

# Climate Change, Climate variability and Water Management

Ainun Nishat Ph.D.

Country Representative, Bangladesh

IUCN, the International Union for Conservation of Nature

# From “Water and Climate Change: IPCC technical Paper IV, June 2008”

- Changes in the large-scale Hydrologic Cycle
  - Increase in water vapour content
  - Changes in precipitation pattern
    - Intensity and extremes
    - Melting of ice and snow cover
    - Changes in soil moisture and runoff
- Frequency of heavy precipitation events increased.
- Increase in risk of flooding and drought
- Increase in stream flow as snow melts; in the long run flow will decrease
- Higher temperature and changes in extremes, including floods and droughts will affect water quality and exacerbate water pollution
- Changes in water quantity and quality will affect food availability, stability, access and utilization.
- Climate change affects the function and operation of existing infrastructures
- Past hydrological experiences will not provide guide for future conditions.
- Current water management practices not robust enough,

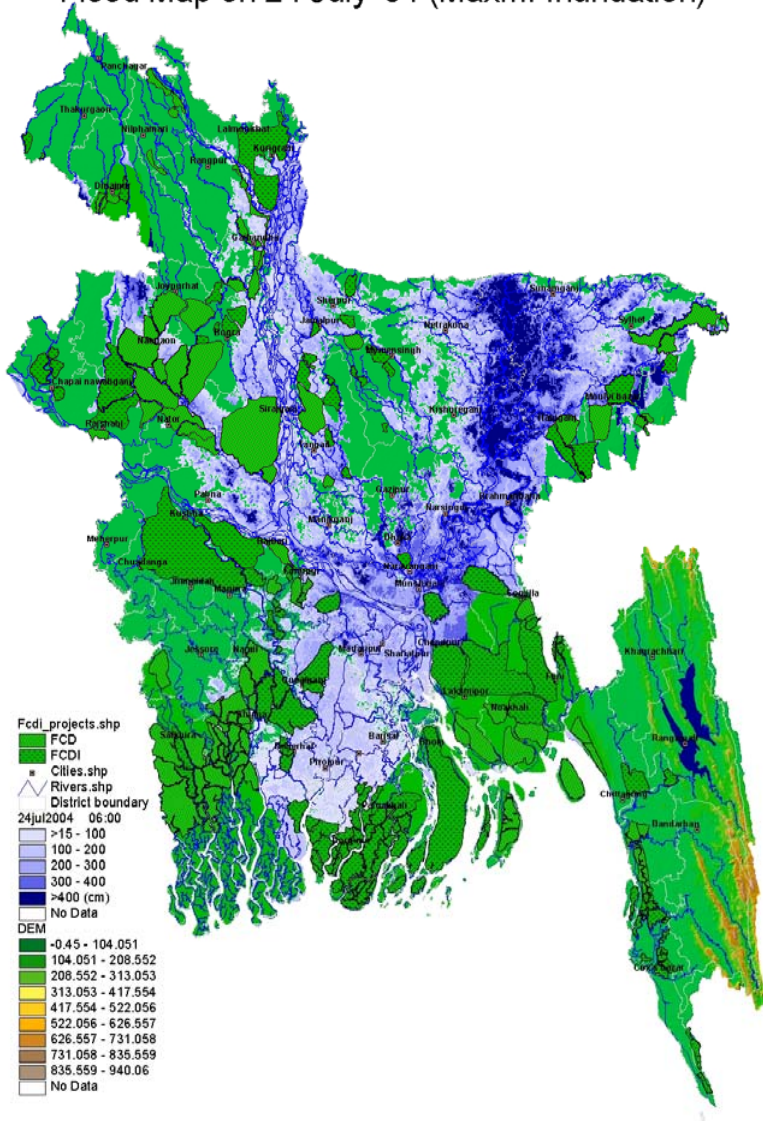
# What is likely to happen

- ✘ Frequency of extreme climatic events will increase e.g. same location will face floods and drought in shorter frequency;
- ✘ Intensity of extreme climatic events will increase; e.g. short duration heavy rainfall specially in urban areas
- ✘ Occurrence of erratic and unusual behaviour of weather will be frequent e.g. rain will occur at unexpected time and will not occur at expected time;
- ✘ Snow and Ice will melt; in the long run the volume of snow melt water will be very low; threat of GLOF will increase;
- ✘ Sea Level will rise; to what level is being debated.

