a Sustainable Development Monitoring Coucnil (SDMC) to address cross-cutting issues related to climate change, biodiversity and desertification (land degradation)	Sys	S	MoEF/DoE
	3.3 Develop a matrix in terms of local, national and international implications focusing the Rio Conventions and other MEAs	Sys	S	MoEF/DoE
	3.4 Form a multidisciplinary team (field workers to policy-makers) and undertake interdisciplinary actions	Sys	S	MoEF/DoE
	3.5 Facilitate joint reporting to achieve synergies among the MEAs by developing synergistic reporting formats and contents	Sys	S	MoEF/DoE
	3.6 Facilitate joint calendar of events to achieve synergies among the MEAs	Sys	S	MoEF/DoE
	3.7 Ensure that synergies are reflected in the national MDG report preparation	Sys	S	MoEF/DoE

Table 6.4.4: Communication and awareness

Output	Activity	Nature of CD	Time Frame	Implementing Agency
4. Communication and awareness raising on environmental issues facilitated	4.1 Publish news features in national printing media to celebrate environment related events	Ind	S	MoEF/DoE
	4.2 Encourage learned societies to organize workshops/ seminars to disseminate scientific findings to general public	Ind	S	MoEF/DoE
	4.3 Convince appropriate authorities such as, public and private universities and academics to incorporate the Rio Conventions in their academic curricula	Ind	S	MoEF/DoE
	4.4 Develop early warning systems for natural disasters and land degradation processes	Ind	S	MoEF/DoE
	4.5 The mass media should be made active by initiating talk-shows on the leading public and private TV channels to generate awareness	Ind	S	MoEF/DoE
	4.6 Organize regular consultation between policy-makers and other stakeholders for decision-making in environmental sector and to share knowledge and skills	Ind	S	MoEF/DoE

Table 6.4.5: National policies

Output	Activity	Nature of CD	Time Frame	Implementing Agency
5. Inter-linkages among national policies and thair implementation promoted	5.1 Integrate EIAs, social impact assessments (SIAs) and Strategic Environmental Assessments (SEAs) into structural adaptation measures	Ind	S	MoEF
	5.2 Facilitate the process of giving IPSU a permanent shape from the experience of IPSU	Sys	M	MoEF
	5.3 Develop policy interventions to provide access to resources for bona fide users and to address users' needs	Sys	M	MoEF

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	5.4 Develop policies that support integrated watershed management, sustainable agricultural practices and reduce environmental degradation.	Sys	M	MoEF
	5.5 Take initiative to resolve conflicts between land use, agriculture and fisheries policies	Sys	M	MoEF
	5.6 Ensure that NatComs, NAPA, NAP and NBSAP are complimentary to each other as well with PRSP and MDGs	Sys	M	MoEF
	1.7 Revise existing rules, regulations and acts as per demand (obligations) of the Rio Conventions and their recent developments	Sys	M	MoEF
	5.8 An appropriate committee should be given responsibility to synergize the action programs envisaged in NBSAP, NAPA and NAP to implement them in an integrated manner	Sys	M	MoEF
	5.9 Bangladesh Meteorological Department (BMD) and SPARRSO may be shifted to the Ministry of Environment and Forest from the Ministry of Defence	Sys	M	MoEF

Table 6.4.6: Knowledge and information

Output	Activity	Nature of CD	Time Frame	Implementing Agency
6. Knowledge and information generation facilitated and managed	6.1 Sensitization of the policy-makers (MPs, ministers, political leaders, etc.) through briefing sessions. Orientation programmes for newly elected MPs should include concepts of MSP	Ind	S	MoEF/DoE
	6.2 Facilitate bioprospecting aimed at the development of new drugs and medicines	Ins	S	MoEF/DoE

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	6.3 Documentation of traditional knowledge and databases on climate change (e.g. coastal areas), biodiversity (e.g. medicinal plants in the CHT) and land degradation (e.g. Barinds) need to be done	Ins	S	MoEF/DoE
	6.4 Creation of living database on the inventory of all the existing projects and initiatives and biodiversity related information and regular up date is necessary	Ins	S	MoEF/DoE
	6.5 Establish a database including scientific parameters, tools, techniques, experiences and lessons learned and disseminate this knowledge and information through an appropriate body. BANSDOC may be reorganized for living database	Ins	S	MoEF/DoE
	6.6 Thorough evaluation to identify the specific responsibility of the ministries/ divisions/ departments for compliances of the RCs	Ins	S	MoEF/DoE
	6.7 MoEF may take necessary steps in providing / disseminating/ circulating documents on RCs related protocols/ agreements/ information to other ministries/divisions/ agencies/ institutions/ organization	Ins	S	MoEF/DoE
	6.8 BWDB collects data in 35 points. These points may be enhanced to monitor the hydrological behavior and sea level rise	Ins	S	MoEF/DoE
	6.9 Develop and disseminate tools, tool kits and findings on assessment of adverse impacts of climate change and desertification on biodiversity	Ins	S	MoEF/DoE

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	6.10 Develop suitable agro-silvi-pastoral technologies to deal with adaptation issues	Ins	S	MoEF/DoE
	6.11 Quantitative and qualitative research in terms of projects focusing on climate change, biodiversity and desertification	Ins	S	MoEF/DoE
	6.12 Project should focus on rural energy problem	Sys	S	MoEF/DoE
	6.13 Establishment of network (bottom up approach) and policy, institutions and legal aspects to be linked with poverty, livelihood and food security	Sys	S	MoEF/DoE

Table 6.4.7: Participation

Output	Activity	Nature of CD	Time Frame	Implementing Agency
7. Participation of concerned stake-holders ensured	7.1 Ensure involvement of local community groups in the capacity development process	Ind	S	MoEF/DoE
	7.2 Ministry of Land, Divisional Commissioner's office, Deputy Commissioner's office and the office of the Upazila Nirbahi Officer may be entrusted with more responsibilities to look after the matter of land degradation and other environment related issues	Ins	S	MoEF/DoE
	7.3 Private sector may also be involved with the process of renewable energy in the rural areas of	Ins	S	MoEF/DoE
	7.4 Involve the private sector in flourishing the opportunity of the Jatropha plantation and extraction of bio-diesel	Ins	S	MoEF/DoE
	7.5 Implementation of environmental management mandate at central, division, district and upazila levels	Sys	S	MoEF/DoE

Table 6.4.8: Integrated Ecosystems Management

Output	Activity	Nature of CD	Time Frame	Implementing Agency
8. Integrated ecosystems management facilitated	8.1 Assess adverse impacts of climate change and desertification on biodiversity and effectively disseminate the findings	Ins	M	MoEF/DoE
	8.2 Develop biological indicators for pollution monitoring and assessment of ecosystem health	Ins	M	MoEF/DoE
	8.3 Projects should focus on the exotic species and various ecologically critical ecosystems	Ins	M	MoEF/DoE
	8.4 Establish ecological benchmarks, standards and baselines for monitoring vegetation changes, land degradation, and impacts of climate change on biodiversity and carbon stocks through appropriate research and development efforts, monitoring and evaluation	Ins	M	MoEF/DoE
	8.5 Establish systems of appropriate land-use practices including policy monitoring and zoning through proper characterization of land types	Ins	M	MoEF/DoE

Table 6.4.9: Appropriate technologies

Output	Activity	Nature of CD	Time Frame	Implementing Agency
9. Development and dissemination of appropriate technologies promoted	9.1 Technology need assessment for all vital sectors of the economy and environment	Ins	S	MoEF/DoE
	9.2 Develop pollution treatment and abatement methods that ensure environmental sustainability, conservation and sustainable use	Ins	S	MoEF/DoE
	9.3 Initiate green accounting and valuation of ecosystem functions	Sys	S	MoEF/DoE

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	9.4 Develop and/or facilitate carbon trading systems	Ins	S	MoEF/DoE
	9.5 Develop tools, techniques and management systems that address issues of forest fires (through appropriate actions and policies including through community participation)	Ins/Sys	S	MoEF/DoE

Table 6.4.10: Participation in the Conference of the Parties

Output	Activity	Nature of CD	Time Frame	Implementing Agency
10. Effective participation in the Conference of the Parties (CoP) and Subsidiary Bodies Meeting	10.1 Prepare policies for international negotiations keeping diplomatic position in other areas	Sys	M	MoEF
	10.2 Engage other relevant ministry and agencies particularly Foreign Affairs.	Sys	S	MoEF
	10.3 Identify members of the delegation to attend negotiation well ahead and organize regular capacity building workshop and training before Conference of the Parties and Subsidiary Bodies Meeting	Ins	S/M	MoEF
	10.4 Explore possibility to attend training at international level.	Ins	S/M	MoEF, DoE and RO
	10.5 Specific training for enhancing the climate change negotiation capacity of the member of the negotiating team	Ind	S/M	BCAS, DoE
	10.6 Specialized skills and expertise development on scientific and technical capacities of the scientist and technicians for effective and efficient participation in negotiations involving climate change issues such as those of the Conference of the Parties and its subsidiary bodies	Ind	S/M	BCAS, BIDS, BUP, DoE

Table 6.4.11: Promotion of education, training and public awareness

Output	Activity	Nature of CD	Time Frame	Implementing Agency
11. Promotion of, and cooperation in, the education, training and public awareness related to climate change and also in the exchange of relevant scientific, technological, technical, socio-economic and legal information related to climate system & climate change	11.1 Carryout education, training and public awareness programme on climate change in Bangladesh	Ins/Ind	S/M	FEJB, BTV, Bangladesh Betar
	11.2 Incorporate climate change issues into school curriculum at both secondary and primary levels	Sys/Ins	S/M	National Curriculum Board
	11.3 Incorporate climate change into the training course for journalist and	Ind	S	MoEF, DoE
	11.4 Incorporate climate change into professional training of the Public Service Commission	Sys/Ins	S/M	PSC

6.5 CDAP for Different Sectors

A special focus group meeting on "Capacity Development for Sectoral Planning in Bangladesh" was held on 16 June 2007 at the Academy for Planning & Development, Dhaka exclusively for the key planning officials of the Government of Bangladesh. Among others, Jafar Ahmed Chowdhury, Secretary, Planning Division, Ministry of Planning; Fazle Kabir, Director General (Additional Secretary), Academy for Planning & Development, Ministry of Planning; Larry Maramis, Deputy Country Director, United Nations Development Programme (UNDP); Muhammad Habibur Rahman, Division Chief, Agriculture, Water Resource and Rural Institution, Division, Planning Commission were present as Chief Guest, Special Guests and Chairperson respectively. The officials of the planning cadre identified their respective CDAP for different sectors which are appended below alphabetically.

Table 6.5.1: Agriculture

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Sustainable agricultural practices promoted	1.1 Changes in agricultural systems through introduction of humidity-preserving technologies, application of advanced agro-technical measures, and low water use and drought-resistant high-yielding varieties	Ind/Ins	L	DAE, Climate Change Cell/DoE, BRRI, Farmer Communities
	1.2 Revision of zone distribution of irrigated lands	Sys	M	MoA, MoL, NARS

CD: Capacity Development, CDAP: CD Action Plan; Nature of CD: Ind: Individual Capacity, Ins: Institutional Capacity, Sys: Systemic Capacity
Time Frame: L: Long term (1-10 years), M: Medium term (1-5 years), S: Short term (1-3 years)

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	1.3 Enhanced resistace to diseases and pests	Ind/Ins	S	DAE, NARs
	1.4 Reconstruction of existing irrigation system to cope with climate	Ind/Ins	L	DAE, BRRI, Farmer Communities
	1.5 Awareness raising about expected consequences related to forecasted climate change and other measures	Ind	S	BMD, Bangladesh Betar , BTV, DoE
	1.6 Develop salt tolerant varieties and increase efficiency of water use for agriculture	Ins/Sys	M	BRRI, BWDB, NARS
2. Sustainable hill farming facilitated	2.1 Change in agricultural hill farming practices	Ind/Ins	M/L	DAE, BARI and Hill District Council
	2.2 Introduce terrace cultivation with natural resources practice	Ind/Ins	M/L	DAE / CHTDB
	2.3 Train people and extension workers in appropriate technology for hill farming	Ind/Ins	M/L	DAE and BARI
	2.4 Monitor the soil run off and loss of biodiversity due to "Jhum"	Ind/Ins	M/L	BARI, SRDI
	2.5 Supply hybrid seeds and fertilizer to the marginalized farmers	Ind/Ins	M/L	Moa, badc, Privated sectors
	2.6 Introduce agro-forestry system where crop cultivation is not feasible	Ind/Ins	M/L	MoEF and DAE
3. Production of agriculture increased	3.1 Bring more land under irrigation	Ind/Ins	S	DAE, BADC
	3.2 Ensure power and fuel supply to the farmers	Ind/Ins	M/L	Power division
	3.3 Develop a mechanism to support poor farmers directly through subsidies	Ind/Ins	M/L	MoA
	3.4 Reduce the role of intermediaries in agricultural products / markets	Ind/Ins	M/L	MoA, MoC

