

# Delta Management with Special Reference to Coastal Bangladesh



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# Delta Coalition Countries



Bangladesh, Colombia, Egypt, France, Indonesia, Japan, Mozambique, Myanmar, The Netherlands, The Philippines, South-Korea and Vietnam.

# Organization of Delta Coalition



Delta Coalition is a Government to Government (G2G) Partnership of Currently Twelve Countries with the following broad objectives:

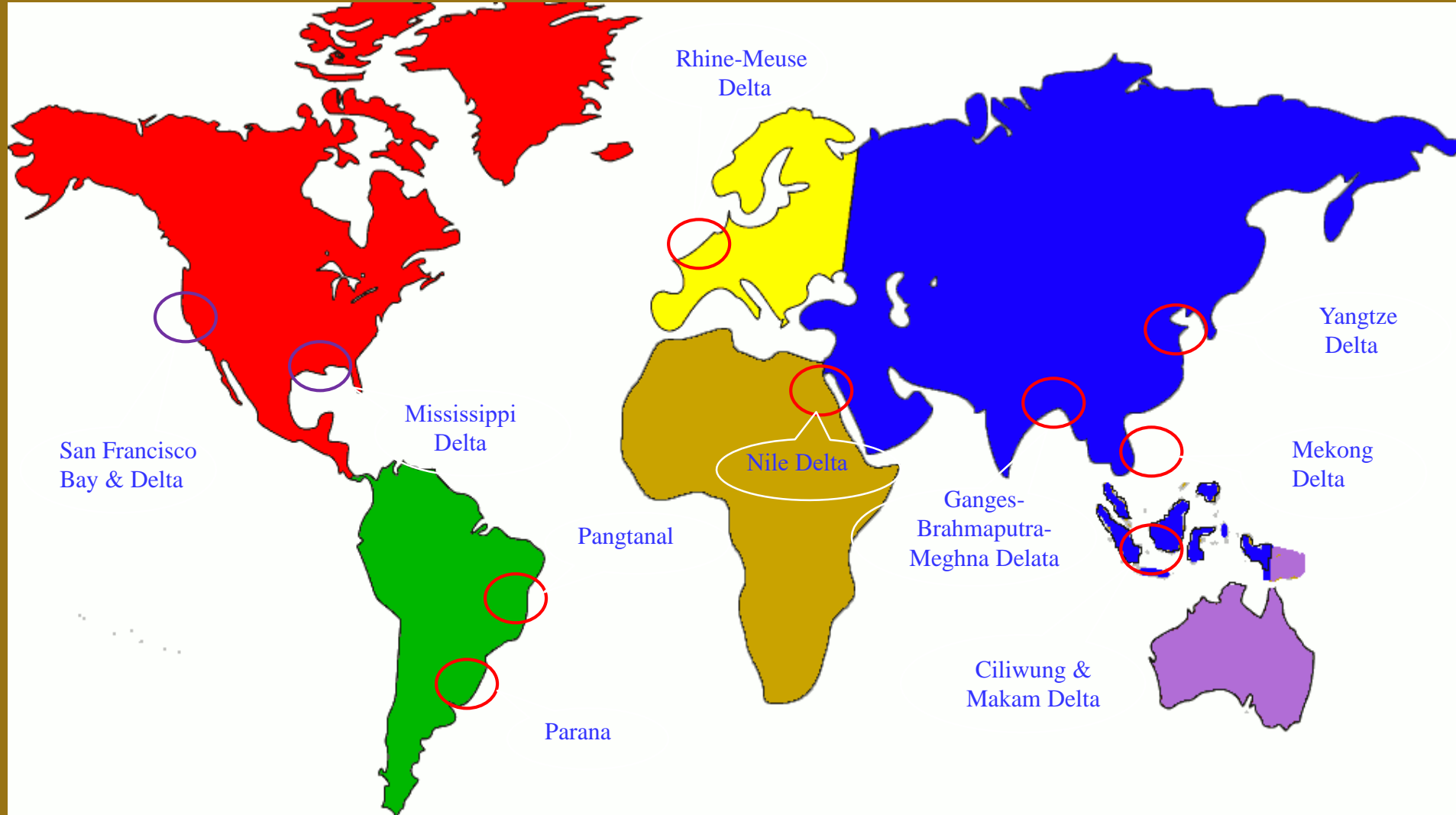
- Working together to get Deltas on the agenda Worldwide
- Facilitating the Development, Availability and Exchange of Knowledge on Deltas, Resilience and Urban Delta Development
- Promoting Practical Implementation and Cooperation to increase the Resilience of Deltas and to increase investments in sustainable urban delta development



**Delta Alliance** is an international knowledge-driven network organization (K2K) with the mission of improving the resilience of the world's deltas

**Delta Alliance** brings people together who live and work in deltas. They can benefit from each other's experience and expertise and as such contribute to an increased resilience of their delta region

