# Welcome to the Presentation on Necessity of Water-related disaster management in Bangladesh

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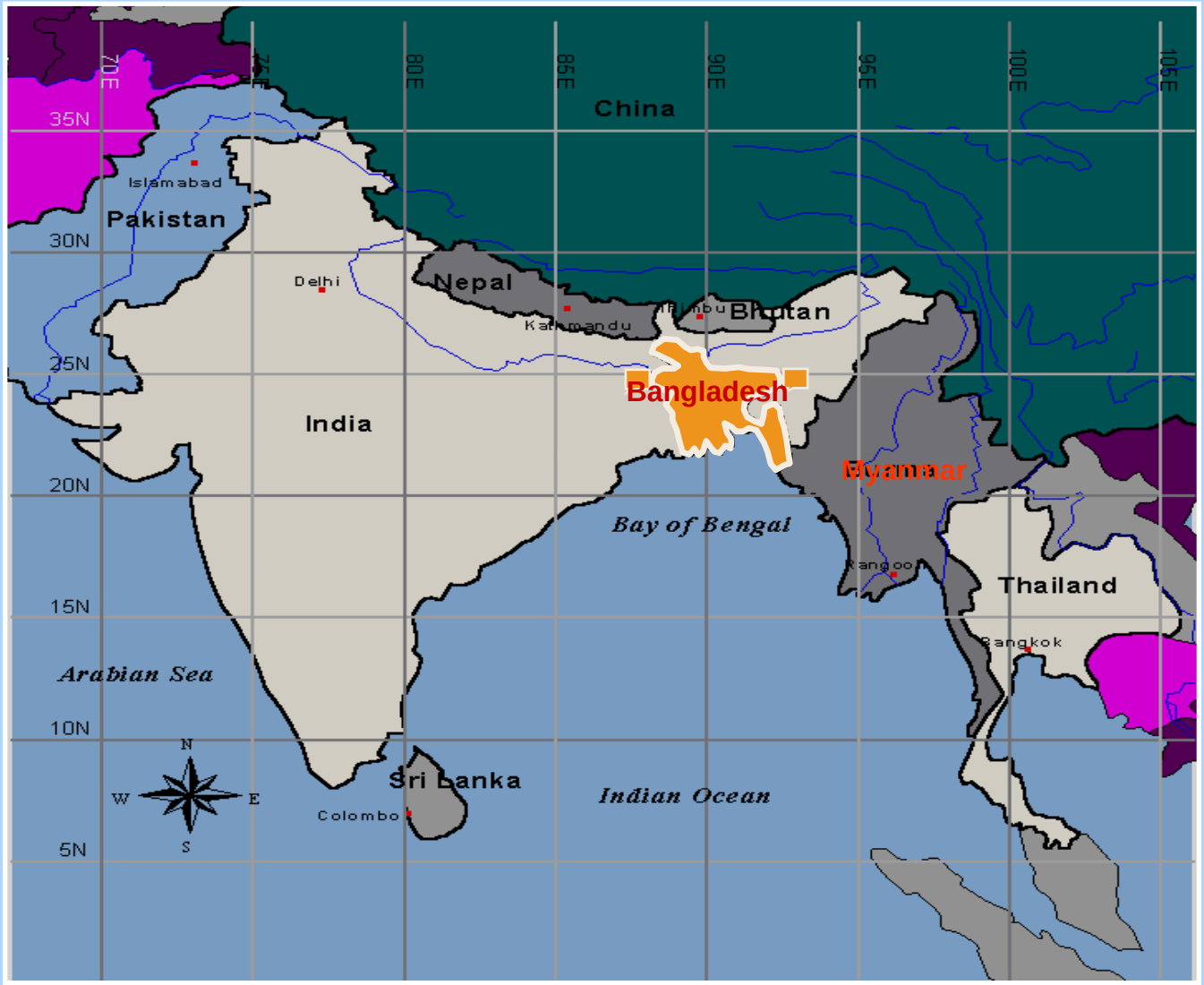
# Geo-Physical Setting
# Bangladesh



# Bangladesh at a glance [Water Sector]

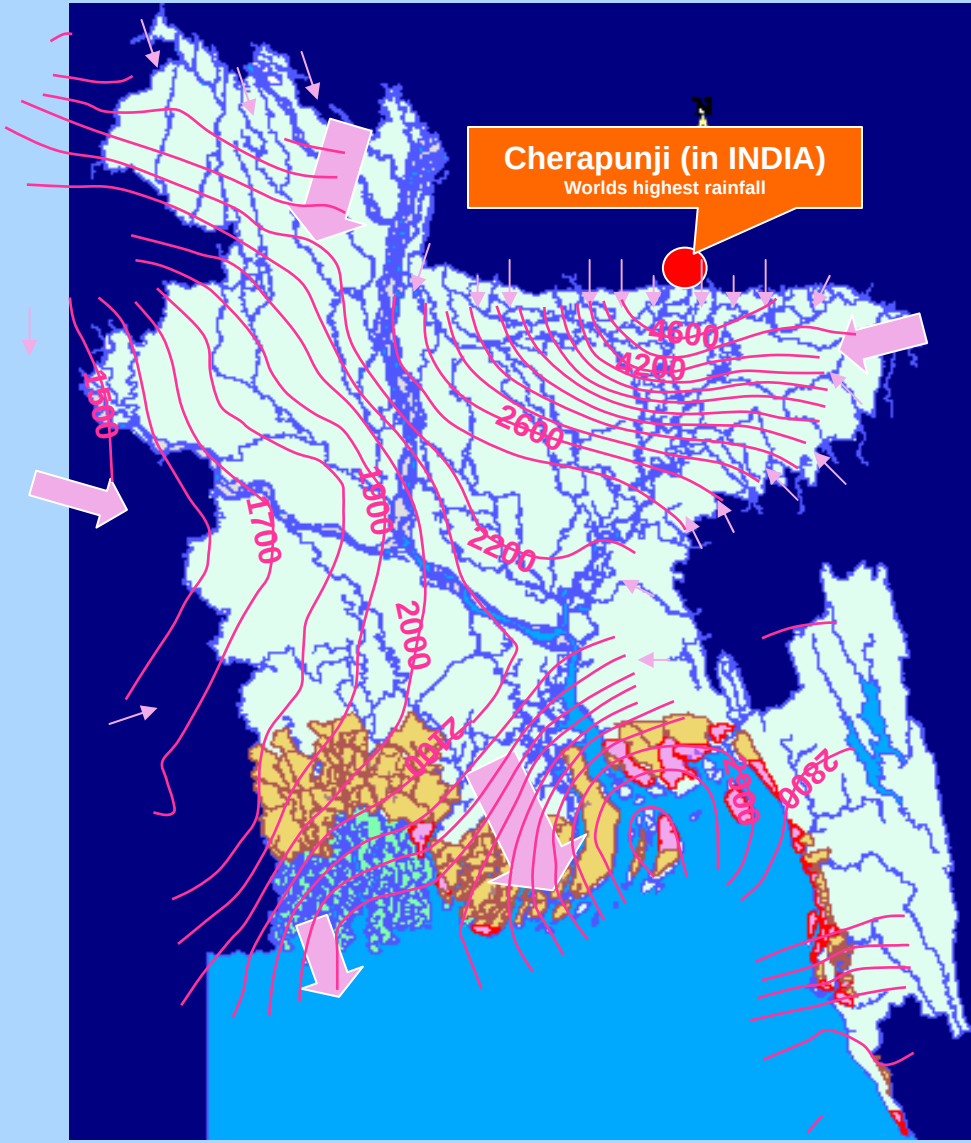
Total area : 1,47,570 sq.km.