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	3.5 Establish new cold storage facilities at the farmers community and bazar levels	Ind/Ins	M/L	MoI, MoA
	3.6 Soft loans for pre-and post-harvesting periods	Ind/Ins	M/L	DAE and NGOs
4. Development of agro-forestry practices promoted	4.1 Introduction of intercropping technology	Ind/Ins	L	DAE, farmers community
	4.2 Development of drought resistant high yielding variety	Ins	M	BARI, BRRI, BINA, BJRI
	4.3 Training of farmer communities	Ind/Ins	M	DAE, BAU, farmer communities
	4.4 Advocacy among the farmer communities	Ins	M	Radio, TV
	4.5 Change in agricultural policy	Ins	L	MoA
	4.6 Awareness building for disaster management	Ins/Ind	M	BMD, DAE, farmer communities
	4.7 Develop small projects on agro-forestry for the farmers	Sys	M	DAE
5. Eco-friendly crop production system encouraged	5.1 Use of crop-specific balanced fertilizers	Ind/Ins	S/M/L	DAE, SRDI, BRRI, BARI
	5.2 Enhanced use of organic fertilizer and recycling crop residues	Ind/Ins	S/M/L	DAE, SRDI, BARI, BINA, BRRI
	5.3 Increased practice of IPM	Ind/Ins	M/L	DAE, BARI, BSTI, BTRI
	5.4 Use of biotechnology for development of pest/ drought/ salinity/ water-logging resistant crop varieties	Ind/Ins/ Sys	M/L	BARI, BINA, BRRI, BSTI, BTRI
	5.5 Increase use of bio-fertilizers and induction of nodulation capacity for major crop varieties	Ind/Ins	M/L	DAE, BARI, BRRI, BINA, BSTI, BTRI
6. Sustainable irrigation management facilitated	6.1 Introduction of pucca irrigation channel in the crop fields in order to reduce water loss	Ins	M/L	BADC

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	6.2 Introduction of hidden plastic piped channel in order to reduce maintenance cost and loss of cultivable land	Ins	L	BMDA, BADC
	6.3 Zonal distribution of irrigated land by	Ins	L	BMDA, BADC
	6.4 Replacing diesel driven pumps with electricity/ CNG to reduce cost of production	Ins	L	BMDA, BADC
	6.5 Assessment of minor irrigation potentiality with respect to under ground and surface water utilization	Ins/Sys	M/L	BADC, BRRI, BARI, BMDA
	6.6 Use of irrigation water free of toxic materials like arsenic and other heavy metals	Ins/Sys	M/L	BADC, BRRI, BARI, BMDA
7. Retention of surface water for dry season enhanced	7.1 Re-excavation of existing canals and rivers in order to ensure water availability in the scarcity	Ins	L	BWDB , WARPO
	7.2 Utilization of maximum surface/ rain water	Ins/Sys	M/L	BADC, BMDA, BRRI, BARI
	7.3 Construction of submerged block / cross dam to check down-stream flow	Ins	L	BWDB, WARPO
	7.4 Surface water management	Ins/Ind	L	DAE, BWDB, Haor Dev.Board
	7.5 Training for pump operators in order to enhance maintenance	Ind/Ins	S	BWDB, WARPO
8. Early warning system for the farmers in place	8.1 Awareness raising of the farmers about flash flood and drought	Sys	L/M	DAE
	8.2 Early warning system for the farmers to develop the traditional agricultural system	Sys	L/M	DAE
9. Farmers are practicing environmentally sustainable agriculture	9.1 Farmers review their farm level environmental concerns on a periodic basis	Ind	L	DAE. and NGOs
	9.2 Award to farmers who maintain good soil health, as an incentive	Ins/Ind	L	DAE, NGOs

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	9.3 Environmentally best manageable block maps are used for allotting public services	Ins	L	DAE, NGOs
	9.4 Review block wise source and extent of pollution and assess cost to internalize in the block's budget	Ins	L	DAE, SRDI
	9.5 Block-wise performance assessment report is reviewed before allocating input subsidy	Ins/Sys	L	DAE, SRDI
	9.6 Output subsidy is in operation	Sys	L	MoA, MoEF
	9.7 Farmers are skillful in vertical expansion and in using diversification technologies	Ind/Ins/ Sys	M/L	DoE, DAE, BARC, BRRI, Local Govt.
	9.8 Intra-block and inter-block wise research projects involving farmers of the locality	Ind/Ins /Sys	S/M/L	BARC,, BRRI, Local Govt.
10. Production & preservation of good seed promoted	10.1 Firm level production of HYV seeds with proper certification, seed distribution and maintenance for comprehensive methods of agriculture	Ind/Ins /Sys	S	BRRI, BARI, BARC, BJRI, NGOs
	10.2 Preserve local traditional variety Seeds	Ins/ Ind	S/M/L	BRRI, BARI, BJRI
	10.3 Selection of varieties suitable for our soil	Ins/ Ind	S	BRRI, BARI, BJRI, NGOs
	10.4 Awareness building regarding certified seeds	Ins/ Ind	S	DAE, NGOs, Private sector
	10.5 Develop more comprehensive methods of agricultural practice	Ins/ Ind/ Sys	S/M/L	BRRI, BARI, DAE

Table 6.5.2: Biodiversity

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1.A co-management system for the conservation of biodiversity established	1.1 Ensure access of poor to the common property	Sys	L	MoEF, DoE, FD
	1.2 Share the benefits with the people living in the forest for collecting fuel wood, fishing	Ins/Sys	L	MoEF, DoE, FD
	1.3 Distributing certain amount of money among the beneficiaries, that is collected from eco-tourism	Ins	M	MoEF, DoE, FD
	1.4 Introduction of benefit sharing	Sys	M	MoEF, DoE, FD
	1.5 Establish a data bank to know total services of plants, animals and micro-organisms in any country	Ins	L	MoEF, DoE, FD
	1.6 Set up a new institution to keep the data bank updated	Ins/Sys	L	MoEF, DoE, FD
2. Conservation of ecosystem and biodiversity in Bangladesh enhanced	2.1 Identify critical areas	Ins	S	MoEF, DoE, FD
	2.2 Establish sanctuaries	Ins/Ind	M	MoEF, DoE, FD
	2.3 Identify degraded water bodies	Ins/Ind	M	MoEF, DoE, FD
3. Patent right establish	3.1 Initiate patent right for animal and plant species including medicinal plants	Sys	L	MoEF, DoE, FD

Table 6.5.3: Disaster management

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Disaster risk reduction supported	1.1 Identify hazards, localities, analyze the risk and find out remedy measures for effective disaster	Ind/Ins	M	Disaster Management Bureau (DMB)
2. Community empowerment enhanced	2.1 Identify vulnerable groups of the community, provide training for capacity building and mobilize resource for them	Ind	M	DMB
3. Disaster management information network enhanced	3.1 Strengthen the capacity of the DMB to face emergency/ disaster	Ins/Sys	M	MoFDM
	3.2 Network among the agencies dealing with disaster management	Ins/Sys	M	MoFDM
	3.3 Establish information cell in DMB	Ins/Sys	M	MoFDM
4. Research and Observation promoted	4.1 Establish a national training and research institute to build up capacity for mitigating the adverse impacts of disaster	Ind/Ins	L	MoFDM

Table 6.5.4: Environment

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Sustainable environmental management promoted	1.1 Establish a pollution (water, land , air, noise) free socio-economic environment	Ins/ Ind/ Sys	S/M/L	MoEF, DoE
	1.2 Implement existing law on the restrictions on hill cutting to prevent land slide	Ins/ Ind/ Sys	S	MoEF, DoE, District Admin.
	1.3 Restriction on extraction of stones and sands	Ins/ Ind/ Sys	S	MoEF, MoL, Energy division

Output	Activity	Nature of CD	Time Frame	Implementing Agency
2. Sustainable waste management practice in place	2.1 Organise disposal and collection of waste from household on regular basis	Ins	M	City Corporation, Pourashava, Private sector
	2.2 Classification of different waste at the source	Ins	M	City Corporation, private sector
	2.3 Introduction of Effluent Treatment Plant (ETP) in all chemical industries	Ins	L	Ministry of Industry
	2.4 Set up incinerator plant in the major cities to produce electricity from waste	Ins/Ind	M	City Corporation, Private sector
	2.5 Restrict disposal of waste in wetlands such as rivers, canals etc.	Ins/Sys	M	Mo Industry, MoA, MoEF, DoE, Private sector
	2.6 Create awareness among the citizens regarding safe disposal of waste	Ind/Ins	S	MoEF, DoE, Mo Information, City Corporation
	2.7 Identify the sources and ingredients that cause environment pollution	Ind/Ins	S	MoEF, DoE, City Corporation/ Pourashava
	2.8 Verify the criteria and process of assessing emission of hazardous waste, so that it can be restricted within the threshold	Ind/Ins	S	MoEF, DoE, City Corporation/ Pourashava
3. Clean air management promoted	3.1 Awareness programme for transport workers and owners	Ind/Ins	S	BRTA, DoE
	3.2 Strengthen capacity of traffic police	Ind/Ins	M	Bangladesh Police, DoE
	3.3 Arrange air pollution measuring equipment and training for the personnel	Ind/Ins	M	DoE
	3.4 Forecast air pollution report through media regularly	Sys	M	BMD, Electronic media such as TV, radio

Table 6.5.5: Education

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Educated society with environmental knowledge base	1.1 Human resource development through higher education specially in the field of environmental management	Ind	M	Mo Establishment, MoEF
	1.2 Incorporating environmental issues in secondary level curriculum	Ins	M	NCTB
	1.3 Training to the secondary school teachers and training of trainers of the institutes	Ind	L	NAEM, HSTTI, DHSE
2. Universal Primary Education promoted	2.1 Preparing a comprehensive programme to meet the target of MDGs relating to Universal Primary Education	Ins	M	PMED
	2.2 Identifying targeted students (school going female, male, working	Ins/Sys	M	MoP and MoEducation, BBS
	2.3 Monitoring and evaluation for further development of primary	Ind/Ins Sys	S/M/L	All concerned agencies
	2.4 Awareness raising through media campaigns, social interactions and service delivery	Ins/Sys	S/M/L	MoE, DoPE, NGOs, CBOs
3. Tobacco-free educational environment encouraged	3.1 Introducing tobacco-free/ anti-tobacco programme in secondary and higher secondary education	Ins	M	MoE, NCTB
	3.2 Curriculum in secondary schools, collages and madrashas on the bad impacts of tobacco	Ins	M	MoE, NCTB
	3.3 Awareness campaign among the students, teachers and guardians	Ins	M	NAEM,

Table 6.5.6: Establishment

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Retention of Institutional Memory	1.1 Modern career planning for the Bangladesh Civil Service (BCS) Cadre officials to ensure socio-economic development and sustainable environmental governance	Ins/Sys	S	Ministry of Establishment
	1.2 Clustering of all ministries/divisions into 5 groups on the following basis - Regulatory Cluster - Economic Development Cluster - Natural Resource Management / Sustainable Environmental Governance Cluster - Infrastructure Cluster	Ins/Sys	M/L	Ministry of Establishment
	1.3 Transfer & posting of the BCS Cadre officials may be considered based on their education and training background.	Ins/Sys	S	Ministry of Establishment
	1.4 Frequent transfer hampers the institutional memory. The competent officials should be posted in the vital posts for at least 5 years	Ind/Ins Sys	S/M/L	Ministry of Establishment
	1.5 Up dating Government Training Policy to ensure Sustainable Environmental Governance in all National Training Institutes	Sys	M	Ministry of Establishment

Table 6.5.7: Food

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Supply of safe, healthy and nutritious food facilitated	1.1 Revision of existing National Food Policy 1988 to ensure food safety and security in the country	Sys	L	MoFDM
	1.2 Update and amendment of existing food related acts/ rules to prevent adulterated / contaminated fruit, fish and other food products	Ins	L	MoFDM, Ministry of Law

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	1.3 Awareness building among the producers, suppliers and consumers	Sys	S	DAE, BSTI, Ministry of Information, Department of Food
	1.4 Ensuring nutritional values of food items	Ind/Sys	M	Ministry of Industries, DAE, BSTI
	1.5 Training for NGO officials, farmers and food producers	Ind/Ins	S	Department of Food, BSTI, DAE
	1.6 Enforcement of Law and Acts to prevent adulterated food through continuous monitoring and review	Ind/Ins	L	Ministry of Home Affairs, Ministry of Law, BSTI

