Webinar on celebrating World Water Day on 22 March 2021 #Water2me

World Water Day - Role of Integrity in Valuing Water

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Facts About Water

- Water is a scarce resources which must be protected
- Around 700 million people in 43 countries suffer today due to water scarcity
- By 2025, 1.8 billion people will be living in regions with absolute water scarcity
- Two-thirds of the world could be living under water stressed conditions by 2050
- The 98% of the Earth is covered with salt water, the remaining 2% is fresh water in which 68% is unusable, stored in glacier
- Globally 2 billion people use water contaminated with faces which leads to diseases like Diarrhea, Cholera, and Typhoid
- Two buckets of safe water a day is what a children need to survive, yet 400 children die everyday due to scarcity

Challenges for Bangladesh

- Bangladesh is a country of over 165 million people
- 2 million Lack access to safe water
- 48 million people lack access to improved sanitation
- 30% of the total population lives on less than sanitation

World Water Day - 2021

- Value water beyond its price
- It determines how it is managed and shared.
- The significance of water is interlinked between households, culture, health, education, economics and the integrity of our natural environment.
- If we overlook any of these values, we risk mismanaging this finite, irreplaceable resources
- Water is under extreme threat from a **growing population, increasing demands of agriculture and industry, and the worsening impacts of climate change**.

Water services and pollution

- Critical value of water services – drinking water, sanitation and health service
- WASH - water, sanitation and hygiene
- Industrial pollution jeopardizes rivers.
- Mismanagement of water can damage ecosystems and harm reputations and affect sales
- **Unsafe water is deadlier than bullets**

Water pollution from industrial effluent

Chemical waste from a local jeans washing plant

Heavy chemicals to wash jeans

Pollution from Dyeing Industries

Pollution from Textile Industries

Dumping of solid waste

Dumping of solid waste to rivers

Insufficient solid waste management

Solid waste reduce capacity of drains

A young girl lives and plays next to a brook of tannery wastewater.

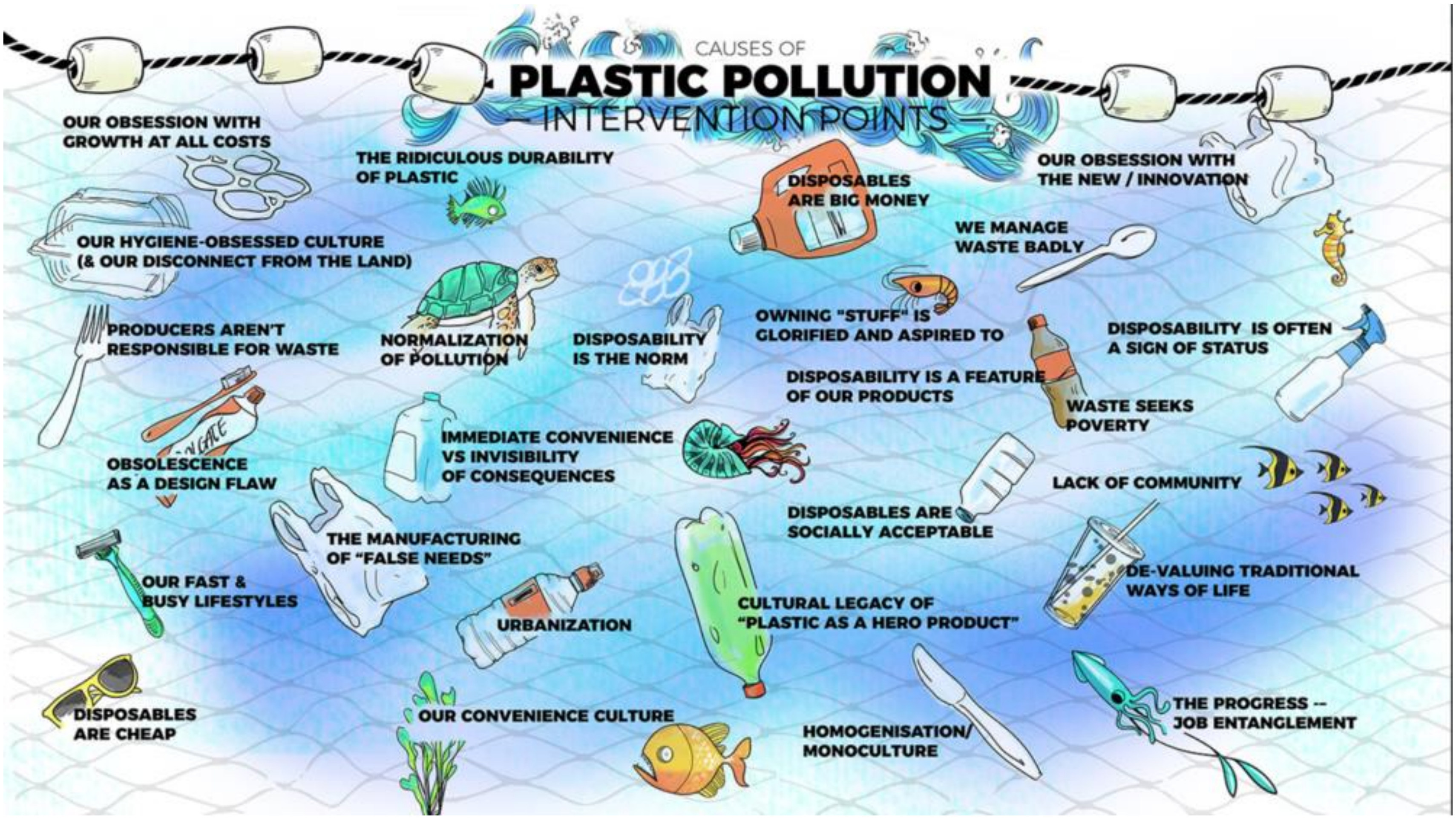
Plastic pollution in the Ocean

- There are 5.25 trillion pieces of plastic trash in the world's oceans, and each year, 8 million tons of plastic are added to the count.

- by 2025, the ocean could contain one ton of plastic for every three tons of finfish.

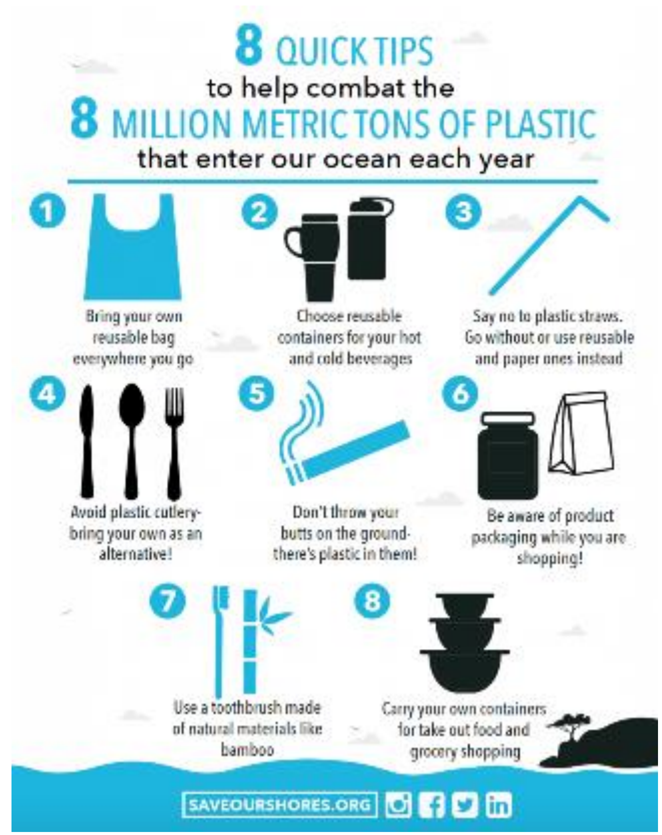
- All these floating bits of plastic–from micron-sized plastic pieces to those six-pack can rings–not only disrupt marine ecosystems, but they also poison the global supply of seafood.