# Deltas Focused by Delta Alliance



# Ganges-Brahmaputra-Meghna Delta, Bangladesh

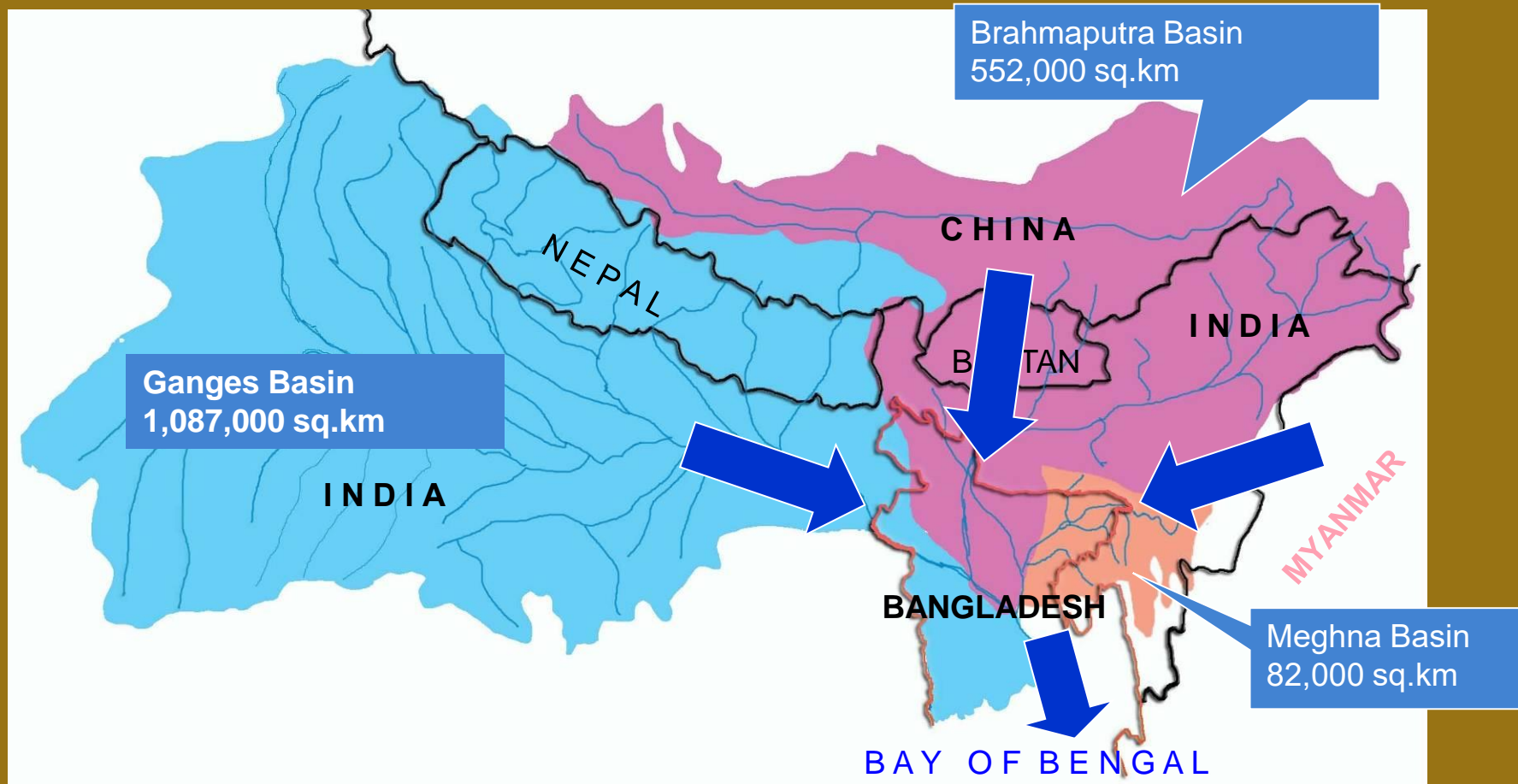


- With 144,570 sq. km. and about 160 million inhabitants the world's largest and most densely populated delta
- Challenges ahead through salt intrusion and changing hydrological dynamics



# Ganges, Brammaputra and Meghna Basin

Bangladesh rivers receive runoff from a catchment of 1.72 million sq. km, around 12 times its land area



# Bangladesh Delta



## Characteristics

- ❖ Largest delta in the world, 57 Trans-boundary Rivers, about 400 internal Rivers
- ❖ Drains 1.72 million sq.km basin area of G-B-M, 93% catchment lies outside Bangladesh
- ❖ Abundance of water in wet season & scarcity of water in dry season
- ❖ Annual Sediment load varies 1.1 to 1.4 billion tons
- ❖ 710 km coastline

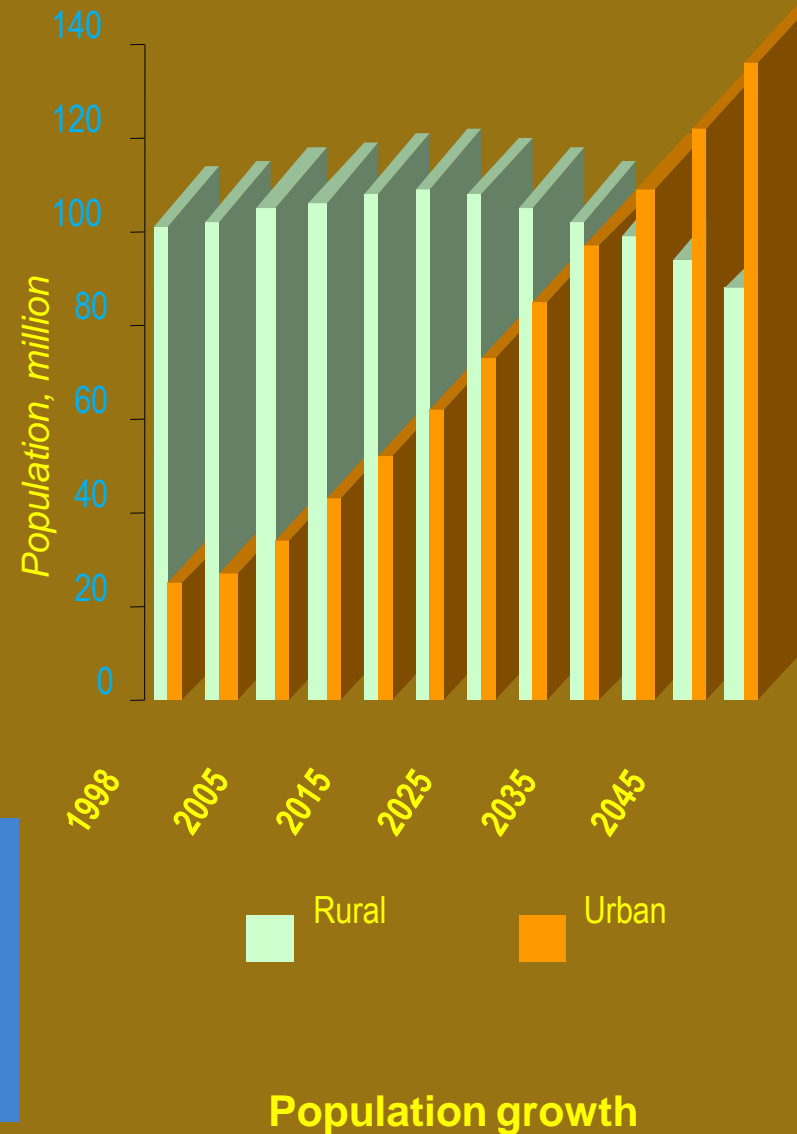


# Population

❖ the present population is 150 million, expected to rise to about 218 million by 2030, to about 224 million by 2050 and to about 250 million by 2100.

❖ Rapid urbanization is expected with about 40% of people (i.e., about 73 million living in towns and major cities by 2025)

❖ More Homestead, increased forestry, Industrialization, Erosion & Global Warming etc. would reduce arable land.



## **It is worthwhile to note that Bangladesh Delta experiences:**

- **Too much (more than 80%) water during monsoon (cause of flood & erosion) and too little water (less than 20%) during non-monsoon (cause of river bed siltation, draught, pollution, salinity intrusion)**
- **Pollution of Surface water & Arsenic Contamination in ground water**
- **Salinity problem in the coastal Delta**