Table 6.5.8: Forest

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Integrated forest management established	1.1 Afforestation of land to reduce environmental pollution	Ins	S	MoEF, FD, DoE
	1.2 Introduction of drought resistant and salt tolerant species	Ins	L	BFRI
	1.3 Development of forest resource related technology and dissemination of the same	Ins	L	BFRI
	1.4 Raising awareness and motivation about importance of forest	Ind	L	MoEF, FD, Media
2. Species conservation enhanced	2.1 Wildlife conservation	Ins/Sys	S	FD, MoEF
	2.2 Wildlife survey	Ind/Ins	M	FD, MoEF
	2.3 Legislative measures	Ind/Ins	L	FD, MoEF
	2.4 Inventory of forest cover	Ind/Ins	S	FD, MoEF
	2.5 Promote silviculture practice	Ind/Ins	S	FD, MoEF

Output	Activity	Nature of CD	Time Frame	Implementing Agency
3. Ecosystem management facilitated	3.1 Zoning of forest land	Ins	S	FD, MoEF
	3.2 Promoting eco-tourism practice	Ins/Ind	M	FD, Mo Tourism of Cvil Aviation
	3.3 Ensuring political commitment	Ins/Ind	S	FD, MoEF
	3.4 Sustainable use of forest resource	Ins/Ind	S	FD, MoEF
	3.5 Controlling human interventions and interferences	Ind/Ins	S	FD, MoEF
4. Genetic conservation promoted	4.1 Developing sanctuary, game reserve and Protected Areas in the areas where there is none	Ins	S	FD, MoEF
	4.2 Encouraging captive breeding of endangered wildlife species	Ins	S	FD, MoEF
5. Conservation and management of reserve forest enhanced	5.1 Preventing illegal cutting of forest trees	Ind/Ins	S	MoEF, FD
	5.2 Alternative livelihood of the people dependent on forest	Ind/Ins	M/S	MoEF, Local Administration
	5.3 Morality and commitment of forest officials should be improved	Ind/Ins	L	FD, MoEF
	5.4 Upgrading existing rules and regulations	Sys	M/S	MoEF, Ministry of Law
6. Extension of forest cover facilitated	6.1 Social forestry/ participatory forest practice	Ind/Ins	M/L	MoEF, FD, Local administration/ NGOs
	6.2 Expansion of private plantation activities	Ind/Ins	S/M	NGOs, Private sector
	6.3 All unutilized fallow land should be brought under forest cover	Ind/Ins	M/L	FD, Private sector
	6.4 Public awareness creation	Ind/Ins	M/L	MoEF, FD, NGOs

Output	Activity	Nature of CD	Time Frame	Implementing Agency
7. Sustainable forest management enhanced	7.1 Strengthening institutional capacity for sustainable forest environmental services	Ins	M	DoE, FD
	7.2 Training for private sector on forest environmental services	Ind	S	DoE, FD, FBCCI
	7.3 Prevention of soil erosion and sustainable wetland resource management through plantation	Sys	L	BWDB, FD
	7.4 Coastal forest management	Ins	L	FD
	7.5 Restriction on illegal tree felling and illegal timber business	Ind/Ins/ Sys	S	MoEF, FD, Local Administration
	7.6 Awareness building among the people live in the coastal zones to be prepared for the tsunami	Ind/Sys	S	MoEF, MoWR, MoFD, Mo Information
8. Indigenous species of trees and plants conserved	8.1Planting fruit trees like jack fruit, mango trees and indigenous trees on the road side and strip plantation	Ins/Sys	M	RHD, MoEF, LGED, FD
	8.2 Plantation of coconut and palm trees instead of ornamental invasive plants on the road side	Ins/Sys	M	City Corporation, LGED, MoEF

Table 6.5.9: Fisheries

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Sustainable fisheries conservation and management promoted	1.1 Formulation of a pragmatic fisheries policy	Sys	L	MoFL, DoF
	1.2 Identification of appropriate ecological niche and ecosystem for natural conservation and management of fisheries	Ins/Sys	L	DoF, DoE

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	1.3 Identification of endangered fish species and reintroduce them into nature	Ins/Sys	L	MoEF/MoFL/BFRI, IUCN
	1.4 Declaration of the breeding ground as sanctuaries in the breeding	Ins	L	DoF
	1.5 Expansion of fish sanctuaries in all major haor, baor, beel and water bodies	Ins	L	DoF
	1.6 Identification of the spawning and breeding ground of fish species	Ind/Ins	S	BFRI, DoF
	1.7 Protection of the fishing ground by restricting fishing on seasonal basis (breeding seasons)	Ins	M	DoF
	1.8 Declaration of the breeding and spawning ground as sanctuaries on seasonal basis	Ind/Ins	M	DoF
	1.9 Strict enforcement of fishery laws and regulations for the sake of offspring	Ins/Sys	L	DoF, Coast Guard
2. Sustainable fish culture facilitated	2.1 Improving fish culture system through water quality management	Ind/Ins	M	DoF, local NGOs
	2.2 Marine fisheries culture	Sys/Ins	M	DoF, local NGOs
	2.3 Livelihoods analysis of fishermen community	Ins	M	DoF, local NGOs
	2.4 Integrated Coastal Zone development and management	Ins	M	DoF, ICZMP
3. Fingerlings stock for increasing fish production ensured	3.1 Producing high quality fingerling through ensuring water quality, introducing intensive or ultra-intensive culture technology and development of proper pond management system	Ind/Sys	L	MoFL, DoF
	3.2 Conservation of natural water bodies and development of community based conservation initiatives	Ind/Sys	L	MoFL, DoF
	3.3 Ensuring regular supply of one day old fingerling	Ins	L	MoFL, BLRI, NGOs, community

Output	Activity	Nature of CD	Time Frame	Implementing Agency
4. Hatchery development facilitated	4.1 Infrastructure and capacity development of the manpower working in the hatchery along with ensuring regular flow of funds	Ind/Ins/ Sys	L	DoF, BFRI, MoFL, NGOs, community
	4.2 Training initiative for the farmers	Ind/Ins	L	MoFL, DoF, BFRI, Community, NGOs
5. Improved sustainable fisheries management promoted	5.1 Identification and restoration of untapped fish land and re-excavation of degraded water body	Ind/Sys	L	MoFL, DoF
	5.2 Development of infrastructure facilities of fisheries department	Ind/Sys	L	MoFL, DoF, BFRI
	5.3 Development of integrated fish culture system	Ind/Sys	M	MoFL, DoF, BFDC
	5.4 Assistance in effective management for sustainable operation and maintenance	Ind/Sys	M	MoFL, DoF, BFRI
	5.5 Initiation of motivational activities to increase awareness	Ind/Ins	S	MoFL
6. Brood bank improved	6.1 Development of brood bank of the indigenous fish species	Ind/Ins	L	MoFL DoF, BFRI, NGOs,
	6.2 Stocking and preservation of native varieties of fish	Ins	L	MoFL DoF, BFRI, NGOs,
7. Need oriented research increased	7.1 Scientific research on biotechnology with specific focus on fish species and biodiversity conservation	Ins	L	BFRI, NGOs
8. Gene bank improved	8.1 Infrastructure development and CD training initiatives for gene banks	Ins	L	MoFL, BLRI, NGOs, community
9. Supply of vaccines ensured	9.1 Appropriate need assessment, production and supply of vaccines	Ins	L	MoFL, BLRI, NGOs, community
	9.2 Formulation of a pragmatic fisheries policy	Sys	L	MoFL, BFRI
10. Shrimp production increased through preventing the white spot disease	10.1 Identifying the source of shrimp diseases	Ins/Sys	S	MoFL, BLRI

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	10.2 Water treatment for water quality management and monitoring	Ins	M	BFRI, DoF
	10.3 Restriction and protection of white spot virus through integrated management	Ins/Sys	M	BFRI, DoF
	10.4 Increasing awareness among shrimp farmers regarding diseases	Ind/Ins	S	BFRI
	10.5 Ensuring quality feed management	Ind/Sys	L	DoF, BFRI, BFDC
11. Shrimp production increased	11.1 Dividing shrimp farms into smaller units for better harvesting	Ins/Sys	S	DoF
	11.2 Improving drainage system and water exchange facilities (water reservoirs)	Ind/Sys	M	DoF/ LGED
	11.3 Producing virus free high quality shrimp fry and feed	Sys	L	MoFL, DoF, BFRI

Table 6.5.10: Health and family welfare

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Child and infant mortality reduced	1.1 Making Immunization and Nutrition Programme more effective	Ind	S/M/L	Mass media, Ministry of Health, DPHE
	1.2 Implementation of participatory community based health care system	Ind	S/M/L	Mass media, Ministry of Health, DPHE
	1.3 Creating awareness among people on health related issues through mass media	Ind/Ins	M/L	Ministry of Health, DPHE
2. Reduction of population growth in the slums and rural areas facilitated	2.1 Special family planning programme in the slum and rural area to reduce unusual growth	Ins	S/M/L	Ministry of Health

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	2.2 Extending health, family planning & sanitation campaign through non-formal education system	Ins	S/M/L	MoE, NGOs, private sector
	2.3 Involving community in the process	Ind/Ins	M/L	NGOs, private sector
	2.4 Rigorous monitoring of population growth in the slum & rural areas	Ins/Sys	L	Ministry of Health, DoFP
	2.5 Engagingmore field representatives in family planning programme	Ind/Ins	S/M	Ministry of Health, NGOs
	2.6 Ensuring supply of modern family planning devices to the poor people free of charge	Ind/Ins	S/M	Ministry of Health, NGOs
	2.7 Reviewing the existing laws and regulations related to family planning to reduce growth	Sys	S/M	Ministry of Health and Family Welfare

Table 6.5.11: Health waste management

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Sustainable hospital/clinical waste disposal/management promoted	1.1 Analyzing the current situation of the waste management system of hospital waste	Ins/Sys	S/M	Ministry of Health and Family Welfare, DPHE
	1.2 Capacity building among personnel concerned in health management	Ins	S/M/L	Ministry of Health and Family Welfare, DPHE
	1.3 Procurement of modern equipment and services for waste disposal	Ins/Sys	M	Ministry of Health and Family Welfare, DPHE
	1.4 Imposing rules and regulations related to disposal of clinical waste	Ind/Ins	S/M	Ministry of Health, DPHE, private sectors
	1.5 Monitoring of the hospital waste management system	Ins	M/L	Ministry of Health, DPHE, private sectors

Table 6.5.12: Housing

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Affordable and sustainable housing (with water supply and sanitation facilities) facilitated	1.1 National Housing Need Assessment for the poor people considering actual income, place of living, migration trend specially in coastal and vulnerable areas	Ins/Sys	S	MoHPW, National Housing Authority (NHA), Housing Building Research Institutes
	1.2 Providing low cost/suitable housing technologies / water supply/ sanitation facilities to the vulnerable people in minimum land areas (both urban & rural areas)	Ins/Sys	S/M	DPHE, WASA, Architecture Departments at universities
	1.3 Finding suitable source of finance to carry out the research and housing programme through corporate responsibilities of private sectors	Ind/Ins	S/L	Development agencies, bank, financial institutes, Private sector
	1.4 Policy intervention to discourage unplanned housing both in urban & rural areas	Ins/Sys	S	MoHPW, NHA, Housing Building Research Institutes

Table 6.5.13: Industrial sector

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Industrial pollution reduced	1.1 Revision of Industrial Policy to accommodate the environmental concern	Sys	M	Ministry of Industry (MoI), DoE
	1.2 Introducing Polluter's Pay Principles to reduce industrial pollution	Sys	M	MoI, DoE
	1.3 Allocation of funds to the Small /Medium Size Enterprises to establish ETP/CETP in the concerned industries	Ins/Sys	M	Ministry of Finance, Private sector
	1.4 Training for the concerned personnel	Ind/Ins	S/M/L	MoEF, DoE, Private sector
	1.5 Proper monitoring layout	Ind/Ins	M/L	MoI, MoEF, DoE

Output	Activity	Nature of CD	Time Frame	Implementing Agency
2. Sustainable industrial practice promoted	2.1 Implementation of Environmental Conservation Rules 1997 strictly and continuous monitoring of pollution	Sys	M	MoI, DoE
	2.2 Promotion of use of water solvent based alternatives	Ins/Sys	M	MoI
	2.3 Sulfur Hexafluoride use reduction	Ins	M	MoI, Private sector
	2.4 Environmental Management System (EMS) Certification enhancement	Ins	S/M	MoI, Mo Law, MoEF