- Arable land: 82,400 sq.km.(8.24 Million ha)
- Population: 145 Million (approx.)
- Population density: 950 persons/ sq. km.
- Poverty level: 49.8% (as per BBS/WB).
- Total food production: 46.17 Million Mt.
- **Ground Elevation (in PWD):**
- **0-5m – 30%**
- **5-30m – 45%**
- **>30m – 25%**

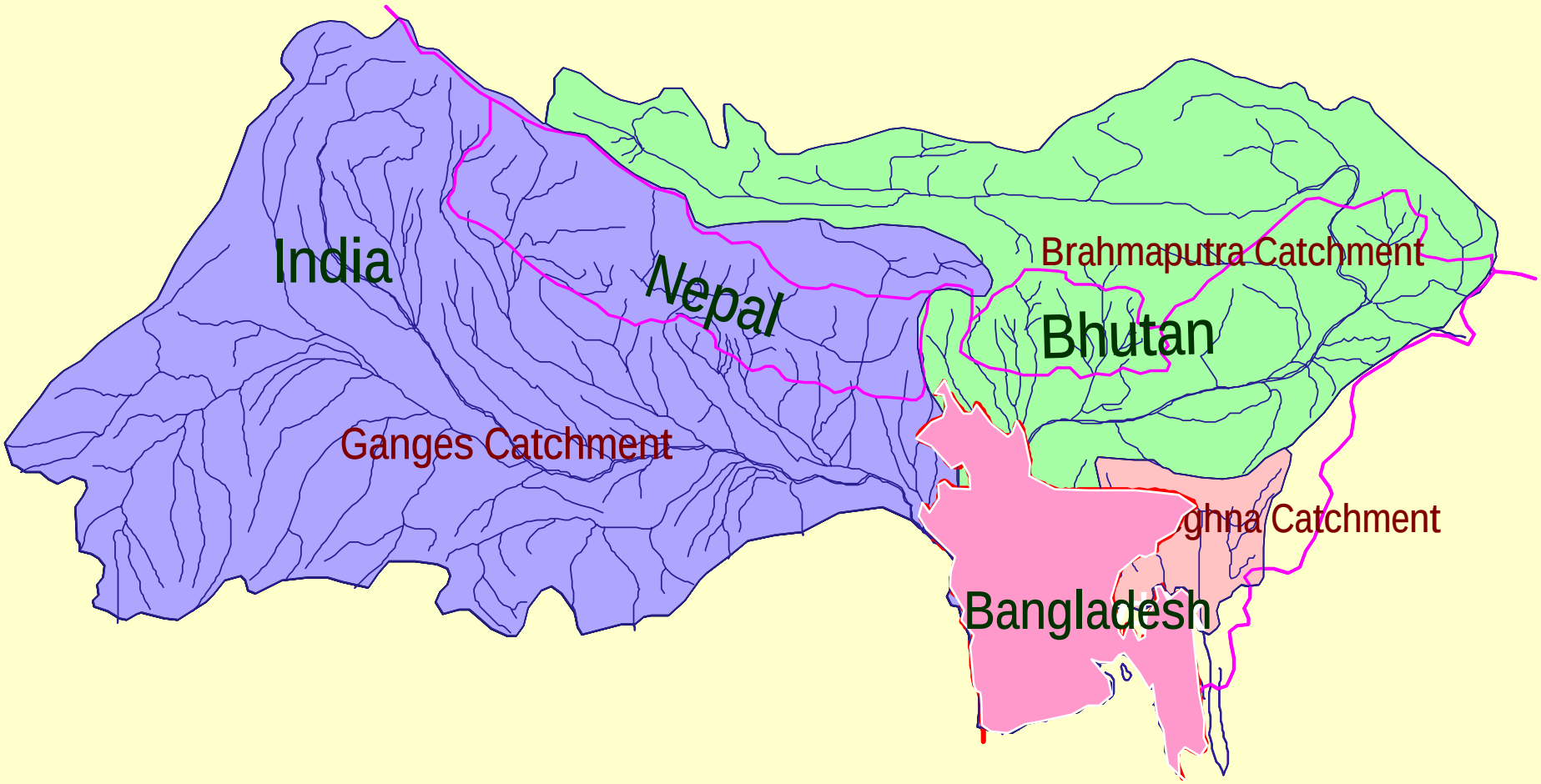
# A riverine country with 310 rivers

- Total river length : 24,000 km
- Trans-boundary rivers :
  57 nos. - 54 from India and
  - 3 from Myanmar

River erosion
- Annual land loss: 10,000 ha.
- Annual displacement of population: 64,000.
- Annual accretion in the Meghna estuary: 1,880 ha.



# Ganges, Brahmaputra & Meghna Basin Area




Catchment of main three rivers is 1.72 million sq. km, of which only 7% lies within Bangladesh

# Main Features of Major Rivers of Bangladesh

| | Brahmaputra | Ganges | Meghna |
|---|---|---|---|
| Length of River (km) | 2,900 | 2,550 | 900 |
| Length within Bangladesh (km) | 270 (9.3%) | 260 (10.2%) | 400 (44.44%) |
| Total Basin Area ($km^2$) | 552,000 | 1,087,001 | 82,000 |
| Basin Area within Bangladesh ($km^2$) | 39,100 (7%) | 46,300 (4%) | 35,000 (43%) |
| Highest Recorded Discharge ($m^3/s$) | 98,300 | 76,000 | 19,800 |
| Lowest Recorded Discharge ($m^3/s$) | 2,860 (2.9%) | 261 (0.34%) | Tidal (---) |
| Annual Sediment Transport (Mton) | 600 | 286 | |

- Annual River flows 1200 BCM
- Stored over Bangladesh floodplain would have about 9.0 m water depth
- Annual Sediment flows 1.8-2.0 Billion Tons
- Stored over Bangladesh floodplain would have about 1.60 m thick sedimentation

# Integrated Water Resources Management (IWRM)

Integrated Water Resources Management (IWRM) is a well coordinated and participatory approach of a multi-functional system of water, man, land and related resources, to ensure a sustainable utilization of the water resources and an equitable distribution of its benefits, which optimally contribute to the social and economic development of the society; without compromising the sustainability of the vital eco-system.

# Integrated Water Resources Management

The most important elements of Water Resources Management, that need to be integrated are:

- Efforts of man
- Water quality and quantities
- Technical, environmental and social issues
- Land and water use
- River basin, estuary and coastal zone
- Legal frame work
- Community based national and international water management and cooperation

# Key Challenges of Water Resources Management in the 21st Century

- Meet demand for human system
- Protect Nature and nurture the natural system
- Political will.
- Uncertainty on availability of Water and sensitivities of Trans boundary River issues.
- Sustainable development
- Professional need
- communication skills
- in-depth knowledge of policy, finance and public involvement

# Natural Disasters/Vulnerabilities

- Flood
  - Flood occurs in Bangladesh regularly.
  - 1954, ’55, ’74, ’87, ’88, ’98,’04 & 07 floods were catastrophic.

Drought

  - About 25% of the country suffer water stress in dry season.

- River erosion
  - About 10,000 ha agricultural land erodes every year.
  - Bank erosion ranges from 250-800 m every year.
- Sedimentation
  - Loss of navigability.

# Natural Disasters/Vulnerabilities (cont'd..)

- **Salinity intrusion**

  **- Severe environmental degradation in SW areas.**

- **Arsenic contamination**

  **- 59 district out of 64 are affected.**

- **Desertification**

  **- Reduction of dry season flow induces creeping desertification in the Ganges dependent area.**

- **Cyclonic surge**

  **- Annual phenomenon, however cyclone 1970, 1991 & 2007 were catastrophic.**

- **Climate change**

  **- 1.5 m sea level rise would affect 15% of the total population & 16% of the land area.**

# Disasters in Bangladesh

# Flood

- Flood occurs in Bangladesh regularly
- Being low-lying country, average 22% area is flooded every year
- In case of severe flood, 66% area inundated
- 1954,'55,'74,'87, '88,'98, 2004 & 2007 floods were catastrophic

# Causes of Floods

- Unique Geographical Location
- Excessive run-off from upstream
- Low topography
- River siltation
- Sea swell during monsoon
- Hydraulic Characteristics
  - –low gradients of major rivers
    - Ganges: 4 cm/km, B.Putra: 8 cm/km, Meghna: 3 cm/km

