



Making Research on Climate Change in Bangladesh More Effective

Climate change baseline study for the Bangladesh Delta Plan: methodology and initial findings

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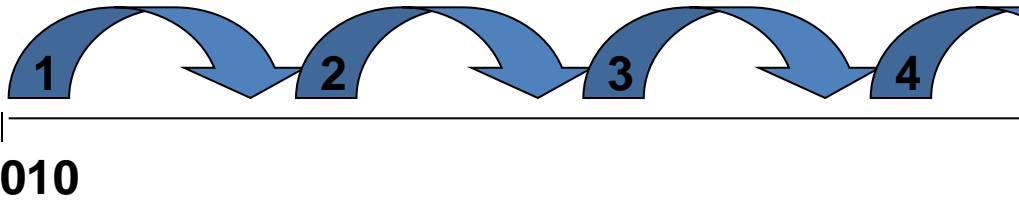
Presentation overview

1. Bangladesh Delta Plan – Vision based planning
2. Current climate
3. Climate change (temperature, precipitation, SLR, cyclones)
4. Future climate change future
5. Interactive map
6. Next steps / knowledge agenda

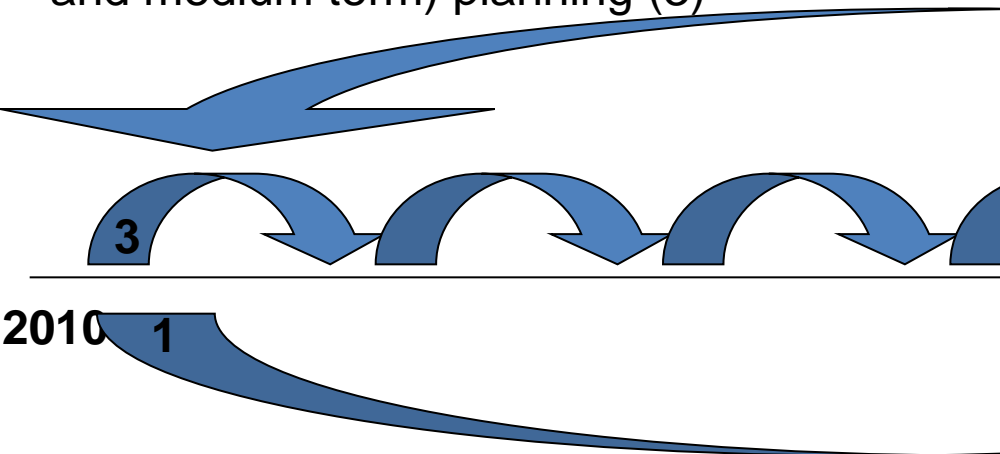


1. BDP: Vision based

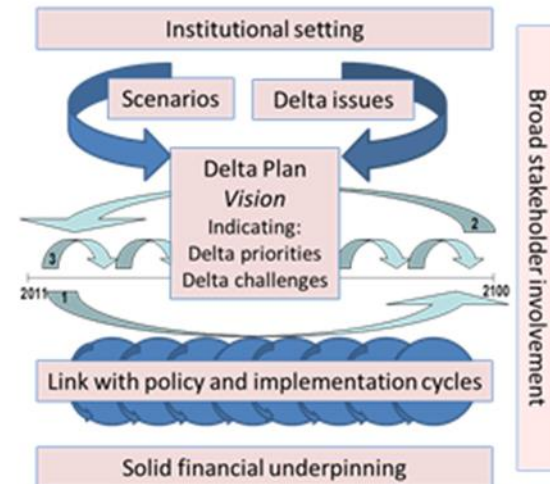
Instead of current planning in 5 year cycles



Create a longer term vision for e.g. 100 years
 'translate' it back to the present (2); and sub-
 (short and medium term) planning (3)



Key elements Bangladesh Delta Plan



2. Current climate

Current climate in Bangladesh

Temperature: Maximum - peak in April (33.5 °C)
secondary peak in Sep (31.6 °C)
Minimum - in January (12.5 °C).

