

Session 1

Basic concepts on Climate Change issues and Climate - Resilient Natural Resources Management (NRM)

Name of the facilitator:

Date:

Venue:

Outline of the presentation

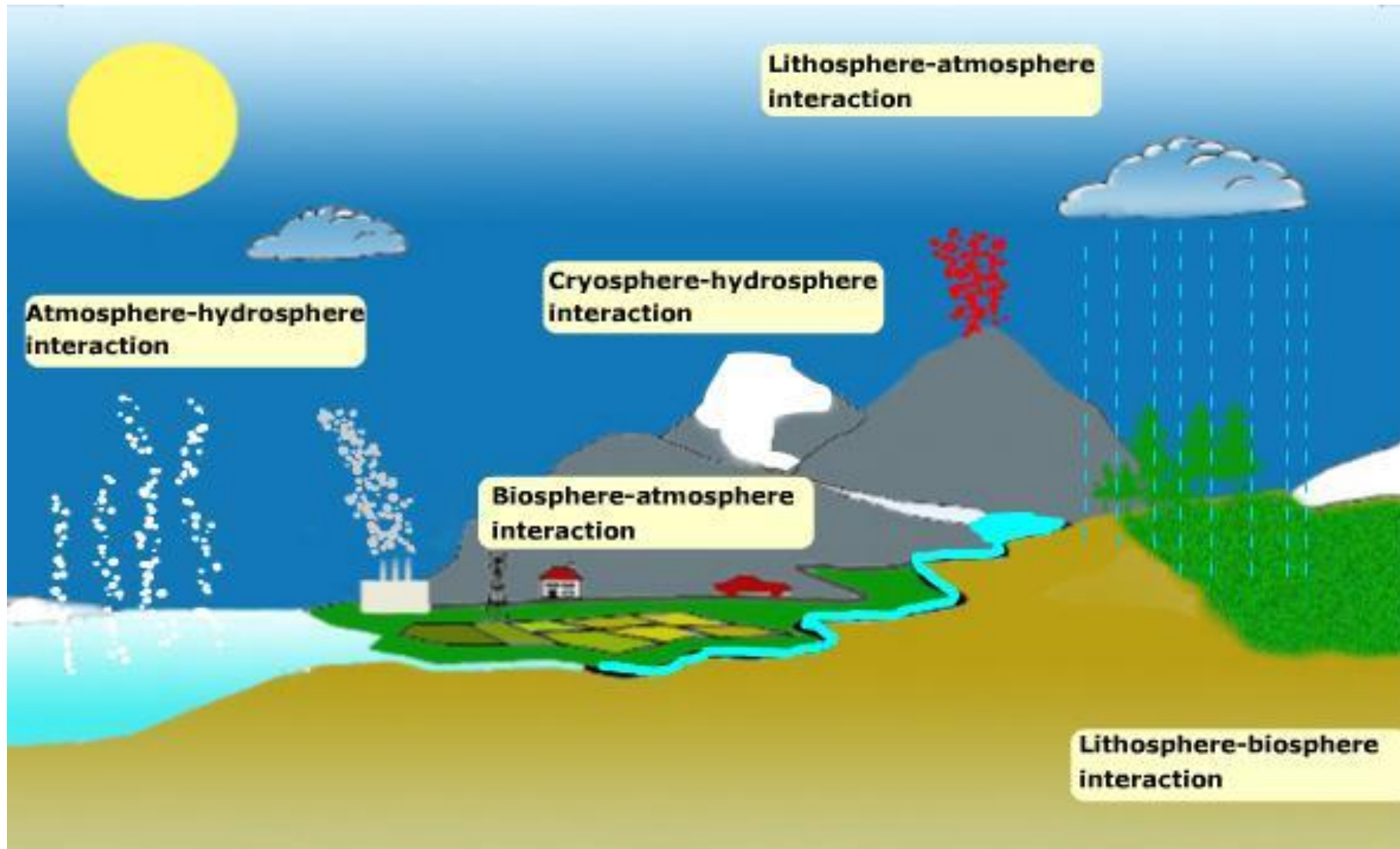
Weather is the continuously changing condition of the atmosphere usually considered on a time scale that extends from minutes to weeks

Climate is the average state of the lower atmosphere, and the associated characteristics of the underlying land or water, in a particular region, usually spanning at least several years.

Climate Change refers to any change in climate over time, whether due to natural variability or as a result of human activity (IPCC).

Climate Change refers to any **persistent** change in the statistical distribution of climate variables (NCAR)

Climate variability is the variation around the average climate, including seasonal variations and large-scale regional cycles in atmospheric and ocean circulations



Source: know climate change

USAID's Climate-Resilient Ecosystems and Livelihoods (CREL) Project

Major Greenhouse Gas and Global Warming Potential

Green house gases:

- A greenhouse gas (sometimes abbreviated GHG) is a gas in an atmosphere that absorbs and emits radiation within the thermal infrared range.
- This process is the fundamental cause of the greenhouse effect.
- The primary greenhouse gases in the Earth's atmosphere are carbon dioxide, methane, nitrous oxide, CFCs, water vapor, and ozone.
- Greenhouse gases greatly affect the temperature of the Earth; without them, Earth's surface temperature would average about 33 °C colder, which is about 19 °C below the Earth's present average temperature of 14 °C.

Sources of GHGs

(a) Energy Sector

- *Energy Industry*
- *Manufacturing Industries and Construction*
- *Transport*
- *Residential Sector*
- *Commercial*
- *Agriculture*

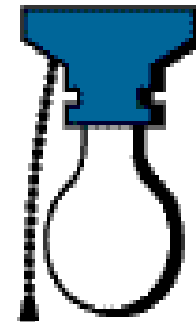
(b) Industrial processes

Mineral products

- *Chemical industry*
- *Metal production*
- *Production of halocarbons and sulphur hexafluoride*
- *Consumption of halocarbons and sulphur hexafluoride*

c) Agriculture Sector

- *Enteric fermentation*
- *Manure management*
- *Rice cultivation*
- *Agricultural soils*
- *Prescribed burning of savannas*
- *Field burning of agricultural residues*



- **Waste**

- *Solid waste disposal on land*
- *Wastewater handling*
- *Waste incineration*

- **Land use Change and Forestry**

- *Conversion of Land*
- *Consumption of Timber and Deforestation*



Landuse Change



Solid waste



Deforestation



Consumption of Timber



Industry

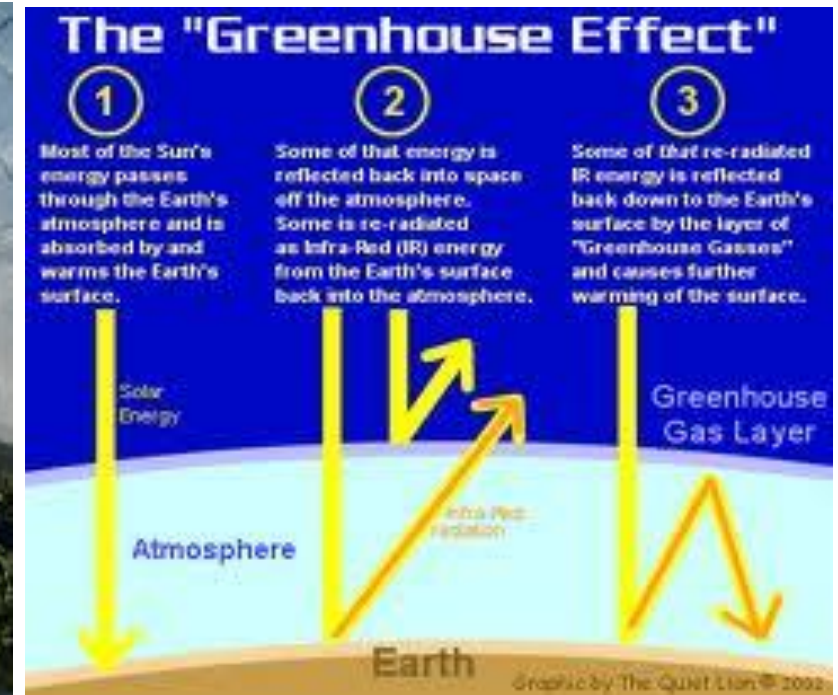
Global Warming Potential of Major GHGs

(Source: Atiq Rahman, 2010)

Major GHGs	Global Warming Potential
Carbon dioxide (CO ₂)	1
Methane (CH ₄)	24
Nitrous oxide (N ₂ O) (burning fossil fuels and the manufacture of fertilizer)	310
Hydrofluorocarbons (HFCs)	1300-11,700
Perfluorocarbons (PFCs) (by-product of aluminum smelting and uranium enrichment)	6500-9200
Sulphur hexafluoride (SF ₆) (used in heavy industry to insulate high-voltage equipment and to assist in the manufacturing of cable-cooling systems)	23,900

Greenhouse Effect

The greenhouse effect is a process by which thermal radiation from a planetary surface is absorbed by atmospheric greenhouse gases, and is re-radiated in all directions.



Contribution of Greenhouse gases

When ranked by their direct contribution to the greenhouse effect, the most important are:

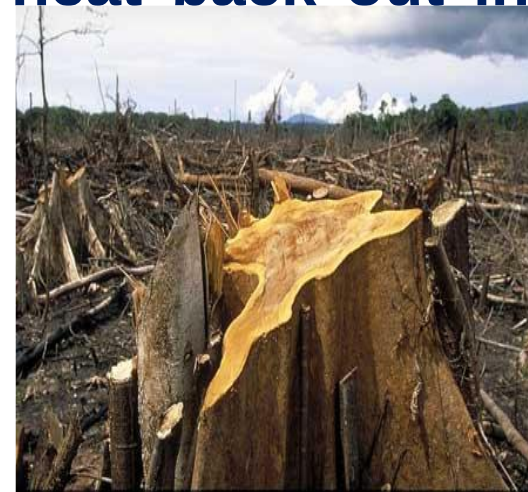
Compound	Formula	Contribution (%)
Water vapor and clouds	H ₂ O	36 – 72%
Carbon dioxide	CO ₂	9 – 26%
Methane	CH ₄	4–9%
Ozone	O ₃	3–7%

Causes of the Greenhouse Effect

Trace gases in the atmosphere cause the greenhouse effect by acting like a blanket on a global scale and slowing the radiation of heat back out into space.

The Main Causes:

- Human Emissions and Consumption
- Coal burned in power stations contains carbon which combines with oxygen in the atmosphere to form carbon dioxide.
- The man-made (or anthropogenic) component of the greenhouse effect is caused by man's activities that emit greenhouse gases to the atmosphere.



- The most important of these is the burning of fossil fuels. Fossil fuels contain carbon, and when they are burnt this carbon combines with oxygen in the atmosphere to form carbon dioxide.
- Changes in land use are also important sources of greenhouse gas emissions.
- For example deforestation results in the emission of carbon dioxide to the atmosphere that was previously stored on the Earth's surface in the form of trees and other vegetation, or locked up in soils.

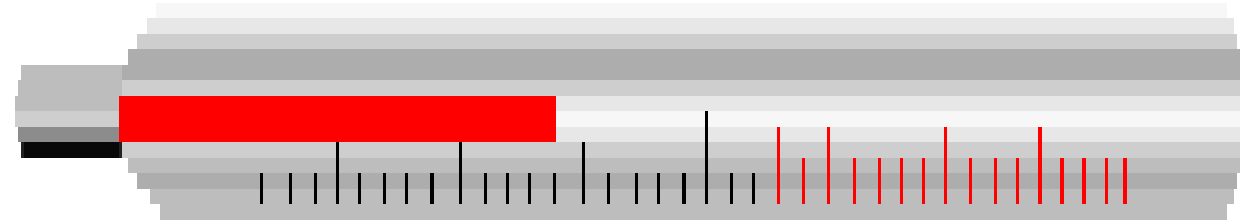


Severe Consequences

- Temperature Rise
 - Land Surface Temperature
 - Sea Surface Temperature
- Variation in Precipitation (Rainfall, Snow, Hail, Sleet)
- Ice Melting and Sea Level Rise

60-70% global impacts of climate change can be reflected in water. This is:

- a. Too little water
- b. Too much water
- c. Wrong type of water
- d. Wrong timing of water



Trend of CO₂ Concentration

Before the Industrial Revolution, levels of carbon dioxide (the main greenhouse gas) were approximately 280 parts per million (ppm). The it has been increasing at a higher rate:

280 ppm in 1870

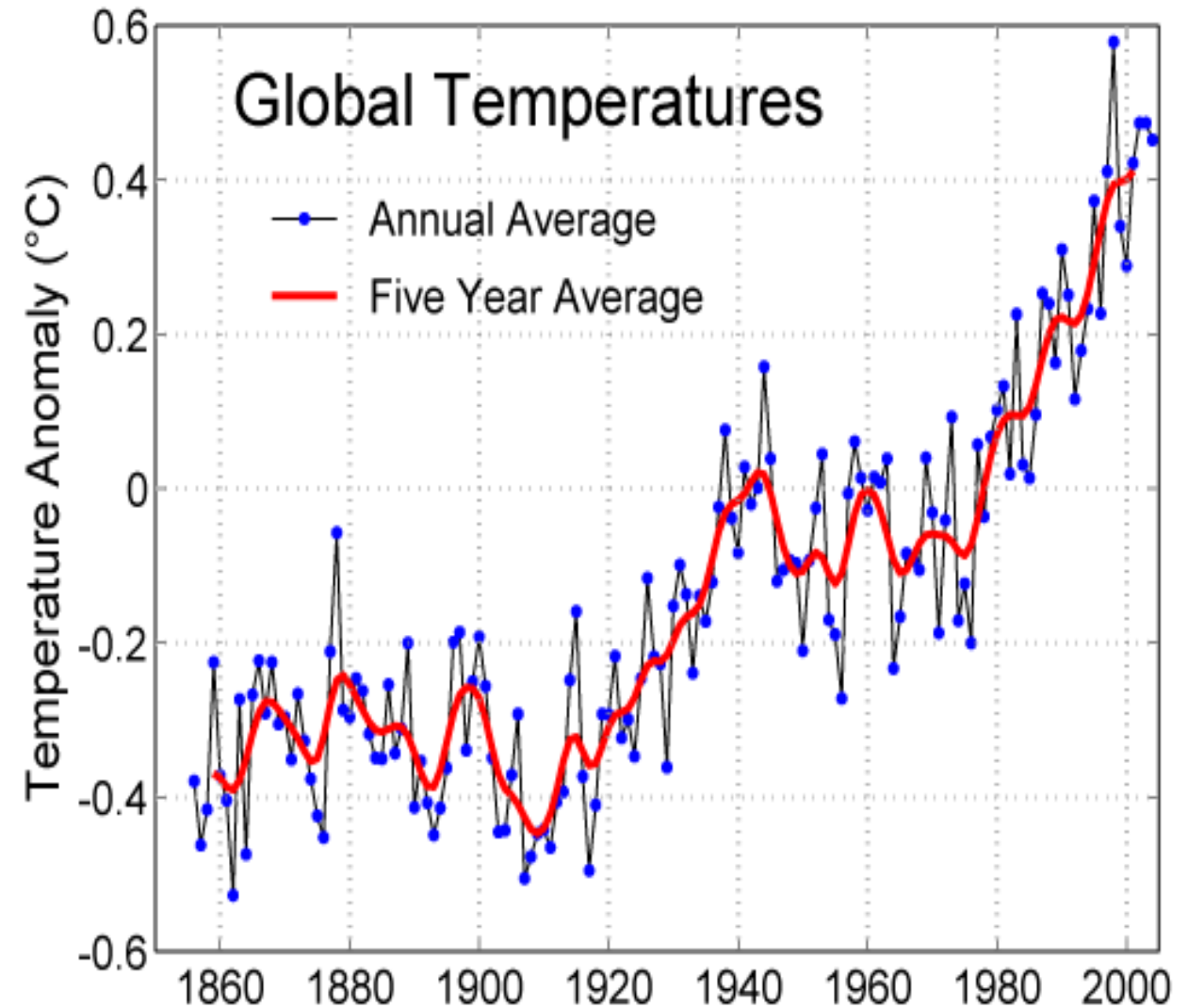
390 ppm in 2010

450 ppm by 2050

Some have argued that climate change is actually caused by natural occurrences. However, the earth's average surface temperatures have risen by 0.4°C since the 1970s, which is an irregular increase that is extremely difficult to explain by natural causes.

Global Warming

- The Earth's average surface temperature rose by 0.74 ± 0.18 °C over the period 1906–2005.
- The rate of warming over the last half of that period was almost double that for the period as a whole (0.13 ± 0.03 °C per decade, versus 0.07 ± 0.02 °C per decade).

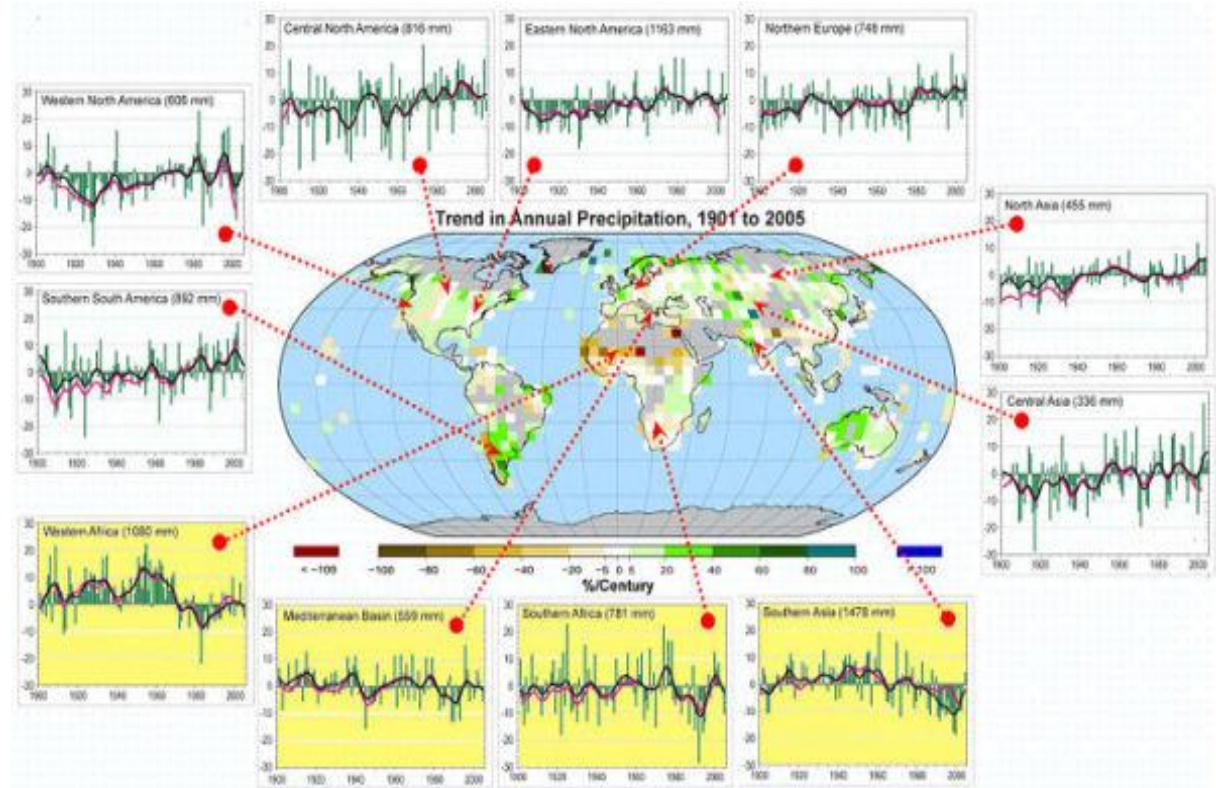


- In 2007 the UN Intergovernmental Panel on Climate Change forecasted that by 2100 global average surface temperatures would increase 1.8–4.0 °C.
- It is now 90 percent certain that most of the warming observed over the previous half century could be attributed to greenhouse gas emissions produced by human activities (i.e., industrial processes and transportation).

Global Change in Precipitation

- Global warming (land and ocean) will affect the atmospheric moisture, precipitation and atmospheric circulation.
- Increases in temperature lead to increases in the moisture-holding capacity of the atmosphere and enhance the hydrological cycle, altering the characteristics of precipitation amount, frequency, intensity, duration, type, etc.

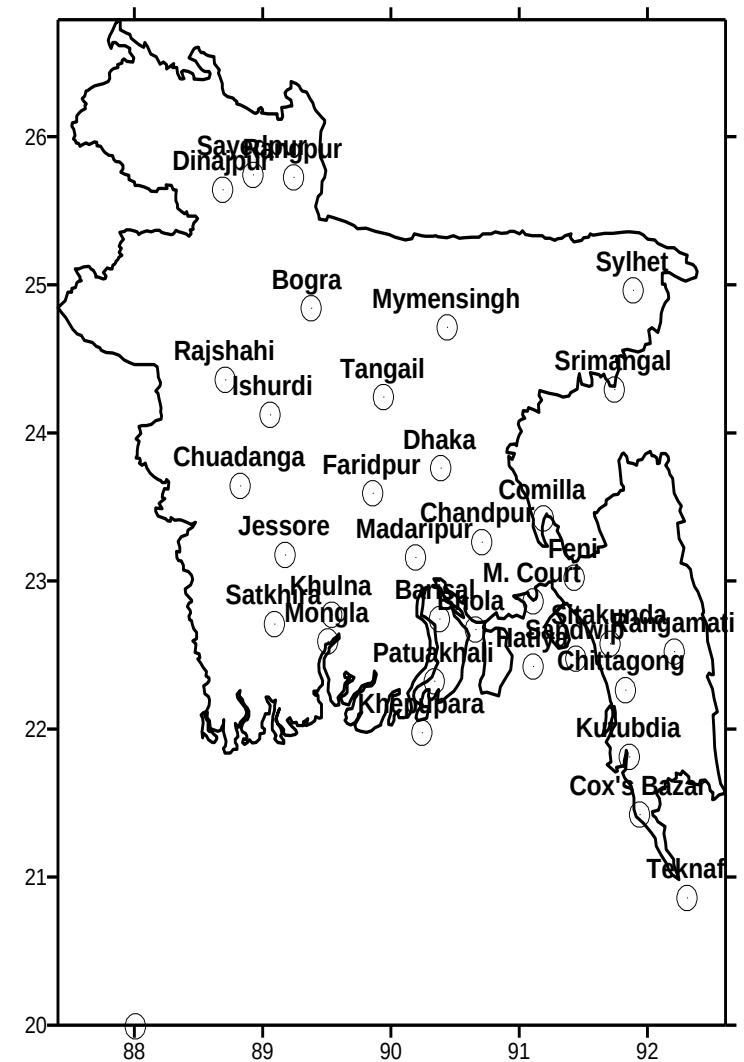
- Analysis of long-term data shows that, unlike the global temperature rise, the regional variation in precipitation trends is large.
- Some regions had a rising trend while some had a downward trend



The diagram shows the precipitation trends (1900-2005) at various regions. Precipitation curves with white background are having rising trends and those with yellow background falling trends. (Source: IPCC, 2007)

.Climate Change in Bangladesh

- Monthly and annual temperature and rainfall for 34 stations of Bangladesh Meteorological Department (BMD) for the period 1961 through 2012 have been considered for the study.
- The stations are shown in the figure.
- The country-averaged annual and seasonal temperature and rainfall have been determined by averaging the data of 34 stations.



Trends in country-averaged annual mean temperature in Bangladesh

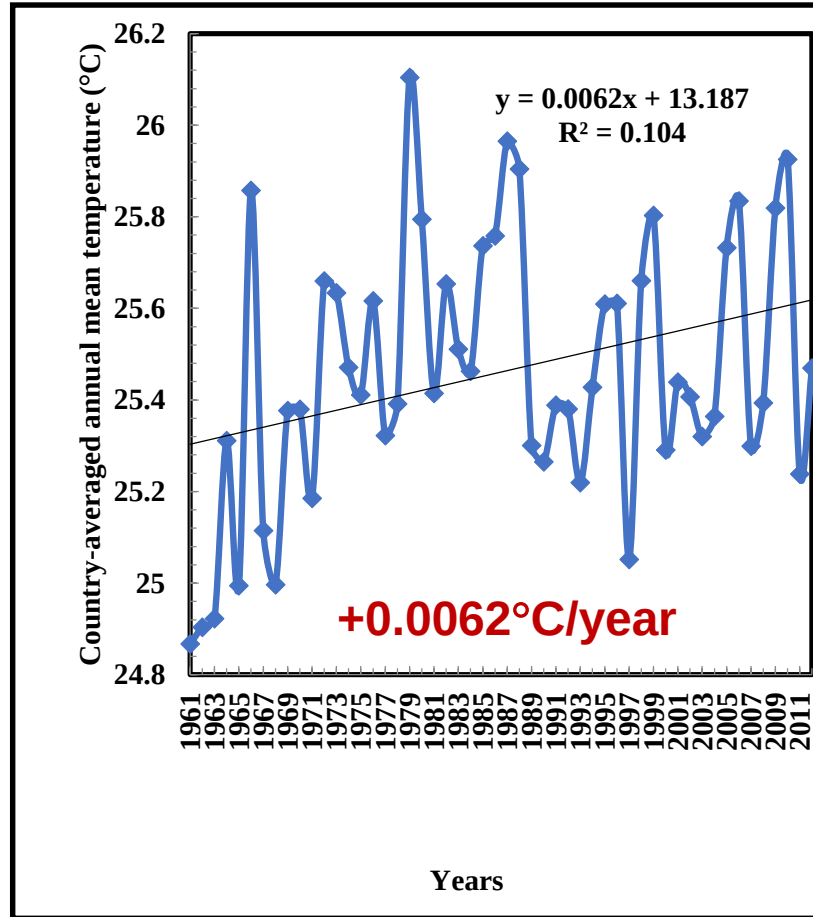


Fig. : Trend in country-averaged annual mean temperature in Bangladesh during 1961-2012

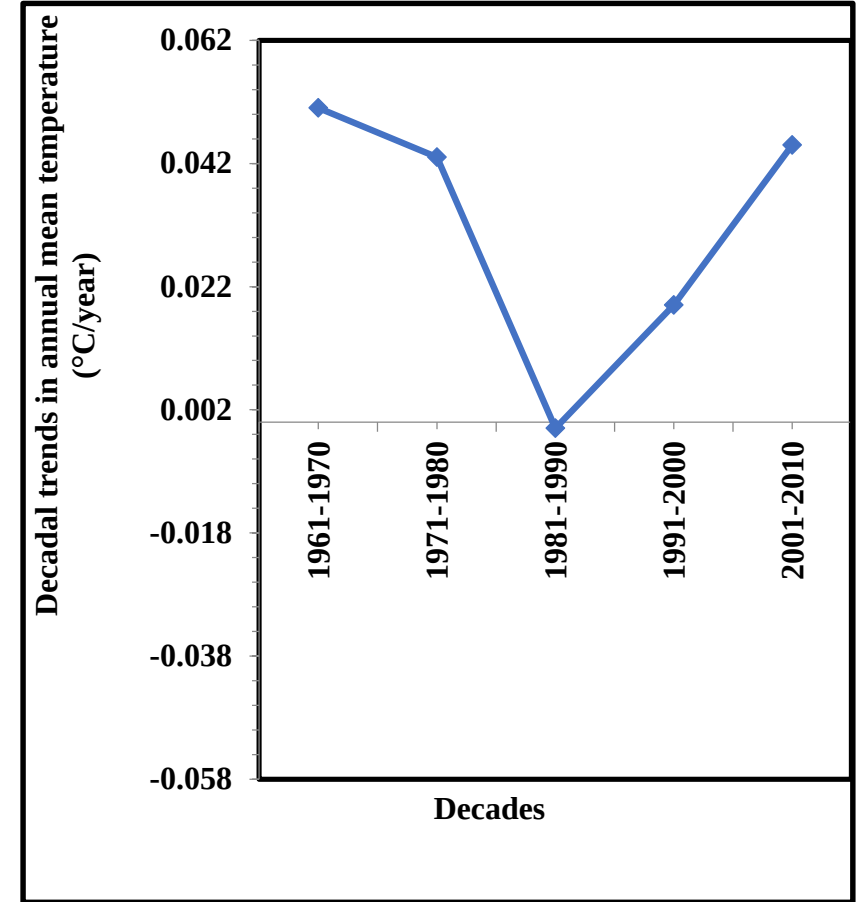


Fig. : Variation of decadal trends of country-averaged annual mean temperature in Bangladesh

Data source: BMD

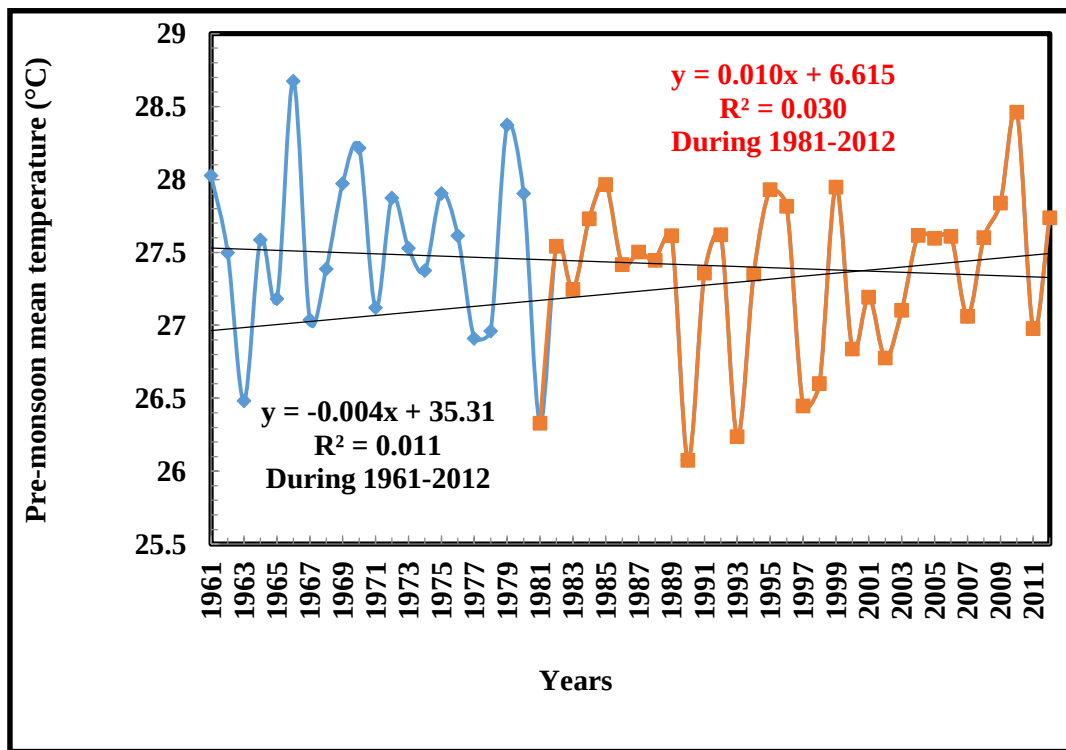
Decadal variability of country-averaged annual mean temperature in Bangladesh during 1961-2010

Decades	Mean annual temperature in Bangladesh	Variability of annual mean temperature (°C) in every 10 years	Mean annual temperature (°C) over Bangladesh	Trend in annual mean temperature (°C/year) in Bangladesh
1961-1970	25.17			+0.051
1971-1980	25.56	0.39		+0.043
1981-1990	25.60	0.04	25.46	-0.001
1991-2000	25.44	-0.16		+0.019
2001-2010	25.55	0.11		+0.045

**Projected increase in country-averaged annual mean temperature (°C)
with respect to the mean country-averaged annual temperature during
the period 1961-1990**

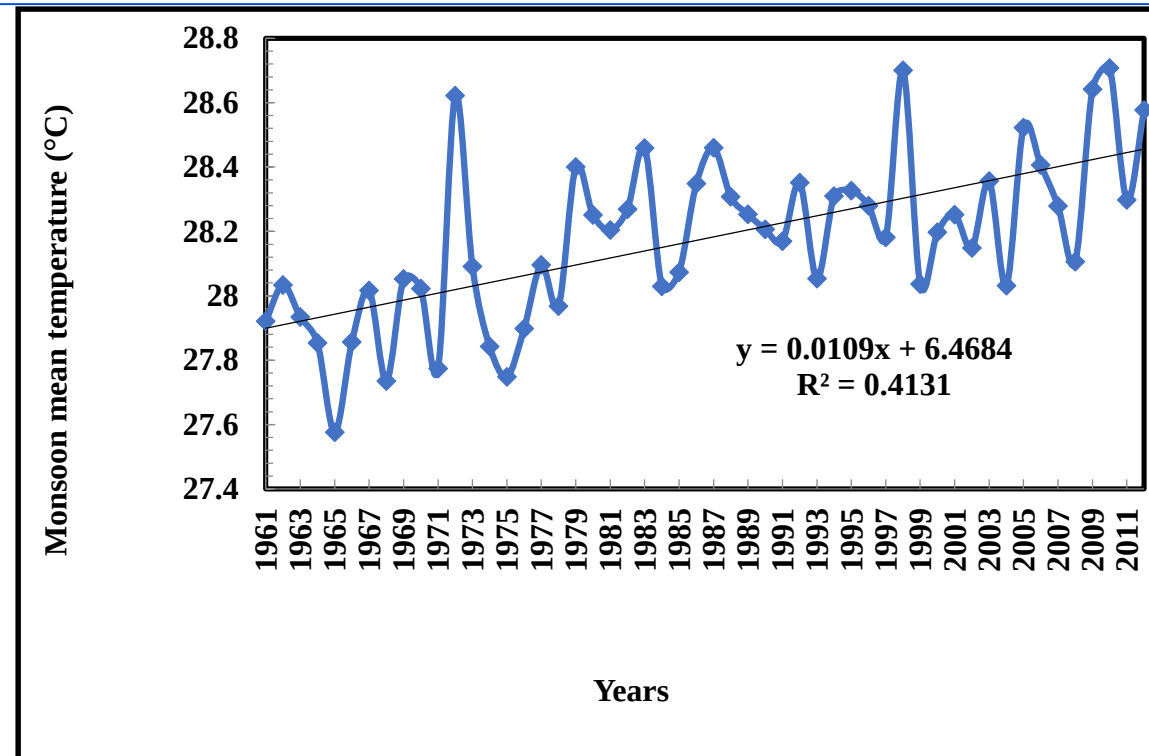
Country-averaged annual mean temperature (°C) during 1961- 1990	2030 (°C)	2050 (°C)	2100 (°C)	2150 (°C)
25.44	0.333	0.457	0.767	1.077

Trends in country-averaged seasonal mean temperature in Bangladesh



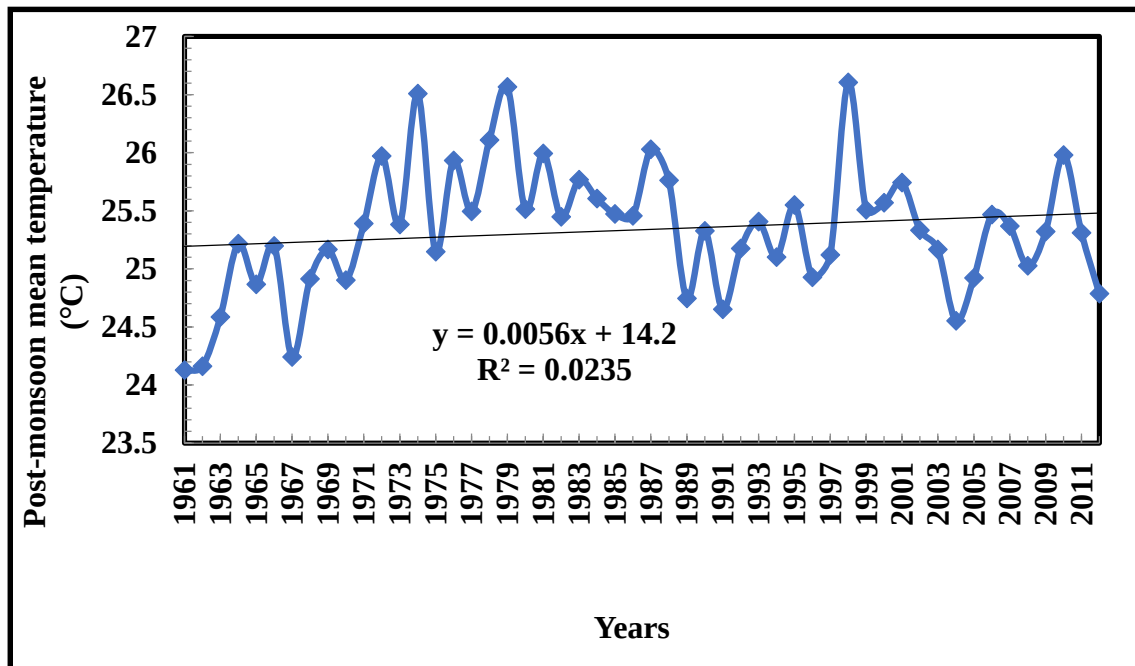
Rate:-0.004 °C/year during 1961-2012
Rate:+0.010 °C/year during 1981-2012

Trend in country-averaged pre-monsoon mean temperature in Bangladesh during 1961-2012



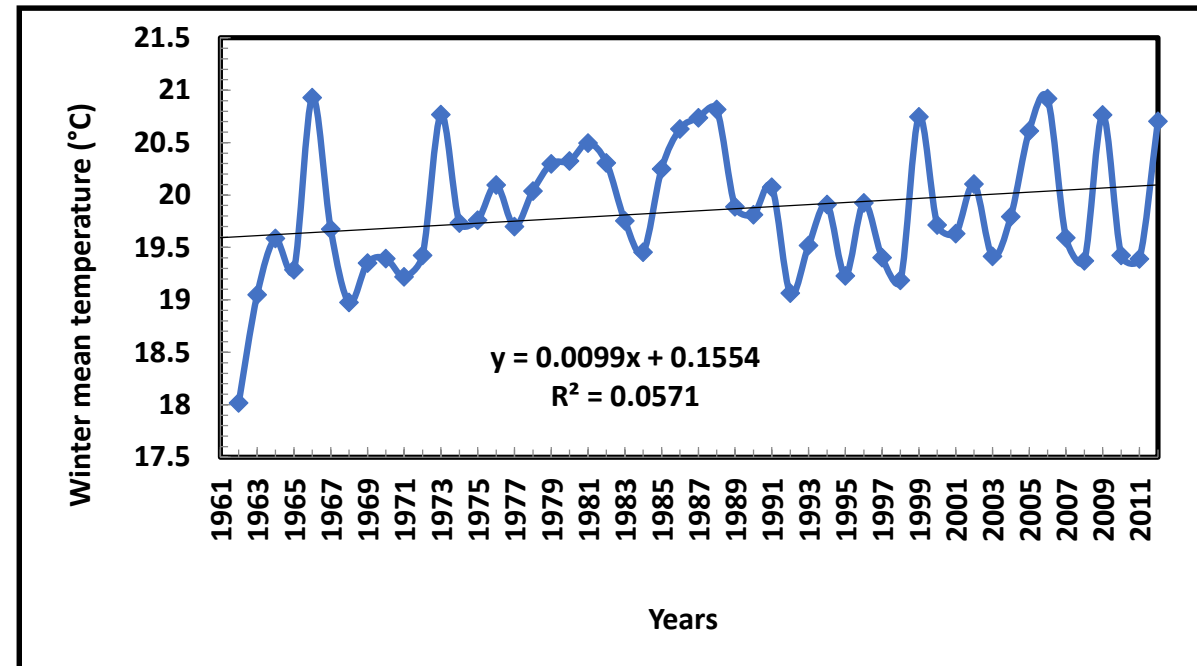
Rate:+0.010 °C/year during 1961-2012

Trend in country-averaged monsoon mean temperature in Bangladesh during 1961-2012



Rate: +0.005 °C/year during 1961-2012

Trend in country-averaged post-monsoon mean temperature in Bangladesh during 1961-2012



Rate: +0.009 °C/year during 1961-2012

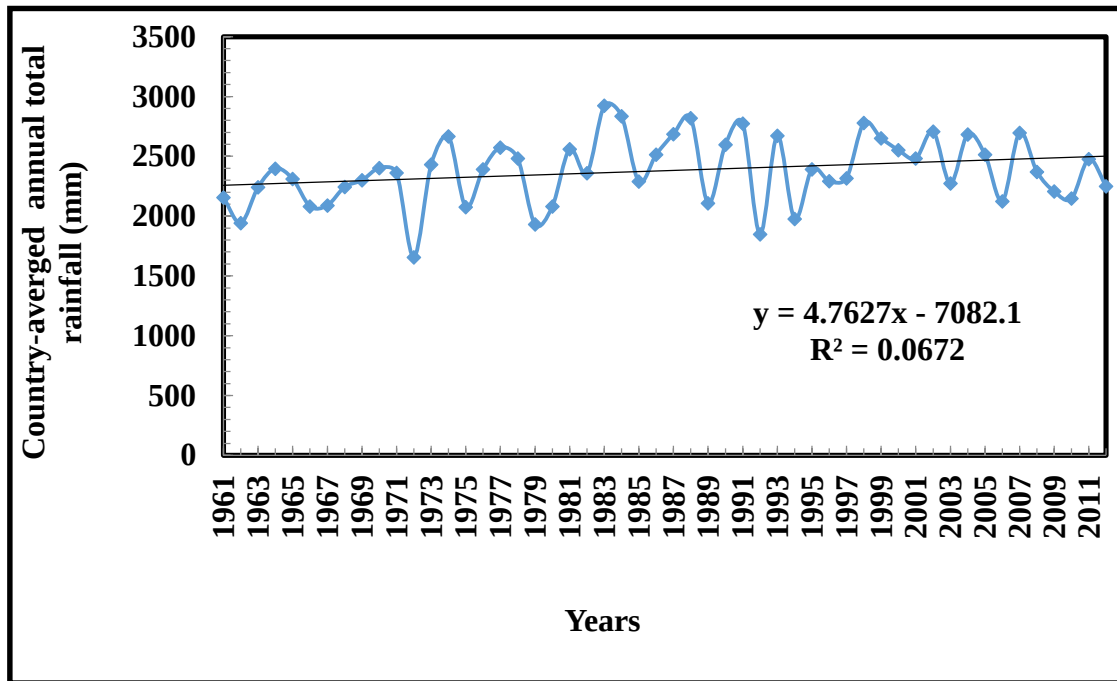
Trend in country-averaged winter mean temperature in Bangladesh during 1961-2012