# Flood Management

- Structural
- Non-structural

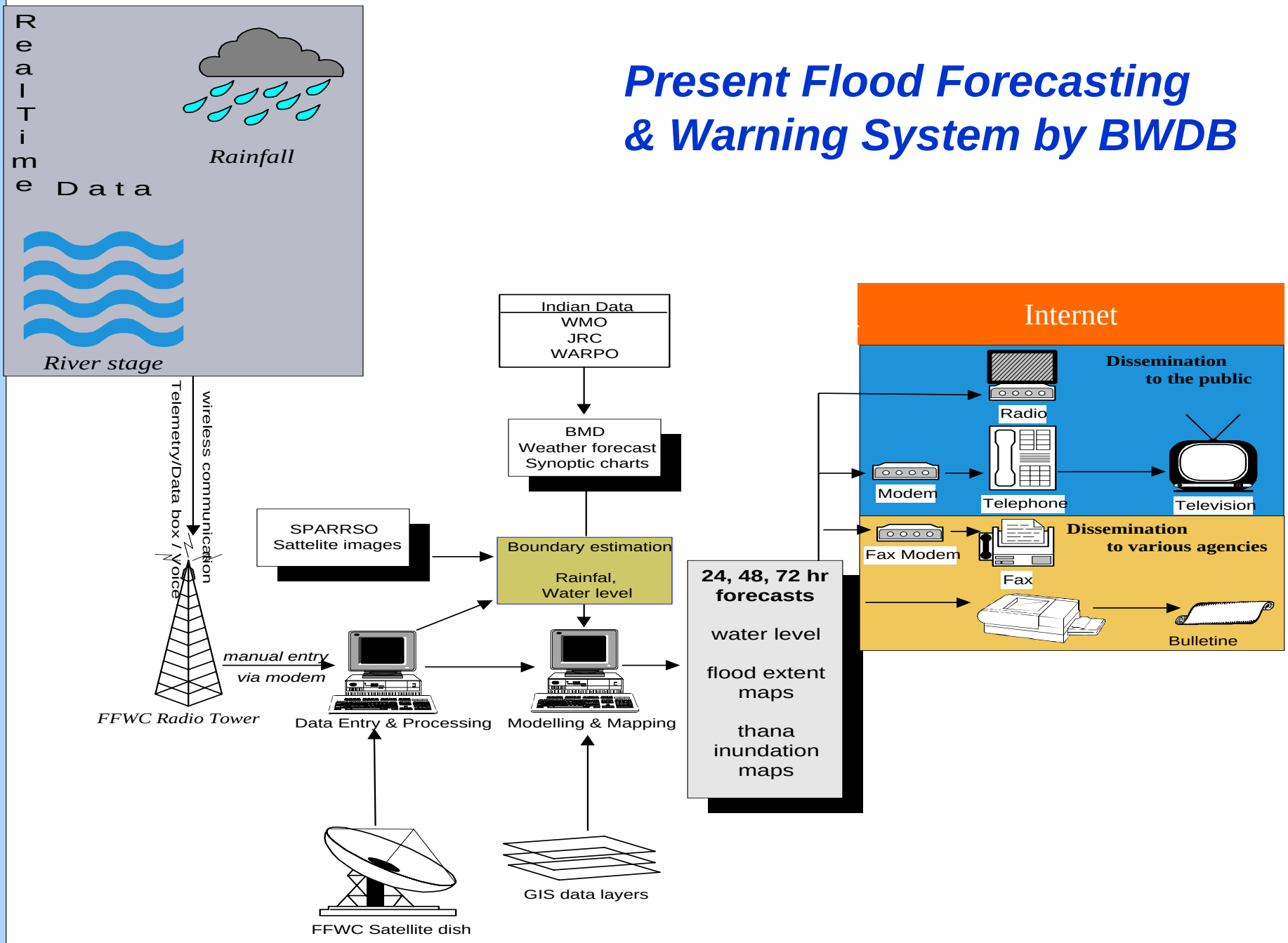
# Structural

- **Building Embankments**
- **Different Hydraulic Structures**
- **Reservoirs**
- **Dams**
- **Groynes**
- **Spurs**

# Non-structural

- **Flood Forecasting & Warning**
- **Erosion Prediction**
- **Environmental Monitoring**
- **Watershed Management**
- **Planning & Development Policy**

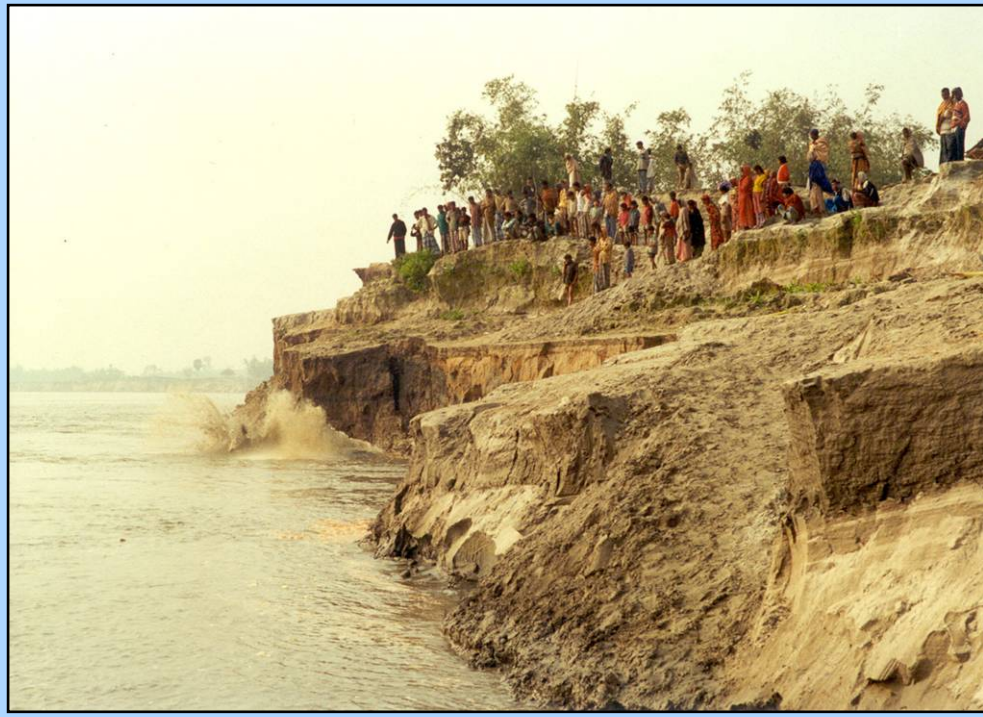
# Present Flood Forecasting & Warning System by BWDB



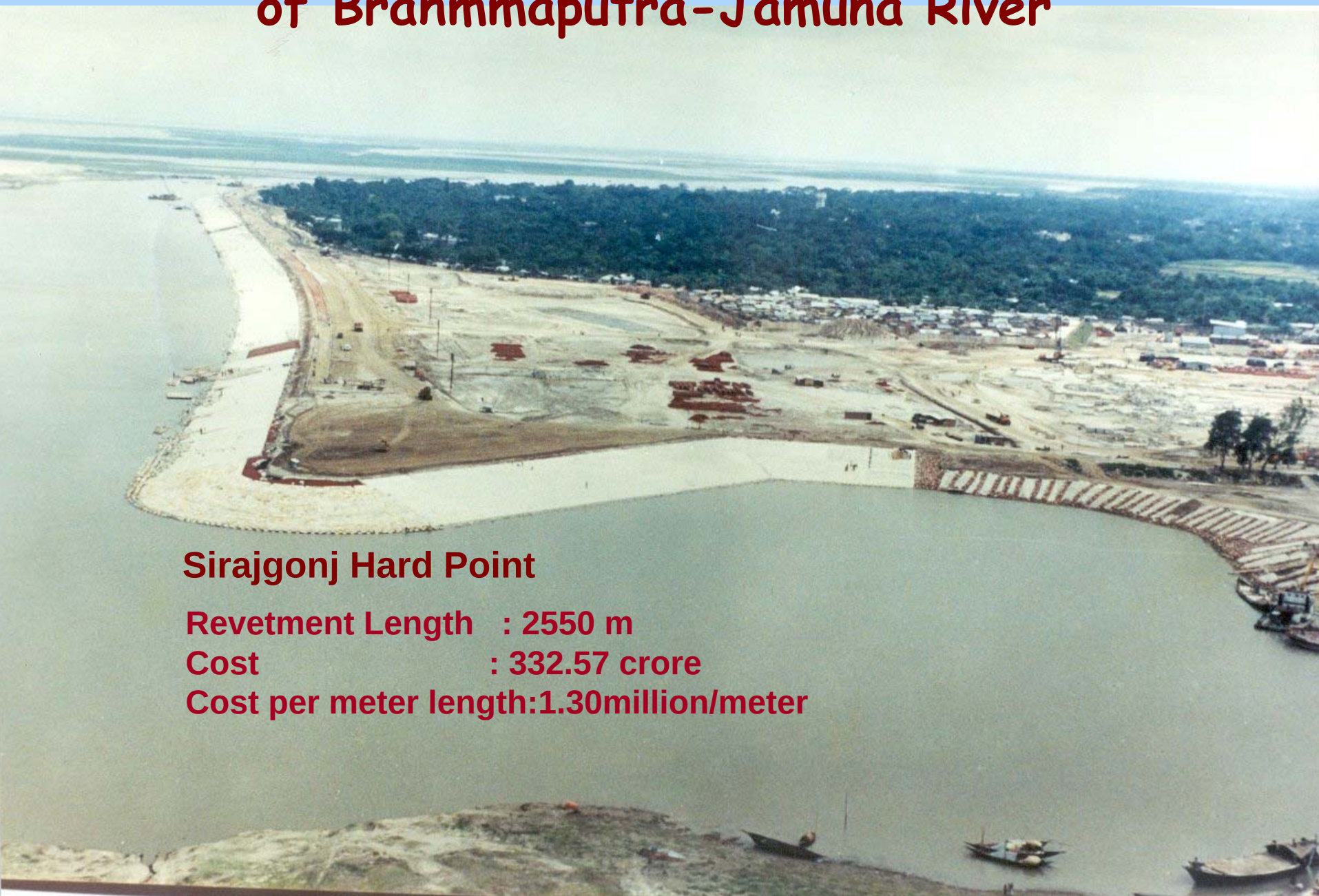
# River Erosion

- River erosion is an inevitable natural phenomenon and causes human sufferings
- 70,000 ha lost in Jamuna/Brahammaputra only (1970-1998)
- Severe cut in living standard
- Loss of life, valuable assets, crops, livelihood
- Displaced to city slums & unending misery
- Displaced as high as 24 times in life span
- River course stabilization is needed for flood mitigation and effective development