# Natural Hazards in Coastal Delta



➤ Cyclone and Storm Surge



➤ Coastal Flooding



➤ Water Logging and drainage

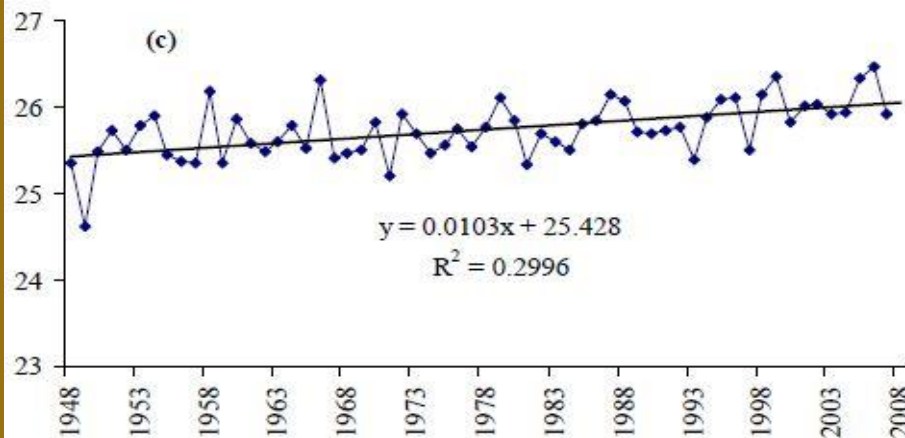


➤ Coastal Erosion

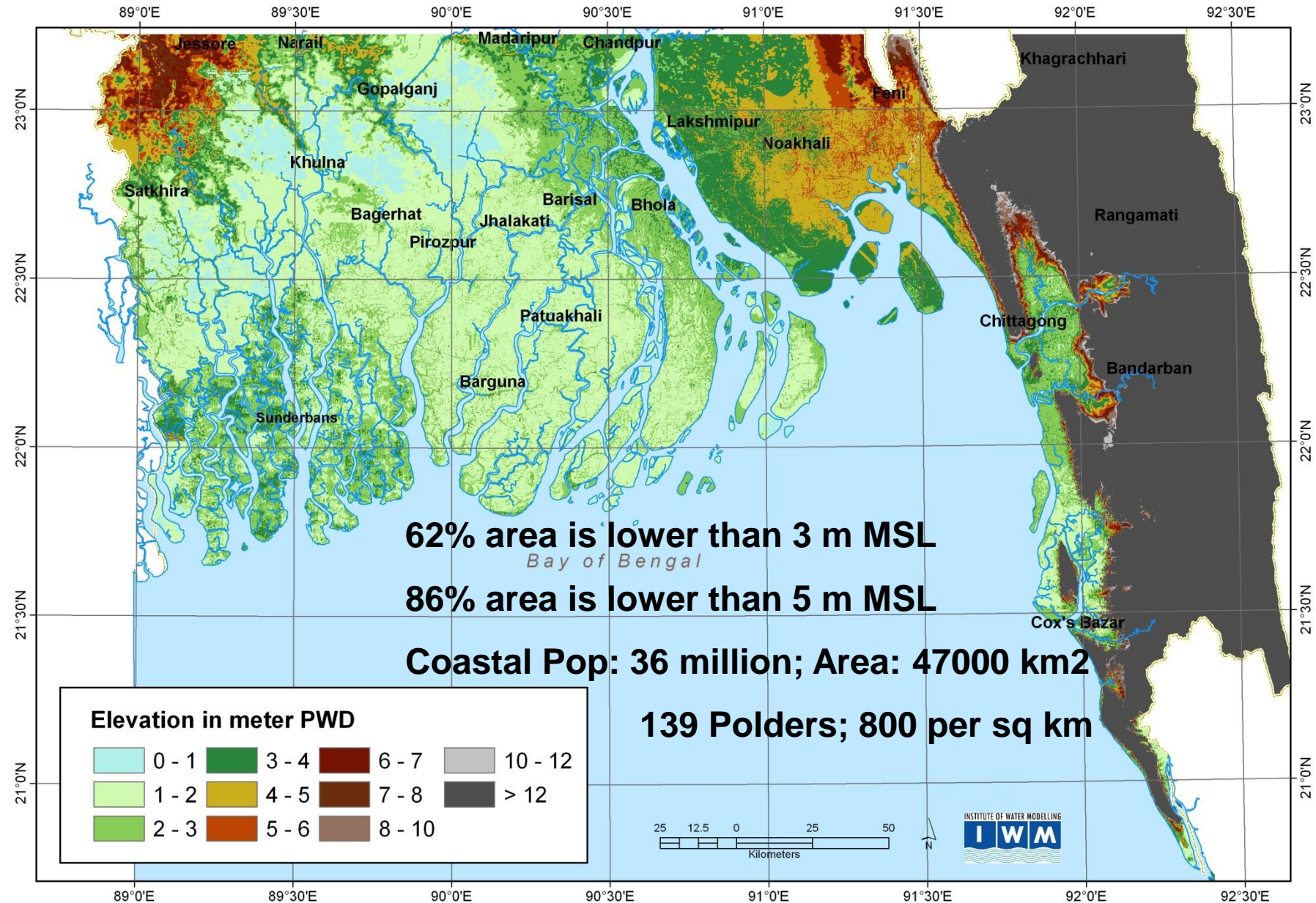


➤ Salinity Intrusion

➤ Climate Change and Sea Level Rise



# Coastal Area of Bangladesh with Elevation



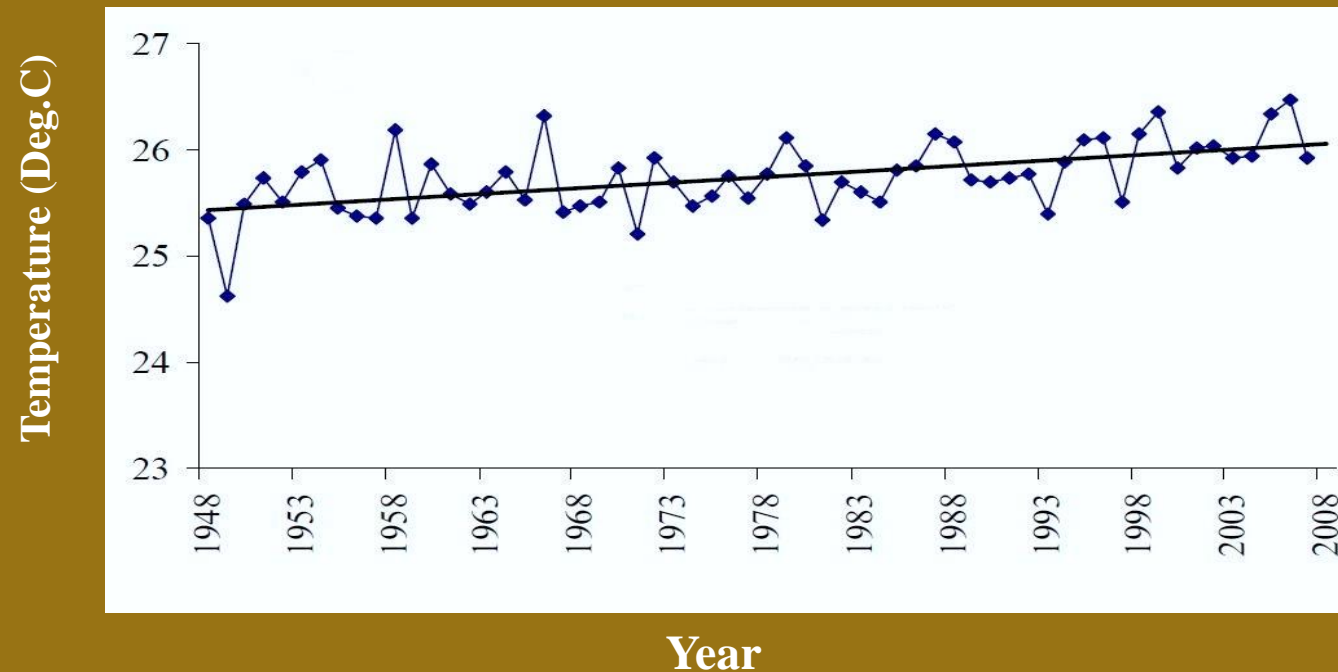
# Impact of Climate Change

The impacts of climate change for Bangladesh are most critical because of its geographical location, high population density, high levels of poverty, and the reliance of many livelihoods on climate-sensitive sectors.