Plastic Footprint

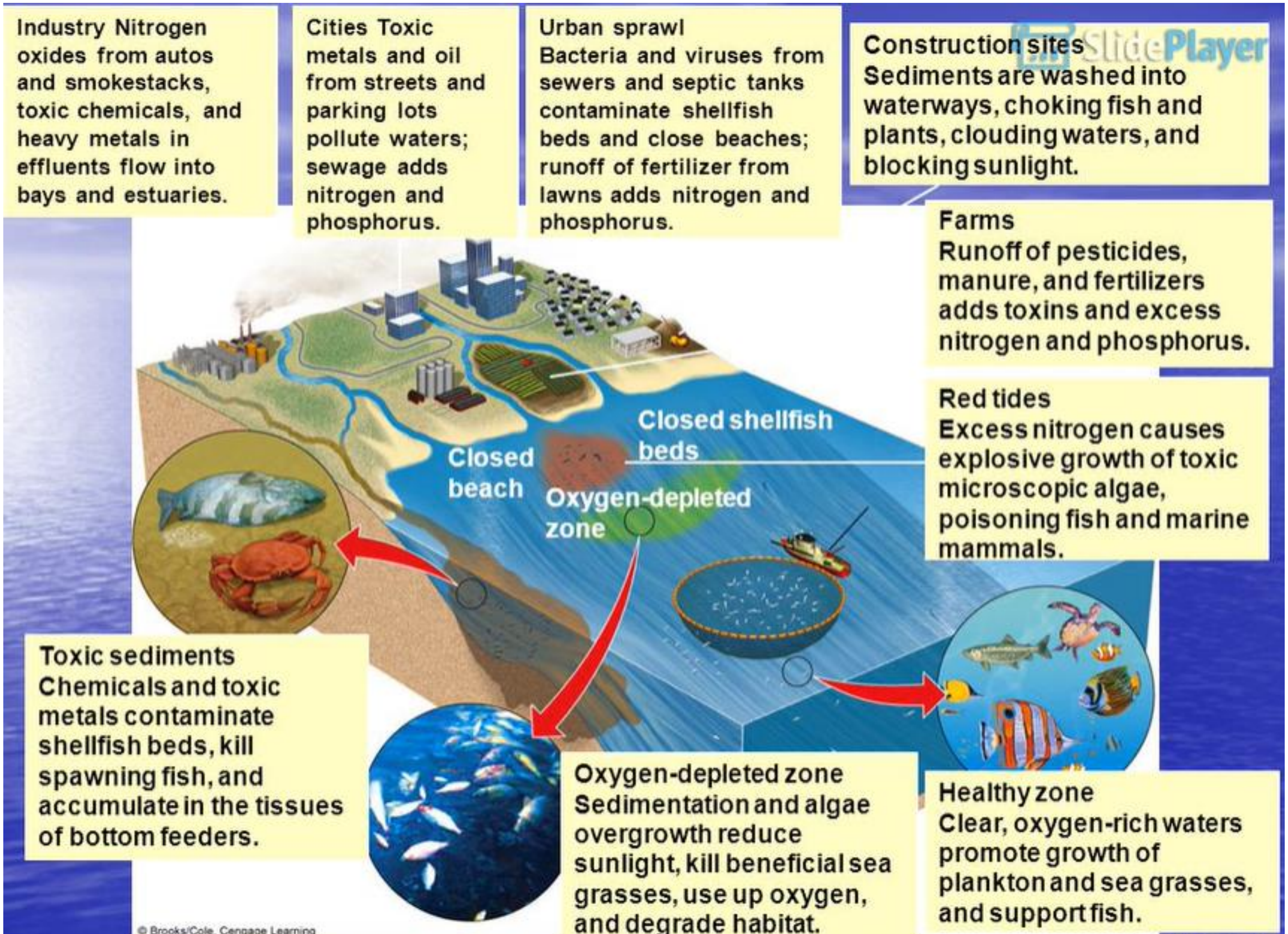


Single Use Plastic (SUP) Pollution and its impact on Human Health and Environment in Bangladesh

Reduce plastic pollution

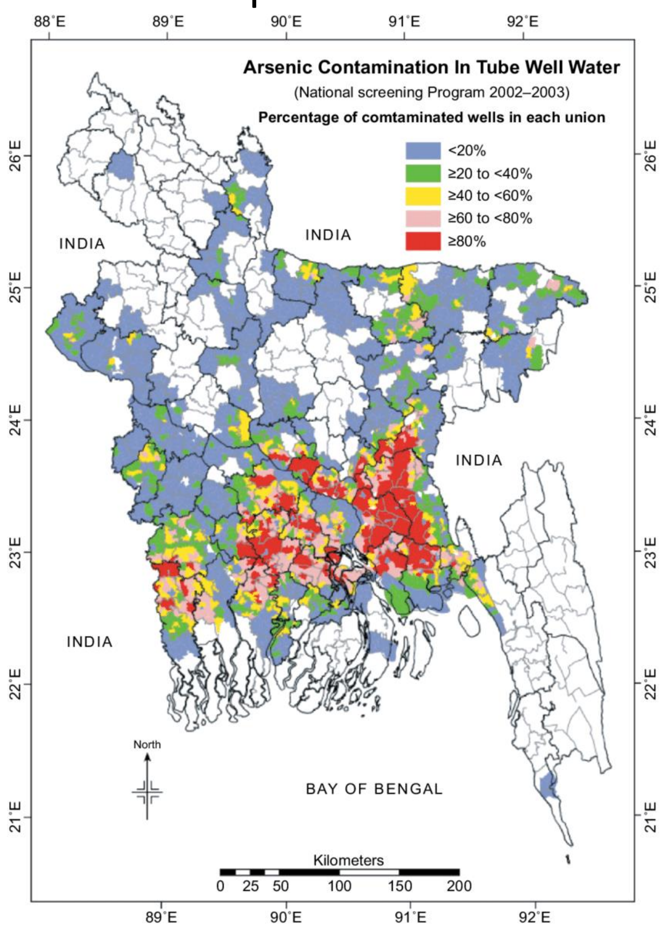


Oxygen depletion and acidification



Arsenic contamination in Tube wells

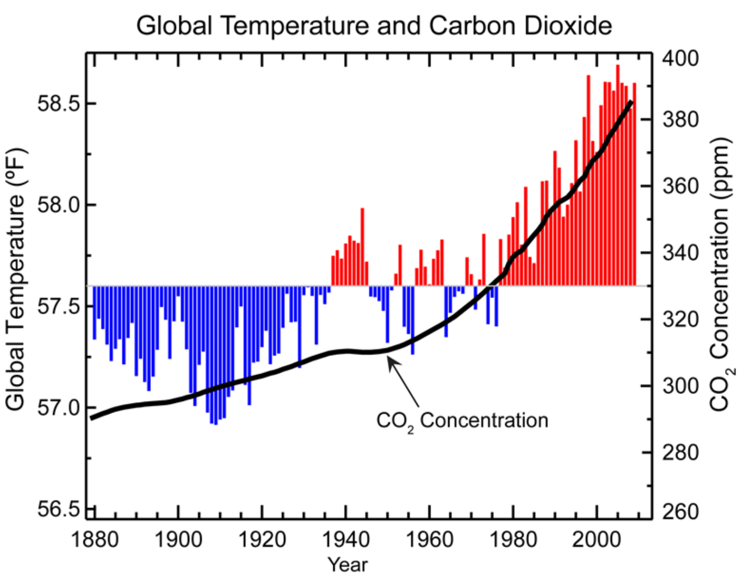
- Fifty million people of Bangladesh were estimated to be at risk of exposure to arsenic through consumption of water from contaminated tubewells.
- The nationwide screening further revealed that in 15% of the villages, more than 80% of the tubewells were contaminated, and these villages were assigned as "hot spots.