Rainfall: Annual 2425 mm; high variation -
standard deviation 286 mm.

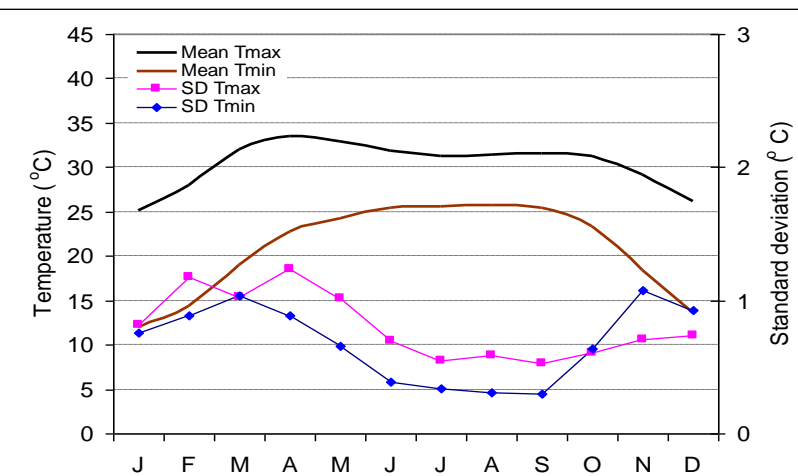
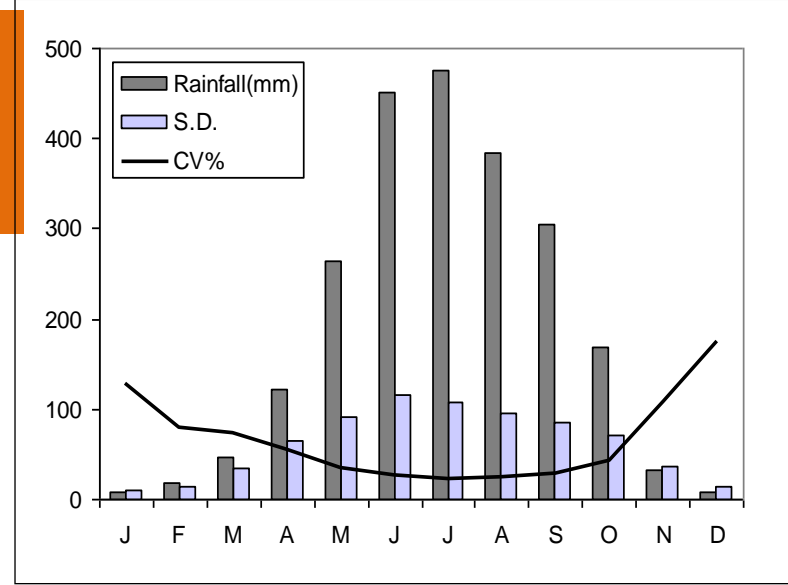
Distribution of the rainfall (% of annual)

Monsoon: 1750 mm (72 %)

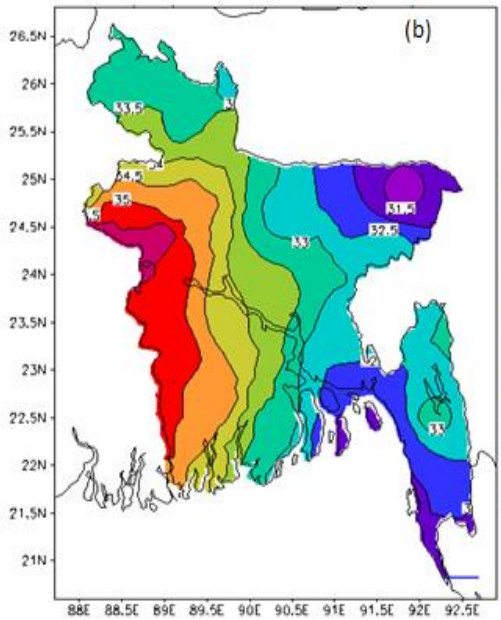
Pre-monsoon (17 %)