Likely impacts of climate change on Bengal delta:

## Rise of Temperature:

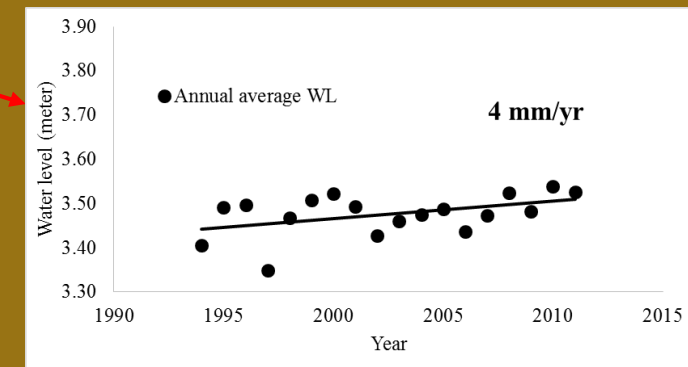
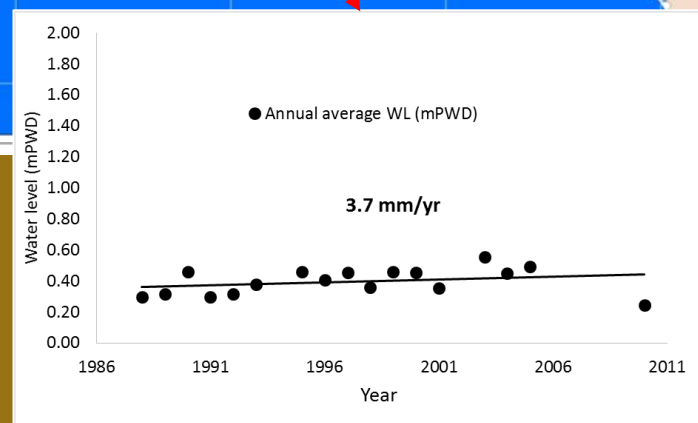
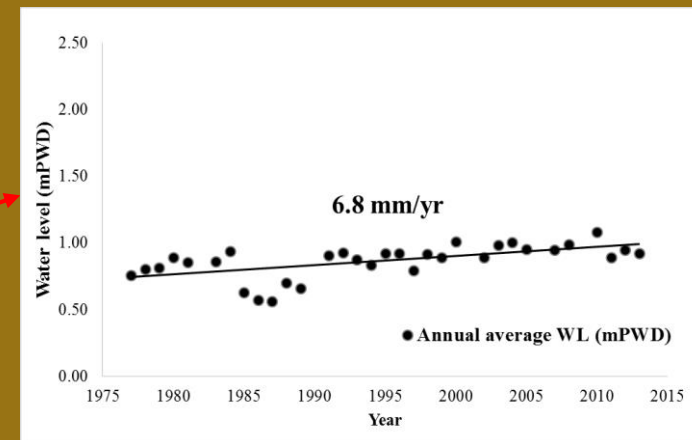
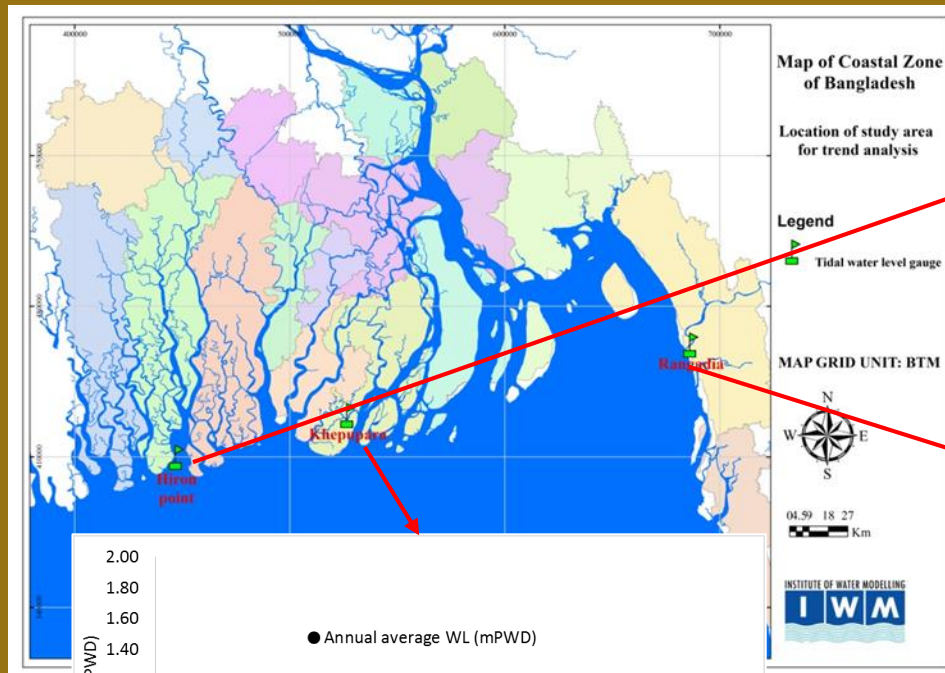
Analysis of measured temperature (1948-2007) at 34 locations shows that the overall trend in all Bangladesh annual temperature is rising at a rate of about 1 °C per century (Islam et al. 2009). This trend has become stronger in recent years.



# Impact of Climate Change: Mean Sea level rise

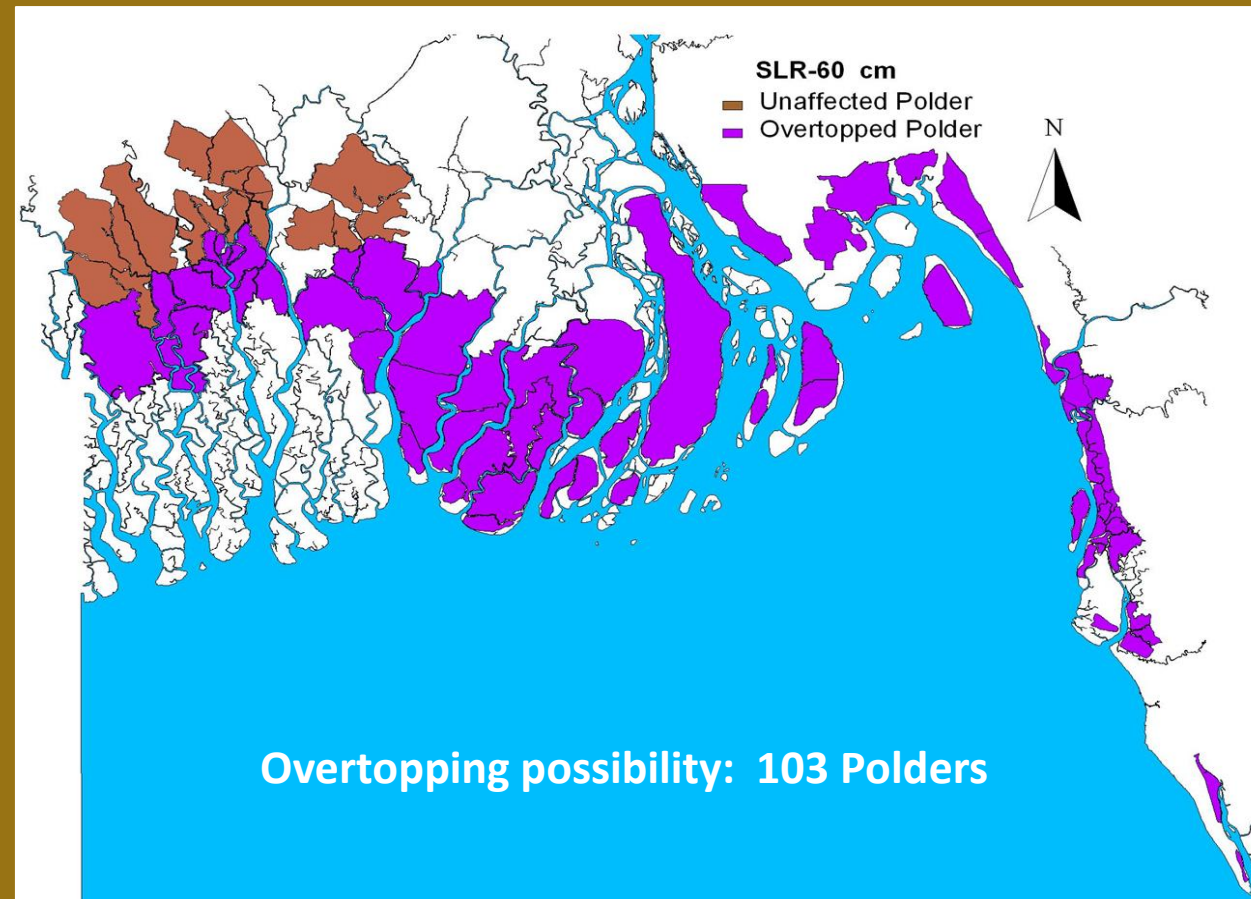
The relative mean sea level change is variable along the coast of Bangladesh depending upon the local and regional factors.