# River Bank Erosion



# River Bank Protection Project along the R/B of Brahmmaputra-Jamuna River



**Sirajgonj Hard Point**

**Revetment Length : 2550 m**
**Cost : 332.57 crore**
**Cost per meter length:1.30million/meter**

# Contribution of BWDB through River Bank Protection Work (Since inception)

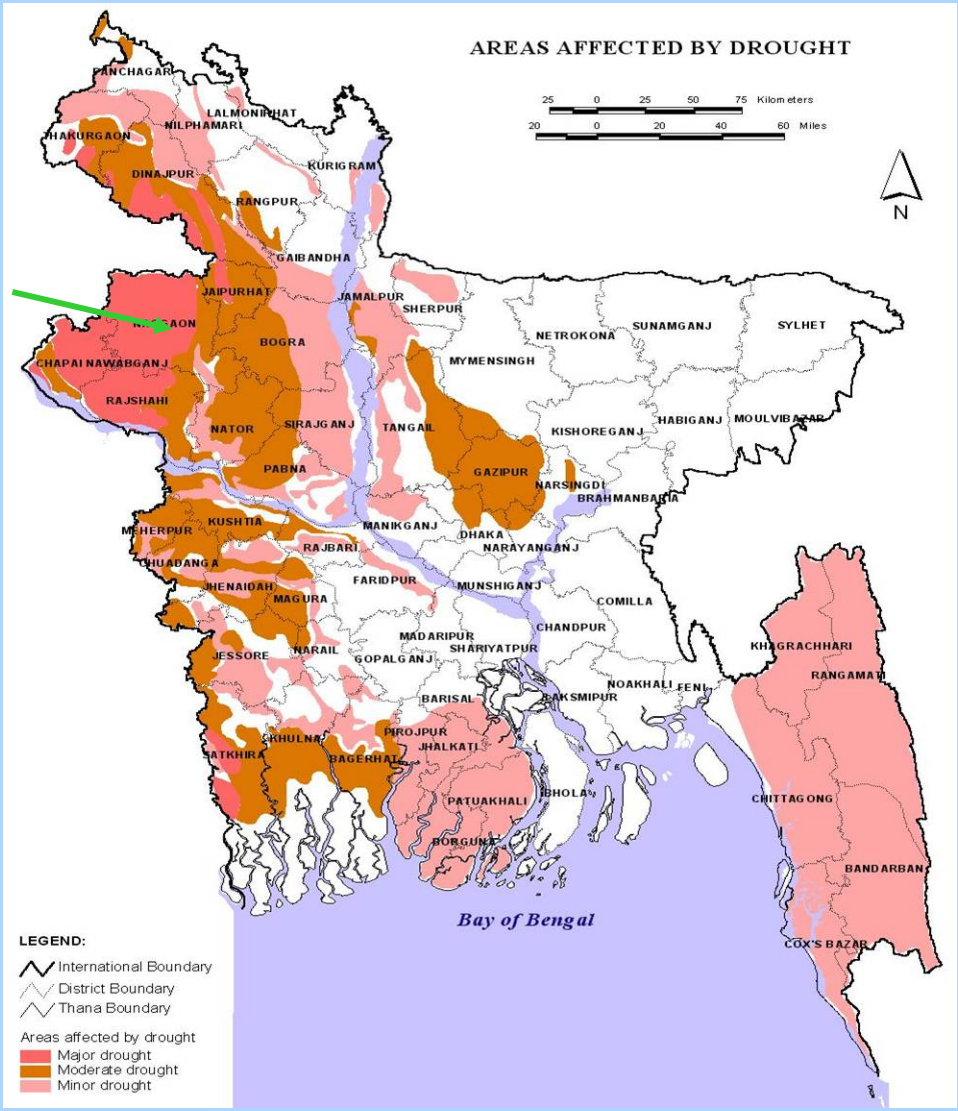
| Facilities | Type of protection work | | Expenditure (Tk. in Crore) | Value of assets protected (Tk. in Crore) |
|---|---|---|---|---|
| | Groynes/ Spurs (Nos) | Revetment (km) | | |
| River bank protection work | 220 | 468 | 3,784 | 40,000 |

- About 30 district Head quarters , 70 upazila Head quarters and 100 commercial installations are fully or partly protected through the aforesaid works.

# Drought.

- **To minimize drought effect, no measures have yet to be followed while Bangladesh faced significant loss in the last few years.**
  - **The most drought prone area in Bangladesh is north western region.**
  - **Even in irrigated areas sometimes drought occurs because of improper irrigation scheduling.**

# Drought




*About 25% of the country suffer water stress in dry season*

# River Sedimentation

- 1.8 to 2.0 billion tons of sediment are carried by the three river systems annually
- Sedimentation is very acute in the river system in the south west region, because of decrease in discharge in the Ganges during low flow
- Sedimentation is also acute in the major distributaries

# Adverse Impact of Intervention in the Upper Catchment due to Farakka barrage in India.

**Ganges under Hardinge bridge**

- *Ecological disaster*
- *Desertification*
- *Heavy Siltation*
- *Disruption in navigation*
- *Decrease in Lively hood*
- *Mass Migration*

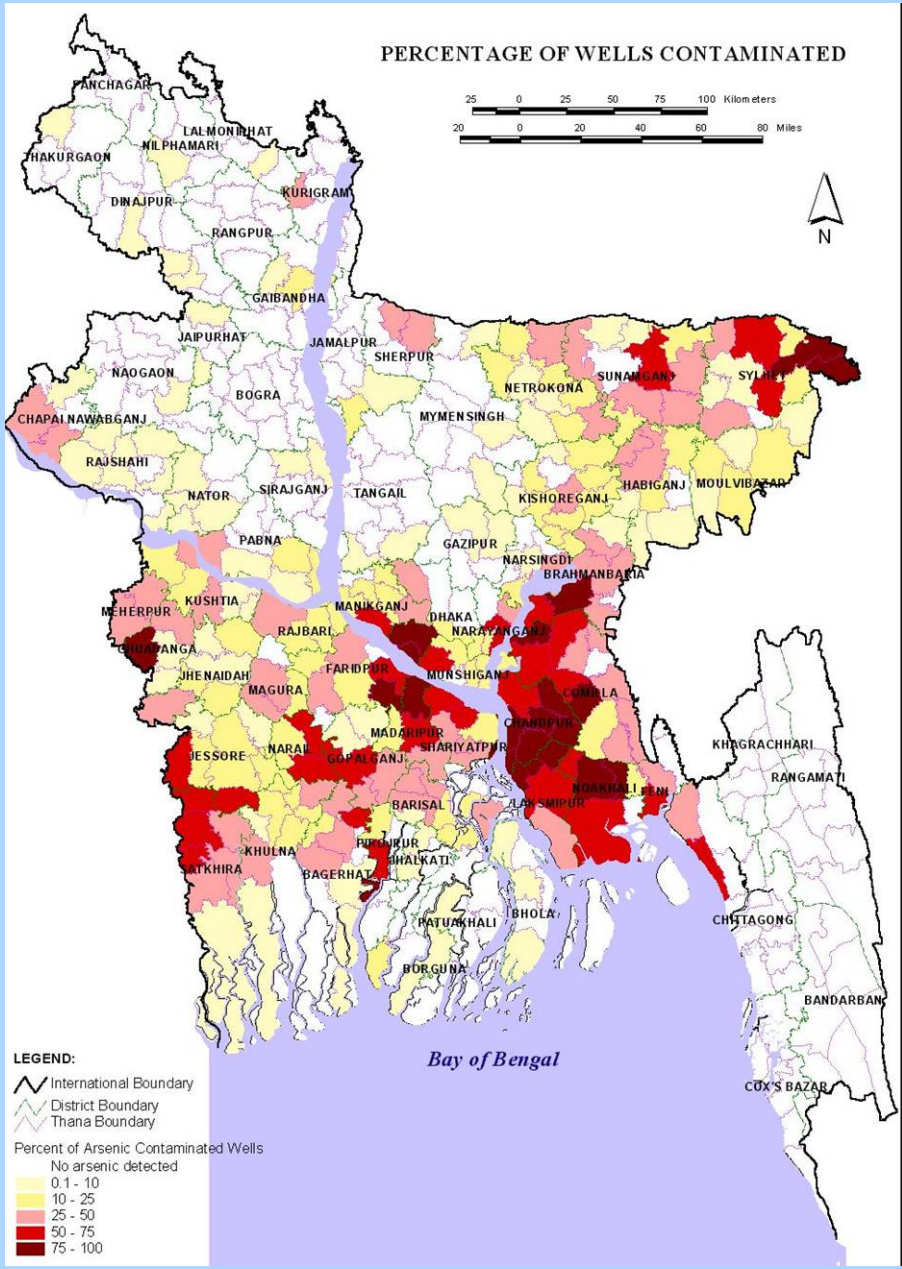
- *Decrease in agricultural production*
- *Tremendous reduction of dry season flows*
- *Intrusion of saline front (about 80 km)*
- *Reduction of induced groundwater recharges*
- *Significant area will be silted up*
- *Increased soil salinity*