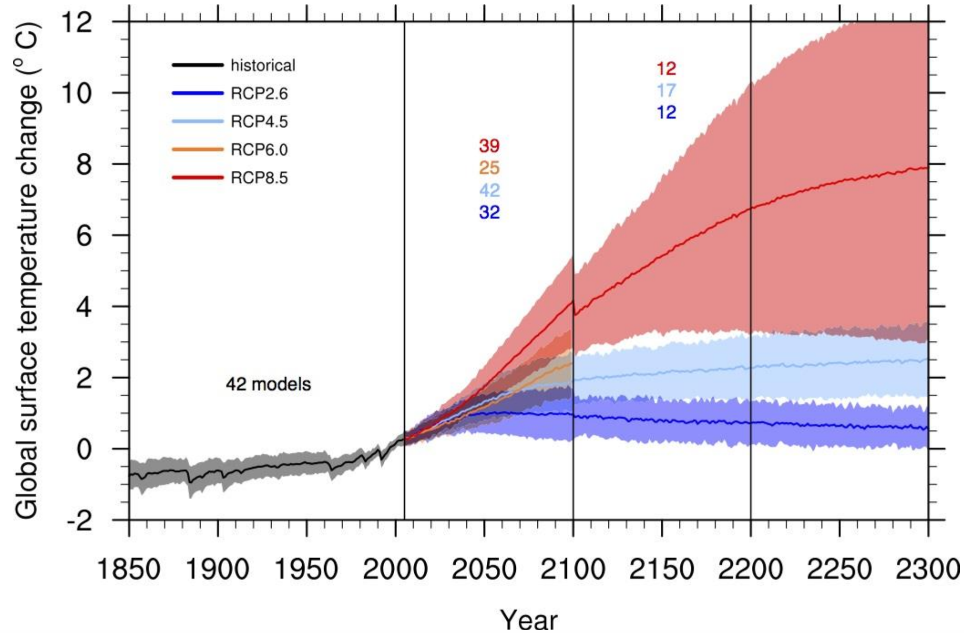


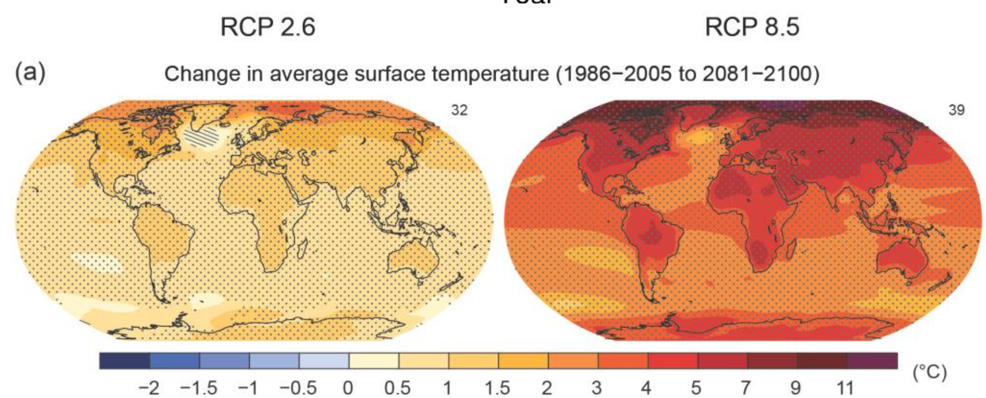
Agricultural Runoff

- Agricultural runoff encompasses both natural and unnatural sources of contamination.
- Soil erosion: As areas are plowed and planted again and again, the soil is loosened and becomes much more prone to drifting into the water supply. This can make the water dirty and can easily contribute to the rise of bacteria present.
- Pesticides - made with harsh chemicals are also a problem, especially when they enter into water supplies. Humans and animals both should not consume these pesticides, but it’s impossible to avoid it when they’re used so frequently that they are present in water.

