

# SECURITY IMPLICATION OF CLIMATE CHANGE: A Case Study of Bangladesh

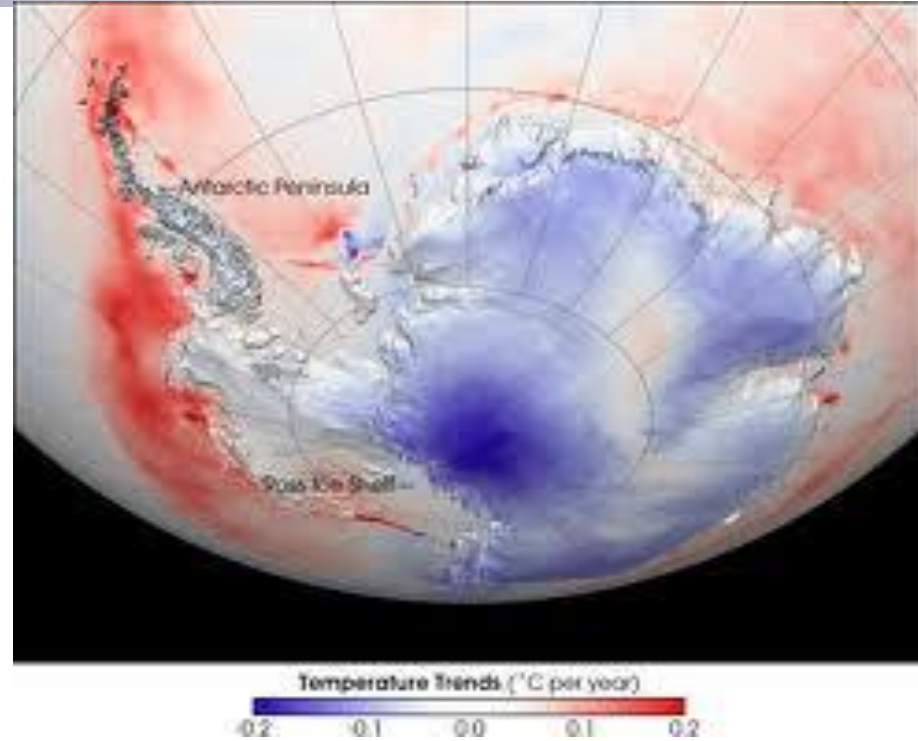
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**President**

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# Flow of Presentation

- Introduction
- Issues of Climate Change Security
- Geo-demographic Profile of Bangladesh
- Security Implications of CC for Bangladesh
- Conclusion and Recommendation



# Introduction



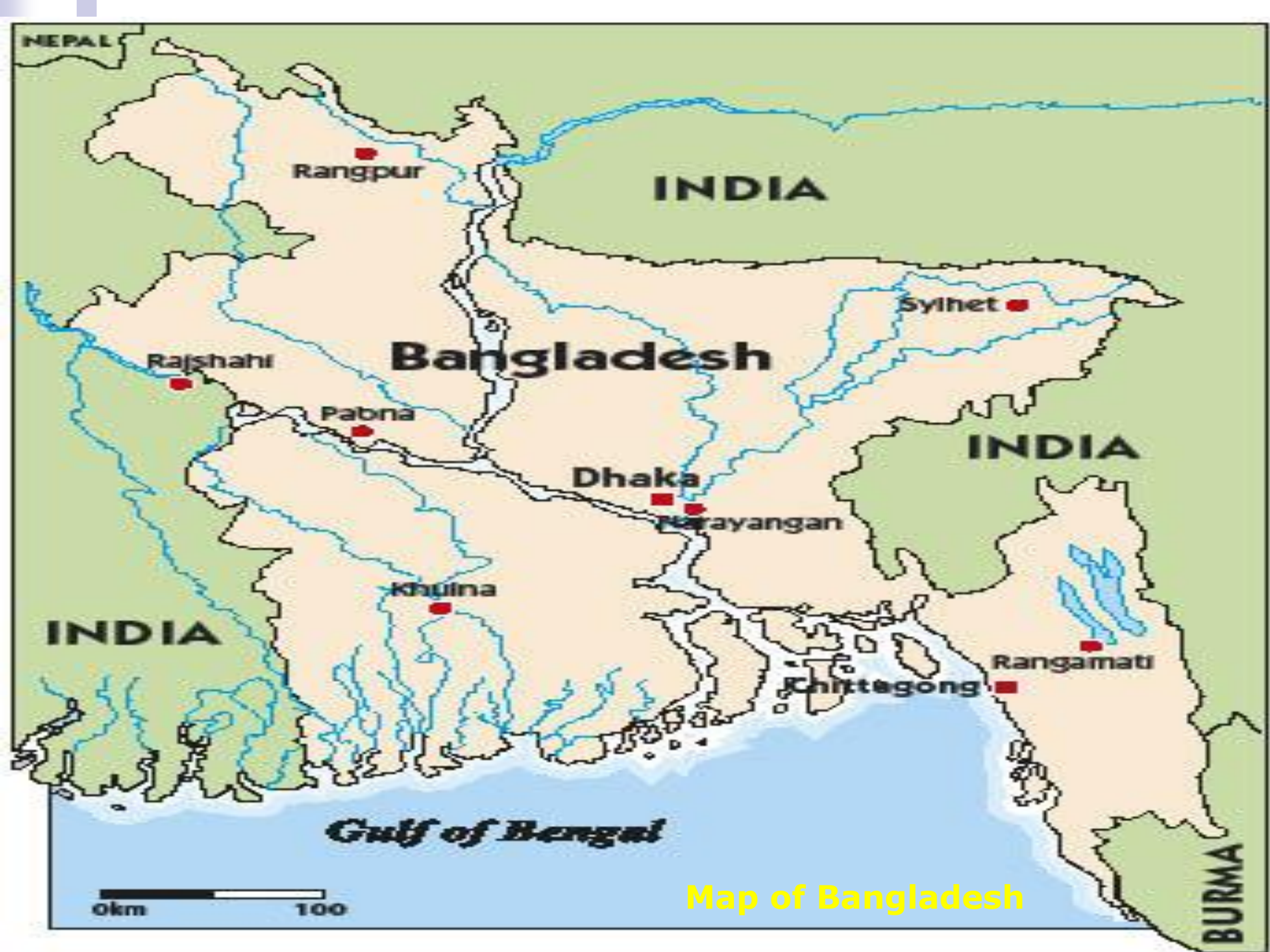
- Climate change security is the most challenging non traditional security issues in today's world.
- The urgent issue facing this and future generations is the need to manage environmental impacts arising from the carbon economy.
- Climate change security impacts cause hunger, disease, poverty and pose a threat to social and political stability.
- The climate change and security nexus provide an essential perspective for meeting development and human security challenges arising from environmental scarcity, conflicts, and economic transition.

# Geo-Demographic Profile of Bangladesh

- Total area : 55,598 *square miles*
- Total population: 162 million (8<sup>th</sup> largest in the world)
- Mostly flat alluvial plain with some hilly areas in southeast.
- 800 rivers runs across the country.
- Large riverine mega delta.
- 47.5 percent are income poor







NEPAL

INDIA

**Bangladesh**

Sylhet

Rajshahi

Pabna

Dhaka

Narayanganj

INDIA

INDIA

Khulna

Chittagong

Rangamati

*Gulf of Bengal*

BURMA

0km 100

Map of Bangladesh



# Climate Change induced Conditions: Glimpses of Bangladesh





# Climate Change induced Conditions: Glimpses of Bangladesh







Grappling with solutions ... villagers repair a vital flood-protecting embankment after Cyclone Aila struck in 2009. Photograph: Munir Uz Zaman/AFP/Getty



# Climate Change induced Conditions: Glimpses of Bangladesh







## **Climate Change induced Conditions: Glimpses of Bangladesh**



# Security Implications of Climate Change

## Bangladesh Perspective





# Climate Change Security : Major Issues in Bangladesh

- Water Security
- Food Security
- Health Security
- Impact of Global Warming
- Sea Level Rise and Coastal Vulnerability
- Climate Changed induced Natural Disasters
  - Salinity Intrusion
  - River Bank Erosion
- Environmental Security and Climate Refugees
  - Loss of Biodiversity
- Impact on livelihood (Fisheries and Aquaculture)
  - Impact on Tourism
- Gender and Climate Change
- Adaptive and carrying capacity of Bangladesh

# Water Security in Bangladesh (1): Water Shortage

- Water from the rivers originating from the Himalayas will continue to decrease as the ice glaciers get diminished.
- Of the 147 BCM water required in the country during dry season, only 90 BCM is available.
- The 40% deficit leads to drought in some regions.
- 125 million Bangladeshis were at risk of drinking contaminated water. (WHO, 2000)
- Almost one in five people in Bangladesh still lack improved water resources

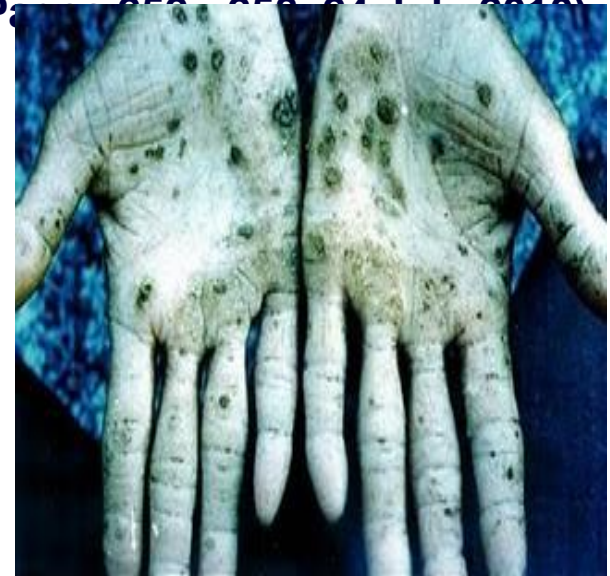
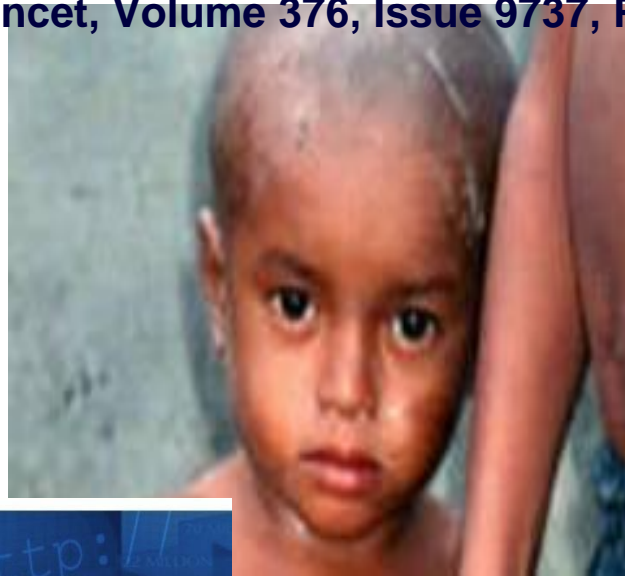