**Siltation in Ganges Dependent Area and increase of water salinity i.e. expansion of areas being affected by salinity**

**Overall biodiversity including the production of Agriculture, Fisheries and industries, navigation and the production of wood in Sundarbans have been seriously deteriorated.**

# Arsenic Contamination of Groundwater

*59 districts out of 64 are affected*

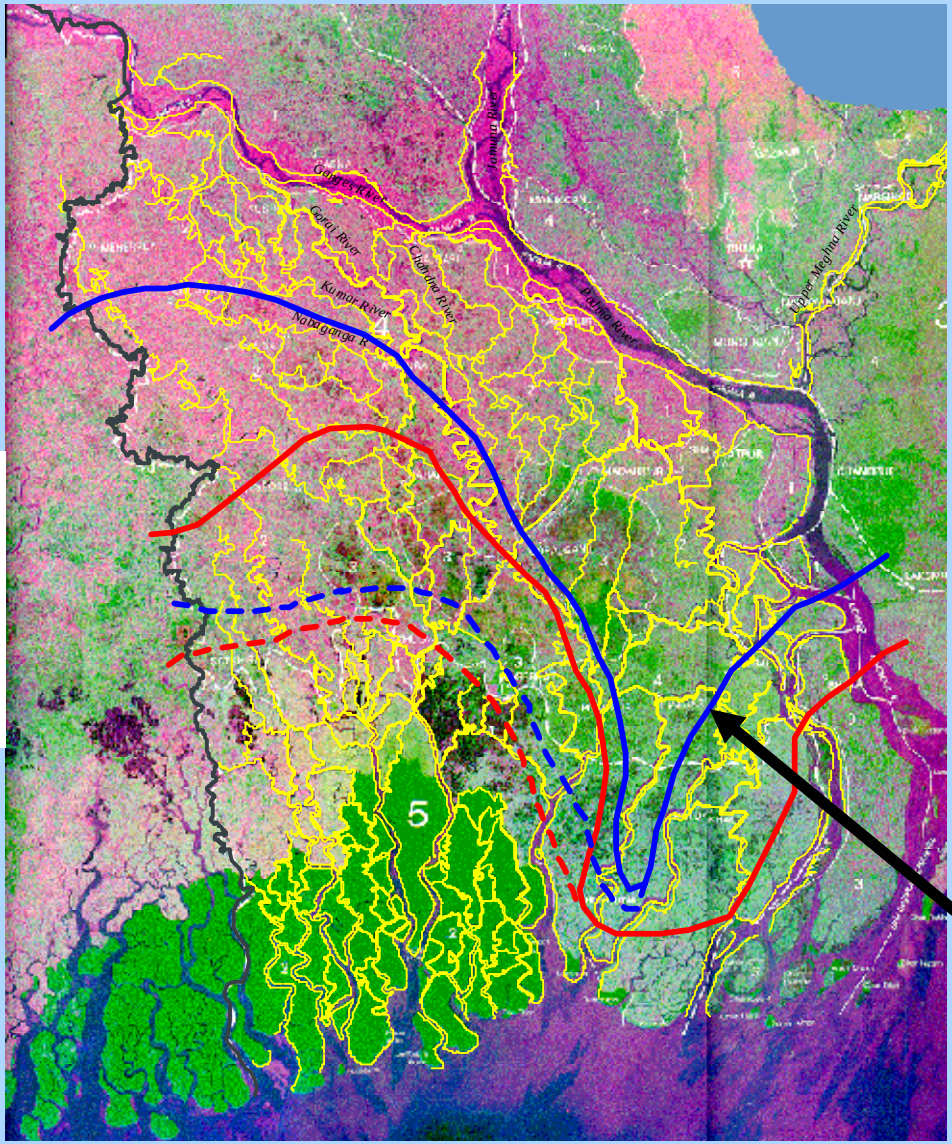


# Salinity Intrusion

**Industrial units suffered a progressive damage due to increased corrosion**

**Industrial operation needed to carry fresh water from a long distance**

**Top-dying of Sundari trees**




**Crop Damage and Yield Reduction**

**River water turned impotable**

**Increased water borne diseases**

**Degradation of public health**

2000 micro mhos/cm = 1.2 ppt

Severe Environmental Degradation in SW areas

# India's proposed mega-project for interlinking its rivers

*It is reported that India has proposed project for interlinking its rivers to resolve it's water crisis in the next 10 years. Thirty seven Indian rivers will be linked under this project.*

*It has been proposed to divert the waters of the major tributaries of the Ganges in India to the south. It also envisages to divert waters of the Manas and Sankosh, Dharla, Dudhkumar etc. - the tributaries of the Brahmaputra to West Bengal and to Godavari-Krishna in South India.*

