



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,

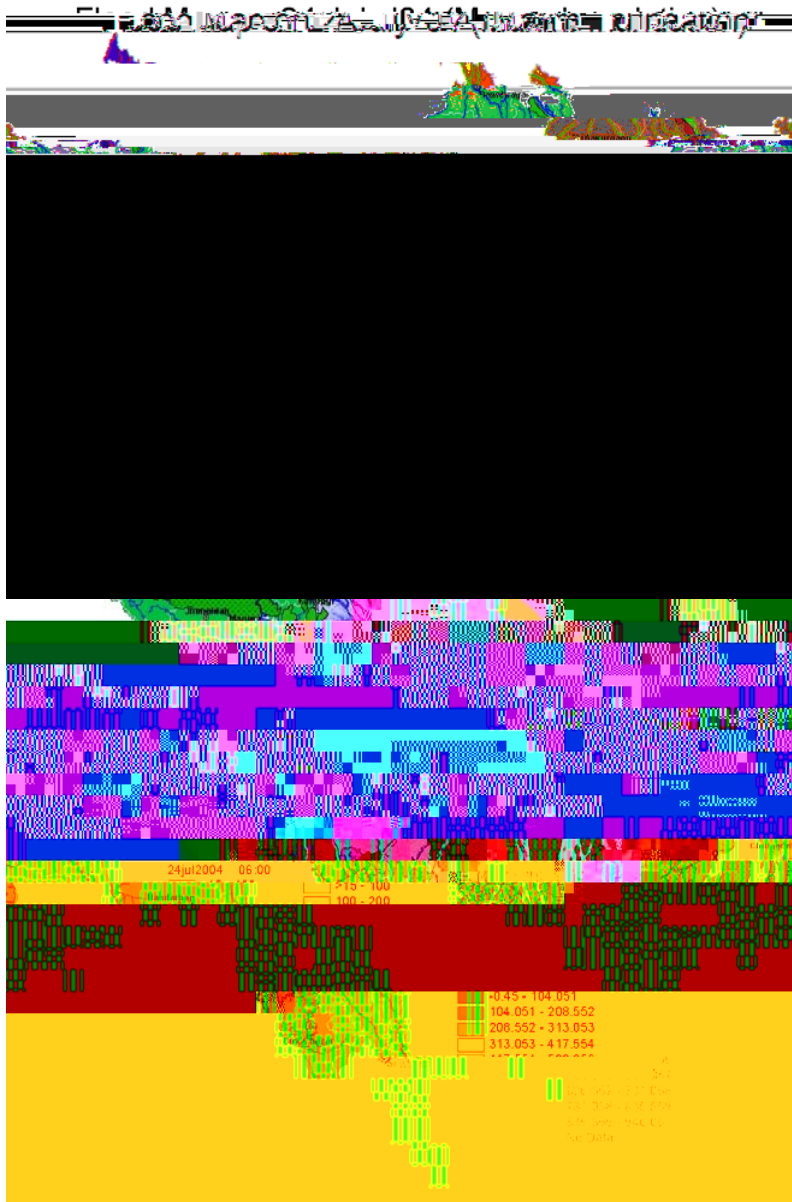
What is likely to happen



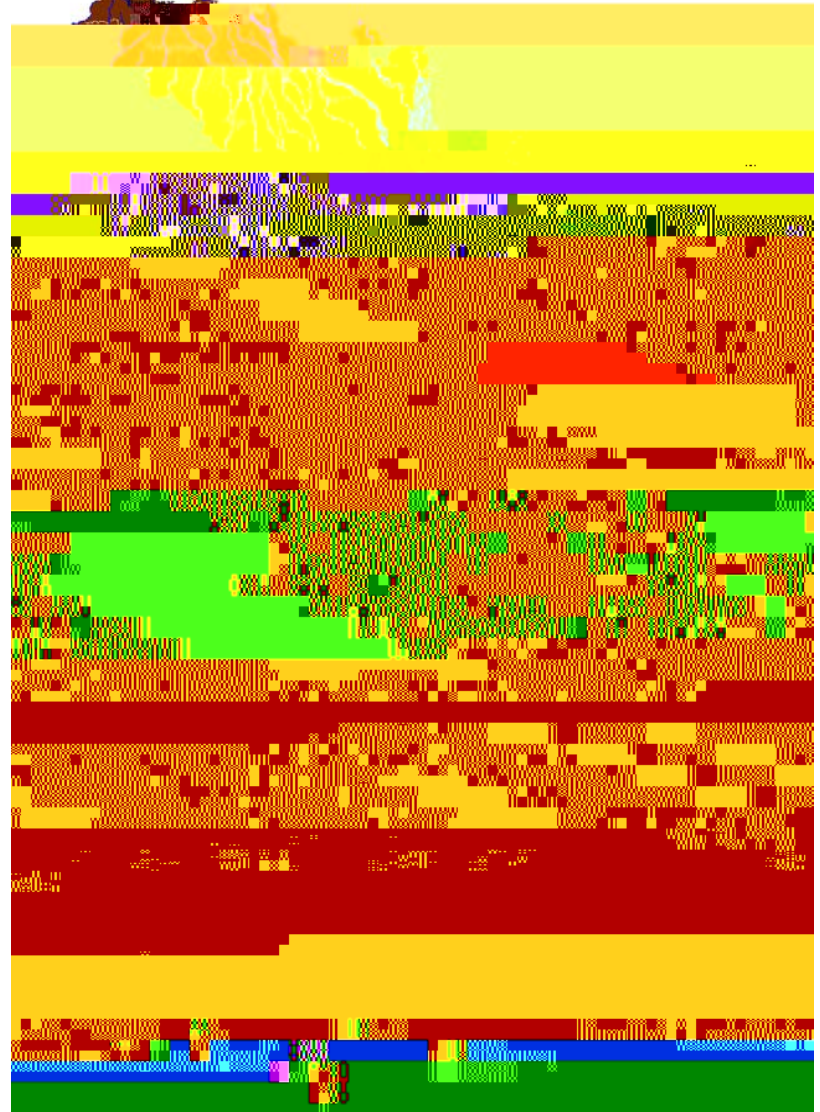
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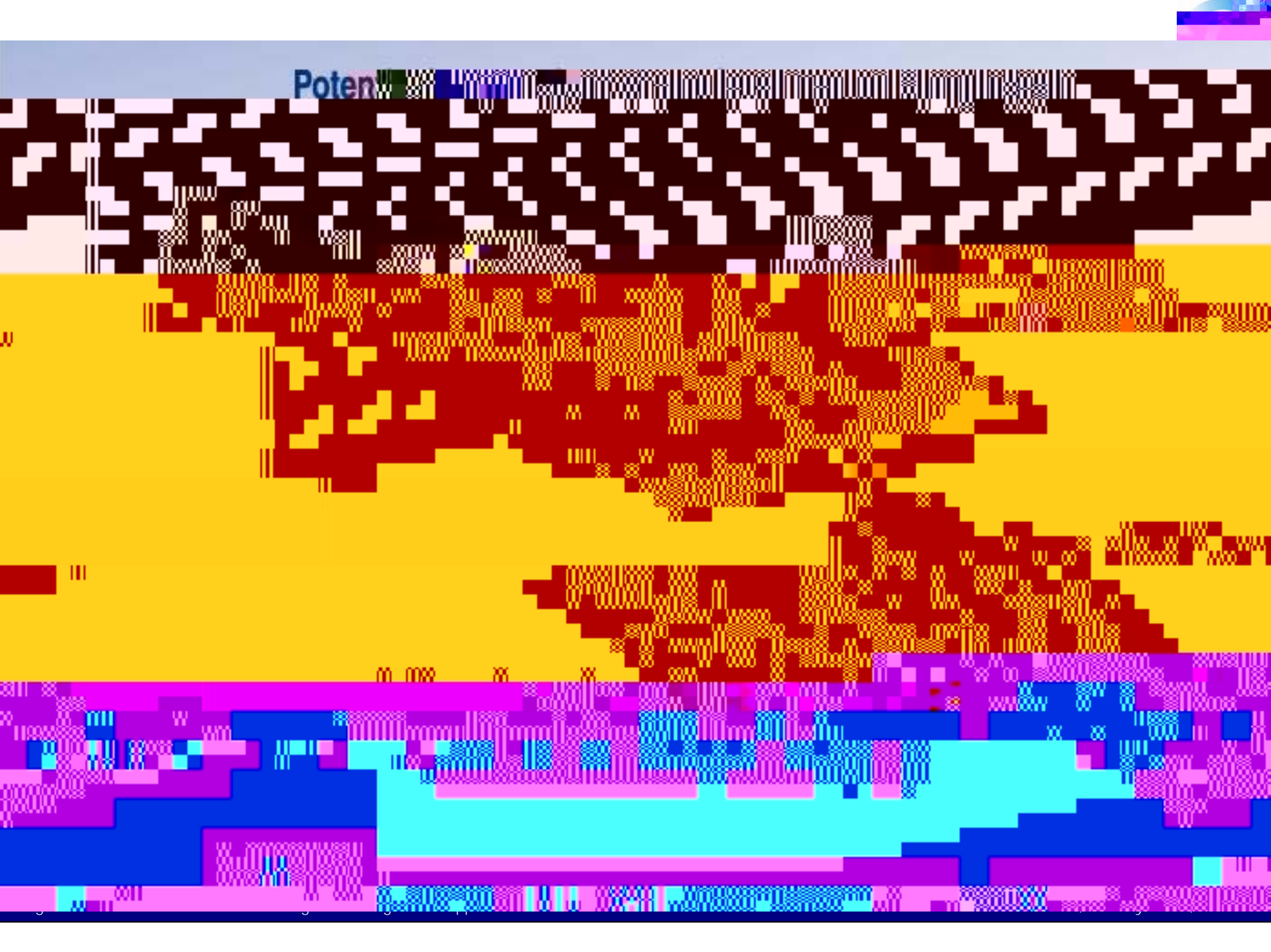
EVIDENCES OF CLIMATE VARIABILITY AS



Inundation Map of Bangladesh



Poten



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.



- Target year
 - 2012 – to match with Kyoto protocol ?

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