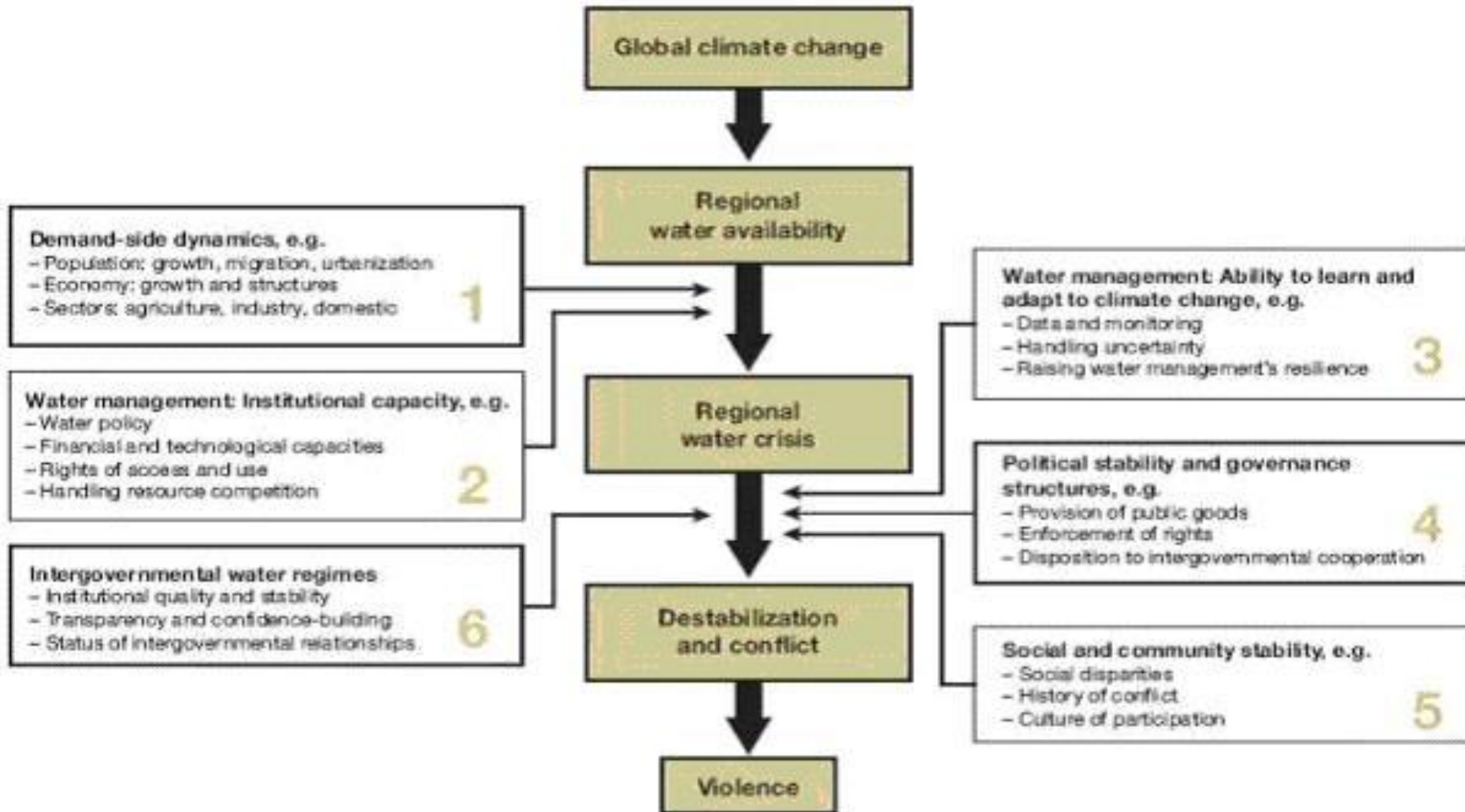
## Water Security in Bangladesh (2): Arsenic Poisoning

- World Health Organization described the arsenic contamination in Bangladesh as “the largest mass poisoning of a population in history”.
- Half of Bangladeshis, up to 77 million people, have been exposed to the toxic arsenic (British Medical Journal “The Lancet”)

(Source: The Lancet, Volume 376, Issue 9737, Pp. 252-253, 24 July 2010)



# Water Security in Bangladesh (3): Climate Change, water stress and violence





# Water Security in Bangladesh (4): Trans-boundary Water Disputes

- Trans-boundary water inflow is 1000 km<sup>3</sup> annually through 57 rivers linked with territory of India and Myanmar.
- 80% of it occurs between July to October when Bangladesh receives 250 km<sup>3</sup> more water from rainfall that makes massive water forces than the carrying capacity of 800 rivers in Bangladesh

(Gupta, Babel, Albert, & Mark, 2005; Bujarbarua, & Baruah, 2009).



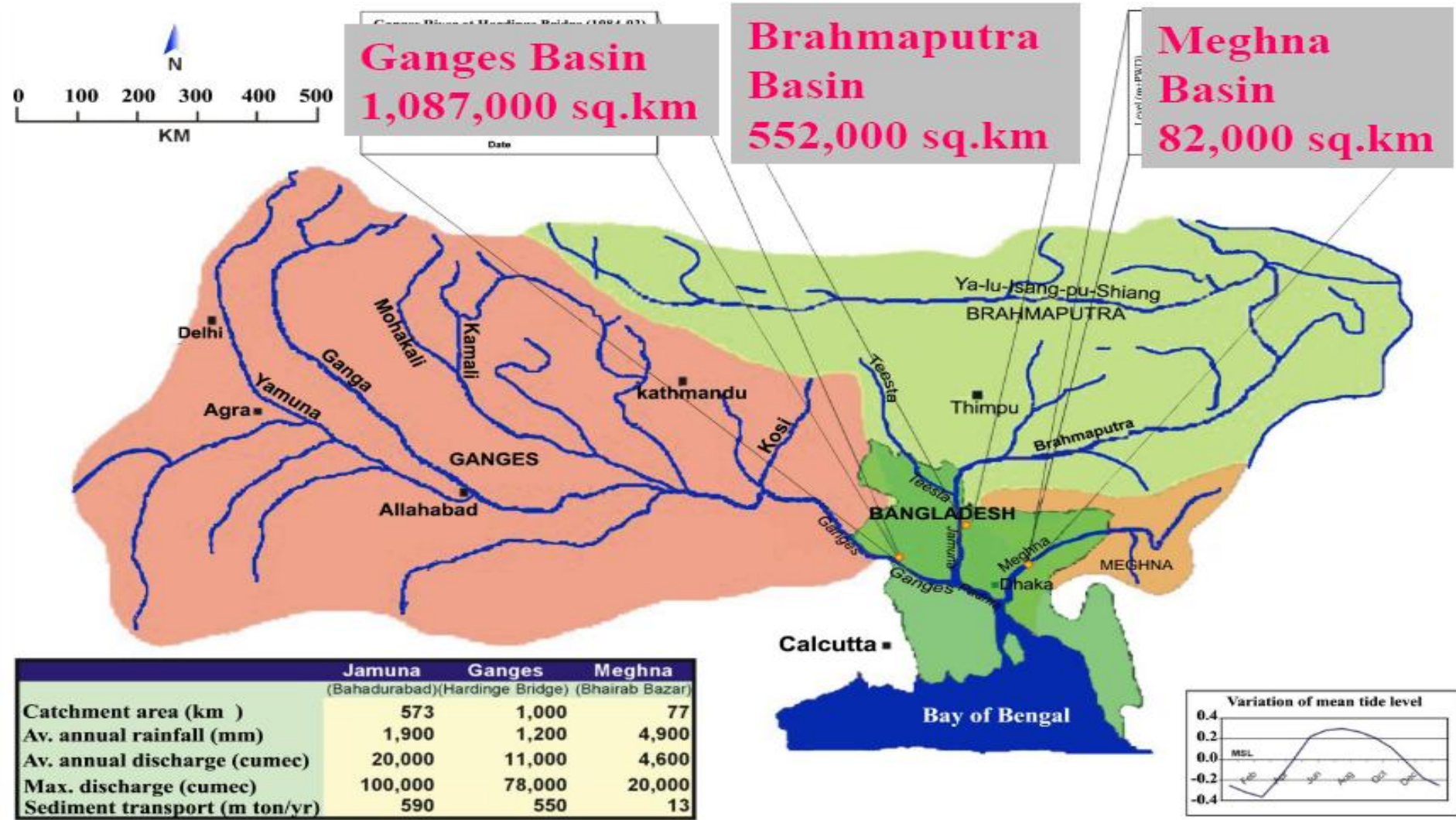
**FARAKKA BARRAGE**



A project of national-level importance, being the terminal barrage on the river Ganges, located in the state of West Bengal, completed in 1974, serves the purpose of flushing the channels of Calcutta Port, as well as to augment water supply to Calcutta city.