Increasing trend of annual mean water level in the southwest coast (Hiron point), Meghna estuary (Khepupara) and Chittagong coast (Rangadia) by 6.8mm, 3.7mm and 4mm per year, respectively (IWM, 2015). The impacts on water management, coastal erosion and flood risks are considered to be substantial.



# Impact of Climate Change: Cyclonic Storm surge

**Overtopping:**  
103 numbers of polders out of 139 polders are very likely to be overtopped in times of climate change with 60cm sea level rise and 8% increase of cyclonic wind speed in 2050

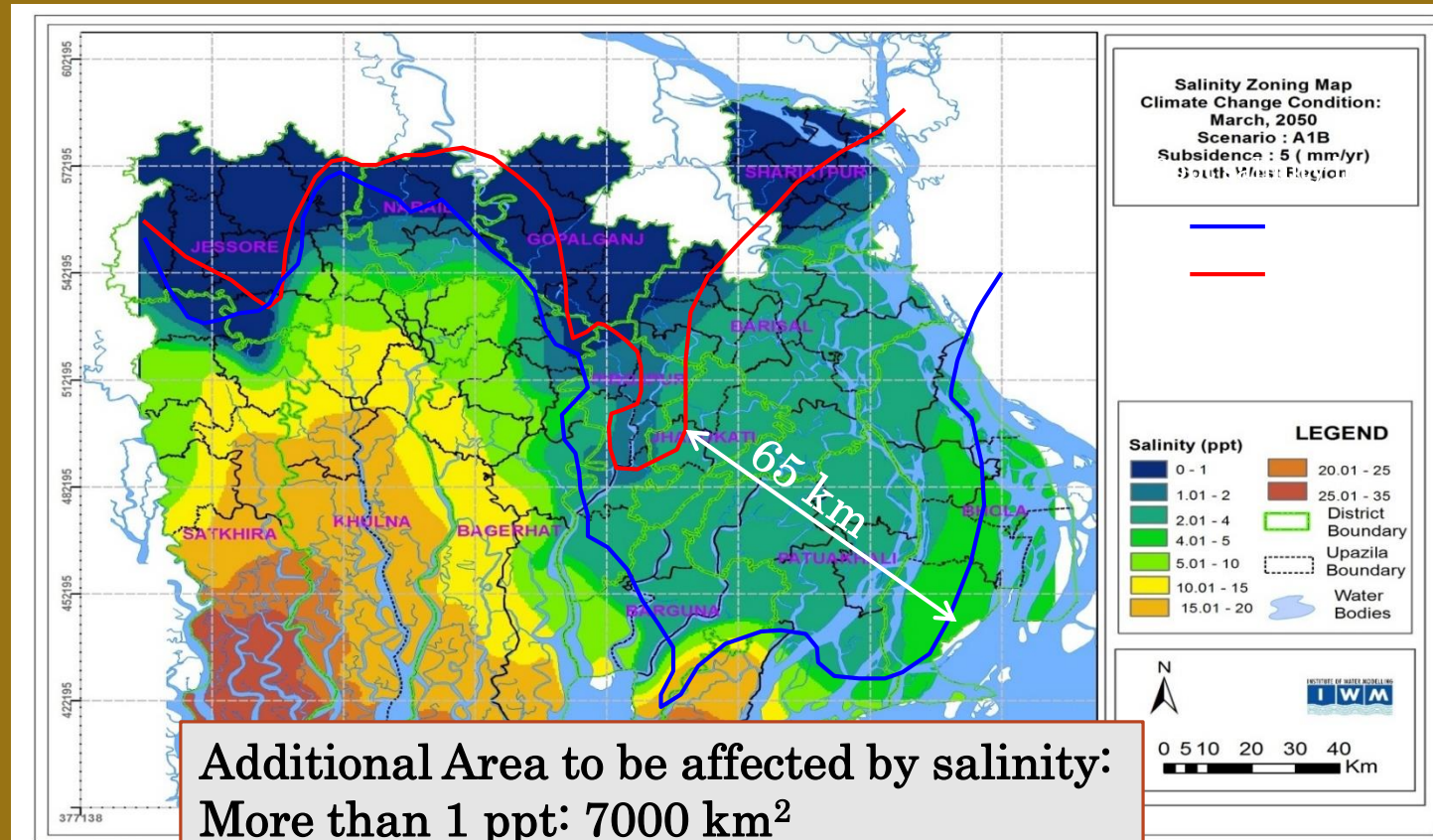


Additional 1,600km<sup>2</sup> is very likely to be high risk area in the coastal zones due to inundation of more than one meter depth, which is about 9% increase compared to base condition

# Impact of Climate Change

## Salinity Intrusion

Salinization of river water in the coastal area is a major risk from climate change. Sea level rise is likely to cause significant changes in river salinity in the southwest coastal area of Bangladesh. It is seen that an area of 7000 sq km is likely to be affected by more than 1 ppt and about 8400 sq km would be affected by more 2 ppt salinity in the southwest and south central zones by 2050 under 52 cm sea level rise

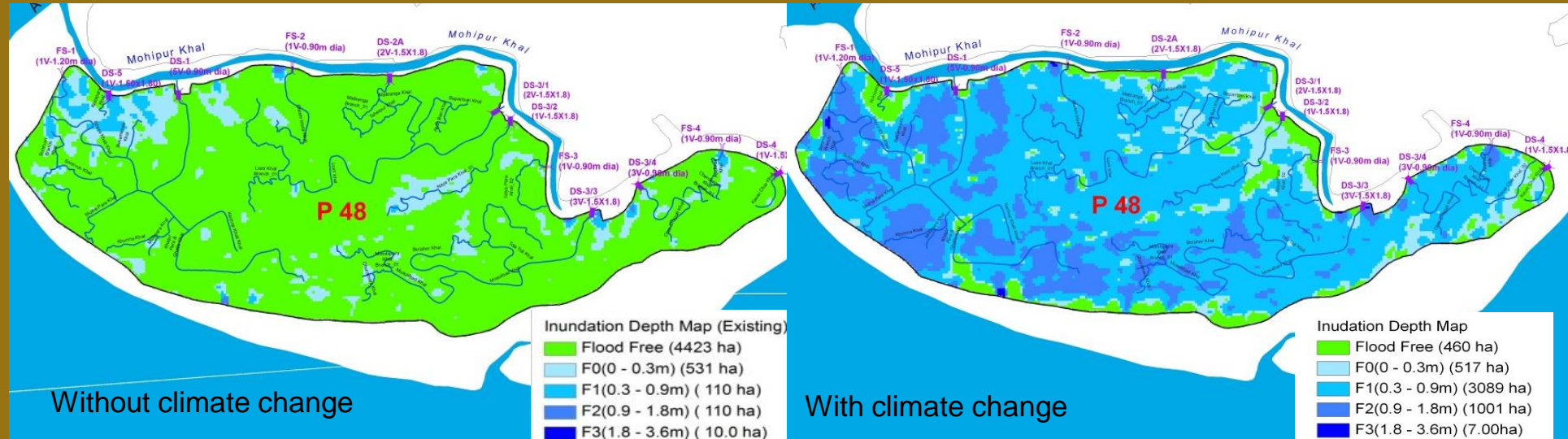


Additional Area to be affected by salinity:  
More than 1 ppt: 7000 km<sup>2</sup>  
More than 2ppt: 8400 km<sup>2</sup>