Post-monsoon (9 %)

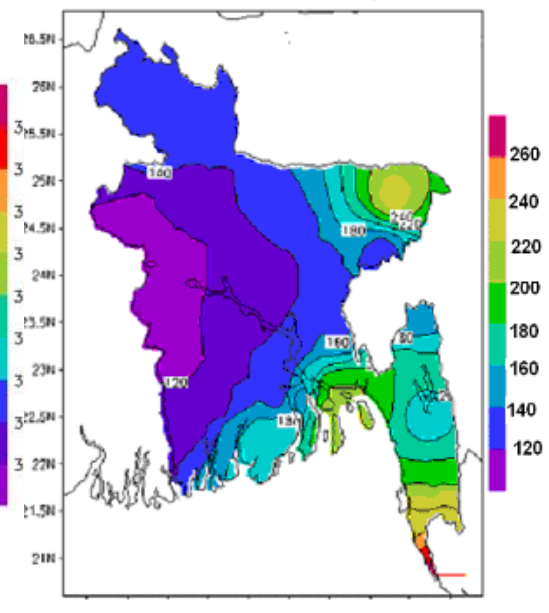
Winter, relatively dry (1.5%)



Maximum temperature in April, 1948-2004

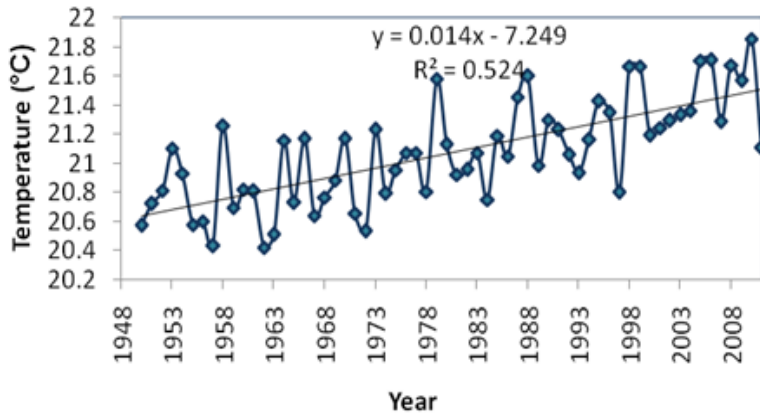


JJAS rainfall (cm) 1948-2004 recomputed mean

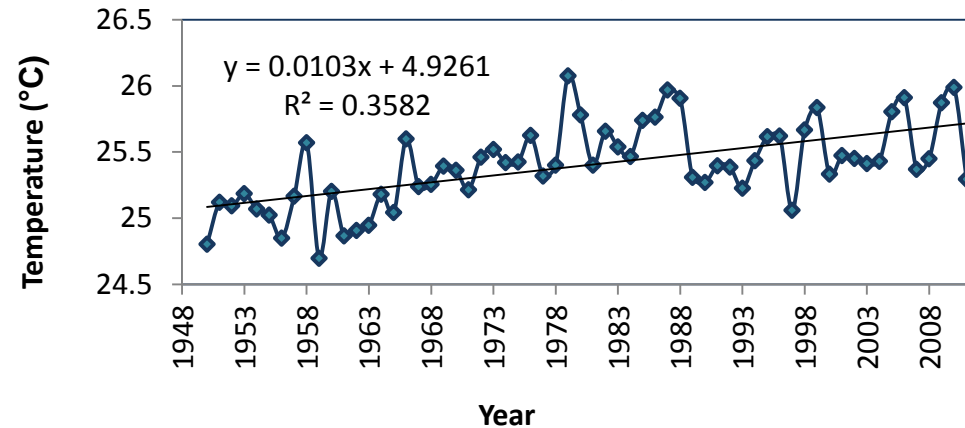


3. Climate change: Temperature

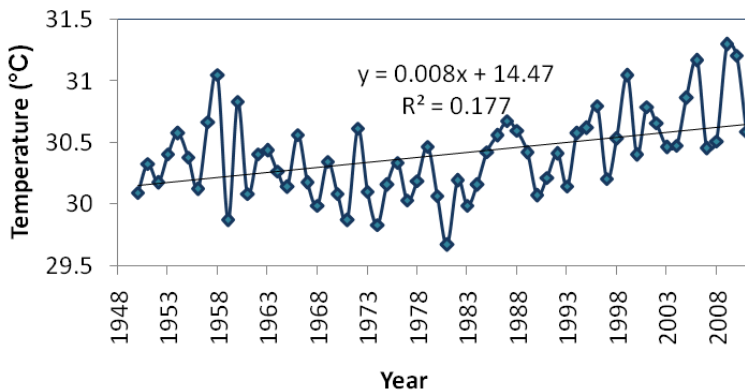
Annual Trend of Minimum Temperature



Annual Trend of Mean Temperature