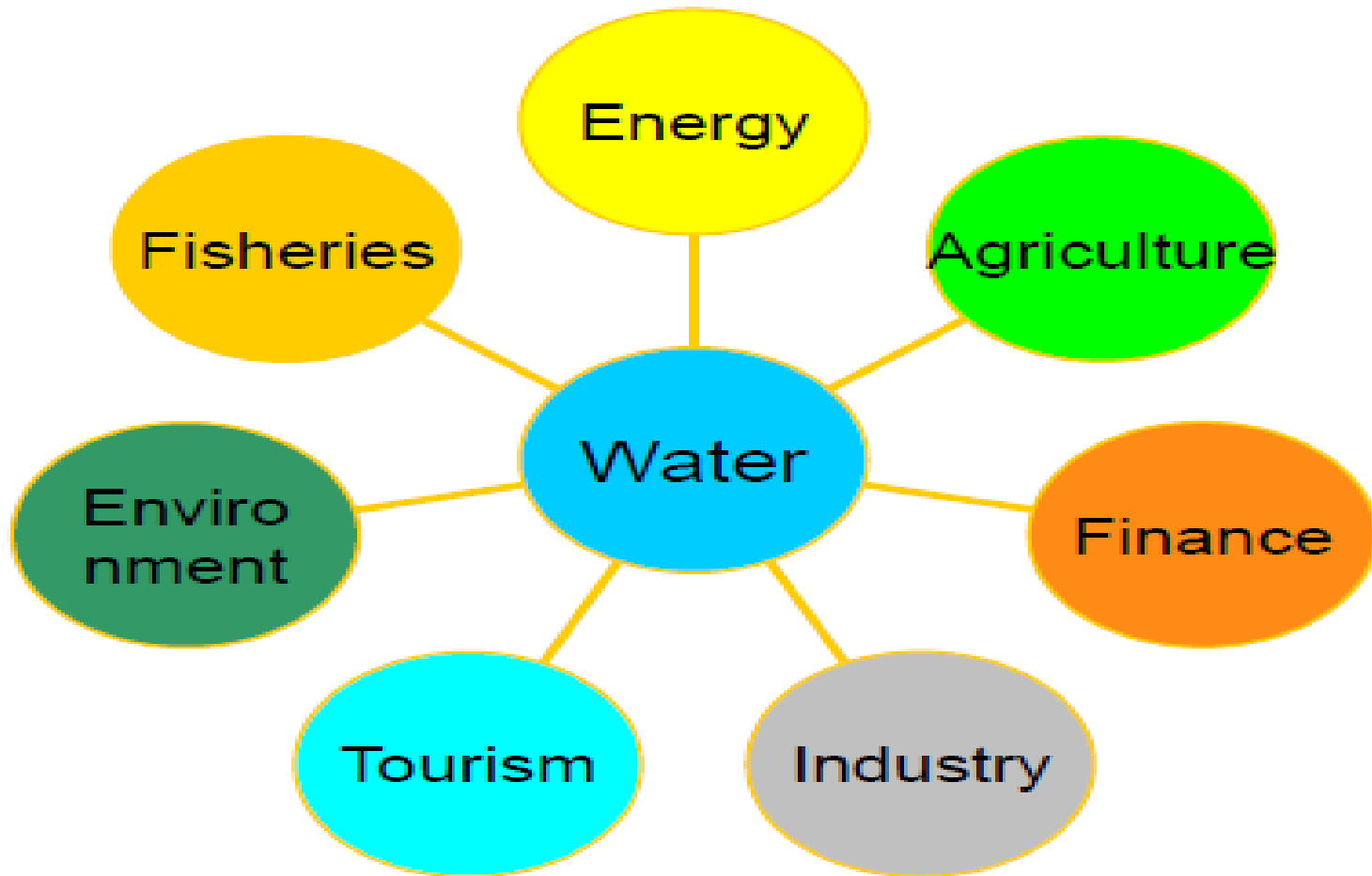


# Water Security in Bangladesh (5): Indo-BD Water Disputes

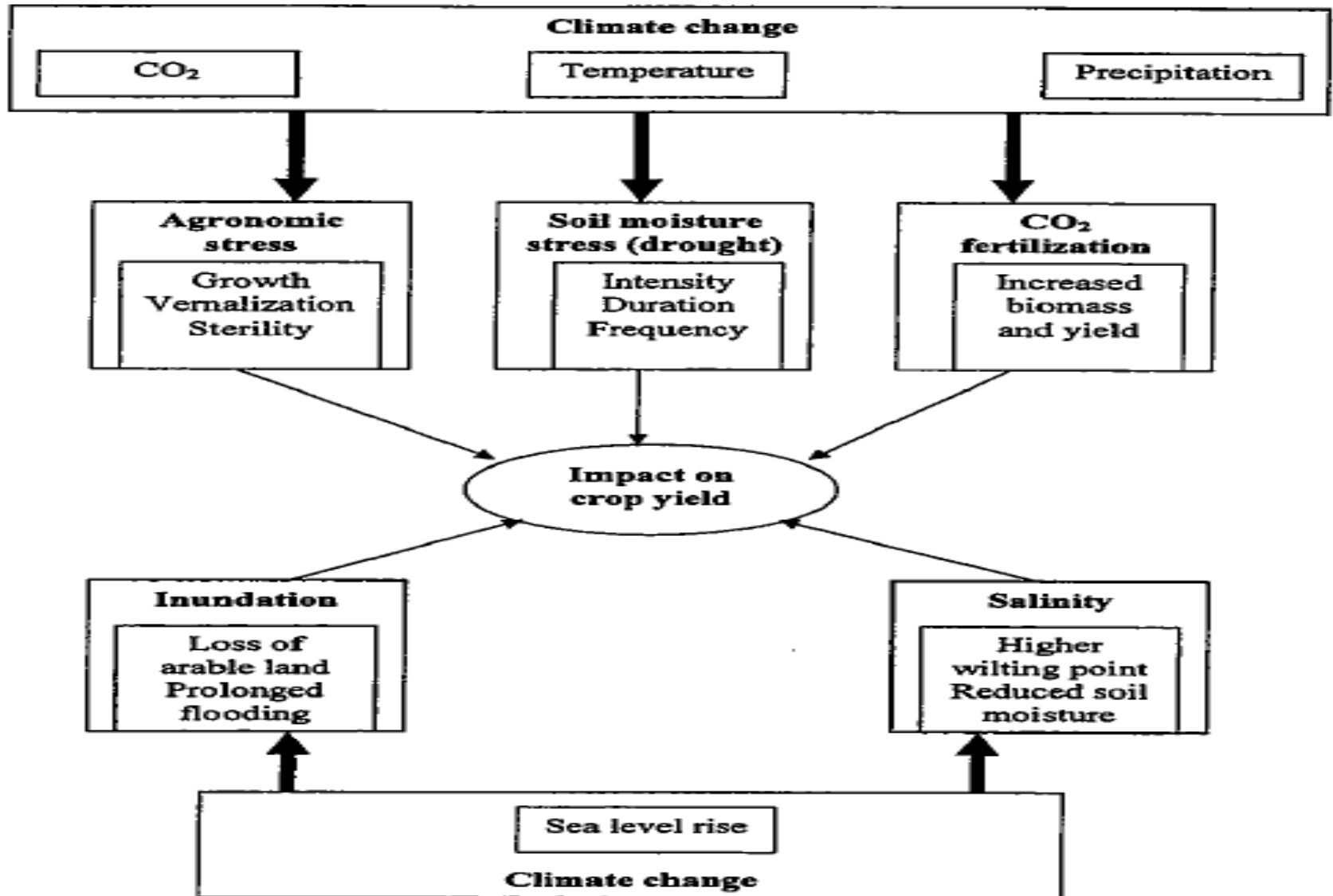




# Water Security in Bangladesh (6): Water and other Sectors



# Food Security in Bangladesh (1)







## Food Security in Bangladesh (2):

### Food Scarcity

- 33 million people in Bangladesh cannot afford an average daily intake of more than 1800 kilocalories due to climate change induced conditions.
- The number of food insecure has risen by 7.5 million since 2006 primarily due to high food prices and floods.
- In 2008, 65 million people (approximately 45 percent of the population) were food insecure and consumed less than 2,133 kcal per day in Bangladesh (WFP 2009)

# Food Security in Bangladesh (3): Impact on Agriculture Productivity

- Sea level rise, and salinity intrusion decrease agricultural production by unavailability of fresh water and soil degradation. (Rashid, 2004; Ashraf, 2002).
- For example Loss of rice production in a coastal village of Satkhira district - was 69 per cent in 2004 compared with previous year. (Ali, 2005)

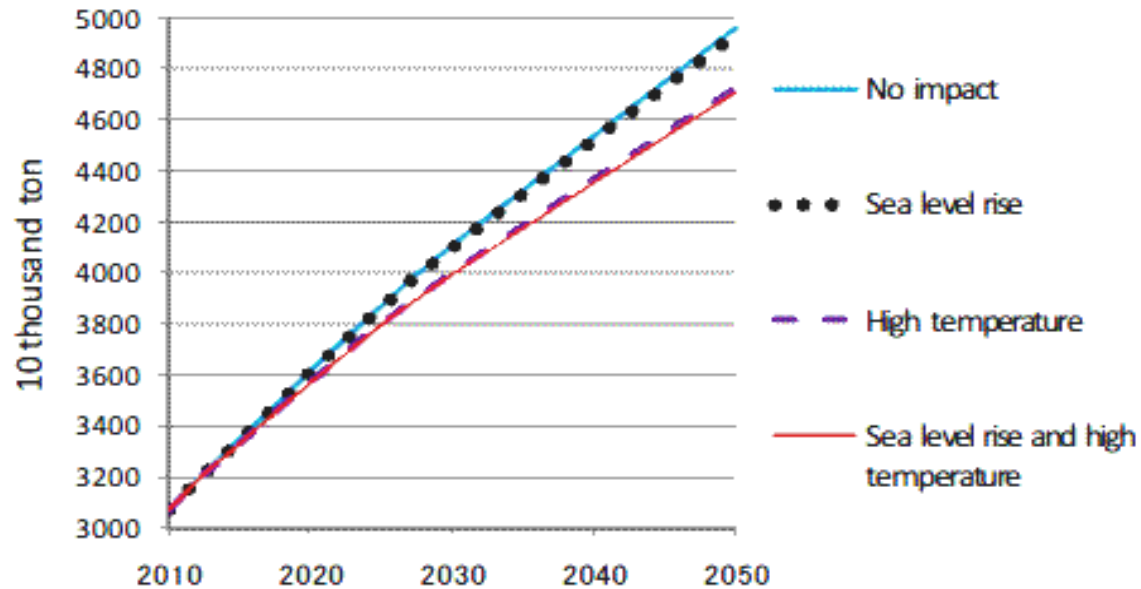




# Food Security in Bangladesh (4): Impact on Agriculture Productivity

High temperature and sea level rise affect national food security

Loss of rice production due to salinity



Year	Aus	Aman	Total
Baseline (1990)	65.60	130.80	196.40
2030	75.80	196.20	272.00
2050*	85.49	358.20	443.69

\*Interpolated from the estimates for 2030 and 2075.