Projected increase in country-averaged seasonal mean temperatures with respect to the mean temperature during 1961-1990 in Bangladesh

Seasons	Mean temperature (°C) during 1961-1990	2030 (°C)	2050 (°C)	2100 (°C)	2150 (°C)
Winter	19.86	+0.39	+0.59	+1.09	+1.58
Pre-monsoon*	27.48	+0.25	+0.46	+0.98	+1.5
Monsoon	28.08	+0.52	+0.73	+1.28	+1.82
Post-monsoon	25.37	+0.21	+0.31	+0.59	+0.87

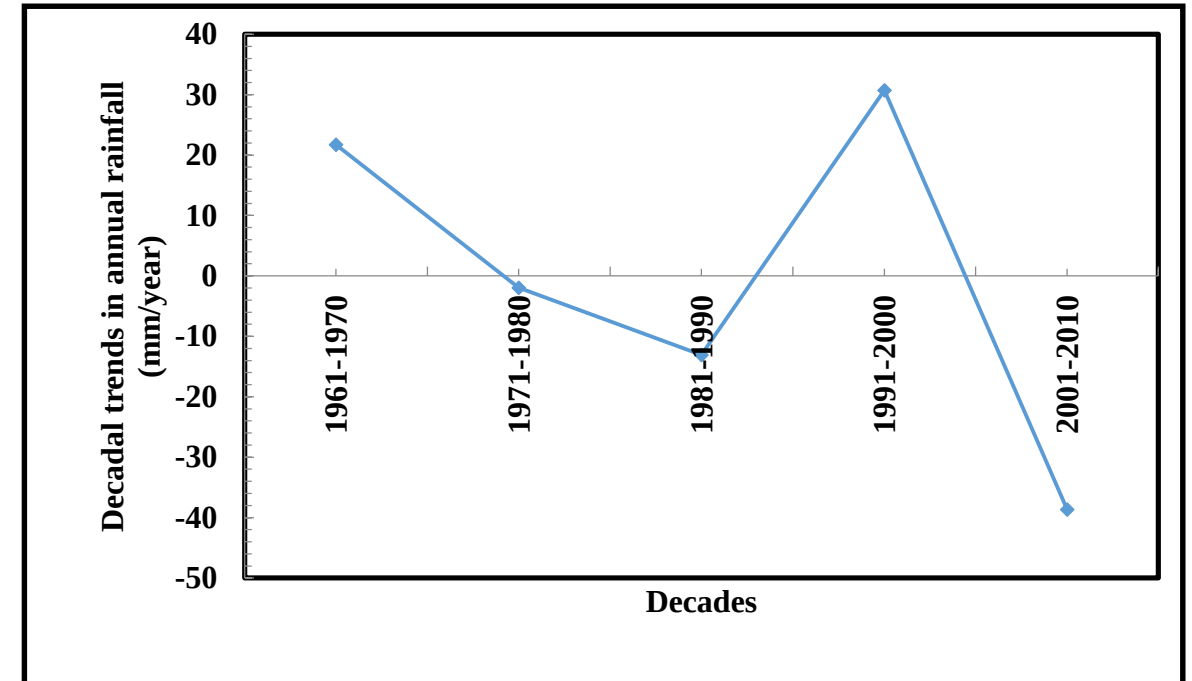
*Pre-monsoon: Using the trend during 1981-2012

Trends in country-averaged annual total rainfall in Bangladesh



Rate: +4.762 mm/year

Trend in country-averaged annual total rainfall in Bangladesh during 1961-2012

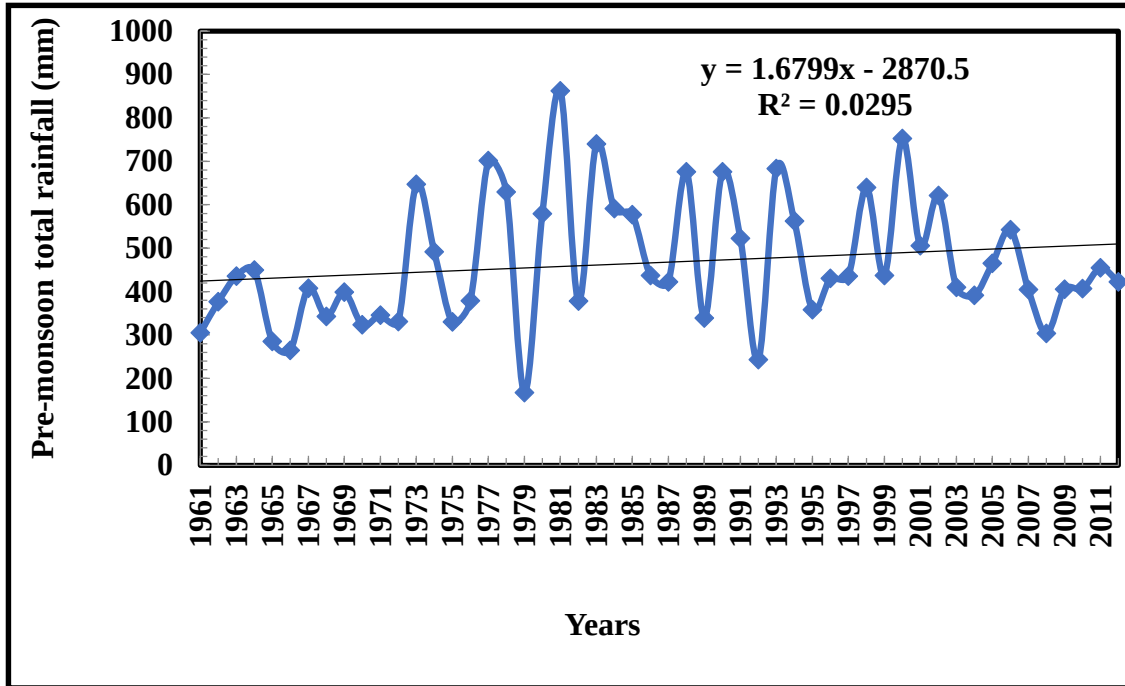


Decadal trends of country-averaged annual total rainfall in Bangladesh

Projected increase in country-averaged annual total rainfall (mm) with respect to the country-averaged annual total rainfall during the period 1961-1990

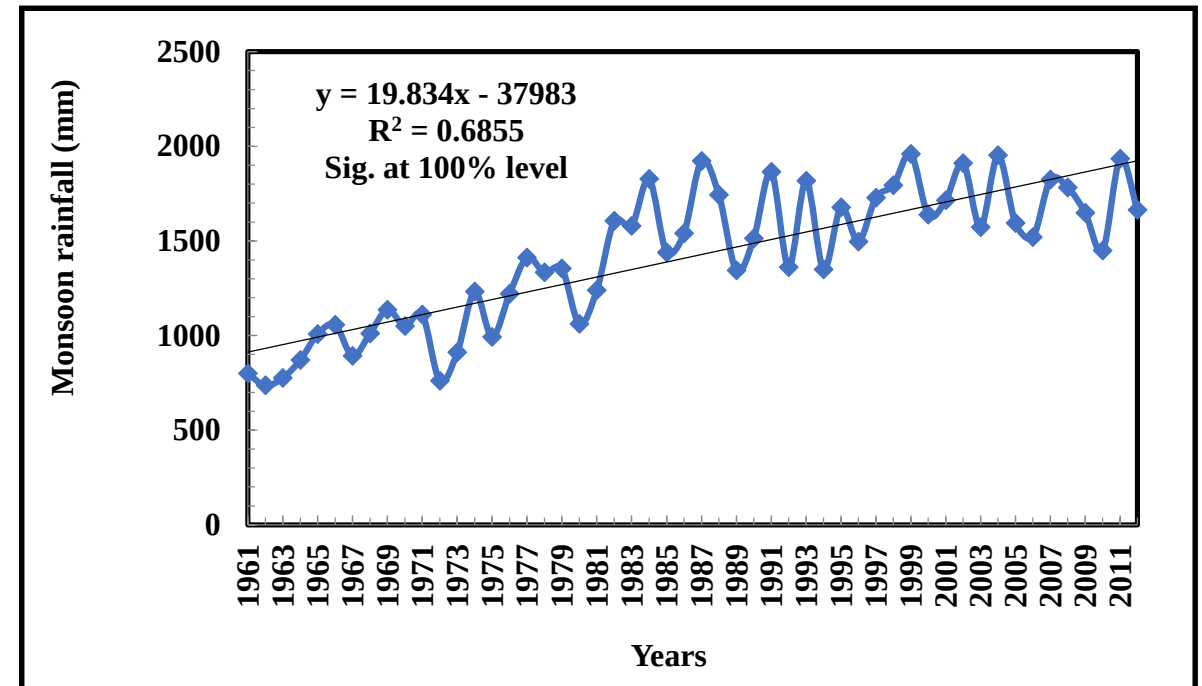
Mean annual total rainfall during 1961-1990	Change in projected annual total rainfall (mm)			
	2030	2050	2100	2150
2323.51	154.19	217.99	377.49	536.99

Trends in country-averaged seasonal total rainfall in Bangladesh



Rate :+1.679mm/year

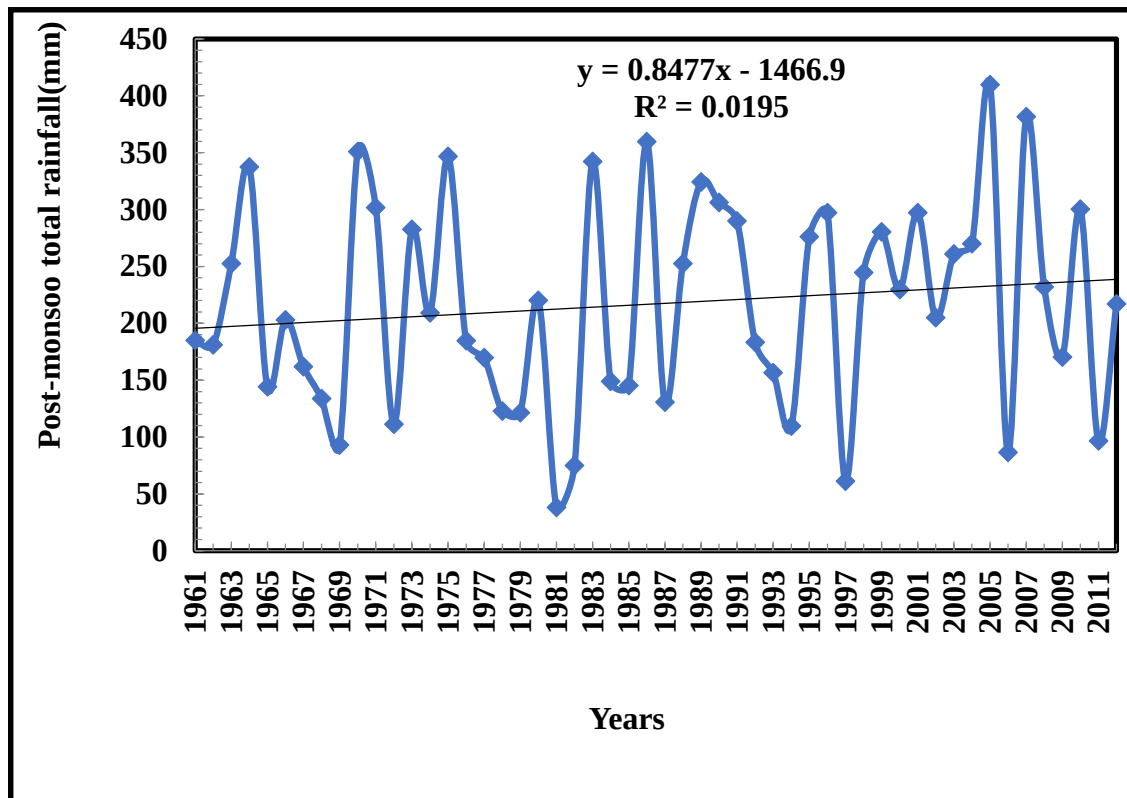
Trend in country-averaged **pre-monsoon** total rainfall (mm) in Bangladesh during 1961-2012



Rate :+19.834 mm/year

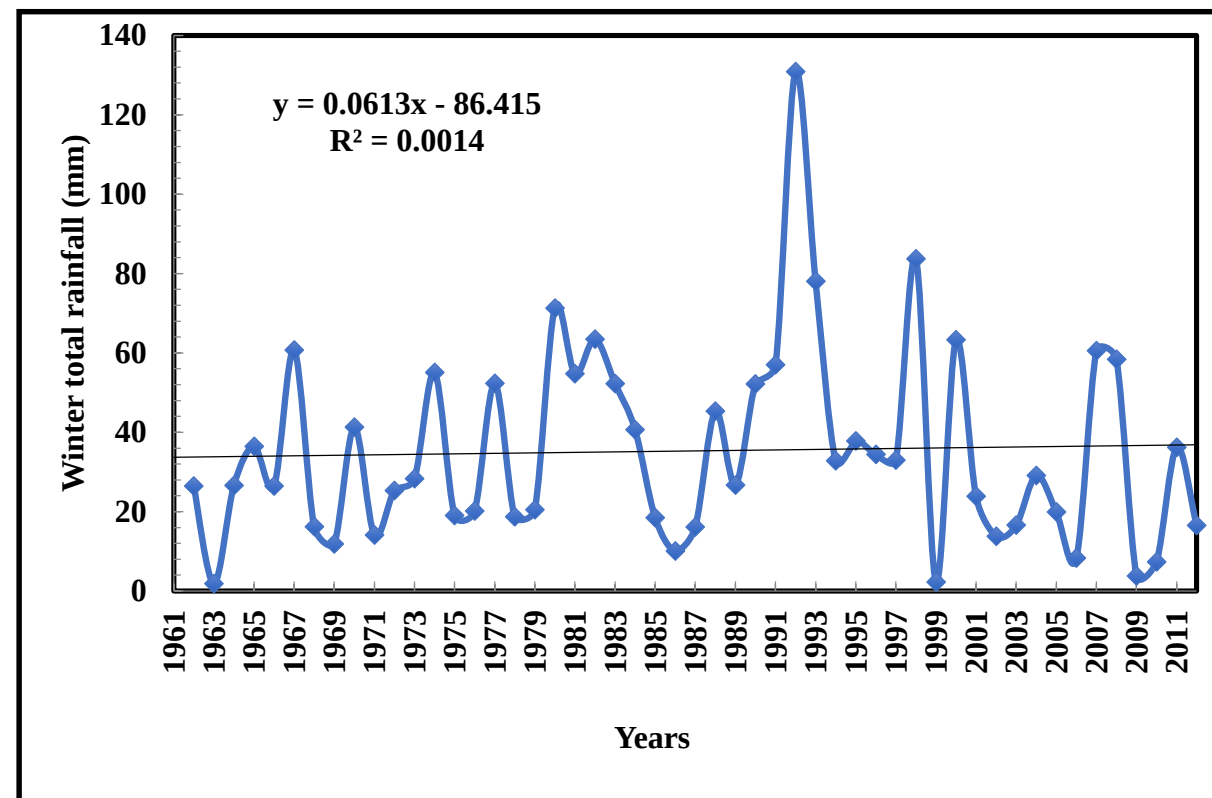
Data source : BMD

Trend in country-averaged **monsoon** total rainfall (mm) in Bangladesh during 1961-2012



Rate :+ 0.847 mm/year

Trend in country-averaged **post-monsoon** total rainfall (mm) in Bangladesh during 1961-2012



Rate :+ 0.061 mm/year

Trend in country-averaged **winter** total rainfall (mm) in Bangladesh during 1961-2012

Projected increase in country-averaged seasonal total rainfall with respect to the total rainfall during 1961-1990 in Bangladesh

Seasons	Mean country averaged seasonal total rainfall during 1961-1990 in Bangladesh	Projected change in seasonal rainfall (mm)			
		2030	2050	2100	2150
Pre-monsoon	462.57	75.8	109.38	193.33	277.28
Monsoon	1691.86	137.7	192.74	330.34	467.94
Post-monsoon	207.83	45.58	62.52	104.87	147.22
Winter	32.86	4.56	5.78	8.83	11.88

Trends in Annual and Seasonal Mean Temperature at different Regions

Regions	Trends in mean temperature (°C/year)				
	Annual	Pre-monsoon	Monsoon	Post-monsoon	Winter
Cox's Bazar	+0.0162	0.016	0.015	0.018	0.018
Chittagong	+0.0176	0.006	0.019	0.023	0.015
Sylhet	+0.011	0.016	0.004	0.009	0.016
Khulna	+0.0000 (+0.03 from 1981)	-0.010	0.015	0.008	-0.010

Projected change in Annual and Seasonal Mean Temperature with respect to the Mean temperature during 1961-1990 at different Regions

Trend Annual Mean temperature

Regions	<i>Mean temperature (°C) during 1961-1990</i>	Projected change in Annual mean temperature (°C)			
		2030	2050	2100	2150
Cox's Bazar	25.6	0.95	1.28	2.09	2.9
Chittagong	25.51	0.96	1.31	2.19	3.07
Sylhet	24.46	0.63	0.86	1.44	2.02
Khulna	26.08	-0.05	-0.031	0.014	0.059

Trend in Seasonal Mean temperature

Pre-monsoon Season

Regions	Mean temperature (°C) during 1961-1990	Projected change in Pre-monsoon mean temperature (°C)			
		2030	2050	2100	2150
Cox's Bazar	27.41	0.75	1.07	1.87	2.67
Chittagong	27.18	-1.37	-1.25	-0.95	-0.65
Sylhet	25.51	-0.81	-0.73	-0.53	-0.33
Khulna	29.61	-0.16	-0.36	-0.86	-1.36

Monsoon Season

Regions	Mean temperature (°C) during 1961-1990	Projected change in Monsoon mean temperature (°C)			
		2030	2050	2100	2150
Cox's Bazar	27.31	0.711	1.011	1.761	2.511
Chittagong	27.67	-0.35	0.03	0.98	1.93
Sylhet	25.47	-0.77	-0.69	-0.49	-0.29
Khulna	28.62	-0.749	-0.449	0.301	1.051

Post-monsoon Season

Regions	Mean temperatre (°C) during 1961-1990	Projected change in Post- monsoon mean temperature (°C/year)			
		2030	2050	2100	2150
Cox's Bazar	25.97	-0.78	-0.42	0.48	1.38
Chittagong	25.82	-0.21	0.25	1.4	2.55
Sylhet	24.62	0.027	0.207	0.657	1.107
Khulna	25.79	-0.841	-0.681	-0.281	0.119

Winter Season

Regions	Mean temperatre (°C) during 1961-1990	Projected change in Winter mean temperature (°C)			
		2030	2050	2100	2150
Cox's Bazar	21.28	0.5	0.86	1.76	2.66
Chittagong	20.71	-1.03	-0.73	0.02	0.77
Sylhet	19.17	-0.14	0.18	0.98	1.78
Khulna	20.21	-0.3	-0.5	-1.0	-1.5

Trends in Annual and Seasonal Total Rainfall at different Regions

Trend in Annual total Rainfall

Regions	<i>Mean total rainfall (mm) during 1961-1990</i>	Projected change in Annual mean total rainfall (mm)			
		2030	2050	2100	2150
Cox's Bazar	3556.46	274.69	354.79	555.04	755.29
Chittagong	2812.74	391.28	539.96	911.66	1283.36
Sylhet	4129.8	-59.54	-48.7	-21.6	5.5
Khulna	1724.79	267.857	378.155	653.9	1481.135

Trends in Seasonal total Rainfall

Pre-monsoon Season

Regions	Mean total rainfall (mm) during 1961-1990	Projected change in Pre-monsoon total rainfall (mm)			
		2030	2050	2100	2150
Cox's Bazar	376.67	234.32	316.98	523.63	730.28
Chittagong	376.67	232.16	313.38	516.43	719.48
Sylhet	1002.94	216.07	307.41	535.76	764.11
Khulna	311.94	-38.891	-46.525	-65.61	-84.695

Monsoon Season

Regions	Mean total rainfall (mm) during 1961-1990	Projected change in Monsoon total rainfall (mm)			
		2030	2050	2100	2150
Cox's Bazar	2815.07	70.98	79.68	101.43	123.18
Chittagong (based on 1979-2012)	2815.07	832.43	1311.43	2508.93	3706.43
Sylhet	2812.06	-238.01	-311.31	-494.56	-677.81
Khulna	1228.24	186.458	263.19	455.02	646.85

Post-monsoon Season

Regions	Mean total rainfall (mm) during 1961-1990	Projected change in Post-monsoon total rainfall (mm)			
		2030	2050	2100	2150
Cox's Bazar	332.98	-41.16	-55.28	-90.58	-125.88
Chittagong	580.83	96.11	126.07	200.97	275.87
Sylhet	266.04	-26.53	-28.99	-35.14	-41.29
Khulna	161.16	75.01	103.79	175.74	247.69

Winter Season

Regions	Mean total rainfall (mm) during 1961-1990	Projected change in Winter total rainfall (mm)			
		2030	2050	2100	2150
Cox's Bazar	23.63	5.67	7.27	11.27	15.27
Chittagong	26.73	26.54	34.92	55.87	76.82
Sylhet	48.65	-6.33	-10.25	-20.05	-29.85
Khulna	41.88	18.53	27.27	49.12	70.97

Trends in Relative Humidity at different regions

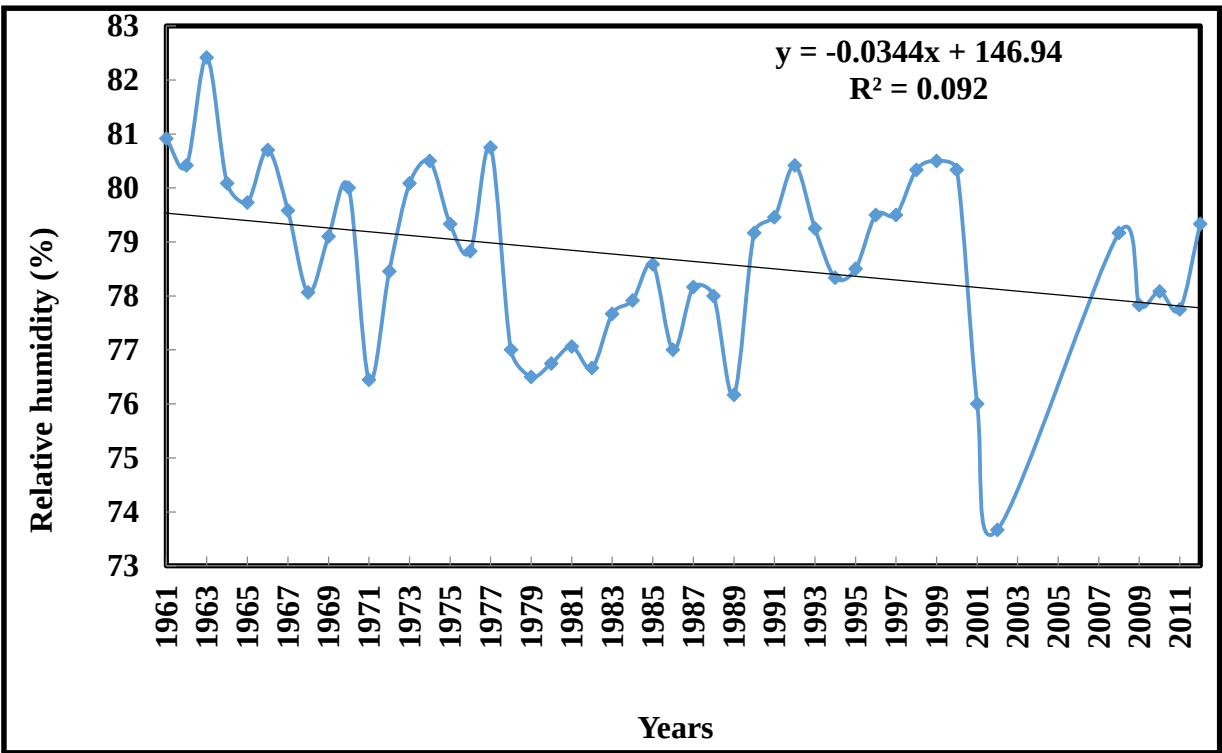


Fig. Trend in RH (%) at Chittagong during 1961-2012

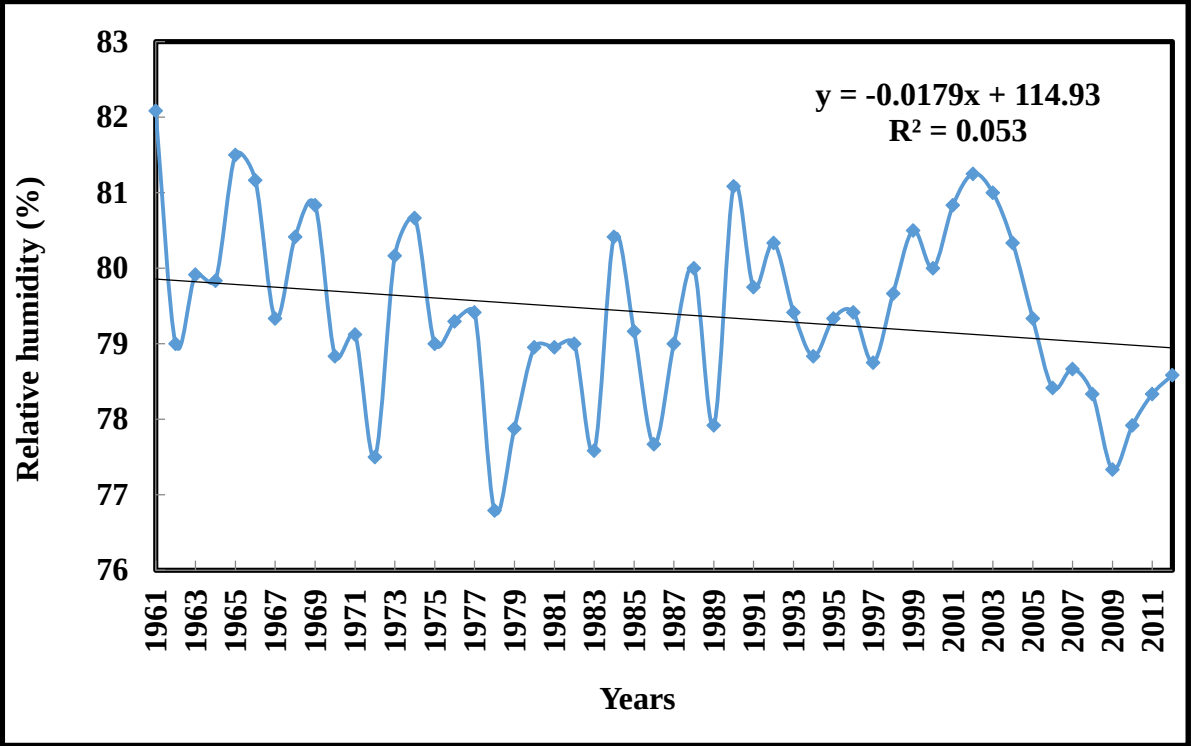


Fig. Trend in RH (%) at Cox's Bazar during 1961-2012

Trends in Relative Humidity at different regions

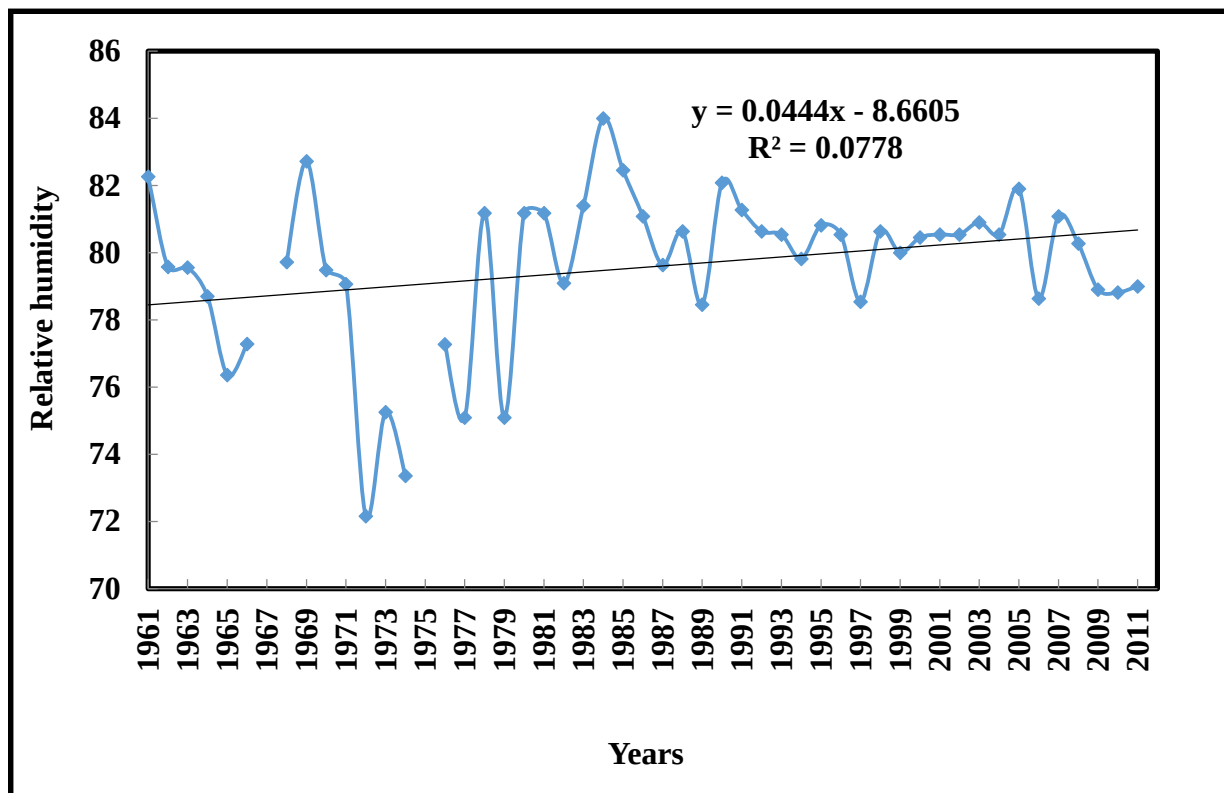


Fig. Trend in RH (%) at Khulna during 1961-2012

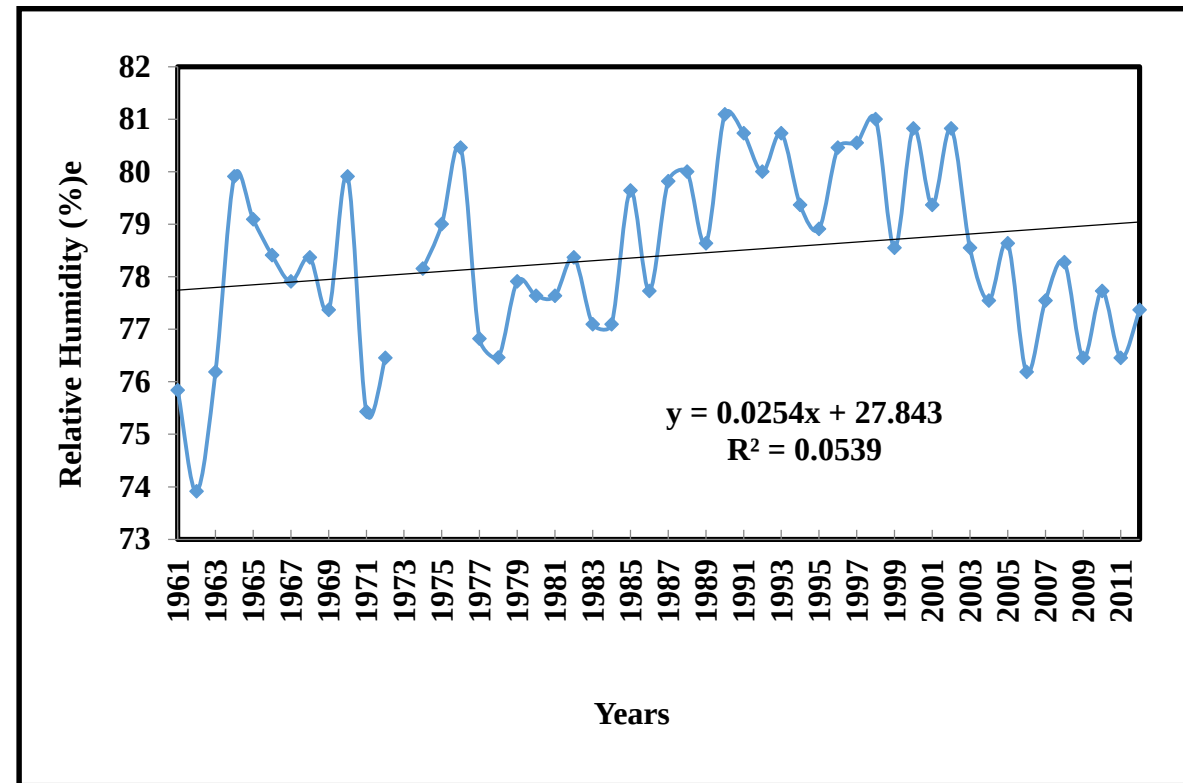
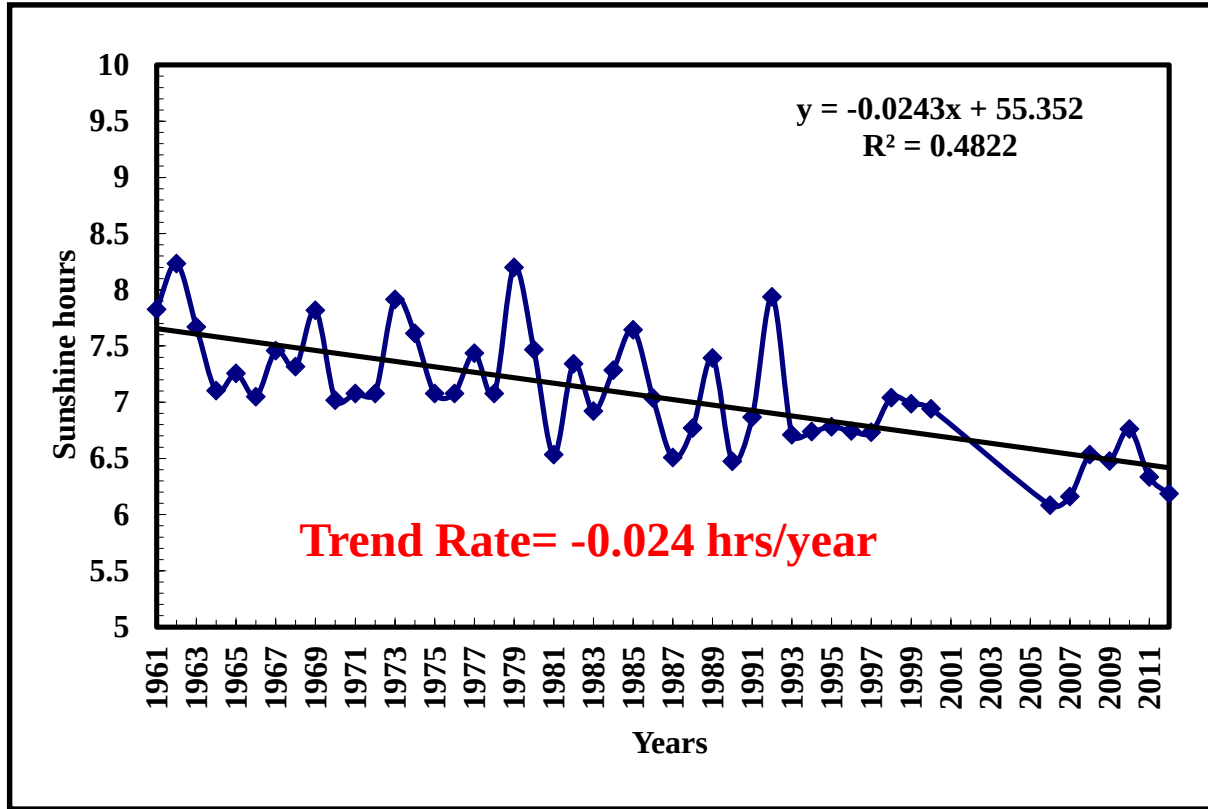
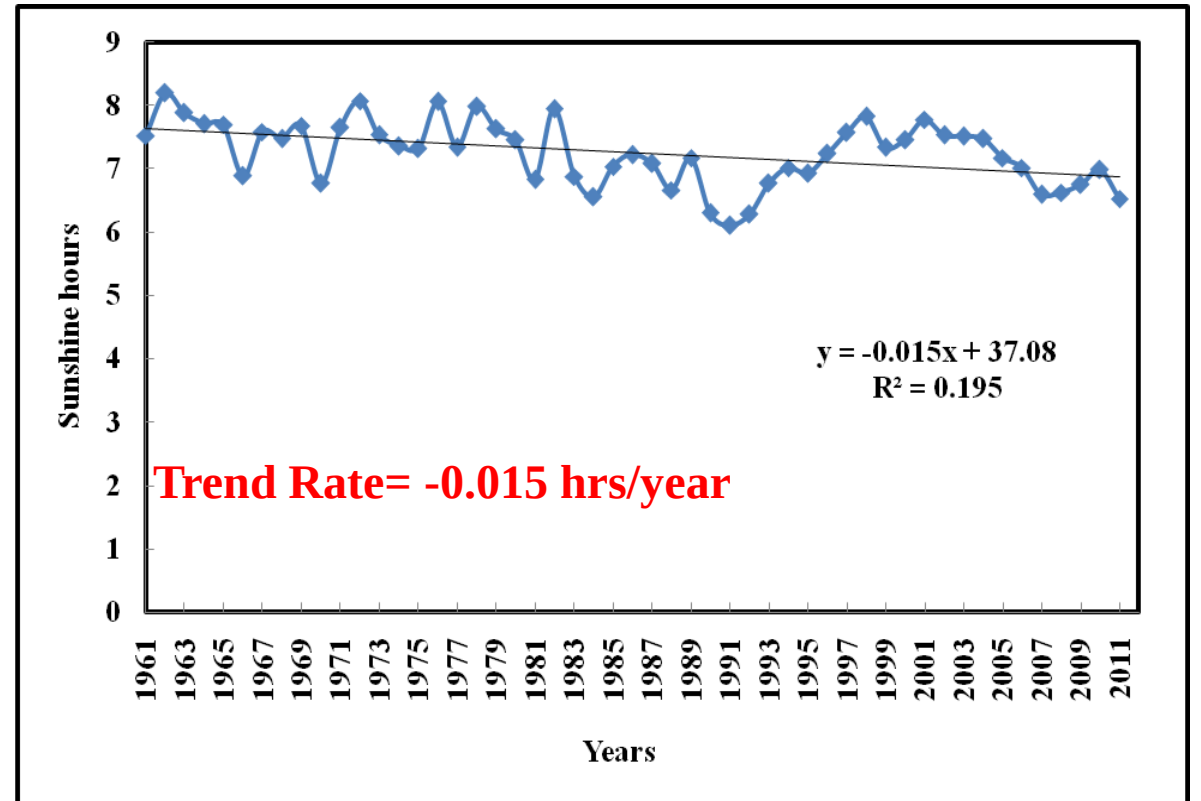