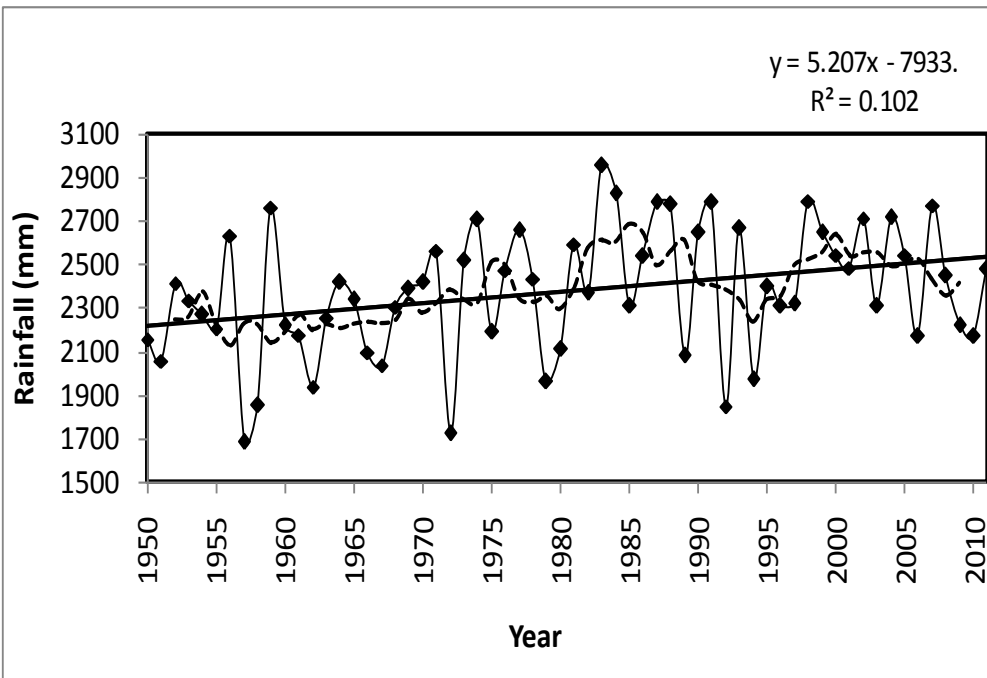


Annual Trend of Maximum Temperature



Season	Trend (°C/year) and R ² values					
	Tmin	p	Tmax	p	Tmean	p
Annual	0.014	<0.001	0.008	<0.001	0.010	<0.001
Winter	0.021	<0.001	0.000	n.s.	0.013	<0.002
Pre-monsoon	0.014	<0.002	-0.004	n.s.	-0.001	n.s.
Monsoon	0.008	<0.001	0.015	<0.001	0.011	<0.001
Post-monsoon	0.016	<0.001	0.024	0.528	0.016	<0.001