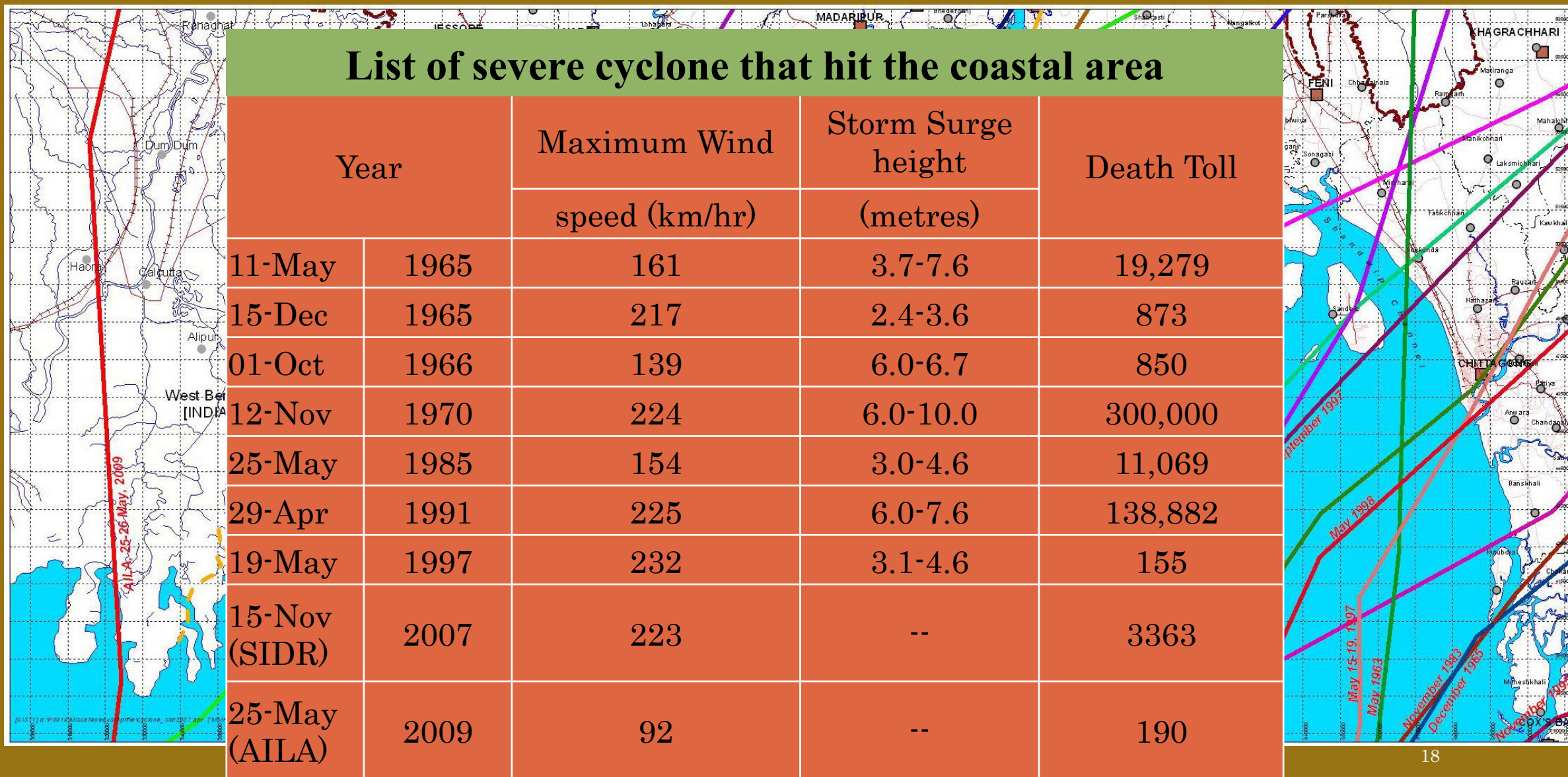


# Impact of Climate Change

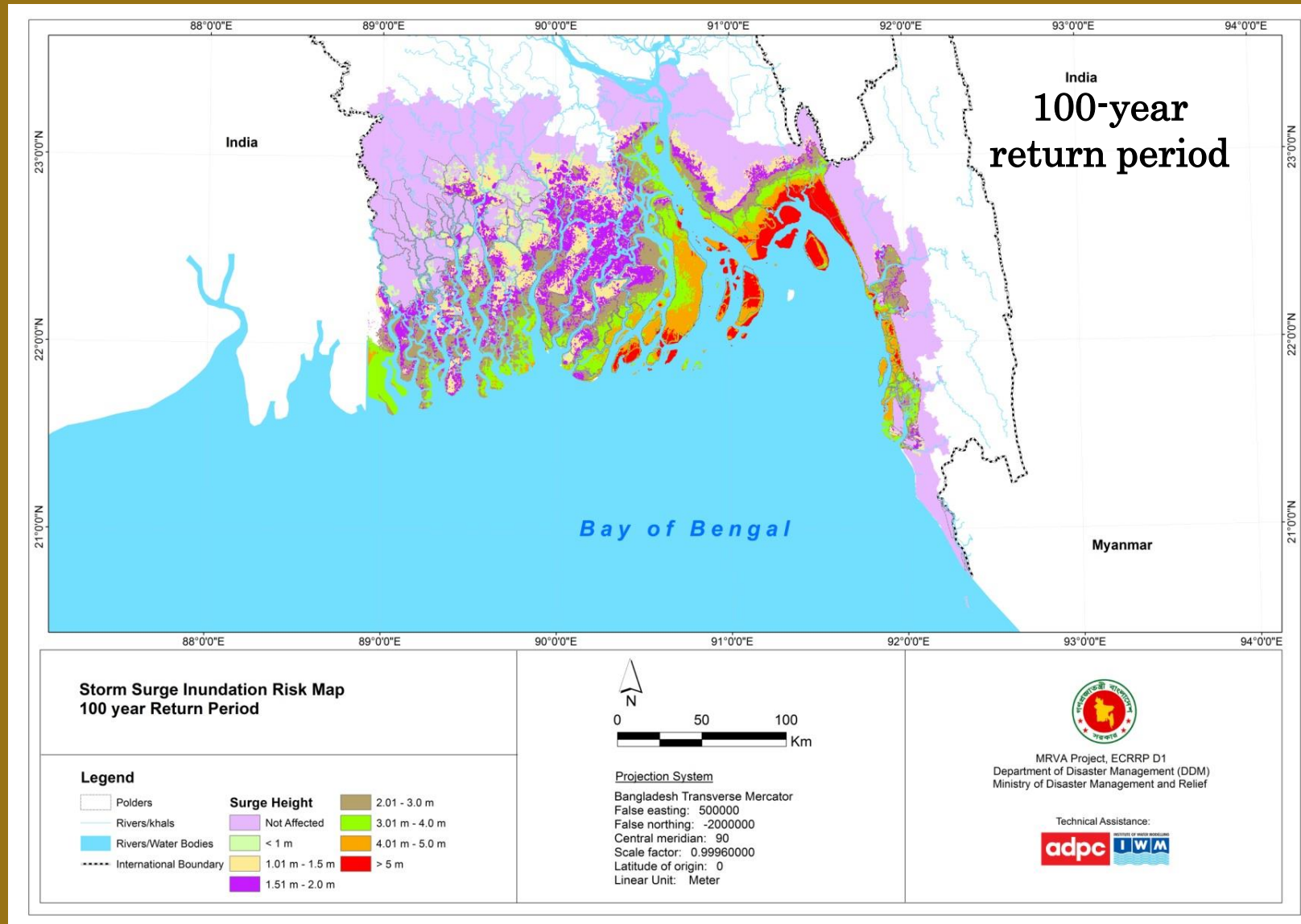
## Impact of Climate change on water logging



