

Effects of Climate Change on Water Supply and Agriculture in the Coastal Regions, the Steps being taken and the Steps needed

By

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Nepal

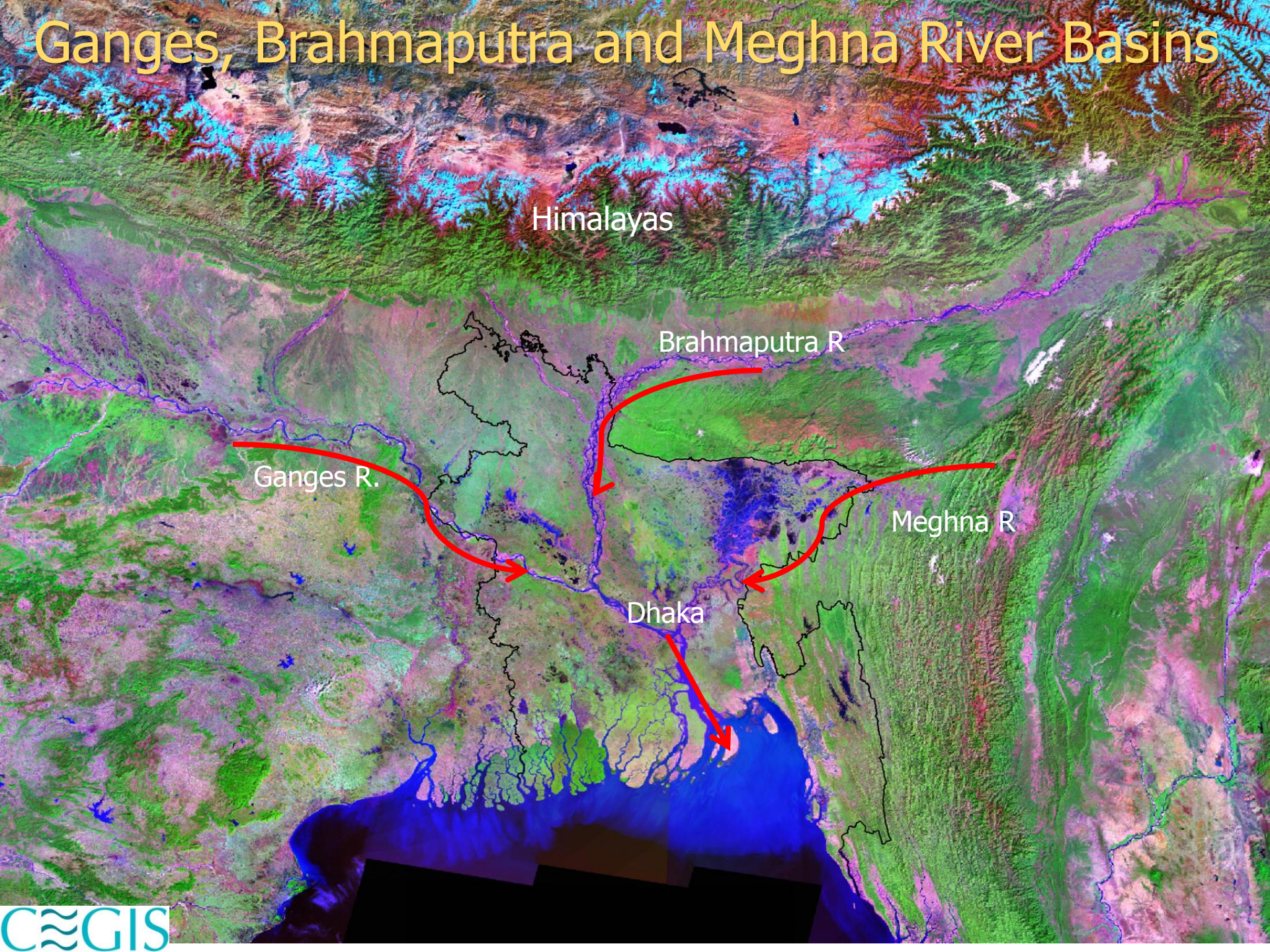


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South Asia



Ganges, Brahmaputra and Meghna River Basins



Agriculture in South Asia

- Agriculture employs about 60% of the labor force and contributes 22% of regional GDP.
- Agricultural growth is less than 3%
- Rice is the main crops
- Demand for lower value traditional crops like wheat and rice is slowing.
- Demand for higher value products like fruits, vegetables, meat, dairy and fish are increasing.



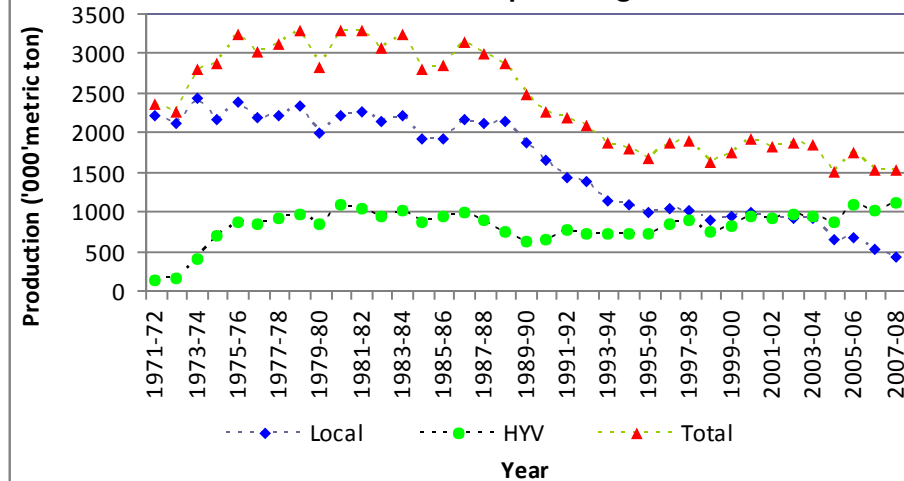
Agriculture in Bangladesh



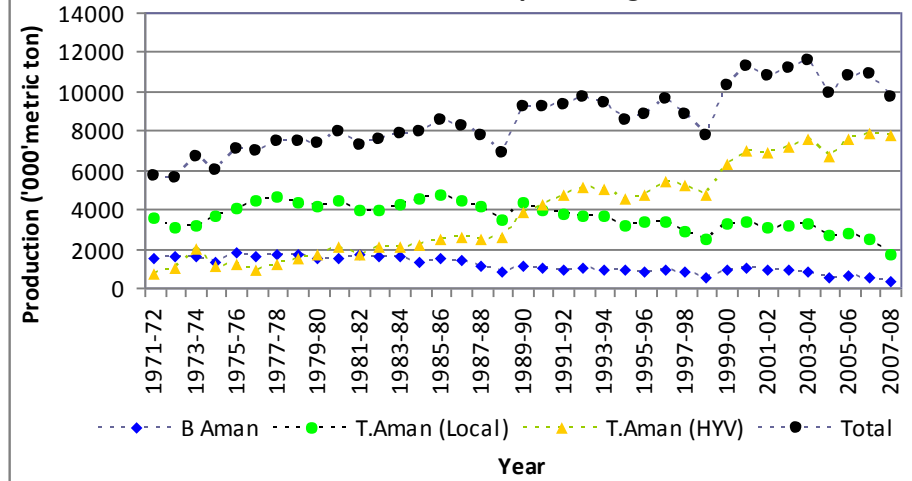
- Total cultivable Land- 60% of the land
- Paddy cultivation- over 80% of the cultivable area
- Arable land : 0.075 ha/person
- Contribution in GDP- around 20 %
- Employment - about 50%
- Boro is the dominant crop