3. Climate change : Precipitation (Country average)



Season	Trend value (mm/year)	% of Seasonal rainfall in 50 year	Probability p
Winter	0.181	25	n.s.
Pre-monsoon	1.719	20.5	<0.05
Monsoon	3.082	8.5	<0.05
Post-monsoon	0.279	3.4	n.s.
Annual	5.207	10.7	<0.02

Note: In Brammer, 2014, Kolkata annual rainfall 1829-2012 – shows upward trend for last 50 years, which could be part of cycle (1830-1870 also showing upward trend)

3. Climate Change: Observed RSLR

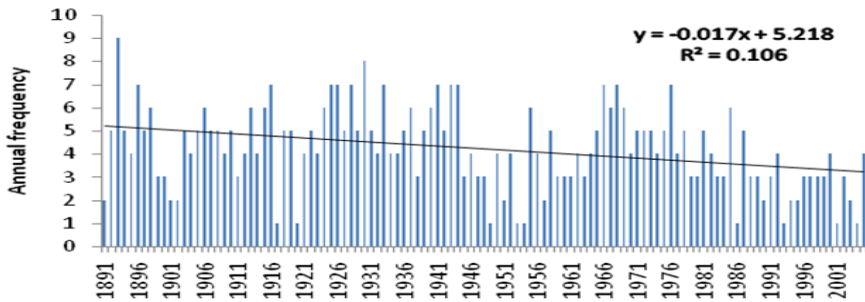
(1978-1998) based on tidal data

Stations	Latitude	Longitude	Sea Level Rise (mm/year)	IPCC (AR5) observed 1981-2000
Western Sundarban Coast (Hazra, 2002)	-	-	3.24	2.0 mm/year
Hiron Point	21°48' N	89°28'E	4	
Char Changa	22°08' N	91°06'E	6	
Cox's Bazar	21°26' N	91°59'E	7.8	
CEGIS (2011)	1991-2010			
Sandwip			7.0	
Moheshkhali			7.5	

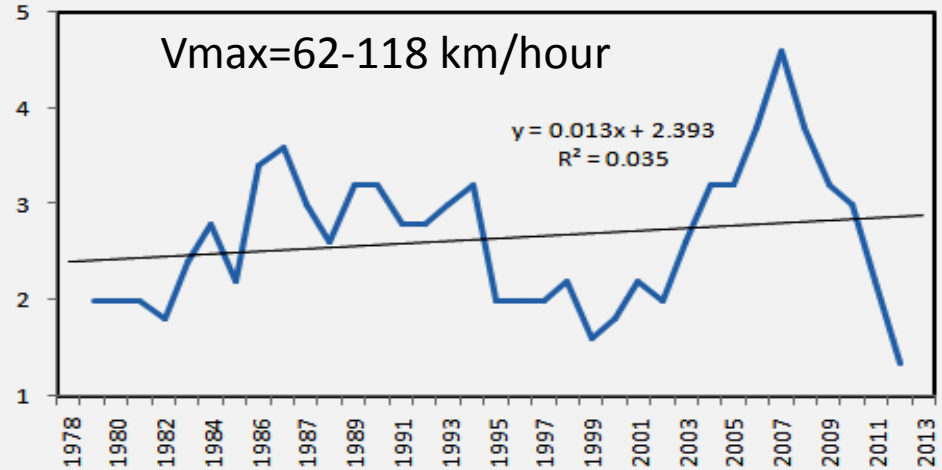
RSLR = Relative Sea Level Rise (including subsidence)