Table 6.5.14: Information and communication

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Awareness among the people about environment created	1.1 Social mobilization, advocacy programme and communication	Ind	L	Mo Information
	1.2 Message dissemination through drama, songs, popular theaters	Ind	S	Radio, TV
	1.3 Information dissemination through court yard meeting and inter personal communication	Ind	M	District Information Officer (DIO)
	1.4 Awareness creation through films and documentaries	Ind	L	DFP, DMC
	1.5 Awareness creation through folksong, village drama, jatra, puppet show	Ind	S	DIO
2. Capacity development of the radio, TV, print media journalists and district information officers (DIOs) facilitated	2.1 Training of electronic & print media people about environment	Ins	S	NIMCO
	2.2Training of DIOs about environment	Ins	S	NIMCO
	2.3 Capacity building training for the trainers	Ins	S	NIMCO/APD
	2.4 Capacity building training for the trainers	Ins	S	NIMCO/APD
	2.5 Training on environment for religious leaders	Ind	S	UNO office at the upazila level

Table 6.5.15: Land

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Sustainable land management Facilitated	1.1 Enhancing capacity of the Ministry of Land (MoL) and other concerned department for implementation of Land Use Policy	Ins/Sys	L	MoL
	1.2 Upgrading land acquisition rules, regulations and laws to accommodate the EIA, ecosystem and biodiversity concern	Ins/Sys	L	MoL
	1.3 Reform of land administration system under a single umbrella instead of dual/ triple administration	Ins/Sys	M	MoL
	1.4 Database on the existing land with classification and proper zoning	Ins/Sys	S	MoL
	1.5 Redefining of land ownership for homogeneous and rational distribution of land	Ins/Sys	S	MoL
	1.6 Rigorous training of land management personnel, local govt. bodies and village or community leaders	Ind/Ins	S	MoL, Mo Establishment

Table 6.5.16: Livestock

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Sustainable livestock management facilitated	1.1 Formulation of a pragmatic livestock policy	Sys	L	MoFL, DLS, BLRI
	1.2 Training and awareness on livestock management and disease resistant varieties	Ind/Ins	M	DLS, BLRI, Mass Media, farmer community
	1.3 Regular supply of vaccine and medicine	Ins	M/L	DLS, BLRI, private sector, farmer community
	1.4 Management of waste of the livestock	Ins/Ind	M	DLS, BLRI, private sector, farmer community

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	1.5. Enhancing marketing linkages for livestock	Ind/Ins	M/L	DLS, private sector, farmer community
	1.6 Conservation of Chittagong Red Cow	Ins/Sys	M/L	DLS, private sector, farmer community
	1.7 Collection & protection of good quality parent stock	Ins	L	MoFL, BLRI, NGOs, community

Table 6.5.17: Local Government

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Capacity of Local Government to ensure sustainable development enhanced	1.1 Strengthening local government at union, upazila, district and divisional levels to handle Priority Environmental Issues	Ins	L	LGD
	1.2 Allocation of sufficient fund for LG to monitoring the sustainable development	Ins	M	LGD
	1.3 Delegation of authority to LG institutions (UP)	Ins	M	LGD
	1.4 Mass awareness campaign	Ins/Sys	S	LGD
	1.5 Capacity development training for the LG bodies	Ins/Sys	S	NILG
	1.6 Introduction of reward and punishment for good & bad performance in LG system	Ins	L	LGD
2. 100% sanitation facility all over the country by 2010 ensured	2.1 Awareness raising on the importance of sanitation	Ind/Ins	S	Local Institutes and LG
	2.2 Provide free latrine slabs to poor people	Ins	M	DPHE
	2.3 Involving local leaders, teachers, Imams and elite to improve sanitation condition	Ins	M	LGD, Ministry of Education, Mo Religious Affairs

Table 6.5.18: Local Government (Urban)

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Sustainable urban development through waste management promoted	1.1 Waste management through engaging LG and NGOs	Ins	M/L	DoE, City Corporation
	1.2 Introduction of regional and zonal waste collection and report card system	Ins/Sys	S	Ward and zone levels institutions and departments
	1.3 Reduction of waste through recycling	Ind/Ins	M	DoE, City Corporation
	1.4 Promoting "Zero waste" at the source of packaging industry	Ins	M	DoE, Urban local Govt., Private sector
	1.5 Determining economic value of waste	Ins	S/M/L	DoE, MoEF
2. Quality of life in the urban areas enhanced	2.1 Human resource strengthening in waste management	Ins	M	DoE, Urban Local Govt.
	2.2 Determination of urban air quality	Ins	M	DoE, Meteorological Department
	2.3Determination of the water quality	Ins	S/M	WASA, Dhaka City Corporation, DoE
	2.4 Regular monitoring of the sewage lines, drains for proper discharge of the waste water	Ins	S/M	WASA, City Corporation, DoE
	2.5 Control of chemical disposal through the drains	Ins	S/M	DoE, City Corporation

Table 6.5.19: Meteorology and space

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Forecasting for river going vessels improved	1.1 Establishment of signal stations in different coastal areas	Ins	S	BMD
	1.2 Awareness programme for fishermen and navigators	Ind/Ins	S	BMD, Media, Radio, TV
2. Agro-Meteorological Services in Bangladesh established	2.1 Introduction of Agro-Meteorological Services in Bangladesh	Ins	M	BMD
	2.2 Updating data dissemination system and data dissemination to the farmers	Ins	S	BMD, Radio, TV
	2.3 Establishing satellite data receiving station	Ins	S	SPARRSO
3. Establish improved weather forecasting system established	3.1 Establishing modern radar system in Bangladesh	Ins	S	BMD
	3.2 Establishing numerical weather prediction system	Ins	S	BMD
	3.3 Establishing seismographic observation station with networking	Ins	S	BMD
	3.4 Strengthening the capacity of the BMD & SPARRSO in weather forecasting	Ins	S	BMD, SPARRSO

Table 6.5.20: Planning

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Environment-friendly development projects promoted	1.1 Awareness building among relevant officials on environmental	Ind	S	MoE
	1.2 Training on EIA for the officials who formulates approaches to development projects	Ind	S	MoE
	1.3 Incorporation of EIA in the planning process to be made mandatory	Sys	S	Planning Cell of all Ministries and Departments

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	1.4. Incorporation of Social Impact Assessment (SIA) for development projects	Sys	S	Planning Cell of all ministries
	1.5 Ensuring EIA of all the development projects	Ins	L	MoE, MoP, APD
	1.6 Sensitizing policy makers and planners to priority environmental issues	Ind	S	Planning Commission
	1.7 Minimal use of agricultural and hilly areas in the development projects	Ins	L	MoE, MoP, Planning

Table 6.5.21: Power and Energy

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1.1 Capacity of the Local Company (BAPEX) for gas exploration improved	1.1 Capacity building of the Local Company (BAPEX) for gas exploration in order to reduce dependence on foreign company	Ins	S/M	Ministry of Energy, BAPEX, Petrobangla
	1.2 Exploring more gas fields in the country including onshore and offshore	Ins	S/M	BAPEX, Petrobangla
	1.3 Improving the transmission of gas pipeline & gas distribution to reduce system loss	Ins	S/M	GTCL, Petrobangla
2. Power supply improved	2.1 Installing more gas based power stations	Ins	S/M/L	Power Development Board (PDB)
	2.2 Importing hydro-electricity from Nepal, Bhutan and Myanmar	Ins	M/L	PDB, Mo Energy
	2.3 Tapping hydro-power potential in the hilly areas	Ins	M/L	PDB
	2.4 Increase the potentiality of renewable energy sources including solar panel, wind mill, bio-gas plant to reduce pressure on energy	Ins	M/L	PDB

Table 6.5.22: Public Administration

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Good governance promoted	1.1 Sensitization of Police Administration to Priority Environmental Issues (PIEs)	Ind	S	Ministry of Homes, Police Directorate
	1.2 Training for police officials through Police Academy	Ins	S	Ministry of Homes
	1.3 Development of training module incorporating PIEs	Ins	L	Police Directorate
	1.4 Purchase of vehicle for movement of police	Ins	S	Ministry of Homes
	1.5 Seting up people-oriented model police stations	Ins	M	Police Directorate
	1.6 Introduction of reward and punishment for good and bad performance	Ind/Ins	M	Ministry of Homes
	1.7 Introduction of neutral transfer and posting system in Police Administration	Ins	S	Police Directorate
	1.8 Maintaining sustainable law and order situation in all socio-economic, environment and development processes	Ins	S	Police Directorate

Table 6.5.23: Mass awareness through religious leaders

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Mass awareness promoted through religious leaders	1.1 Providing education to the religious leaders through Imam training academy as TOT	Ind/Ins	L	Islamic Foundation Bangladesh, Ministry of Religious Affairs
	1.2 Dissemination of knowledge to the common people (such as mussallis) by religious leaders (Imams, purahits etc.)	Ins	L	Islamic Foundation Bangladesh, Ministry of Religious Affairs

Table 6.5.24: Social Welfare

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Sustainable Socio-economic development	1.1 Socio-economic development of poor people in the slum areas / living in the street by providing proper housing, sanitation, education, health education, family planning awareness, capacity building on environment	Ind/Ins	M	Mo Social Welfare, DSS, LGD, NGOs
	1.2 Expanding social safety net for the poor community people both in urban & rural areas of Bangladesh	Ind/Ins	M	Mo Social Welfare, DSS, LGD, NGOs
	1.3 Special programme for the street children for their nutrition, health, education, HR development	Ind/Ins	M	Mo Social Welfare, DSS, LGD, NGOs
	1.4 Prevention of street begging and creating alternative livelihood for them	Ind/Ins	M	Mo Social Welfare, DSS, LGD, NGOs
	1.5 Setting up more women hostels in the major cities for the women employees, specially for garment workers	Ind/Ins	M	Mo Social Welfare, DSS, LGD, NGOs

Table 6.5.25: Ports and shipping

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Sustainable inland navigation routes	1.1 Regular dredging of the major rivers in order to ensure sustainable water transport	Sys	S/M	BIWTA
	1.2 Removing silt from all the major rivers	Ind/Sys	L	BIWTA
	1.3 Procurement of efficient dredger and other equipment	Ins	M/L	BIWTA
	1.4 Capacity building of the manpower in the shipping sector	Ins	S/M	BIWTA, BWDB
	1.5 Initiation of hydrographic survey	Ins	M/L	BIWTA

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	1.6 Reducing oil spillage in the major rivers of the country	Ins	M/L	BIWTA
2. Effective and efficient sea port operation in place	2.1 Privatization of port operation and container handling	Ins/Sys	S	CPA, MPA, MoS, Cabinet
	2.2 Computerized operational system of sea ports	Ins	M	CPA, MPA, MoS
	2.3 Minimizing the administrative procedures of port and customs	Sys	S	MoS, Cabinet, NBR
3. Timely, speedy and adequate transport system established for carrying goods to and from the ports	3.1 Private ICDs allowed and established	Ins	S	MoS, CPA, MPA, Mo Commerce
	3.2 Providing efficient & speedy railways service between Dhaka-Chittagong, Dhaka-Mogla	Sys	M	MoS, CPA, MPA, BIWTA
	3.3 Establishment Internal Container Depots (ICDs)	Ins	M	MoS, CPA, MPA, BIWTA
	3.4 Procurement of barge to transport containers between ports and ICDs	Ins	S	BIWTA, MoS
	3.5 Widening road to transport containers	Sys	M	MoS, Mo Commerce
4. Scope of business of through sea/land ports among the regional countries increased	4.1 Exploring possibility of regional cooperation treaty among Bangladesh, India, Nepal, Bhutan to strengthen transit of goods and services	Sys	M	MoS, MoC, MoFA
	4.2 Road link from CPA, MPA to Bangladesh-India border post	Ins	M	MoS, MoC
	4.3 Facilitating Nepal, Bhutan and North Indian States to use Bangladesh ports in order to tapping foreign exchange	Sys	M	MoFA, MoC, MoS

Table 6.5.26: Surface Transport & Communication

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Sustainable roads and highways and railway network system facilitated	1.1 Proper master plan for national railway, road & highway development	Ins	S	RHD , LGED
	1.2 Long term plan for Monorail, Sky train, underground railway in the Dhaka city to reduce pollution	Ins	L	MoC, DCC
	1.3 Regional master plan for roads at upazila level priority fixation for rail, road and water ways	Ins	M	BIWTA, JMBA
	1.4 Considering water-logging issues while construction of rural roads	Ins	M	LGD, LGED
	1.5 Necessary measures in case of large bridge construction to avoid siltation and other environmental problems	Ins	L	LGD, LGED
2. Network between the districts, upazila and villages improved	2.1 To avoid more roads in the same area and to save scare agricultural land, proper planning and mapping system for the rural road network	Ins	L	LGD, LGED, RHD
	2.2 Prevent water-logging situation in the rural road especially in the rainy season	Ins	L	LGD, LGED
	2.3 Construction of roads and railways with the provision of proper water channels	Ins/Sys	S/L	LGED
	2.4 Constructing bridges/culverts after appropriate study on river morphology and hydrology	Ins/Sys	M/L	RHD, LGED, IWM
	2.5 Construction and expansion of the railways to promote mass transportation	Ind/Ins /Sys	M/L	BIWTC
	2.6 Building up capacity of BRTA to regulate road transportation system	Ind/Ins /Sys	S/M	BRTA
	2.7 Promoting energy efficient air and water pollution free transportation system	Ins/Sys	M/L	BRTA, BIWTC, BWDB