Changes in Agricultural practice

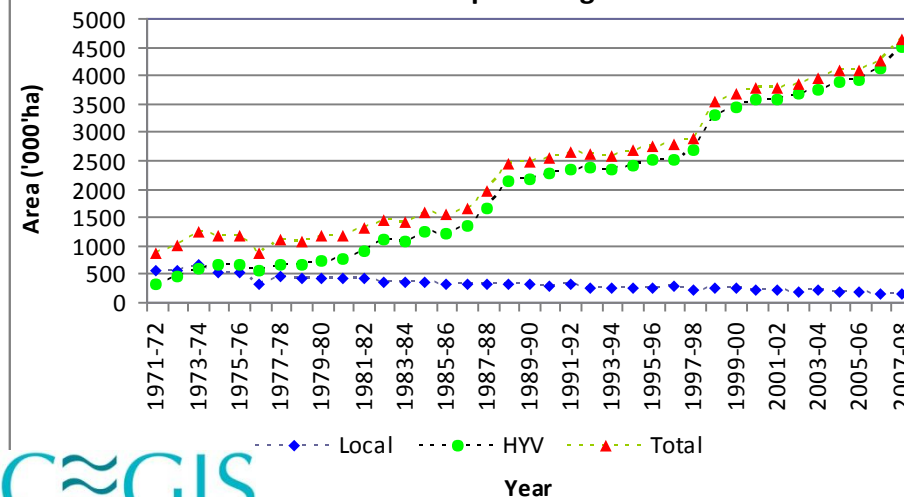
Production of Aus Crop in Bangladesh



Production of Aman Crop in Bangladesh



Area of Boro Crop in Bangladesh

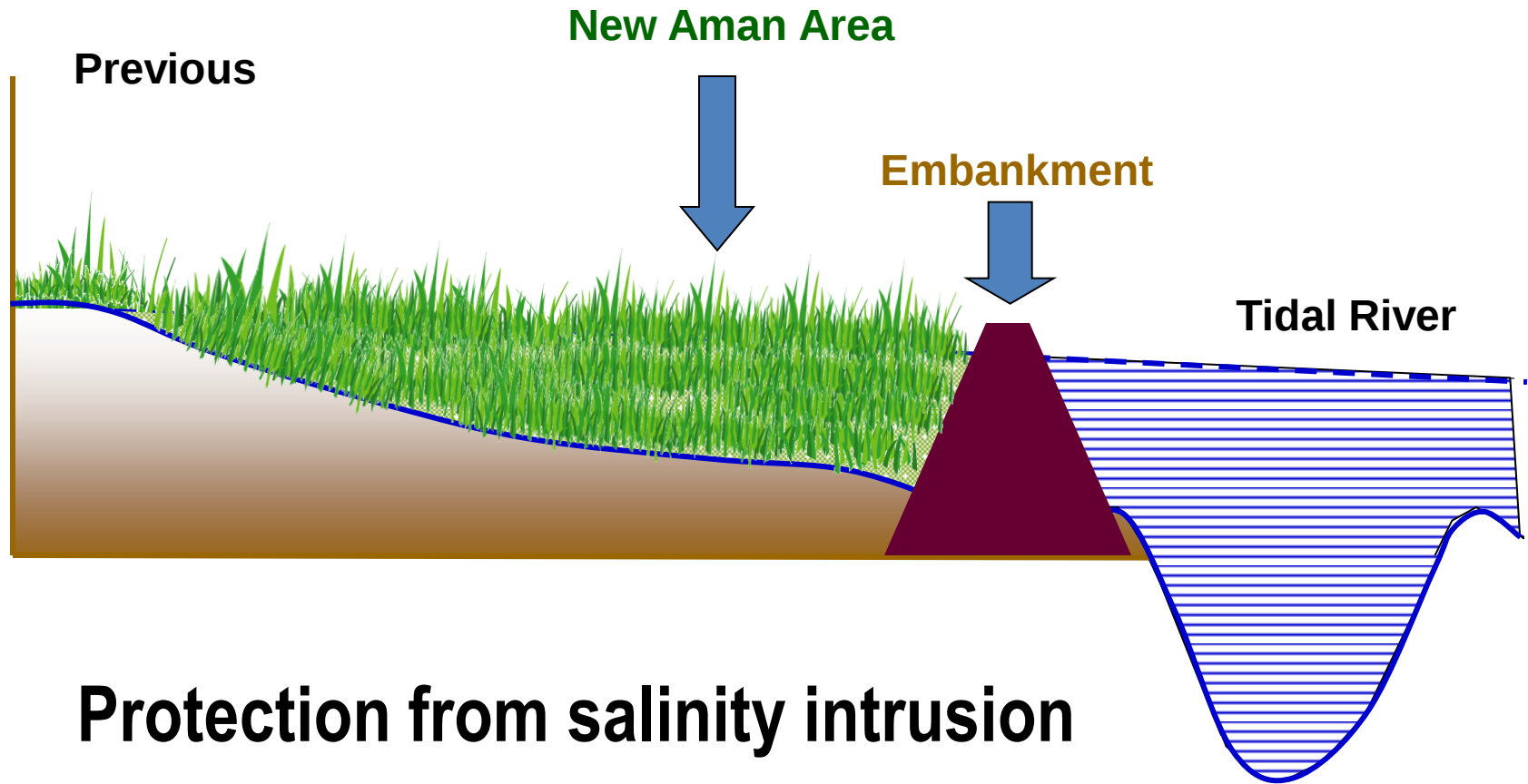


High risk crops → Low risk crop

Traditional Variety → High Yielding Variety

Coastal polders for more area to cultivate

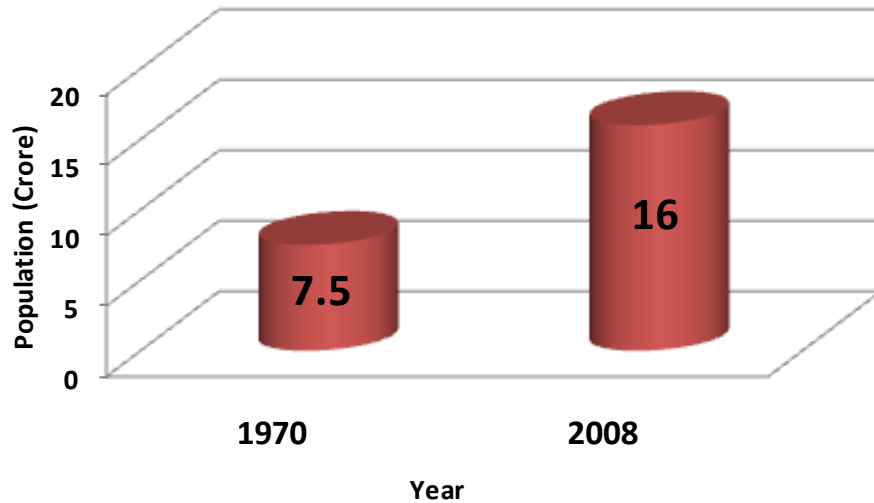
With FCD



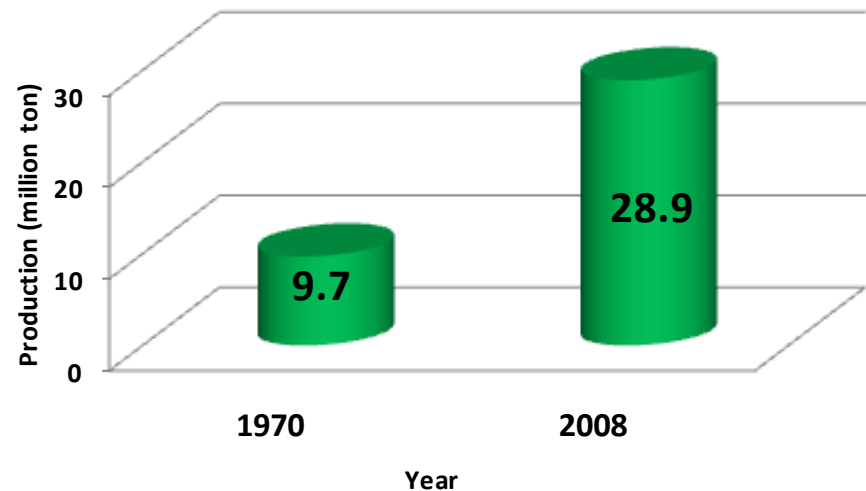
- ❖ Protection from salinity intrusion
- ❖ Protection from tidal flooding

Agricultural Development

Population in Bangladesh



Rice Production in Bangladesh



Water supply in South Asia

Safe water access in South Asia has increased from 71% in 1990 to 85% in 2004

Sources of Water

- Surface Water
 - Pond, lake, canal, river
- Ground Water
 - Tube-well, dug well

Major Challenges

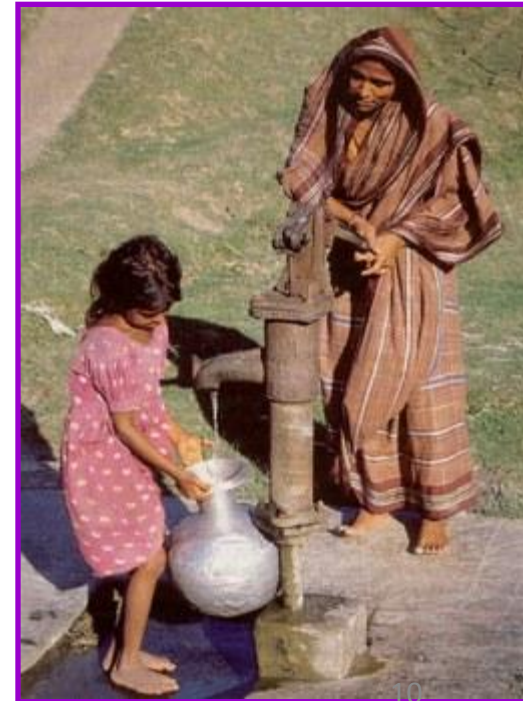
- Water quality- salinity, arsenic, storm surges
- Accessibility