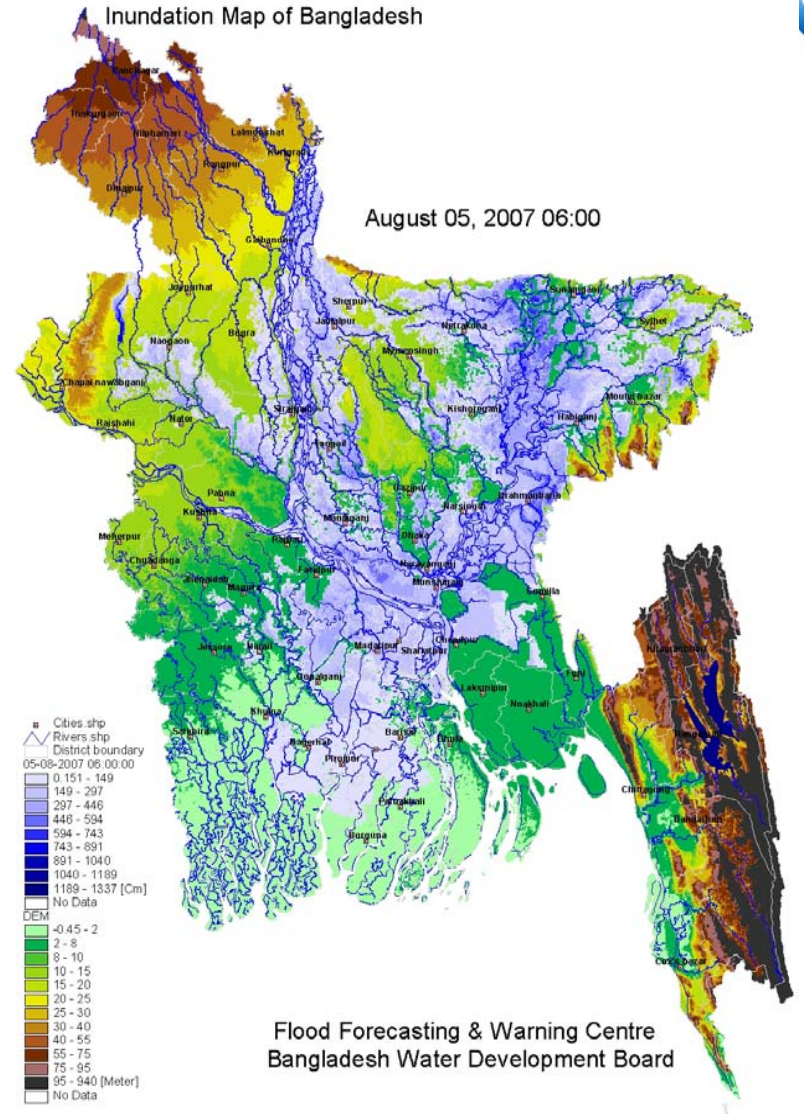
## **EVIDENCES OF CLIMATE VARIABILITY AS IDENTIFIED BY RURAL PEOPLE ( IUCN-BD 2003)**

- ☞ Excessive rainfall at times, untimely and irregular heavy rain,**
- ☞ Increase in tidal bores, increase in number of cyclonic conditions, variation in tidal flow**
- ☞ Increase in frequency of flash flood,**
- ☞ Temperature variation, change of seasonal cycle, cloudy and cold winter,**
- ☞ Increase in droughts and dry spells,**
- ☞ Storms and hailstorms,**
- ☞ Increased surface temperature,**
- ☞ Intensity of mist/fog increased in the winter.**

Flood Map on 24 July '04 (Maxm. Inundation)



Inundation Map of Bangladesh



# Potential impact of sea-level rise on Bangladesh



Today

Total population: 112 Million

Total land area: 134,000 km<sup>2</sup>



1.5 m - Impact

Total population affected: 17 Million (15%)

Total land area affected: 22,000 km<sup>2</sup> (16%)

# Options for Adaptation

## FLOOD MANAGEMENT

- Flood forecasting system
  - Lead time, Language and Effective Dissemination
- Flood Evacuation shelters
  - Multi-purpose shelters
  - Evacuation and Shelter management
- Flood Zoning, Flood Insurance, Adjustment Cropping Calendar, Watershed management etc.
- Flood management infrastructure
  - Effective management and up-gradation of existing flood management infrastructures embankment, sluices, Pump stations etc.
  - Construction of additional infrastructures.

# Options for Adaptation .....

## Drought Management

- Infrastructures for harnessing surface water through Dams, Reservoirs, Barrages, water conservation structures
- Deep Tube Wells.
- Dry-foot crops, Adjustment in cropping pattern

## Water Supply and sanitation

- Water conservation, rain water harvesting;
- Recycling and reduce and reuse of water;
- Deep tube wells.

## Urban Drainage

- Improvement in urban drainage system including pumping provisions,
- Detention storages,
- Restoration of pervious surfaces for enhancing infiltration capacity,



# Options for Adaptation .....

## Storm surge and Cyclones

- Effective management and up-gradation of existing polders and construction of additional polders
- Coastal afforestation
- Multi-purpose Cyclone Shelters
  - Evacuation
  - Shelter management
- Cyclone forecasts and Warning
  - Lead time, Language, warning Dissemination

## Erosion control measures

- River training

# Options for Adaptation .....

## Adaptation in Health Sector

- Control over areas where vectors grow,
- Awareness raising programme to combat diarrhoeal diseases,
- Awareness against heat strokes etc.

# Some other concerns...

- What happens to run-of-the-river hydro-power stations.
- Watershed management is important water conservation and sediment load management
- Inter-sectoral and inter-ministerial coordination and collaboration is essential.
- Proper IWRM practices must be ensured including improvement in water use efficiency.

# Planning horizons .....

- Target year
  - 2012 – to match with Kyoto protocol ?
  - 2015 – to match with MDG Targets ?
  - 2030, 2050, 2100 to match with IPCC projections.
- Short term, Mid Term and Long term scenarios may be developed;
- A basin-wise planning is essential; but information and data from upstream regions are not readily available.

# Tools and methodologies for analysis

- Statistical analyses based on probability functions on basis of **past observed** data (preferably of 30 years) is used by engineers and professionals to plan and design irrigation projects, flood management infrastructures, drainage systems ( also bridges/ culverts) etc. Modification to this approach will be required because projection of past trend will no longer be valid.
- Results from GCMs/ Climate Models, developed at regional or country level, on the basis of small grids that will project **future** conditions will be required to '**climate proof**' all infrastructures and decide upon planning and design parameters.

# Concluding Remarks

- We must prepare for Adaptation to Climate Variability (the already occurring extreme events) and keep in mind the trend indicated in Climate Change forecasts. Time is now to act on Adaptation specially in water sector.
- Response to floods, droughts, urban drainage problems, storm surge and cyclones are known but response to sea level rise and snow and glacier melting has to be evolved.

# Thank You