Fig. Trend in RH (%) at Sylhet during 1961-2012

Trends in Annual Mean Sunshine Hours at different regions

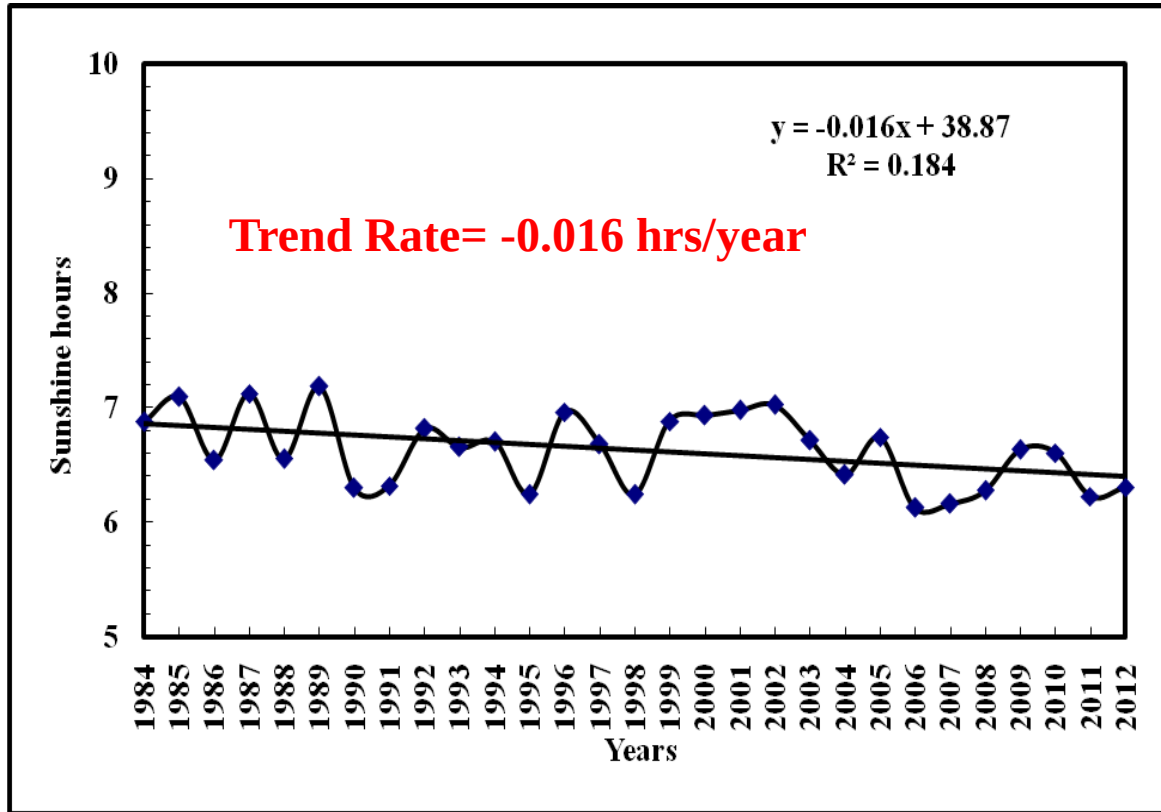


Trend in annual mean sunshine hours at Chittagong during 1961-2012

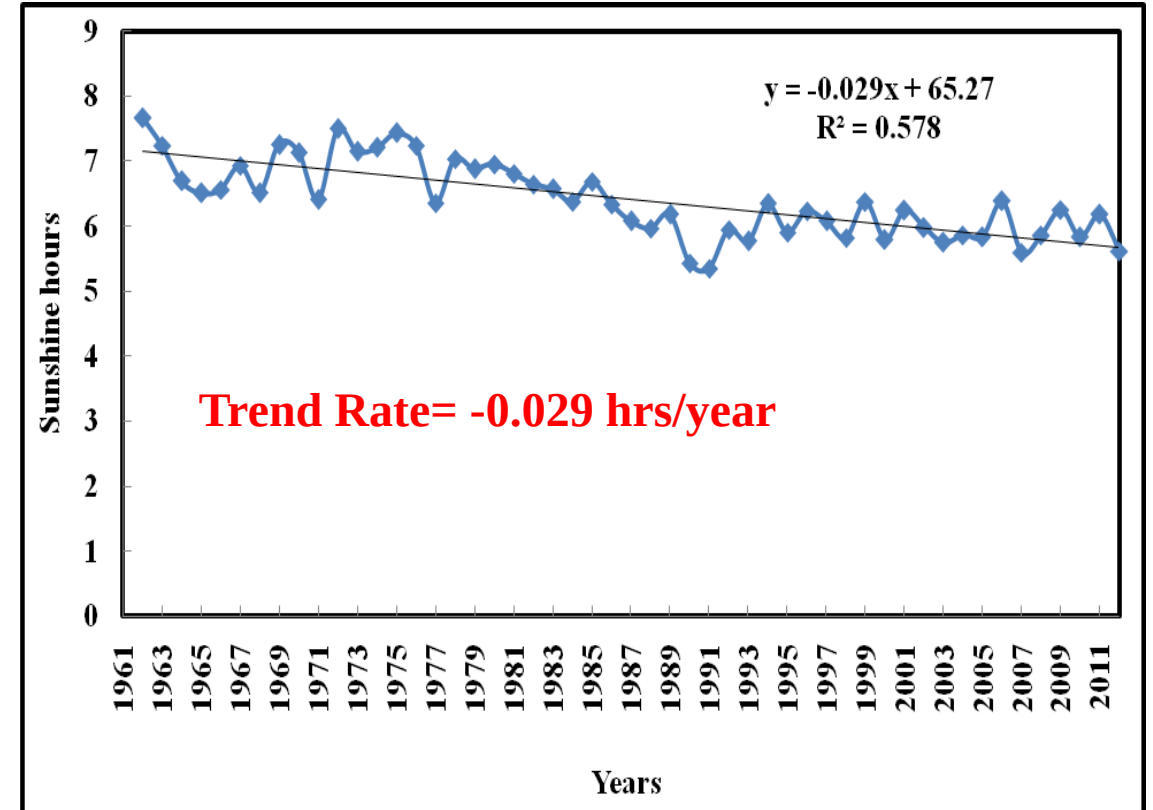


Trend in annual mean sunshine hours at Cox's Bazar during 1961-2012

Trends in Annual Mean Sunshine Hours at different regions



Trend in annual mean sunshine hours at Khulna during 1984-2012

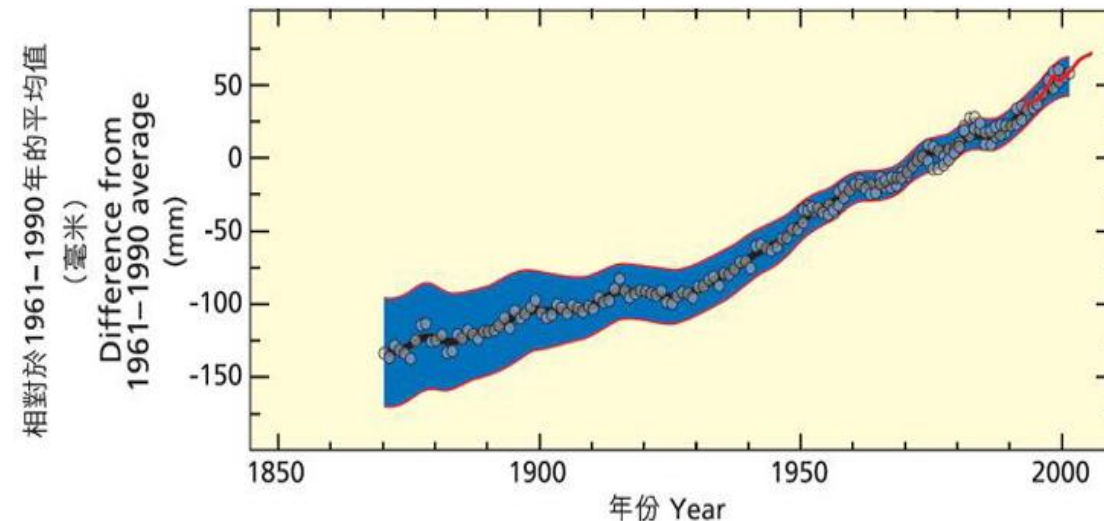


Trend in annual mean sunshine hours at Sylhet during 1961-2012

Impacts of Climate Change (Source: Rahman, A. BCAS)

Nine Major Impacts of Climate Change in Bangladesh

- Sea Level Rise
- Cyclone (Intensity & Frequency)
- Deeper Penetration of Saline Water
- Erratic Rainfall
- Flood (Intensity & Frequency)
- Drought
- River Bank Erosion
- Health
- Food Security



Observed changes in global average sea level rise from tide gauge (blue) and satellite (red) data. Changes are relative to corresponding averages for the period 1961-1990. Smoothed curve represents decadal averaged values while circles show yearly values. The shaded areas are the uncertainty intervals. (Source: IPCC 2007)

Impact of Sea Level Rise



Table: Sea level rise (SLR) in Bangladesh and its possible impacts (Source: World Bank 2000)

Year	2020	2050	2100
Sea level rise	10 cm	25 cm	1 m (high end estimate)

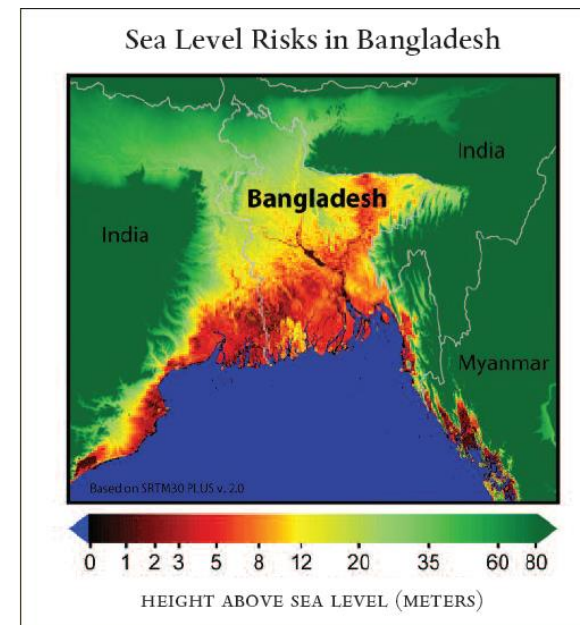
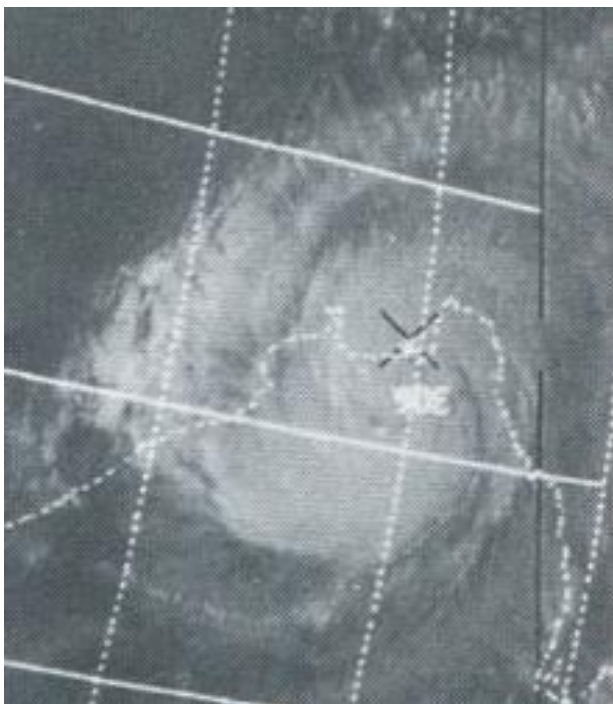


Figure 3. Low-elevation areas in coastal Bangladesh at risk of inundation from climate change induced sea-level rise (Source: www.globalwarmingart.com/wiki/Sea_Level_Rise_Maps_Gallery).

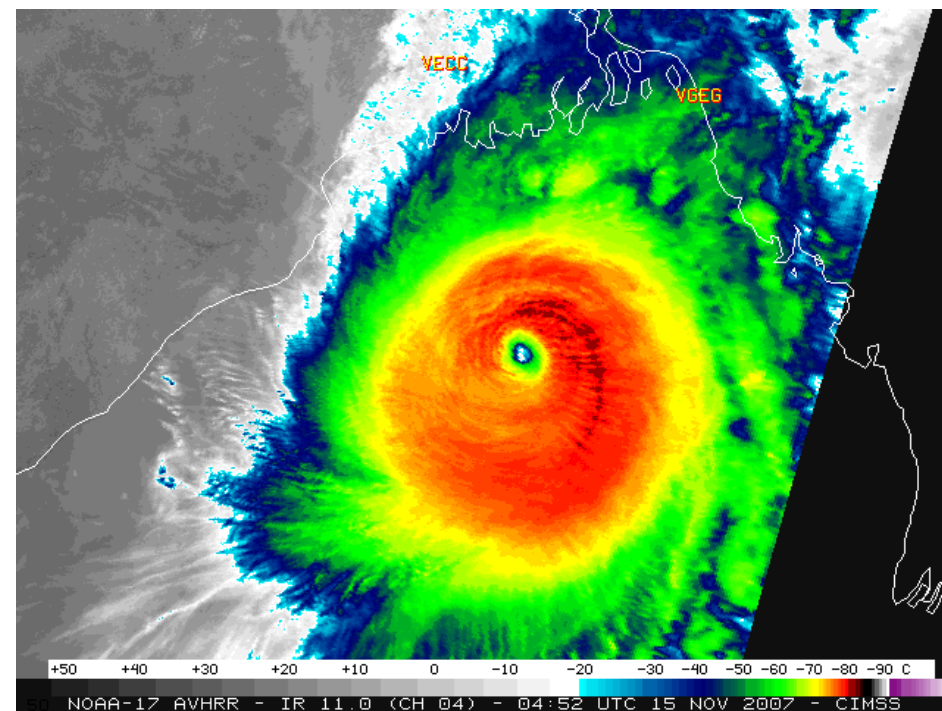
Catastrophic Cyclones



Great 12 November Cyclone 1970
Wind: 225 km/hr (Source:BMD)
Death:300,000

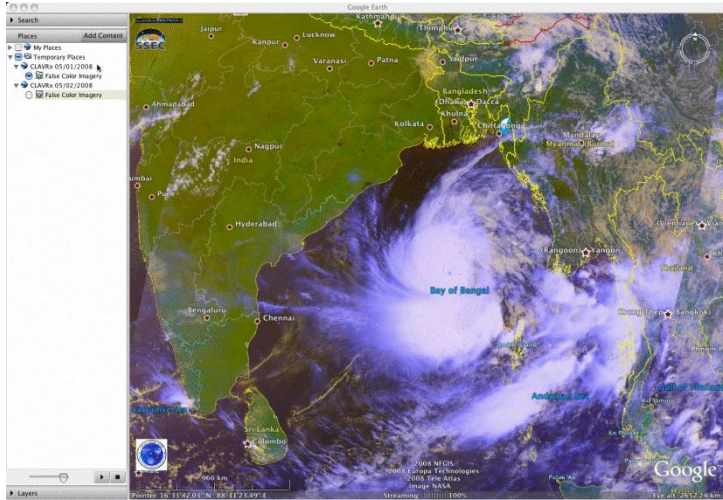


Killer Cyclone of 29 April 1991
Wind:224km/hr (Source:BMD)
Death: 1,38,882



Cyclone SADR of 15 November 2007
Wind: 260 km/hr (Source: internet)
BMD Recorded:222 km/hr
Death: 3275

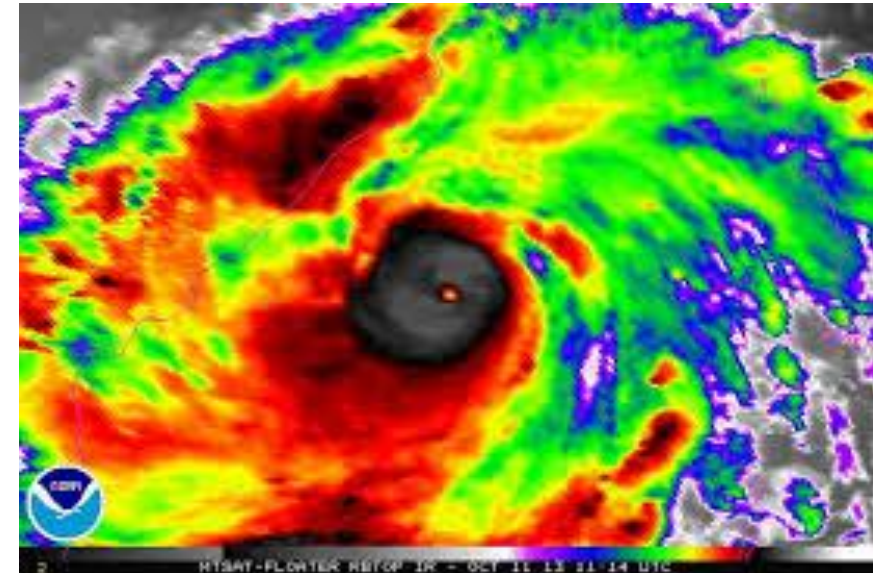
Catastrophic Cyclones



Cyclone Nargis 3 May 2008
Wikipedia
Wind:215km/hr
Death:138,366 in Burma



Fig. Severe Cyclone
Aila of 26 May 2009
(Wikipedia)
Wind;120 km/hr
Death:330
Missing:8,208



Cyclone Phailin of 11 October 2013
Wind: 260 km/hr (wikipedia)
Death:45 in Orissa, India

Basic Concept on Climate-Resilient Natural Resources Management (NRM)

Natural resources:

- Natural resources occur naturally within environments that exist relatively undisturbed by humanity, in a natural form.
- A natural resource is often characterized by amounts of biodiversity and geodiversity existent in various ecosystems.
- Natural resources are derived from the environment. Some of them are essential for our survival while most are used for satisfying our wants.
- Natural resources may be further classified in different ways.



- Natural resources are materials and components (something that can be used) that can be found within the environment.
- Every man-made product is composed of natural resources (at its fundamental level).
- A natural resource may exist as a separate entity such as fresh water, and air, as well as a living organism such as a fish, or it may exist in an alternate form which must be processed to obtain the resource such as metal ores, oil, and most forms of energy.



Dulhazr Safari park, Cox's Bazar



Bangladeshi Gaur in DulaHazara Safari Park, Cox's Bazar

Natural Resources



What is Natural Resource Management

- The term natural resource management is frequently used when dealing with a particular resource for human use rather than managing the whole ecosystem.
- A main objective of natural resources management is the sustainability for future generations, which appoints ecosystem managers to balance natural resources exploitation and conservation over long-term timeframe.
- The balanced relationship of each resource in an ecosystem is subject to change at different spatial and temporal scales. Dimensions such as, watersheds, soils, flora and fauna, need to be considered individually and on a landscape level. A variety of natural resources are utilized for food, medicine, energy and shelter.

- For primary producers, natural resource management means taking into account the climate, soils, water, vegetation and organisms when making decisions about the land they manage.
- The goal is sustainability - balancing social (people and communities), economic (money and jobs) and environmental (land, water, air and living things) factors to make sure that our children and grandchildren can equally benefit from our natural resources.
- Our social, economic and environmental wellbeing depends on the sustainable management of natural resources.
- In fact, in many instances, the goal is to leave a better natural environment for people in the future than what we have today! It's possible to see this happen, with modern science and research and adopting new primary production techniques.

Management approaches

The various approaches applied to natural resource management include:

- Top-down (command and control)
- Community-based natural resource management
- Adaptive management
- Precautionary approach
- Integrated natural resource management

These Approaches will be discussed in details in other session.

Thank you

Session 2

Convention, Protocols, Treaties on Climate Change, Ecosystem and Biodiversity Conservation

Global Climate Change Process

1988 : World Meteorological Organization (WMO) and UNEP established the IPCC. The UN General Assembly takes up climate change for the first time.

1990 : Intergovernmental Negotiating Committee (INC) for framework convention on climate change.

1992 : **UN Framework Convention on Climate Change (UNFCCC)** adopted at the fifth session of the INC at New York and Open for signature at the “Earth Summit” in Brazil.

Global Climate Change Process

1994 : 21 March, the convention enters into force after ratification by 58 Parties.

Objectives of the UNFCCC

- *Stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.*
- *Such level should be achieved **within a timeframe** 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***

Global Climate Change Process

1995 : First Session of the Conference of the Parties COP1, Berlin, Germany.

- *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.*

1996 : Second Session of the Conference of the Parties COP2, Geneva, Switzerland

- *Ministerial Declaration confirming the findings of the IPCC Second Assessment Report (SAR) and calling for “legally binding” commitments*
- *US announced its support for a legally binding protocol or other legal instrument*

Global Climate Change Process

1997 : Third Session of Conference of the Parties (COP), Kyoto, Japan

- *Parties to the UNFCCC adopted the Kyoto Protocol (KP) with the unprecedented, legally enforced ambition of limiting and reducing the greenhouse gas emissions*
- *Average reduction target is 5.2 percent*
- *Three Flexible Mechanisms, Joint Implementation, Emission Trading, and Clean Development Mechanism*

1998 : The Kyoto Protocol opened for signature at UN headquarters in New York. It has an equation of 55 countries and 55% emission of Annex I countries to enter into force.

Global Climate Change Process

2009 : The Copenhagen Accord

2010: Cancun Agreement

2011: Durban Platform, Adaptation Committee, GCF, Life support to
KP, Global Climate Change Agreement by 2015

2012: Doha Outcome

2013: Warsaw Outcome

Global Climate Change Process

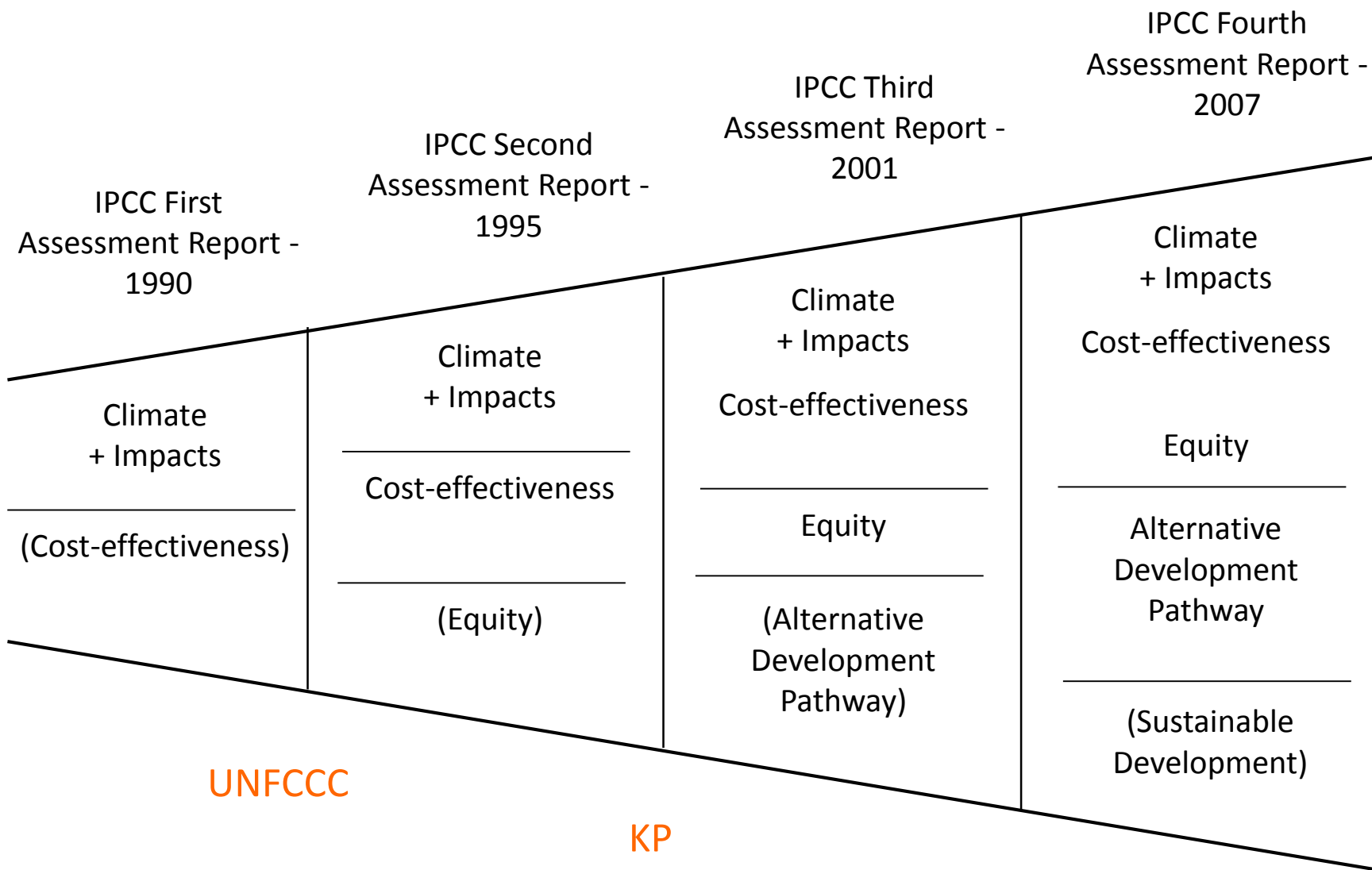
1990 : IPCC First Assessment Report

1995 : IPCC Second Assessment Report

2001: IPCC Third Assessment Report

2007: IPCC Fourth Assessment Report

2014: IPCC Fifth Assessment Report



■ **The Convention on Biological Diversity (CBD)**

- **The Earth's biological resources are vital to humanity's economic and social development.**
- **In 1989, it established the Ad Hoc Working Group of Technical and Legal Experts to prepare an international legal instrument for the conservation and sustainable use of biological diversity.**
- **By 1991, the Ad Hoc Working Group had become known as the Intergovernmental Negotiating Committee.**
- **The Convention entered into force on 29 December 1993, which was 90 days after the 30th ratification.**

The Stockholm Convention on Persistent Organic Pollutants (POPs)

- The stockholm convention is a global treaty to protect human health and the environment from persistent organic pollutants (POPs).
- POPs are chemicals (eg. DDT) that remain intact in the environment for long periods, become widely distributed geographically, circulate globally, accumulate in the fatty tissue of living organisms and are toxic to humans and wildlife.

Source : www.pops.int and www.uspopswatch.org

THANK YOU

Session 3

Roles of CREL Project in building climate resilient NRM (Forests and Wetlands)

CREL Project Overview

The Climate-Resilient Ecosystems and Livelihoods (CREL) project is

- **supported by the United States Agency for International Development (USAID)**
- **being implemented by Winrock International in partnership with**
 - **Department of Environment (DOE) and Bangladesh Department of Forests (FD) under the Ministry of Environment**
 - **Forests (MOEF), Department of Fisheries (DOF) under the Ministry of Fisheries and Livestock (MOFL) and**
 - **Ministry of Land (MOL).**

CREL has four inter-related components:

Component 1: Improved governance of natural resources and biodiversity

Component 2: Enhanced knowledge and capacity of key stakeholders

Component 3: Strengthened planning and implementation of climate-resilient NRM and adaptation

Component 4: Improved and diversifies livelihoods that are environmentally sustainable and resilient to climate change

CREL: Goal and Targets

USAID Bangladesh's Climate-Resilient Ecosystems and Livelihoods (CREL) project will scale up and adapt successful co-management models to

- conserve ecosystems and protected areas (PAs),**
- improve governance of natural resources and biodiversity, and**
- increase resilience to climate change through improved planning and livelihoods diversification.**

Selected Targets

- **350,000 stakeholders with increased capacity to adapt to impacts of climate variability and change**
- **500,000 people with increased economic benefits**
- **475,000 ha under improved NRM**
- **\$20 million leveraged from public and private sources for REDD+ and to improve responsiveness to climate change**
- **4,800 stakeholders using climate information in decision-making**

The broad objectives include:

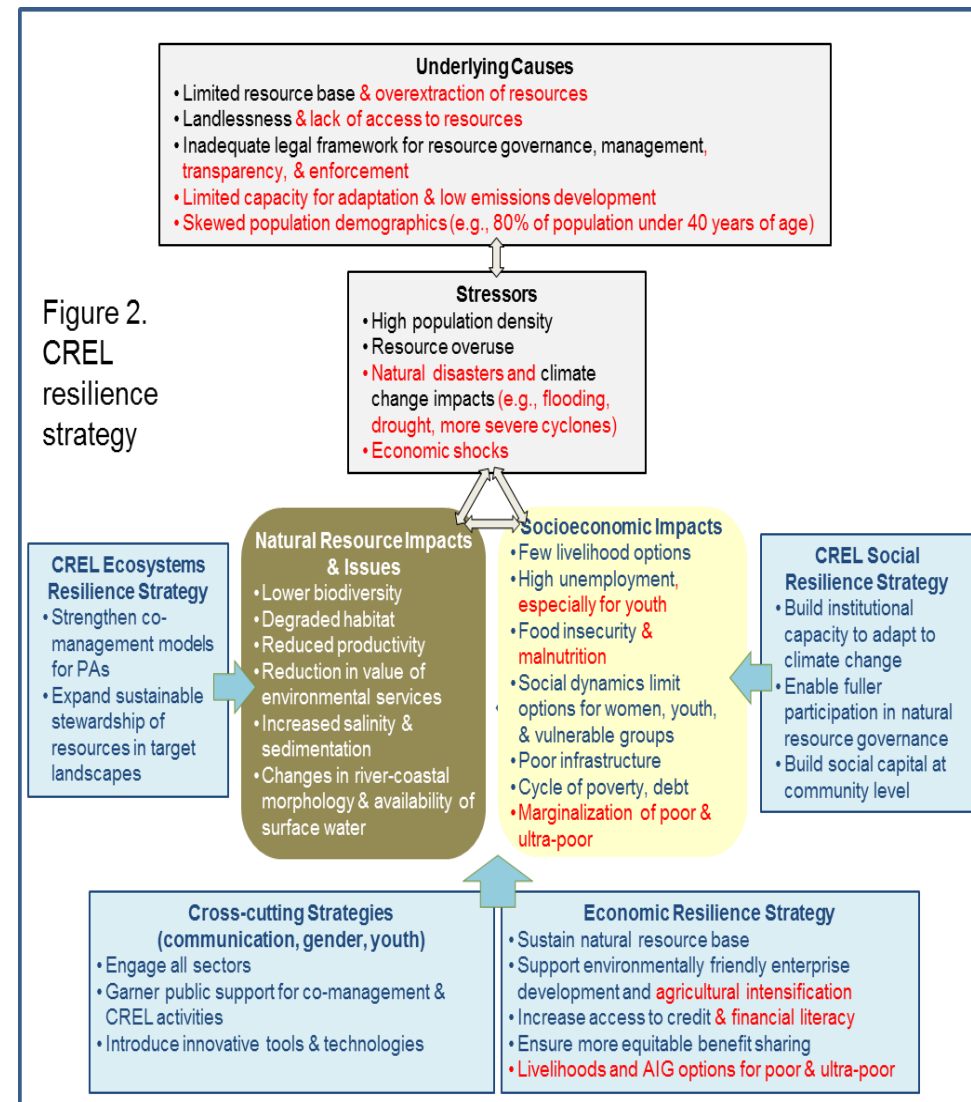
- **Natural Resources Management**
- **PA management**
- **Successful Management of critical ecosystems**
- **Building resiliency to climate risks for enhanced adaptation to climate change impacts**
- **Improve livelihoods.**

CREL Strategy

• CREL addresses the environmental, socioeconomic, and policy/legal issues and stressors that threaten PAs and surrounding landscapes in the target areas by scaling up proven approaches to increase resilience.

• To expand biodiversity conservation, PA management, and natural resource governance to the landscape level, CREL will collaborate with USG-funded food security programs to pair income gains from resource co-management and alternative livelihoods with products and services that reduce malnutrition.

• The CREL strategy addresses the key development challenges identified in the Request for Applications (RFA), including demographic issues such as marginalization of the poor and ultra-poor.



CREL Areas

The project has been working in three regions:

- The Northeast Region focused on haors and forests based in Sylhet Region (Srimangal Sunamganj and Hobiganj)
- The Southwest Region focused on the Sundarbans based in Khulna
- The Southeast Region focused on forests and coastal wetlands based in Chittagong and Cox's Bazar.

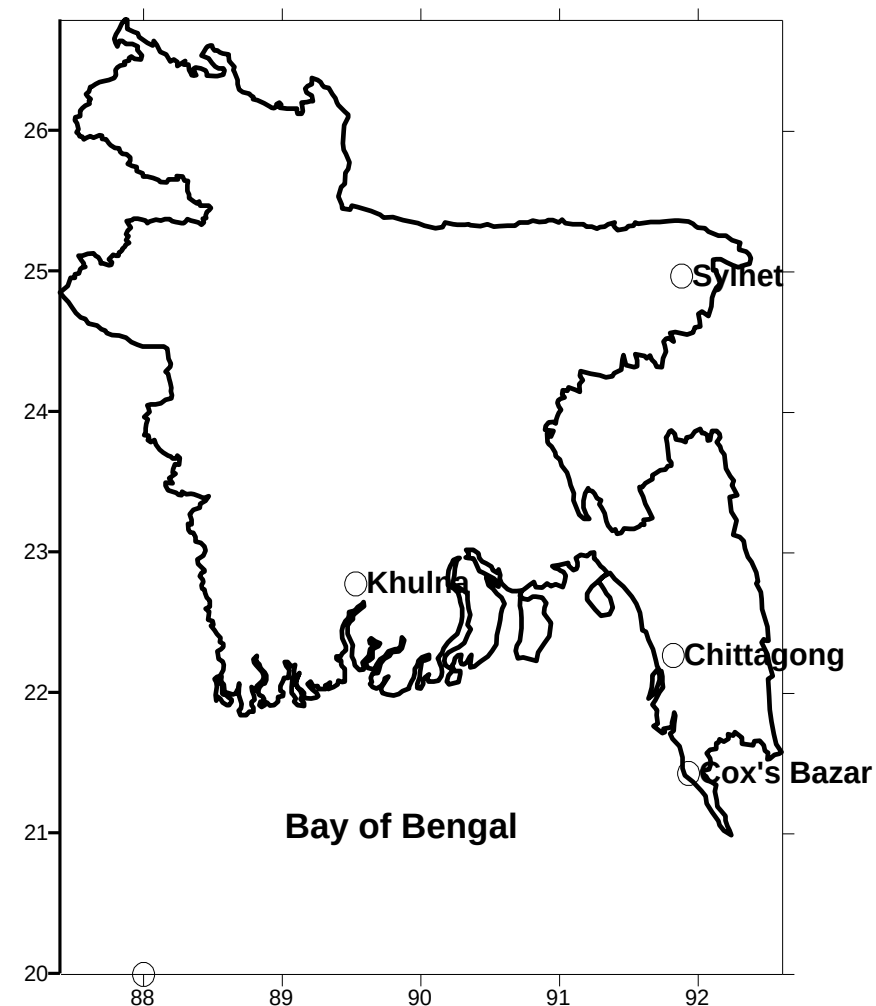


Fig. CREL Regions

Implementing Partners

CREL has a team of national and international partners to implement the project in partnership with GoB. These partners are BCAS, CNRS, CODEC, NACOM, WorldFish and TetraTech ARD, led by WINROCK International.

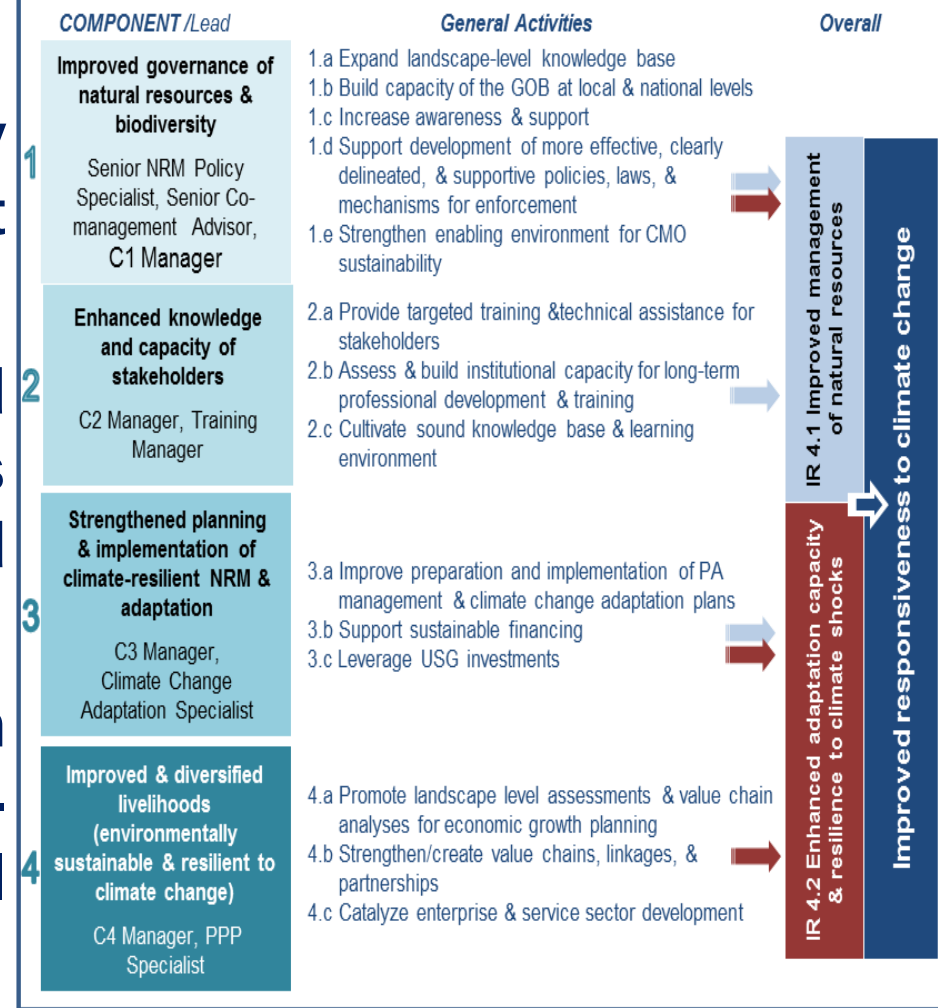
The roles and responsibilities of the partners are:

- prepare the TNA report (BCAS),**
- prepare the plans for carrying out the training and capacity building (BCAS),**
- prepare the training Manuals and Modules for training and capacity building (BCAS), facilitate ToTs (BCAS),**
- implement the plans for training and capacity building in different levels (CODEC, CNRS, WorldFish, NACOM and TetraTech)**
- Strategic Guidance/Expertise; Implementation of Training and Capacity Building Plan; Monitoring and Supervision of Partners Training Activities (CREL)**

Technical Approach

- Major activities and lead implementing staff, by component, and how they contribute to project results.
- CREL approach combines rigorous science and technology with proven, innovative approaches to citizen and stakeholder engagement that build on the existing knowledge base.
- It promotes gender, ethnic, and youth equality in analysis, decision-making, and benefits. Our co-management approaches meet specific regional challenges:

Figure 3. CREL activities lead to USAID's desired results



Component wise activities and expected results

Component 1: Improved governance of natural resources and biodiversity

This component aims to establish a long-term framework for sustainable co-management of biologically diverse landscapes base on commitment from co-managers to good governance, an informed public, and policy that incorporates climate change considerations into land use planning.

C 1 Results

- Strengthened national framework for PA management including Nishorgo Network
- Action plan addressing barriers to CMO sustainability
- Climate change considerations and land use planning integrated into PA management plans
- Enhanced NRM/ biodiversity coverage

Component 2 :Enhanced knowledge and capacity of key stakeholders

- CREL C2 will use and adapt tools developed and tested through similar programs in the region, and utilize USAID's HICD Handbook to evaluate the training and capacity building needs of GOB ministries, local government partners, community organizations, CSOs, private sector and micro-finance partners, and marginalized groups (women, youth, and other vulnerable populations).
- The team will use a **three-pronged** approach to build individual and institutional capacity.

C2 Results

- Completed assessments for GOB and CMOs (knowledge/institutional capacity)
- Trainings and cross-visits for key stakeholders
- Increased GOB capacity on NRM, biodiversity, climate change adaptation
- Strengthened technical, organizational, and financial capacity of CMOs for long-term sustainability
- Periodic assessments of biodiversity, climate change threats, key species, ecosystem valuations

Component 3 : Strengthened planning and implementation of climate-resilient NRM and adaptation

- CREL C3 activities will enhance and expand CMO stewardship and increase resilience through improved planning and implementation in the three regions.
- Lessons and evidence from previous studies and projects will enable CREL to assist CMOs in integrating climate change risk reduction and adaptation into long-term PA conservation plans.
- Landscape-scale planning will be integrated across sectors to ensure synergy with other development activities. We will catalyze private sector partnerships and financing to implement plans and leverage USG investments.

C3 Results

- Local climate change adaptation plans developed and integrated into PA management plans
- Sustainable financing mechanisms
- Linkages with other USAID programs and other development partners

Component 4 :Improved and diversified livelihoods that are environmentally sustainable and resilient to climate change

- Most project stakeholders are poor, ultra-poor, and/or marginalized.
- Many of Bangladesh's rural poor earn a marginal living by harvesting fish, shrimp post-larvae, fuel wood, and **NTFPs**.
- Overharvesting is common, both for subsistence and to repay loans. The economic vulnerability of these communities is compounded by frequent environmental and climate-related calamities, including flooding, cyclones, salinity, land loss, and impacts on agricultural infrastructure and marine resources.
- CREL C4 activities will improve and scale up diversified livelihood alternatives that are environmentally sustainable and resilient to climate change using a multi-pronged approach to achieve results.

C4 Results

- Promotion of environment-friendly, climate-resilient, sustainable livelihood options
- Increased income from livelihood activities
- Improved access to household/community level, climate-resilient basic infrastructure
- Improved access to climate information and financing mechanisms

Output

The CREL project will ensure successfully implement co-management and biodiversity conservation in the targeted areas of the country: the South (notably the Sundarbans), Northeastern region (Sylhet, Moulvibazaar, Habiganj and Sunamganj districts) and the Southeastern region (Chittagong and Cox's Bazaar districts).

CREL will provide customized hands-on courses to orient stakeholders to landscape approaches for resource and land use planning, climate change adaptation strategies, and the practical application of tools, methods, and technologies, focusing on gaps identified through organizational assessments.

CREL will develop capacities to support long-term training and education through mentoring and curriculum development in partnership with educational institutions and organizations that provide non-degree training, research, and TA to projects and GOB agencies.

Through targeted TA, we will expand the scientific knowledge base and foster a learning environment by building capacity to monitor natural resources and biodiversity and to perform economic valuations and scientific analyses.