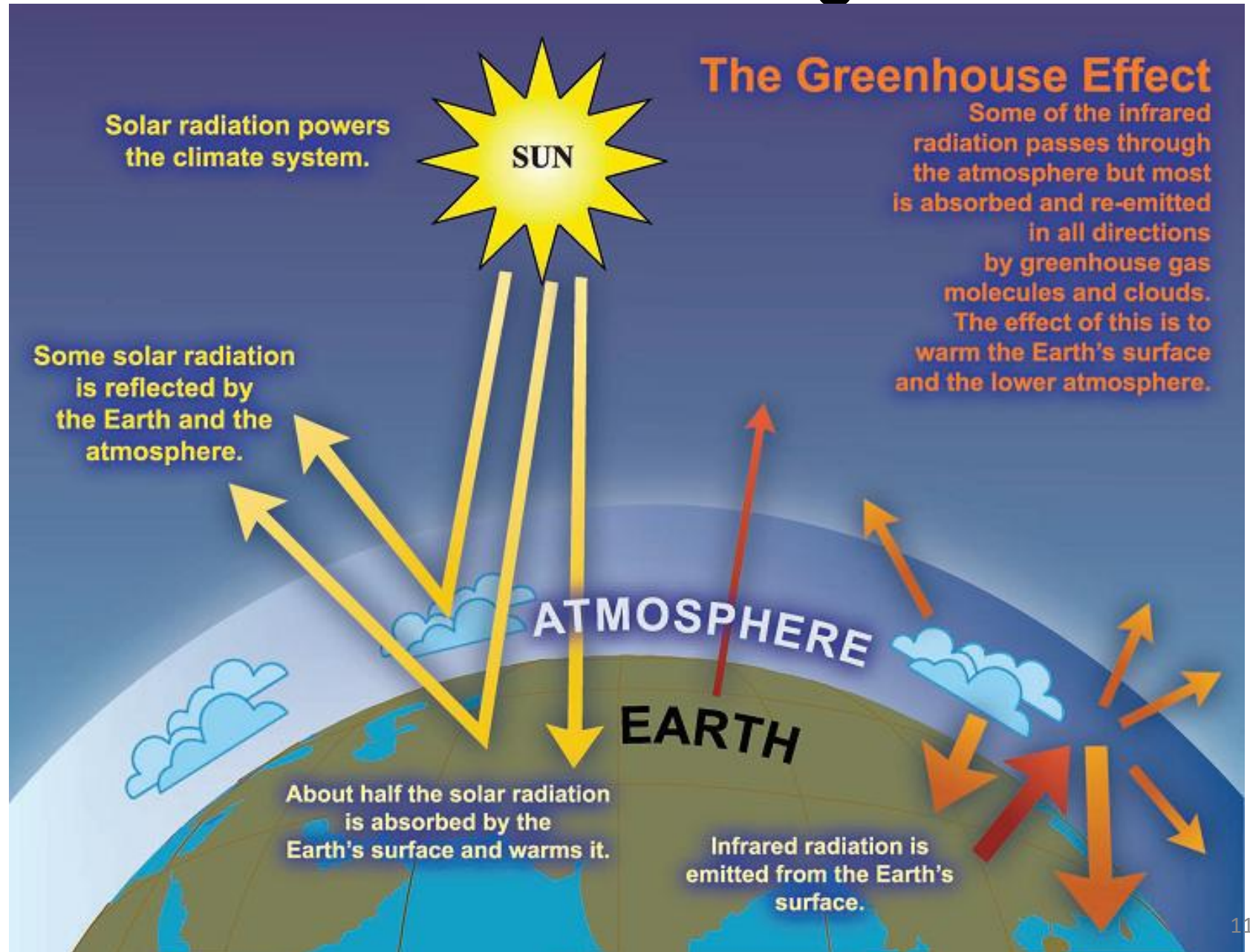
Water Supply in Bangladesh

- Access to safe water supply increased from 72% in 1990 to 74% in 2004
- 99% of the urban population and 97% of the rural population had access to improved water supply
- Arsenic poisoning has reduced access to safe drinking water to 17%

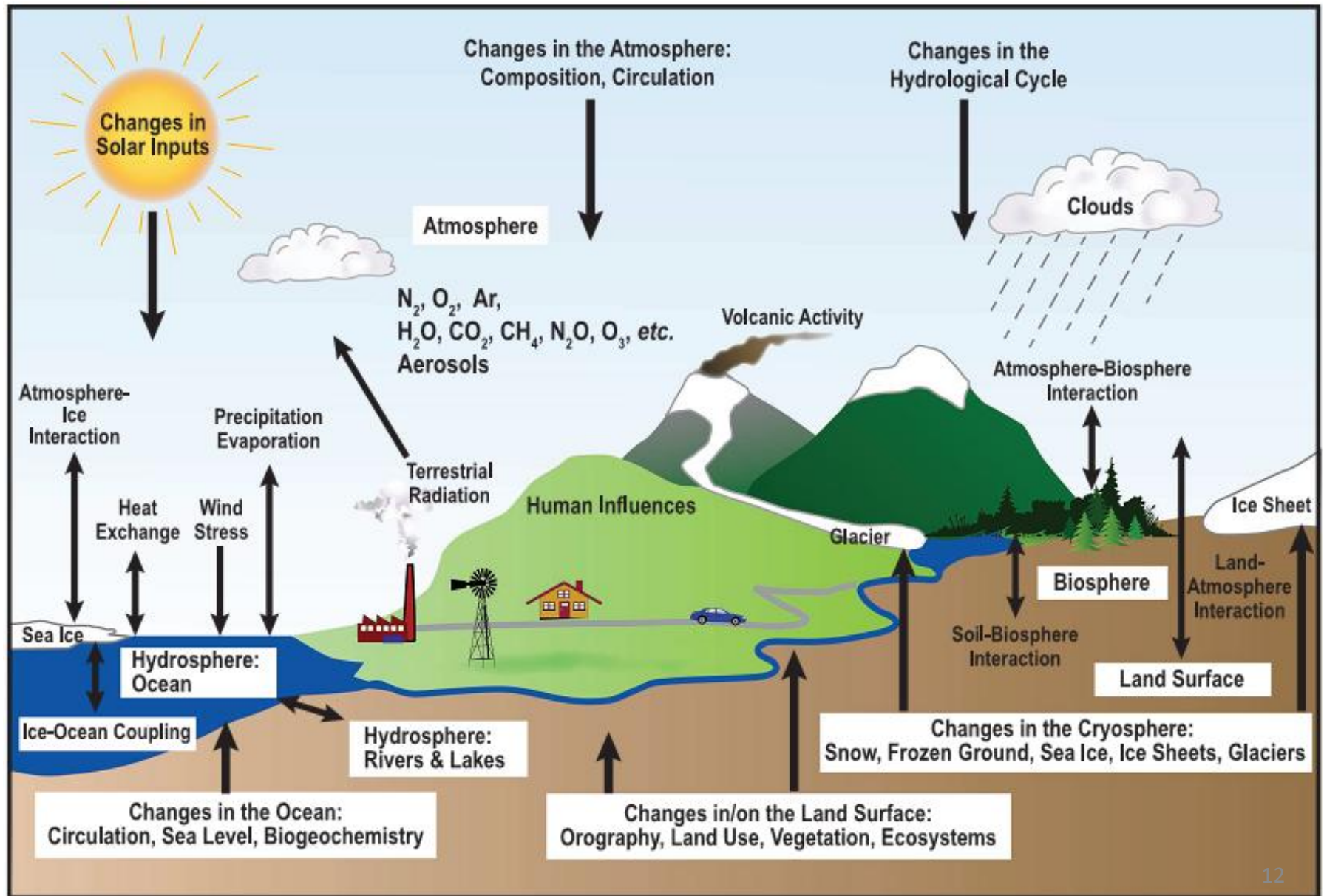
Sources	Urban	Rural
Piped	23 %	0.6 %
Tube-well	68 %	96 %
others	9 %	3.4 %