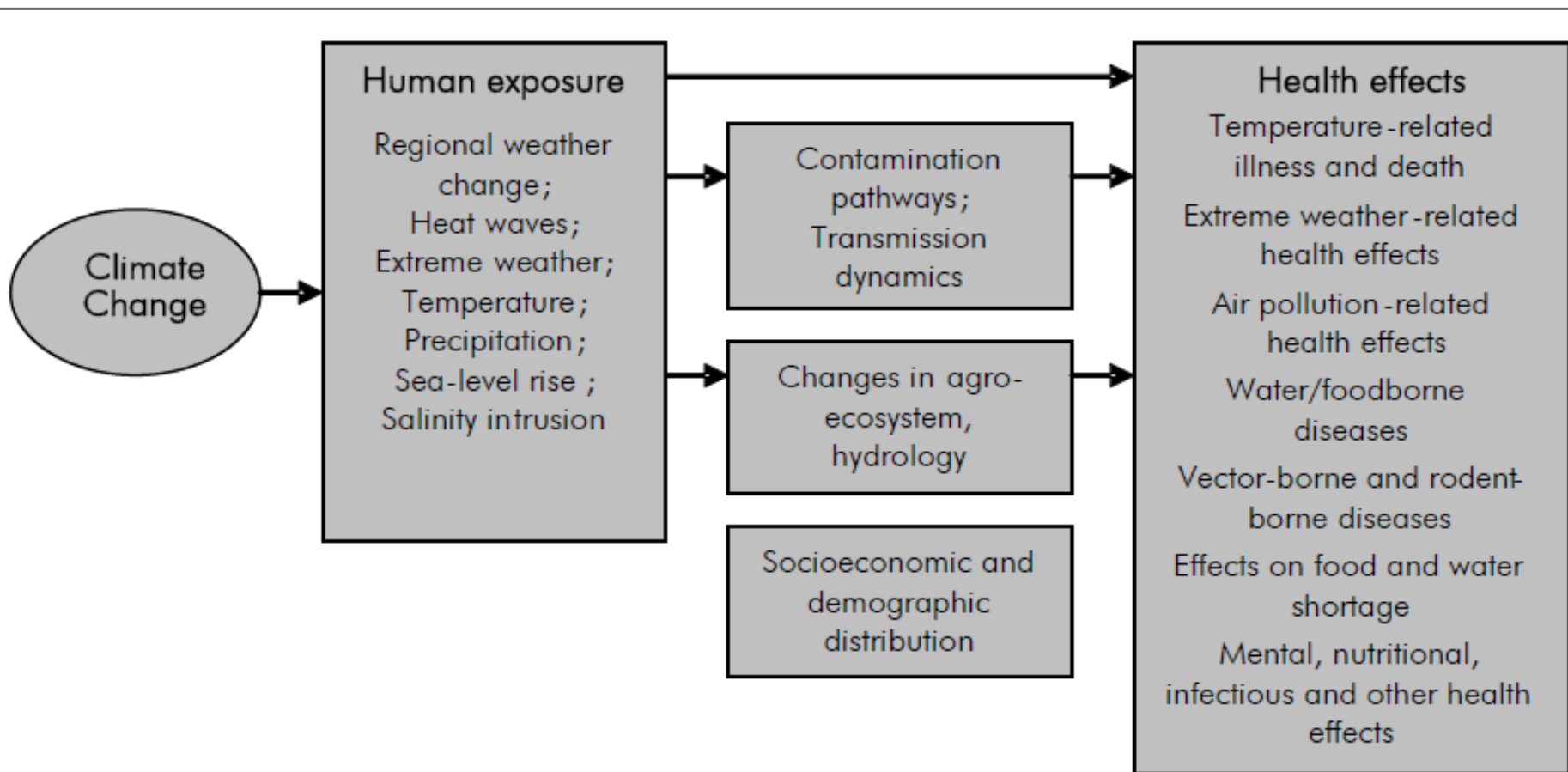
# Food Security in Bangladesh (5): Malnutrition and Hunger

- By 2050, climate change expected to increase the number of hungry people by 10 to 20 percent, and the number of malnourished children is by 24 million – 21 percent more (Action Aid)
- 9.5 million children are stunted and 56% are underweight due to climate change induced conditions. (FAO)





# Health Security in Bangladesh (1)



Source: WHO, 2003



## Health Security in Bangladesh (2): Indoor Air Pollution

**The child mortality rates are increasing about 1.34% in rural areas by the indoor air pollution, which is induced by climate change.**

(Dasgupta, Huq, Khaliquzzaman, Pandey, & Wheeler, 2006)



## **Health Security in Bangladesh (3): *Destruction of medical infrastructure due to the impacts of climate change***

**In 2005 the aggregated damage for health centers and hospitals due to floods, cyclones, sea-level rise and salinity intrusion is estimated at 1,682 and 5,212 respectively.**

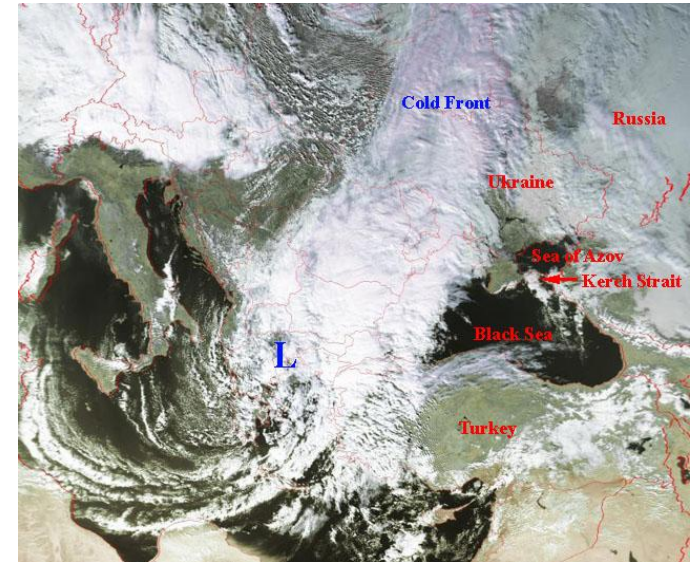
(CCC, 2008)





# Impact of Global Warming in Bangladesh

- 17- 20% of Bangladesh could be under water if sea water rises 1 meter (IPCC)
- The mangrove forests of Sundarban islands, a world heritage site, the Bengal tiger and hundreds of bird species may disappear.

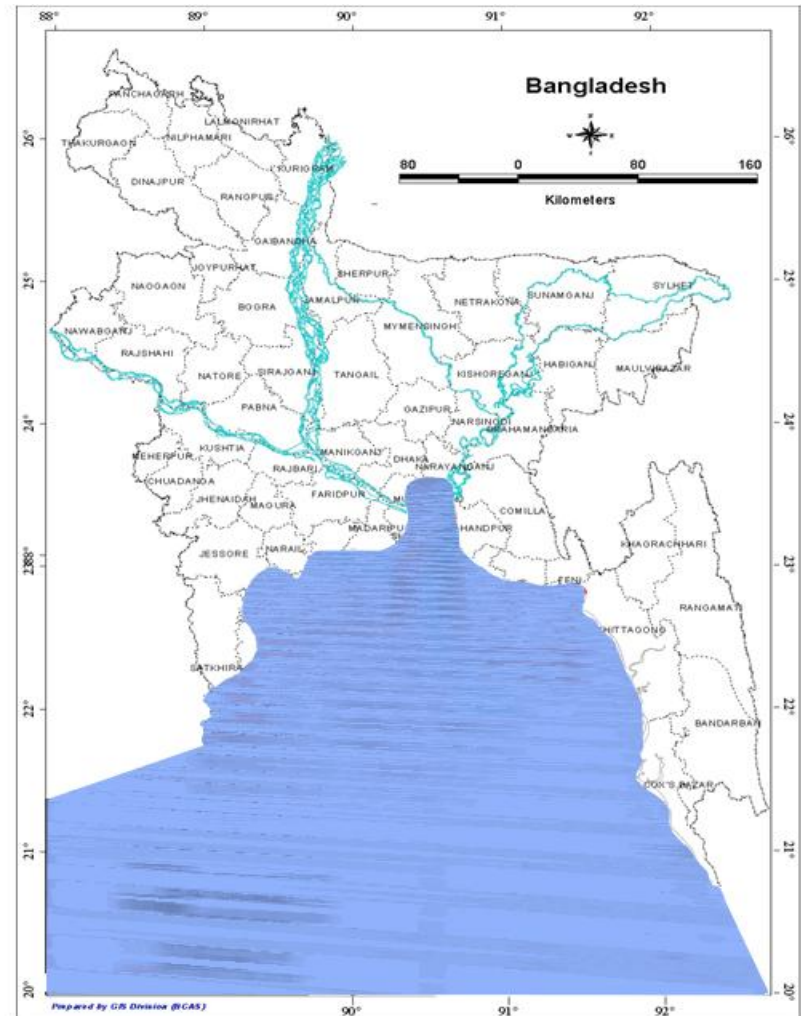
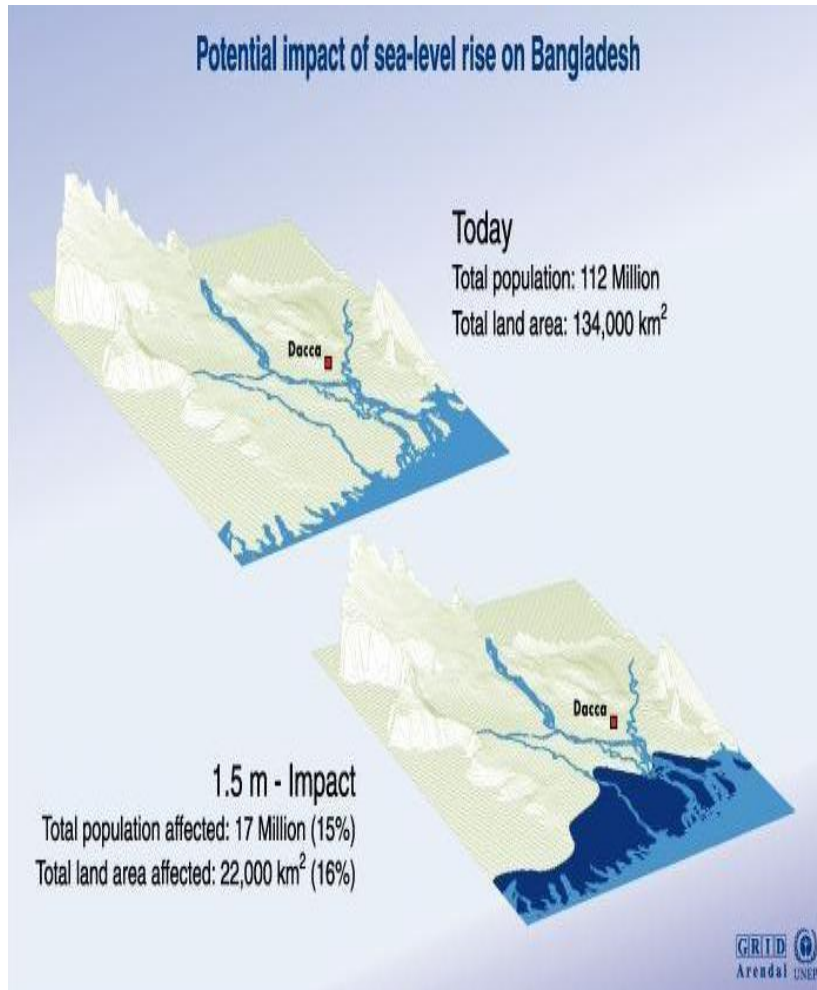