Thank you

Session 4

Functions and services of ecosystem focused on: Restoration of Ecosystems and Habitats of Wildlife/Forests/ & Wetlands

Types of Ecosystems in Bangladesh (please add some good pictures)

The types of ecosystems in Bangladesh are:

Wetland ecosystems

- Coastal and marine ecosystems
- Inland freshwater ecosystems

Forest ecosystems

- terrestrial forest ecosystems

Man-made ecosystems

Wetland ecosystems (please add representative pictures)

- **Wetlands are the most important natural ecosystems of Bangladesh.**
- **Bangladesh possesses enormous area of wetlands including rivers and streams, freshwater lakes and marshes, haors, baors, beels, water storage reservoirs, fish ponds, flooded cultivated fields and estuarine systems with extensive mangrove swamps.**
- **The haors, baors, beels and jheels are of fluvial origin and are commonly identified as freshwater wetlands.**



Wetland ecosystems

- These freshwater wetlands occupy four landscape units - floodplains, freshwater marshes, lakes and swamp forests.
- The haor basin is known for its rich biodiversity.
- The largest haor in Bangladesh is Hakaluki Haor, which supports one of the largest inland fisheries in the country.



Hakaluki Haor

Tanguar Haor, Sunamganj

Wetland ecosystems: Definitions

- Wetlands are unique ecosystems that often occur at the edge of aquatic (water, fresh to salty) or terrestrial (upland) systems.
- Wetland area is characterized by sluggish or standing water that can create an open water habitat for wildlife.
- The Ramsar Convention (1971) has defined wetlands as –
“areas of marsh, fen, peatland, or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres”.

- The Ramsar definition of wetlands lumps together a wide range of contrasting habitats like fluvial, coastal and marine.
- However, the Ramsar definition has been adopted and being used in Bangladesh.
- Based on biological and physical characteristics, 39 categories of wetlands were globally identified; of which 30 are natural and nine man-made.
- As a result of waterlogged and anaerobic conditions, wetlands are dominated by hydrophytic plants that are *specifically adapted* to withstand these demanding conditions.

[Source: [Wetland - Banglapedia](http://www.banglapedia.org/HT/W_005):www.banglapedia.org/HT/W_005]

The total area under wetlands in Bangladesh has been variously estimated at **seven to eight million hectares**, which is about 50% of the total land surface. The areal extent of wetlands under various categories are given in the following:

Open waters	UNIT???
Rivers	7,497
Estuaries and mangrove swamps	6,102
Beels and haors	1,142
Inundable floodplains	54,866
Kaptai Lake	688
Closed water	
Ponds	1,469
Baors (Oxbow Lakes)	55
Brackish-water farms	1,080
Total	72,899

Source Akonda 1989 and Khan 1994.

Forest Ecosystems in Bangladesh

- A forest ecosystem is a natural unit consisting of mostly plants, animals and micro-organisms in forest area and functions together with all of non-living physical factors of the environment.
- The Sundarban is the largest mangrove forest in the world. It is situated in the southwestern part of Bangladesh and in the West Bengal state of India.
- Despite high population pressure and environmental hazards such as siltation, cyclone, flooding and sea level rise, the areal extent of the mangrove forest has not changed significantly in the last 25 years.



Sundarban Mangrove Forest

Source: *United Nations Environment Programme*
[*Atlas of Our Changing Environment*](#)

The Sundarban:

- **Area: About one million ha**
- **Bangladesh (62%) and India (38%)**
- **With its array of trees and wildlife the forest is a showpiece of natural history.**
- **It is also a center of economic activities, such as extraction of timber, fishing and collection of honey.**
- **The area of Sundarban experiences a subtropical monsoonal climate with an annual rainfall of 1600-1800 mm and severe cyclonic storms.**

•The Sundarban is known for its wide range of flora and fauna. The most famous among these :

- The Royal Bengal Tigers,
- numerous species of birds,
- spotted deer,
- crocodiles and
- snakes

•The mangroves have been extensively exploited over centuries for timber, fish and prawns, honey, fodder, or converted for paddy and aquaculture and now it faces the serious challenges for its existence.

• Javan rhino, wild buffalo, hog deer, and barking deer are already extinct from the area.



Flora And Fauna Of Bangladesh



Cox's Bazar reserve forest (please add more features on reserve forests)

- According to the Cox's Bazar South Forest Department, Ukhiya upazila has two forest ranges stretching over 25,000-acre land with 12 forest bits.
- The trees in the forest ranges of Ukhiya and Inani in Cox's Bazar are being erased and burnt nonchalantly to make into charcoal, a much easier way for woodcutters to earn a living.



Source: Cox's Bazar reserve forest disappearing, ecology at risk (internet)

See more at:

<http://www.dhakatribune.com/environment/2014/jun/19/cox%E2%80%99s-bazar-reserve-forest-disappearing-ecology-risk#sthash.eqYpLMUA.dpuf>

Himchari National Park please add representative pictures :

- **The Park is a pretty tropical rain forest (evergreen & semi-ever-green) around the South Asia.**
- **The park was established in 1980.**
- **This place is maintained, protected and secured by the government for the foreign tourists and the local visitors.**
- **The park gets high forest, low forest & grasslands with a few trees.**
- **The park is also regarded as a paradise of birdwatcher.**
- **Lots of bird watchers are gathered here for the seeing the different kinds of birds, as over 286 species of birds found there.**

- **Himchari national Park contains:**

- Around 58 species of trees,
- 4 species grasses,
- 15 species of shrubs,
- 19 climbers and
- 21 species of herbs
- Altogether 117 plant species are available here.
- In the forest area there are other kinds of important herbs like *Curculigo recurvata*, *Swintonia floribunda* and *Alpinia nigra*.
- Additionally, 55 species of mammals, 56 species of reptiles and 13 species of amphibians are present in the evergreen forest.

- **A little number of elephants and leopard also found here.**

Forest in Chittagong

- Chittagong Hill Tracts (CHT) is considered as one of the rich forest areas of Bangladesh.
- The area is different from other areas of Bangladesh due to its unique geographic and social structures, which is characterized by hilly topography and inhabited by different indigenous communities.
- The indigenous culture, lifestyle and livelihood are mostly related to forest and forest resources.



Forests in Chittagong Hill Tracts (internet)

- Unfortunately, over the past several decades, unsustainable use of these resources has led to the loss of biodiversity, degradation of the overall environment and ecosystems as a whole.
- As a result, forest resource oriented indigenous communities faced with several crises for their subsistence requirements.
- Standing on such degraded condition, government has initiated many development programs for forest dependant indigenous communities in CHT.
- Government has formed Community Management Organizations (CMOs), Village Common Forest (VCF) for the protection and sustainable forest management.

Forest in Sylhet region: Lawachara Rain Forest:

It is located about 30 kilometres from Srimangal town in Sylhet.

- Lawachara National Park covers approximately 1,250 ha (12.5 km²) of semi-evergreen forests of the Tropical and subtropical coniferous forests Biome and mixed deciduous forests of the Tropical and subtropical moist broadleaf forests Biome.
- The land was declared a national park by the Bangladesh government on July 7, 1996 under the Wildlife Act of 1974.



Biological diversity in the Lawachara National Park consists of

- 460 species, of which 167 species are plants, 4 amphibian species, 6 reptile species, 246 bird species, 20 mammal species, and 17 insect species.

- One of this is the critically endangered western hoolock gibbons, of which only 62 individuals remain in the area.



A mother hoolock with her child.
[source:Wikipedia]

There are other forest areas in Sylhet region such as:

(i) Ratargul Swamp Forest

- Ratargul Swamp Forest is a freshwater swamp forest located in Gowainghat, Sylhet, Bangladesh.
- It is the only swamp forest located in Bangladesh and one of the few freshwater swamp forest in the world.
- The forest is naturally conserved under the Department of Forestry, Govt. of Bangladesh.
- The evergreen forest is situated by the river *Goain* and linked with the channel *Chengir Khal*. Most of the trees grow here are Pongamia pinnata (*Koroch tree*).
- The forest goes under 20-30 feet water at rainy season. Rest of the year the water level is about 10 feet deep.

(ii) Satchari National Park

- **Satchari National Park is a national park in Habiganj District, Bangladesh.**
- **After the 1974 Wild Life Preservation Act, in 2005 Satchari National Park was built on 243 hectares (600 acres) of land.**
- **Literally 'Satchari' in Bengali means 'Seven Streams'. There are seven streams flowing in this jungle, and the name 'Satchari' came from there.**

Terrestrial Forest Ecosystems

- Terrestrial ecosystems are distinguished from aquatic ecosystems by the lower availability of water and the consequent importance of water as a limiting factor.
- Terrestrial ecosystems are characterized by greater temperature fluctuations on both a diurnal and seasonal basis than occur in aquatic ecosystems in similar climates.
- The availability of light is greater in terrestrial ecosystems than in aquatic ecosystems because the atmosphere is more transparent in land than in water.

Impact of Climate Change on "Sundarbans"

- The changing salinity is the primary process of ecosystem degradation both through rising sea levels encroaching from the Bay of Bengal and reduced freshwater flow.
 - The Sundarbans ecosystem is a balance between freshwater and salty ocean wetlands environments.
 - "It is feared that the anticipated sea level rise due to global warming will degrade the forest environment predominantly by increasing salinity, and hence will destroy major forest resources.
- Moreover, construction of Farakka Barrage on the Ganges by India has caused shrinkage of flow in the Padma River.
- As a result, the flow in the Gorai River, a distributary of the Ganges and a major source of fresh water flow in the Sunderbans water system, is being diminished."

•Ecosystem Functions and Services

- Ecosystem functions are the physical, chemical, and biological processes or attributes that contribute to the self-maintenance of an ecosystem; in other words, what the ecosystem does.
- Some examples of ecosystem functions are provision of wildlife habitat, carbon cycling, or the trapping of nutrients.
- Thus, ecosystems, such as wetlands, forests, or estuaries, can be characterized by the processes, or functions, that occur within them.
- Ecosystem services are the beneficial outcomes, for the natural environment or people that result from ecosystem functions.

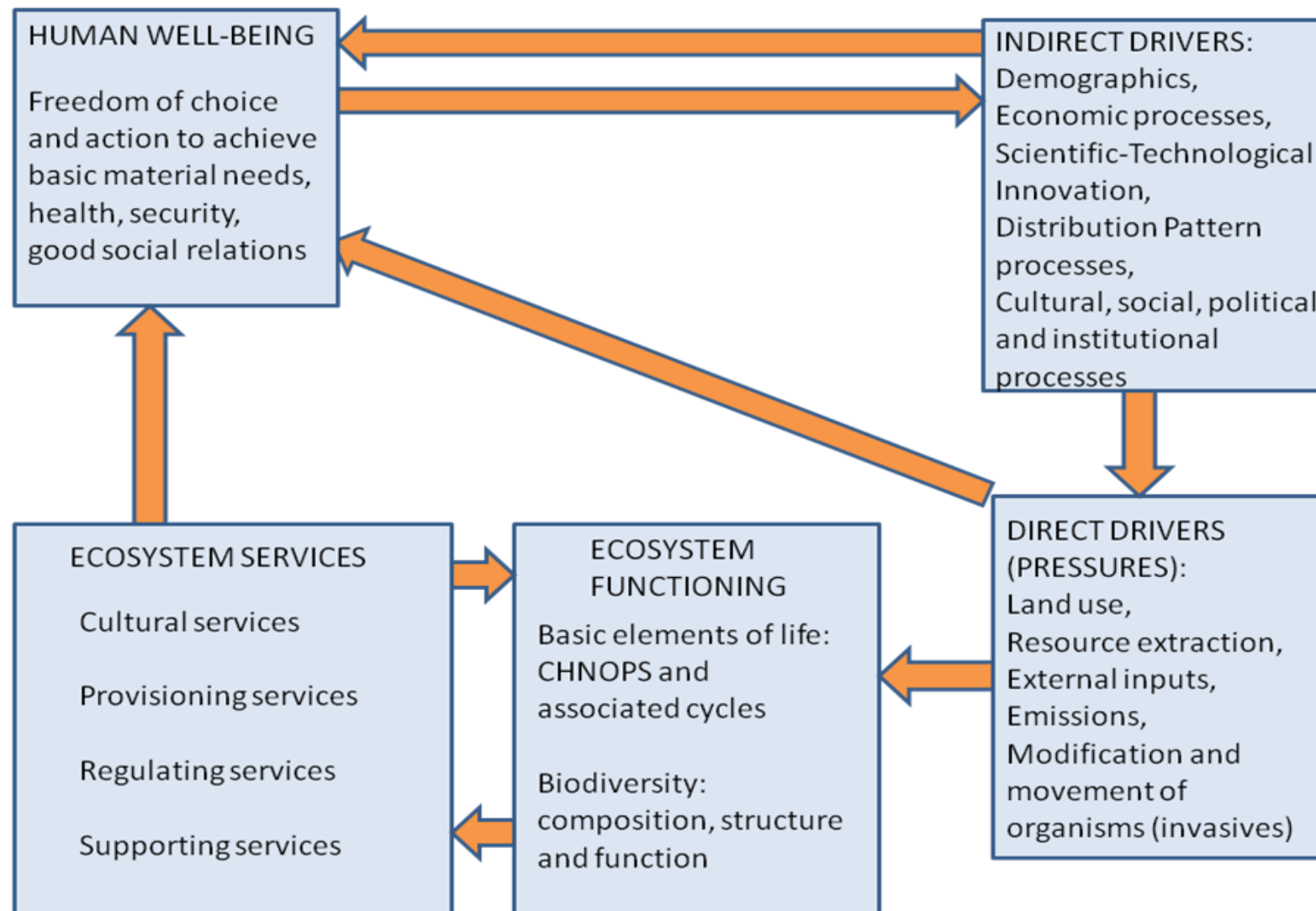
Degradation of wetlands

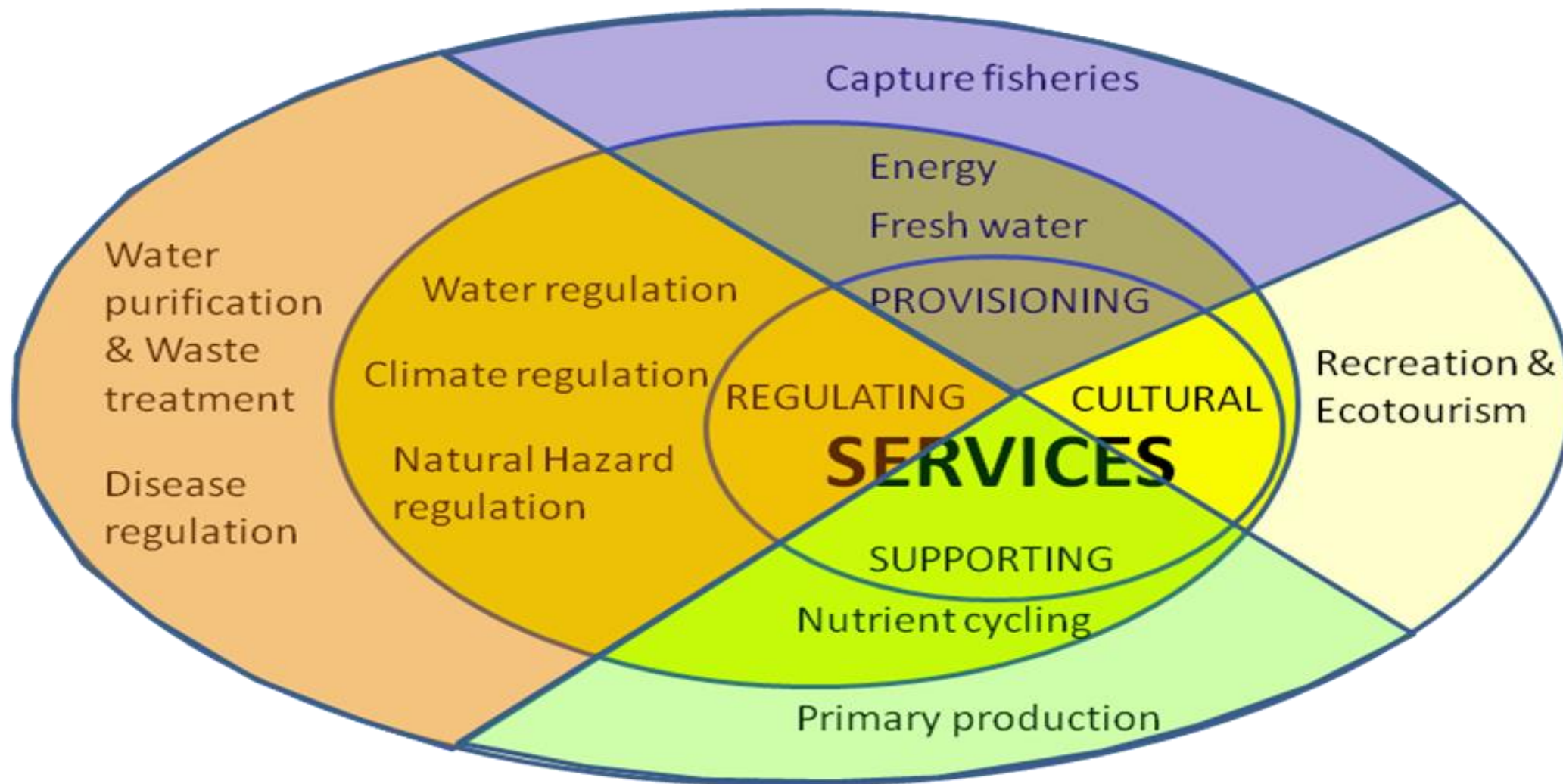
Since independence there has been an accelerated expansion of physical infrastructure in the floodplains and haor areas.

In recent years, decentralization of administration at the Upazila (sub-district) level also led to a rapid expansion of roads and feeder roads even in the rural areas of the haor basins.

These infrastructures were often done without proper planning or without paying due regard to natural water flows.

These poorly planned roads and drainage structures created water logging and had serious impact on the water regimes in the flood plains.







Services	Comments and Examples
Provisioning	
Food	Production of fish, wild game, fruits and grains
Fresh Water*	Storage and retention of water for domestic, industrial, and agricultural use
Fiber and fuel	Production of logs, fuelwood, peat, fodder
Biochemical	Extraction of medicines and other materials from biota
Genetic materials	Genes for resistance to plant pathogens, ornamental species, and so on
Regulating	
Climate regulation	Source of and sink for greenhouse gases; influence local and regional temperature, precipitation, and other climatic processes
Water regulation (hydrological flows)	Groundwater recharge/discharge
Water purification and waste treatment	Retention, recovery, and removal of excess nutrients and other pollutants
Erosion regulation	Retention of soils and sediments
Natural hazard regulation	Flood control, storm protection
Pollination	Habitat for pololinators
Cultural	
Spiritual and inspirational	Source of inspiration; many religions attach spiritual and religious values to aspects of wetland ecosystems
Recreational	Opportunities for recreational activities
Aesthetic	Many people find beauty or aesthetic value in aspect of wetland ecosystems
Educational	Opportunities for formal and informal education and training
Supporting	
Soil formation	Sediment retention and accumulation of organic matter
Nutrient cycling	Storage, recycling, processing, and acquisition of nutrients

Degradation of the wetlands in Bangladesh has created the following impacts:

- 1) Serious reduction of fish habitat, fish population and diversity;**
- 2) Extinction and reduction of wildlife including birds and reptiles;**
- 3) Extinction of many indigenous varieties of rice with the propagation of high yielding varieties; 4) Loss of many indigenous aquatic plants, weeds and shrubs,**
- 5) Loss of natural soil nutrients; Deterioration of living conditions;**
- 6) Loss of natural water reservoirs and degeneration of wetland-based ecosystems, occupations, socio-economic institutions and cultures**

Some Factors that Complicate Ecosystem Management Decisions

- Decisions about ecosystem management are complicated by the fact that various types of market failure are associated with natural resources and the environment.
- Market failures occur when markets do not reflect the full social costs or benefits of a good.
- Market failures related to ecosystems include the facts that:
 - (i) many ecosystems provide services that are public goods;
 - (ii) many ecosystem services are affected by externalities; and
 - (iii) property rights related to ecosystems and their services are often not clearly defined.

If property rights for natural resources are not clearly defined, they may be overused, because there is no incentive to conserve them.

For example, unregulated fisheries are an open-access resource – anyone who wants to harvest fish can do so.

Because no one person or group “owns” the resource, open access can lead to severe over-harvesting and potentially severe declines in fish abundance over time.

Thank You

Session 5

Impacts on Biodiversity focused on Forests and Wetlands

**(Please change the slides thoroughly based on IUCN, CBD and
CHARM project reports)**

Biodiversity and its importance

- Biological diversity is the variety and variability among living organisms and the ecological complexes in which they occur.
- Diversity can be defined as the number of different items and their relative frequency.
- For biological diversity, these items are organized at many levels, ranging from complete ecosystems to the chemical structures that are the molecular basis of heredity.
- Thus, the term encompasses different ecosystems, species, genes, and their relative abundance."



Aquatic plant
Source : Banglapedia

- The variety of life on Earth, its biological diversity is commonly referred to as biodiversity.

- The number of species of plants, animals, and microorganisms, the enormous diversity of genes in these species, the different ecosystems on the planet, such as deserts, rainforests and coral reefs are all part of a biologically diverse Earth.

- Appropriate conservation and sustainable development strategies attempt to recognize this as being integral to any approach to preserving biodiversity. Almost all cultures have their roots in our biological diversity in some way or form.



St. Martin island's
Crab

Ecosystem diversity

- *Ecosystem diversity* encompasses the variety of habitats that occur within a region, or the mosaic of patches found within a landscape.
- A familiar example is the variety of habitats and environmental parameters that constitute the Bangladesh Bay-Delta ecosystem: grasslands, wetlands, rivers, estuaries, fresh and salt water.

Importance of biodiversity

- Everything that lives in an ecosystem is part of the web of life, including humans. Each species of vegetation and each creature have a place on the earth and play a vital role in the circle of life.
- Plant, animal, and insect species interact and depend upon one another for what each offers, such as food, shelter, oxygen, and soil enrichment.
- At least 40 per cent of the world's economy and 80 per cent of the needs of the poor are derived from biological resources.
- In addition, the richer the diversity of life, the greater the opportunity for medical discoveries, economic development, and adaptive responses to such new challenges as climate change.

Biodiversity boosts ecosystem productivity where each species, no matter how small, all have an important role to play.

For example,

- A larger number of plant species means a greater variety of crops**
- Greater species diversity ensures natural sustainability for all life forms**
- Healthy ecosystems can better withstand and recover from a variety of disasters.**

And so, while we dominate this planet, we still need to preserve the diversity in wildlife.

The Convention on Biological Diversity

• The Convention on Biological Diversity (CBD) is an international legally-binding treaty with three main goals:

- conservation of biodiversity;
- use of biodiversity; fair and
- equitable sharing of the benefits arising from the use of genetic resources.

Its overall objective is to encourage actions which will lead to a sustainable future.

The Objectives of the Convention

The Convention's objectives 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".

The Convention is thus the first global, comprehensive agreement to address all aspects of biological diversity: genetic resources, species, and ecosystems.

It recognizes -- for the first time -- that the conservation of biological diversity is "a common concern of humankind" and an integral part of the development process.

Facts and Figures of the Convention

- The Convention on Biological Diversity (CBD) was opened for signature at the Earth Summit in Rio de Janeiro on 5 June 1992 and entered into force on 29 December 1993.
- To date, there are 193 Parties.
- Components of biodiversity are all the various forms of life on Earth including ecosystems, animals, plants, fungi, microorganisms, and genetic diversity. With its three objectives, the CBD is often seen as the key international instrument for sustainable development.
- Ecosystems, species and genetic resources should be used for the benefit of humans, but in a way that does not lead to the decline of biodiversity.

- Substantial investments are required to conserve biodiversity, but it will bring significant environmental, economic and social benefits in return.
- The Ecosystem Approach, an integrated strategy for the management of resources, is the framework for action under the Convention.
- The precautionary principle states that where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat.

Source: International Day for Biological Diversity 22 May 2014, US Secretary General's Message

Impact of climate change on Biodiversity in Bangladesh

It is now recognized internationally that Bangladesh is at the forefront of adverse climate change impacts. One key reason is the disadvantaged geographical location of Bangladesh at the bottom of the three mighty river systems-those of the Ganges, the Brahmaputra, and the Meghna, with a long coastal belt and much of the country low-lying and flat. The country has no control over its water resources as over 92 per cent of the annual run-off that flows through Bangladesh on to the Bay of Bengal enters the country from upstream outside the country. Another key reason is that Bangladesh is the most densely populated country in the world, except for few city and tiny states. The following paragraphs depict the present and potential impact of climate change on different aspects as follows:

•Climate change impact on forest

- Bangladesh is characterized by both natural and plantation forests which, however, account for 17.5 percent of the total land in documents, but only 6-7 percent in reality.
- The notable natural forest ecosystems are tropical wet evergreen and semi-evergreen forest (hill forests), moist deciduous forestry (sal forest), tidal forest (mangrove forest), and village forestry.
- The plantation forests are now increasing under the auspices of social forestry programme to ensure peoples participation and their socio-economic benefits.
- Because of the increased rainfall in monsoon, water runoff rate on the forest floor has increased.

- As a result, rapid soil erosion causes nutrient leaching, destroys micro-organism and reduces overall site quality for better forest growth in the previously dense hill forests of Chittagong, Chittagong Hill Tracts (CHT), Sylhet, and Cox's Bazar.

- Most of the forests are also likely to be affected from the absence of ecological memory that is the network of species for interaction between each other and environment, and building the capacity for reorganization within or outside the forest patch after different perturbations.

- Moreover, the increasing frequency of flood, drought, cyclones, storm surges as a consequence of climate change, and its prolongation also triggers the mortality of some home-garden species such as jackfruit, papaya and bamboo mainly found in the plain land village forests

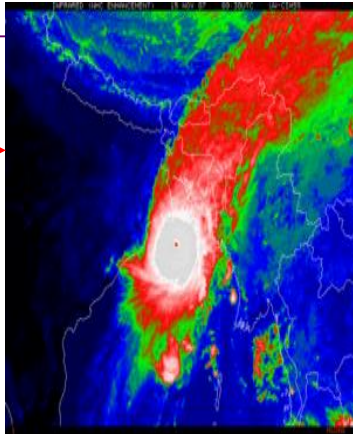
•Climate change impact on Mangrove Biodiversity of Sundarbans

- Being the largest single tract of mangrove forests in the world, the Sundarbans, a World Heritage Site is already affected with climate change impacts, importantly from increasing salinity and extreme weather events like tropical cyclones.
- Though, the main causal factors of top dying is yet to be known, but, some researchers predict that top dying of sundari trees (*Heritiera fomes*) is likely to be the consequence of slow increase of salinity over a long period of time.
- Salinity increase also affects the species' combination and regular succession patterns in the Sundarbans as some non-woody shrubs and bushes replace the tree species, reducing the forest productivity and habitat quality for valuable wildlife.

- World Wildlife Fund for Nature Conservation (WWF) estimates that due to sea level rise, nearly 7,500 hectare of mangrove forest in the Sundarbans are likely to submerge.
- Many researchers have shown that tropical cyclones destroy the mangrove forests to a large extent. For instance, in the recent cyclone, Sidr, has destroyed one-third of the Sundarbans.

SIDR affected areas at Nishanbaria (Karmakar, 2007)

**SID
R** →



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- Reduced freshwater flow increasing salinity intrusion and forest dieback in Sundarbans

- Sundarbans ecosystem is a balance between freshwater and salty ocean wetlands environments. It needs the flow of freshwater via the Ganges and the Gorai river, particularly during dry periods to balance the saline intrusion.



Source: <http://takvera.blogspot.com/2013/01/mangrove-forests-threatened-by-climate.html>
12 Jan 2013

It is feared that the anticipated sea level rise due to global warming will degrade the forest environment predominantly by increasing salinity, and hence will destroy major forest resources.

Moreover, construction of Farakka Barrage on the Ganges by India has caused shrinkage of flow in the Padma River.

As a result, the flow in the Gorai River, a distributary of the Ganges and a major source of fresh water flow in the Sunderbans water system, is being diminished.

Threatened Sundarbans Livelihoods

- The sea level rise and availability of less fresh water particularly during winter when rainfall will be less will cause inland intrusion of saline water.
- As a result, many mangrove species, susceptible to increased salinity, may be threatened.
- In addition, the highly dense human settlements just outside the mangrove area will restrict the migration of the mangrove areas to less saline area.
- The shrinking of the mangrove areas will have effect on the country's economy.
- Many industries which depend on raw materials from the Sundarbans will be threatened with closure and create large

- **Climate change is real a threat to ecosystem and biodiversity.**
- **The Sundarbans may be completely inundated by a 1 m rise in sea level.**
- **Increase in temperature and sea level rise will seriously affect the Sundarbans' ecosystem and bio-diversity.**
- **The area may shrink and many flora and fauna species may face extinction. Water stress during winter and excess water during summer will have effects on ecosystem and bio-diversity.**
- **A wide range of mammals, birds, amphibians, reptiles, crustaceans, and above all the Royal Bengal Tiger will face extinction.**

- The coastal length covered by mangrove forest will be exposed to cyclones and storm surges. In addition, more than half a million people, dependent on forest products in the Sundarbans, would also be exposed to economic uncertainties as Sundarbans faces extinction threats.
- It has been listed as World Heritage Site and is the most important ecosystem and protective natural barrier against the calamities like tidal surge, cyclone etc. This gift of nature would simply be submerged by the rising sea.

•Climate change impact on Mangrove Ecosystem

- Top dying of Sundri tree (*Heritiera fomes*) and salinity increase due to lack of freshwater flush during the dry months. These are causing the negative effects in the ecology of Sundarbans.
- Due to a combination of high evapo-transpiration and low flow in winter, the salinity of the soil would increase.
- As a result the growth of freshwater loving species would be severely affected.
- Eventually the species offering dense canopy cover would be replaced by non-woody shrubs and bushes, while the overall forest productivity would decline significantly.

- The degradation of forest quality might cause a gradual depletion of rich diversity of the forest flora and fauna of the Sundarbans ecosystem.
- As a consequence of salinity penetration in the Sundarbans, majority of the moderately saline areas will be transformed into saline areas, while relatively freshwater areas would be reduced to only a small pocket along the lower Baleswar river in the eastern part of the forest.

•Climate change impact on Wildlife

- Deer will be the worst sufferer due to food shortage and habitat loss.
- During high tide deer usually move to high lands in the forests. Otherwise, remain standing in the water until the tidal water recede.
- There will be no dry land left in the forest after sea level rise. Wild boars can better tolerate water. But without food their fate will be the same as deer.
- Monkey is semi arboreal and may continue to survive longer than deer and boar. But when trees will start dying due to inundation their fate will also be the same due to lack of food and shelter.

- Tigers are the world's most endangered species and survive only in a few places including the Sundarbans of Bangladesh in very small number.
- Tiger is a good swimmer and may move from one place to another but the prevailing condition will not be favourable.
- Tigers of the Sundarbans usually move to higher places during high tide, but in a situation of complete and prolonged inundation their existence too become further harder.
- Birds: Resident and migratory terrestrial birds of the Sundarbans and coastal areas will create excess pressure and ecological problems on the existing fauna and flora where they will fly.
- Aquatic birds like herons, gulls, terns, owls, nightjars, wagtails, pratincoles, snipes, sand-pipers, finfoot, culew,

- Hole-nesting birds like woodpeckers, kingfishers, swallows have better chance to survive for more time. They use to feed on the insects from wood and fish from water and flying insects from air, respectively, and all will breed in the tree holes. But changed climate will also affect their food chain.
- Crocodiles become more dominant because of expansion of habitat in the forests for preying on fishes and animals as food. But in absence of these food species the crocodile will not be able to survive.
- Leatherback is the largest sea turtle of the world and is critically endangered.
- The leatherback turtles including other sea turtles lay eggs on the sandy beaches along the coastal zone mainly St. Martin's Island, Sonadia, Kutubdia, Moheshkhali, Cox's Bazar, Inani, Shapari dip of Toknaf and the Sunderbans every year from

•Thousands of sea turtles come to shallow water areas of the Bay for mating and laying eggs on the beaches nearby. They will certainly lose their breeding ground due to inundation by sea level rise. There will be no exit along the coast.



Threatened Species and Threatened Flora

•Threatened Species

- There are 375 species of birds, 55 species of mammals and 83 species of reptiles and amphibians in the Sundarbans.
- Besides, more than 150 species of fish, 50 species of shrimp and other invertebrates also live there.
- It is the largest habitat of the most endangered Royal Bengal tiger, salt water crocodile, the leatherback sea turtle, python, king cobra and spot-ted deer.
- Besides, wild boar, rhesus monkey, dolphins, snake bird/darter, stork, sea eagle, vulture, forest eagle owl, swamp partridge, bustard quail, pigmy woodpecker, brown wing kingfisher, racket tailed rongo, forest wagtail, streaked spider hunter, scarlet minivet, ring lizard, sea snakes, green frog and other species living in the Sundarbans are presently at a threatened stage.

•Threatened Flora

- There are shon grasslands at a number of places like Hiron Point, Kochkhal, Jamtoli of Katka, Rash Mela of Alorkol in Dublar and Kalar chars, which are likely to be threatened due to climate change and sea level rise.
- Mangrove vegetation of the Sundarbans would be seriously affected by sea level rise.
- The pnematophores (roots of mangrove plants) regularly go under water twice daily during high tide for 1-3 hours. In the inter-tidal period trees in mangrove and coastal mud flat areas use to respire by specially growing roots called pneumatophores.
- Each tree has thousands of such pnumatophores growing up about 10 cm to 1m high in the air and spreading 2-5m around

- These air roots are smaller in golpata, hantal, goran, etc. and longer in sundri, gewa, amur, keora, etc.
- If the sea level rises from 0.5 to 1m the pneumatophores will remain under water permanently and trees will die due to problem of respiration and sand deposition.

Wetland-dependent species / population status

Waterbirds—20% extinct or threatened

- **Mammals— 30% decline (dolphins, manatees, porpoises)**
- **Fish (freshwater) – 20% threatened or extinct**
- **Amphibians—30% threatened (not all are aquatic)**
- **Turtles—50% threatened**
- **Crocodiles—45% threatened**

[Source:RAMSAR, Changwon 2008, Document 25]

Impact of climate change on wetlands/Projected Impact o

- Variations in temperature, erratic rainfall patterns, drought, cyclones and storm surges, flooding, salinity intrusion have been affecting existing water sources in Bangladesh.
- Sea level has been rising due to climate change at a rate of about 2.5 mm per year in the Bay of Bengal and is likely to rise of 30 cm and 50 cm in 2030 and 2050 respectively (World Bank, 2000).
- This increased SLR may intensify the impacts of cyclones and storm surges and result in increased salinity intrusion into existing water resources along the coast and larger areas of agriculture land in the future.
- Besides the coastal area of Bangladesh, the wetlands in other areas such as in Sylhet region are likely to be affected by variations in temperature, rainfall, erratic rainfall and other

•As a result, wetlands are likely to be degraded increasingly, which will enhance release of carbon gases. Some consequences of the impact of climate change on wetlands are mentioned below:

- Climate change will affect wetlands and their species e.g. through biological responses to changes in temperature, rainfall, water regimes, salinity.
- Wetlands play important roles in the global as well as regional/local cycling of water, and the storage and cycling of carbon gases – these cycles will be affected by climate change.
- Changes in climate have already begun to affect wetland biodiversity.
- Frequency and impacts of disturbances (storms, droughts etc) are likely to increase.
- Climate change may cause changes in pest/disease outbreaks/vectors

- Increased temperatures in the water bodies of Bangladesh may also impact on fisheries, such as by advancing the sexual maturation process of Hilsa ilisha fish and the timing of their spawning leading to a decline (Ali, 1999).
- In terms of impact on livelihoods and the economy most affected by a rise in surface water temperatures would be Bangladesh's coastal shrimp farming industry, for if the temperature goes above 32°C, the small shrimp fries would have high death rates. Warmer water would also encourage algal bloom which reduces shrimp growth (Ahmed, 2006).

Adapting to Climate Change: The Role of Biodiversity

- During the course of human history, societies have often needed to cope with managing the impacts of adverse weather events and changing climatic conditions.
- Nevertheless, the pace of global change is now so rapid that additional measures will be required to reduce the adverse impacts of projected global climate change in the near and long term.
- Moreover, vulnerability to climate change can be exacerbated by other stresses, including the loss of biodiversity, damage to ecosystem services, and land degradation.
- Adaptation will become an increasingly important part of the development agenda.

- Enhanced protection and management of natural ecosystems and more sustainable management of natural resources and agricultural crops can play a critical role in adaptation strategies.
- Adaptation activities can have positive impacts on biodiversity through:
 - Maintaining and restoring native ecosystems
 - Protecting and enhancing ecosystem services
 - Actively preventing, and controlling, invasive alien species
 - Managing habitats for rare, threatened, and endangered species
 - Developing agroforestry systems in transition zones between ecosystems
 - Monitoring results and changing management regimes accordingly.

Thank you

Session 6

Integrating Climate Change into Forest and Wetland Management

Climate Change and Extinction of Biodiversity

- The impacts of climate change, such as variations in air temperatures, erratic rainfall and increased frequency of extreme climatic events have been affecting forest, wetlands as well as biodiversity directly and indirectly.
- Climate change could act as a major cause of extinctions in the near future.
- Climate change may render a quarter of land animals and plants extinct unless greenhouse gas emissions are drastically reduced (Source??).



- Climate change over the past 30 years has produced numerous shifts in the distribution and abundance of species worldwide (source??).
- It can affect the distributional area of each species independently and has already produced shifts in the distribution of some species, such as amphibians, grasses, migratory birds and butterflies.
- Now-a-days, the vultures, kites, eagles, monkeys and many other birds and animals are not seen in Bangladesh as seen 30-40 years before.
- While over-exploitation, deforestation, habitat change to agriculture, pollution, and invasive species are being considered the most important current drivers of biodiversity loss



- A wide range of mammals, birds, amphibians, reptiles, crustaceans, and above all the Royal Bengal Tiger may face extinction in Bangladesh due to climate change.
- Other species may survive elsewhere only to face new threats, notably if the new area is covered by crops or urban sprawl.

Forest Processes

- Forests provide water, timber and pulp for residential and industrial use, and are an important sink of atmospheric carbon dioxide (CO₂).
- Long-term impacts of changes in air temperature, precipitation, atmospheric CO₂, and ozone (O₃) and their variation could significantly impact these forest processes during the next century.
- Examination of national and regional scale forest process models, combined with **two transient and five static climate change scenarios**, suggested that forests will experience slight to moderate (5 to 30%) increases in forest productivity (Source??).
- Although most of the climate scenarios suggest a generally more productive environment, certain regions may experience significant reductions (>20%) in forest productivity, especially if other stresses such as ozone impacts are included in the analysis.

Major factors controlling biological diversity

- Climate and land use are the two major factors controlling biological diversity.
- Species richness generally increases with increasing air temperature and precipitation.
- Ecosystems are complex, communities and current models only associate biodiversity with existing environmental conditions.
- If climate change occurs faster, the historic relationships between plants, animal and climatic conditions may not be re-established and biological diversity will be threatened and reduced.

Climate Change threats for Ecosystems and Biodiversity in Bangladesh

• *Higher Inundation*

One of the resultant affects of sea level rise is likely to be higher levels of inundations. Such situations will definitely change the species composition.

- The species that do not thrive under higher inundation will die off from the areas that start receiving higher inundations.
- The fauna will be affected by loss of habitat and elimination of many of water holes that are supplying drinking water to the wildlife at present.
- The tiger population in turn is very likely to decline and seriously suffer from short of prey possibly turning to humans as prey (**please use sources.....**).

•Higher Tide Current

- During higher inundation situation, higher volumes of water will flow during the given time period (fixed by lunar timings).
- Thus the tide current will be more than what it is at present. Such situation will adversely affect the softer vegetations, especially the creepers, which in turn may ultimately decline.
- Besides these, movement of soft clayey particles is likely to increase.
- The water turbidity may increase. Such situation will change the soil texture at some locations which in turn will affect the species composition at those specific sites as well.
- More over the enhanced water turbidity will adversely affect the aquatic population and its composition.

•Higher Salinity

- Salinity is a very important factor for mangrove ecosystems.
- With the impact of climate change, the Sundarbans is very likely to experience higher salinity.
- The existing fresh water zone (technically low salinity zone of Northern parts of Sundarbans) is likely to get obliterated.

Addressing climatic hazards

- Mitigation

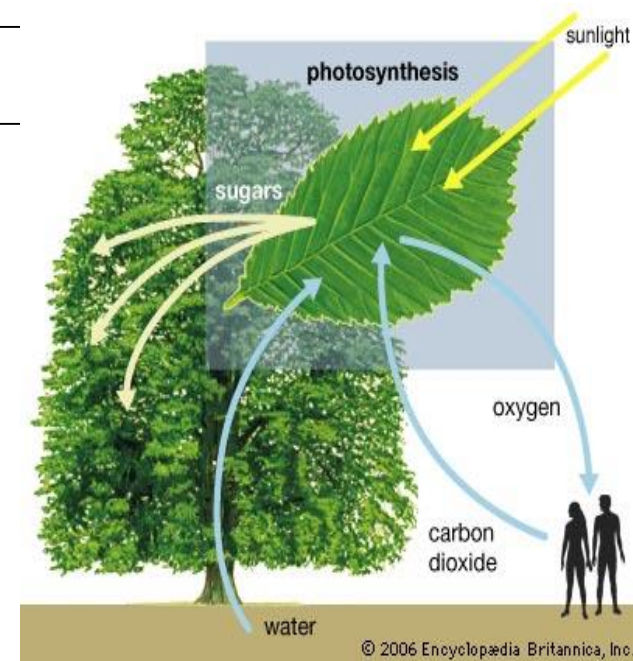
According to the IPCC, a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks in the long term, while producing an annual sustained yield of timber, fiber, or energy from the forest, will generate the largest sustained mitigation benefit.