Climate Change



Climate Change



Observed climate trends and variability in South Asia

Country	Change in temperature	Change in precipitation
India	0.68°C increase/century, increasing annual mean	Increased extreme rains in north-west in recent decades, lower number of rainy days along east coast
Nepal	0.09°C rise/year in Himalayas, 0.04°C in Terai region, more in winter	No distinct long term trends in precipitation records for 1948-1994
Pakistan	0.6°C - 1°C rise in mean temperature in coastal areas	10-14 % decrease in coastal belt and hyper arid plains, increase in summer and winter over last 40 years in Northern Pakistan
Bangladesh	Increasing trend of about 1°C in May and 0.5°C in November during 1985-1998	Decadal rain anomalies above long term averages since 1960s
Sri Lanka	0.016°C increase/year between 1961-1990 over the country, 2°C increase/year in central highlands	Increasing trend in February and decreasing trend in June

Projected Changes in Climate (South Asia)

- Changes during 1980-1999 to 2080-2099

	Temperature change (°C)			Precipitation change (%)		
Season	Min.	Avg.	Max.	Min.	Avg.	Max.
DJF	2.7	3.6	4.8	-35	-5	15
MAM	2.1	3.5	5.3	-30	9	26
JJA	1.2	2.7	4.4	-3	11	23
SON	2.0	3.1	4.4	-12	15	26
Annual	2.0	3.3	4.7	-15	11	20

Annual average changes in temperature and precipitation in Bangladesh

Emission Scenario	Temperature (Change in °C)		Precipitation (% change)	
	2030s	2050s	2030s	2050s
A2	0.73	1.32	4.9	8.1
B1	0.78	1.62	6.3	8.4

Changes in Annual Temperature

Emission
Scenario

A2

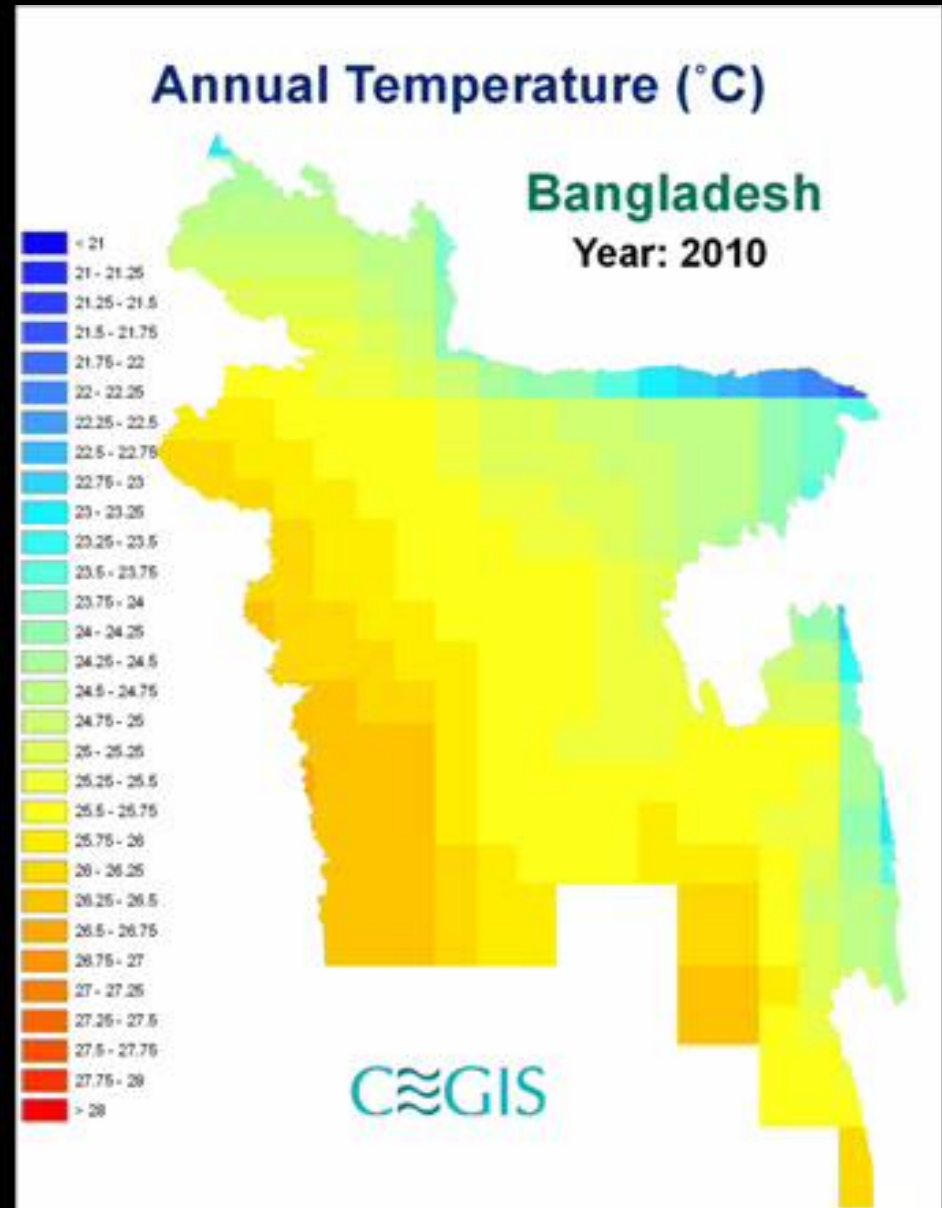
Temperature
(Change in °C)

2030s

2050s

0.73

1.32



Changes in Annual Precipitation

Emission
Scenario

A2

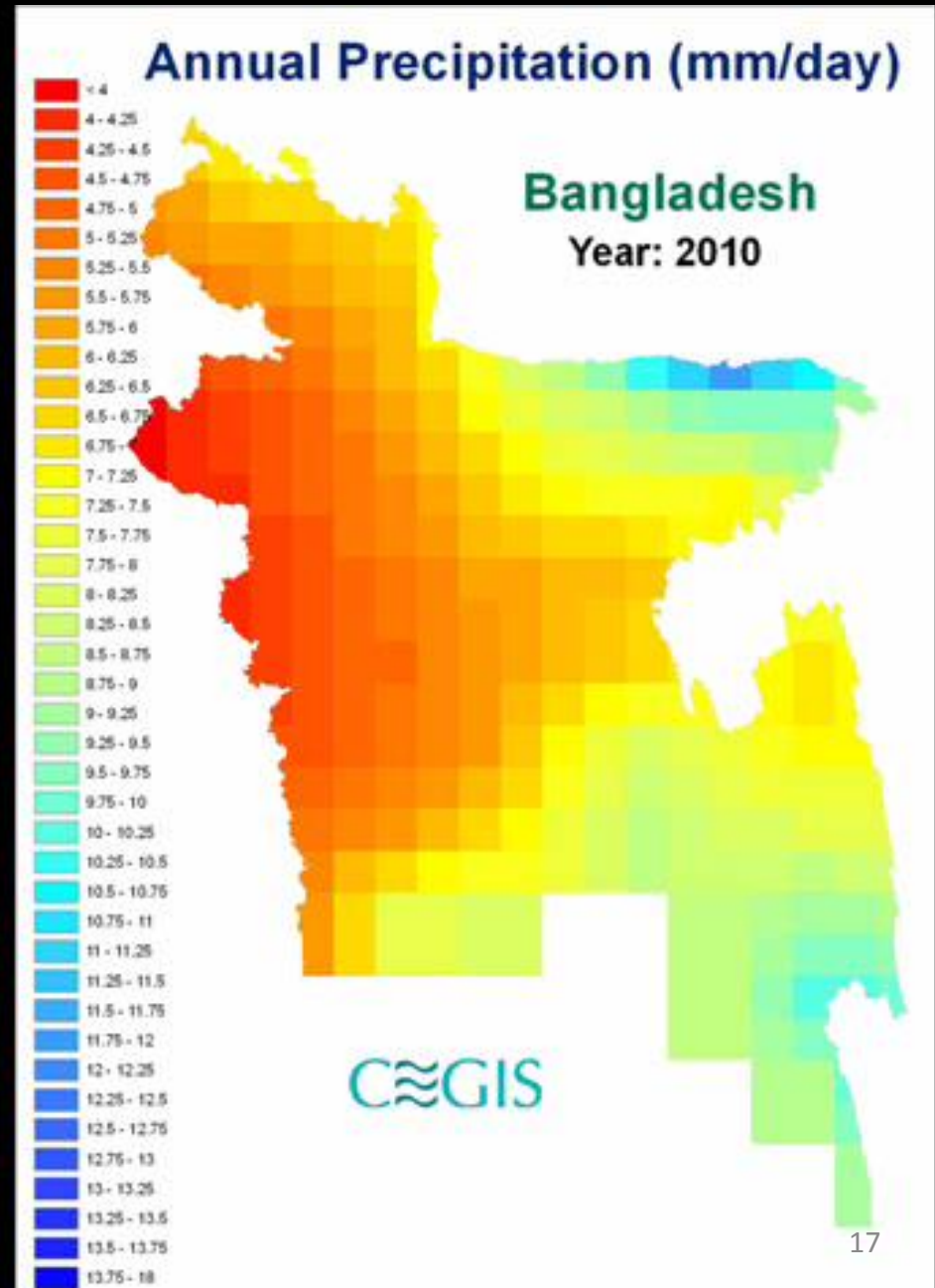
Precipitation
(% change)