Global warming and Climate Change

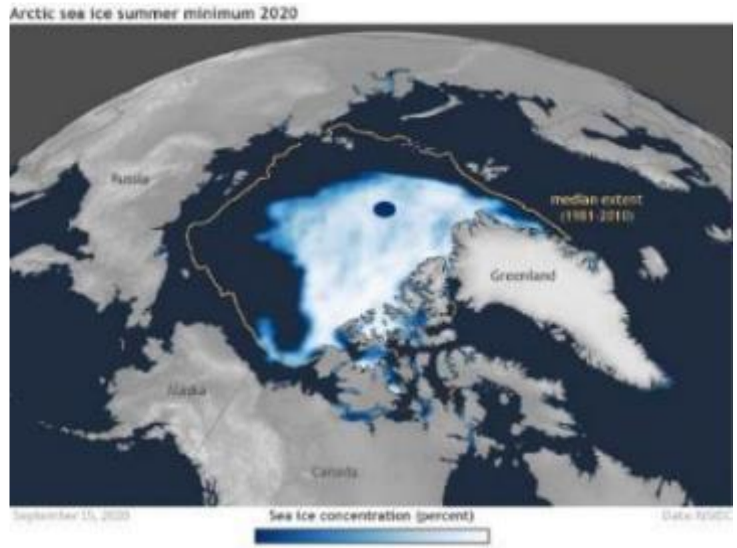




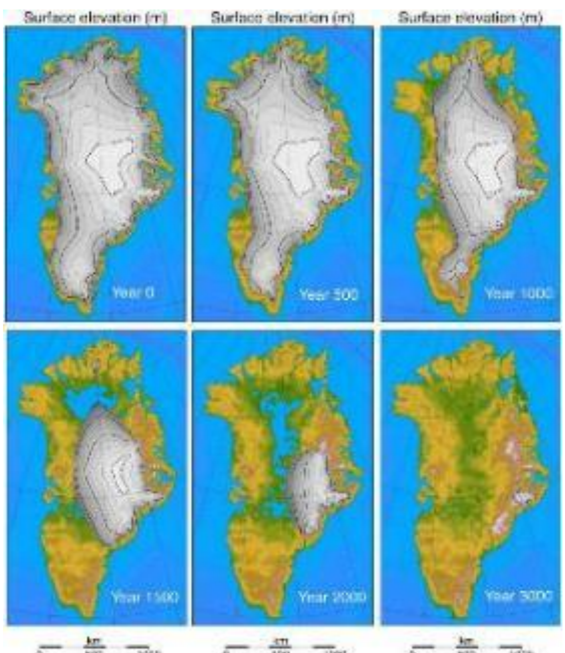


Impact of Sea Level Rise

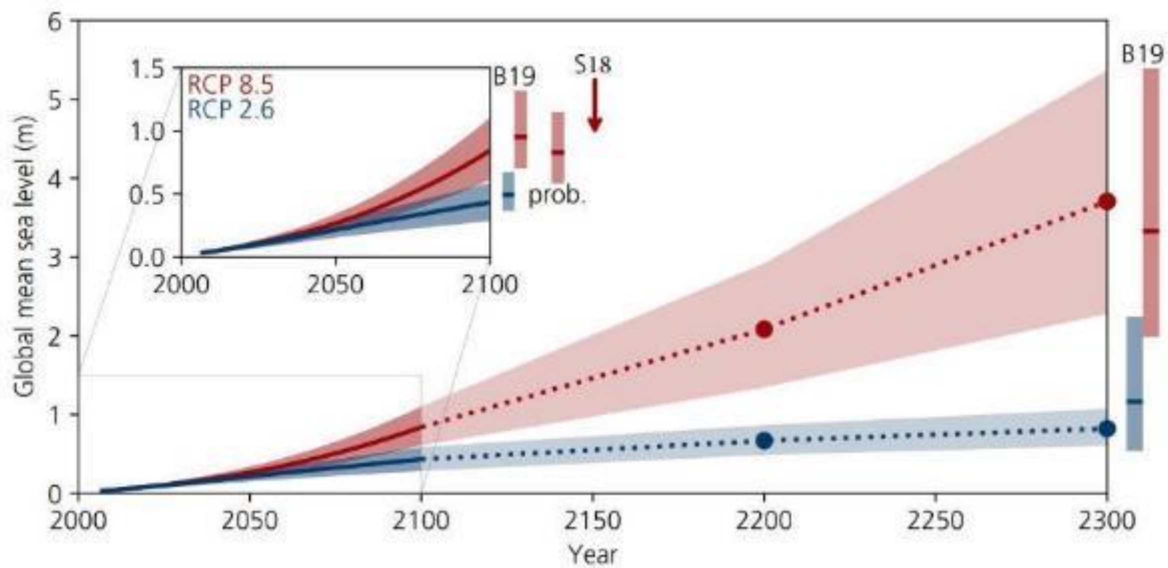
- Changes of downstream water level due to SLR



Greenland ice-sheet evolution



Future Sea level rise projections by IPCC SROCC



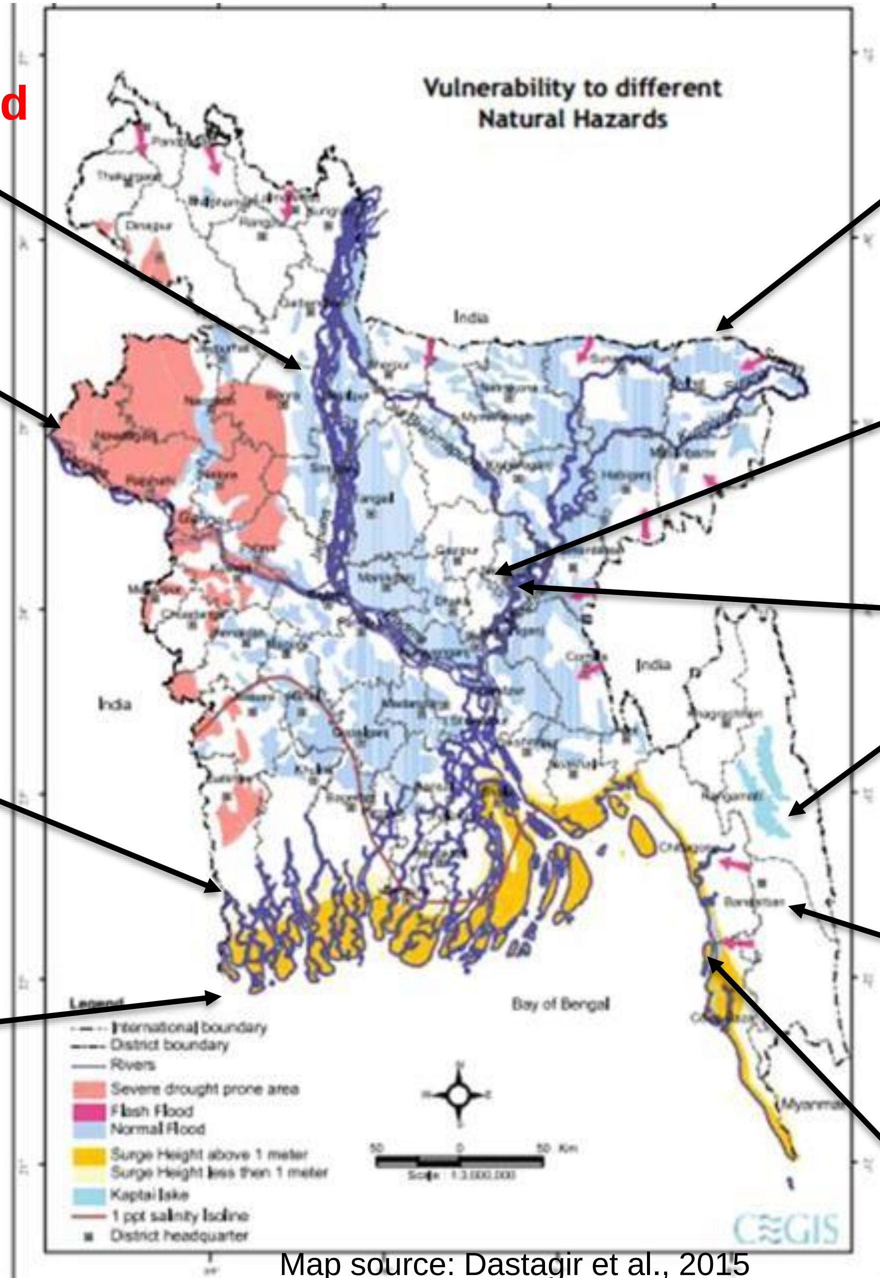
Hazards Expected to Change under Global Warming

Riverine Flood
More intense
& frequent

Drought
More frequent
& Severe

Salinity
Continue to
Increase

Sea level Rise
Continue to Rise



Map source: Dastagir et al., 2015

Flash Flood
More severe &
frequent

Urban flood
More frequent
& intense

Heatwave
Prolonged

Flash flood
More intense

Landslides
Frequent

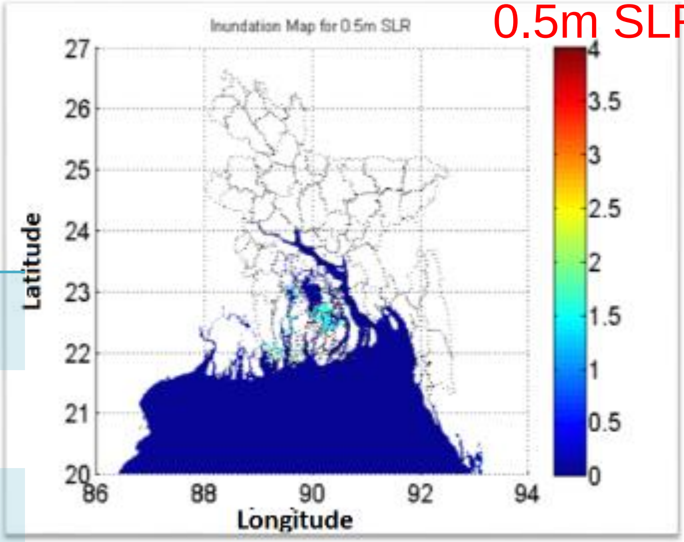
Cyclone and storm sur
Cyclone more intense
Increased Surge

Changes of Inundation due to SLR

Permanent Inundation

SLR (m)	Inundated Area (square km)	Area Percent of Bangladesh	Affected Population (million)
0.5m	2000	1.6	2.5
1m	3930	3.8	6
1.5m	5300	5.1	8