# Sea Level Rise and Coastal Vulnerability in Bangladesh (1)

- The coastal region covers almost 29,000 sq. km or about 20% of the country.
- About 53% of the coastal areas are affected by salinity.
- By 2050, rice production is expected to drop 10 percent and wheat production by 30 percent (IPCC).
- About 20 to 30 million people in Bangladesh alone could be on the move by 2050 because of climate change, causing the worst migration in human history.



# Sea Level Rise and Coastal Vulnerability in Bangladesh (2)





## Sea Level Rise and Coastal Vulnerability in Bangladesh (3): Coastal Erosion and Land Inundation



Coastal areas of Bangladesh are formed of silty and sandy soils which make them vulnerable to sea level rise.

# Climate induced Natural Disasters in Bangladesh (1)

- Flood
- Draught
- Cyclone
- Earthquake
- Tornado





# Climate induced Natural Disasters in Bangladesh (2)





# Climate induced Natural Disasters in Bangladesh (3): Human Exposure and Tracks of Cyclones

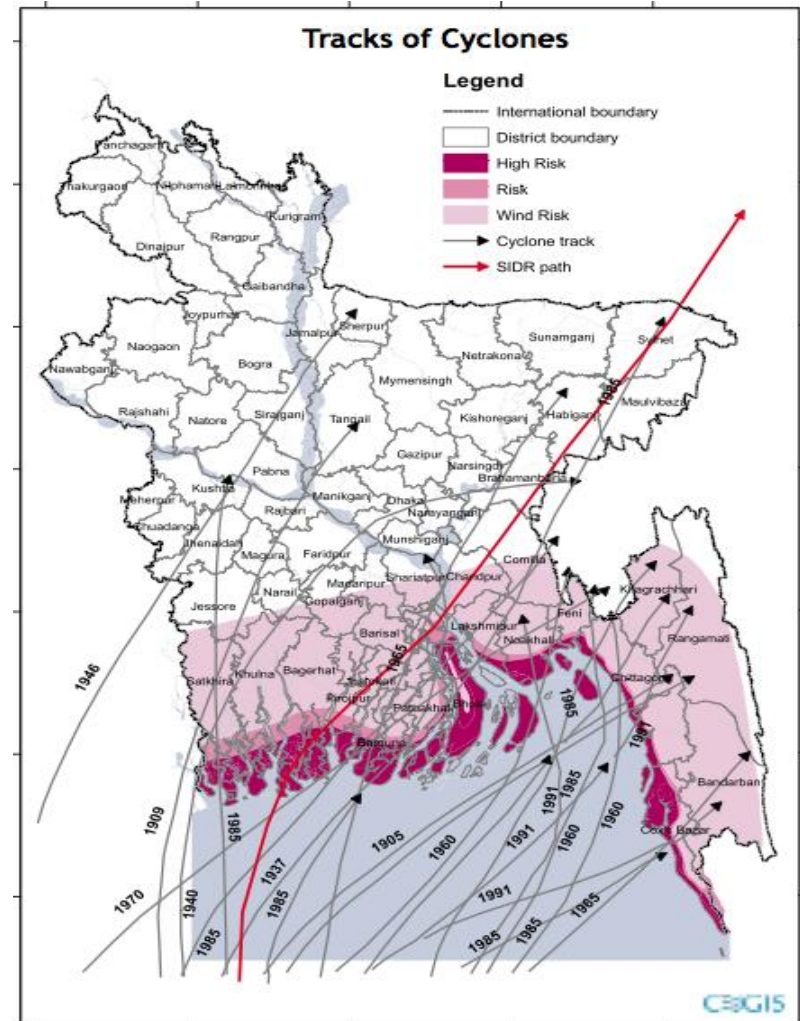
## Human Exposure

Modelled number of people present in hazard zones that are thereby subject to potential losses.

### Absolute human exposure

	Average people exposed per year	Country
1	22,548,120	Japan
2	16,267,090	Philippines
3	9,933,174	China
4	7,607,821	India
5	6,507,695	Taiwan, prov. of China
6	4,641,060	Bangladesh
7	3,573,351	United States of America
8	2,083,071	Korea (Rep. of)
9	1,885,541	Madagascar
10	872,234	Viet Nam
11	867,976	Myanmar
12	629,325	Mexico
13	602,264	Dominican Republic
14	488,556	Cuba
15	423,511	Hong Kong

Legend:  
Tropical Cyclones (Saffir-Simpson categories)  
Cat1 Cat2 Cat3 Cat4 Cat5



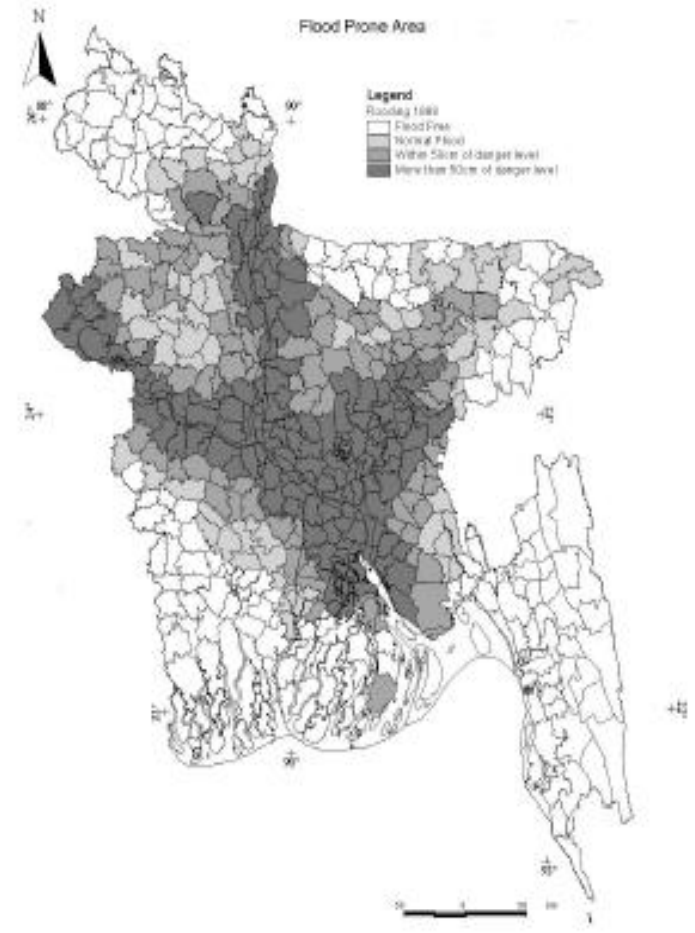
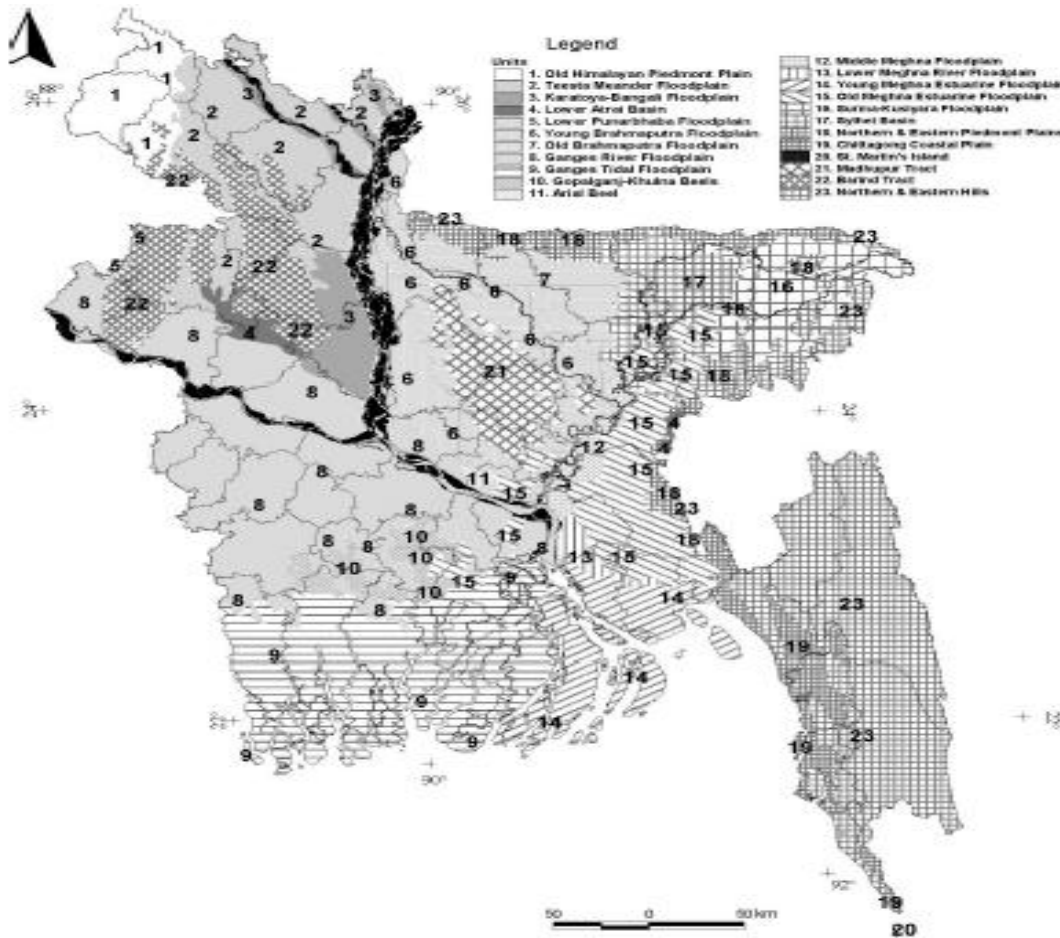
# Climate induced Natural Disasters in Bangladesh (4): Flooding