In its Fourth Assessment Report, the IPCC considers four groups of activities as available options to reduce emissions by sources and to increase removals by sinks in the forest sector:

•Afforestation and Reforestation

The role of forests in carbon sequestration from photosynthesis is well known. Because trees have a much longer lifespan than agricultural crops, they act as long term reservoirs, which lock up the carbon for decades, even centuries, in the form of cellulose and lignin.

Therefore, enhancing carbon sinks and reducing GHG emissions from forests can contribute substantially to mitigating climate change and its effects on ecological and social systems.



- **Afforestation and reforestation are the direct human induced conversion of no forested land to forested land through planting, seeding, human induced promotion of seed sources, and/or natural seed sources.**
- **Afforestation and reforestation activities lead to increases in the carbon pools.**
- **These two activities are currently the only forest management practices that contribute to the mitigation of climate change for which developing countries can be rewarded.**

•Bio Fuel Plantations and Substitution through Wood Products

Substitution of products with high upstream emissions by products with lower upstream emissions is an interesting possibility for mitigating climate change. In the forest sector, it includes mainly three options:

- Substituting wood for high energy consuming materials in the building industry using wood for heating;
- Promoting forest based bio fuels (for example through the planting of *Jatropha curcas* (*Jatropha Curcas* is a non edible oil crop predominately used to produce bio-diesel)).



Jatropha curcas (For biofuel)



**Pongamia pinnata
(Origin:India, For Biofuel)**

•Wind break

- A windbreak or shelterbelt is a plantation technique usually made up of one or more rows of trees or shrubs planted in such a manner as to provide shelter from the wind by breaking its force and to protect soil from erosion.
- They are commonly planted around the edges of fields on farms.
- If designed properly, windbreaks around a home can reduce the cost of heating and cooling and save energy.



Aerial view of field windbreaks

•Reduction of Emissions from Deforestation and Forest Degradation

- Deforestation and forest degradation are the main emission sources in many developing countries and are responsible for up to 20 - 25 percent of the total global anthropogenic emissions.
- In some circumstances, deforestation and forest degradation can be delayed or reduced through strict protection of forests, through sustainable forest management practices, and through forest uses not involving tree removal, such as tourism and harvesting of non-timber forest products.
- Protecting forest from all harvests typically results in maintained or increased forest carbon stocks, but it also reduces the wood and land supply needed to meet other societal needs.

Improvement of Forest Management

Forest management activities include silvicultural interventions (Silviculture is the practice of controlling the establishment, growth, composition, health, and quality of forests to meet diverse needs and values) **that promote a greater proportion of the desired species, tree population, and size structure, which, in terms of timber, means promoting the maximum volume of usable growing stock and, therefore, of carbon that may not be released to the atmosphere.**

Such activities also include harvest systems that maintain partial forest cover, minimize losses of dead organic matter or soil carbon by reducing soil erosion, and avoid slash burning and other high emission activities.

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•Forest Restoration

- Restoration is the most promising option in forestry for restoring carbon stocks.
- Restoration is a combination of the planting of trees and human induced natural regeneration within a degraded forest area that has lost most of its carbon stock.
- Forest restoration aims to enhance and accelerate natural processes of forest regeneration, including carbon stocks, to regain the desired species composition and growing capacity of the forest ecosystem.
- In terms of mitigating climate change, forest restoration becomes complementary to reducing emissions from reducing forest degradation.

- **Management of protected areas and wildlife**

- Protected areas are among the most important tools for forest and wildlife conservation.

- Accordingly, improved management, and possibly expansion, of protected areas is considered one of the REDD+ mitigation options.

- Wise management of wildlife and protected areas is critical for successful conservation and sustainable use of wild animals in the prospects of a changing climate.

- **Priority activities include:**

- ✓ Developing adaptation strategies, policies and legislation;
- ✓ Setting up long-term monitoring and reporting schemes for indicator plant and animal species;
- ✓ Transboundary cooperation;
- ✓ Involvement of local communities etc

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Wetland Management

It has been recognized that climate change may substantially affect the ecological character of wetlands and their sustainable use. Following steps are important for the management of wetlands:

- River management systems, such as levees and flow diversions, have reduced river - pulsed floods and the delivery of sediment to delta wetlands, decreasing their ability to form soil and raise elevation.**
- Dredging of river beds combats increased sedimentation, thereby improving navigability.**
- High bank of pond and or using nets around the pond.**
- Increasing vegetative coverage along river banks protects against erosion resulting from increased flow and flooding.**

- **Protection and regeneration of the swamp forest in the haor ecosystem.**
- **Establishment of fish sanctuary, priority will be given to the fish breeding grounds and harvesting on the breeding season, usually it is early monsoon in haor and mid monsoon in beel basin.**
- **Protection of reed lands and swamp forest.**
- **Legislation to prevent eutrophication: established standards for agricultural, industrial, and household water sources.**
- **Ordinance for the conservation of Reed vegetation zones: reeds play an important role in purifying water as well as providing**

Thank You

Session-7

Policy and Institutional Arrangement for:

- a. Natural Resources Management: Policy, Strategy and Plans, and Institutions (**NRM Policy and Institutions missing!!**)
- b. Climate Change: Policy, Strategy and Institutions

1. Climate change elements :Sensitivity and vulnerability

- In Bangladesh, the temperature is predicted to increase by 0.7°C in monsoon and 1.3°C increases in winter (World Bank, 2000).
- The recent analysis indicates that the temperature is generally increasing in the pre-monsoon(March-May), monsoon (June-September), post-monsoon (October-November) and winter (December-February) seasons in Bangladesh. The rates of increase are $+0.010^{\circ}\text{C}/\text{year}$ (starting from 1981), $+0.010^{\circ}\text{C}/\text{year}$, $+0.005^{\circ}\text{C}/\text{year}$ and $+0.009^{\circ}\text{C}/\text{year}$ respectively (BCAS, 2014).
- Increased temperature is a major concern as expressed in different community consultation in the recent past in the coastal zone.

- The country-averaged total rainfall in Bangladesh has been increasing at rate of +4.762 mm/year and the seasonal rainfall has been also increasing in all seasons with a maximum rate of increase +19.838 (BCAS, 2014).
- There is erratic behavior in rainfall being observed in different locations of the country. For example, an analysis shows an increasing trend of annual rainfall in Satkhira during 1950-2006 while it was a decreasing trend for the period of 1950-1980 (Rimi et al., 2011).
- In addition, rainfall in monsoon and post monsoon was found to be on the increasing trend while it was on decreasing trend in pre-monsoon and winter at Satkhira.

- Almost all parts of the country face erratic behavior of rainfall that includes early rainfall, late rainfall, and excessive rainfall in short period of time.
- The geographical shape of the country coast possibly makes it more vulnerable to recurrent cyclones and storm surges.
- The coast of the country was affected by at least two super cyclone (greater than 220 km/hour) and 19 very severe cyclones (119-220 km/hour) in last 40 years.
- is now evident that both the frequency and intensity of cyclonic events along the Bay of Bengal is on increasing trend over the years.

- The salt water is intruding to fresh water and increasing the level of salinity in many coastal districts (southern part of the country) including Patuakhali, Pirojpur, Satkhira, Bhola, Khulna, Feni and Noakhali (Islam, 2004).
- These are affecting agricultural production and supply of clean water to domestic, industrial, agricultural and also business purposes.
- Saline water intrusion remains one of the major physical effects of climate change for the coast of the country in future.
- Cyclone Sidr affected at least 6000 ponds with saline water in the coastal zone in 2007 (Rabbani et al., 2010).

- The north-western districts of the country usually face drought almost every year during the pre-monsoon season (March-May).
- Some of the coastal districts also suffer from drought problems.
- The severity of drought may increase in future under changing of climate system.
- The flood and water logging due to excessive rainfall often affect the communities and ecosystems. The recent floods in 1998, 2004 and 2007 affected most of the districts.

- In future, the increased snow melt from the Himalayan permafrost, due to increase in temperature may force more water to flow through the Ganges, Meghna, Brahmaputra river systems and their river networks resulting additional flooding extending over the central flood plain of Bangladesh (**Rahman et al., 2007**).
- On the Sea Level Rise (SLR), the World Bank report states that the country would face 30 cm and 50 cm SLR in 2030 and 2050 respectively (**World Bank, 2000**).
- A recent report shows that there is a trend of increasing sea level rise at Hiron Point near Sundarban by 5.3 mm/year during 1977 to 2002 (**CEGIS, 2006**).

International convention to combat climate change and natural resource management problems

There are various conventions to fight climate change and environmental development problems in the world. These include:

- ✓ **The Rio Declaration on Environment and Development**
- ✓ **United Nations Framework Convention on Climate Change**
- ✓ **Montreal Protocol**
- ✓ **The Convention on Biological Diversity**
- ✓ **The Biosafety Protocol**
- ✓ **The International Treaty on Plant Genetic Resources for Food and Agriculture**
- ✓ **The Convention on International Trade of Endangered Species of Wild Fauna and Flora**
- ✓ **The Basel Convention on control of Transboundary movements of Hazardous Waste**

Policy and Institutional Arrangement: Addressing Vulnerability of Climate Change

•National Level

- The Government of Bangladesh through Ministry of Environment and Forests (MOEF) has taken a number of policy and institutional decisions to address climate change and climate variability issues in Bangladesh
- The following sections provide brief description and synthesis of policy and institutional aspects at the national level in relation to climate change.

•Policy and Institutions

- The MOEF has taken the lead on discussing, planning and developing policy and programmes on climate change issues in the government system.
- The MoEF has made substantial progress in developing some policy and institutional instruments to reduce impacts of climate change.
- These mainly include development of
 - National Adaptation Programmes of Action (NAPA),
 - Bangladesh Climate Change Strategy and Action Plan (BCCSAP), establishing Climate Change Trust (CCT) under the MoEF, Climate Trust Fund.

- The CCT is currently supporting adaptation actions under Climate Trust Fund (CTF) which is being guided by a Trusty Board and a Technical Committee.
- The government has also initiated another window namely Bangladesh Climate Resilience Fund (BCRF) for supporting actions to address climate change.
- A number of high level committees were also formed to have close look at the planning and implementation process of the adaptation actions in the country.
- The committees include Inter ministerial Committee on climate change headed by the state minister, MoEF;
- All Party Parliamentary Committee on Environment and Climate Change headed by a senior member of the Parliament.

Climate Change Trust (CCT)

- The government officially launched the “Climate Change Trust” under the Ministry of Environment and Forests (MoEF).
- The main responsibilities of CCT will be to manage the climate related funds of the government.
- The unit will be equipped with senior officers and general staff. Some national level experts will also be recruited as advisors to strengthen the unit and make it better functional.

Bangladesh Climate Change Strategy and Action Plan (BCCSAP)

- **Bangladesh Climate Change Strategy and Action Plan (BCCSAP) is the latest policy documents of the government to address both adaptation and mitigation for the current decade (until 2018).**
- **It was developed in 2009 which suggests 10 years action measures to face challenges and changing condition.**
- **It recognizes all the climate induced hazards including flood, drought, SLR, salinity intrusion, cyclone and storm surge variations in temperature and rainfall etc and their associated impacts on different sectors.**

• **BCCSAP identified a set of activities/measures under six major themes:**

- i. Food security, social protection and health**
- ii. Comprehensive Disaster Management**
- iii. Infrastructure**
- iv. Research and knowledge management**
- v. mitigation and low carbon development and**
- vi. Capacity building and institutional strengthening**

Climate Change Fund

The Government of Bangladesh has allocated specific budget to address climate change impacts in the country.

In 2009-2010 FY, the total allocation was 100 million USD under CTF to take adaptation and mitigation actions on the ground.

It is to be noted that another 100 million USD was added with initial allocation in 2010-2011 FY, and more recently the government allocated 100 Million USD more for 2011-2012 FY to implement BCCSAP.

In addition, the country recently established Bangladesh Climate Change Resilience Fund (BCCRF) with contribution from development partners/donor countries to implement the projects and programmes.

- It is reported that 66 percent of the fund will be spent to implement activities under BCCSAP while 34 percent will be deposited in the bank to face crisis.
- A policy titled “Climate Change Trust Fund Policy” has been developed by the Cabinet as part of an integrated plan to face disaster due to climate change in the country.
- In addition, **Climate Change Trust Fund Act, 2010** has been approved recently by the Cabinet to utilize the climate change fund judiciously and transparently to ensure that the affected communities are benefited properly.

•Regional level

- South Asian ministers adopted the Dhaka Declaration on climate change 3rd July 2008, under the auspices of the South Asian Association for Regional Cooperation (SAARC).
- They declared that they would work together to build regional capacity to reduce the impacts of climate change and consult each other before international negotiations.

(Source:The Daily Star, July 4, 2008).

The declaration concluded with an action plan which includes Capacity building for Clean Development Mechanism (CDM) projects, exchange of information on disaster preparedness and extreme events, exchange of meteorological data, monitoring climate change impacts including sea level rise (SLR), glacial melting and threats to biodiversity, mutual consultation in international negotiation process, media briefing as and when required.

The Sixteenth Meeting of the Heads of State or Government of the Member States of SAARC also adopted “Thimphu Statement on Climate Change (TSCC)” in Thimphu, Bhutan, during 28-29 April 2010. The TSCC identified 16 activities to be implemented at the regional level to address climate change. Some of the key activities include:

- Establishing an Inter-governmental Expert Group on Climate Change to develop clear policy direction and guidance for regional cooperation as envisaged in the SAARC Plan of Action on Climate Change;**
- Initiating a study for presentation to the Seventeenth SAARC Summit on ‘Climate Risks in the Region: ways to comprehensively address the related social, economic and environmental challenges’ ;**

- **Undertaking advocacy and awareness programs on climate change, among others, to promote the use of green technology and best practices to promote low-carbon sustainable and inclusive development of the region;**
- **Commissioning a study to explore the feasibility of establishing a SAARC mechanism which would provide capital for projects that promote low-carbon technology and renewable energy; and a Low-carbon Research and Development Institute in South Asian University;**

- **Incorporating science-based materials in educational curricula to promote better understanding of the science and adverse effects of climate change;**
- **Planting ten million trees over the next five years (2010-2015) as part of a regional afforestation and reforestation campaign, in accordance with national priorities and programmes of Member States;**

•International Level (brief)

- The government has formed a Committee for Climate Change Negotiation under UNFCCC.
- The committee is co-chaired by the Secretary, MOEF and senior expert on climate change from the civil society organizations.
- Members of the committee include representatives from the government relevant organizations and civil society experts and scientists.
- Currently, the government is putting its utmost efforts to raise the voice of the affected communities of the country at both regional and global level climate discussions.

Thank you

Session 8

Co-management and NRM (Forest and Wetlands): Lesson Learnt of Bangladesh

1. Co-management in Protected Areas

Background

- Only thousand years ago, eighty percent of the Indian Subcontinent was estimated to possess dense forest cover.
- Historians believe that much of the area comprising present-day Bangladesh and the Indian State of West Bengal was in wilderness till about 1000 BC (Sources??).
- The mangrove forest covered the southern part, bordering the Bay of Bengal; the hills of the Arakan Range, spreading from Sylhet in the north to Chittagong and Cox's Bazaar in the south, were covered by dense mixed evergreen forest, and the central part, the Modhupur Tract and the northern parts covering the district of Dinajpur, were enveloped by thick deciduous sal forest.

- The forests were rich in bio-diversity, having various types of birds and animals.
- The famous Royal Bengal Tigers of the Sundarbans were the most exotic and notable among others.
- Human settlements started only after 1000 BC by Dravidian speaking people who were later known as Bang.
- People lived in small village settlements, collectively helping each other in their efforts towards exploiting nature for their survival and livelihood.
- The landscape was crisscrossed by the mighty rivers, the Ganges the Meghna and the Brahmaputra and their numerous tributaries, endowing the country with thriving wetland resources.
- Rich alluvial soil and good weather provided ideal condition for agriculture; water bodies supplied fish in abundance.

•Link between Deforestation and Poverty

- **Forests provide fuel, material for building and fencing, fruits, fodder and shade. Poor people collect biomass and take fuel wood but the rich extract valuable timbers.**
- **Tress stop soil erosion, helps in water conservation and trigger precipitation.**
- **In fact, the visible problems of land degradation, silting of river beds and less availability of fish, shrinking of grazing land for cattle, lowering of ground water table and manifestation of desertification syndrome are all due to unplanned over extraction of forest resources that offset the symbiotic biophysical relationship and contribute to accentuation of poverty that falls disproportionately on the poor.**
- **In Bangladesh, many forest covers have disappeared, the existing ones have become badly denuded, in many cases beyond redemption.**

•Depleting Forest

- Although statistics on Bangladesh forestry vary considerably from one source to another, rapid decline in forest cover is clearly visible.
- According to the Forestry Sector Master Plan (FSMP), the total land area covered by forest is 2.56 million hectares, which accounts for 17.8% of the total land area of Bangladesh.
- The Bangladesh Bureau of Statistics notes that the total forestland is about 2.25 m ha, which is 14% of the total land area.
- Whatever might be the spatial coverage of the forest, the striking reality is that much of country's forest land is devoid of trees, and the actual tree cover is alarmingly less; disappearing rapidly.

- The FSMP has estimated that the total ‘area under forest vegetation’ is as **low as 0.84 m ha or 5.8% of the total land area.**
- The World Bank has also estimated the forest vegetation to be only 7,70,000 ha or **6% of the forestland having tree cover of at least 20 per cent.**
- Apart from the designated government forest land of 1.49 m ha under the there is about 0.72 m ha of land designated as “un-classed state forests (USF)” under the control of the Ministry of Land, 0.27 m ha of home gardens and village forest groves scattered all over the country and 0.27 m ha of tea estate and rubber gardens.
- The public forest land, un-classed state forest, home gardens, tea estate and rubber plantations together **make up about 17% (2.46 m ha)** of the potential tree cover of the country.

This limited forest cover is depleting fast due to illegal felling.

In order to prevent the country from experiencing environmental apocalypse due to further denudation of forest cover, the government, under the Bangladesh Wild Life (Preservation) Order of 1973, has established 16 protected areas covering an area of 2,41,675 hectares where any extraction of forest products is declared as illegal and punishable offence.

Sl. No.	NATIONAL PARKS	FOREST TYPE	AREA (HA)	ESTABLISHMENT YEAR
1	Bhawal National Park	Sal forest	5022	1974/1982
2	Modhupur National Park	Sal Forest	8436	1962/1982
3	Ramsagar National Park	Sal Forest	27.75	2001
4	Himchari National Park	Hill Forest	1729	1980
5	Lawachara National Park	Hill Forest	1250	1996
6	Kapatai National Park	Hill Forest	5464	1999
7	Nijhum Deep National Park	Coastal Mangrove	16352.23	2001
8	Medha Kachapia National Park	Hill Forest	195.92	2004
9	Satchari (Proposed) National Park	Hill Forest	240	
	WILD LIFE SANTUARIES			
10	Rema-Kalenga Wild Life Sanctuary	Hill Forest	1795.54	1996
11	Char Kukri-Mukri Wild Life Sanctuary	Coastal Mangrove	40	1981
12	Sundarban East Wild Life Sanctuary	Natural Mangrove	31226.94	1960/1996
13	Sundarban West Wild Life Sanctuary	Natural Mangrove	71502.13	1996
14	Sundarban South Wild Life Sanctuary	Natural Mangrove	36970.45	1996
15	Pabla Khali Wild Life Sanctuary	Hill Forest	42087	1962/83
16	Chunuti Wild Life Sanctuary	Hill Forest	7761	1986
	GAME RESERVE			
17	Tekhnaf Game Reserve	Hill Forest	11615	1983
	ECO-PARK			
18	Bashkhali Eco-Park		n/a	2003
19	Madhupkunda Eco-Park		125	2001
20	Sitakundu Eco-Park & Botanical Garden		1000	2000
21	Dulhazara Safari Park		600	1999
22	Mirpur Botanical Garden		84	1961

People's Participation in Forest Management: Some Initiatives of the Forest Department

i. The First Initiative

- Involvement of community people in forestry was initiated first in 1979 on government owned denuded hilly forest land at a place called Betagi under Rangunia Upazila in Chittagong district.
- The programme, following the Sawnirvar principles, involved 101 families, each receiving about 4 acres of land.
- The families planted mainly fruits and timber trees; the Krishi Bank provided credit and Grmeen Bank workers supervised the credit.
- The Betagi project achieved notable success and was extended to Pamora mouza which was a part of the protected forest but in denuded condition. **Betagi was, perhaps, the first experiment in community involvement in forest management in Bangladesh.**

ii. Community Forestry Project--1981-1988

- Another attempt to introduce participatory approach to forest management was made through the Community Forestry Project.
- The project was targeted to the rural poor and concentrated on developing awareness among community people about **the benefit of tree plantation and motivating them to plant fuel wood, fruit and timber trees collectively along road strips and undertake agro-forestry.**
- The programme also concentrated on developing a permanent institutional capacity within the FD to undertake social forestry throughout the country.

The physical targets, such as establishment of strip plantations, fuel wood plantations, agro-forestry, training, institutional support, were mostly achieved.

- However, limited headway was made in achieving the social goals.
- Farmers were generally indifferent to the timber species promoted by FD; they were also suspicious of government's benefit-sharing plan since no written, formal assurance was given on the share of the harvest once the trees had matured.
- Furthermore, fuel wood grown under the project was not used by farmers for domestic consumption, but catered for industrial uses.
- The project, however, provided employment to several thousand laborers in nurseries and plantations and contributed to an increase in the biomass production.

(iii) Upazila Afforestation and Nursery Development Project: 1989-1996

- The project was undertaken in 61 out of 64 districts.
- The level of participation of the participants in the programme varied significantly.
- Generally, farmers actively participated in protecting trees in their agro-forestry plots. In the woodlots, the intensity of participants' involvement in protection varied with the degree of fuel scarcity and the value they attached to the provision of tree by-products (e.g. leaves and twigs).
- The worst performance was noted in the case strip plantations. The main burden of protecting trees in the strip plantations fell on the poorer participants who had no resources and whose abiding concern was to work and earn their daily subsistence..

- Furthermore, they did not have the strength or courage to prevent local elites' use of the strip plantations for livestock pasturage.
- Land tenurial insecurity negatively impacted on participants' morale. The government's commitment of reviewing and reconsidering the one-year land use permit was not translated into action.
- The attempts at organizing the participants into community organizations, coined as the 'forestry associations', were only partially successful.

(vi) Coastal Greenbelt Project: 1995-2002

- This was another project implemented in coastal areas through community involvement.
- The objective of the project was to protect and improve the coastal environment by increasing tree cover and reducing poverty by creating supplementary income opportunities for the poor.
- Some 8934 km of strip plantations and 665 ha of foreshore plantations were established, and about 143936 participants and more than 100 NGOs were engaged.
- 12.56 m seedlings were distributed free of cost for planting in homesteads and institutions.
- Participants received direct benefits from intercropping vegetables, and extracting fuel wood, fodder and fruits. Some 100,000 participants received payment for planting activities in the year 2000.
- The project helped in generating employment for more than 3.5 m man/days. Initially few women were involved in the project activities; however, female participation increased in the last two years.

(vi) The Forestry Sector Project: 1998-2004

- The project was approved in 1997 and was initiated in 1998 with funding from ADB.
- The primary objectives were to: increase production of wood; institutionalize forest resource management through local community participation, strengthen FD's management capacity and promote policy reform.
- The primary objective was to involve the community in afforestation activities under a benefit sharing arrangements where by the participants get the total share of the pruned products after three years and a certain mutually agreed proportion of benefit at harvest end, which may be after 10-12 years.
- The Project achieved insufficient progress on meeting plantation targets. The component of Participatory Natural Forest Rehabilitation and Management through local community also lagged behind the targets due to delay in government's approval of the project. The strip and institutional plantations showed good progress.

- Initially, the participants were reluctant to take active part because of their skepticism about getting a share of the product at maturity.
- However, after getting benefits from the first rotation felling, participants gained confidence in FD and have become more eager to participate in the Project through Participatory Benefit Sharing Agreement (PBSA).
- So far under participatory approach about 35000 families, mostly poor have been integrated in the plantations as beneficiaries or participants.

(v) Sundarban Biodiversity Conservation Project: 1999-2006

- The project was a rudimentary attempt towards collaborative management of natural resources involving the community.
- The project aimed at development of a sustainable management and biodiversity conservation for the Sundarban Reserve Forest (SRF) resources, and reduction of poverty of 3.5 m people living in the impact zone.
- The basic objective aimed at following a participatory and flexible approach for social progress in the impact zone, which included:
 - (i) assessment of baseline data on socioeconomic condition of target population in the impact zone;
 - (ii) Mobilization and development of organizations of resource users,

(iii) provision of alternative resource options to organized resource user groups in the form of micro-credit to promote employment and enterprise development to reduce their dependence on the Sundarbans for their livelihoods, and

(iv) development of social infrastructure. The organizational and institutional structures, such as the Sundarban Management Unit (SMU), Sundarban Stewardship Commission and Stakeholder Advisory Council, were put in place, although the SMU remained understaffed. Plans for enrichment planting and sample plots were prepared and reviewed.

2. Co-management and its Initiatives

- Natural forests in Bangladesh have been severely degraded due to over exploitation, changes in land use, encroachment on forestlands, fire, uncontrolled and wasteful commercial logging, illegal felling, grazing, and the collection of fuel wood to support the energy needs of a large population.
- The total forest area affected by encroachment in Bangladesh is estimated to be about 36,000 hectares (Haque 2007).
- It is estimated that approximately 1,000,000 people in Bangladesh live and farm on encroached land (Haque 2007).
- As a result of these various factors the Sal forests of central and northern Bangladesh have been seriously depleted.

- Conventional forest management without the participation of local people has not succeeded in curbing deforestation and forest encroachment.
- To save Bangladesh's forests and their associated biodiversity, it is imperative that the dependence of local people on forests should be reduced and to bring them into the mainstream of management.

Co-management and its initiatives

Co-management or collaborative management is defined as a "situation in which two or more social actors negotiate, define and guarantee amongst themselves a fair sharing of the management functions, entitlements and responsibilities for a given territory, area or set of natural resources" (Borrini-Feyerabend *et al.* 2000).

The Bangladesh government adopted its first co-management program for natural resources, the Management of Aquatic Ecosystems through Community Husbandry (MACH) project, to restore the productivity of three major wetlands between 1998 and 2007.

- **In 2003, the FD launched the Nishorgo Support Project (NSP) with assistance from the United States Agency for International Development (USAID) to test a participatory co-management approach to PA management.**
- **The NSP broadly covered five PAs in Bangladesh (Lawachara National Park, Rema-Kalenga Wildlife Sanctaury, Satchuri National Park, Chunoti Wildlife Sanctaury and Teknaf Game Reserve) and lasted until 2007.**

- **NSP officials worked closely with the FD personnel and key conservation stakeholders to develop and implement a co-management strategy to help conserve the country's PAs.**
- **The focus of the NSP was on building equitable partnerships between the FD and key local, regional, and national stakeholders to assist in the conservation of Bangladesh's PAs (GOB 2007).**
- **In 2008, the FD and USAID started the Integrated Protected Area Co-management (IPAC) project in 17 PAs and one eco-park in Bangladesh with the aim of improving local people's livelihoods through greater access to and control over local forest resources.**
- **IPAC project officials work with personnel in the FD, the Department of Fisheries (DoF), and the Department of Environment (DoE) to:**

- 1) provide support to sustain success in biodiversity conservation and alternative income generating (AIG) activities at NSP and MACH pilot sites;**
- 2) expand and support development of an integrated strategy and coherent national program to support co-management and environmental governance; and**
- 3) mitigate and adapt to climate change (Sharma *et al.* 2006).**

5. Structures and Functions of the Co-management Committees

A two-tier institutional structure for sustainable forest management in protected areas based on the principles of co-management has been proposed here:

- **Protected Area Conservation Council:**

It is the first tier of the structure, and would take area specific name such as, Lawachara National Park Conservation Council, Satchuri National Park Conservation Council, Tekhnaf Game Reserve Conservation Council, etc.

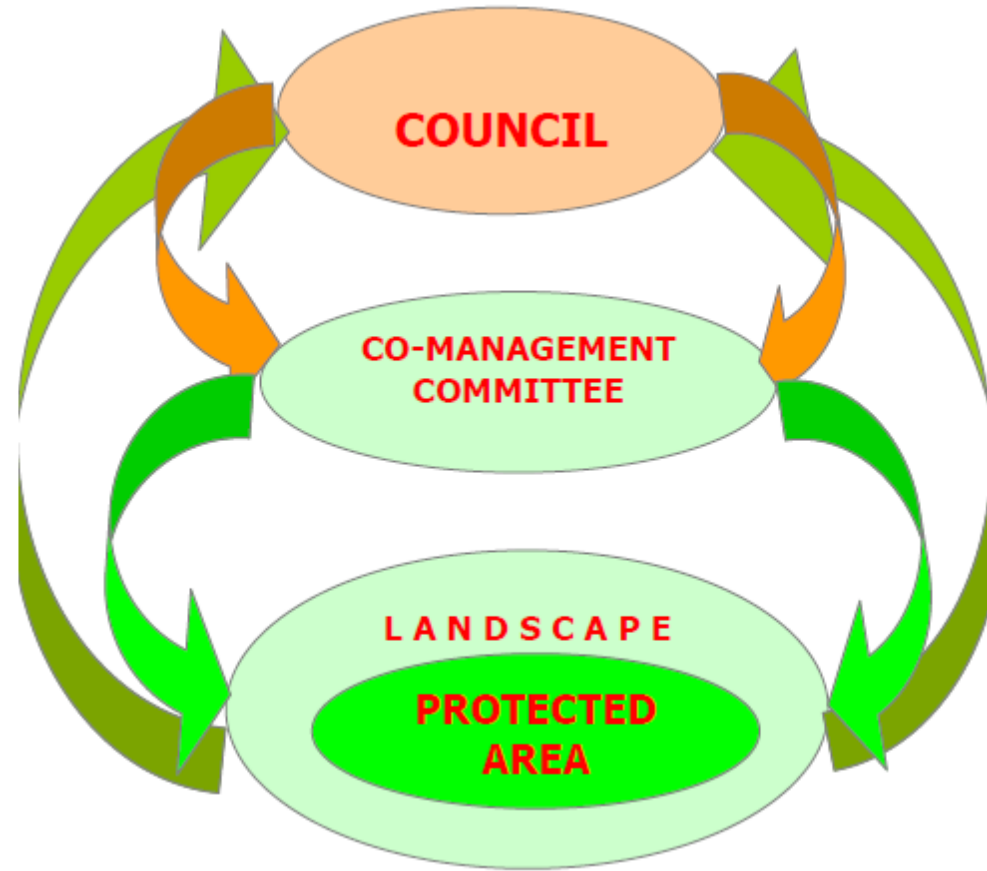
Spurce: CO-MANAGEMENT OF PROTECTED AREAS IN BANGLADESH: A STRATEGY FOR ESTABLISHING AN INSTITUTIONAL FRAMEWORK

Prepared for: International Resources Group (IRG), Prepared by: Dr. Khawja Shamsul Huda, With partners: CODEC, NACOM & RDRS, Task no.: USAID Contract no.: 388-C-00-03-00050-00

- **Protected Area Conservation Co-Management Council and Committee:**
- This is the second tier of the structure and would also take area specific name such as,
 - Lawachara National Park Co-Management Committee,
 - Tekhnaf Game Reserve Co-Management Committee,
 - Satchuri National Park Co-Management Committee, etc.
- The Council and the Committees will be formed within a defined landscape.
- For all practical purposes and based on objective realities the landscape, for the Northern Sites, has been delineated as an area covering one kilometer around the protected areas and for the southern sites the delineated area is two kilometers.

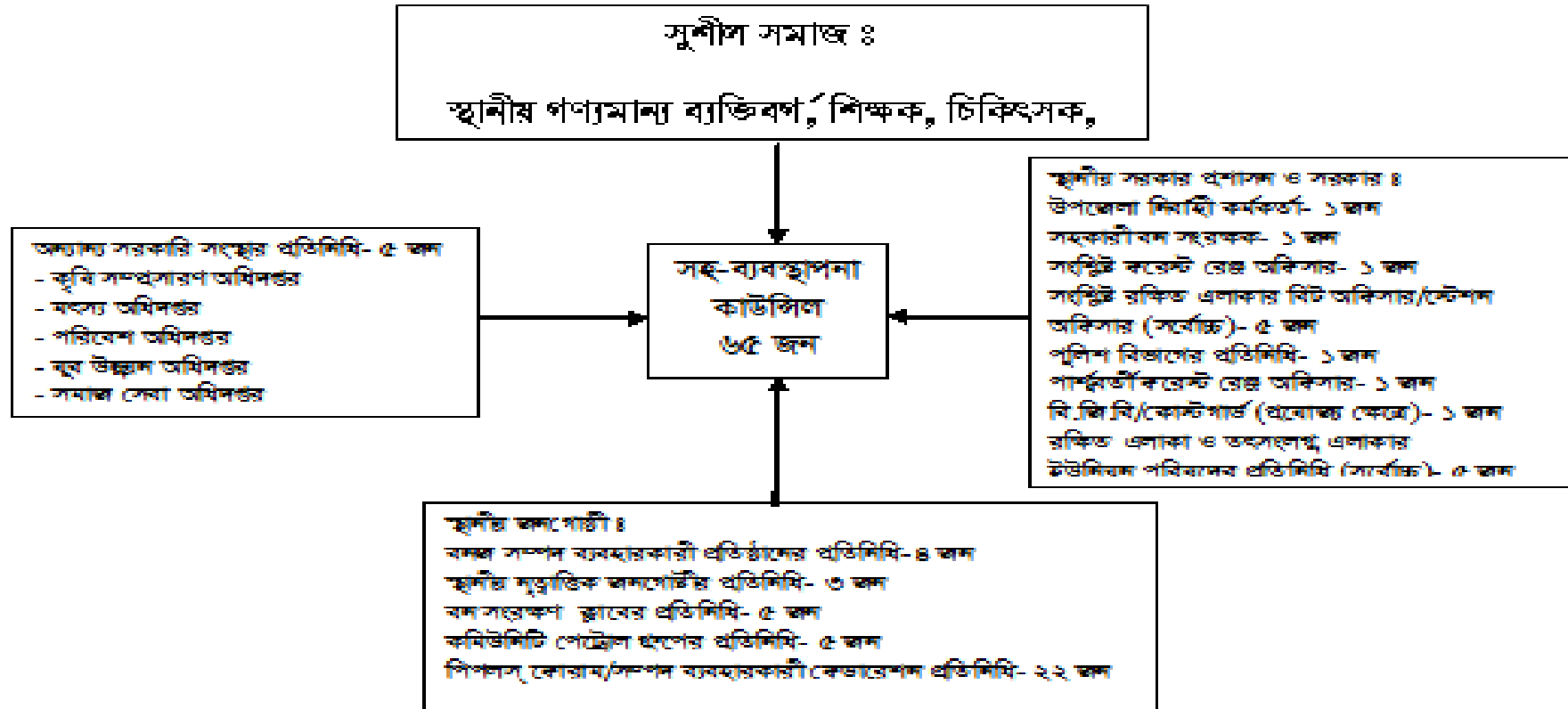
- If the spatial coverage of the landscape is large, it will be divided into smaller segments, if possible, aligning with the Union Parisad (UP) boundaries.
- It is expected that such lining up with the UP boundaries will help in avoiding conflicts of authority and consequent indifference and lack of cooperation that could emerge if UP representatives from two different Union Parisads were together in the same committee.

Link between Protected Area Conservation Council and Protected area Conservation Co-management Committee:



**As per Gazette of the MoEF No. নং-পৰম/পৰিণা-
8/নিগৰ্গ/১০৫/সিট/২০০৬/৩৯৮, তারিখঃ ২৩/১১/২০০৯খ্রিঃ,
Government of the People's Republic of Bangladesh,
the Structures of the Co-management Council and
Co-management Committee are given below:**

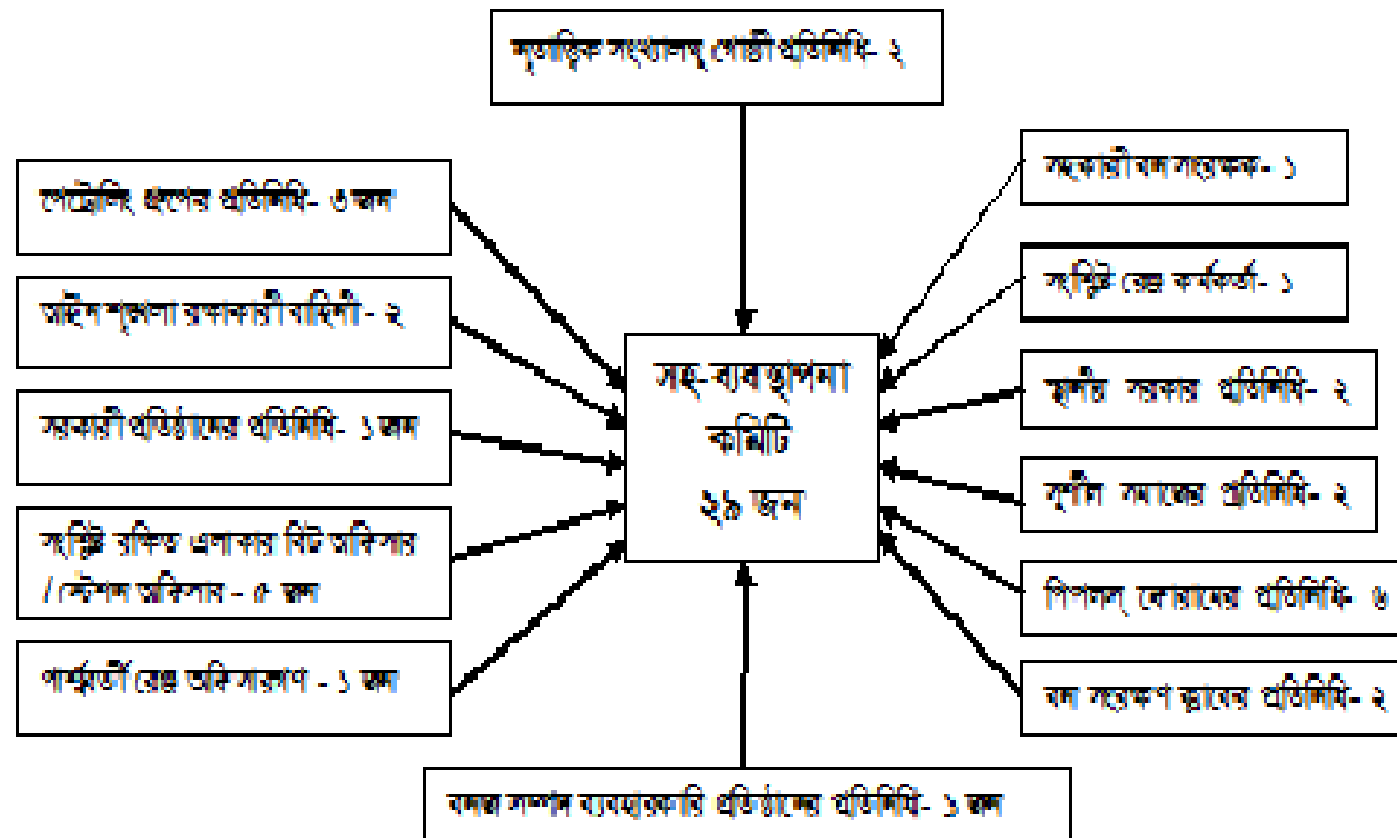
১. সহ-ব্যবস্থাপনা কাউন্সিল (Co-management Council)



২. সহ-ব্যবস্থাপনা কাউন্সিলের (Co-management Council) কার্যপরিধি :

- ক. স্থানীয় সরকার ও প্রশাসন এবং সুশীল সমাজের নেতৃবৃন্দকে রক্ষিত এলাকা সহ-ব্যবস্থাপনা কার্যক্রমে অংশগ্রহণ এবং কার্যক্রম তত্ত্বাবধানে সম্পৃক্তকরণ নিশ্চিত করা;
- খ. রক্ষিত এলাকা ব্যবস্থাপনায় বার্ষিক কর্ম-পরিকল্পনা পর্যালোচনা ও অনুমোদন করা;
- গ. রক্ষিত ও তার আশপাশের এলাকার জন্য গৃহীত কার্যক্রম মনিটরিং ও মূল্যায়ন করা;
- ঘ. সহ-ব্যবস্থাপনা কমিটিকে প্রয়োজনীয় সহযোগিতা ও দিক নির্দেশনা প্রদান করা;
- ঙ. রক্ষিত এলাকা হতে উৎপাদিত এবং প্রাপ্ত পণ্য ও সেবা সংশ্লিষ্ট এলাকা ব্যবস্থাপনায় জড়িত অংশীদারদের মধ্যে বিতরণের জন্য নীতিনির্ধারণ ও পরামর্শ প্রদান করা;
- চ. সহ-ব্যবস্থাপনা কমিটির সদস্যদের মধ্যে কিংবা ব্যবস্থাপনা কার্যক্রম বাস্তবায়নে কোন দ্বন্দ্ব বা বিবাদ দেখা দিলে তা নিরসনে কার্যকরী ভূমিকা পালন করা;
- ছ. সহ-ব্যবস্থাপনা কার্যক্রমের মাধ্যমে প্রাপ্ত আয় ও ব্যয়ের হিসাব নিরীক্ষা নিশ্চিত করা;
- জ. বার্ষিক সাধারণ সভাসহ কাউন্সিলের সভা অনুষ্ঠান করা ।

৩.০ সহ-ব্যবস্থাপনা কমিটি (Co-management Committee):



6. Wetlands Management Plans

- i. Involvement of local villagers in commercial fisheries;
- ii. Providing access of local villagers to non-commercial fishing resources such as monsoonal subsistence fishing, livestock grazing, duck keeping, grass and reed collecting;
- iii. Establishing regulations to limit excessive use of these natural resources (based on consensus within the community, rather than on imposition of levies or threats);
- iv. Community development projects, to improve health and alleviate rural poverty;
- v. Restoration of the natural environment (e.g. replanting of swamp forest and reed beds, and re-stocking of fish); and
- vi. Clear-cut roles for monitoring and implementation.