Output	Activity	Nature of CD	Time Frame	Implementing Agency
	2.8 Controlling emission from the vehicles in the urban areas	Ins	M/L	BRTA
	2.9 Efficient regulatory body to control sound pollution	Sys	M/L	BRTA, BIWTC
	2.10 To perform EIA and SIA prior to construction of roads	Ins	L	MoEF, DoE

Table 6.5.27: Water resource

Output	Activity	Nature of CD	Time Frame	Implementing Agency
1. Riverbank erosion prevented	1.1 Afforestation on the river side	Ins/Sys	S/L	MoEF, MoWR
	1.2 Suspension bridge instead of pillar bridge to reduce siltation	Ins	L	MoC, MoEF, MoWR, RHD
	1.3 Retention of water through excavating ponds	Ins	L	MoWR, MoEF
	1.4 Use of surface water source for irrigation instead of ground water source	Ins	L	MoWR, MoEF
2. Sustainable irrigation facilities in place	2.1 Re-excavation and restoration of canals and rivers	Sys/Ins	L	MoWR, BWDB
	2.2 Comprehensive and integrated water basin connection system	Sys/Ins	M	MoWR, BWDB, WARPO
	2.3 Awareness building activities to motivate the beneficiaries	Ins/Sys	M/L	MoWR, LGD
3. An integrated and comprehensive management of Flood Control Drainage and Irrigation (FCDI) established towards sustainable development	3.1 Riverbank protection activities	Ins/Sys	L	MoWR, BWDB
	3.2 An updated study on Flood Action Plan	Ins/Sys	S	MoWR, BWDB
	3.3 Development of drainage system through re-excavation of canals and rivers	Ins/Sys	L	MoWR, BWDB, LGD

Output	Activity	Nature of CD	Time Frame	Implementing Agency
4. Sustainable water resource management pomoted	4.1 Surface water utilization for irrigation, fisheries and livestock	Ind/Ins	L	BWDB, WARPO, BRRI
	4.2 Construction of submergible embankments for protecting crops from flash flood	Ind/Ins	S/L	BWDB, Haor and Wetland Development Board
	4.3 River bank protection to save the cities and towns and important ecological zones	Ind/Ins	S/L	BWDB
	4.4 Construction and rehabilitation of the sluice gates and regulators	Ind/Ins	S/L	BWDB
	4.5 Control over intrusion of saline water	Ind/Ins	S/L	BWDB
	4.6 Control of water-logging situation	Ind/Ins	S/M/L	BWDB
	4.7 Conduct EIA for all water related projects	Ind/Ins	S/L	BWDB, IWM, CEGIS

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Chapter 7

MONITORING & EVALUATION

Implementation monitoring is one of the significant aspects of any plan, policy and programme under any development initiatives. In the past, in absence of such monitoring, the people and the nation have been deprived of the outcomes of such good initiatives. Hence, an institutional framework for implementation mechanism of such plan, policy and programme is an integral part of a policy document.

During the thematic assessment and stakeholder consultation process under NCSA, almost all concerned, recommended the constitution of an apex body, which would be known as "Sustainable Development Commission" (SDC) to monitor the implementation of CDAP prepared under the National Capacity Self-Assessment Project and facilitate sustainable development (Box 7.1) in Bangladesh with particular focus on environmental governance. The status of the Commission would be like that of the National Economic Council (NEC) or National Implementation Committee on Administrative Reorganization (NICAR). The proposed Commission would be advisory, but with some regulatory authority. The objectives of the apex body would be to ensure sustainable development, the coordination mechanism among all the ministries/divisions/ departments/agencies and to develop partnership between the public and private entities.

Box 7.1: Historical Landmarks in Sustainable Development

1972 : UN Conference on the Human Environment held in Stockholm, Sweden.

1987 : The World Council on Environment and Development was formed.

1989 : UNGA adopted a resolution: 44/228 to call for a UN Conference on Environment and Development.

1992 : UN Conference on Environment and Development (Earth Summit) held in Rio-de-Janeiro, Brazil. Adopted Rio Declaration which sets 27 principles supporting the Sustainable Development and agree on a plan of action known as Agenda 21 in which a national sustainable development strategy was recommended.

2000 : Millennium Development Goals (MDGs)

- Eradicate Extreme Poverty and Hunger
- Achieve Universal Primary Education
- Promote Gender Equality and Empower Women
- Reduce Child Mortality
- Improve Maternal Health
- Combat HIV/AIDS, Malaria & other diseases
- Ensure Environmental Sustainability
- Develop a Global Partnership for Development

2002 : World Summit on Sustainable Development held in Johannesburg, South Africa

- Poverty Eradication
- Sustainable consumption and production
- Natural resource base of socio-economic development
- Globalization, health, Regional Priorities
- Sustainable Development Governance
- Plan of Implementation (Water, Energy, Health, Agriculture & Biodiversity)

7.1 Institutional Framework for Monitoring and Evaluation

Against this backdrop, a "Policy Dialogue on Institutional Framework for Sustainable Environmental Governance" was organized in Dhaka on 31 August 2007. A total of 65 high level Government officials – of the rank of Joint Secretaries – from various line ministries/divisions attended the dialogue to review the framework of the proposed 'Sustainable Development Commission' for the future sustainable environmental governance. A questionnaire was provided to the participants to obtain their opinion on the framework. A summary of the results of the dialogue is given in Annex 7.1 of this report. The outcome of the dialogue is reflected in the next sections.

7.1.1 Sustainable Development Monitoring Council (SDMC)

Most of the participants, including chief guest Md. Abdus Salam Khan, Secretary, Ministry of Establishment, Government of the People's Republic of Bangladesh and Special Guest A.H.M. Rezaul Kabir, ndc, Secretary, Ministry of Environment and Forests, appreciated the concept of a body for monitoring the sustainable environmental governance. However, the participants suggested renaming the proposed body as "Sustainable Development Monitoring Council (SDMC)" to be headed by the Finance Minister. They also suggested inclusion of more professionals, scientists and specialists and reducing the number of the bureaucrats.

Based on the recommendations of the policy dialogue, the composition of the Council has been revised and the related ministries, divisions, departments, agencies, research organizations, leading training institutes, NGOs, members of civil society, and private sectors have been included in the Council. The composition of the proposed SDMC is given in Annex 7.2. A diagram is shown in Figure 7.1. below.

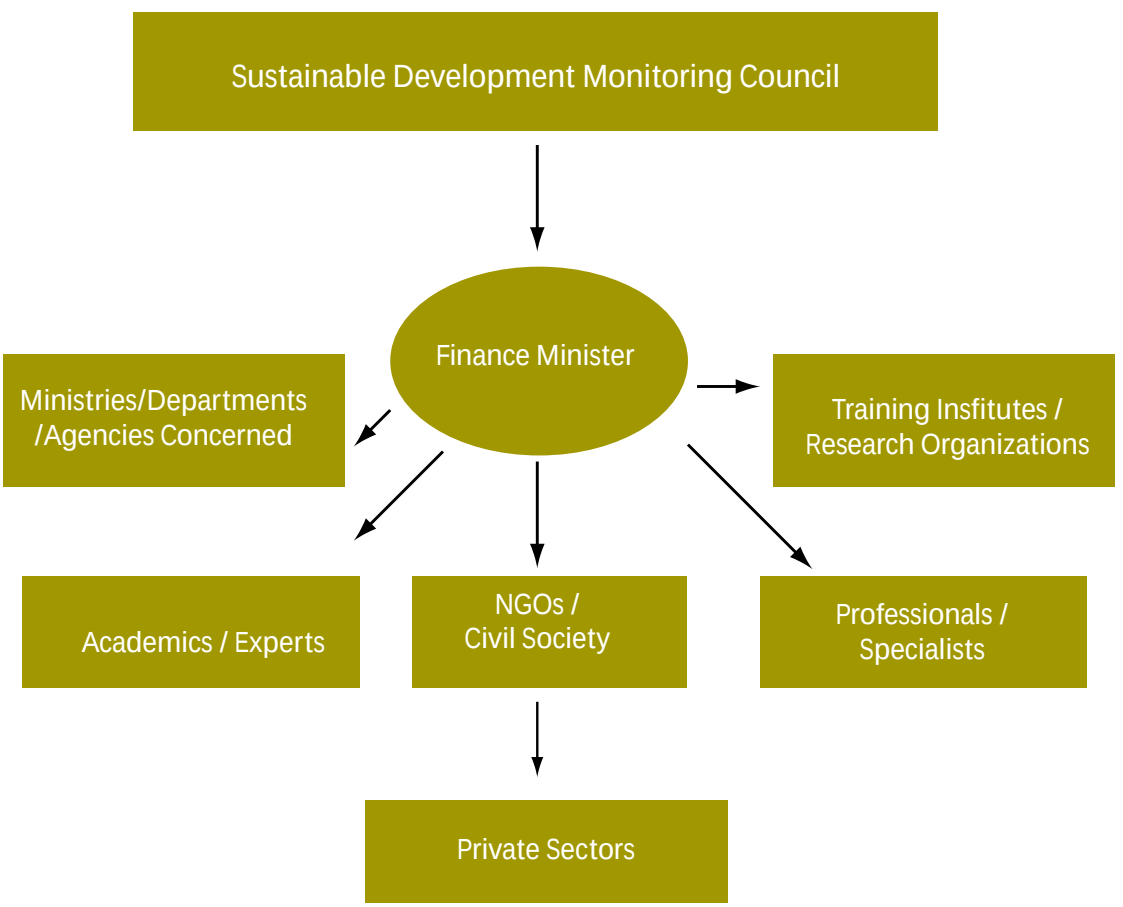

Fig. 7.1. Composition of the Sustainable Development Monitoring Council (SDMC)

7.1.1.1 ToR for the SDMC

The terms of reference (ToR) for the SDMC may be outlined as follows:

1. The Council will review the obligations and commitments under the Multilateral Environmental Agreements (MEAs) with special thrust on the following:
   - United Nations Framework Convention on Climate Change (UNFCCC),
   - United Nations Convention on Biological Diversity (UNCBD) and
   - United Nations Conventions to Combat Desertification (UNCCD).
2. The Council will ensure the overall sustainable development of the country with special thrust on the following:
   - Natural Resources Management of the country;
   - Review the Priority Environmental Issues and provide guidelines to the authorities concerned to resolve the issues;
   - Major infrastructures i.e. roads & highways, embankments, housing etc of the country;
   - Socio-economic growth accompanied with sustainable environmental governance;
   - Biodiversity hotspots of the country; and
   - Management of internationally significant and nationally recognized Ramsar Sites under the Ramsar Convention on Wetlands.
3. The Council will review and monitor the implementation mechanism of the following national planning and strategy documents:
   - National Capacity Self-Assessment (NCSA) & Capacity Development Action Plan (CDAP) for global environmental management;
   - National Adaptation Programme of Action (NAPA) to address the climate change under UNFCCC;
   - National Biodiversity Strategy and Action Plan (NBSAP) under UNCBD;
   - National Action Plan (NAP) to address land degradation under UNCCD.
4. Any other matters as the Council may deem necessary for the sake of overall sustainable development of the country.

7.1.1.2 Institutional Support for SDMC

Conducting meetings and implementation of the decisions of the SDMC will be a continuous process. The existing set-up of the MoEF may not be able to provide secretarial support to the Council. Hence a separate branch (Sustainable Development Branch) may be created under the MoEF to provide secretarial support to the Council (Fig. 7.2). The Council would require a separate budget to carry out its mandates. So a separate budget line may also be created for the Council.

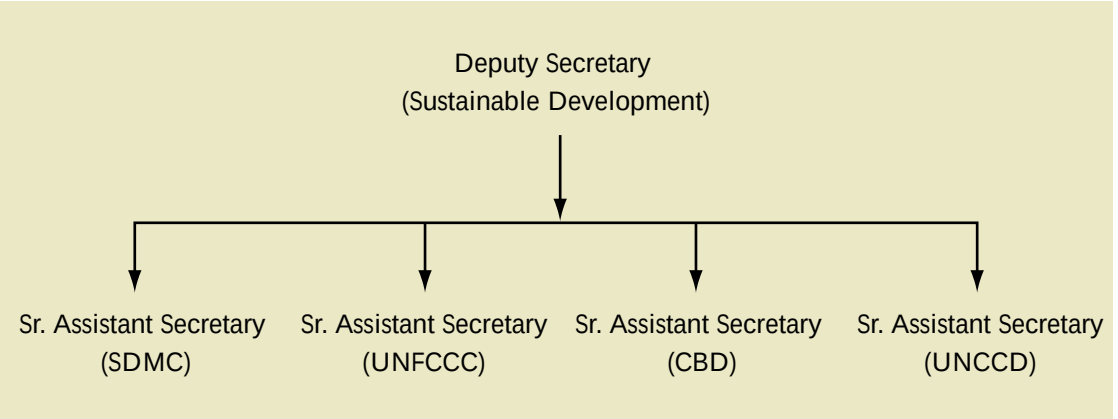

Fig. 7.2. Sustainable Development Branch under the Ministry of Environment and Forests

7.1.1.3 Statutory Regulation Order (SRO) / Notification of SDMC

Since the mandates of the SDMC would be beyond the purview of the MoEF, a special Notification/Statutory Regulation Order (SRO) may be issued from the Cabinet Division/ Ministry of Law, Justice and Parliamentary Affairs. The composition of draft of such Council is shown in Annex 7.2.