# Indian River Linking Project *Major Threats.*

## HIMALAYAN COMPONENT

**NAME OF THE LINKS**

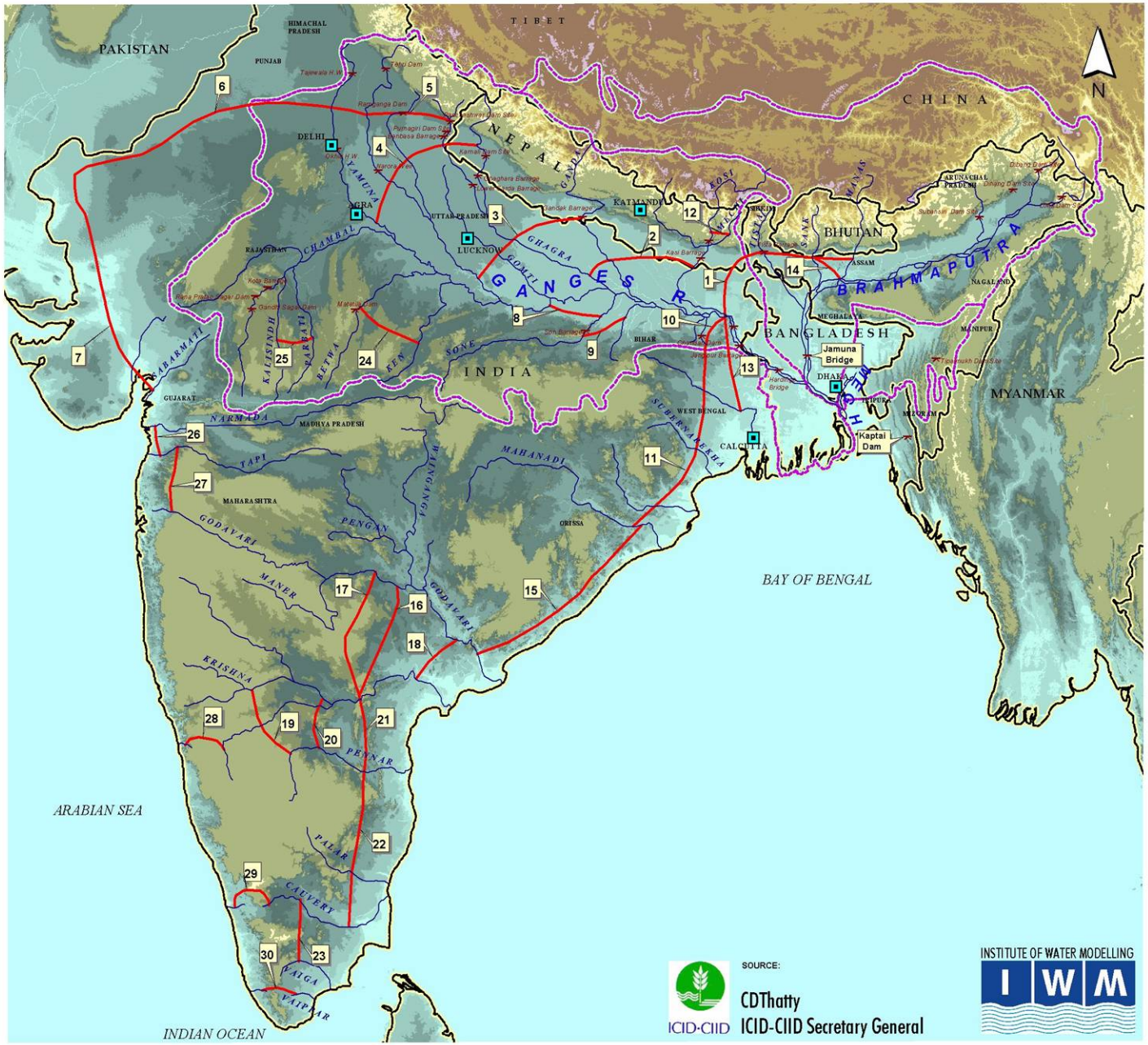
1. Brahmaputra-Ganga (MSTG)
2. Kosi-Ghagra
3. Gandak-Ganga
4. Ghagra-Yamuna
5. Sarda-Yamuna
6. Yamuna-Rajasthan
7. Rajasthan-Sabarmati
8. Chunar-Sone Barrage
9. Sone Dam-Southern Tributaries of Ganga
10. Ganga-Damodar-Subernarekha
11. Subernarekha-Mahanadi
12. Kosi-Mechi
13. Farakka-Sunderbans
14. Brahmaputra- Ganga (JTF) (ALT)

## PENINSULAR COMPONENT

**NAME OF THE LINKS**

15. Mahanadi (Mani Bhadra) - Godavari (Dowlaiswram)
16. Godavari (Inchampalli Low Dam) - Krishna (Nagarjunasagar Tail Pond)
17. Godavari (Inchampalli) - Krishna (Nagarjunasagar)
18. Godavari (Polavaram) - Krishna (Vijayawada)
19. Krishna (Almatti) - Pennar
20. Krishna (Srisailam)- Pennar
21. Krishna (Nagarjunasagar) - Pennar (Somasila)
22. Pennar (Somasila) - Cauvery (Grand Anicut)
23. Cauvery (Kattalai) - Vaigai-Gundar
24. Ken-Betwa
25. Prabati-Kalisindh-Chambal
26. Par-Tapi-Narmada
27. Damanganga-Pinjal
28. Bedti-Varda
29. Netravati-Hemavati
30. Pamba-Achankovil-Vaippar

FIGURE 1



# International Treaties and Protocols

## *Treaty*

In 1996, Bangladesh and India signed a thirty year agreement regarding sharing of the Ganges water. This is the only existing agreement between the two countries regarding sharing of the water of one of their common rivers. The sharing between India and Bangladesh of the Ganges water is on the basis of agreed division of flow at Farakka by ten day periods from 1st January to 31st May every year.

Negotiation on 7 rivers with India is going on with priority to Teesta. Other rivers are Dharala, Dudkumar, Manu, Khowai, Gumti, Muhuri

# Cyclone and Tidal Surges

Catastrophic Cyclone and Tidal Surges occurred in the year 1970 (12$^{th}$ , Nov),1991(29$^{th}$ April) and 2007(15$^{th}$ Nov)

# Disaster and Bangladesh

## Recent major disasters

| Year | Disaster | Deaths |
|---|---|---|
| 1970 | Cyclone | 300,000+ |
| 1988 | Cyclone | 6,000+ |
| 1991 | Cyclone | 140,000+ |
| 1997 | Cyclone | 600+ |
| 2007 | Cyclone | 4000+ |