2030s

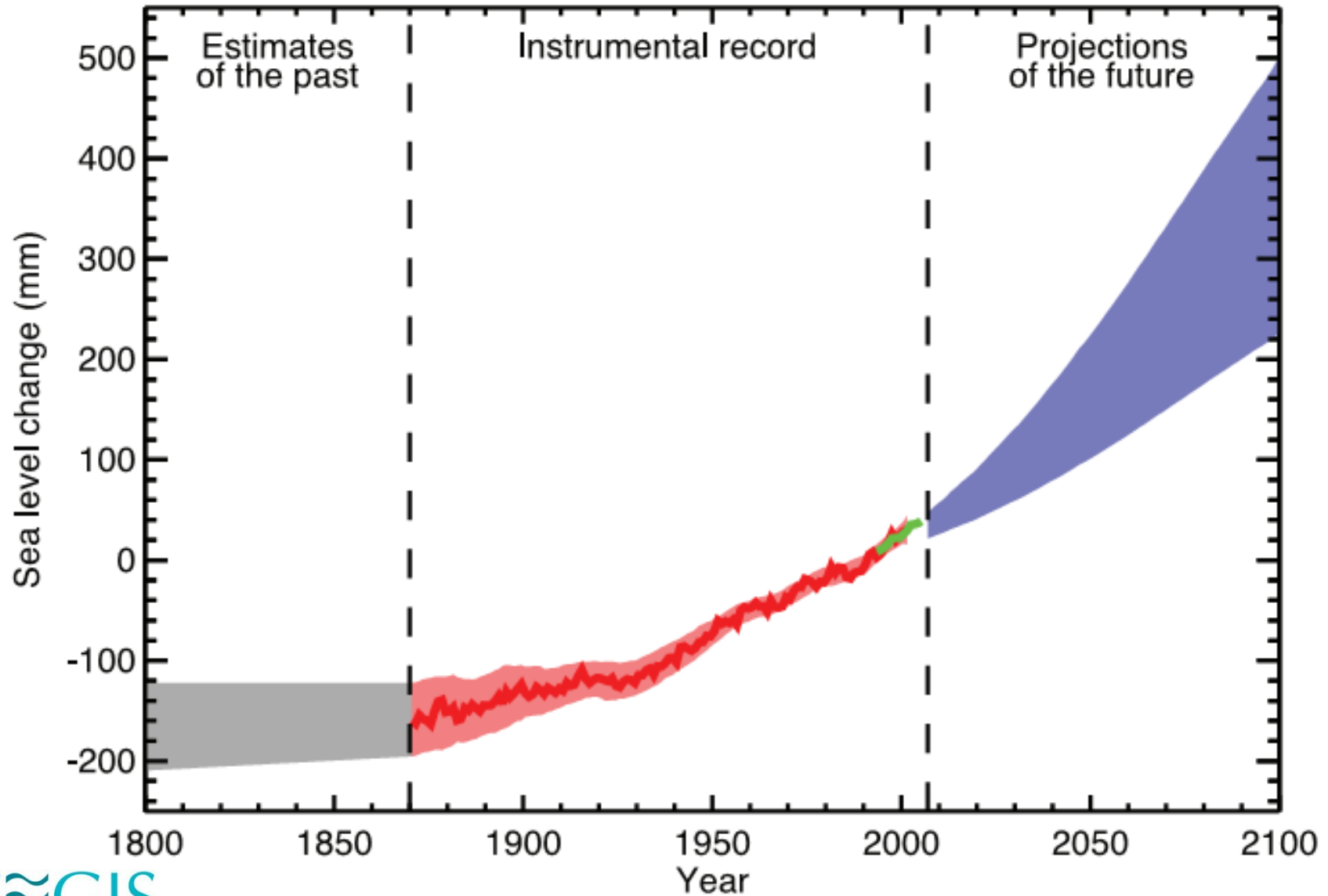
2050s

4.9

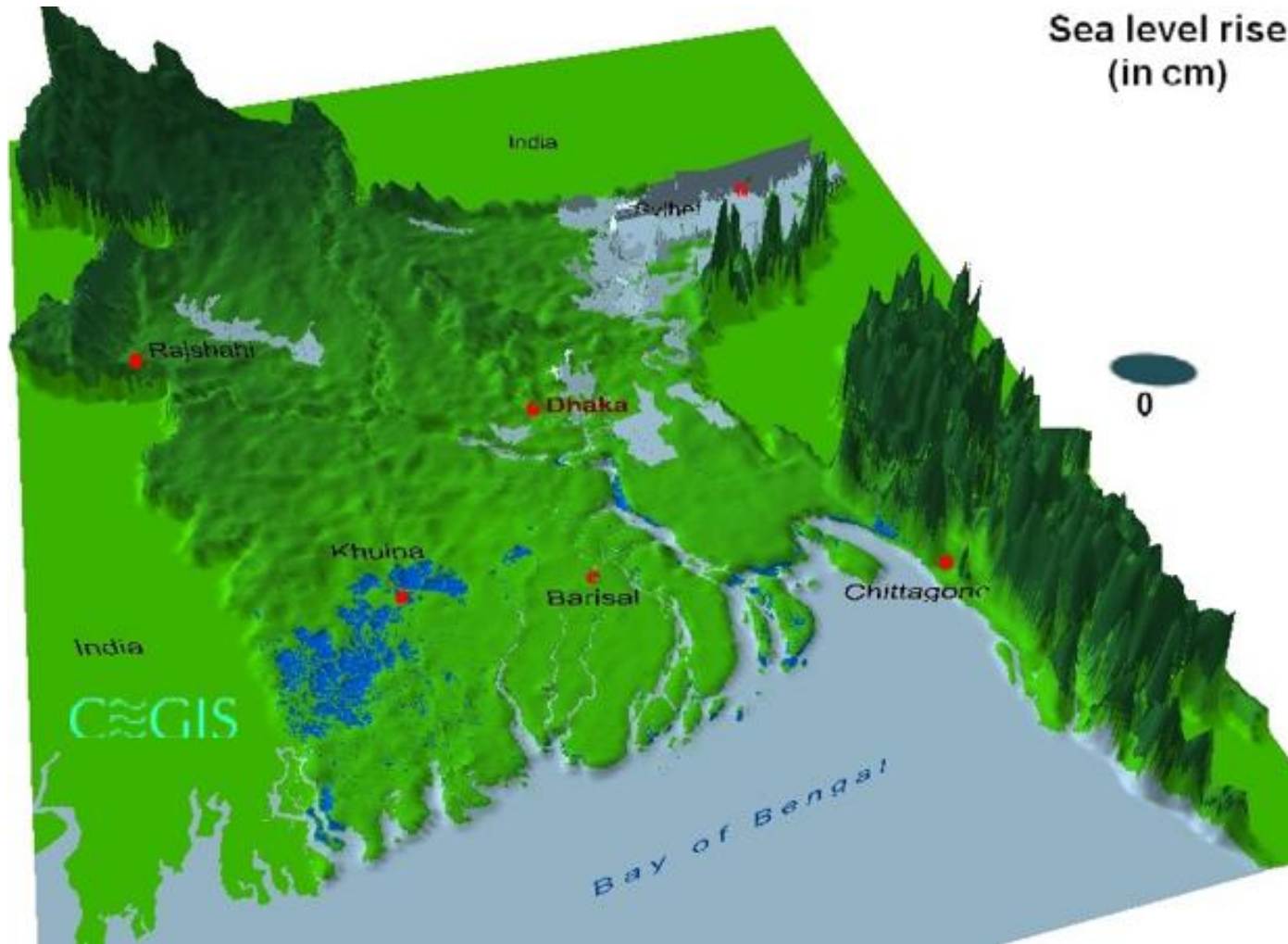
8.1



Observed & Predicted Global Sea Level Rise: 1800 to 2100 (IPCC, 2007)