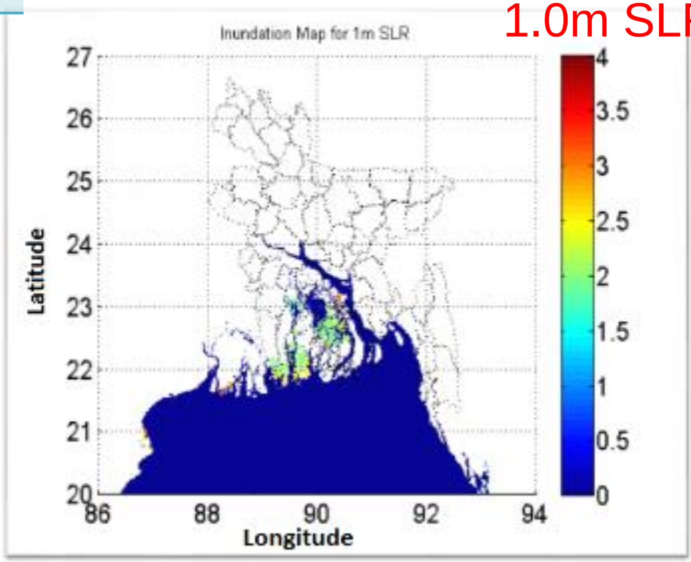
0.5m SLR



Inundation of the Sundarbans

SLR (m)	Inundated Area (square km)	% of inundation Area
0.5m	491	11.37
1m	1847	42.78
1.5m	2635	61.04

1.0m SLR



Recent Cyclones in the Bay of Bengal

Cyclone Amphan (2020) Date: 16-21 May 3-min wind: 240 km/hr 1-min wind: 260 km/hr Surge: 3-4 m **Damage: USD 1.5 billion** **Fatalities: 26**	Cyclone Bulbul (2019) Date: 5-11 November 3-min wind: 140 km/hr 1-min wind: 195 km/hr Surge: < 2 m **Damage: USD 33 million** **Fatalities: 128**	Cyclone Fani (2019) Date: 26 April -05 May 3-min wind: 215 km/hr 1-min wind: 250 km/hr Surge: < 2 m **Damage: USD 63.6 million** **Fatalities: 17**
Cyclone Mora (2017) Date: 28-31 May 3-min wind: 110 km/hr 1-min wind: 150 km/hr Surge: < 2 m **Damage: USD 6 million** **Fatalities: 0**	Cyclone Roanu (2016) Date: 16-21 May 3-min wind: 85 km/hr 1-min wind: 110 km/hr Surge: 2 m **Damage: USD 31.8 million** **Fatalities: 30**	Cyclone Aila (2009) Date: 17-27 May 3-min wind: 110km/hr 1-min wind: 120km/hr Surge: 3 m **Damage: USD 1 billion** **Fatalities: 190**
Cyclone Sidr (2007) Date: 11-15 November 3-min wind: 215 km/hr 1-min wind: 260 km/hr Surge: 5.5 m **Damage: USD 2.31 billion** **Fatalities: 3,447**	1991 Cyclone (1991) Date: 24-30 April 3-min wind: 235 km/hr 1-min wind: 260 km/hr Surge: 6.1 m **Damage: USD 1.5 billion** **Fatalities: 138,000**	Bhola Cyclone (1970) Date: 3-13 November 3-min wind: 185 km/hr 1-min wind: 240 km/hr Surge: 10.6 m **Damage: USD 86.4 million** **Fatalities: 500,000**

Changes of inundation patterns or cyclone Sidr (2007), Aila (2009) and Roanu (2016)

Conditions	Sidr			Aila			Roanu		
	Area	%	p	Area	%	P	Area	%	P
Only cyclone	1484	1.2	1.9	1999	1.5	2.3	676	0.46	0.52
0.5m SLR	3380	2.6	4.1	4226	3.3	5.1	2912	1.97	2.24
1m SLR	5777	4.4	7.0	6216	4.8	7.5	7832	5.31	6.02
1.5m SLR	7588	5.8	9.1	7497	5.8	9.0	12550	8.5	9.65

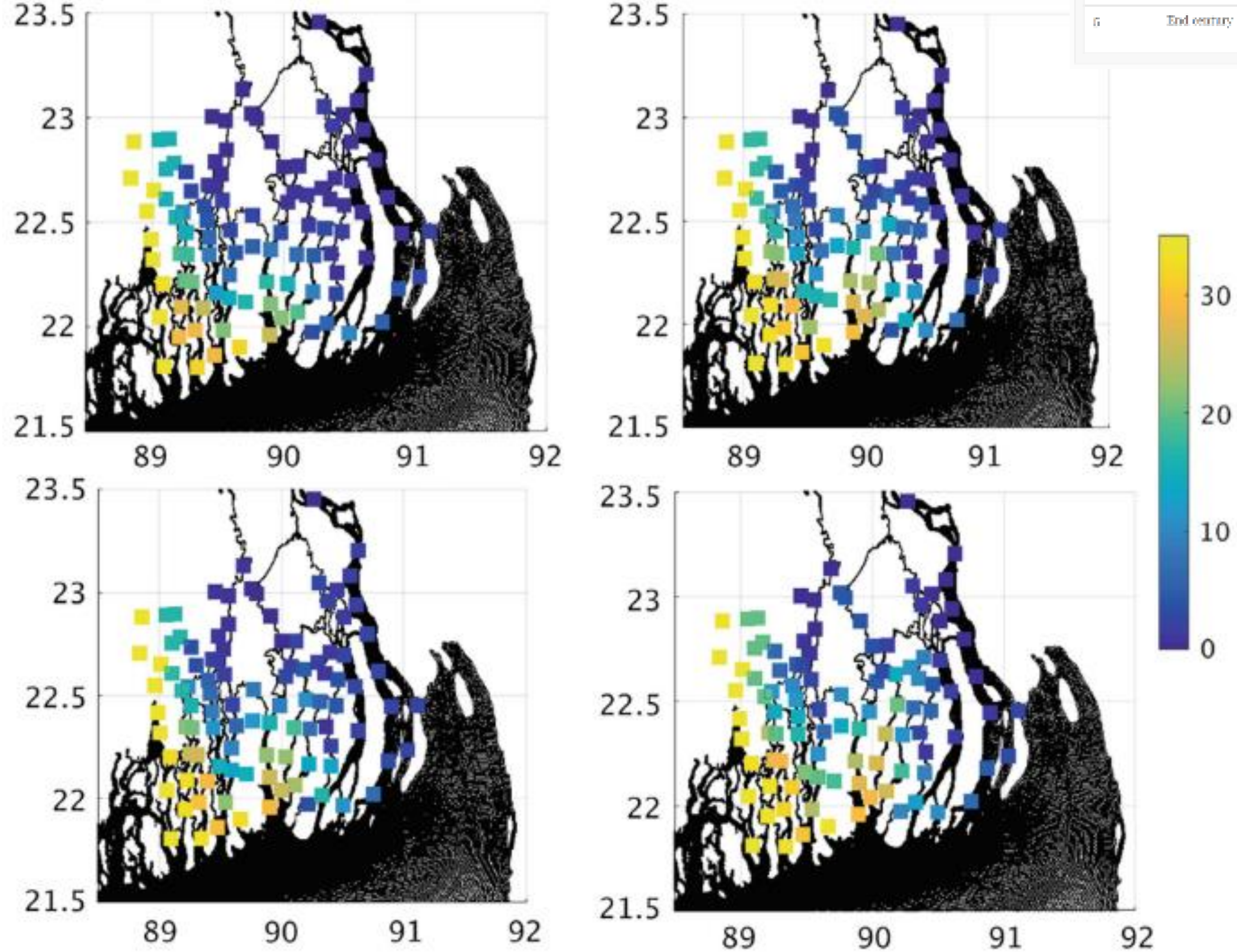
*Inundation Area in Km^2, % of area w.r.t. country and Affected population in Million

Salinity in coastal Bangladesh

Annual maximum salinities for 103 selected points under the four future scenarios