3. Climate change: Tropical Cyclones

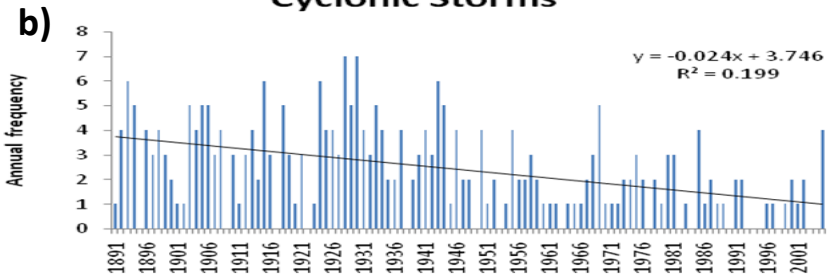
All tropical Cyclones



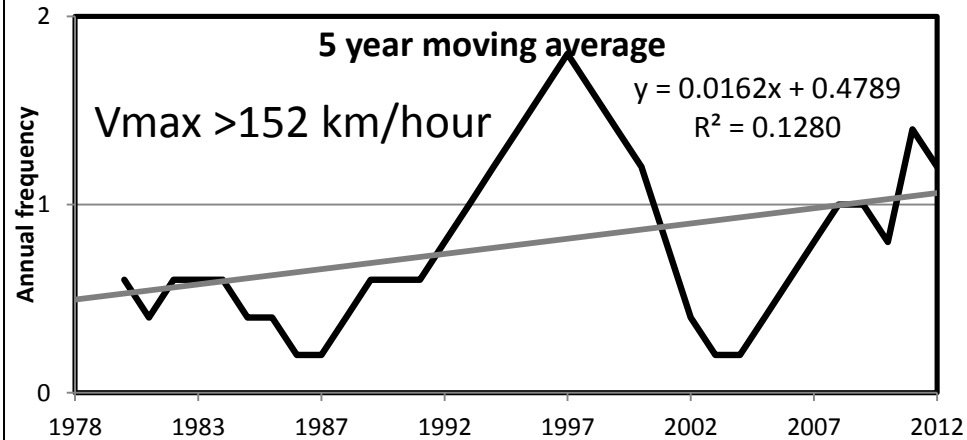
Vmax=62-118 km/hour



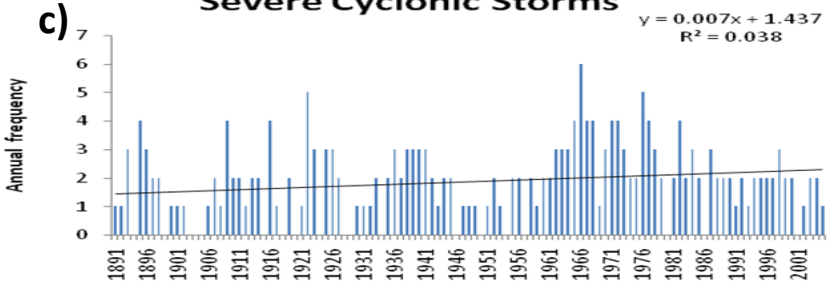
Cyclonic Storms



5 year moving average



Severe Cyclonic Storms



4. Future climate change

IPCC Climate Model results for south Asia using 5 GCMS

GCMs used: :

MPI-ESM-LR

IPSL-CM5A-LR

HADGEM2-ES

ECEARTH

CNRM-CM5

- Interpolated to 0.5x0.5 deg lat/lon for Bangladesh

- Future scenarios of temperature

- Future scenarios of rainfall

- Runoff scenarios

- Future Sea Level Rise (IPCC)