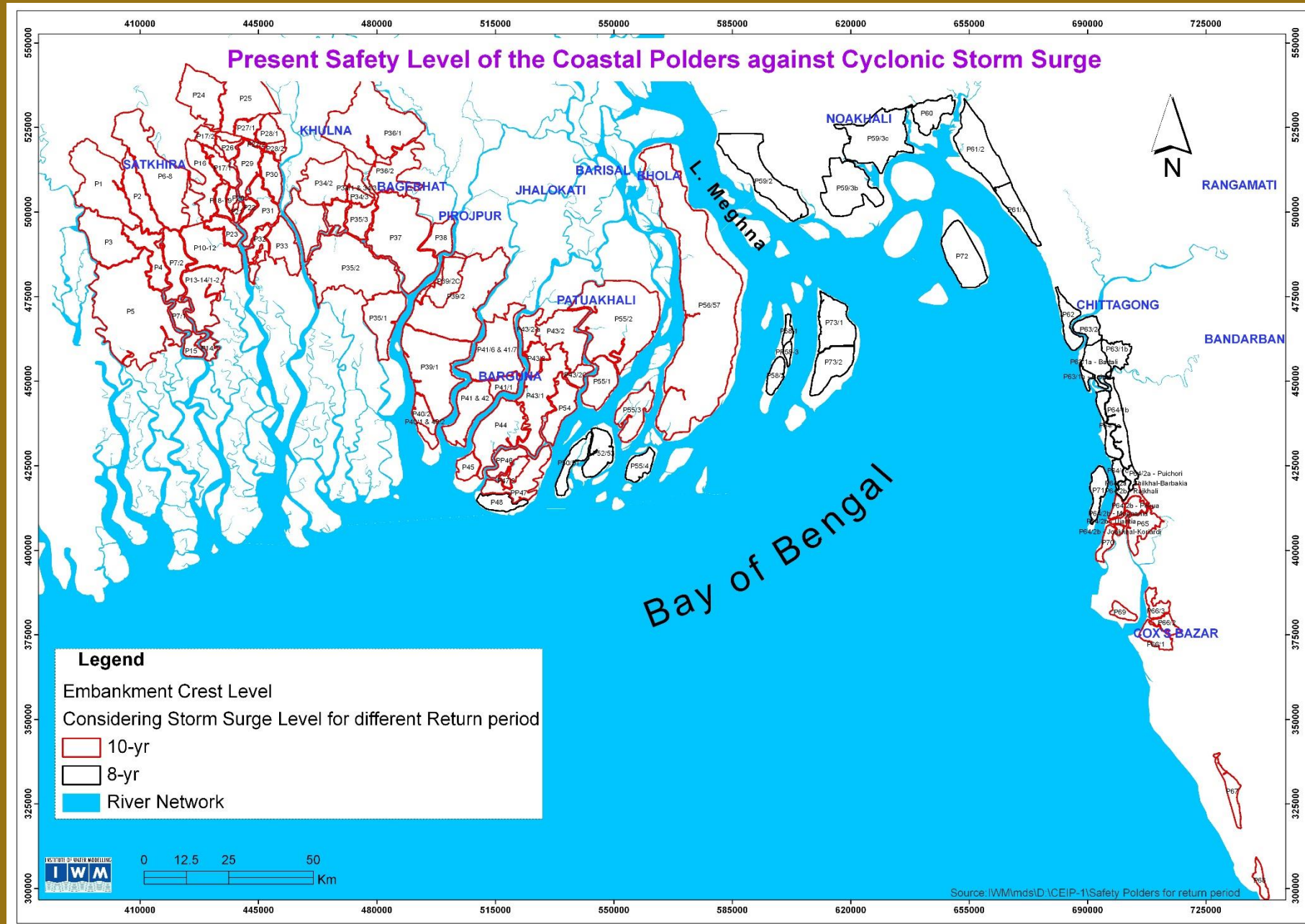
# Tracks and Human Losses of previous severe cyclones



# Storm surge inundation map of entire coastal area at 25-year/50-year/100-year return period



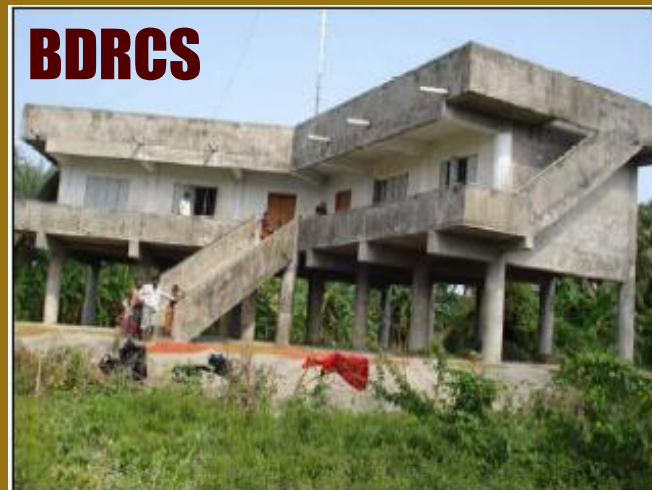
# Existing Polders-adequate for 8 to 10 year Cyclonic Storm Surge