- The Management Plan aims to involve local people in the commercial fisheries, and have them regain their rightful access to other *haor* resources, by means of reaching a trade-off agreement with both the local community and the leaseholder.
- The leaseholder will be bound by a new lease agreement to involve local people in the fishery enterprise (target percentages and dates fixed) and immediately cease with the illegal withholding of access rights.
- In return, the leaseholder is to receive a consolidated lease agreement for the all waters in the hoar, and receive a longer lease-term.

•Implementation of Wetland Plan

Apart from the Local Community and the Fisheries Leaseholder, the following stakeholders are recognized as being principle actors in the implementation of the Management Plan :

- Ministry of Environment and Forest (MOEF), which is to be responsible for overall implementation of the Management Plan taking initiatives to ensure implementation by involving other ministries, and selecting suitable NGOs for assisting implementation.
- DCOs Office/Ministry of Land (MoL), which is responsible for the issuing of the *Jalmohal(waterbody)* lease.
- Department of Fisheries (DoF), which is responsible for fisheries management.

- **Forestry Department (FD)**, which is responsible for forest and wildlife management.
- **National Environment NGO**, which is to be involved for developing resource use guidelines, monitoring of wildlife, training of FD field staff, and awareness campaigns.
- **National Development NGO**, which is to be responsible for monitoring of socio-economic activities, developing resource use guidelines, and the poverty-alleviation programme (Development Programme).
- **International Environmental NGO**, which is to perform external monitoring and evaluation.
- ***Tanguar Haor* Monitoring Team (THMT)**, a new body which is to be chaired by the District Commissioner, Sunamganj, and include representatives from DoF, FD, MoL, and the two national NGOs

- The expected impacts of the plan, once implemented, include
 - i) sustainable management of the haor ecosystem and its natural resources to ensure equitable distribution of benefits leading also to the resources being enjoyed by future generations
 - ii) community involvement at various stages of implementation (as it was in the case of development and adoption) in ensuring protection of their interests and the best possible care of natural resources
 - iii) the plan to serve as a model for replication in similar situations.

The Lessons Learned from Bangladesh

The co-management approach to be applied at will capitalize upon lessons learned to date from co-management at the NSP sites. To this end, each of the principal Objectives of NSP are reviewed below and major lessons learned or emerging issues are identified.

As the project has evolved, it has become clear that the management implementing mechanism should be considered another – seventh – objective to the Project.

A number of important lessons have been learned about the best ways to deliver technical and financial support for co-management, and these lessons learned should be taken into account for any future adaption of the approach.

Objective as per Original Nishorgo DPP	Brief Description of Objective
#1: Develop a functional model for formalized co-management of Protected Areas.	<i>Governance</i>
#2: Create alternative income generation opportunities for key local stakeholders associated with pilot co-managed Protected Areas.	<i>Altered economic incentives</i>
#3: Develop policies conducive to improved Protected Area management and build constituencies to further these policy goals.	<i>Policy change and constituency building</i>
#4: Strengthen the institutional systems and capacity of the Forest Department and key stakeholders so that improvements in co-management under the Project can be made permanent.	<i>Institutional capacity building</i>
#5: Build or reinforce the infrastructure within Protected Areas that will enable better management and provision of visitor services at co-managed sites.	<i>Infrastructure</i>
#6: Design and implement a program of habitat management and restoration for pilot Protected Areas.	<i>Habitat restoration</i>
#7: Provide management framework for supporting the co-management process	<i>Support management</i>

•Lesson learned for wetlands

- Future management and development plans for Baikka Beel and Hail Haor need to be geared towards improving the socio-economic condition of local people while also conserving and restoring the environment upon which fisheries (and fishers) depend.
- The beels adjacent to fishing communities are important components of this region's ecosystem.
- There are several fisher groups in Baikka Beel that traditionally engage in fishing as their full time occupation. The livelihoods of MACH fishers are better than those of non-MACH fishers, and according to some indicators far better.

- There are differences between MACH and non-MACH fishers regarding resource use, access to alternative income generating activities, socioeconomic status, and social perspectives.
- Development activities appeared to have a considerable impact on the quality of people's livelihoods and fishing practices. It has been found that MACH fishers are doing better than non-Mach fishers in terms of income, assets, and food security.
- The problems faced by communities in Baikka Beel likely reflect problems faced by traditional fishing communities throughout the country.
- To make a positive impact on the socio-economic conditions of fishers, it is essential that living standards, health and sanitation, housing, education, and credit availability are all improved and that there are an increased number of alternative employment and income-generating activities for fishers during off-seasons.

- Moreover, fishers would benefit from trainings and technical support through different government and non-government organizations.

Thank you

Session 9

Community participation for better Management of Natural Resources: Case study Experiences

1. Forest Conservation and Community participation

In forest conservation, participation is often associated with community forestry, which refers to forest management or co-management by people living close to the forest.

Legal, political and cultural settings for community forestry vary widely, and the term covers a wide range of experiences and practices.

Community forestry is often associated with South and Southeast Asia, but it is also common in other regions.

Although local participation is important in forest conservation, there are circumstances in which it is absolutely necessary, for example high population pressures and resource use conflicts, communal ownership and in smaller and more vulnerable protected areas.

- **In such cases, conservation without local participation is doomed to failure. Nevertheless, participation in itself provides no guarantee of success.**
- **The outcome of participatory processes often depends on additional factors such as institutional or legal frameworks, and the education or interests of local people and other stakeholders.**
- **Case studies have shown that governments and their agencies play a significant role in participatory processes by providing-or not providing-an 'enabling environment'.**

•What is participation?

- The concept of participation originally grew out of radical criticism of mainstream development projects in the 1960s and 1970s. Critics who asked why development projects often failed to meet their objectives came to the conclusion that a lack of participation was the reason.
- It now seems that every plan adopts a 'participatory approach', often because this is required by donor organizations for political reasons.
- Unfortunately, project planners and implementers frequently use the word 'participation' while continuing a traditional style of management that does not involve local people.
- Nevertheless, true participation may lead to more effective conservation of forest resources.

Three basic meanings of participation:

- i) Participation is a process in which information on a planned project is made available to the public. This type of participation often involves only community leaders. These people are consulted but decision-making power rests with external planners and project implementers.**
- ii) Participation includes project-related activities and not merely the flow of information. These might involve community labour or a longer-term commitment by local groups to maintain services or facilities, or even to plan for their future use. Although involved, people are not in control.**
- iii) Participation means that a project is a direct outcome of people's initiatives. A famous example of this is the Chipko movement, which began in the Himalayas in the 1970s when local women mobilized themselves to protect trees that were vital to the local economy.**

2. Participation as a social process

- If effective participation in conservation means involving people throughout the organization and decision-making processes, how can we promote this kind of participation?
- To begin with, it is helpful to think of participation as a process. Participation means communicating and working together with different people and groups in order to achieve common goals.
- Participation also means learning from each other's knowledge and mistakes. It is a series of steps or phases, each of which presents new insights and challenges.
- Participation is sometimes difficult but the rewards of truly participatory processes can be impressive, particularly if forests are conserved effectively.

- **Conserving forest resources requires that stakeholders trust one another and commit themselves to sustainable forest use.**
- **Legal or administrative procedures may have to be reformed or power redistributed to build relations of trust.**
- **Mutual trust often takes time to develop, especially if stakeholders have no previous experience of sharing decision-making or management responsibilities.**
- **It is the concrete actions taken by stakeholders in relation to each other-rather than their words or promises-which ultimately determine whether trust will evolve or not.**

3. Advocating Public Participation for Better Management of Natural Resources

Lives and livelihood in Bangladesh are inseparable from nature and natural resources. The agriculture as a whole contributes to 22% of the GDP while the contribution of the fisheries and forestry sector is 9% and 3% respectively. The three main types of public forests that Bangladesh has are:

- i. Tropical evergreen or semi evergreen forest comprising 640,000 ha in eastern districts of Chittagong, Cox' s Bazar and Sylhet.**
- ii. Moist or dry deciduous forest known as Sal forest comprising 122,000 ha located mainly in the central plains and the freshwater areas in the north east region.**
- iii. Tidal mangrove Forest along with the coast comprising 520,000 ha, known as the Sundarbans in the south-west region.**

- Over the years, forest cover in Bangladesh has come down to 6% from an officially claimed 20%.
- Statistics say that despite having the legal authority, the government has failed to finally declare substantial patches of forests as 'reserve' (a mode of protected area management that restricts peoples' access and exercise of customary rights) and categorically failed to manage those declared both as an ecosystem and also as service providers to these bulk of ethnic people.
- This is because the mode of administration missed to perceive the linkages between people and nature and overlooking the genuine needs of the marginalized.
- People's participation is very much needed to conserve natural resources.

4. Development of Participatory Forest Management in Bangladesh

- There is a growing recognition and consensus among the policy makers that, traditional forestry practices need to be replaced by a more sustainable option of management.
- Participatory forestry in Bangladesh draws attention in this regard as a strategy both for resource management and community development. Encompassing greater control over forest resources has created ample opportunities for participatory forestry and the possibilities to improve the livelihood of the local forest dependent people.
- However, community participation is a difficult task in any society and situation which is more decisive in developing country context like Bangladesh due to the socio-economic inequalities and absence of good governance in the wider society.

•Community participation in forestry sector: existing and evolving trends

- Community participation in the forestry sector of Bangladesh is a recent development drawing momentum in the face of global recognition.
- The Forestry Master Plan (FMP, 1994) described and highlighted the participation as a new mission and challenge to develop the forestry sector in order to overcome the colonial legacy characterized by bureaucratic and revenue oriented management, widespread isolation from community by ignoring their traditional rights, indigenous knowledge and resource use practices.
- The participatory concepts of forestry were officially recognized through community forestry projects that were further expanded and replicated through various projects such as:

- TANDP (Thana Afforestation and Nursery Development Project - funded by the ADB),**
- Forestry Sector Project,**
- Coastal Green Belt Project and Sundarban Biodiversity Project.**

Although these projects made significant provision in engaging community involvement in the name of participants, the nature and extent of participation varied significantly that is also influenced by the governance mechanism.

This was a pioneer attempt of the Forest Department (FD) of Bangladesh with an objective of benefiting rural poor by producing fuel wood for domestic uses, fruits, construction timber, and fodder and to mobilize community towards tree plantation.

- Institutional capacity building of the FD was also among the other agendas with a view to expanding social forestry throughout the country.
- The project was implemented in seven North-western districts of Bangladesh with the financial assistance of Asian Development Bank (ADB) loan grant.
- Patches of *Sal forest* and marginal lands were brought under the project jurisdiction.
- The project sets various physical targets such as establishment of strip plantation, wood lot plantation, agro-forestry, training and institutional support.
- Although it succeeded to achieve majority of the physical targets, the development in terms of social goals were very limited.

- **Failure to scope harness immediate benefits and the land tenural insecurity adversely influenced the notion of participation.**
- **This was also influenced by the patronage relation between poor farmer and local elites (Das 2008).**
- **The institutional capacity building of the FD is also experienced complexities since a large section of the project staffs were recruited on temporary basis and that significantly influenced the overall governance of the project.**

•Forestry Sector Project

- Forestry Sector Project (FSP) was another development support of ADB in the forestry sector during the period of 1996-2004.
- It was the largest public sector intervention on SF in Bangladesh.
- The designated aims of the project included conservation of forest in selected PAs, increase wood production, institutionalization of forest resource management through community participation, institutional capacity building and policy reform.
- According to ADB Mission Report, the project was a successful one although some of the components like protection of the natural forest through community participation failed to achieve the target.

- **A significant achievement took place during the project tenure in terms of institutional and policy reforms.**
- **The Forest Act, 1927 was amended in the year 2000 and comprehensive stakeholder consultation took place to finalize draft rules and regulations to give a legal shape to SF.**
- **However, the Indigenous and ethnic minority groups questioned the process of consultation.**
- **The positive side of the project is that, it involved a considerable number of NGOs as partners in the implementing process.**
- **The project succeeded in increasing the green coverage of the country through partnership initiative (public-private-NGOs) but the issues of governance still remained unresolved.**

•Sundarban Biodiversity Project

- The Sundarban Biodiversity Project was also an initiative through ADB loan support implemented with a view to ensuring sustainable management and conservation of the biodiversity of Sundarban Reserve Forest.
- The project aimed at the reduction of poverty of 3.5 million people living in and around the impact zone of Sundarban by adopting the following participatory approaches for social development in the impact zone:
 - Assessment of base line data to determine socio-economic condition;
 - Organizing and mobilizing the resource users;
 - Creation of alternative source of microcredit support to the community-based groups to create alternative employment opportunities;
 - Social infrastructure development.

- Although the project was designed to implement various components related to participatory management of the Sundarban Reserve Forest, the project was suspended due to the lack of actual significant progress in community and stakeholder engagement.
- Ineffective governance and poor financial management was the major reason behind this suspension.
- The donor advised FD to re-formulate the project proposal through active community participation and consultation with various stakeholders as a precondition to revive the project.

•Coastal Greenbelt Project

- This ADB supported project was initiated in the coastal districts of Bangladesh with a view to improving the coastal environment by tree plantation and to fight poverty through creating alternative income generation opportunities.
- The project managed to raise 8934 km of strip plantation whereby 143936 participants and more than 100 NGOs were directly involved with the project implementation.
- As per the review report the physical achievement was satisfactory. It also generated employment and the frequency of women participation in the project was higher compared to other programmes.
- However, land use and tenural rights remained big issues that significantly influenced the notion of active community participation.

5. Socio-economic and Governance attributes of the Participatory Forestry

Although project proposals made various provisions for public participation the active engagement of community in the decision-making process was obscure. The following discussion examines the socio-economic and governance attributes based on several evaluation studies.

•Socio-economic attributes

- Participants selection was a crucial factor which in many instances was influenced by patronage relationship. A significant portion of participants was drawn from large land owners, local influential and elected representatives of the local government bodies. Such inclusion of elite members forced or obscured the voice of the grassroots people in management and governance.

- Women ' s participation in planning and decision-making process was marginal. However, their involvement in protection and maintenance of the plantation was significant.**
- Participants received a good amount of money as share of the harvested products. They invested the received amount for various purposes such as debt repayment, purchasing of farming animals, buying land and in small businesses.**
- Participants received training on plantation technique and management both by FD and NGOs. Community organizing and mobilizing strategy training was provided to FD officials as well as to the participants that helped increasing awareness regarding participatory forestry approaches.**

-Participatory forestry in the name of CF, SF enabled participants to be more respectable within community .Their economic solvency helped to uplift their status and recognition in the society.

However, access to better health, education and sanitation still remain as a far reaching goal.

•Governance

•Passive community participation was experienced. Participants were not actively involved in the planning, monitoring and group formation process. FD or nominated NGOs were mainly engaged in accomplishing all these activities. In some project areas FD informed the participants about the project and the potential benefits of involvement as participants in the project.

- The species choice for plantation was even decided and directed by the FD and accordingly arrangements were made that significantly influenced the participation process as participants were confused about the future existence of the programme(assumed it as an another adhoc intervention).**
- FD was taking and implementing all the key decisions. Formal procedures were maintained just by informing and receiving approval from the *Upazilla* and *District* Coordination Committees related to forestry.**
- In some project locations participants expressed a sense of ownership which is manifested by regular contacts with FD people, regular vigilance of plantation site and presence in meeting.**
- The coordination among various stakeholders was not satisfactory. Top-down management approach was still dominating in the process in the name of participatory forestry.**

6. Development of Co-management of in the PA Governance of Bangladesh

- The major weakness of forest management in Bangladesh was the inability to ensure participation of the forest dependent communities.
- Participation in governance and the necessary legal and policy frameworks was weak as demonstrated in many forestry projects of Bangladesh.
- Although most of the participatory forestry projects have managed to achieve physical targets, meeting social targets of community participation and equitable distribution of share and rights were still lacking.
- The inefficient top-down approach still persisted that also ignored the rich history of traditional practice and knowledge base.

- Since the 1980's, the government has begun to gradually recognize the weakness of the conventional forest management and the continued depletion and degradation of the forest resources.
- It started establishing PAs and gradually adopted legal frameworks for community participation in governance through co-management approach.
- However, the declaration of these PAs adds little to the conservation and management of depleting biodiversity because of the predominant classical approach to management with an ecological focus that often excludes local rights and practices.

- **The co-management concept was first adopted for the aquatic resource management in the name of MACH (Management of Aquatic Ecosystems through Community Husbandry) during 1998 on pilot basis with a view to addressing poverty and ensuring sustainable management of wetland and aquatic resources through engaging local community in decision-making process.**
- **Based on the relative success of this project, the government of Bangladesh with the active support of USAID took a similar pilot project for the management of the PAs in the name of Nishorgo Support Project.**
- **In Bangladesh the PAs quite often overlap with the forest area since most of the PAs are the forest PAs.**

These PAs represent three major forest types of Bangladesh namely Hill forest, Sal Forest and Mangrove Forest and belong to the IUCN Guidelines of PA Management Categories II and IV.

•**The Nishorgo Protected Area Co-management Initiatives (NSP)**

- NSP was based on the normative framework of conserving vanishing forest biodiversity and ensuring livelihood support for the local community dependent on PAs.
- NSP selected 5 PAs as pilot sites in order to develop a model that can be replicated gradually to the other PAs of the country.
- The main focus of the co-management approach under NSP includes:

- protection and conservation of all natural forest and its biodiversity,**
- conversion of monoculture of exotic tree species with indigenous species,**
- development of co-management agreements with key stakeholders and**
- capacity building of the FD for better administrative, management and policy support for the PAs.**

- **Most of the PAs of Bangladesh are part of some reserved forest (RF) and have been subject to massive exploitation by neighbouring people for subsistence and income for years.**
- **One of the key challenges for Nishorgo in these PAs was therefore, to provide people with alternative income generating (AIG) options to divert their dependency on forests and forest products.**
- **However, as the effort was limited by resources, it was obviously impossible to bring the entire forest dependent community under the umbrella of AIG.**
- **To promote participation in park management and decision making process *Nishorgo* formed some legal institutions in the name of Co-management Councils and Co-management Committee (CMC) in each of the pilot sites taking representatives from all stakeholder groups including representatives from government.**

7. Experiences from the Empirical Studies: Governance and Institutional Attributes

- Empirical studies were conducted in two of the pioneer PAs namely Chunati Wildlife Sanctuary and Lawachara National Park.
- Focused Group Discussion (FGD), semi-structured interview, personal observation were the major tools frequently used to gain required information.
- Monthly meeting of the co-management committee (CMCs) were attended apart from visiting their official documents.
- Secondary data and information were also referred to ascertain the governance and institutional aspects of the PAs

•Chunati Wildlife Sanctuary

- Chunati Wildlife Sanctuary (CWS) is particularly important as it is the habitat and an important corridor for Asian elephants.
- Furthermore, a significant number of community people directly or indirectly are dependent on this sanctuary for their livelihood.
- CWS is part of the southern cluster of IPAC managed PA where co-management was in practice from the NSP period.
- The recent field work, conducted during the period of July, 2010 to January 2011 revealed that institutional and legal framework in support of the co-management approach significantly influences the governance issue.
- Currently two CMC are in operation in CWS (one in Chunati range and the other in Jaldi range).

•Lawachara National Park

- Lawachara is famous for its rich faunal diversity, particularly for one of the largest population of critically endangered *Hollock gibbons* in south-east Asia.
- The park is also inhabited by several indigenous communities including *Khasia* and *Tripura*, who have been enjoying the usufruct right to use a limited forest area within the park for their traditional betel vine (*Piper betel*) and lemon (*Citrus limon*) cultivation.
- One of the *Nishorgo* initiatives in the park was, recruiting former illegal loggers as CPG (Community Petrol Group) members to protect poaching of valuable timber from the park area.

- **All the participants were paid lump sum remuneration and basic gears for their protection service, and the effort brought a noticeable change in the area whereby significant reduction was experienced in illegal forest activities.**
- **Furthermore such effort also adds a vibrant impact on enriching floral and faunal biodiversity.**
- **However, the enthusiasm and the efforts have started fading with time due to several reasons i.e. absence of monitoring by CMC, lack of support from the project and reluctance of the field staffs belonging to the FD.**
- **Such limitations in co-management concept are adversely affecting the governance mechanism.**

Figure shows the illegal logging (in terms of No. of trees felled illegally) in Lawachara National Park (blue line) with other *Nishorgo* pilot sites between four different periods.

It is clear from the graph that, the number of trees illegally felled during 2003- 04 period was about 1,200, being the highest amongst the pilot sites, which fell down to about 400 during 2006-07 period.

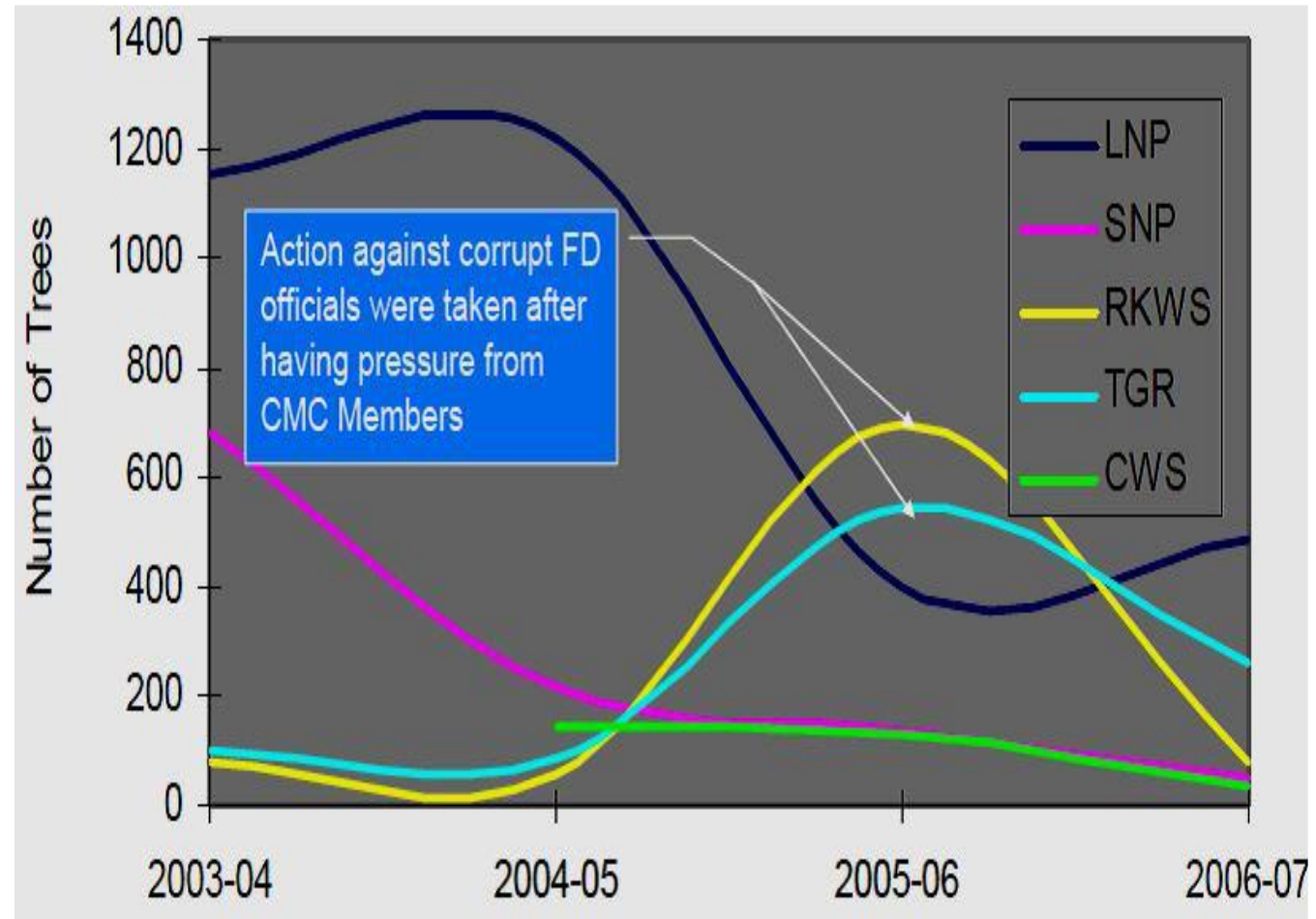
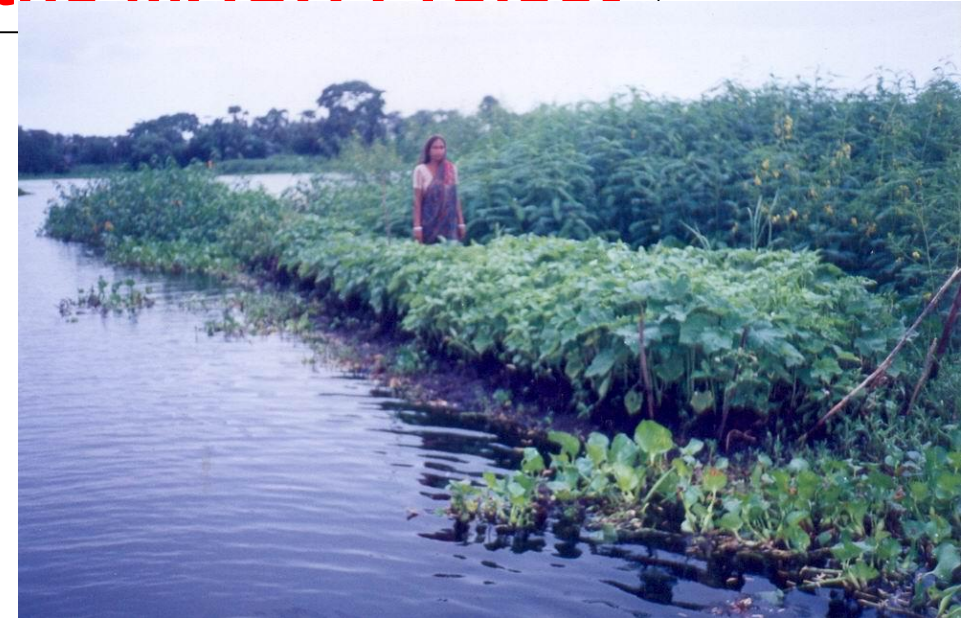


Figure: Illegal tree felling at different *Nishorgo* pilot sites
(Source: Mazumder *et al.* 2007)

8. Wetlands Management: Case Study on the MACH Project

- The Management of Aquatic Ecosystem through Community Husbandry (MACH) Project is an innovative integrated pilot programme to develop approaches and to demonstrate sustainable management of water resources including fish, plants, agriculture, livestock, forestry, and wildlife over entire wetland ecosystems.
- Wetlands in Bangladesh provide a critical sources of income and nutrition for millions of rural Bangladesh's poorest people.
- Unfortunately, the productivity of these habitats is in decline due to over-use, increase rates of sedimentation from watershed degradation, pollution, diversion of water for agricultural uses and the conversion of wetlands for agricultural and urban development.



•MACH is a GoB project that has been implemented by four non-government organizations, Winrock International, the Bangladesh Centre for Advanced Studies (BCAS), the Centre for Natural Resources Studies (CNRS) and CARITAS-Bangladesh with support for USID.

MACH has taken a unique three-pronged community-based co-management system:

- Firstly, working with local communities and government to develop co-management institutions;
- Secondly, building the capacity of those institutions to manage themselves and to restore and protect wetland ecosystems comprising of water, fish, trees, and wildlife; and
- Thirdly, providing support to improve the livelihoods of poor people dependent on these wetlands.

- **MACH helped develop two interacting organizations:**

- (a) community based organizations consisting of the users, whose responsibility is to manage specific wetland areas, and
- (b) local government committees that include officials, elected representatives and community based organization leaders to coordinate and guide the process.

- **Results Achieved**

MACH has addressed sustainable wetland resource management at the landscape level rather than just in individual rivers and lakes, working in three wetlands covering about 25,000 ha. Over 110 villages inhabited by over 184,000 people are directly involved in the project, while the total benefited population may exceed half a million. MACH has done this through:

- **Mobilizing communities into registered organizations that are empowered to conserve resources;**
- **Helping communities make resource management maps and plans;**
- **Undertaking habitat restoration;**
- **Adopting conservation measures for sustainable harvesting; and**
- **Introducing alternative sources of income to reduce pressure on wetlands and enhance incomes.**

The management actions implemented through this arrangement have already resulted in dramatic changes for the better in the environment and in people's lives.

•Wetland Habitat Rehabilitation

- RMOs identified locations within their respective wetland management areas that were affected by siltation to the point that they dried out and could not support fish in the dry season.
- Re-excavating canals to improve flows and re-excavating beels (lakes or dry season water) to increase the depth to maintain water year round restored the wetland habitats.
- In total, about 46 hectares of beels were excavated and 30 km of canals were expanded to retain dry season water, 56 sanctuaries in 173 hectares of area were established and 605,000 trees were planted resulting in increased fish catches of 2-5 times over 1999 baselines of 58-171kg/ha, reaching 316-388 kg/ha across the entire wetland system of nearly 25,000 hectares in 2004-05, and increases in fish consumption of 45% over the same period which benefit the landless as much as large landowners.

- The improved habitat is also crucial for fish to survive the dry months and facilitates breeding and regeneration of aquatic plants and animals.
- RMOs and local government formed Project Implementation Committees to oversee contractors and in some cases employ the laborers required for earthworks.

•Wetland Sanctuaries

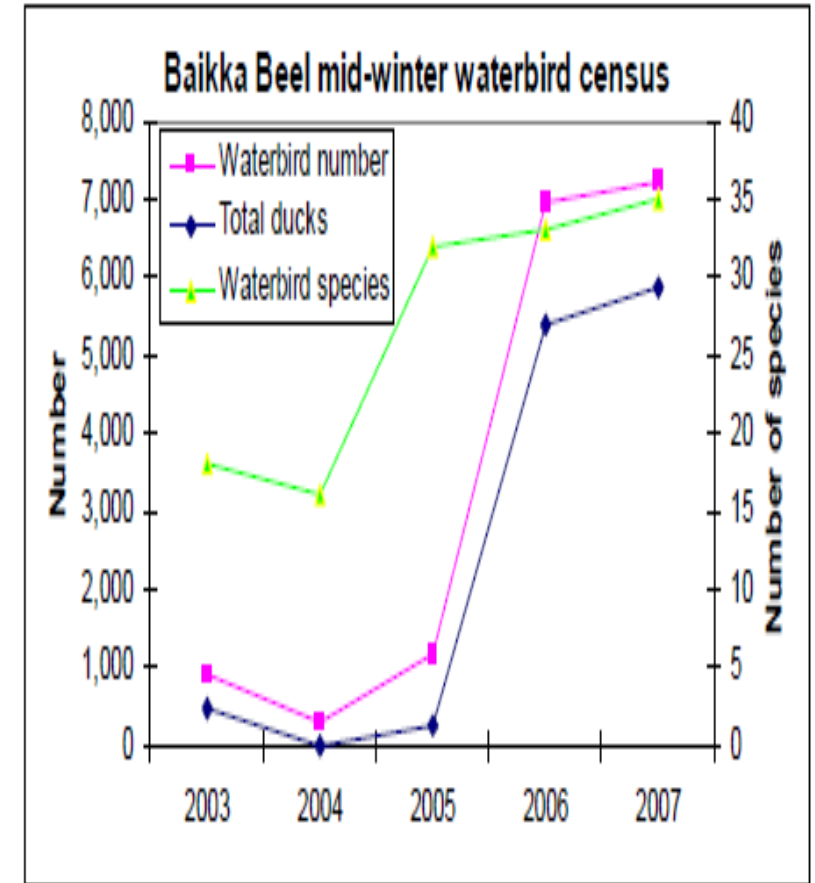
The single most important resource management intervention has been establishing 56 wetland sanctuaries at the three sites covering 427 acres (173 ha).



Fig. Permanent sanctuary in Baikka Beel, Hail Haor

- These are areas ranging from less than one hectare to over 100 ha in size that retain water throughout the year and where the community has banned all fishing to allow fish to breed and repopulate the wider primarily for protecting fish with the aim of restoring and enhancing yields from the rest of the wetland system outside the sanctuaries, they also benefit aquatic life in general, including waterbirds and plants.

- This is particularly the case in the large permanent sanctuary established in Hail Haor that within two years has attracted up to 7,000 wintering water birds where there were less than 100.



- **Most sanctuaries have been established by the RMOs within water bodies where they hold fishing rights for 5-10 years and are part of the local management plans designed to restore fish catches.**
- **A few sanctuaries have been declared directly by the Ministry of Land, following proposals made by the projects, which incorporate larger areas of national importance for overall wetland habitat protection.**
- **These have been removed from the fisheries leasing system permanently.**

•New Waterfowl Sanctuary Established in Bangladesh

The Ministry of Land has designated Baikka Beel, a 100-hectare area of the Hail Hoar wetland in Bangladesh, as a permanent waterfowl sanctuary.

The MACH project has been instrumental in restoring this diverse and productive wetland that is now able to support the needs of local populations for fishing and collection of aquatic plants.

The fish that are protected year round here repopulate the haor in the wet season, helping to increase fish catches.

Bird populations that dwindled in the 1980s are recovering in both numbers and species diversity.

By early 2007, 111 bird species, including 55 waterbird species, had been recorded in the sanctuary, including four that are globally threatened.

•The future of these birds looks secure. Resource management organizations, with local government backing, have successfully foiled attempts by local elites to shoot ducks in the sanctuary

•**Closed Season and Fishing Norms**

•Sanctuaries alone cannot restore wetland productivity. Developing local institutions –sets of rules and norms– which are widely accepted in the local communities and result in sustainable fish catches has been important.

• Each RMO along with the fishers has banned fishing for 2-3 months in the early monsoon when fish breed, allowing fish protected in the sanctuaries to safely repopulate the floodplain. Fishing restrictions are the other key set of rules.

- The RMOs have banned complete dewatering of those water bodies under their direct management, which means that even outside the sanctuaries more fish can survive over winter.
- RMOs advocate this practice to leaseholders in other water bodies within the sites. They have banned using fixed gears, particularly barriers (pati bundhs-mat made up of split bamboo) that completely close off channels so that fish can once again move between habitats at their needs.
- Similarly, they have worked to stop use of other harmful fishing practices including use of fine mesh seine nets, fishing that targeted shoals of juvenile catfish, fishing festivals where many people from outside the area were attracted to fish out a wetland, and current jals (monofilament nylon gill nets).
- The RMOs are also trying to restrict extraction of water for agriculture in the dry season to the beels.

•Re-introduction of Locally Lost or Threatened Fish Species

- Restored wetland habitats and sustainable fishing practice allowed some fish species to recover, but others needed a helping hand.
- MACH supported the RMOs in re-stocking about 1.19 million fish (mostly juveniles) of 15 native species.
- The fishers reported them as having been present in the sites but project monitoring showed they had declined to negligible catches and were threatened with local extinction.

• Increase in Fish Catches, Consumption and Biodiversity

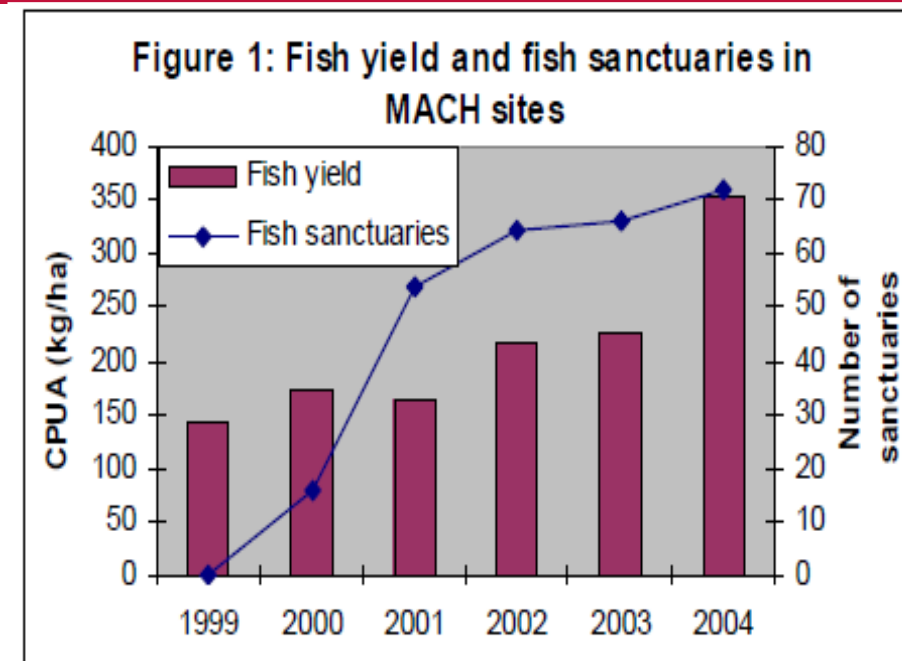
- Project data shows that catch per hectare has increased by about 140% between 1999 and 2004.
- Fish yields increased by 2 to 5 times over baseline yields before intervention of 58-171 kg/ha, to 315-390 kg/ha in 2004-05 and re-established 8-10 threatened fish species.
- In addition several locally rare fish species have been restored.
- As all species are consumed and form a staple part of the diet, fish consumption has also increased.



- By 2004 fish consumption was on average 52% higher than before MACH started, at 17.5 kg/person/year in 2004, which compares with a national average that declined between 1995-96 and 2000 by 14% to 11.1 kg/person/year.

•Tree Planting and Improved Watershed Management

- Tree planting for habitat restoration and improvement has been one of the MACH project's key interventions since its inception.
- Communities felt it was important to plant native trees to mitigate the past trend for loss of tree cover including swamp forest in the wetlands and riparian areas.



- The habitat restoration program envisaged mitigation of the degraded environment and micro-climate to benefit people and wildlife, and for soil and water conservation in the watersheds of the project wetlands.
- It also aimed to increase the national tree cover and generate financial returns for the country in general and for poor people in particular.
- Activities included contour planting of pineapple in the hills surrounding one site where siltation was raising the wetland bed by 5 cm per year. This has reduced runoff and erosion rates and at the same time permitted denser planting and improved soil fertility which increased farmer incomes.
- A total of 605,365 saplings of 56 species (48 native and 8 domesticated exotic) had been planted under the program by the end of 2005, 21% to restore swamp forest. Swamp forest will be preserved as a long-term investment in ecological restoration.

- **Contour cultivation of pineapples can increase profits by over 100% and reduces soil erosion which severely affects wetlands such as Hail Haor.**

9.Future Directives

- **From the field study as well as from opinion of the various stakeholders, it is quite evident that co-management activities in PA sites has brought slow but explicit changes whereby decentralized, site specific and community based activities are gradually taking the place of centralized classical approach to some extent.**
- **Households who were previously plunderers are now active forest protectors.**
- **Growing community awareness of conservation and livelihood attributes needs further and long term nourishment to bring positive changes.**

- To ensure long term sustainability in conservation and better forest governance, it is essential to focus on generous socio-economic upliftment of the communities living on forests, and ensure equity in benefit sharing.
- Attitudinal changes of the forest department and its officials towards the shifting paradigm of PA management are crucial in this regard. To avoid conflict, and promote traditional livelihoods of the communities, there is also the need to allow people to harvesting certain amount of forest products ensuring ecological sustainability.
- Financial and technical sustainability of the CMC' s must be ensured through innovative mechanisms (i.e. continuous training for capacity building, provision of direct grants to CMC; linking with external and internal funding agencies, funding through international negotiable instruments such as REDD11 followed by constant supervision and monitoring.

- **Finally legal, policy and financial support to adore the concept is important since it is the precondition to bring better governance in management.**
- **The adhoc nature of the projects is one of the limiting factors as seen in various participatory forestry projects. Such short term programmers are also weakening the institutional and professional capacity building process.**
- **In order to overcome this barrier we need to mainstream the projects through internal funding channel. The improvement and continuation of the programme will not only increase the accountability and transparency but will also help to build confidence among the participants to be involved in the process.**

- **Institutional capacity building both for the FD and CMC is crucial. Training, logistic support, financial incentives and strict monitoring and evaluation process can ensure better governance to harvest better management outcome.**
- **NGOs are playing crucial role for community mobilization and better utilization of the resources needed for the project management. Furthermore, the credibility of some NGOs is more to development partners for their better monetary management.**
- **However, they cannot be the replacement of the state institutions such as FD who has the mandate, legitimacy and nationwide technical strength and physical coverage to disseminate various concepts and attributes of NRM especially in the PA sector.**

- Good governance in PA management through active community and stakeholder participation may add significantly to the journey of SD.