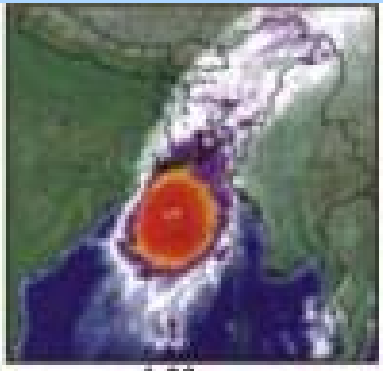
# Tidal Surges

*Cyclone*

*About 1/4 th of the country susceptible to tidal surges*

# Cyclone

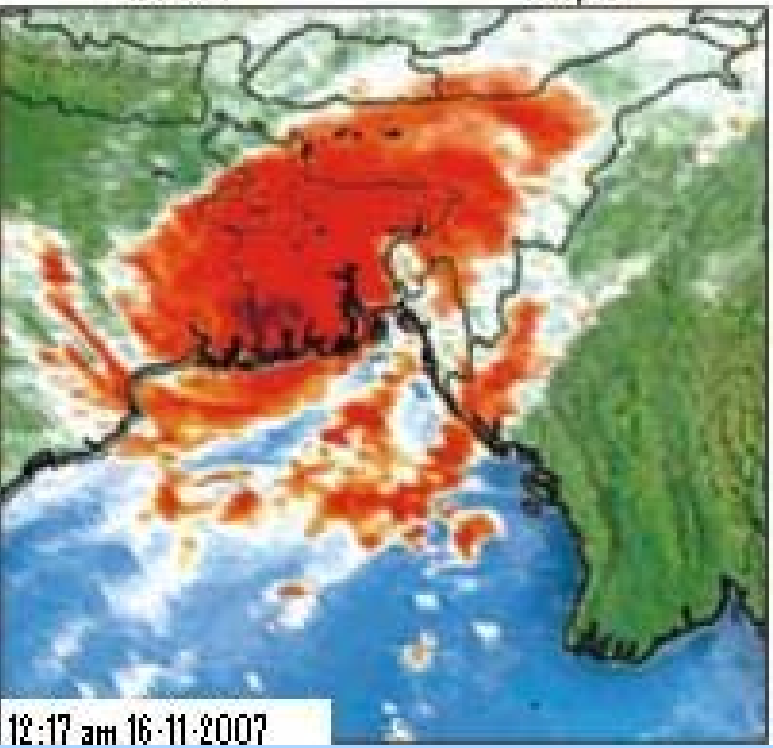
10:05am



1:00pm

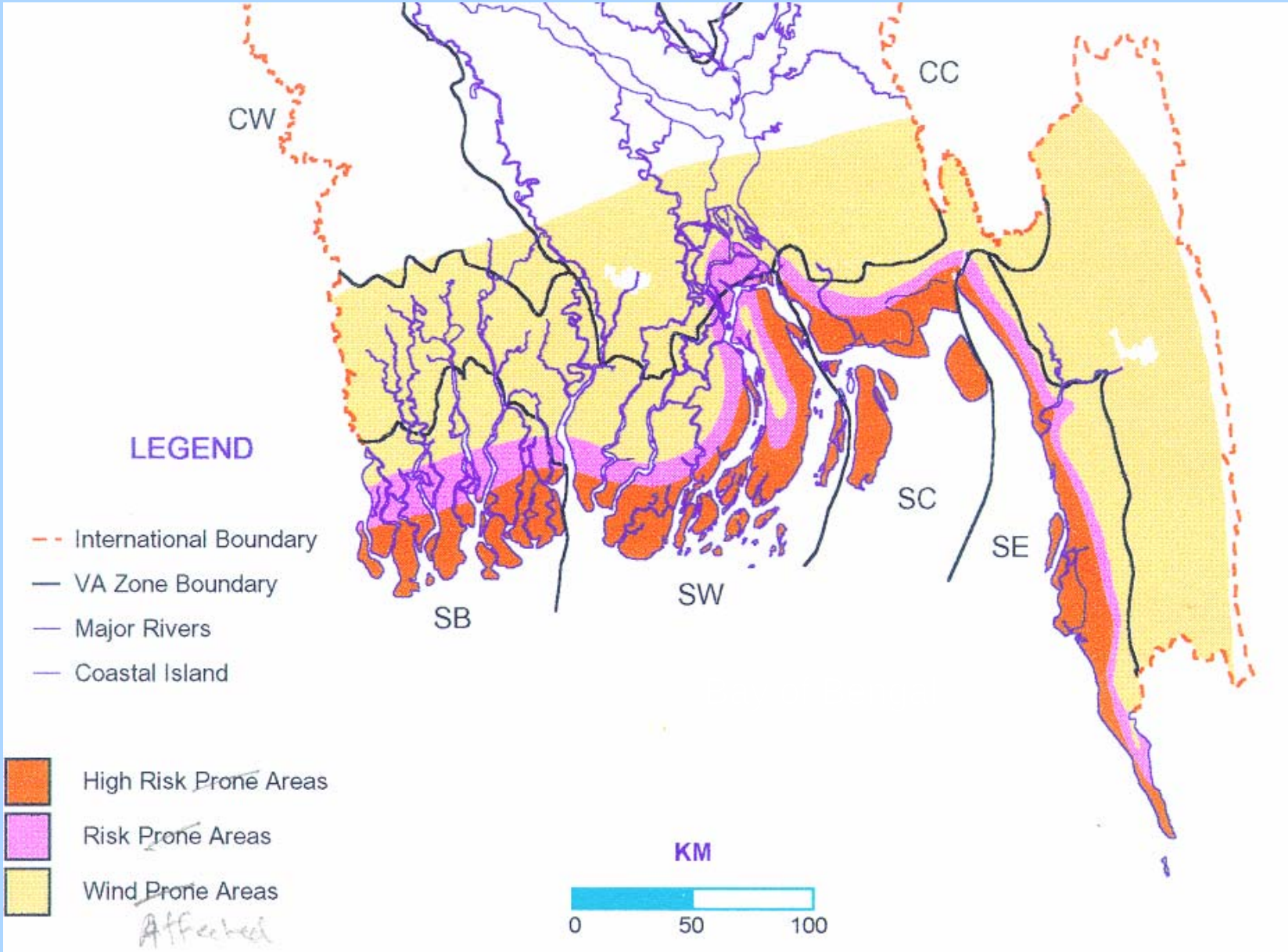
4:03pm

7:02pm

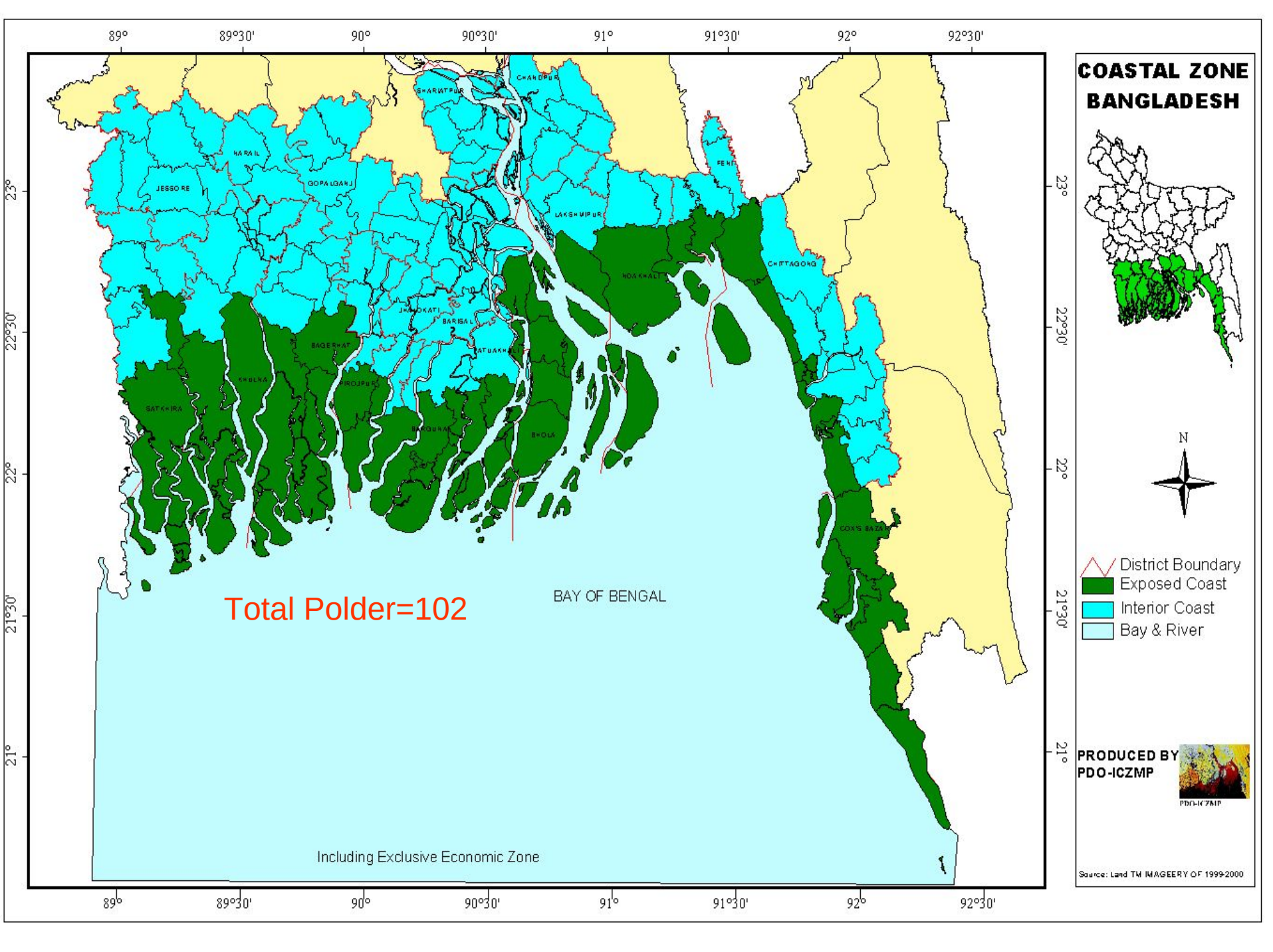

Cyclone SIDR hit on 15th November at 9 . P.M. local time during ebb tide with 5m to 8 m storm surge

# Cyclone Surges Area



# Integrated Coastal zone management Project

- Coastal Zone policy (CZP) adopted by GoB.
- Coastal Development Strategy (CDS) approved by GoB.
- Priority Investment Project Portfolio formulated.
- Large scale Investment need Donors involvement.


COASTAL ZONE
BANGLADESH
N
District Boundary
Exposed Coast
Interior Coast
Bay & River
PRODUCED BY
PDO-ICZMP
Source: Land TM IMAGEERY OF 1999-2000
Total Polder=102
BAY OF BENGAL
Including Exclusive Economic Zone
89°
89°30'
90°
90°30'
91°
91°30'
92°
92°30'
23°
22°30'
22°
21°30'
21°
SHARIATPUR
CHANDPUR
NARAIL
JESSORE
GOPALGANJ
LAKSHMIPUR
NOAKHALI
CHITTAGONG
JHALOKATI
BARISAL
PATUAKHALI
BAGERHAT
KHULNA
SATKHIRA
BHOLA
COX'S BAZAR

# Landmark Projects of BWDB

# Teesta Barrage Project



- A pride project and symbol of self reliance.
- Constructed solely by local engineers, technocrats and contractors

# Project Features

Gross Benefited Area

748990 ha ( Phase I & II)

Irrigable Area

540486 ha (Phase I & II)