7.1.2 Sustainable Development Board (SDB)

While the size of the SDMC would be large and it will not be possible for it to sit every month, there may be a small professional/expert body to provide technical advice to the SDMC. During the policy dialogue of NCSA, most of the participants suggested that this body may be headed by the Cabinet Secretary and may be named "Sustainable Development Board (SDB)". The composition and mandates of SDB are given in Annex 7.3.

A tentative schedule of the meetings of the SDMC and SDB is given in Table 1.

The tentative schedule of the meetings of the SDMC and SDB is as follows:

Name of the months	Meeting Schedule	
January		SDMC
February	SDB	
March	SDB	
April		SDMC
May	SDB	
June	SDB	
July		SDMC
August	SDB	
September	SDB	
October		SDMC
November	SDB	
December	SDB	
Total	SDB – 8	SDMC – 4

7.1.3 Institutional Framework for Sustainable Environmental Governance at Divisional Level

The Government of Bangladesh has steadily been trying to decentralize power, moving parts of its administrative functions to the division, district and upazila levels. The objective of decentralization is to promote local socio-economic and sustainable development strategies and initiatives by empowering the local people to participate in and make decisions on their own plans and programmes, while enabling them to adopt approaches and practices that suit local needs. As a part of this overall decentralization process, Bangladesh is striving to translate its policy of environmentally sustainable development into on-the-ground level actions. Bangladesh is increasingly facing adverse environmental impacts in different region of the country. With a view to avoiding or minimizing such impacts, there is a growing need to introduce and implement procedures for assessment and management of regional environmental impacts. Notably, identifying priority environmental issues is an overarching process, involving all the three areas of global environmental management – biodiversity, climate change and land degradation – cutting across various sectors and agencies. The NCSA process highlighted the capacity gaps at the local levels as one of the greatest barriers to effective local environmental management. Accordingly, a concerted effort to develop local capacity for cross-cutting, effective and sustainable environmental management is one of the highest priorities for the country in the upcoming decade.

Hence, it has been suggested that the local environmental governance system should be strengthened through a committee at the division level under the leadership of the Divisional Commissioner and the committee should involve the local City Corporation, university teachers, key officials, NGOs, media and civil society. The Cabinet Division / MoEF may constitute such a committee through a separate notification. The terms of reference of such Divisional Committee may be as follows.

a. To identify the Priority Environmental Issues (PEIs) in the division;

b. To prepare Capacity Development Action Plan for the division to resolve PEIs; and

c. Any other matters as Divisional Committee may deem necessary for the division concerned.

7.1.4 Institutional Framework for Sustainable Environmental Governance at District Level

Field administration at the mid-level is governed by the Deputy Commissioners in all the 64 districts. At present, there is a District Development Coordination Committee (DDCC) in each district. The MoEF has also constituted a District Environment and Forest Committee (DEFC) headed by the Deputy Commissioner. But the mandate for the monitoring of the priority environmental issues is missing in the ToR of the DDCC and DEFC. During the policy dialogue, majority of the participants voted for a separate committee on Sustainable Environmental Governance at the district level. The MoEF may take initiative to form a separate committee on Sustainable Environmental Governance at the district level or reorganize the existing district committee with the following mandates.

a. To identify the Priority Environmental Issues (PEIs) in the district concerned;

b. To prepare Capacity Development Action Plan for the district to resolve PEIs; and

c. Any other matters as the District Committee may deem necessary for the district concerned.

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7.1.5 Institutional Framework for Sustainable Environmental Governance at Upazila Level

Field administration at the lower level is directed by the Upazila Nirbahi Officer (UNO) in all the 490 upazilas. At present, there is a Upazila Development Coordination Committee in each Upazila. The MoEF has also constituted a Upazila Environment and Forest Committee headed by the UNO. But the mandate for the monitoring of the priority environmental issues is missing in the ToR of the above two committees. During the NCSA policy dialogue, majority of the participants voted for a separate committee on Sustainable Environmental Governance at the upazila level. The MoEF may take steps to form a separate committee on Sustainable Environmental Governance at the upazila level or reorganize the existing upazila committee with the following mandates:

a. To identify the Priority Environmental Issues (PEIs) in the upazila;

b. To prepare Capacity Development Action Plan for the upazila to resolve PEIs; and

c. Any other matters as the Upazila Committee may deem necessary for the upazila.

7.2 Financial Mechanism for Implemention of NCSA

Leveraging resources is one of the key instruments to implement the CDAP prepared under NCSA. It provides a framework for mobilization of resource to implement the NCSA. The framework provides some ideas on how the existing financial sources can be used as well as new funds raised so that implementation of the NCSA is financially sustainable. The financial mechanism not only indicates ways of raising funds, it also deals with the implementation responsibilities of different sectors so that Bangladesh becomes self-reliant in capacity development for sustainable environmental conservation and management. The mechanism also provides a framework for donors to prioritize their support to capacity development efforts in Bangladesh.

7.2.1 Global Environment Facility (GEF)

The GEF support for climate change adaptation comes in three stages. Stage I provided support for the national communication process, a part of which is the vulnerability and adaptation assessment. Stage II provides further assistance for other capacity-building efforts for adaptation. The forthcoming Stage III is intended to support actual adaptation activities, including insurance, and has been implemented in the form of the GEF Strategic Priority on Adaptation (SPA). The GEF has allocated US$ 50 million under SPA of which US$ 5 million is for piloting community adaptation initiatives through the Small Grants Programme (SGP).

The goal of the Community-Based Adaptation (CBA) Programme is to support the community component of the GEF SPA, and provide the basis upon which the GEF and other stakeholders can effectively support small-scale adaptation activities. This goal will be realized through three immediate objectives:

(i) development of a framework, including new knowledge and capacity, that stretches from the local to the national levels (cross-scale 'policy laboratories'), to respond to unique community-based adaptation needs;

(ii) identification and financing of diverse CBA projects (small-scale 'policy laboratories') in a number of selected countries; and

(iii) dissemination of lessons learned at the community level to all stakeholders, including Governments.

The MoEF received funds for preparing the Initial National Communication to the UNFCCC and submitted its First National Communication in 2002. The Government has also submitted a proposal to GEF for the Second National Communication. Recently, Bangladesh has become a member of GEF Small Grant Programme and CBA activities are expected to be implemented soon.

Financial support for the development of this NCSA was provided by the GEF. It has also provided support to NBSAP (National Biodiversity Strategy and Action Plan), National Biodiversity Report, NAP (National Action Plan for Desertification), a small component of the Sundarbans Biodiversity Conservation Project, the Coastal and Wetland Biodiversity Project (CWBMP) at Cox's Bazar and Hakaluki Haor, and to the biodiversity component of the Fourth Fisheries project.

7.2.2 Least Developed Countries Fund (LDCF)

The LDCF was established to support the preparation and implementation of National Adaptation Programmes of Action (NAPA) – a prioritised list of urgent and immediate adaptation projects, identifying those priority activities "whose further delay could increase vulnerability, or lead to increased costs at a later stage" (Decision 28/CP.7). The operational modalities and procedures have been finalized. At present LDCF has approximately 120 million US$ for funding priority activities in 49 LDCs under UNFCCC.

The MoEF received US$ 200 thousand for preparation of NAPA which was submitted to the UNFCCC secretariat in 2005. It has identified 15 priority areas as immediate and urgent needs for Bangladesh to address adaptation to climate change.

As a follow-up to the NAPA, Bangladesh has developed two projects i.e. a) Community based Adaptation to Climate Change through Coastal Afforestation and b) Mainstreaming Adaptation to Climate Change and Capacity Building for Climate Resilient Development in Bangladesh. The Government has submitted its first project for funding under LDCF.

7.2.3 Special Climate Change Fund (SCCF)

The SCCF was established to finance developing country activities in (1) adaptation, (2) technology transfer, (3) key sectors (energy, transport, industry, agriculture, forestry and waste management), and (4) economic diversification for countries with economies dependent on the fossil fuels. A project entitled "Mainstreaming Adaptation to Climate Change and Capacity Building for Climate Resilient Development in Bangladesh" was developed as a follow-up to NAPA and has been submitted for funding from SCCF under the UNFCCC. Till date the SCCF has got more than US$ 60 million pledging from Annex I Parties.

7.2.4 Kyoto Protocol Adaptation Fund (KPAF)

The Adaptation Fund (AF) under the Kyoto Protocol, which is to be based on contributions from the 'Adaptation Levy', placed on all transactions under the Clean Development Mechanism (CDM) of the Kyoto Protocol. This fund is meant to support 'concrete adaptation' activities. The AF is expected to be operational at COP 13/MOP3 in 2007.

All three funds (LDCF, SCCF and KPAF) as mentioned above are to support adaptation in developing countries, but differ in important ways (Table 7.1). The LDCF and SCCF are established under the UNFCCC and based on voluntary contributions from developed countries. These additional funds are for addressing the adaptation needs to that of a country that has received an allocation under Resource Allocation Framework (RAF).

Several developed country parties declared at the COP 6 in Bonn that they will collectively contribute US$ 410 million a year as extra funding for developing countries by 2005, with this level to be reviewed in 2008. In addition to these funds, the GEF has allocated US$ 50 million to a new pilot adaptation action programme for use over the next few years.

Table 7.1: The Multilateral Adaptation Financing Account

Adaptation fund	Total pledged (US$ million)	Total received (US$ million)	Total disbursed (less fees) (US$ million)
Least Developed Countries Fund	156.7	52.1	9.8
Special Climate Change Fund	67.3	53.3	1.4
Adaptation Fund	5	5	-
Sub-total	229	110.4	11.2
Strategic Priority on Adaptation	50	50	14.8[a]
Total	279	160.4	26

a. Includes fees.
Note: data are as of 30th April 2007.

Sources: Adopted form Human Development Report 2007/ 2008, UNDP (2007

7.2.5 Other donors

There are ample scopes and opportunities for adaptation using funds from bilateral and multilateral donors. The multi-agency paper on poverty and climate change points out that climate change adaptation objectives can be incorporated into development activities funded through Overseas Development Assistance (ODA).

The long-term effects of climate change on ODA are connected in at least three ways. First, climate change poses a threat to projects that involve ODA. Second, the community or ecosystem that benefits from ODA may be vulnerable to climate change. Finally, the ODA project may have (positive or negative) effects on the vulnerability of the community or ecosystem to climate change. Risk assessments, vulnerability assessments and environmental impact assessments as part of ODA-funded projects could help to reduce the vulnerability of these projects to climate change. The European Commission (EU) has identified adaptation as a relevant response strategy in development cooperation for most EU partner nations, using a set of indicators. Most of the proposed assistance, though, is limited to capacity-building (such as joint research and knowledge exchange), and does not include the provision of funds for the implementation of adaptation.

7.2.6 Government contributions

As per Socio-Economic Indicators of Bangladesh Economic Survey 2007, GoB contributes around 55% of ADP from its own resources. But Government contributions to capacity development of Bangladesh cannot be ascertained exactly as budget allocations to different national public organizations support a variety of activities, among which capacity development is not always explicitly indicated. Recently, the Government of India has calculated that 2% of its GDP goes to environment protection projects. Finance Division/ Planning Commission should have similar exercise during the preparation of national budget in Bangladesh and GoB may enhance its contribution towards environment related projects.

7.2.7 Options for Securing New and Additional Resources

A major challenge in implementing the NCSA is to secure additional financial resources needed to undertake the actions identified in the NCSA, build capacities to sustain actions and provide support to pay for indirect costs. It is, therefore, essential to find ways of enhancing and supplementing the current level of support, to seek new partnerships with the business community, NGOs, private sector etc., and to find better ways of administering available resources. This challenge will require innovation. The following paragraphs describe some approaches used in other parts of the world, from which lessons may be drawn for capacity development in Bangladesh.

7.2.7.1 Public budget allocations

In addition to the Ministry of Environment and Forests, a number of other ministries/divisions/departments are either directly or indirectly involved in environment conservation efforts. Their contribution to actions at the local level typically does not directly address priority environmental issues but does support the actions identified in NCSA. A function of the 'Apex Body', as discussed earlier in this chapter, will be to liaise with other ministries/divisions/departments so as to improve coordination of such activities and facilitate investment toward environmental objectives.