Thank you

Session 10

Gender Issues in Climate Change Adaptation and Mitigation (in the context of Natural Resources Management)

1. Difference between sex and gender

Sex = male and female

Gender = masculine and feminine

So in essence:

- **Sex refers to biological differences; chromosomes, hormonal profiles, internal and external sex organs.**
- **Gender describes the characteristics that a society or culture delineates as masculine or feminine.**
- **So while your sex as male or female is a biological fact that is the same in any culture, what that sex means in terms of your gender role as a 'man' or a 'woman' in society can be quite different cross culturally. These 'gender roles' have an impact on the health of the individual.**

•In sociological terms 'gender role' refers to the characteristics and behaviours that different cultures attribute to the sexes. What it means to be a 'real man' in any culture requires male sex plus what our various cultures define as masculine characteristics and behaviours, likewise a 'real woman' needs female sex and feminine characteristics. To summarize:

•'man' = male sex+ masculine social role
(a 'real man', 'masculine' or 'manly')

•'woman' = female sex + feminine social role
•(a 'real woman', 'feminine' or 'womanly')

2. Gender identity and gender role

- Gender identity is defined as a personal conception of oneself as male or female (or rarely, both or neither).
- This concept is intimately related to the concept of gender role, which is defined as the outward manifestations of personality that reflect the gender identity.
- Gender identity, in nearly all instances, is self-identified, as a result of a combination of inherent and extrinsic or environmental factors; gender role, on the other hand, is manifested within society by observable factors such as behavior and appearance.

•For example, if a person considers himself a male and is most comfortable referring to his personal gender in masculine terms, then his gender identity is male. However, his gender role is male only if he demonstrates typically male characteristics in behavior, dress, and/or mannerisms.

Thus, gender role is often an outward expression of gender identity, but not necessarily so.

In most individuals, gender identity and gender role are congruous. Assessing the acquisition of this congruity, or recognizing incongruity (resulting in gender-variant behavior), is important in the developing child.

It is important also to note that cultural differences abound in the expression of one's gender role, and, in certain societies, such nuances (to a very small difference in color, meaning, or feeling) in accepted gender norms can also play some part in the definition of gender identity.

3. Gender and climate change

- It is already established that climate is changing and there are evidences that there is increase in temperature, rainfall, erratic rainfall, drought etc. in Bangladesh.
- Detrimental effects of climate change can be felt in the short-term through natural hazards, such as landslides, floods and hurricanes; and in the long-term, through more gradual degradation of the environment.
- The adverse effects of these events are already felt in many areas, including in relation to, inter alia, agriculture and food security; biodiversity and ecosystems; water resources; human health; human settlements and migration patterns; and energy, transport and industry.

- In many of these contexts, women are more vulnerable to the effects of climate change than men—primarily as they constitute the majority of the world's poor and are more dependent for their livelihood on natural resources that are threatened by climate change.
- Furthermore, women face social, economic and political barriers that limit their coping capacity.
- Women and men in rural areas in developing countries are especially vulnerable when they are highly dependent on local natural resources for their livelihood.
- Those charged with the responsibility to secure water, food and fuel for cooking and heating face the greatest challenges.

- **Secondly, when coupled with unequal access to resources and to decision-making processes, limited mobility places women in rural areas in a position where they are disproportionately affected by climate change.**
- **It is thus important to identify gender-sensitive strategies to respond to the environmental and humanitarian crises caused by climate change.**
- **It is important to remember, however, that women are not only vulnerable to climate change but they are also effective actors or agents of change in relation to both mitigation and adaptation.**
- **Women often have a strong body of knowledge and expertise that can be used in climate change mitigation, disaster reduction and adaptation strategies.**
- **Furthermore, women's responsibilities in households and communities, as stewards of natural and household resources, positions them well to contribute to livelihood strategies adapted to changing environmental realities.**



Sidr Affected Women, Source: Newspaper



Bangladeshi villagers, affected by the cyclone, wait in queue for relief at Ashasunee village in Shatkhir, 176 kilometers south west of Dhaka, Bangladesh, May 27, 2009, Cyclone Aila .

Source: Raveena Aulakh, Environment, Published on Sat Feb 09 2013

4. Need for Gender Responses to the Effects of Climate Change

•Women, agriculture and food security in climate change context

- Climate change has serious ramifications in four dimensions of food security: food availability, food accessibility, food utilization and food systems stability.
- Women farmers currently account for 45-80 per cent of all food production in developing countries depending on the region.
- About two-thirds of the female labour force in developing countries is engaged in agricultural work.
- In the context of climate change, traditional food sources become more unpredictable and scarce. Women face loss of income as well as harvests—often their sole sources of food and income.

- **Related increases in food prices make food more inaccessible to poor people, in particular to women and girls whose health has been found to decline more than male health in times of food shortages.**
- **Furthermore, women are often excluded from decision-making on access to and the use of land and resources critical to their livelihoods.**
- **For these reasons, it is important that the rights of rural women are ensured in regards to food security, non-discriminatory access to resources, and equitable participation in decision-making processes.**



- **Women, gender equality and biodiversity in the context of climate change**
- According to the Millennium Ecosystem Assessment, climate change is likely to become the dominant driver for the loss of biodiversity by the end of the century.
- Biodiversity plays an in important role in climate change adaptation and mitigation. For example, in contexts where deforestation is responsible for an average of 20% of human-induced carbon dioxide emissions, the conservation of natural habitats can reduce the amount of carbon dioxide released into the atmosphere.
- Additionally, the conservation of mangroves and drought-resistant crops can reduce the impacts of climate change such as flooding and famine. In the rural areas of Asia, women and men are highly dependent on biomass, such as wood, agricultural crops, wastes and forest resources for their energy and livelihoods.

- However, in the face of climate change, the ability of women and men to obtain these indispensable resources is reduced. It is important to note that the declining biodiversity does not solely impact the material welfare and livelihoods of people; it also cripples access to security, resiliency, social relations, health, and freedom of choices and actions.
- The majority of the biodiversity decline has a disproportionate impact primarily on poor people in developing countries. In many parts of the world, deforestation has meant that wood - the most widely used solid fuel - is located further away from the places where people live.
- In poor communities in most developing countries, women and girls are responsible for collecting traditional fuels, a physically draining task that can take from 2 to 20 or more hours per week.

- As a result, women have less time to fulfil their domestic responsibilities, earn money, engage in politics or other public activities, learn to read or acquire other skills, or simply rest. Girls are sometimes kept home from school to help gather fuel, perpetuating the cycle of disempowerment.
- Moreover, when environmental degradation forces them to search farther field for resources, women and girls become more vulnerable to injuries from carrying heavy loads long distances, and also face increased risk of sexual harassment and assault.

Source: Women_and_Climate_Change_Factsheet, UN WomenWatch: www.un.org/womenwatch

- **Biodiversity, Indigenous Women and Climate Change**

- Biodiversity also comes in the form of the wealth of knowledge on the environment that indigenous people and communities possess.

- Indigenous knowledge comprises: an understanding of wild ancestors of food, medicinal plants and domestic animals; symbiotic relations with ecosystems; an awareness of the structure of ecosystems and the functionality of specific species; as well as the geographic ranges of said species.

- A greater inclusion of indigenous communities and indigenous women further validates the significance of their knowledge.



- **Women, gender equality and water resources in the context of climate change**
- Climate change has significant impacts on fresh water sources, affecting the availability of water used for domestic and productive tasks.
- The consequences of the increased frequency in floods and droughts are far reaching, particularly for vulnerable groups, including women who are responsible for water management at the household level.
- All over the developing world, women and girls bear the burden of fetching water for their families and spend significant amounts of time daily hauling water from distant sources.
- The water from distant sources is rarely enough to meet the needs of the household and is often contaminated, such that women and girls also pay the heaviest price for poor sanitation.

- Given the changing climate, inadequate access to water and poor water quality does not only affect women, their responsibilities as primary givers, and the health of their families', it also impacts agricultural production and the care of livestock; and increases the overall amount of labour that is expended to collect, store, protect and distribute water.

- Gender equity should be here in case of bringing water from a distant place. Male person may help in this respect significantly.



Water fetching from a distant place due to drought effect

•Women, gender equality and health in the context of climate change

- For in terms of health, some potential climate change scenarios include: increased morbidity and mortality due to heat waves, floods, storms, fires and droughts.
- The risk of contracting serious illnesses is aggravated by environmental hazards caused by climate change.
- In addition to the reference provided above of climate impacting women's health through water scarcity and water contamination, an abundance of evidence links the evolution and distribution of infectious diseases to climate and weather.
- This entails a greater incidence of infectious diseases such as cholera, malaria, and dengue fever, due to the extension of risk seasons and wider geographic distribution of disease vectors.

- Warmth accelerates the biting rate of mosquitoes and speeds up the maturation process of the parasites they carry.
- Rising temperatures are likely to accelerate the lifecycle of the malaria parasite and to spread malaria to new areas.
- Furthermore, floods—increasing consistently with climate change—may also increase the prevalence of water-related diseases, especially water and vector-borne diseases, which affect millions of poor people each year.
- In addition, an increase in prevalence of diseases will likely aggravate women's care-giving of family and community members who are ill. These diseases include malaria, diarrhea, etc.

•Women, gender equality and changes in human settlements and migration patterns due to environmental degradation

•Climate change adds a new complexity to the areas of human mobility and settlement by exacerbating environmental degradation. People are migration for the climate change affected areas to other places. This happens more in the coastal region due to Flood, Sea Level Rise and salinity intrusion.

•The gradual process of environmental deterioration is likely to increase the flows of both internal and cross-border human migration over the next decades.

•Increased human migration entails that a greater number of people are being displaced due to severe coastal weather events, the erosion of shorelines, coastal flooding, droughts and agricultural disruption.

•For example, Cyclone Nargis that struck the Irrawaddy Delta region in Myanmar in May 2008 severely affected 2.4 million people and led to the displacement of 800,000 people.

- The migratory consequences of environmental factors result in higher death rates for women in least developed countries, as a direct link to their socioeconomic status, to behavioural restrictions and poor access to information.
- While migration is a survival response to climate change, frequent human resettlement further exacerbates the loss of biodiversity and ecosystems.
- This is the case given that migration entails vast changes in land-use, the physical modification of rivers or water withdrawal from rivers, the loss of coral reefs, and damage to sea flows, among other things.

Sea Level Risks - Bangladesh

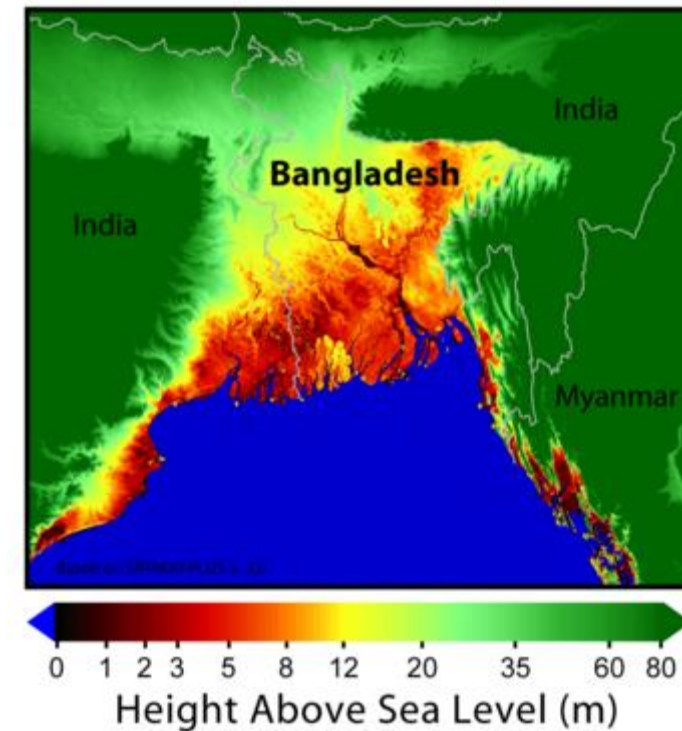




Photo of migration (internet)

•Women, gender equality and energy

- Energy is a particularly critical area and renewable energy is often cited as a key climate change mitigation technology.
- Many people question the role of women in energy issues, where energy is primarily thought of in terms of: **electricity to operate appliances and equipment, gasoline and diesel fuels for motors and vehicles, and the delivery of oil for natural gas.**
- Dealing with these different mediums (electricity and fuel) is often considered **as men's work**, where women are not expected to be involved with power generation and fuel distribution.
- As a result of these considerations, women and men face differences in training and social expectations, where women are not usually included in discussions about energy plans and policies.

- This exclusion also means that women do not participate in, nor contribute to the elaboration of key strategies to mitigate climate change.
- However, in many developing countries, especially in the poorest areas, **most energy currently comes from traditional biomass fuels such as wood, charcoal and agricultural wastes – and collecting and managing these fuels is strictly the business of women.**
- **It follows that the lack of recognition of the role of women in the energy sector, leads to ‘gender-blind’** (this is to say that gender is not taken into consideration) energy policies that fail to address some of the most pressing factors affecting the capacity of developing countries to adapt and mitigate climate change.
- Women in developing countries should be actively engaged in national energy decision-making. Women should be given greater involvement so that energy supplies can be managed more effectively and productively in the face of climate change, but also so that the dependence on biomass fuels can be quelled, raising communities out of extreme poverty.

•Women, gender equality and technology in adaptation responses to climate change

- The word “technology” is typically known to mean simply a tool or machine. However, the term has now evolved to a broader concept that also includes knowledge, processes, activities, and socio-cultural context.
- As such, technology reflects the foundation of everyday life and touches upon most aspects of both women and men’s lives.
- Moreover, most methods of adaptation to climate change involve some form of technology: this can include “soft” technologies based on insurance schemes, crop rotation patterns or traditional knowledge; it may also include “hard” technologies such as irrigation systems, drought resistant seeds or sea defences.

- In many developing countries, the access of girls and women to information and communication technology is constrained by: social and cultural bias, inadequate technological infrastructure in rural areas, women's lower education levels (especially in the fields of science and technology) and the fear of or lack of interest in technology, and women's lack of disposable income to purchase technology services.
- In UNFCCC and CDM, gender equality is given minimal attention and the degree of difference in the impact of climate change on women and men has been overlooked.
- It is important to point out that equal inclusion of women and men in all aspects of climate change projects, including technology, pays off; this is especially true in the case of technologies aimed at tasks most frequently performed by women.

- **Women, gender equality and emergency measures during natural disasters**
- At the most basic level, mortality rates for women and men are often different in natural disasters.
- A 2006 study of 141 natural disasters by the London School of Economics found that when economic and social rights are fulfilled for both sexes, the same number of women and men die in disasters.
- At the same time, when women do not enjoy economic and social rights equal to men, more women than men die in disasters. This gender discrepancy has come to light in a range of major disasters such cyclones, Tsunamis, etc.

- **The vulnerability of women to disasters is increased for a number of reasons. During post-disaster, women are usually at higher risk of being placed in unsafe, overcrowded shelters, due to lack of assets, such as savings, property or land.**
- **In the context of cyclones, floods, and other disasters that require mobility, cultural constraints on women's movements may hinder their timely escape, access to shelter or access to health care.**
- **Exacerbating this effect, women often avoid using shelters out of fear of domestic and sexual violence, and become even less mobile as primary family care-givers.**
- **Poor women and those in countries of higher gender inequality appear to be at the highest risk: a direct correlation has been observed between women's status in society and their likelihood of receiving adequate health care in times of disaster and environmental stress.**

- It is thus important to identify gender-sensitive strategies for responding to human security needs and environmental and humanitarian crises caused by climate change.
- These efforts should focus on: reducing women's vulnerability, in tandem with men's susceptibilities; promoting gender sensitive emergency responses; and enlisting women as key environmental actors in natural disaster management decision-making processes, alongside men, tapping on women's skills, resourcefulness and leadership in mitigation and adaptation efforts.

5. Implications of climate change for women's human rights

- Studies show that global warming and extreme weather conditions may have calamitous human rights consequences for millions of people.
- Global warming is one of the leading causes and greatest contributors to world hunger, malnutrition, exposure to disease, and declining access to water.
- Moreover it poses limitations to adequate housing, spurring the loss of livelihoods as a result of permanent displacement.
- Climate change affects the economic and social rights of countless individuals; this includes their rights to food, health and shelter. As climate change will inevitably continue to affect humanity, a key UN priority is safeguarding the human rights of people whose lives are most adversely affected.

6. Impact of climate change on women's reproductive health

- Apocalyptic natural forces like disasters, diseases, drought, famine, flood threatened lives of millions, specially of women who suffered severely as an impact of climate change.
- Although findings of many studies have made it crystal clear that the climate change may affect people's health negatively, but the relationship between climate change and reproductive health is not yet very clear.
- While evidences showed the association between these two, scientists are yet to figure out the exact process of how the climatic factors affect the reproductive health.

• Source: [FEATURE & ANALYSES](#), Published : Saturday, 23 March 2013 by Bipasha Dutta, Email: bipasha@eminence-bd.org)

- Since the most visible and severe effect of climate change is the increase of natural disaster including cyclones, flood and draught, it is very likely that a large number of population, including the women of reproductive age would be greatly affected.
- According to World Disaster Report 2012, Asia accounted for 63.67% of the disaster deaths and 40.73% of the disaster-affected globally between 2002 and 2011.
- In a traditional society like Bangladesh women are more susceptible among the vulnerable groups. After the disaster, danger of women becoming victims of sexual violence increases. Even, relief efforts do not take into consideration health needs of women like obstetrical care.

- **Miscarriage and abortion increases in crowded shelter houses. Forced marriage of the pregnant widowers after tsunami caused low-birth weight children.**
- **Even cases of sexual harassment take place on the way to shelter where they lack gender-friendly sanitation facility. Also, prolonged exposure to filthy water during post-disaster period causes severe skin diseases and gynecological problems to women.**
- **During the dry season in saline prone areas, women including pregnant women and adolescent girls, are compelled to fetch water that causes various health and gynecological problems like premature birth, abortion and still birth (blue-baby syndrome).**

- Furthermore, in the coastal area, women are consuming more sodium per day from drinking water alone that exceeds the WHO-recommended allowable limits.
- As a consequence, higher percentage of women is diagnosed with hypertension and (pre) eclampsia in the dry season, when water salinity peaks.
- The salinity intrusion into the drinking water also exacerbated by climate change induced sea level rise.
- Around 2.8 million hectares of land in Bangladesh are highly affected by salinity which is one-third of the 9.0 million hectares of the total national cultivated area, and about one fifth of the total area of Bangladesh.
- The causal relationship between excessive dietary salt intake and high blood pressure in adults and children is well established and concerned so far.

- **Increased salinity of drinking water is likely to have a range of health effects, including increased hypertension rates.**

In the coastal area, prominent numbers of pregnant women are facing pre-eclampsia, eclampsia, and the prevalence of pregnancy-induced systolic and diastolic hypertension is highly increased than before.

- **Both peri-natal and maternal mortality is persistently high in the coastal area and an urgent assessment of this situation is warranted.**

- **Both in hypertension and pre-eclampsia, the expecting mother encounters impaired liver function and low blood count; the unborn baby risks growth retardation and premature birth; and both are at risk of death**

Thank you

Session 11

REDD+ and Carbon trading option in Bangladesh for Bio-diversity Conservation : Case Study Experience from FD

1. Climate change and national Strategy in Bangladesh

- Bangladesh is likely to be one of the most vulnerable countries in the world to the projected impacts of climate change.
- The global warming due to the increase in greenhouse gas (GHG) concentrations in the earth's atmosphere and the consequent sea level rise are likely to have profound and far-reaching impacts on Bangladesh.

The impact of global climate change on Bangladesh is becoming more visible every day (IUCN 2011). Changes in natural events have been observed such as increasing temperature (Karmakar and Shrestha, 2000), change in natural disturbance regime (flooding) (GED 2009), changing frequency and intensity of rainfall, increasing trends of severe cyclonic storms of hurricane intensity (Karmakar, 2003; Quadir and Iqbal 2008), saline water intrusion (SRDI 1998) and sea level rise (Khan, Quadir *et al.* 1999).

- The Government of Bangladesh (GoB) recognizes that tackling climate change requires an integrated approach involving a number of different ministries and agencies, civil society and the private sector.
- The GoB has made climate change an integral part of the new draft Poverty Reduction Strategy Paper (Planning Commission 2008), which outlines its strategy for the next three years and which lays the foundations for continuing efforts to achieve the United Nation's Millennium Development Goals (MDGs) and to build a fair, equitable and just society in Bangladesh.
- The Government of Bangladesh has recently established a Climate Change Trust Fund (CCTF) which will focus mainly on adaptation.
- Bangladesh is also looking beyond its borders to find common cause with neighbouring countries to manage climate change impacts through regional action plans.

- The National Adaptation Programme of Action (NAPA) was launched in 2005 and provides a response to the urgent and immediate adaptation needs and identified priority programmes.
- The Bangladesh Climate Change Strategy and Action Plan (BCCSAP) is a 10-year programme (2009-2018) to build the capacity and resilience of the country to meet the challenge brought on by climate change.
- The needs of the poor and vulnerable, including women and children, will be mainstreamed in all activities under the Action Plan.
- The BCCSAP programme comprises six pillars for the first five year period (2009-13):

- 1. Food security, social protection and health**
- 2. Comprehensive Disaster Management**
- 3. Infrastructure**
- 4. Research and knowledge management**
- 5. Mitigation and low carbon development**
- 6. Capacity building and institutional strengthening**

- The forests of Bangladesh are under tremendous pressure. According to FAO, the country lost on a yearly average 0.17% of its forest cover between 1990 and 2010.
- Factors contributing to deforestation in Bangladesh are rapid urbanization, industrialization, agriculture expansion, shifting cultivation, and a lack of effective implementation of forestry and resource management policy.
- Currently, there appears to be a consensus that the issue of deforestation and forest degradation must be effectively tackled as it would otherwise **limit the options available to reduce greenhouse gas emissions, greenhouse gas concentrations and increases in temperature to acceptable levels.**
- Any reduction in the rate of deforestation and forest degradation has the benefit of avoiding a significant source of carbon emissions.**

- Unlike afforestation and reforestation activities, which generally cause small annual changes in carbon stocks over long periods of time, **stemming (the ascending axis of a plant, whether above or below ground, which ordinarily grows in an opposite direction to the root or descending axis) deforestation causes large changes in carbon stocks over a short period of time.**
- Most emissions from deforestation take place rapidly, whereas carbon removal from the atmosphere through afforestation and reforestation activities is a slow process.
- In addition to mitigating climate change, stopping deforestation and forest degradation and supporting sustainable forest management conserves **water resources and prevents flooding, reduces run-off, controls soil erosion, reduces river siltation, protects fisheries and investments in hydropower facilities, preserves biodiversity and preserves cultures and traditions.**

- **With all that at stake it is clear what has to happen.**
- **With all the services that forests provide both to humanity and the natural world, there is now widespread understanding of a simple yet profound fact—that forests are more important left standing, than cut.**
- **Out of that understanding has come the Forest Carbon Partnership Facility.**

2. The role of the forestry sector to mitigate climate change in Bangladesh

- Forests in Bangladesh harbour rich biodiversity as well as resources upon which millions of people rely for their livelihoods.
- Moreover, forests are important sources of fuel and other inputs needed for domestic, industrial, and commercial use, such as poles (e.g. for electrification purposes), pulpwood and timber.
- These factors, together with stressors such as population growth and urbanization, migration, and resulting changes in land use, have led to deforestation and degradation in many of the country's forest areas.

•Forest plays an important role in storing carbon of GHGs, thus mitigating climate change significantly in Bangladesh.

•Carbon assessment conducted during 2010 and 2011 in the country's several protected areas including Sundarbans is shown in Table 1.

•This table provides ideas about the existing carbon that are trapped in the mangrove forest as well as in the protected areas of hill forest.

Forest locations	Annual C increase (tC/ha/yr)	Forest land area (ha)	Total C stock Ct/ha
Dudpukuria-Dhopachari Wildlife Sanctuary *	3.99	2,653	105.46
Fasiakhali Wildlife Sanctuary *	3.99	301	110.16
proposed Inani National Park *	3.99	2,249	25.99
Medhakachapia National Park *	3.99	112	187.75
Sitakunda Reserved Forests *	3.99	2,461	22.51
Teknaf Wildlife Sanctuary *	3.99	1,794	43.08
Chonati Wildlife Sanctuary*	3.6	763	105
Sundarbans Reserved Forest**	15.5	412,000	250

*based on (GoB 2011) and ** (Donato and Ahmed 2010).

3. Climate Change Mitigation Initiative in Forestry Sector in Bangladesh

- **Social forestry**

- In order to address the primary drivers of deforestation and forest degradation, and promote peoples' participation in the improved management of forest resources, the **GoB has adopted a social forestry approach** as laid out in the **Forestry Master Plan completed in 1993**, as well as revised the Forest Act of 2000 and created the **Social Forestry Rules of 2004**, amended in 2010.

- This has facilitated collaboration between the GoB through the Forest Department and local communities to enhance conservation while striving to meet the latter's consumption needs.

- **FD initiated Community Forestry Project during 1981-1987 through active participation of local people financed by Asian Development Bank (ADB), which paved the foundation of social forestry in Bangladesh.**
- **Consequently, the FD implemented:**
 - **the ADB-funded Upazila Afforestation and Nursery Development Project (1989-1996),**
 - **the Coastal Green Belt Project (1995-2002),**
 - **the Forestry Sector Project (1998-2004) and**
 - **World Bank (WB) funded Forest Resources Management Project.**
- **FD and engaged a number of poor and landless people including men and women in the social forestry programmes**

- Currently the number of participants with FD is nearly 0.5 million.
- Encroached forest lands, depleted forest areas, buffer areas of PAs, vacant marginal land and road side areas were reforested under these projects.
- The major components of these projects were to establish woodlot, agroforestry and strip plantations throughout the country.
- To date, 148,550.7 ha of block plantation and 48,782.24 km of strip plantation has been undertaken under the social forestry programmes (Development Planning Unit, BFD 2011).
- The plantations established under social forestry programme are being harvested at the end of the rotation (10 years) and of which 75% of the benefit will go to the participant according to the Amended Social Forestry Role of 2010 (Social Forestry Wing, BFD 2011).

- To date 94,201 social forestry participants have received benefits out of the social forestry practices (Management Planning Unit, BFD 2011).
- The forest land available for afforestation and reforestation and avoided deforestation and degradation under the social forestry benefit sharing mechanism has the potential to pave the way for mitigation as well as conservation and benefit to the local dependent communities of the country.

•Co-management for protected area conservation

- The Bangladesh Forestry Sector adopted the Nishorgo Network, a platform for collaborative management of protected areas.
- The USAID Nishorgo Support Project (2003-2008) and the subsequent Integrated Protected Area Co-management (IPAC) project (2008-2013) contributed to strengthen co-management approach with multiple stakeholders.
- Since 2012, the Forest Department has declared 34 protected areas in the country, with 18 of these managed by 23 co-management organizations.
- The co-management approach aims to promote an enabling policy environment for people-oriented management, capacity building of FD and community leaders and through sustainable and equitable livelihood development.

- The scope of community-led monitoring of resources in protected areas is being developed through community score-cards, indicator bird monitoring and tracking of forest offence records.
- National MRV appreciates such community-driven resource monitoring protocols which require further improvement and training to representatives from the communities.

- **Other initiatives to tackle the climate change issues**

- Different projects under different themes of BCCSAP are being provided with financial support from the CCTF.

- , including the Ministry **So far, 62 government projects comprising different line ministries related to climate change** of Environment of Forests, have already been undertaken with the approval of the Trustee Board and a number of projects are underway.

- For taking adaptation and mitigation activities to tackle the impact of climate change, **the DoE is implementing six projects**, while the **Bangladesh Forest Department is implementing 10 projects under the CCTF.**

- It is expected that the successful implementation of the projects under CCTF will contribute to addressing climate change in Bangladesh through adaptation and mitigation measures.

4. REDD+ and its History under the UNFCCC

- The 15th Conference of the Parties (COP15) to the UNFCCC in 2009 adopted Decision 4/CP.15 (UNFCCC 2009) on “Methodological guidance for activities relating to reducing emissions from deforestation and forest degradation; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries” (REDD+), an international policy mechanism to reduce emissions and enhance removals from forestry activities.
- While not defining the structure of the REDD+ mitigation mechanism, Decision 4/CP.15 set out methodological principles that should be followed for measuring forestry emissions and removals (GOB, 2012).

- **REDD** originally referred to "reducing emissions from deforestation in developing countries".
- **Reducing emissions from deforestation and forest degradation (REDD)** is a mechanism that has been under negotiation by the United Nations Framework Convention on Climate Change (UNFCCC) since 2005, with the twin objectives of mitigating climate change through reducing emissions of greenhouse gases and removing greenhouse gases through enhanced forest management in developing countries.
- In the last two decades, various studies estimate that land use change, including deforestation and forest degradation, accounts for 17-29% of global greenhouse gas emissions.
- For this reason the inclusion of reducing emissions from land use change is considered essential to achieve the objectives of the UNFCCC.

• **REDD+ (or REDD-plus)** refers to "reducing emissions from deforestation *and forest degradation* in developing countries, and the role of *conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries*" (emphasis added); the most recent, elaborated terminology used by the COP.

• REDD received substantial attention from the UNFCCC – and the attending community – at COP 13, December 2007, where the first substantial decision on REDD+ was adopted, Decision 2/CP.13:

• "Reducing emissions from deforestation in developing countries: approaches to stimulate action", calling for demonstration activities to be reported upon two years later and assessment of drivers of deforestation.

•Perhaps more interestingly, REDD+ was also referenced in decision 1/CP.13, the "Bali Action Plan", with reference to all five eligible activities for REDD+ (with sustainable management of forests, conservation of forest carbon stocks and enhancement of forest carbon stocks constituting the "+" in REDD+).

•The development and implementation of mechanisms to reduce emissions from deforestation and forest degradation (REDD), and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks (REDD+) has become a national priority for the Government of Bangladesh as part of its climate change mitigation and adaptation strategy. As part of its REDD-readiness activities, Bangladesh became a partner country of the UN-REDD Programme in 2010 (GOB, 2012).

•The five REDD+ activities

A subsequent Decision (1/CP.16) adopted by Parties at COP16 in Cancun, December 2010, sets out the five forest related activities eligible under the REDD+ mitigation mechanism (UNFCCC 2011):

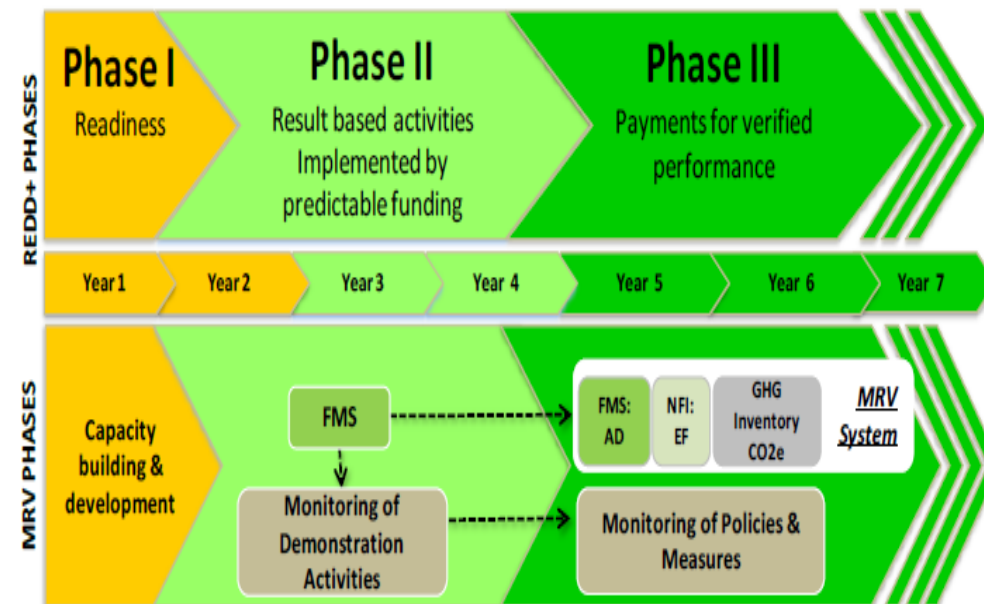
- i. Reducing emissions from deforestation;
- ii. Reducing emissions from forest degradation;
- iii. Conservation of forest carbon stocks;
- iv. Sustainable management of forests;
- v. Enhancement of forest carbon stocks

Phase 1: “Development of national strategies or action plans, policies and measures, and capacity-building”.

Activities here focus on capacity building, awareness raising and implementation planning, as well as the development of documents such as the present one, to describe the development and implementation of components for information, monitoring and MRV;

2. Phase 2: “Implementation of national policies and measures and national strategies or action plans that could involve further capacity-building, technology development and transfer and results-based demonstration activities”.

This phase requires the implementation of demonstration (pilot) activities to test strategies and methodologies, as well as i) a system to make freely available information on how the REDD+ safeguards are being respected and ii) a REDD+ monitoring system to monitor the outcomes of the demonstration activities;



Countries will need to define their national system for forest monitoring forest, safeguard's information and MRV and initiate capacity building of all the institutions involved, with a view to operationalising these institutional arrangements in Phase II. Another area of work I is the development of a national framework for REDD+ Policies and Measures.

This is a transition phase focusing on the implementation of results-based demonstration activities. The net outcomes of these activities will be assessed by a Land Monitoring System (LMS). The FMS will also contribute to providing information on some of the REDD+ Safeguards.

REDD+ will be fully integrated with other mitigation mechanisms under UNFCCC. The MRV System will become fully operational. Activity data (AD) and emission factors (EF) will be assessed to generate the national GHG inventory. This will require a LMS and National Forest Inventory (NFI) becoming fully operational. This Phase will result in payments for verified performance. The results will be verified by a roster of experts coordinated by the UNFCCC Secretariat.

Phase 3: “*Evolution of all the REDD+ activities into results-based actions that should be fully measured, reported and verified*”.

REDD+ is integrated with other mitigation mechanisms under the UNFCCC and national policies and measures are implemented across the country.

information system continues to provide information on the REDD+ safeguards as relates to national implementation; the REDD+ monitoring system is upgraded to monitor the outcomes of national REDD+ policies and measures; the MRV system assesses GHG emissions and removals in the forestry sector and to reports this to the UNFCCC Secretariat in a transparent, accountable and verifiable manner.

•REDD+ Readiness Program

In order to be ready for tapping climate change funds under REDD+ mechanism, it is important that GOB develops a REDD+ readiness program that will include:

- Preparing an effective REDD strategy to be developed in consultation with relevant stakeholders
- In-house capacity building in GOB Departments that deal with natural resources including Forest Department, Department of Environment (DOE) and Department of Fisheries (DOF)
- Designing and implementing a suitable monitoring, reporting and verification (MRV) system for forest carbon accounting
- Developing baseline scenarios and assessing historical rates for deforestation and forest degradation

- Community benefits sharing mechanism and enabling legal framework
- Enabling framework for carbon ownership rights, forest and land contractual arrangements. Establishing separable and transferable rights
- Identifying role of private sector under public-private partnerships arrangements
- Establishing a natural carbon registry.

•On-going REDD+ Program

The following REDD+ related activities have been completed under IPAC:

- Carbon forest inventory methods have been tested, designed and validated for assessing benchmark carbon stocks in identified carbon forest pools.
- Carbon forest growing stocks modeling has been attempted.
- Participatory monitoring indicators have been identified.
- Carbon stocks have been assessed in Chunati and Sundarbans mangrove forests.
- A major carbon policy workshop has been organized for senior policy makers and planners.

- **Two capacity building workshops have been organized for imparting to the field staff of FD, DOF, and DOE, and the students from National Universities.**
- **Carbon forest field inventory has been completed in Sundarbans mangrove forests and 6 PAs.**
- **A workshop has been conducted for writing carbon project proposals for the Sundarbans Reserve Forests and 6 PAs (Teknaf, Inani, Medhakochochia, Fasiakhali, Dudhpukuria, Dhopachari and Sitakunda).**

5. Experiences in assessing emission factors for the forest sector

- Experience from different inventory shows that, inventories are designed mainly based on project requirements and conducted to develop long-term (5-10 years) management plans.
- Field inventory designs are varied in different interventions. For example, circular cluster plots at 1 minute interval were applied in FRMP inventory (1996-97) throughout the forest areas, whereby NFA (National Forest Assessment, 2007) applied 1sq.km sample tracts with 250m X 20m rectangle plots at 10 minute and 15 minute interval.
- A unique inventory design throughout the forest landscapes and over time is crucial.

•The national Forest and Tree Resources Assessment of Bangladesh

- Country level NFA was undertaken for the first time during 2005-07 with the technical assistance of FAO. The NFA was designed under “Strengthening capacity to generate quality information on forest resources” project of FD.
- Topographical sheets of 1: 50,000 scale maps produced by the Survey of Bangladesh were used to delineate the tracts. 299 tracts were identified and they were systematically distributed throughout the country at an interval of 15 degrees latitude and 10 degrees longitude.
- A globally harmonized classification system was developed and five major land use classes were identified for the inventory.
- Finally, 29 land use classes were identified for field data collection.

- **Field data collection comprises multiple functions of forests and trees, covering their socio-economic, environmental as well as productive functions, associated with a wide range of variables and collected using different methods.**
- **A group of trained field crews collected the data. Wall-to-wall Landsat TM satellite imagery was used to identify the land use classes.**
- **Ground truth data was collected to classify the imagery.**
- **The country was divided into four parts and the images were accordingly mosaicked. These mosaics were used for visual interpretation of the land use types and on screen digitization was carried out to separate the classes. Accuracy was not checked for the classified images.**

- **The forest Carbon inventory for the natural mangrove**

- FD has an experience on carbon inventory on SRF under the USAID-funded IPAC project during 2010.
- For this carbon inventory, a Tier 3 approach (IPCC guideline) was considered. The carbon inventory methodology followed a similar sampling design and data collection methodology that was used in forest inventory of 1995 for the forest.
- Systematic sample grids and a clustered plot composed of five circular subplots were employed for data collection.
- 150 plots were measured to calculate the carbon. Trees, non-tree vegetation, dead wood, and soil were measured for the forest.

- Several trained inventory team collected the data from the forest.
- Strict precautionary measures were taken in the process of data collection and data entry to minimize errors.
- Aboveground and root Carbon pools were computed using both locally derived allometries (via destructive harvests of various shrub species outside the plots) and international standard common mangrove tree allometries combined with local tables of wood density by tree species.
- Soil C storage was calculated as the product of soil Carbon concentration, soil bulk density, and soil depth range.
- FD staffs and other team members were trained on field data collection, data recording, standardized measurement procedure/techniques, field plot layout, soil sample collection by the project prior to starting the inventory.

•Chunati Wild Life Sanctuary Carbon Inventory

- Chunati carbon inventory was conducted during 2008 by Inventory Division of BFRI.
- Soil organic carbon, above-ground biomass, below-ground biomass, and on-ground biomass were measured for the WS. Trained crews collected the data. FD and Co-management Committee (CMCs) staffs were included in the inventory team for data collection.
- Growing stocks were estimated for each of seven identified land-use categories by using the field data and growing stock models as developed by the Forest Inventory Division of BFRI.
- Carbon sequestration rates were then estimated by following the methods as developed under CDM/IPCC procedures. Soil carbon analyses were done in the laboratory of the Soil Sciences Division of BFRI.

The forest inventory data was analyzed for estimating growing stock in terms of volume, biomass and carbon stock changes in baseline and mitigation scenario for different reforestation technologies.

The use of volume equations for different tree species as developed by BFRI was examined for their application.

- **Forest carbon inventory for protected areas**

- USAID funded IPAC project of FD conducted Carbon inventory for other six PAs.
- Tier 3 approach (IPCC guideline) was adopted for field inventory and carbon assessments.
- Clustered plot composed of five circular subplots was employed to collect tree, non-tree vegetation, leaf litter, dead wood data and forest soil by trained field crews. set systematically.

- **Total number of plots was estimated for different PAs as: 41 plots for Medakchapia NP, 72 plots for Fasiakhali WS, 62 plots for Dudpukuria-Dhopachari WS, 56 plots for Inani forest reserve, 35 plots for Sitakunda hill reserve and 54 plots for Teknaf WS.**
- **Variable square grids with appropriate minute intervals were laid out on the maps by RIMS Unit depicting these plots. Plot locations were set systematically.**

- **Regional activities on forest inventories**

- **FD strengthens its capacity towards to conduct carbon inventory for the forest areas.**
- **The South Asian Association for Regional Cooperation (SAARC) arranged a five day international training workshop that conducted by the FD's trained staff to disseminate the carbon inventory methodology to the international community.**

•Overall carbon sink in the forests of Bangladesh

•Owning diversified forest ecosystems, i.e., wet forest lands, rain forests, moist deciduous forest, semi-arid areas and mangroves, Bangladesh forestry sector is acting as an important carbon sink.

•It has been estimated that about 5000 species of higher plants with thick foliage and species diversity occur in Bangladesh.

Forest types	Aboveground biomass tdm ha ⁻¹	Underground biomass tdm ha ⁻¹	Total biomass tdm ha ⁻¹	Carbon stock tC ha ⁻¹
Closed large-crowns	206-210	32	242	121
Closed small-crowns	150	23	173	87
Disturbed closed	190	29	219	110
Disturbed open	85	13	98	49
Average				92

(Shin *et al.*, 2007)

- **Experiences in developing the GHG inventory**

- Bangladesh as a Non-Annex-1 country party to the UNFCCC has to prepare a national Communications to the Conference of the parties in accordance with article-4, paragraph-3 of the convention.
- Department of Environment, Ministry of Environment and Forests prepared its Initial National Communication to the UNFCCC in October 2002.
- DoE has completed the study on Second National Communication and published the report this year.
- At present DoE conducts the national communication with the support of different research organization and experts.