Phase-I

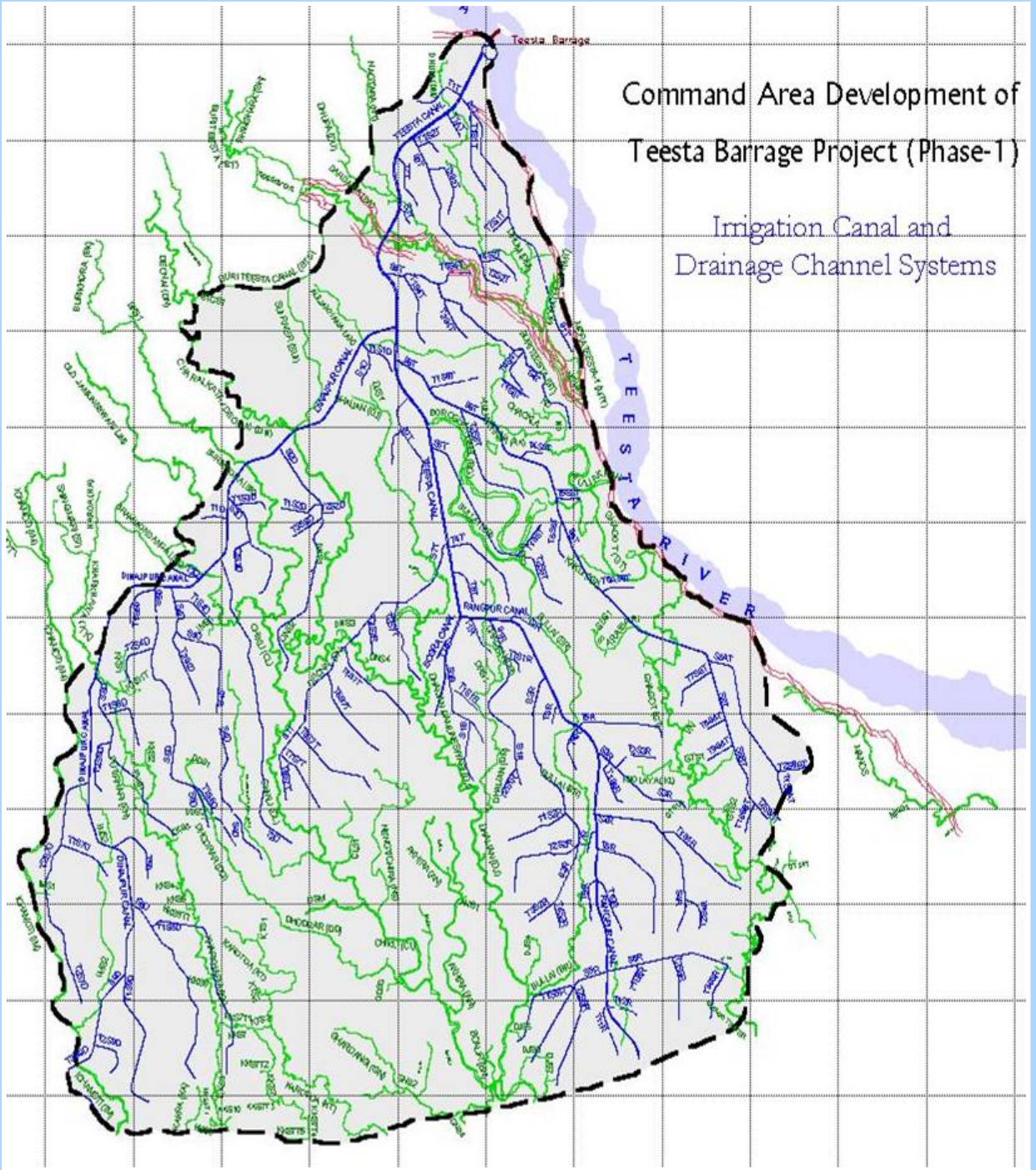
Gross Benefited Area

1,54,250 ha

Irrigable Area

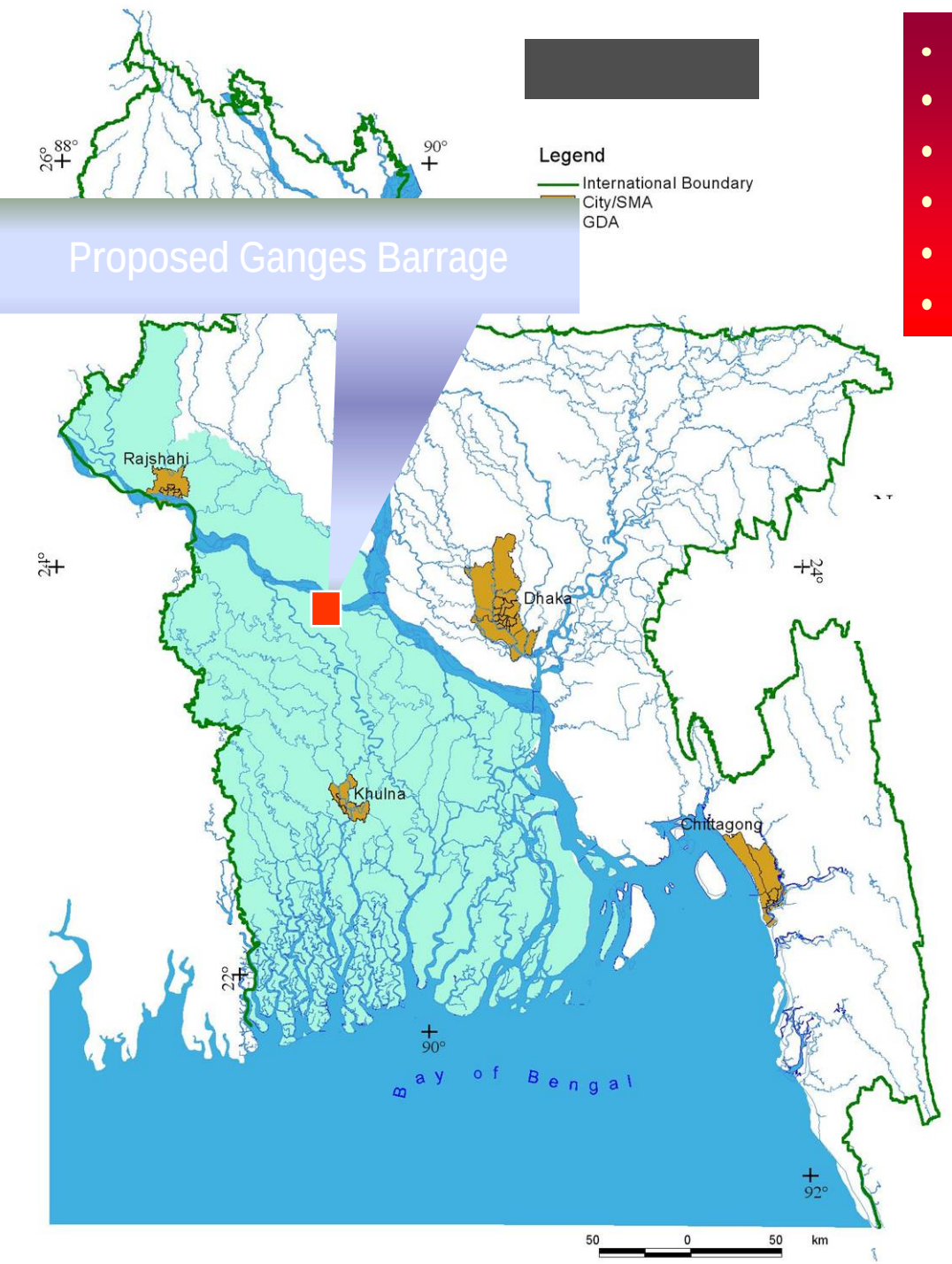
1,11,406 ha

Annual increased food grain production:2.77 lakh tons



# Long Term Projects

1. Ganges Barrage Project.
2. Dhaka Integrated Flood Control Embankment cum Eastern Bypass Road Multipurpose Project.
3. Water Management Improvement Project (WMIP)
4. Pani Bhaban.
5. Integrated Coastal Zone Management Project (ICZMP)
6. Brahmaputra Barrage Project.




- Barrage length - 1.94 km
- Capacity of diversion structure - 1200 $m^3/s$
- Irrigation Canal - 131 km
- Irrigation command area - 1.35 Mha
- Drainage & FC area - 1.50 Mha
- Storage capacity - 290 $m^3/s$ in April

## Benefited Districts:19 nos.

Kushtia,Jessore,Jhinaidaha,

Faridpur,Madaripur,

Shariatpur,Rajshahi,Pabna,

Natore,Khulna,Sathkhira,

Chudanga,Magura,Meherpur, Narail,Gopalgonj,Nawabgonj, Rajbari,Barisal.

# Concluding Remarks

i) *Basin wide Water Resources Management* with its neighbors through regional cooperation for integrated development of trans-boundary river resources is very much essential:

ii) *Water issues between Bangladesh and India* is very crucial; International Community has a role to play

# Concluding Remarks (Cont.)

iii) Existing Laws and regulations need to be reviewed and updated/furnish new laws to meet the present or future day demand;

iv) Enforcement of the Policy,regulation and Laws is the main issue;

v) Exchange of data and informations on water related disasters amongs the co-riparine countries would help to mitigate the sufferings of the people living in the river basin.

# Thank you