**Flooding:**



# Climate induced Natural Disasters in Bangladesh (5): Flooding



**Physiography of Bangladesh showing major floodplains**

**Areal coverage of the 1998 flood**



# Climate induced Natural Disasters in Bangladesh (6): Human Displacement and Migration

Between 64, 000 and 1 million Bangladeshis are rendered homeless every year due to riverbank erosion alone (Haque and Zaman 1994; Lein 2000; Siddiqui 2005).

13 million people will be internally displaced persons within coming decade (NAPA, 2005).



# Salinity Intrusion in Bangladesh

Both water and soil salinity due to climate change induced conditions along the coast will be increased with the rise in sea level, destroying normal characteristics of coastal soil and water.

Figure-7:  
Soil salinity map  
of Bangladesh  
of the year 1973  
(Source: SRDI, 1998b)

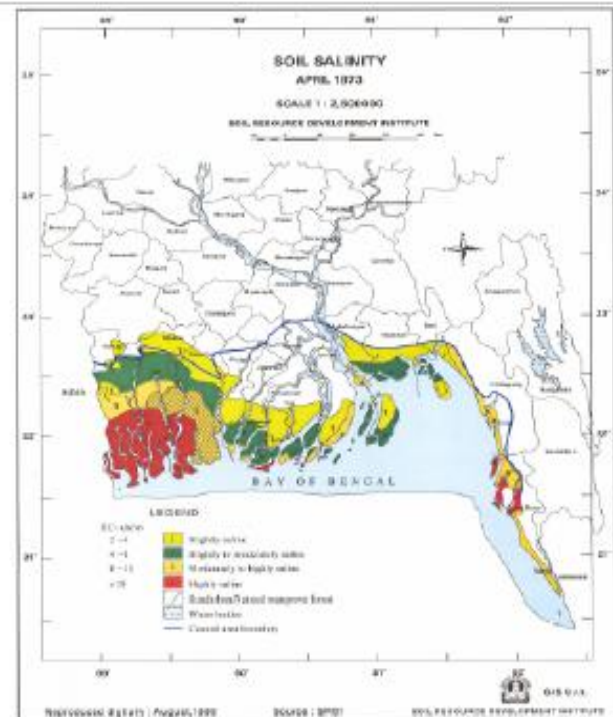
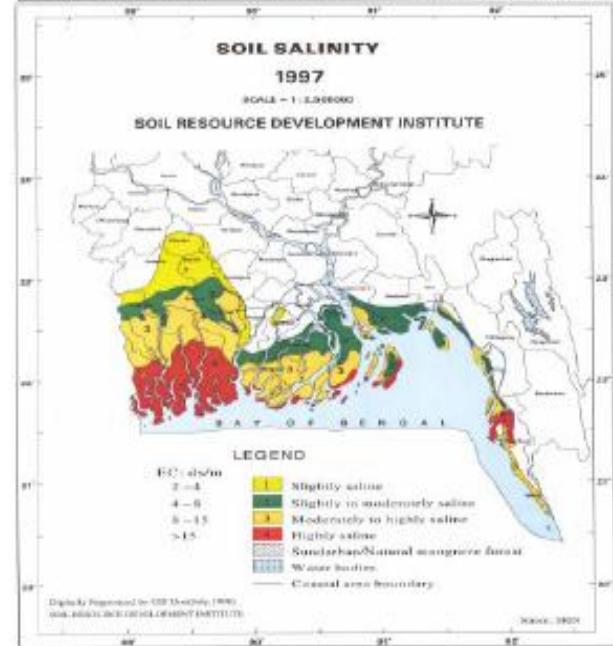


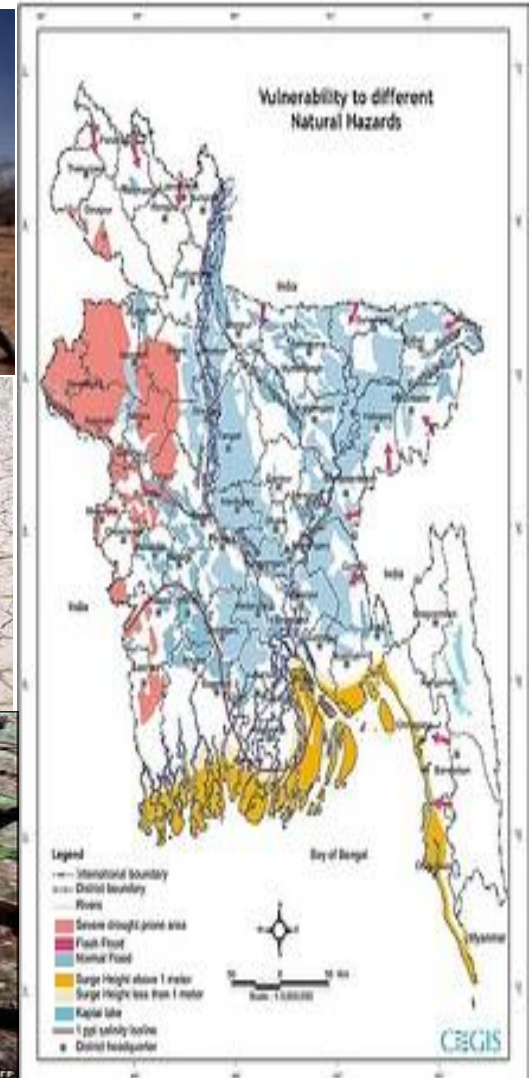
Figure-8:  
Soil salinity map  
of Bangladesh  
of the year 1997  
(Source: SRDI, 1998c)





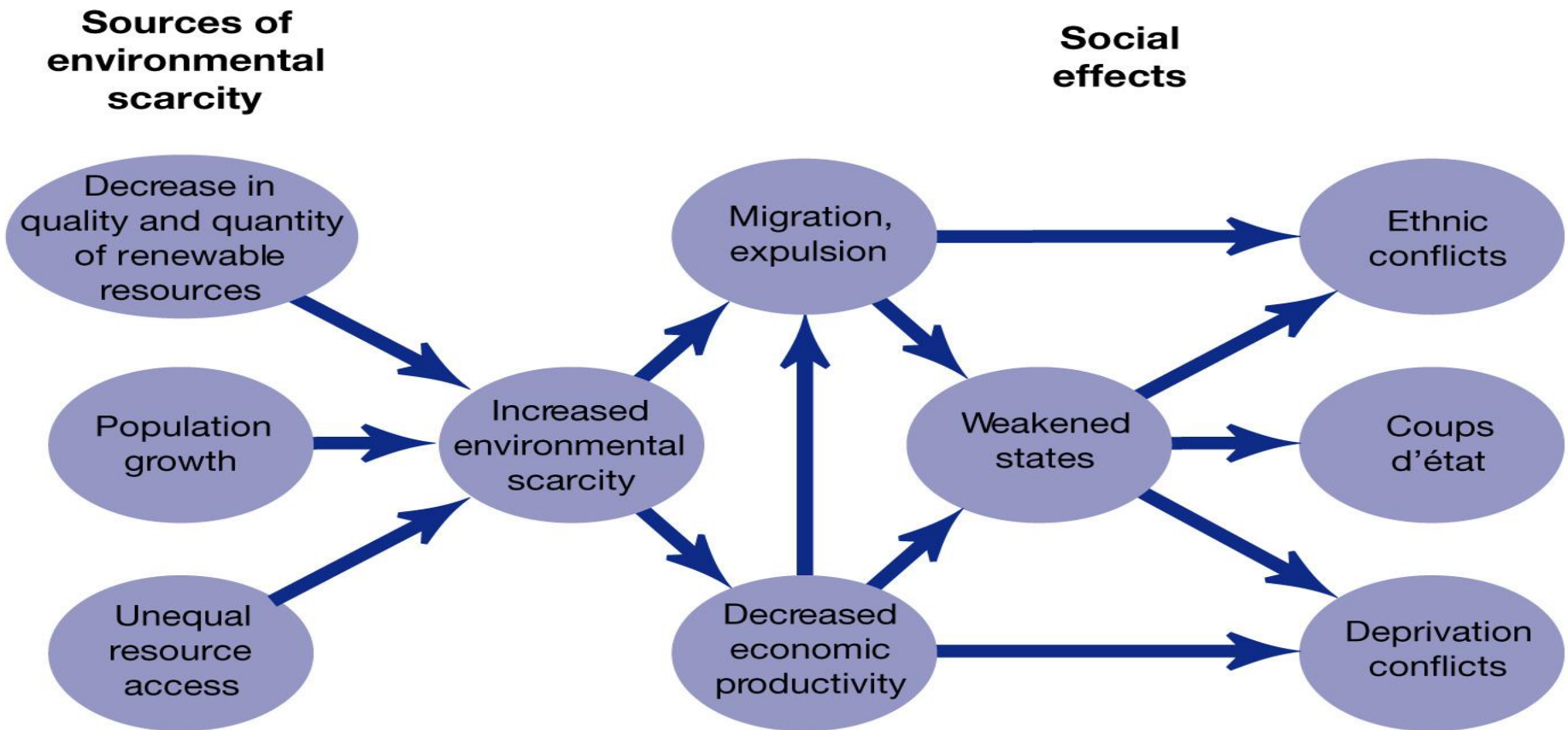
# Environmental Security in Bangladesh (1)

- Water and Air Pollution
- Deforestation
- Desertification
- Development Induced Pollution
- Depletion of Natural Resources





# Environmental Security in Bangladesh (2)



**FIGURE 10.3** Some Sources and Consequences of Environmental Scarcity

*Essentials of International Relations*, 4th ed.  
Copyright © 2008 W. W. Norton & Company

# Environmental Security in Bangladesh (3)

## Environment – A Complex Nexus



To abate the crisis Bangladesh would need to embank 715 km of coastal island perimeters, 370km of coastline and 7600 km of riverbanks. This would cost USD 10 Billion, which Bangladesh doesn't have. Paying for this cost inevitably means further indebtedness.