Table 17.1
Summary of scenario runs with annual river discharge over time discussed in this chapter

Scenario	Description	Climate and management	MSLR (cm)	Year	Annual river discharge (m³)	'Wet' or 'dry'
1	Baseline	Q0+business as usual	0.0	2000–2001	9,028,407	
2	Mid-century	Q0+business as usual	31.96	2047–2048	13,479,424	Wet
3	Mid-century	Q8+less sustainable	27.06	2050–2051	10,011,085	Dry
4	End century	Q8+more sustainable	58.77	2082–2083	16,517,208	Wet
5	End century	Q0+business as usual	59.01	2097–2098	10,978,254	Dry



Bricheno et al., 2018

Trends in Water Level and Subsidence

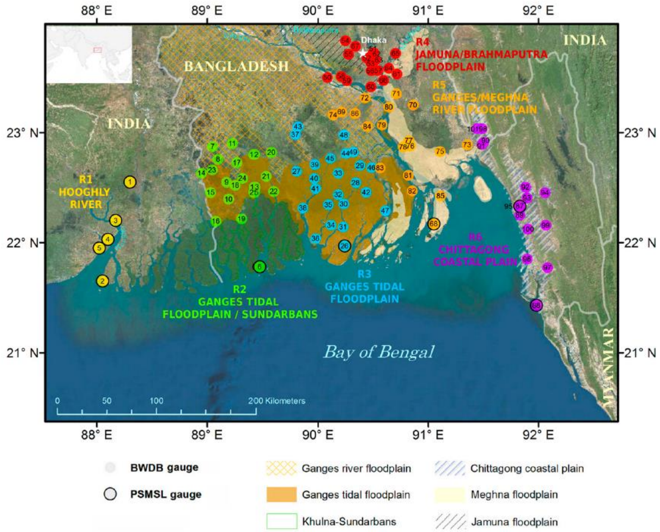


Fig. 1. Map of the GBM delta region together with the location of stream/tide gauges from the Bangladesh Water Development Board (11) and tide gauges from the PSMSL and the 6 regions defined in this study. Each number corresponds to the station position in *SI Appendix*, Table S1. The physiographic units originate from Brammer et al. (72). GBM delta imagery basemap courtesy of Esri, DigitalGlobe, Earthstar Geographics, CNES/Airbus DS, GeoEye, USDA FSA, USGS, Aerogrid, IGN, IGP, and the GIS User Community.

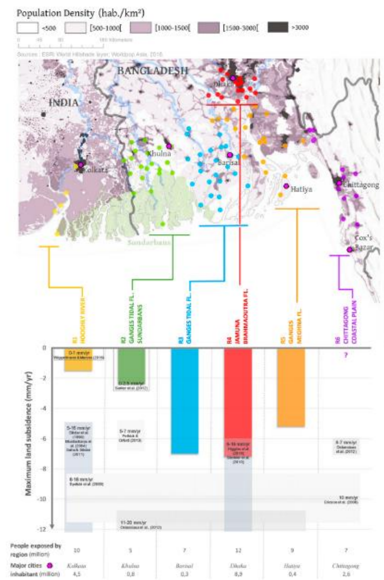


Fig. 4. Map and maximum subsidence rates expected over the contemporary period. The solid colored bars correspond to the significant subsidence rates obtained in this study (upper bound of the likely range, Table 1). In R6, "?" means that we are not able to provide reliable information about the subsidence in this region. The shaded gray bars correspond to the subsidence rates obtained from the literature for the contemporary period. The 2015 population density (habitants per square kilometer) map is provided by Worldpop Asia (5). World Hillshade basemap courtesy of Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap, and the GIS user community.


Water level changes, subsidence, and sea level rise in the Ganges–Brahmaputra–Meghna delta

Mélanie Becker, Fabrice Papa, Mikhail Karpytchev, Caroline Delebecque, Yann Krien, Jamal Uddin Khan, Valérie Ballu, Fabien Durand, Gonéri Le Cozannet, A. K. M. Saiful Islam, Stéphane Calmant, and C. K. Shum

Table 1. Trends (millimeters per year) of regional relative water level (RWL) and absolute sea level (ASL)

	RWL		ASL		Expected max. subsidence
Region	Trend 1968–2012, mm/y	SD σ, cm	Trend 1993–2012, mm/y	Correlation coefficient $r_{[RWL,ASL]}$ (lag in months)	Trend 1993–2012, mm/y
R1-Hooghly River	2.1 ± 0.8***	8	2.7 ± 1.4***	0.9(0)	1.5
R2-Ganges tidal floodplain/Sundarbans	2.7 ± 1.3***	9	2.1 ± 1.4*	0.7(0)	2.4
R3-Ganges tidal floodplain	3.6 ± 1.8***	16	3.2 ± 1.6***	0.8(0)	7.0
R4-Jamuna/Brahmaputra floodplain	3.1 ± 2.3*	28	3.1 ± 1.5***	0.6(−1)	7.2
R5-Ganges/Meghna floodplain	3.0† ± 2.6*	16	3.4 ± 1.6***	0.7(−1)	5.2†
R6-Chittagong coastal plain	1.3 ± 1.4	17	3.4 ± 1.7***	0.4(0)	—

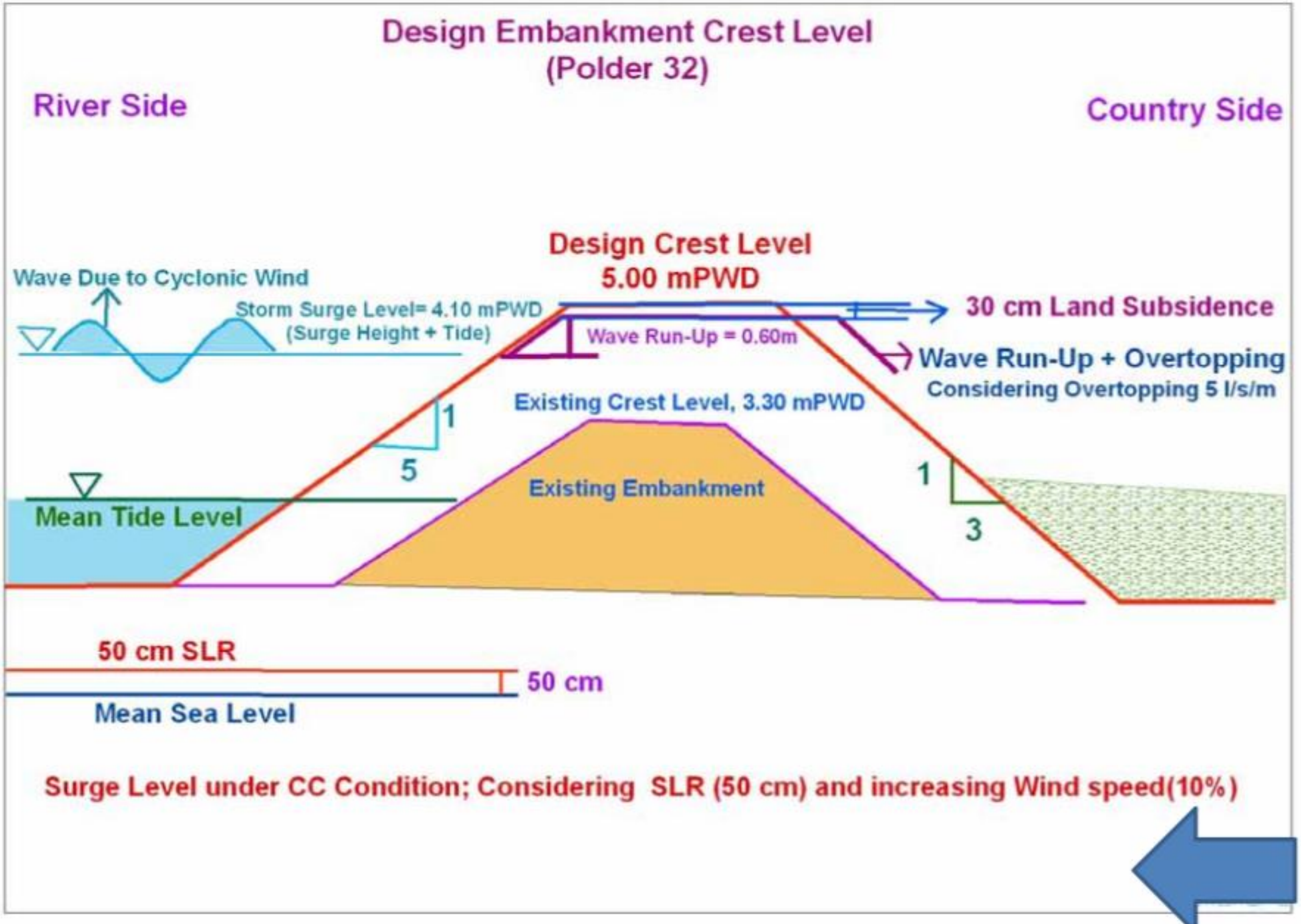
The linear trend estimates are obtained from a robust regression model with the bisquare weight function (67). Their significances and uncertainties are estimated by a random phase method to maintain the autocorrelation structure of RWL and ASL series (24) and given at 1σ significance level. The maximum expected subsidence rate is defined as the 10% lower bound in the VLM rates distribution (subsidence corresponds to VLM < 0). *, **, and *** correspond to a significant linear trend with $P \leq 0.1$, $P \leq 0.01$, and $P \leq 0.001$, respectively.