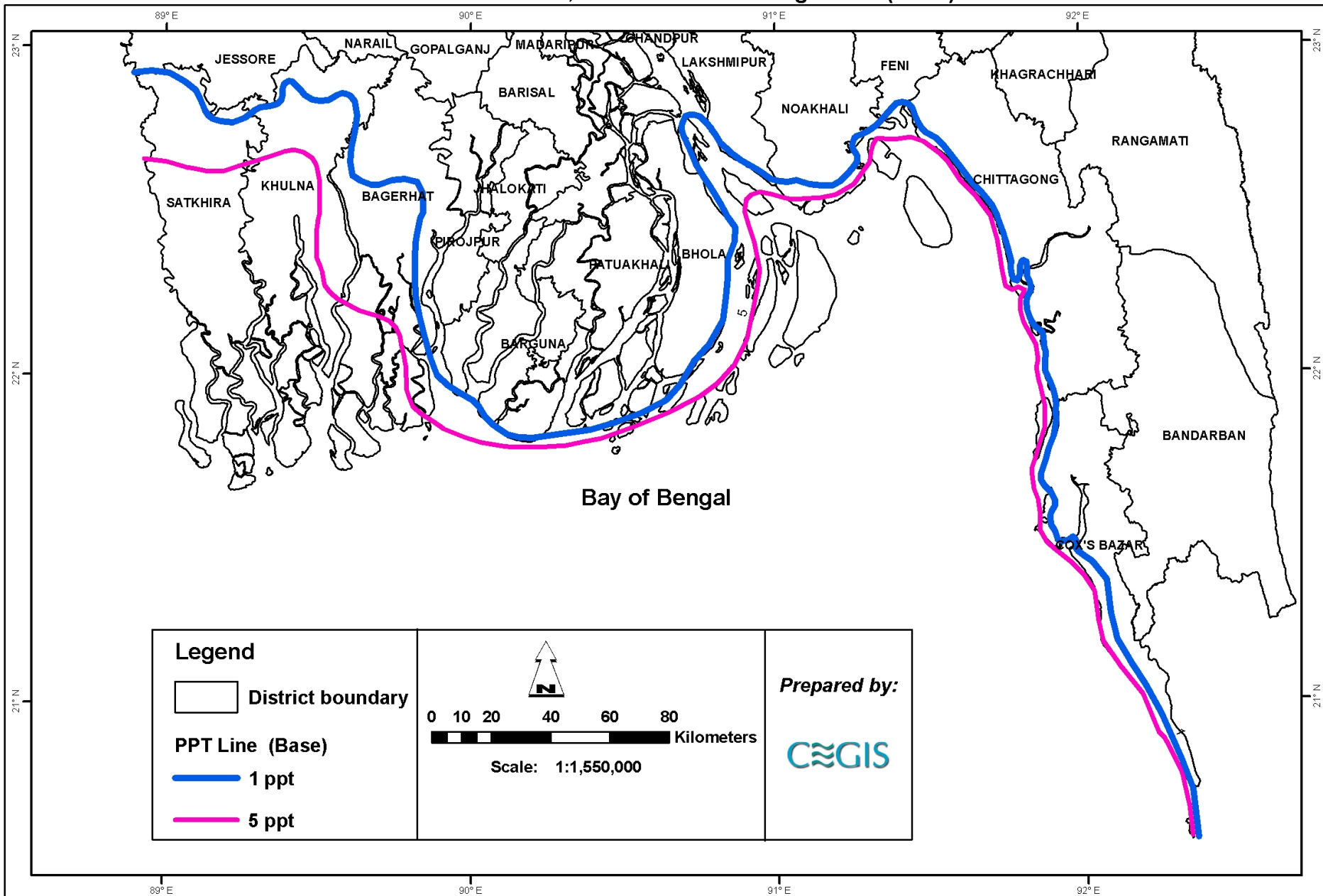


Inundation with Sea Level Rise <1m

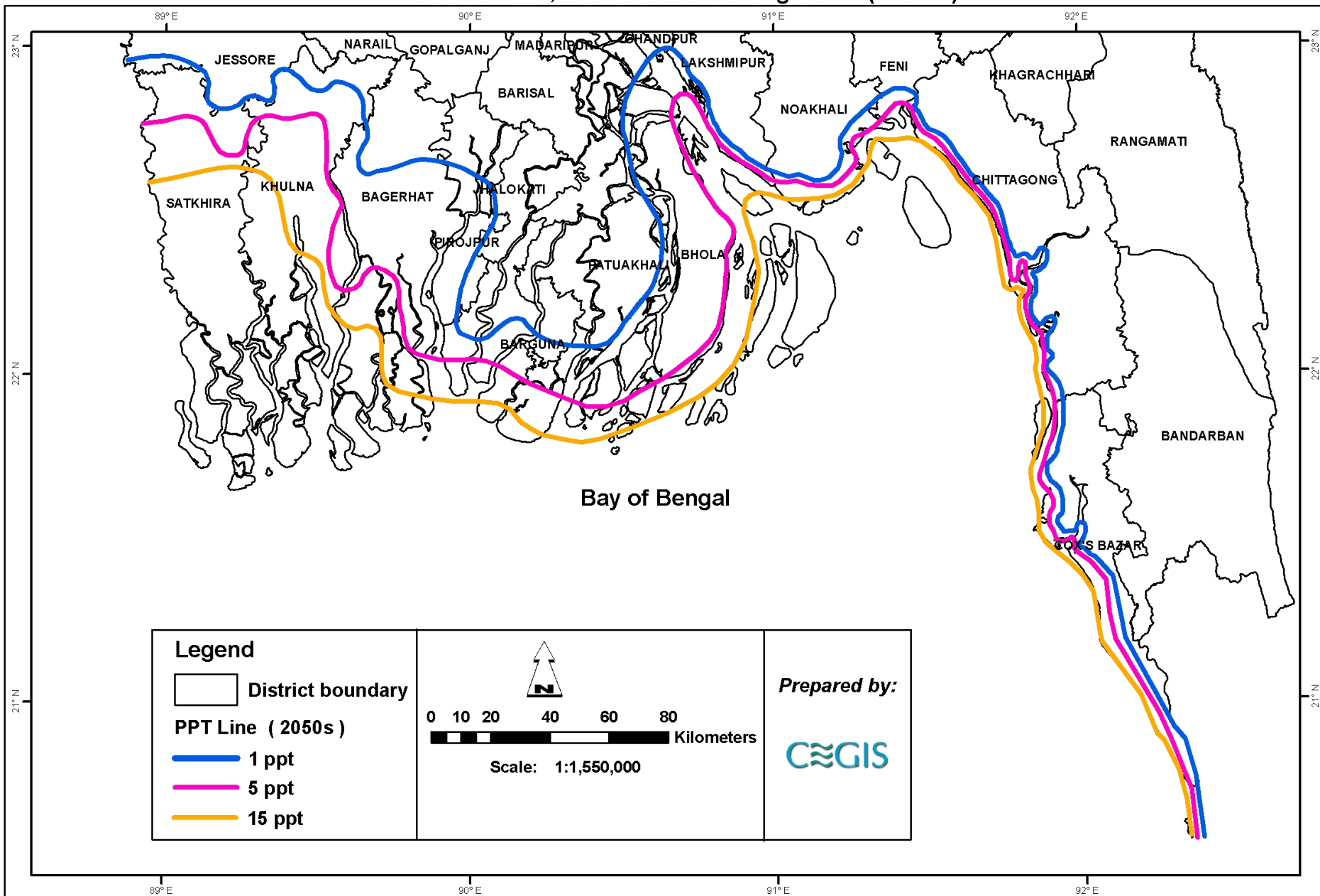


Sea level rise (cm)	Inundation (sq.km.)	Net inundation (sq.km.)
0	3,300	3,300
50	6,000	2,700
100	11,000	7,700

Isosaline Line, Coastal Area of Bangladesh (Base)