7.2.7.2 Domestic fiscal instruments

Many countries have used taxes or levies as a means to support environmental conservation. For example, in Iran, all private sector companies dependent on natural resources, such as mining companies, must pay 1% of their annual revenues to support anti-pollution measures. The Department of Conservation in Papua New Guinea meets its wildlife trade monitoring costs through taxes levied on export of crocodile skins. In Nepal, 30% of the Mount Everest climbing fees are invested in community development work, while in Pakistan, the Government allows community retention of 60-80% of timber sale revenues. Bangladesh may also identify appropriate fiscal measures to support implementation of the NCSA. Collection of such taxes can be made from the emerging private sectors under "Corporate Social Responsibility (CSR)" where they contribute a small percentage of their revenues to conservation efforts.

7.2.7.3 Payments for environmental services

Many environmental goods and services had, in the past, been viewed as being free of cost. However, since the conservation of forests or other ecosystems that provide such services incurs costs, those making use of environmental services should meet these costs. In many cases the natural resources from which environmental services are derived are partly or wholly owned by communities or individuals from within the local communities. Thus, payments for environmental services can serve not only to promote conservation, but can also simultaneously provide new and additional income opportunities for capacity development.

7.2.7.4 Trust funds

Various types of funds have been created by many countries for environmental conservation. Perhaps the best example is from Bhutan, where a trust fund established in part with financial support from the GEF has now far exceeded its initial capitalization target. Another example, the Mongolian Environmental Trust Fund, illustrates some of the problems of trust fund establishment, as it has proven very difficult to secure sufficient domestic and international contributions to reach a viable level of capitalization. The Government of Vietnam has been working to establish a Conservation Fund for Special Use Forests, with support from GEF. The structure and operational principles of the Fund are to support protected area management while improving incomes for local communities. In Bangladesh, a trust fund can be set up by the Government through 'Public-Private Partnership' toward the objective of capacity building.

7.2.7.5 Polluters Pay Principle (PPP)

Many countries including Japan have introduced Polluters Pay Principle (PPP) to reduce the air pollution and industrial pollution. GoB may also introduce a similar principle to reduce the burden on the environment and raise funds for capacity building.

7.2.8 Recommendations for financial arrangement

It is clear that there are many options available to raise resources to implement the NCSA in Bangladesh. The following actions are proposed:

Short-term: (1-3 Years)

It is important to estimate the costs of implementing the NCSA and arrange to have them reflected in the annual budgets of the Government agencies and Country Assistance Strategies of the donors. In particular, the need for public investment in capacity building should be highlighted and justified in terms of its contribution to socio-economic development and poverty

reduction. Development efforts by donor agencies should consider the elements of NCSA and draw linkages, where possible.

Medium-term: (1-5 years)

The options on taxes and levies can be assessed for their feasibility and the national policies and regulations in this regard needs to be put in place within the next 1-5 years.

Long-term: (1-10 Years)

Issues of sustainable market linkage, support from private sector regarding environmental services and additional budget allocations specifically to address priority environmental issues and establishing a trust fund should be addressed, in addition to looking into the option of 'debt-for-nature swaps'.

ANNEXURE

Annex 1.1

Schedule of Thematic Group (TG) Meetings

1. Thematic Group on UNFCCC			
SL	Name of TG	Resource Person	Meeting date
1.1	TG on Mitigation, Kyoto Protocol – mandates and elements (CDM)	Mr. A. H. M. Maqsood Sinha, Executive Director, Waste Concern	02.11.06 3.00PM
1.2	TG on Adaptation, implementing NAPA – five year PoW on Adaptation (including access to LDC fund, Special CC fund, KP Adaptation Fund, GEF-RAF etc.)	Mr. Mohammad Reazuddin, Director (Technical), Department of Environment	30.11.06 3.00 PM
1.3	TG on reporting and post 2012 climate change regime (e.g. NatCom and NAPA	Dr. Atiq Rahman Executive Director Bangladesh Centre for Advanced Studies	27.12.06 3.00 PM

2. Thematic Group on CBD

SL	Name of TG	Resource Person	Meeting date
2.1	TG on Bioprospecting and ABS issues	Dr. Md. Abdur Razzaque, Member Director (Crops), BARC	28.11.06 3.00 PM
2.2	TG on Cartegena Protocol on Biosafety including risk assessment and risk management	Mr. M. Solaiman Haider Assistant Director Department of Environment (DoE)	17.12.06 3.00PM
2.3	TG to address capacity needs to implement CBD 2010 Countdown (including NBSAP, 4th National Biodiversity Report of Bangladesh to CBD, GTI, SBSTTA etc)	Dr. G.P. Das, Country Coordinator, Agricultural Biotechnology Support Project II	29.11.06 11.00 AM

3. Thematic Group on UNCCD

SL	Name of TG	Resource Person	Meeting date
3.1	TG on land degradation including resource mobilization (Global Mechanism of GEF)	Mr. Jalal Uddin Md. Shoaib, Principal Scientific Officer, Soil Resource Development Institute (SRDI)	14.12.06 3.00 PM
3.2	TG on issues other than land degradation, and reporting and communication including NAP	Dr. S.M. Imamul Huq Professor Department of Soil, Water and Environment University of Dhaka	20.12.06 3.00 PM

4. Thematic Group on Synergy

SL	Name of TG	Resource Person	Meeting date
3.1	Thematic Group on synergies among the Rio Conventions	Mr. M. Qamar Munir, Project Manager, Institution and Policy Support Unit (IPSU), Ministry of Environment and Forests	19.02.07 11.00 AM

Annex 1.2

List of Focus Group Meetings

Date	Title	Venue	Remarks
22nd May 2007	Multi-stakeholder Consultation Meeting on the occasion of observing the International Biodiversity Day 2007	BIAM Auditorium, Dhaka	Govt. Officials, NGO and civil society representatives and the members of print and electronic media.
24th May 2007	Community Level Consultation Meeting	Jadimura Private School Campus, Teknaf	Local Community
24th May 2007	Focus Group Consultation with Government officials, defense officials, NGO and civil society representatives and the members of print and electronic media at Upazila level.	Ne Tong, Teknaf, Cox's Bazar	Govt. officials, and local government and NGO representatives
6th June 2007	"Combating Climate Change: Institutional and Individual Capacity Development" to observe the World Environment Day 2007	Osmani Auditorium, Dhaka	Govt. Officials, NGO and civil society representatives and the members of print and electronic media.
16th June 2007	"Capacity Development for Sectoral Planning in Bangladesh"	Academy for Development Planning, Nilkhet, Dhaka	Planning cadre officials
28th June 2007	District-level Focus Group Consultation Meeting on NCSA	Circuit House, Sunamganj	Govt. officials, and local government, NGO and media representatives
31st August 2007	"Institutional Framework for Sustainable Environmental Governance"	Spectra Convention Centre, Dhaka	Joints Secretaries to the Government of Bangladesh
6th October 2007	"Role of Media in Sustainable Environmental Governance"	National Press Club, Dhaka	Members of the press and electronic media
4th-5th November 2007	"Training Workshop for the Project Directors on Capacity Building for Sustainable Environmental Governance"	Forest Department, Agargaon, Dhaka	All Project Directors under MoEF

Annex 2.1

List of the Proposed Projects under NAPA 2005

Sl/ No.	Title of the Proposed Projetcs	Amount for Project Design (USD)	Amount for Full Project (USD million)
1	Reduction of climate change hazards through coastal afforestation with community focus	100,000	23
2	Providing drinking water to coastal communities to combat enhanced salinity due to sea level rise	25,000	1.5
3	Capacity building for integrating climate change in planning, designing of infrastructure, conflict management and land-water zoning for water management institutions	25,000	2
4	Climate change and adaptation information dissemination to vulnerable community to raise awareness	50,000	7
5	Construction of flood shelter, and information and assistance centre to cope with enhanced recurrent floods in major floodplains	50,000	5
6	Mainstreaming adaptation to climate change into policies and programmes in different sectors(focusing on disaster management, water, agriculture, health and industry)	25,000	1
7	Inclusion of climate change issues in curriculum at secondary and tertiary educational institution	25,000	0.5
8	Enhancing resilience of urban infrastructure and industries to impacts of climate change including floods and cyclone	25,000	2
9	Development of eco-specific adaptive knowledge (including indigenous knowledge) on adaptation to climate variability to enhance adaptive capacity for future climate change	50,000	5
10	Promotion of research on drought, flood and saline tolerant varieties of crops to facilitate adaptation in future	50,000	5
11	Promoting adaptation to coastal crop agriculture to combat salinization through maize production under Wet Bed No-tillage Method and Sorjan systems of cropping in tidally flooded agro-ecosystem	50,000	6.5
12	Adaptation to agriculture systems in areas prone to enhanced flash flooding- North East and central region through No- tillage potato cultivation under water hyacinth mulch in wet sown condition, and Vegetable Cultivation on Floating Bed	50,000	6.5
13	Adaptation to fisheries in areas prone to enhanced flooding in North East and Central Region trough adaptive and diversified fish culture practice	50,000	4.5
14	Promoting adaptation to coastal fisheries through culture of salt tolerant fish special in coastal areas of Bangladesh	50,000	4
15	Exploring options for insurance and other emergency preparedness measures to cope with enhanced climatic disaster (e.g. flood, cyclones and drought)	25,000	0.2
	Total	650,000	37.7

Annex 3.1

Protected Areas and Eco-Parks of Bangladesh for in situ conservation under the management of Forest Department

Sl/ No.	Name	Area (ha.)	Year of Notification
1	Sundarban East Wildlife Sanctuary	31,226.938	1960/1996
2	Sundarban South Wildlife Sanctuary	36,970.454	1996
3	Sundarban West Wildlife Sanctuary	71,502.130	1996
4	Rema-Kalenga Wildlife Sanctuary	1,795.540	1996
5	Char Kukri-Mukri Wildlife Sanctuary	40	1981
6	Pablakhali Wildlife Sanctuary	42,087	1962/1983
7	Chunati Wildlife Sanctuary	7,7611	986
9	Himchari National Park	1,729	1980
10	Bhawal Natioanl Park	5,0221	974/1982
11	Modhupur National Park	8.436	1962/1982
12	Lawachara National Park	1,250	1996
13	Kaptai National Park	5,464	1999
14	Ramsagar National Park	27	2001
15	Nizhum Dwip National Park	16,352	2001
16	Teknaf Game Reserve	11,615	1983
17	Medha Kachapia National Park	395.92	2004
18	Shatchari National Park	242	2006
19	Banskhali Eco-Park	1,200	2003
20	Madhob-Kunda Eco-Park	253	2000
21	Sita-Kunda Eco-Park	403	2000
22	Madhu- Tila Eco-Park	100	1999
23	Dulahazara Safari Park	900	1997
24	Khadimnagar National Park	679	2006

Source: Protected Areas of Bangladesh: A Visitor's Guide By Nishorgo Support Program (2006)

Annex 3.2

Sixteen strategies of NBSAP	
Sixteen strategies have been developed to shape and direct the actions towards achieving the goals and objectives of the NBSAP. These are:	
Strategy 1:	Recognize the value and importance of biodiversity for the Bangladesh people and document properly its components, distribution and value
Strategy 2:	Conserve ecosystems, species and genetic pool of the country to ensure that the present and future wellbeing of the country and its people are secure
Strategy 3:	Restore ecosystems and rehabilitate endangered species
Strategy 4:	Adopt national measures and standards to deal with invasive alien species and genetically modified organisms
Strategy 5:	Promote equitable sharing of biodiversity conservation costs and benefits among different sectors of the society
Strategy 6:	Contribute to raising awareness and building capacity of biodiversity conservation among the different sectors of the society
Strategy 7:	Promote use of traditional knowledge for conservation, use and protection of the local communities' intellectual property rights
Strategy 8:	Establish institutions for inter-sectoral implementing mechanism for the Bangladesh National Biodiversity Strategy and Action Plan
Strategy 9:	Enhance Protected Area management, recognizing the benefits of collaboration with local communities in their management (co-management)
Strategy 10:	Ensure wise use of wetland resources
Strategy 11:	Establish participatory mechanisms to receive and utilize the inputs from private sector, civil society, academia and local communities about the different processes leading to biodiversity conservation, use and sharing of benefits
Strategy 12:	Review and develop biodiversity related legislation(s) and establish a specific branch in the Judiciary to deal with biodiversity and environmental issues
Strategy 13:	Establish an open and transparent monitoring and reporting system status and trends of implementing the principles of CBD
Strategy 14:	Develop a financial strategy that is innovative and sustainable
Strategy 15:	Address issues of synergies with other Multilateral Environmental Agreements (MEAs) and processes that deal with climate change, disaster management, livelihoods, food security and sustainable development
Strategy 16:	Integrate biodiversity conservation into the national development making, planning and processes