# Loss of Biodiversity in Bangladesh

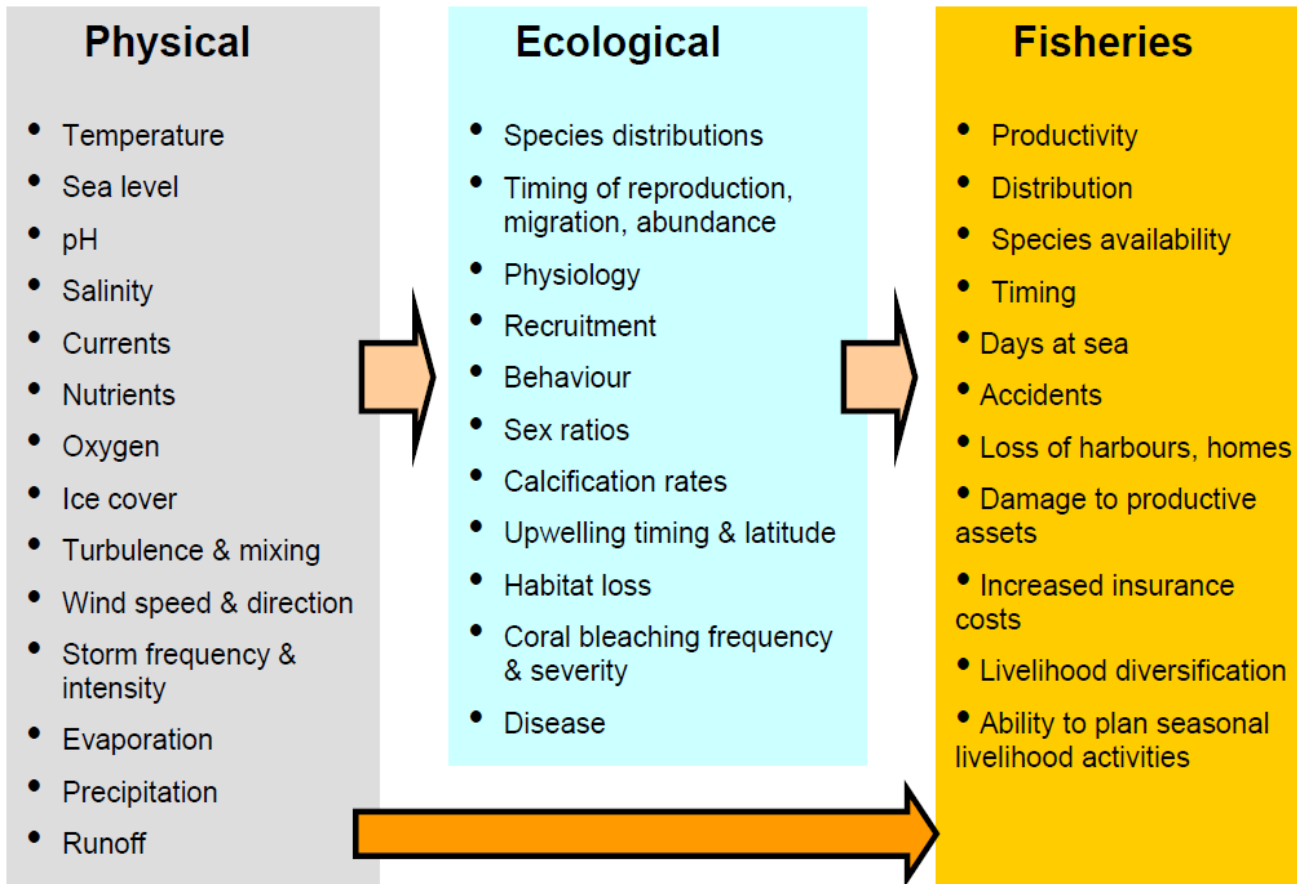
- Loss of biodiversity causes climate change; on the other hand, climate change induced natural calamities contribute to biodiversity loss in Bangladesh.
- Being the most bio-diverse forest in Bangladesh, Sundarbans alone supports 53% of birds, 43% of animals, 42% of reptiles, 36% of amphibians, 29% of plants and 17% of fish species of the country's total biodiversity resources those are threatened by climate changes induced conditions.





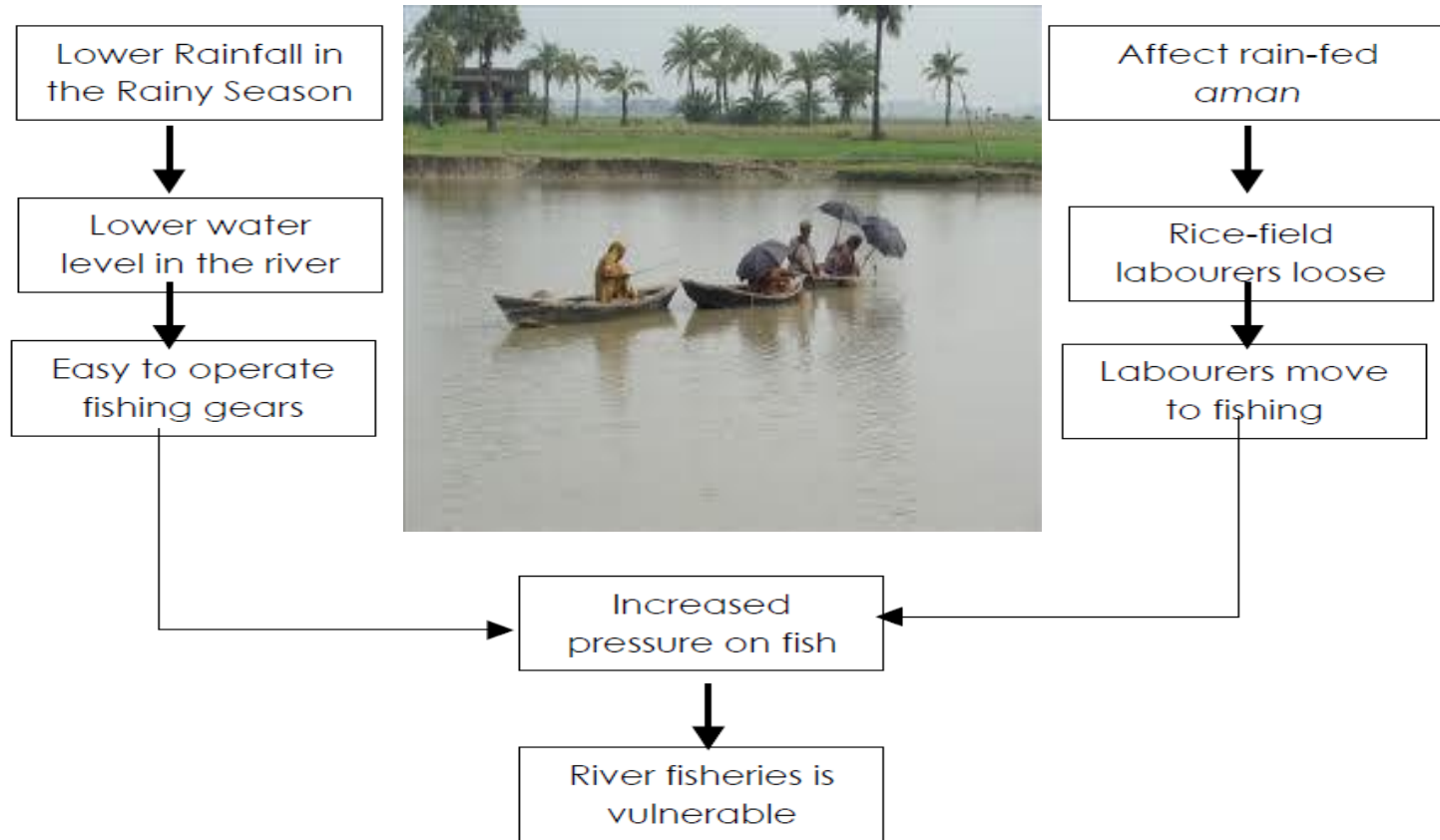
# Livelihood Security in Bangladesh (1)

## Climate-induced changes in fisheries systems



(Source: Edward Allison et. al., 2009)

# Livelihood Security in Bangladesh (2)



## Effects of low rainfall on the river fisheries

(source: Mustafa, & Sharmin, 2010)

# Livelihood Security in Bangladesh (3)

Fish Seed Producing

Grow-out farms

- High temperature and its fluctuations
- Low rainfall causing less water available in ponds and problem with keeping brood fish
- Additional cost of water pumping to brood fish ponds (Tk. 20-30/decimal)
- Breeding performance is poor and even no breeding

- Low rainfall causing low level of water in culture ponds
- Irrigating grow-out ponds needs additional investment
- Many farmers do not have own pumps adjacent to their farms
- High temperature in shallow ponds caused fish disease and mortality



Aquaculture is Vulnerable

## Impacts of higher temperature and low rainfall on Aquaculture



# Impact on Tourism in Bangladesh

- Bangladesh Parjatan Corporation suggests that each year 19 per cent of foreigners visiting Bangladesh are tourists, which has been declining due to climate change induced conditions.
- Sea level rise, by affecting this promising sector will affect the national economy and heritage of Bangladesh.