•Initial National Communication (INC)

- Bangladesh has prepared its Initial National Communication (INC) and this includes the National Circumstances; Greenhouse Gas Inventory (for 1994), Vulnerability and Adaptation, Mitigation and Climate Change Response Strategies.
- According to this communication report, the main areas of GHG generation are energy, industrial process, agriculture, land-use change and forestry and waste sectors.
- The national GHG inventory was carried out for a base year 1994 following “Sectoral Approach” of revised IPCC guideline 1996.
- The Initial communication report exhibits that in Bangladesh, CO₂ emission has been the **largest from the energy sector (62.74%) followed by land-use changes and forestry sector (32.26%) (MoEF 2002) respectively.**

- According to the INC report, total carbon uptake was **6155.73 Gg** and carbon released was **8293.36 Gg** in 1994.
- That means that there is a net Carbon emission of **2137.62 Gg**, which is equivalent to **7837.97 Gg of CO₂** emissions from Land Use Change and Forestry sector (MoEF 2002).

- **Second National Communication (SNC)**

- Bangladesh has initiated Second National Communication (SNC) project to fulfill its voluntary obligations to the UNFCCC.

- Five major activities are covered under the inventory, which include:

- (i) Energy (including biomass burning, transport sector, etc.):

- (ii) Industry (cement manufacturing, fertilizer, pulp and paper, etc.);

- (iii) Agriculture (ruminant livestock, livestock and manure management, wet rice cultivation, etc.);

- iv) Waste and refuse management (municipal waste, waste water treatment/management, etc.);

- (v) Land use change and forestry (change in forest cover and woody biomass, change in forest land use, etc.).

- According to the draft report of SNC, there is a decreasing trend in the carbon dioxide emission in the LUCF sector during 2000/01 – 2004/05 years.
- Total carbon emission due to LUCF was **28418.97 Gg** in 2000/01 and **18205.52Gg** in 2004/05.
- This decreasing trend may be attributed to the increase in the social forestry (MoEF 2012).

Thank You

Session 12

Livelihood: Value Chain Analysis and Market Potential for Biodiversity Conservation

1.The Generic Value Chain Approach

- A value chain represents the full range of activities required to bring a product or service from conception, through the different phases of production and delivery, to the final consumer and disposal after use.
- Example:** Farmers use inputs like seed, fertilizer and pesticides, cultivate paddy, sell them to rice mill owners; millers husk the paddy into rice, sell rice to wholesalers; wholesalers sell the rice to retailers; retailers sell rice to us – the household level consumers. The whole process that brings rice from farmers through different processes to us is called the Value Chain.
- A value chain is defined by its raw materials and the target market or market segment it caters to.

- The value chain approach is a heuristic, analytical, and strategic tool that provides a framework for identifying and examining a value chain's different actors, the dynamics of processing and value creation, reward and distribution, power relation structures, and knowledge transfer.
- The aim is to explore potential leverage points that will help in developing a systemic competitive value chain that enables inclusive and sustainable economic growth (Kaplinsky and Morris 2000).



Source: Winrock International, 2014systemic

- **Types of approaches**

There are two approaches for value chain – narrow approach and the broad approach.

Narrow Approach: In the narrow meaning, a value chain includes the range of activities performed within a firm to produce a certain output.

• This might include: the conception and design stage, the process of acquisition of input, the production, the marketing and distribution activities, the performance of after-sale services, etc. All these activities constitute the ‘chain’ which link producers. On the other hand, each activity adds ‘value’ to the final product.

Example: Walton imports different parts and assemble television in Bangladesh. Then they, through their distribution channels, supply TV in different cities and towns from where we buy TV sets.

• This is the television value chain in a narrow meaning .

Broad Approach: The ‘broad’ approach to value chain looks at the complex range of activities implemented by various actors (primary producers, processors, traders, service providers, etc.) to bring a raw material to the retail of the final product.

- The ‘broad’ value chain starts from the production system of the raw materials and will move along the linkages with other enterprises engaged in trading, assembling, processing, etc.

Example: In the rice value chain, farmers produce paddy taking inputs from input suppliers, and collectors collect paddy from farmers.

- Collectors then sell the paddy to paddy wholesalers, who later sell it to rice millers.

- Millers convert paddy into rice and sell it to rice wholesalers, who then sell rice to retailers.

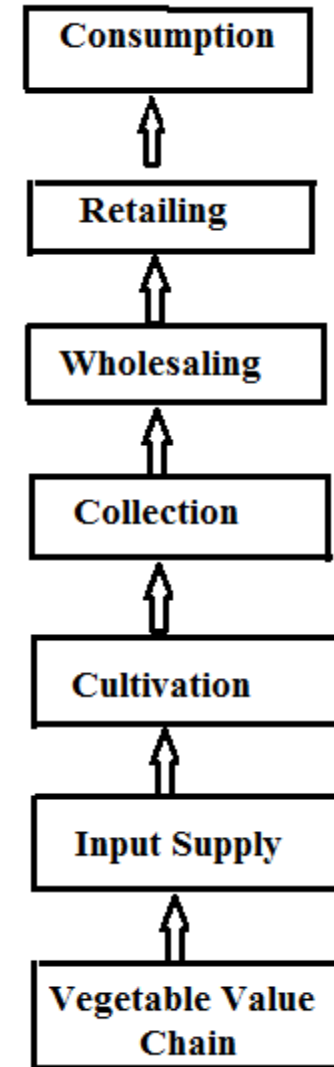
- Retailers sell rice to consumers.

- The main difference between these two approaches is the number of actors involved in the chain. In narrow approach, generally works within one single actor – for example within one company.
- On the other hand, the broad approach does not only look at activities implemented by a single enterprise. Rather, it includes all its backward and forward linkages, until the level in which the raw material is produced will be linked to the final consumers.

2. What are Value Chain Functions?

- As mentioned in the definitions – there are several broad activities involved to transform the product from concept till the end consumer.
- Each of these activities is called Value Chain Function. For example, in the Rice Value Chain, all the broad activities like cultivation, husking, wholesaling, retailing, etc. are required for the rice to reach to the household level consumers.
- All these activities are value chain functions.

Example
Function: of



3. Who are the Value Chain Actors?

Individuals, group of individuals or entities performing activities under a function are the value chain actors.

Example: Seed Retailers, farmers, Retailers, etc.

There are three types of actors in value chains:

- Core Value Chain Actors
- Support service Providers
- Regulatory Actors

Core value Chain Actors

- Core value chain actors purchase the product from the immediate backward function actors, add values and sell the product to the immediate forward function actors, usually for a profit.
- Purchase and sales of the value chain product is a must activity for core value chain actors. Generally all the actors performing value chain functions are the core value chain actors.
- There is a clear business incentive (in most cases, profit) for the core chain actors to participate in the value chain function.

Example: Rice wholesalers purchase rice from rice mill owners and sell to retailers. Mill owners are the backward linkage function actor to wholesaler and retailers are the forward linkage function actor to wholesaler.

- All these three actors (mill owner, wholesaler and retailer) are core value chain actors.
- Sometimes core value chain actors perform more than one function. For example, Chili and maize farmers, apart from cultivation, also perform the drying function.
- In most of the times, there is more than one type of actor performing one function. **For example**, small, medium and large, all types of farmers produce vegetables. Similarly, there are rural retailers and urban retailers, both perform the function retailing in vegetable value chain.

Support Service Providers

These actors provide services to core value chain actors against service charge, but do not get involved in purchasing products or selling product to another actor.

Example: Truck owners provide transportation services to rice mill owners to transport rice from mill to wholesale market, but they do not buy rice from rice mill or sell it to wholesalers.

Truck owners are one type of support service providers. **Other examples** of support service providers include – financial service providers, marketing service providers, research institutes, training providers, extension service providers, etc.

Regulatory Actors

- Regulatory actors establish, change and impose regulations, rules, standards and norms in the wider environment, which facilitates or regulates product transformation within the value chain.
- These actors do not get involved into any financial transactions with the core or support value chain actors.

Example: National Board of Revenue (NBR) sets different types tariffs that regulate export and import of different products from agricultural value chains.

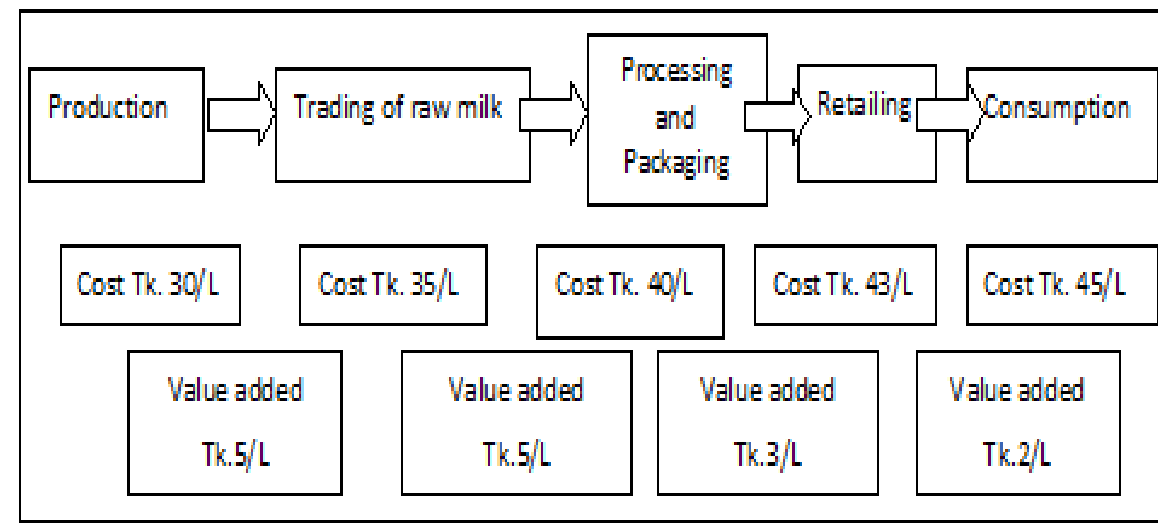
Union Parishad regulates the rules in the local bazaars. Seed Certification Agency allows or restricts certain types of seed to be used by the farmers. These are example of regulatory actors.

4. What is Value? How Value is added in Value Chain?

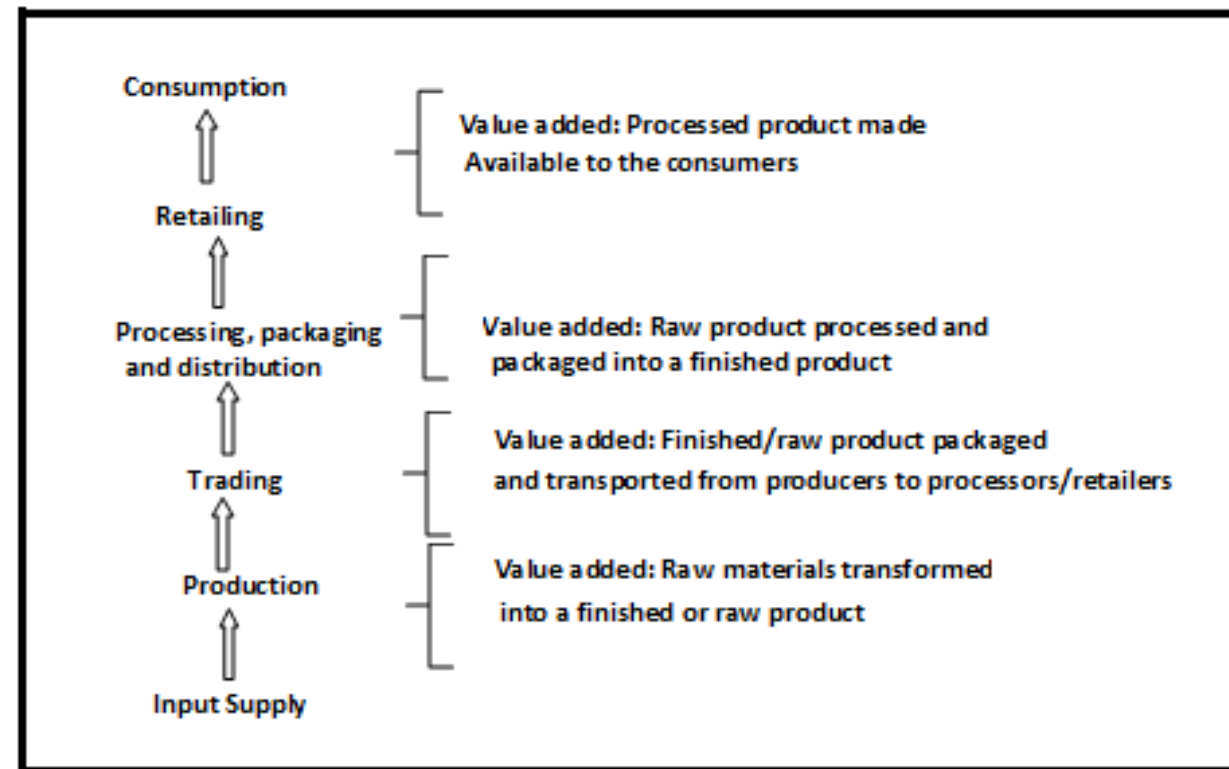
•It is the difference between the direct cost to one value chain actor and the price paid by the immediate value chain actor.

•For instance, milk traders buy raw milk for Tk. 50/litter and then sell it to the milk processing centers for Tk. 55/liter.

•Therefore, the value added at the trader's level is Tk. 5/liter. In other words, it is the difference in the cost of the product at each level or function in the value chain.



- The value added is different from profitability.
- While accounting for profitability we need to consider all direct and indirect costs.
- While accounting for value added we only consider the direct input cost.
- In the example, the profitability of the farmers will be lower than the value added if we account for the marketing costs of the dairy milk producers.



5. Basics of Climate Resilient Value Chain Development Approach

- Natural environment has a significant role on all value chains.
- Climatic conditions like rain, soil condition, etc. affect the production of agricultural products. Variation of these conditions has impact on production volume and price at the end market.
- Climatic conditions not only affect agricultural products, but also livestock products (like cattle, goat, poultry, etc.).
- **For example**, dairy cattle in chars have higher fat content in milk due to abundance of some special varieties of natural fodder in those areas, resulting in higher price for the milk in comparison to mainland dairy cattle milk to the processors.
- Climate not only has impact on production, but also processing (e.g. maize drying, paddy processing, fish processing, etc.), transportation, storing and other value chain functions.

•Nonconformance to climatic conditions, nature and ecosystem has different adverse effects on the value chain activities:

•Reduce flow of inputs for the value chain production function (e.g. reduction of fodder for dairy value chain, decrease of natural food for duck rearing, etc.).

•Reduce production volume and/or yield through reduction of soil fertility, micro nutrients, underground water, level and other natural conditions.

•Increase rationale for excess input usage (like pesticides and fertilizer) and thereby increase the production cost.

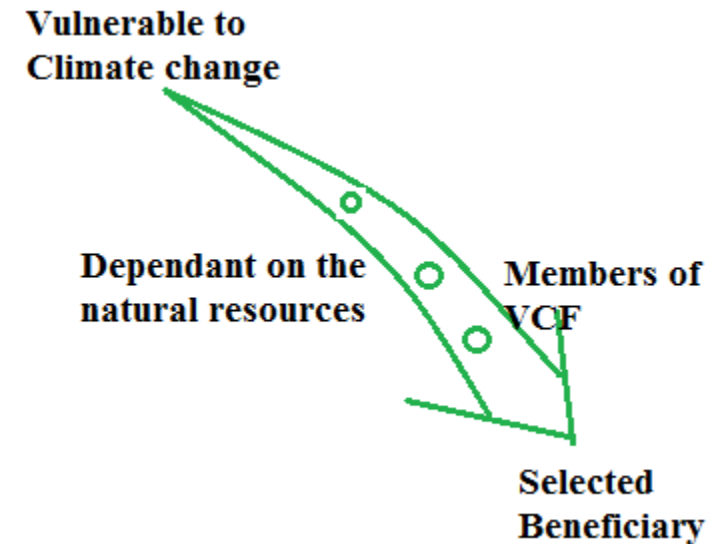
•And many other adverse effects.

- Due to these impacts, the value chain activities end in decreased profit for the actors, which ultimately result in poverty and vulnerability for the actors.

- Hence, value chain activities should be resilient with ecosystem and climatic conditions in the area in which these are being carried out.

- Value chain practitioners, now-a-days suggest climate resilient value chain activities to be carried out by actors.

- Climate resiliency in value chain activities refers to those commercial activities that conserve the ecosystem and have limited adverse effects on climate.



Value chain activities can be climate resilient through performing value chain functions in a way that:

- ... minimizes utilization of non-renewable resources from natural sources like forests, wetlands, seas, etc.
- ... minimizes effluent discharge (solid waste, waste water, chemical residuals, sound, etc.) to the nature by different value chain functions.
- ... have no or limited impact on flora and fauna in performing ecofriendly value chain functions.
- ... enhance climatic conditions (like soil fertility, underground water level, etc.) through utilization of ecofriendly technology (e.g. natural fertilizers and micro nutrients, utilizing ground water for irrigation, etc.)
- ... and/or conserve the overall ecosystem in a geographic location.

6. What is Climate Resilient Value Chain (CRVC) Development

•Climate Resilient Value Chain Development is a **deliberate attempt to support** poor, vulnerable and disadvantaged demographic groups to include into market as value chain actors, enabling them to add values that result in income increase for them, in a sustainable way that have minimum adverse impact on the environment and climatic condition in the geographic area in which the value chain activity is being carried out.

CRVC development, thus focus on the following issues:

- Sustainable income increase for poor and vulnerable and thus reducing poverty
- Mainstreaming disadvantaged demographic groups
- Sustainable natural resource usage and reduction of negative environmental impacts.

CRVC results in sustainability in:

- Linking poor with growing and high value markets
- Developing vibrant and competitive industries
- Attracting private and social investments
- Creation wealth for communities
- Conserving ecosystem
- Ensuring benefit for the whole community rather than target groups.

7. Relationship with Conventional Value Chain Development Approach

- The conventional value chain development approach followed by development agencies and practitioners over the last few years is aimed at driving economic growth with poverty reduction through the integration of large numbers of micro- and small enterprises (MSEs) into increasingly competitive value chains.
- The classical value chain development approach looks at ecosystem conservation as a secondary objective, while CRVC assumes it one of the primary objectives, in parallel to poverty reduction and livelihood development.
- The target beneficiary is also bit different in CRVC development approach.

- The classical value chain approach targets the poor community as a whole, irrespective of geographic location or market and works to mainstream the whole community.
- In comparison to this, CRVC development approach mainly targets the community relying on natural resource extraction from sources like forests, wetlands, coastal areas, water bodies and similar perishable natural resource bases.
- Hence, CRVC development approach can be characterized as a specialized and focused area of the classical value chain development approach.

8. Potential Roles for CREL project stakeholders in CRVC Development Approach

Community People:

- Community people refer to people living in protective areas, core zones and buffer zones of the target geographic areas.
- The community people in a climate resilient value chain should play the role of different vertical and horizontal linkages.
- In the geographic areas, similar to the target area for CREL, there are two broad categories of community people – the resource extractors and the non-resource extractors.
- The non-resource extractors are often found to be playing the roles for core value chain actors for a specific value chain and a specific market system.

- They generally do not rely on natural resource extraction for their livelihood. Rather, they perform specific value chain function and are linked vertically and horizontally with other value chain actors.
- The resource extractors, however, are the target for CREL project. But in most of the cases, they rely on utilizing natural resources for their livelihood in an adverse way, which hearts the very essence of the CRVC approach.

Source: Training module: Climate Resilient Value Chain Dev. Approach, CREL Component, 2013

- The potential role for CRVC development approach is to enable both categories of community people into different core value chain functions in a way that they can enhance their livelihood without minimum resource extraction from nature and causing limited or no negative impact to the ecosystem and climatic condition.
- In ideal climate resilient value chain development process, the community people have **vertical transaction** among themselves in the form of producer, collector, wholesaler, retailer, etc.
- Alongside vertical linkage, successful **horizontal relationship** is also feasible in form of synchronized or group; production, collective trading, etc. among the community people.

Example: In one of the Green Value Chain projects in Uganda, the community living near reserve forests in northern Uganda are engaged in ecofriendly fisheries value chain activities in which, some of the community members cultivate fish, while a few others collect those and sell to nearby town wholesalers.

The collectors, also collect good quality fish fries from the town hatcheries, sell those among the farmers, and also disseminate updated knowledge on fish cultivation.

Thus, a successful vertical integration is established among the reserve forest communities, which reduces the natural resource extraction from the forest and at the same time, enhances livelihood through income increase.

Community Based Organizations (CBOs):

- Community Based Organizations (CBOs) includes Co Management Council (CMC) members, Resource Management Council (RMC), Village Conservation Forum (VCF) (some of the members of this group are common with category a stakeholders), etc.
- CBOs primarily play advisory and support service role in climate resilient value chain programs.
- CBOs provide information on natural conservation and poverty reduction, enhance capacity of the community on these issues, provide advisory services on identification of new markets and enhance linkage with existing market, etc.
- CBOs also set norms, rules and regulations and enforce the conformance of those regulations by the community people. From this aspect, CBOs also perform the role of regulatory actors in CRVC development programs.

Why should we go for Climate Resilient Value Chain Development?

It drives the market towards the producers rather than driving the producers towards the market

- If a development project aims to drive the poor producers towards the market the risk is that it ends up supporting production of products that are not demanded by the market or the market is not ready to consume the product and pay for it.**
- However, if the market is driven towards the producers, the producers are guaranteed that there is a buyer which is willing to pay for the produce. Value chain development instigates the project to undertake demand driven interventions.**

- It fosters collaboration between value chain actors....

The actors in the value chain support each other because of their own commercial interest, this reduces dependence on the project support.

- It helps unleash the untapped potential of the poor....

For instance they might have certain skills which are invaluable for the market but the market never took that skill into recognition; they might have certain products or with little support they might produce certain products that the market is looking for but did not know who were producing it or who could produce

- **It conserves the ecosystem through decreasing dependencies on natural resource extraction....**
- **The climate resilient value chain development approach provides sustainable alternative income generating options for natural resource dependent communities, say resource extractors.**
- **So it reduces the natural resource dependencies.**
- **At the same time, the approach encourages ecofriendly value chain activities (e.g. ecotourism), while reducing the negative environmental impacts from each of the value chain functions (like lower emission, usage of green technologies, etc.), thus assisting in ecosystem conservation.**

It encourages participation of CBOs in ensuring sustainability of intervention impacts....

•CRVC approach encourage CBOs like Co-Management Councils (CMCs), Resource Management Councils (RMCs), Village Conservation Forums (VCFs) and other community based organizations to participate in the value chain as support service providers, regulatory actors and/or facilitators to ensure sustainability and provide advisory services for poor, natural resource dependent community people.

It reduces use of project's resources and increases value for the donor's money....

Since the interventions are implemented jointly with private sector actors and the private sector actors share a major part of the intervention cost the project can do more with their development fund and human resources.

9. Selection of Beneficiaries for CRVC Development

- Beneficiary identification is one of the most critical aspects in climate resilient value chain development.
- Success of such program depends on identifying the most vulnerable natural resource extractors and designing alternative income source for them so that they do not depend on resource extraction for their livelihood. Beneficiary selection involves –
 - Criteria definition
 - Wider community assessment
 - Poverty assessment and
 - Beneficiary selection and validation.

Criteria Selection:

- Criteria should be in line with the project objectives, as well as, the broad communal poverty reduction objectives.
- The criteria should have the potentials to identify most vulnerable members of the community, who depend on the natural resources in the target geographic area. Vulnerability can be both economic and climatic.
- Side by side, discussion with experts on the local context, including representatives from CMCs, RMCs and VCFs will result in effective selection process.

Community Climactic Assessment:

- This is a throughout community assessment, which must include all the community people living in the target geographic area.
- The objective of this assessment should be to identify the community people vulnerable to climate conditions, irrespective to their economic conditions.
- The assessment should have two aspects – vulnerability of community people against climate changes like increase of salinity, sea-level rise,, cyclone, draught, flood, etc. and dependence of the community people on natural resources extracted from sources like forest, wetlands and seas.
- The assessment will also identify whether the community people are willing to conserve ecosystem and climatic conditions or not.

- The result will be a preliminary list of target beneficiaries, who are the most vulnerable within the community, depending natural resource extraction for their livelihoods.

Poverty Assessment:

After identifying the preliminary list of beneficiaries from the climactic assessment, a poverty assessment should be conducted among the preliminary listed beneficiaries.

The assessment should reveal a brief poverty context of the beneficiaries including – Socio-economic and demographic profile of the preliminary listed beneficiaries; Growth, competitiveness potential and challenges, and Key trends prospects, drivers and barriers to poor's participation in economic mainstream etc.

10. Conservation and Tourism :A Value Chain Approach

- Tourism as a tool for sustained socio-economic development is increasingly utilized by donors and beneficiary countries.
- Frequently, Poverty Reduction Strategy Papers incorporate tourism activities as a means to generate alternative incomes in rural areas, finance infrastructure improvements, diversify employment opportunities, and attract foreign direct investment.
- Along with generating revenue, tourism also acts as a driver for general economic development, supporting a variety of local and national businesses, such as restaurants, hotels, transportation and guiding within areas of high biodiversity.

- With 700 million people traveling each year and over 33,000 protected areas (PAs) worldwide, nature-based tourism is a growing source of revenue for the management of Protected Areas, and the communities living within and around them.
- While poorly planned tourism can lead to problems such as waste, habitat destruction and the displacement of local people and wildlife, with sound planning nature-based tourism can provide tremendous incentives for conservation.
- Biodiversity conservation planners around the world need to work with nature-based tourism stakeholders, as they are an important ally in the struggle to preserve the natural environment.

- PAs receive millions of visitors and for some PAs, the fees charged for entry or for recreational activities, generate significant revenue.

Example: In South Africa for example, approximately 60% of all foreign tourists visit a national park or game reserve. With this income, the South African National Parks Board finances up to 80% of its annual budget from tourism receipts alone.

- Nature-based tourism can generate viable economic alternatives for local people living near Biodiversity Hotspots and areas of high biodiversity.

- Thoughtful tourism policies, strategic planning, and community involvement in nature-based tourism development can help ensure sustainable use of natural resources with maximum benefits for the local communities who are their stewards.

- Without alternative economic opportunities natural resources will most likely continue to be threatened or degraded and local communities stuck in a poverty cycle
- **Requirements for Tourism Value Chain activities**
 - planning and developing community-based enterprises
 - creating protected area public-use management plans
 - training and capacity building
 - developing competitiveness strategies with stakeholders
 - working with the private sector to develop good practice guidelines
 - creating strategic partnerships within the tourism industry

- **Governments and others as stakeholders in tourism development can take a initiative in Bangladesh for precise and comprehensive value chain-based approach to tourism development.**
- **This approach enables stakeholders to strategically prioritize opportunities, constraints and develop high-impact upgrading activities.**
- **This approach will also ensure that threats to natural resources and opportunities to generate more income for conservation are incorporated explicitly.**

Source: Conservation International

http://www.ourfutureplanet.org/newsletters/resources/CI TourismValueChain07_02.pdf

•Nature-Based Tourism Value Chain Analysis

•Nature-Based Tourism Value Chain Analysis (TVCA) identifies actors, roles, relationships, costs, opportunities and constraints, incentives for upgrading and flows of information and benefits among critical actors in the tourism value chain.

•TVCA focuses on increasing the value of the natural resource capital found in many Biodiversity Hotspots. This is achieved by improving the competitiveness of micro and small enterprises in the tourism sector with an innovative approach to yield economic growth, poverty reduction and increased conservation.

•The TVCA framework provides the methodology to organize and understand the constraints to competitiveness of nature-based tourism and to systematically identify key interventions.

- IPAC develops a national level eco-guide network of engaging youth who participate in new career opportunities made available to them, facilitates eco-cottages with local entrepreneurs, and maintains new trails of protected areas by networking with tour and hotel operators as well as the Government of Bangladesh.
- IPAC believes that through eco-tourism value chain development new opportunities will arise and thrive for both the community people and the environments sustained recovery.

•CREL Objectives of value chain Tourism

Since all the projects within CREL working areas are focused on poverty eradication and climate conservation, CREL aims to develop the nature based tourism potential of selected sites with two objectives:

- (i) To look for opportunities that the target beneficiaries can utilize and can be integrated into the value chain as a mainstream actor. If the target beneficiaries are already involved in the chain actively, the strategy would define opportunities to increase the scope of value addition by the beneficiaries.
- (i) In doing the mainstreaming, the environment and climactic conditions are unharmed, through minimum utilization of natural resource extraction and minimum adverse impact on environment due to value chain activities.

Thus, the challenge for this project is to maintain the balance between sufficient revenue generation opportunities for sustainable livelihood while controlling the damaging ecological impact of tourist presence and consequent commercialized development of the surrounding areas.

- **Community-based Nature based tourism:** One important contribution in the nature based tourism framework came from Community-based Nature based tourism of Kersten (1997) who defined Community-based Nature based tourism as a kind of nature tourism wherein the local community maintains full (or major) control over the management and the profits of the project.
- The emphasis of this strategy is community development and participation of the marginalized sector (including indigenous groups) rather than on regional or national development.

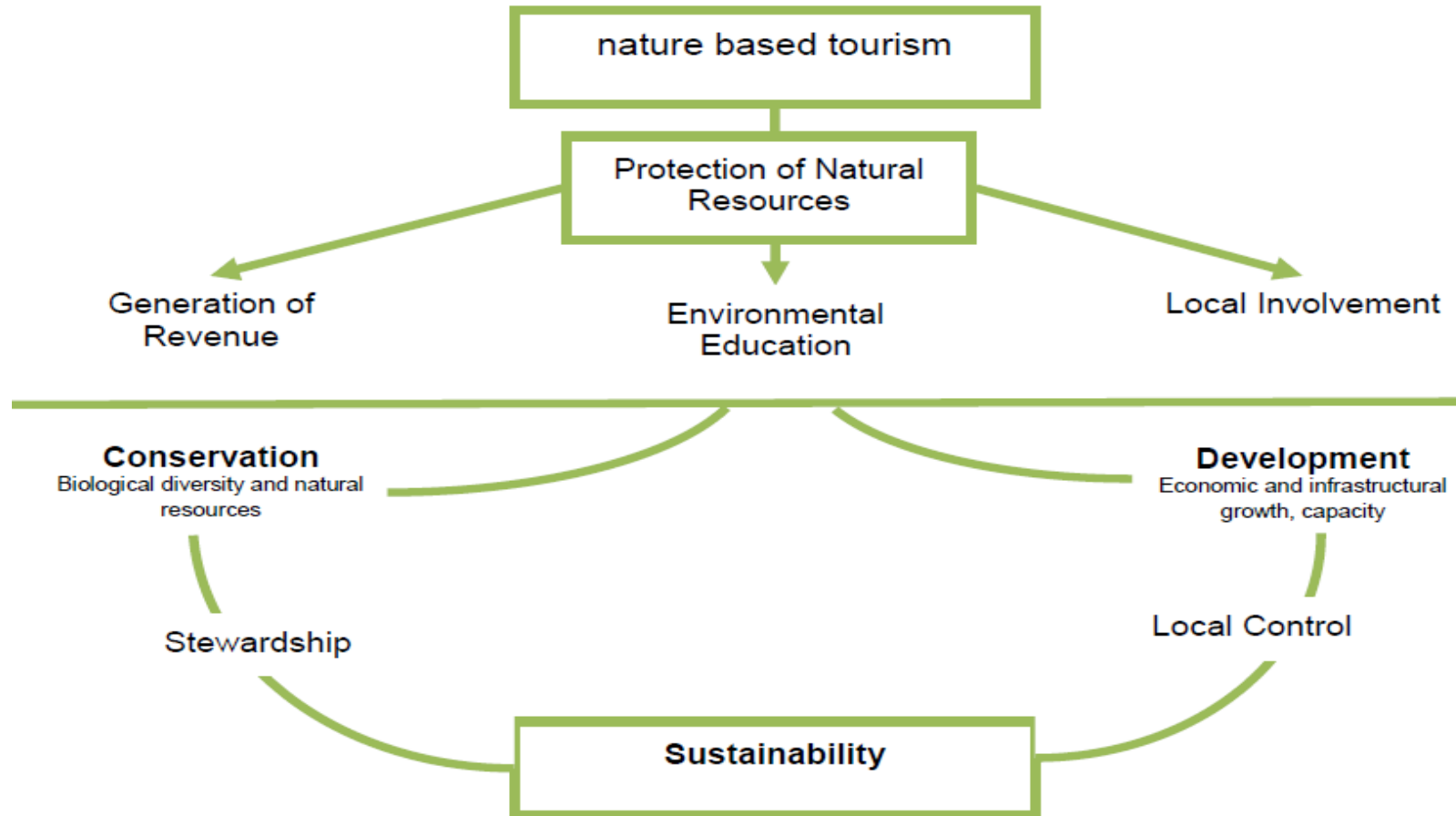
The main focal areas of the Nature Tourism Strategy framework would be divided into five (5) strategic components. They are in order of priority:

- **Capacity Building**
- **Establishing Public/Private Sector Partnerships**
- **Product Development**
- **Marketing**
- **Implementation and Monitoring**

Strategy Framework Sequence of Activities:



Schematic Diagram for Nature based tourism

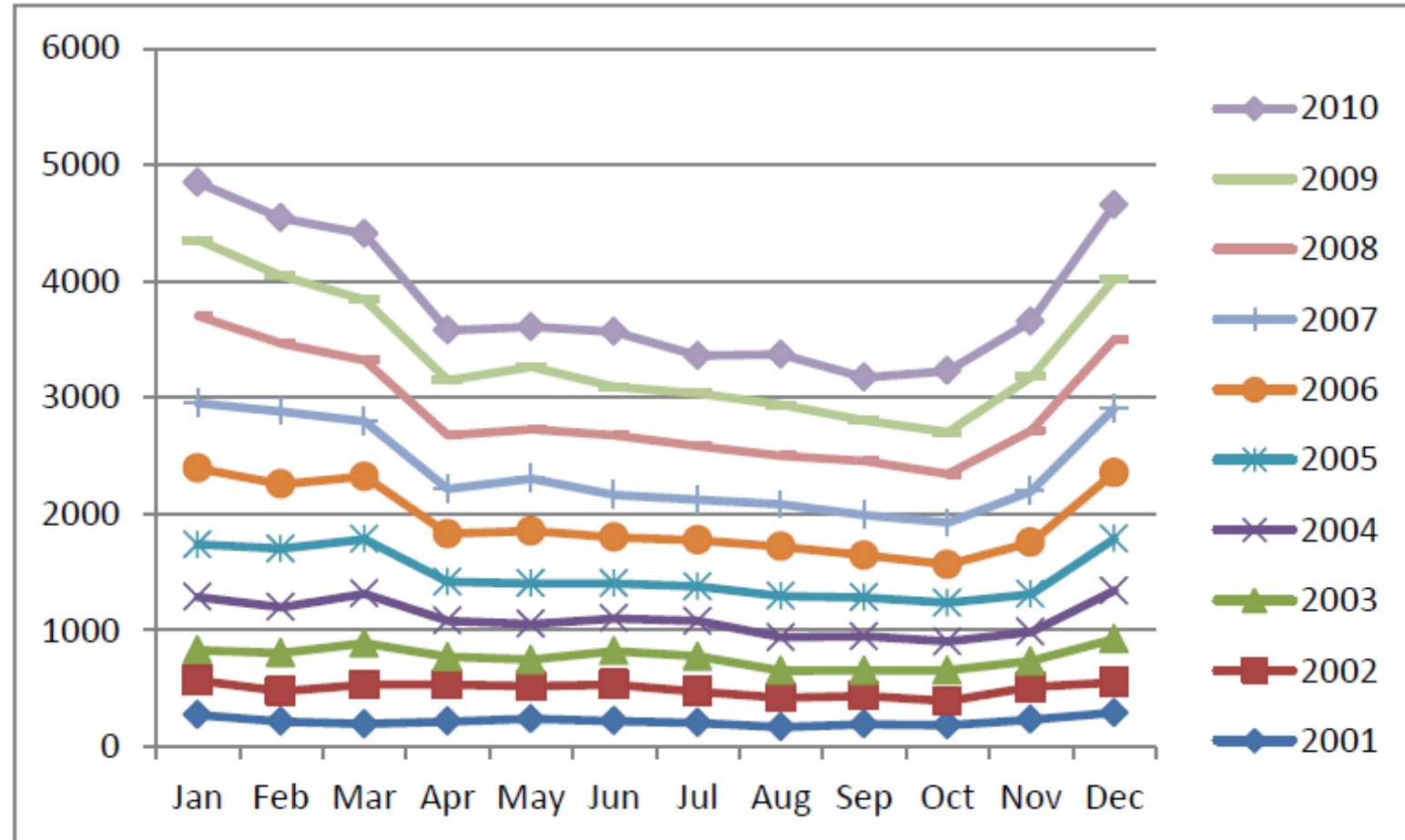


- **Market Size in case of Tourism**

- Tourism in Bangladesh is managed by Bangladesh Parjatan Corporation (BPC) under the Ministry of Civil Aviation and Tourism (MCAT).
- Very recently World Travel and Tourism Council's Bangladesh Country Report 2010 forecasted that the contribution of Travel and Tourism (TT) to Gross Domestic Product (GDP) is expected to rise from 3.9% (BDT 265.9bn or USD 3,786.4mn) in 2010 to 4.1% (BDT 788.4bn or USD 8,781.7mn) by 2020.
- The Real GDP growth for the Travel and Tourism Economy (TTE) is expected to be 1.7% in 2010 and to average 6.4% per annum over the coming 10 years.
- The contribution of the TTE to employment is expected to rise from 3.1% of total employment, 2.37 million jobs or 1 in every 32.3 jobs in 2010, to 3.2% of total employment, 3.11 million jobs, or 1 in every 31.1 jobs by 2020

Foreign Exchange Earnings from Tourism and other Travels (2001-2010)

Source: Bangladesh bank, Foreign Exchange Earnings, 2010



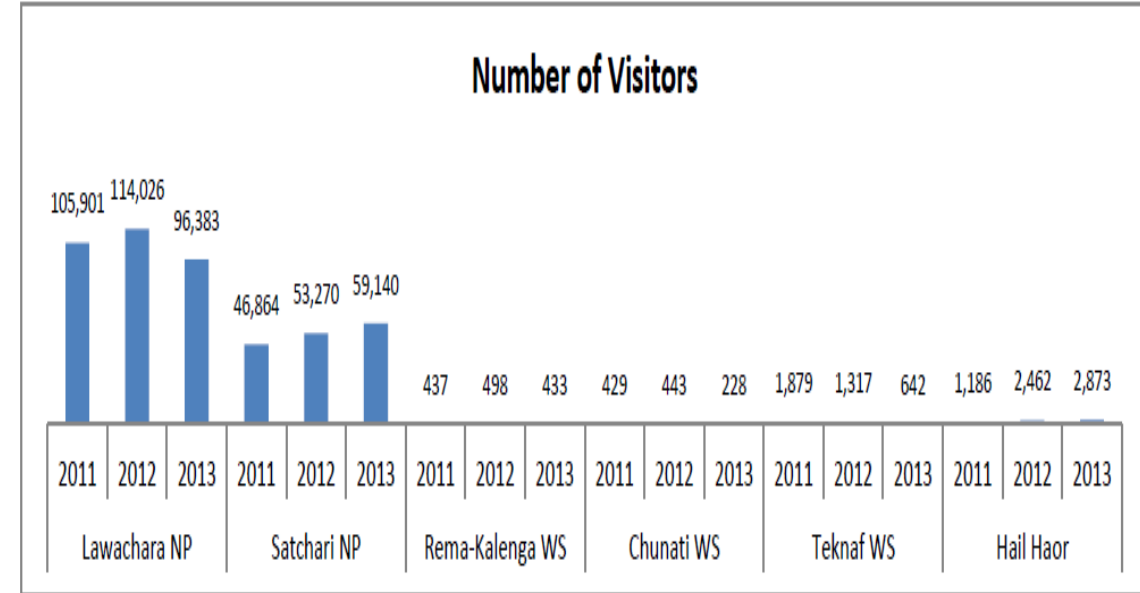
²Source: Bangladesh Bank. N.B: Foreign Exchange Earnings 2010 All Figures are Provisional

•Potential Increase in Number of Tourist

•The number of tourists has been increasing trend for the last 3 years (2011-2013).

•From the table below we can see that numbers in reported nature based tourism sites has been consistently increasing.

• Few noticeable characteristics that we see from these numbers are – Lawachara NP, Chunati WS & Teknaf WS has lower number of tourist in 2013, which is mostly due to the unrest country condition affecting tourism in those areas..



- But the number has increased in other 3 (three) sites since they are situated outside of the main town.
- Also, there's a very large number gap between LNP & SNP with other sites. This gap is an indicator of sheer lacking of the nature based tourism infrastructure in those areas.
- RKWS & HH are located in comparatively remote areas with hard to access transport situation. Nearly same distance oriented problem prevails for both CWS & TWS.
- But putting these problems aside, tourists are getting more and more interested towards nature based tourism.
- Despite the lack of infrastructure more tourists are visiting these locations to experience the nature's beauty through nature based tourism

Eco-Tourism Sites in Bangladesh

Lawachara NP
Satchari NP
Rema-Kalenga WS
Khadimnagar NP
Hail Haor
Tanguor Haor – ECA/RS
Hakaluki Haor ECA
Modhupur NP
Bhawal NP
Turag-Bangshi
Kangsha-Malijhee

Teknaf WS
Teknaf Peninsula -ECA
Chunati WS
Fasiakhali WS
Medha Kachapia NP
Himchari NP
Inani – Forest Reserve
Sita-kunda Eco-park
Kaptai NP
Dudpukuria WS
Sundarbans

IPAC also
developed
some **Guides**
for these sites.

Thank you

Value Chains in Southwest Region



Schematic Diagram for Nature based tourism