- Future Tropical cyclone frequency and intensity

- Meteorological indicator analysis

Meteorological indicators

1. Average maximum temperature (Tmax)

2. Average minimum temperature (Tmin)

3. Difference Tmax-Tmin

4. Heatwaves (>5 days above normal)

5. Number of days Tmax above threshold

6. Average precipitation

7. Duration and length of dry spells

8. Duration and length of wet spells

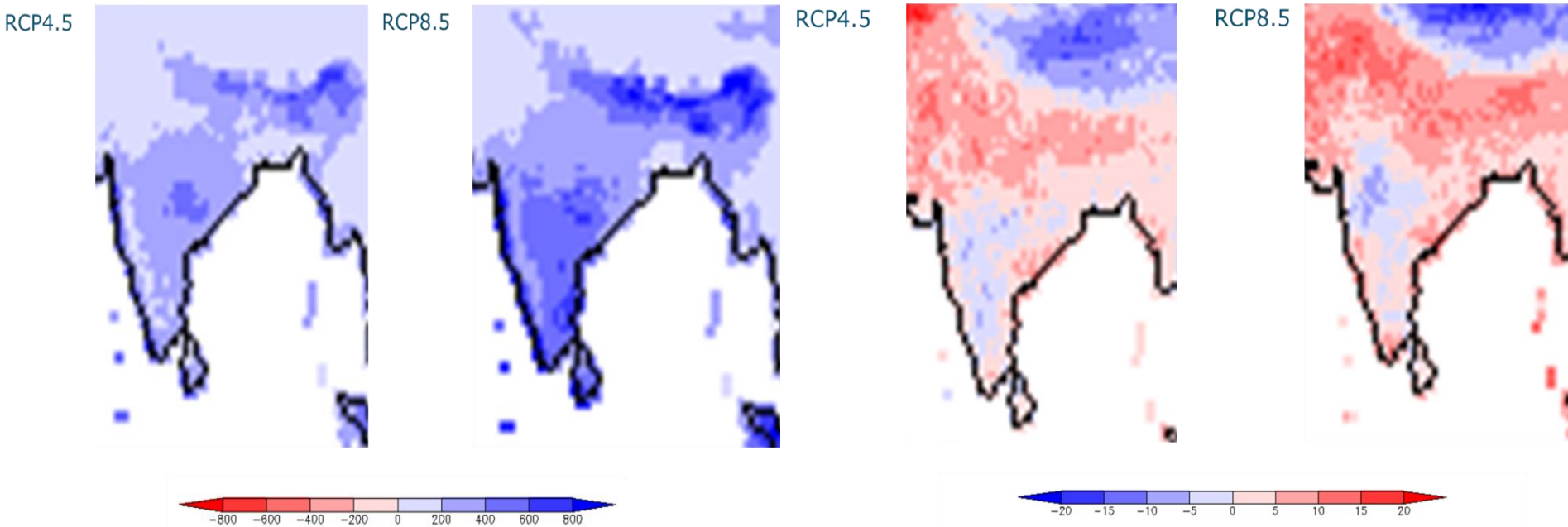
9. Average rain intensity

10. Average highest one day prec. amount

11. Average highest 5 day prec. amount

12. Number of wet days

4. Future climate change: Some results



Average change in the rainfall (mm) at the end of the century (2070-2099 compared to 1970-1999) for rcp4.5 and rcp8.5

Changes in the average length of the largest period of consecutive dry days (cdd) at the end of the century (2070-2099 compared to 1970-1999) for respectively the rcp4.5 and the rcp8.5 scenario. A cdd period is counted when more than 5 consecutive dry days occur.

5. Interactive climate map

Bangladesh Delta Plan – baseline study
climate change in collaboration with
Climate Atlas Service (Touch table team)

<http://www.climateadaptationservices.com/nl/interactieve-klimaAtlas-bangladesh>

Visualising the data – for discussion,
verification, planning



F:\BDP Atlas_Bangladesh_november2014.pdf

6. Conclusion: future steps and knowledge agenda

- **We need to collect facts:** Provide daily data and meteorological indicators – more meteorological stations especially in rural area
- **We need to use facts:** Provide climate change information for adaptation – We'll make factsheets. Need for further research and 'translation' of research
- Climate change trends are a combination of global warming and local changes (e.g. land use)
- Quantification of climate change impacts for indicators, sectors or issues relevant for the Bangladesh Delta Plan
- Quantitative values on climate aspects of delta scenarios
 - Determine future water demand in agriculture under climate change (modelling)
- **We need to work on deepening our understanding (parallel):**
 - Dynamic downscaling of GCM results for GBM region and Bangladesh territory

- Thank you -



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