†In R5, the trends are estimated up to 2005 (see *Materials and Methods* for details).

(Becker et al., 2019)

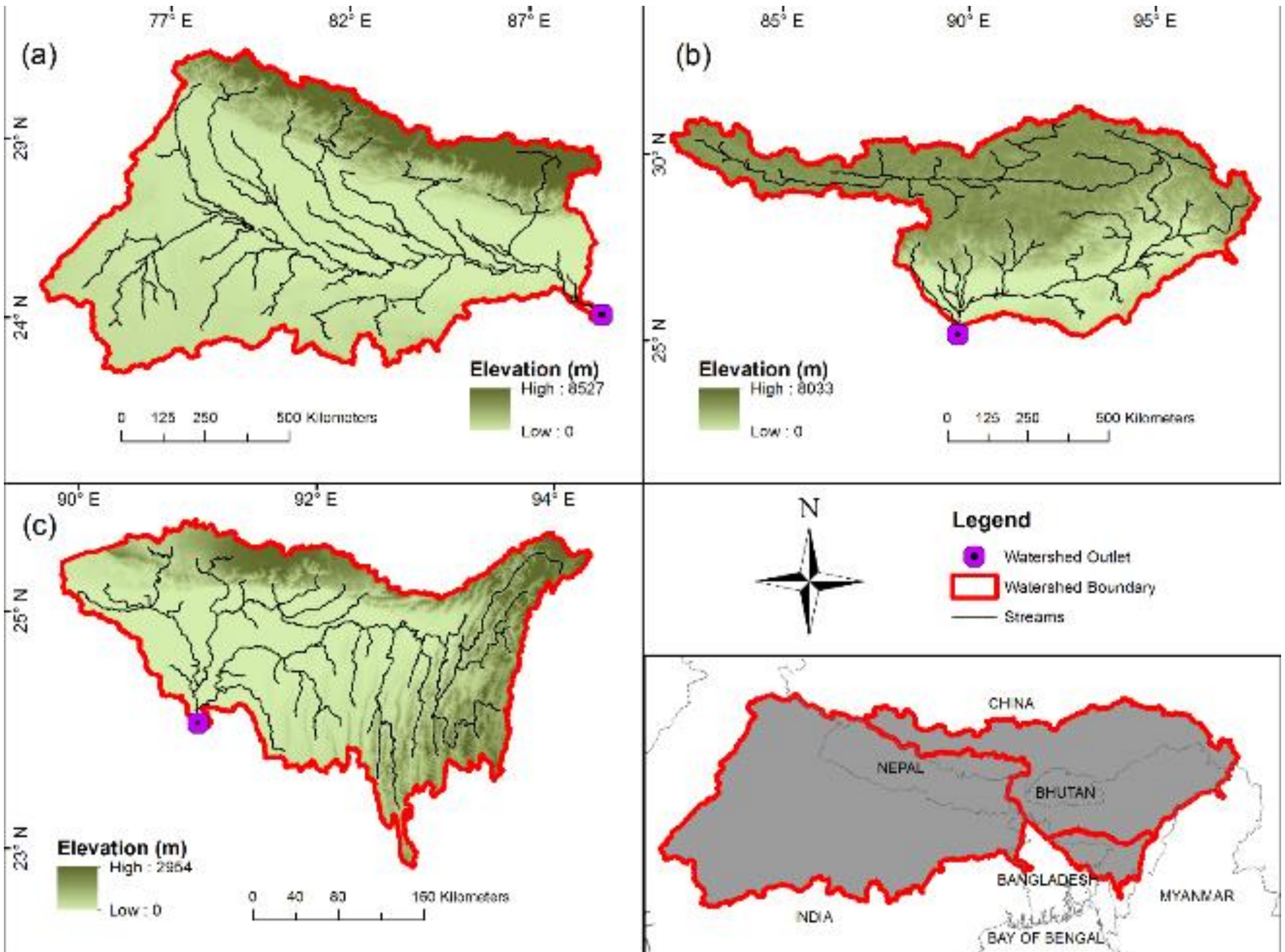
Climate Resilient Coastal Polders

Polder No: 32



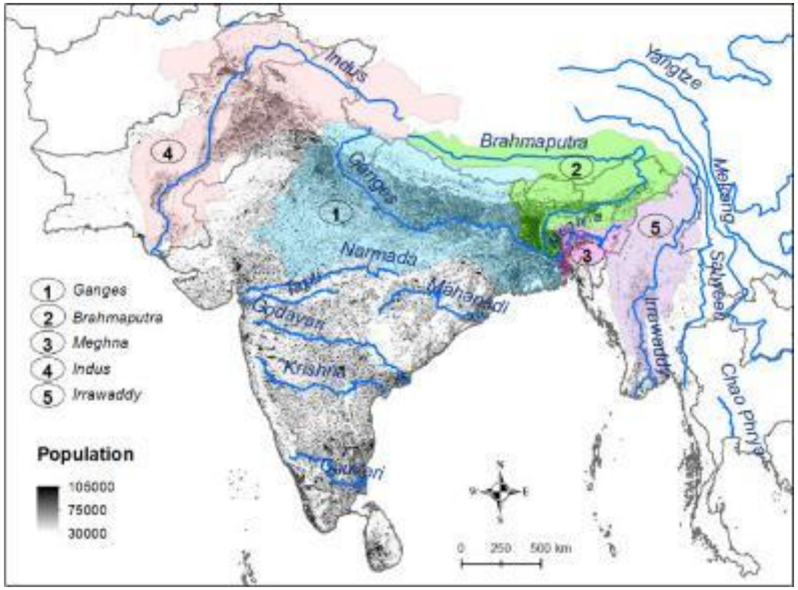
Ganges-Brahmaputra-Megha Basins

The GBM basins are located over India (64%), China (18%), Nepal (9%), Bangladesh (7%) and Bhutan (3%), and the elevation of the basins range from about 0 to above 8000 m above mean sea level (amsl).