# Resilience Measure: Cyclone Shelters



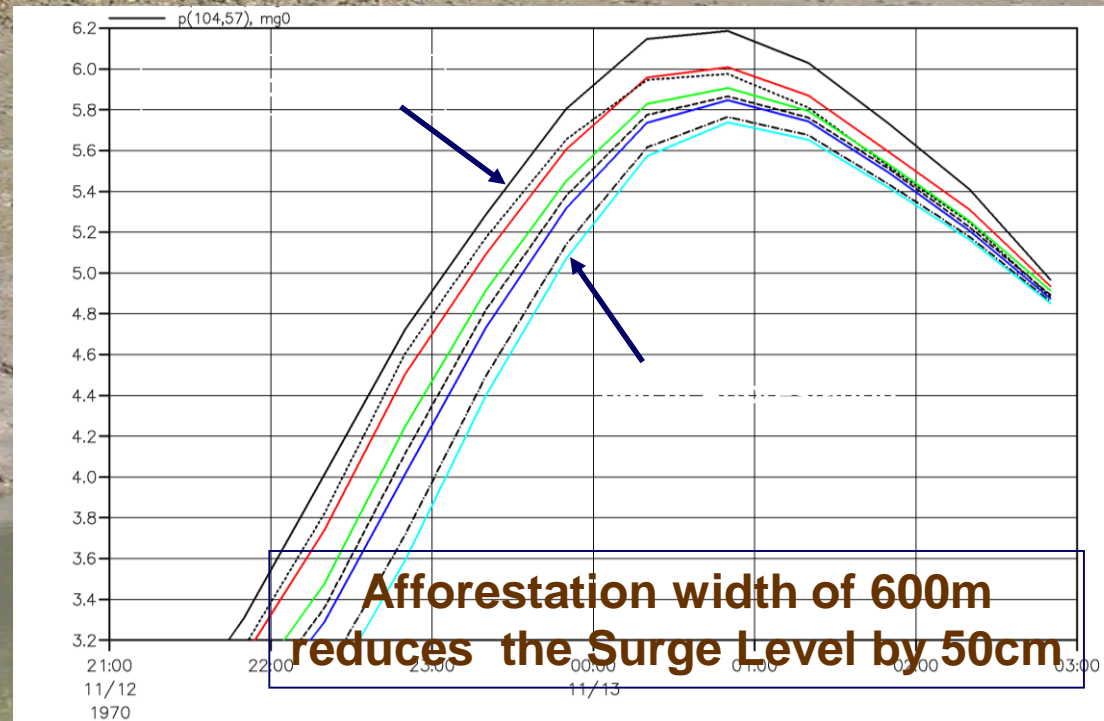
New cyclone shelters in coastal area  
specially in Khulna and Barisal Division



# Resilience Measure: Mangrove afforestation

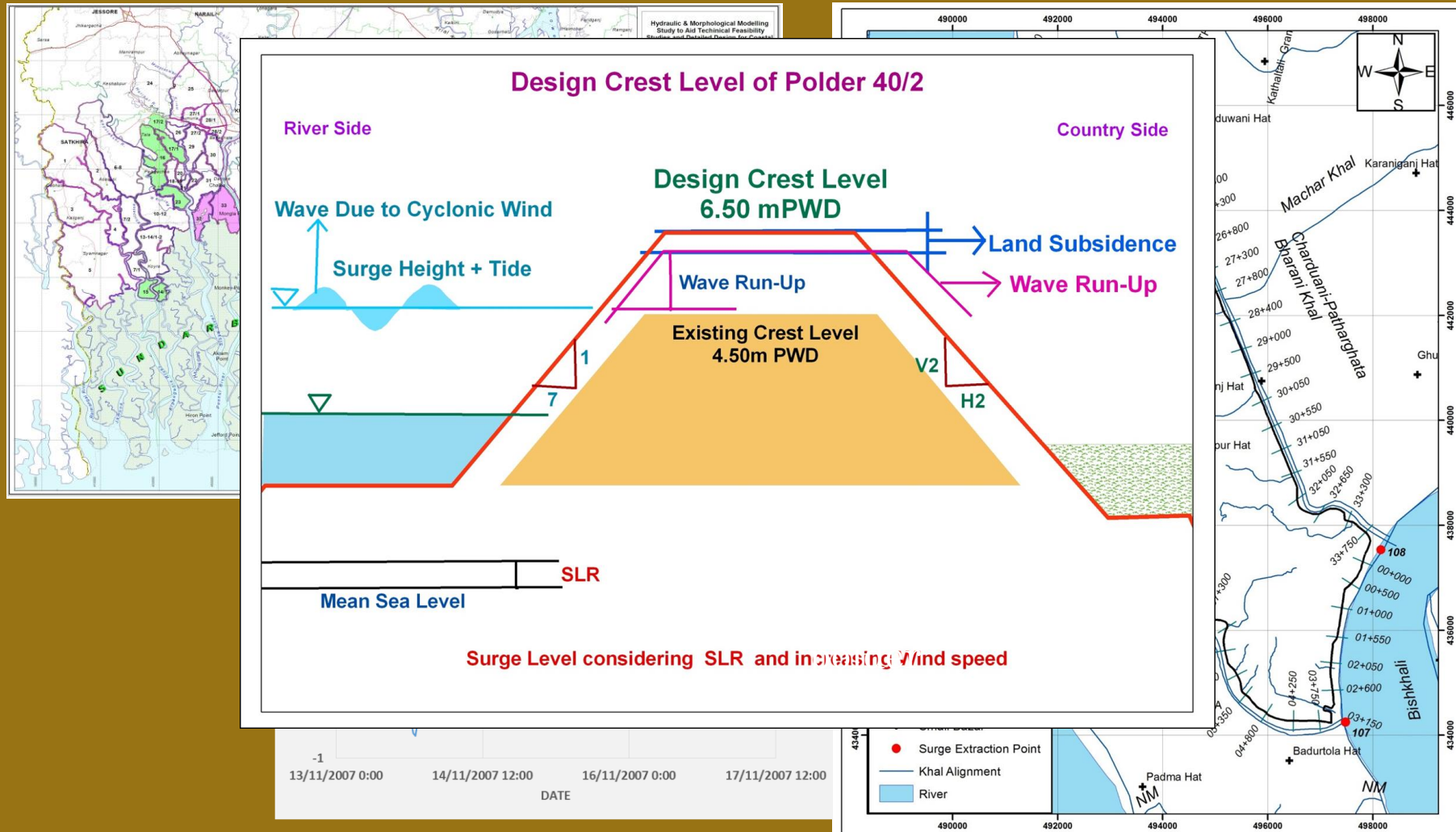


**Reduction of Storm  
Surge height by  
Coastal  
Afforestation**



# Resilience Measures

- ❖ Bangladesh Government has undertaken a Coastal Embankment Improvement project of USD 400million in 2013, the overall project development objective is to increase the resilience of the coastal population to natural disasters and climate change.



# Coastal Delta: Research & New Knowledge Generation

- ❖ **Climate change and river flood and storm surge risk modelling at regional, national and sub-national levels.**
- ❖ **Monitoring of locations and influence areas of major interventions before, during and after implementation.**
- ❖ **Short, medium and Long-term strategies of river dredging for multi sectoral use of river systems including navigation for inland water transport.**
- ❖ **To adequately identify the potential impacts of trans-boundary development on water resources.**
- ❖ **Relative Mean Sea Level Rise (RMSLR) along the coast line of Bangladesh and long term impacts on coastal morphology, river sedimentation and erosion.**
- ❖ **Management of sediment and water-logging in the polders for its long-term sustainability.**



# Summary-Resilience Measures

- Improved river drainage systems
- Improved Early warning systems Flood + Cyclone
- Coastal Embankment Strengthening
- Coastal afforestation
- Removal of Water Logging
- Risk mapping (Flood + Vulnerability mapping)
- Building code / Land-use regulation based on risk mapping
- Community awareness development and participation
- Flood proofing of key urban/rural/coastal systems

## **REMARKS:**

**Since Bangladesh is a small part of a larger hydrodynamic system (G-B-M Basins) that comprises several countries in the region & situated at the lowermost basin area; mutual understanding and Regional & Sub-Regional Cooperation among the co-riparian countries is essential to achieve long-term and sustainable solutions against Climate Change impacts and increasing Delta resilience.**



THANK YOU