Source: NBSAP (2006)

Annex 6.1

Capacity Development through National Training Institutes

Name of the training Institutes	Specialization	Major Courses	Number of Courses Per Year	Number of trainees	Duration of Courses	Status of trainees	Mandates of the institutes	Resource Persons	Remarks
1	2	3	4	5	6	7	8	9	10
Bangladesh Public Administration Training Centre (BPATC), Savar, Dhaka	Civil Service	Foundation Training Course (FTC)	2 Courses	220-250 Per Course	4 months	All entry level officers in all cadre	To provide training to all Government servants	Faculty members plus outsourcing	
	Civil Service	Advanced Course on Administration and Development (ACAD)	3 Courses	30 Per Course	2.5 months	Deputy Secretary	ditto	ditto	
	Civil Service	Senior Staff Course (SSC)	3 Courses	30 Per Course	2.5 months	Joint Secretary	ditto	ditto	
Forest Academy Chittagong	Forestry	M. Sc. in Forestry	Depends on Recruitment	Depends on Recruitment	1 year	Assistant Conservator of Forests (ACF)	To provide training to the cadre officers of forests service	Faculty members plus outsourcing	

Name of the training Institutes	Specialization	Major Courses	Number of Courses Per Year	Number of trainees	Duration of Courses	Status of trainees	Mandates of the institutes	Resource Persons	Remarks
1	2	3	4	5	6	7	8	9	10
Academy for Planning and Development (APD)	Planning	Development Planning & Project Management	FTC for Economic & other Cadre Officers	45-50	4 months, 9 months	Entry Level & Mid Level officer of Economic Cadre		Faculty members plus outsourcing	
Foreign Service Academy Dhaka	Diplomacy	International Relation, Diplomacy, Protocol	1	10-20 Person Per Course	9 months	Entry Level & Mid Level	To provide training to the cadre officers of Foreign service	Faculty members plus outsourcing	
National Academy for Educational Management (NAEM)	Education	FTC for Education Cadre Officers	2	200	4 months	All entry level lectures in the cadre	To provide training to the lecturers, Head Masters and Principals	Faculty members plus outsourcing	
	Education	Managerial Training for Head Masters and Principals	15	35-40	15 days / 1 month	Head Masters and Principals			
Customs Academy									To be included later

Name of the training Institutes	Specialization	Major Courses	Number of Courses Per Year	Number of trainees	Duration of Courses	Status of trainees	Mandates of the institutes	Resource Persons	Remarks
1	2	3	4	5	6	7	8	9	10
Police Academy									To be included later
Bangladesh Foreign Trade Academy (BFTA)									To be included later
Press Institute Bangladesh (PIB)	Journalism	FTC Diploma in Journalism	10-15	30-50	15 days to one year	Graduates & above	To provide training to the journalists	Faculty members plus outsourcing	
National Institute of Mass Communication (NIMCO)	Mass Communication	FTC to the BCS (Information) Officers	2-3	30-40	3-4 months	All entry level BCS (Information) Officers	To provide training to the BCS (Information) Officers	Faculty members plus outsourcing	
Bangladesh Academy for Rural Development (BARD)	Rural Development	Various Subjects on Rural Development	Short, Medium & Long Term	50-60	One week to 4 months	GO-NGO Officers, Local Govt. Leaders	Project Development R & D	Faculty members	
Rural Development Academy (Bogra)	Rural Development	Various Subjects On Rural Development	Short, Medium & Long Term	60-70	One week to 2 months	GO-NGO Officers, Local Govt. Leaders	Project Development R & D	Faculty members	

Name of the training Institutes	Specialization	Major Courses	Number of Courses Per Year	Number of trainees	Duration of Courses	Status of trainees	Mandates of the institutes	Resource Persons	Remarks
1	2	3	4	5	6	7	8	9	10
Bangladesh Rice Research Institute (BRRI)	Rice Production	All aspect of rice production	50-65	35-45	1-6 days, 1 month	Agricultural Officers & Farmers	R & D Technology Transfer	Faculty members	
National Institute of Population Research and Training (NIPORT)	Health and Family Planning	Management Development FWA/ FWV	70	25-45	2 weeks to 2 months	Managers (mid level), Paramedics, Field Workers	To impart Health and family planning related training	Faculty members plus outsourcing	

Annex 7.1

Summary of the Responses of the Participants of Policy Dialogue

Serial	Question	Answer	Number	Percent
A1	Do you support the concept of "Sustainable Development Commission" (SDC) as an Apex Body for monitoring the Sustainable Environmental Governance?	Yes	38	88%
		No	5	12%
A2	What should be the nature of SDC?	a. Regulatory	11	26%
		b. Advisory	16	37%
		c. Facilitator	10	23%
		d. All	6	14%
A3	Who should be the Chairperson of the SDC?	a. Head of the Government	14	33%
		b. Finance Minister	17	40%
		c. Environment Minister	9	21%
		d. Cabinet Secretary	2	4%
		e. Principal Secretary	1	2%
B1	Do you support the concept of "Executive Committee of Sustainable Development Commission" (ECSDC) as an Executive Body for monitoring the decisions of SDC?	Yes	35	81%
		No	8	19%
B2	Who should be the Chairperson of the ECSDC?	a. Cabinet Secretary	21	49%
		b. Principal Secretary	3	7%
		c. Secretary, MoEF	9	21%
		d. Any one	10	23%
C1	Do you think that there should be a separate committee at the Division Level to monitor the Sustainable Environmental Governance?	Yes	26	60%
		No	17	40%
D1	Do you think that there should be a separate committee at District Level to monitor the Sustainable Environmental Governance?	Yes	27	63%
		No	16	37%
E1	Do you think that there should be a separate committee at Upazila Level to monitor the Sustainable Environmental Governance?	Yes	23	53%
		No	20	47%

NB: The total number of respondent was 43.

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Annex 7.2

Government of the Peoples Republic of Bangladesh

No..... Date: .....

Government of the Peoples Republic of Bangladesh is pleased to constitute the following Council entitled "Sustainable Development Monitoring Council (SDMC)" in order to ensure overall sustainable development of the country:

Composition of SDMC

SN	Name, Designation & Organization	Position
1	Minister, Ministry of Finance	Chairperson
2	Minister, Ministry of Environment and Forests	Member
3-5	Three Hon'ble Members of the Parliament (selected by Hon'ble Speaker)	Member
6	Cabinet Secretary, Cabinet Division	Member
7	Principal Secretary to the Prime Minister	Member
8	Secretary, Finance Division	Member
9	Secretary, Economic Relations Division	Member
10	Secretary, Planning Division	Member
11	Secretary, Ministry of Agriculture	Member
12	Secretary, Ministry of Fisheries and Livestocks	Member
13	Secretary, Ministry of Water Resources	Member
14	Secretary, Ministry of Energy and Mineral Resources	Member
15	Secretary, Ministry of Power Division	Member
16	Secretary, Ministry of Industry	Member
17	Secretary, Ministry of Education	Member
18	Secretary, Ministry of Science and ICT	Member
19	Secretary, Local Government Division	Member
20	Secretary, Implementation Monitoring & Evaluation Division	Member
21	Secretary, Ministry of Land	Member
23	Secretary, Ministry of Food and Disaster Management	Member
24	Secretary, Ministry of Health and Family Welfare	Member
25	Secretary, Ministry of Foreign Affairs	Member
26	Secretary, Ministry of Environment and Forests	Member Secretary
27	Rector, Bangladesh Public Administration Training Centre	Member
28-29	Two Professors from National University	Member
30	Director General, Department of Environment	Member
31	Chief Conservator of Forests, Forest Department	Member
32	Inspector General of Police, Bangladesh Police Department	Member
33	Chairman, SPARRSO	Member
34	Director General, Bangladesh Meteorological Department	Member
35	Chairman, Bangladesh Water Development Board	Member
36	Director General, Water Resources Planning Organisation	Member
37	Director General, Department of Agricultural Extension	Member
38	Chairman, Bangladesh Agriculture Research Council	Member
39	Chairman, BCSIR	Member
40	President, FBCCI	Member
41	Country Representative, IUCN Bangladesh Country Office	Member
42-43	Two Representatives from the Civil Society	Member
44-45	Two Representatives from the leading NGOs	Member

The terms of reference for the SDMC may be outlined as follows:

1. The Council will review the obligations and commitments under the Multilateral Environmental Agreements (MEAs) with special thrust on the following:
   - United Nations Framework Convention on Climate Change (UNFCCC),
   - United Nations Convention on Biological Diversity (UNCBD) and
   - United Nations Conventions to Combat Desertification (UNCCD).
2. The Council will ensure the overall sustainable development of the country with special thrust on the following:
   - Natural Resources Management of the country;
   - Review the Priority Environmental Issues and provide guidelines to the authorities concerned to resolve the issues;
   - Major infrastructures i.e. roads & highways, embankments, housing etc of the country;
   - Socio-economic growth accompanied with sustainable environmental governance;
   - Biodiversity hotspots of the country; and
   - Management of internationally significant and nationally recognized Ramsar Sites under Ramsar Convention on Wetlands.
3. The Council will review and monitor the implementation mechanisms of the following national planning & strategy documents:
   - National Capacity Self-Assessment (NCSA) & Capacity Development Action Plan (CDAP) for global environmental management;
   - National Adaptation Programmes of Action (NAPA) to address the climate change under UNFCCC;
   - National Biodiversity Strategy and Action Plan (NBSAP) under UNCBD;
   - National Action Plan (NAP) to address land degradation under UNCCD.
4. Any other matters as the Council may deem necessary for the sake of overall sustainable development of the country.
5. The Ministry of Environment and Forests will provide the secretarial support to the Council;
6. The Council may co-opt any other organization / expert as member of the Council;
7. The SDMC will meet at least once in every quarter of the year

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Annex 7.3

Government of the Peoples Republic of Bangladesh

No..... Date: .....

Government of the Peoples Republic of Bangladesh is pleased to constitute the following body entitled "Sustainable Development Board (SDB)" in order to provide technical advice to the Sustainable Development Monitoring Council:

Composition of SDB

SN	Name, Designation & Organization	Position
1	Cabinet Secretary, Cabinet Division	Chairperson
2	Secretary, Ministry of Environment and Forests	Member
3	Director General, Department of Environment	Member
4	Representative, Ministry of Land	Member
5	Representative, Planning Division	Member
6	Representative, Ministry of Agriculture	Member
7	Representative, Ministry of Fisheries and Livestocks	Member
8	Representative, Ministry of Water Resources	Member
9	Representative, Ministry of Energy and Mineral Resources	Member
10	Representative, Ministry of Industry	Member
11	Chief Conservator of Forests, Forest Department	Member
12	Specialist from Bangladesh Meteorological Department	Member
13	Specialist from Bangladesh Agriculture Research Council	Member
14	Specialist from, Water Resources Planning Organisation	Member
15	Specialist from Department of Agricultural Extension	Member
16-17	Two Professors from the National Universities (To be nominated by VC)	Member
18	Country Representative, IUCN Bangladesh Country Office	Member
19-20	Two representatives from leading NGOs dealing with nature conservation	Member
21-22	Two Biodiversity Specialists	Member
23-24	Two Climate Change Experts	Member
25-26	Two Experts on Sustainable Land Management	Member
27-28	Two representatives from the Civil Society	Member
29	Joint Secretary (Environment), Ministry of Environment and Forests	Member Secretary

The Terms of Reference (ToR) of the "Sustainable Development Board" will be as follows:

1. The Board will review the implementation status of the decisions of the SDMC and provide a report to the SDMC before its meeting;
2. The Board will provide technical advice to the SDMC to mitigate the Priority Environmental Issues as well as to ensure sustainable environmental governance;
3. The Ministry of Environment and Forests will provide the secretarial support to the Board;
4. The Board may co-opt any other organization / expert as member of the Board;
5. The Board will sit at least twice in every quarter of the year.

LIST OF BACKGROUND MATERIALS

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2. Proceedings of the Mid-term National Workshop of the National Capacity Self-Assessment for Global Environmental Management.
3. Proceedings of the Final National Workshop of the National Capacity Self-Assessment for Global Environmental Management.
4. Proceedings of Focus Group Meeting on Capacity Development for Sectoral Planning in Bangladesh prepared under the National Capacity Self-Assessment for Global Environmental Management.
5. Proceedings of Focus Group Meeting on Policy Dialogue on Institutional Framework for Sustainable Environmental Governance prepared under the National Capacity Self-Assessment for Global Environmental Management.
6. Proceedings of Focus Group Meeting on Role of Media in Sustainable Environmental Governance prepared under the National Capacity Self-Assessment for Global Environmental Management.

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