# Gender Security in Bangladesh (1)

- ❑ Women and adolescent girls are usually required to fetch drinking water from distant sources, even 5-6 kilometers each day in some southern areas. Young girls often sacrifice their academic activities in a bid to fetch non-saline water. (Nasreen, 2000)
- ❑ In absence of freshwater, adolescent girls cannot maintain hygienic reproductive health care and often report perinea rashes and urinary tract infections. (Jennifer, 2004)





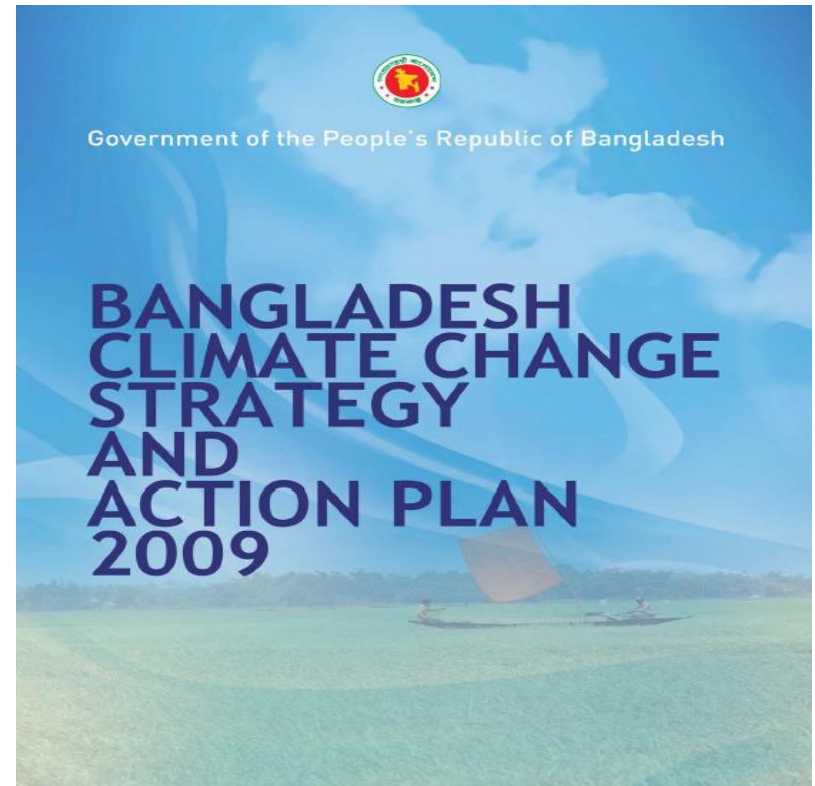
## Gender Security in Bangladesh (2)

- Moving on the embankments or road side high lands often put the adult and young women in constant dangers of sexual harassment and assault. (Jennifer, 2004)
- In the drought prone areas the major concerns of local women include food insecurity, problem in collecting drinking water, and outbreaks of diseases. (Elahi, & Rogge, 1990)





# Climate Change Adaptation in Bangladesh (1)

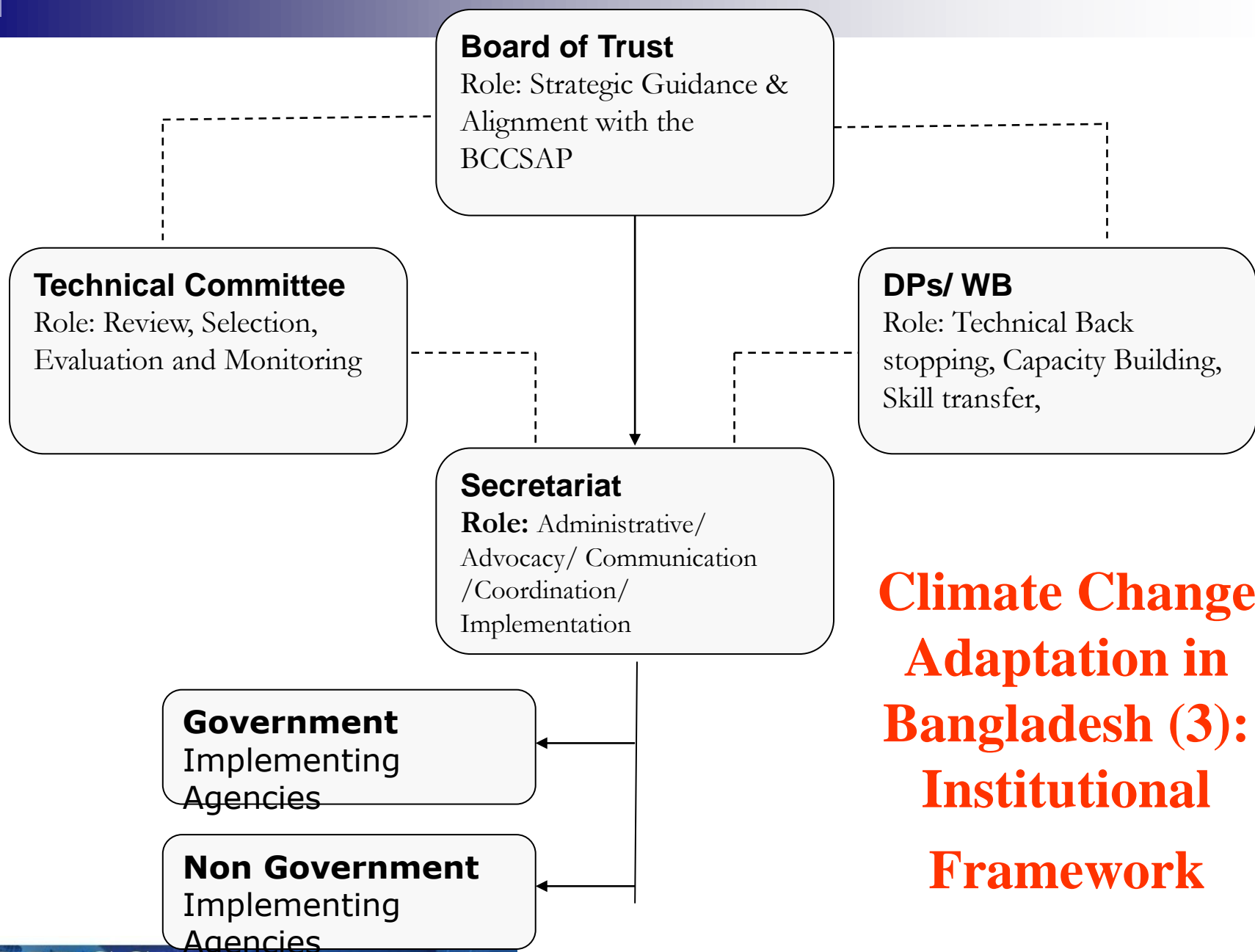


**As a response to the COP7, preparation of NAPA in 2005 and Updated in 2009**

## Climate Change Adaptation in Bangladesh (2)

- Food Security, Social Protection and Health: **USD 13.89 million**
- Comprehensive Disaster Management: **USD 10.47 million**
  - Infrastructure: **USD 31.70 million**
- Research and Knowledge Management: **USD 7.54 million**
  - Mitigation and Low Carbon Development: **USD 28.14 million**
- Capacity Building and Institutional Strengthening: **USD 3.64 million**

**Total : USD 95.38 million**



## Climate Change Adaptation in Bangladesh (3): Institutional Framework



# Climate Change Adaptation in Bangladesh (4): Major Thematic areas

- **Food Security, Social Protection and Health**
  - **Comprehensive Disaster Management**
    - **Infrastructure**
  - **Research and Knowledge Management**
  - **Mitigation and Low Carbon Development**
- **Capacity Building and Institutional Strengthening**

# Climate Change Adaptation in Bangladesh (5)

## Adaptation

- ❑ Stress (flood, drought, submergence, salinity, heat, cold..) tolerant varieties
- ❑ Short duration crops
- ❑ Innovative farming practices
- ❑ Floating cultivation method
- ❑ Crop diversification
- ❑ Changing/shifting cropping pattern
- ❑ Alternate wetting and drying irrigation methods



IET rice variety planted in the high salinity area



Experimental field of selected rice variety planted in high



# Climate Change Adaptation in Bangladesh (6)

- Coastal green belt
- Embankment/Dam
- Tidal River Management
- Early warning and
- Weather forecasting
- Cyclone shelters
- Crop insurance
- Innovative disaster-resilient housing
- Floating community lifeboats
- In-land pond culture





# Measures to Take

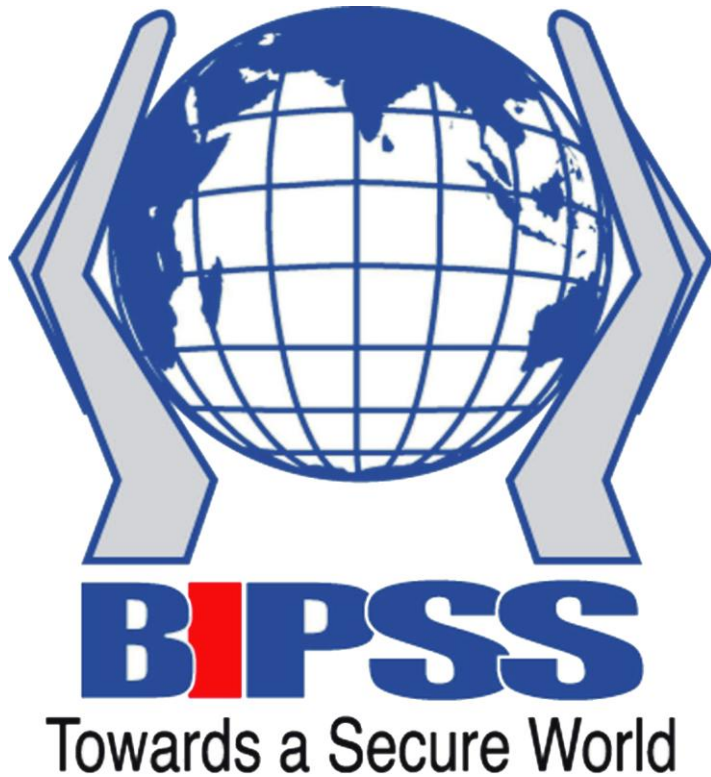
- Capacity building of the states, military and the coastal community.
- Knowledge, information, technology and expertise sharing and exchange.
- National/ Regional policy framework.
- Public Awareness.
- Political will and co-operation.
- Strengthening the Role of international organization.
- Legal regimes.

Questions

and

Comments





# Thank You

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