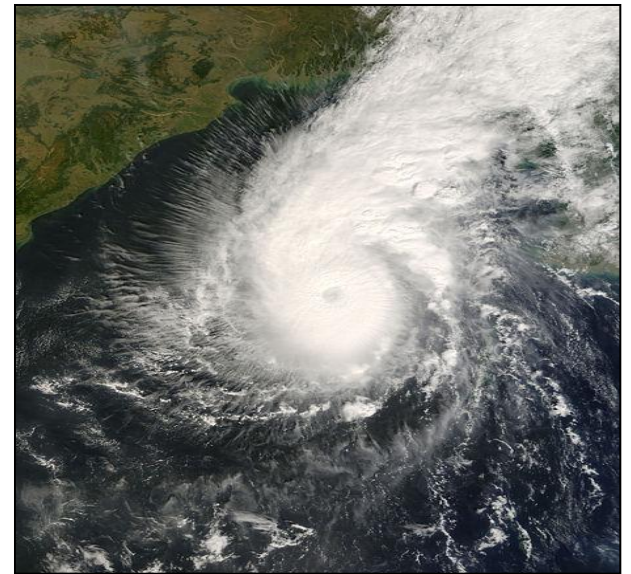


Isosaline Line, Coastal Area of Bangladesh (2050s)



Coastal Threats due to Climate Change

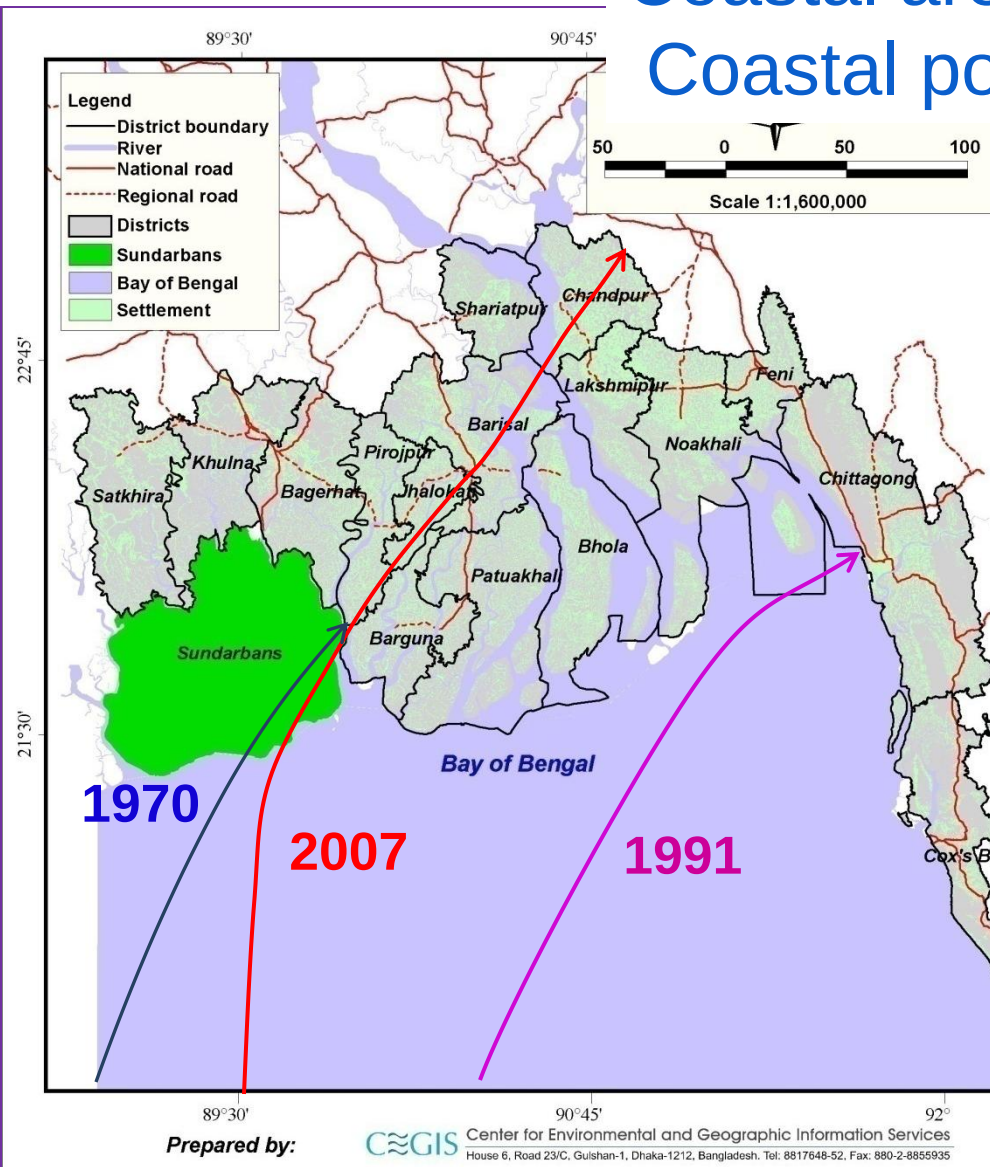
- Cyclone
- Storm Surge
- Sea level rise
- Salinity intrusion



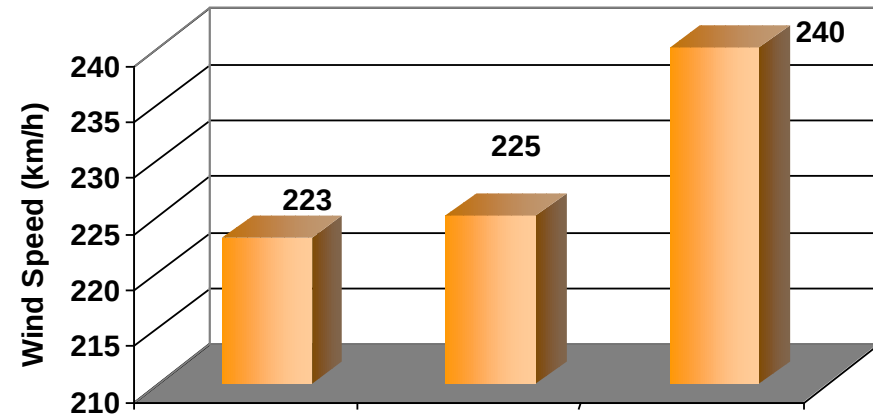
Cyclones in Bangladesh

Coastal area: 42,500 km²

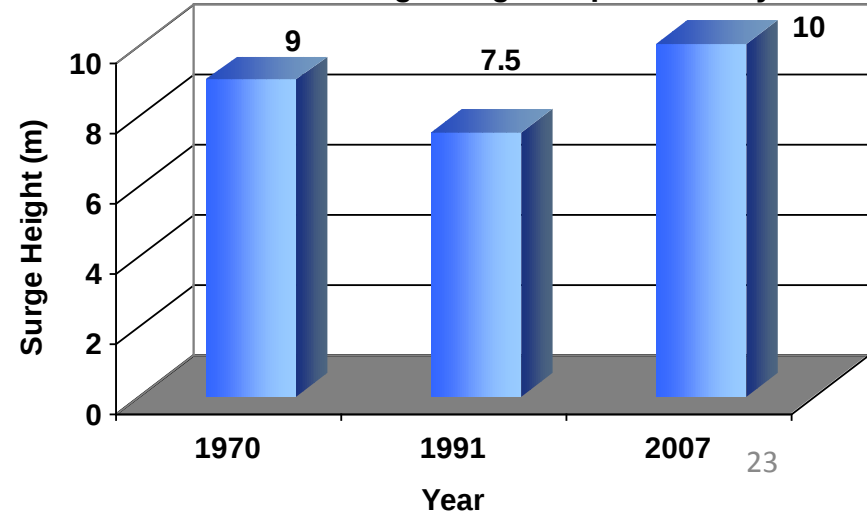
Coastal population: 38 million (BBS, 2005)



Maximum Wind Speed in previous cyclones



Maximum Storm Surge Height in previous cyclones



Damage due to cyclone SIDR



Sector	Sub-Sector	Disaster Effects (BDT Million)			Disaster Effects (US\$ Million)		
		Damage	Losses	Total	Damage	Losses	Total
Infrastructure		71,064	2,130	73,194	1,029.9	30.9	1,060.8
	Housing	57,915	—	57,915	839.3	—	839.3
	Transport	8,006	1,725	9,731	116.0	25.0	141.0
	Electricity	576	359	935	8.3	5.2	13.6
	Water and Sanitation	157	46	203	2.3	0.7	2.9
	Urban and Municipal	1,696	—	1,696	24.6	—	24.6
	Water Resource Control	4,918	—	4,918	71.3	—	71.3
Social Sectors		4,482	1,453	5,934	65.0	21.1	86.0
	Health and Nutrition	169	1,038	1,206	2.4	15.0	17.5
	Education	4,313	415	4,728	62.5	6.0	68.5
Productive Sectors		1,734	32,083	33,817	25.1	465.0	490.1
	Agriculture	1,472	28,725	30,197	21.3	416.3	437.6
	Industry	262	2,035	2,297	3.8	29.5	33.3
	Commerce	—	1,258	1,258	—	18.2	18.2
	Tourism	—	65	65	—	0.9	0.9
Cross-Cutting Issues		420	0	420	6.1	0.0	6.1
	Environment	420	—	420	6.1	—	6.1
Total		79,904	35,665	115,569	1,158.0	516.9	1,674.9

Cyclone Sidr in Bangladesh: Damage, Loss and Needs Assessment for Disaster Recovery and Reconstruction, Government of Bangladesh/ the World Bank/ the European Commission, 2008.

Climate Change Impact on Agriculture in South Asia

- Crop yields could decrease up to 30% in South Asia by the mid-21st century. (IPCC, 2007)
- Average yields of crops will decline in 2050 from 2000 levels by –
 - about 50 percent for wheat,
 - 17 percent for rice, and
 - about 6 percent for maize
- Decreased yields could threaten the food security of 1.6 billion people in South Asia.

Source: Asian Development Bank, *Addressing Climate Change in the Asia and Pacific Region*, 2009

Climate Change threat to water supply

- Climate change will be an additional stress factor that will be difficult to overcome
- Mortality due to diarrhea primarily associated with floods and droughts will rise in South Asia.
- Due to salinity intrusion in coastal areas people will face severe drinking water crisis

Effect on Agriculture in Bangladesh

- Net reduction of Boro production will be 4.74% by 2050 (CO₂ fertilization will increase production by 9.6% ; temperature and precipitation change will decrease production by 13.9%)
- Total Aman production reduces at the rates of 0.62% by 2050
- Total Aus production reduces at the rates of 1.52% by 2050

Affect on Water Supply in Coastal Bangladesh

- 22 and 27 million people will face safe water crisis in the year 2050 and 2080 respectively under A2 scenario.
- Vector borne and water borne disease burden are increasing due to shrinking of freshwater supply and sanitation facilities.

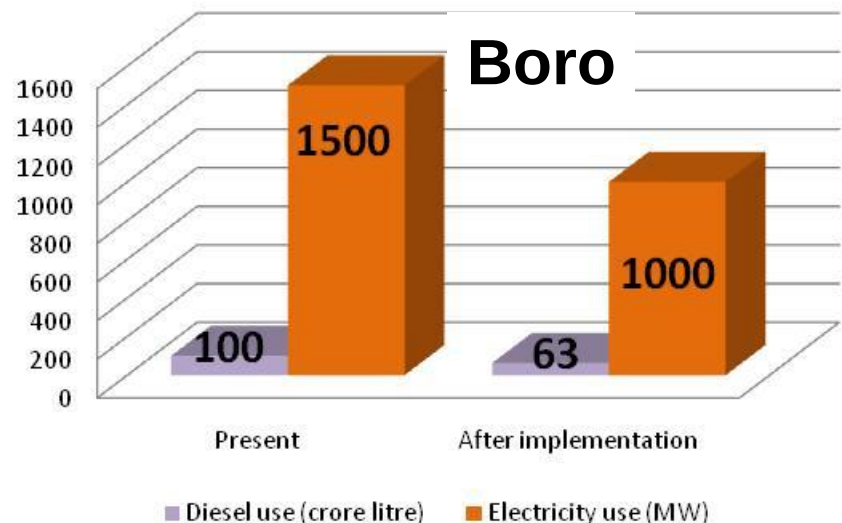
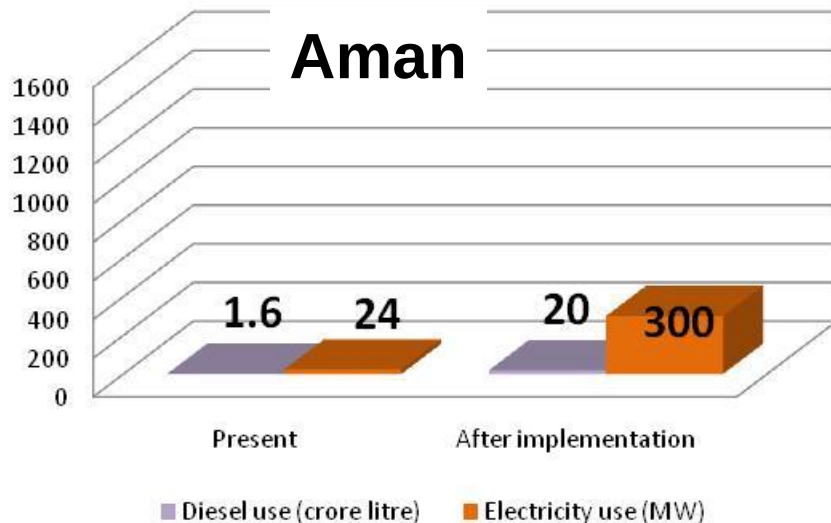
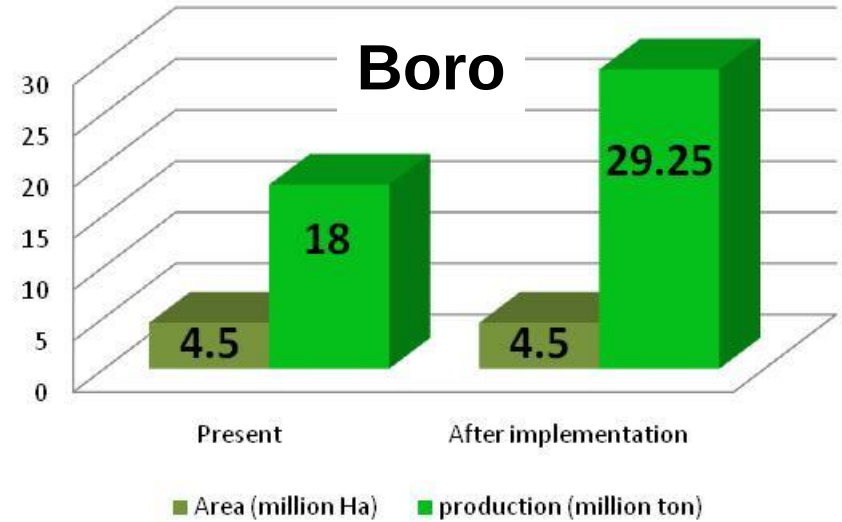
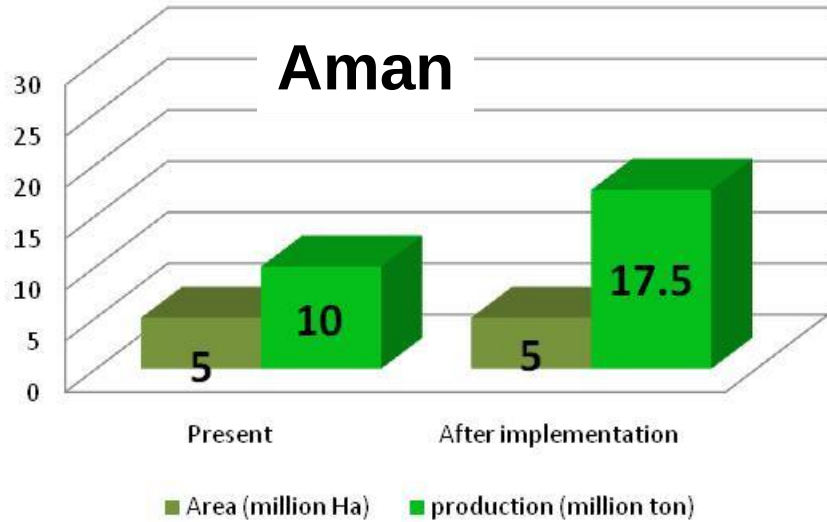
Adaptation Strategy on Agriculture

- New research on hazard tolerant variety like flood, drought, salinity tolerant variety
- Some submergence tolerant varieties (eg. BR 11 sub1, IR 64 sub1, swarna sub1) are already tested in field
- Land zoning
- Climate resilient cropping pattern
- Increase water use efficiency

Improved Irrigation Efficiency through Optimal Water Use Method

Crops	Present Water use (million m ³)	Implementing Optimal Water Use Method (million m ³)	Net Savings (million m ³)
Aman	1,600	 20,000	- 18,400
Boro	99,000	 63,000	+ 36,000

Energy Saving



Adaptation measures for water supply and sanitation

- Rainwater harvesting
- Pond sand filter
- Desalinization plant
- Advocacy and awareness raising campaign
- Regional co-operation



To ensure water and food security
regional cooperation is the only choice

Thank You