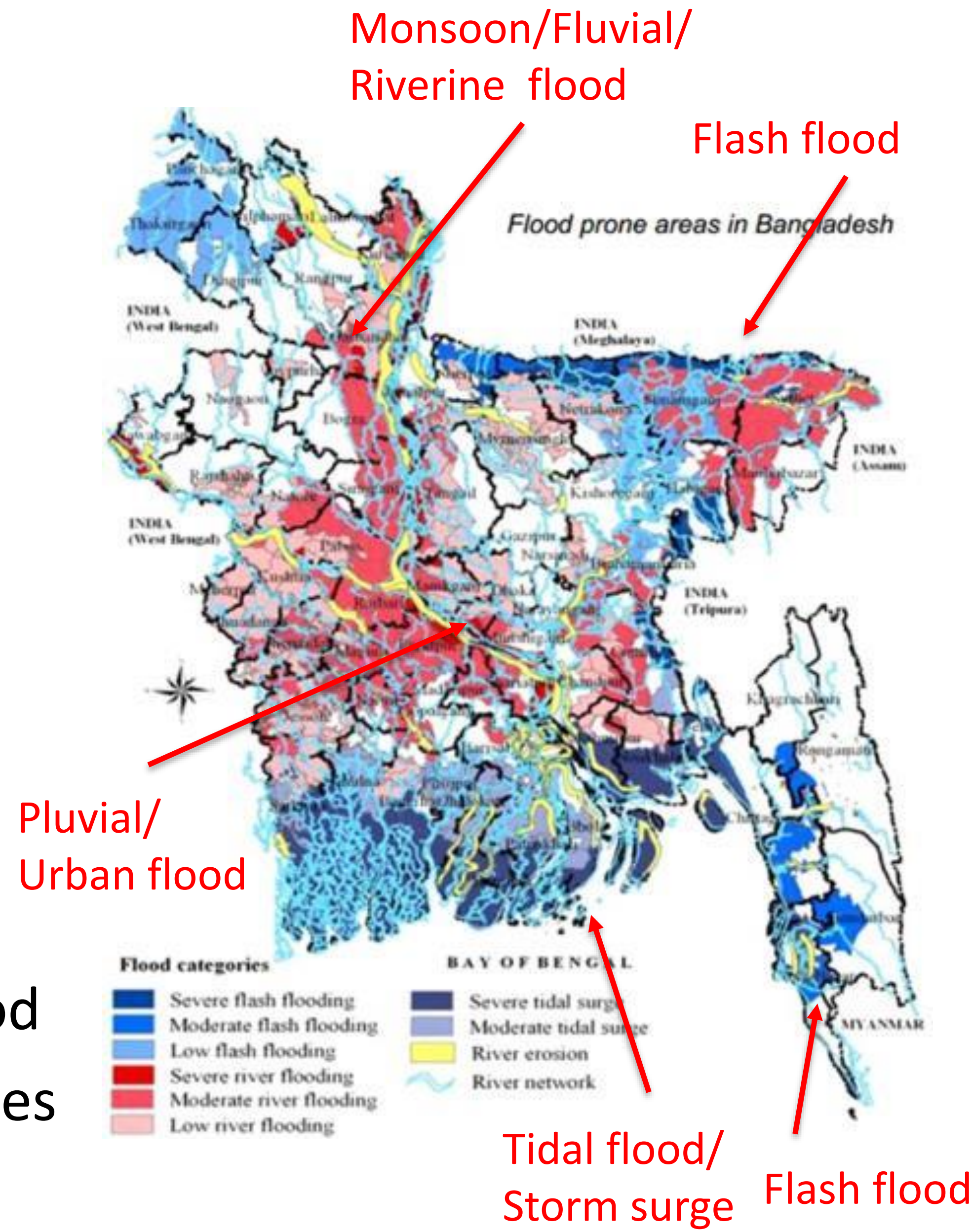
Characteristics of floods in Bangladesh

Ganges-Brahmapura-Meghna (GBM) basins

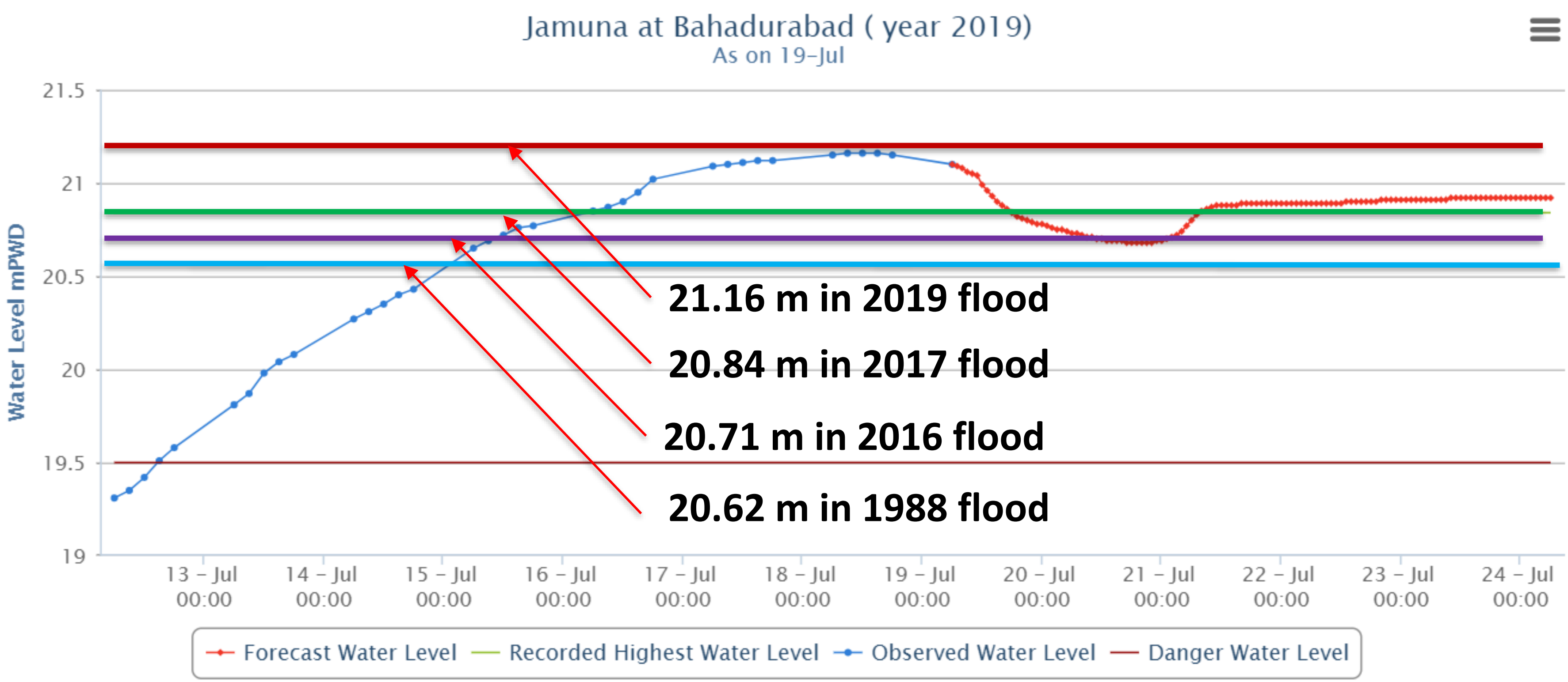


Four flood types include-

1. Flash floods in hilly areas
2. Riverine floods during monsoon season (Jun-Sep)
3. Rain-fed floods/Urban Flood
4. Tidal Flood and Storm Surges



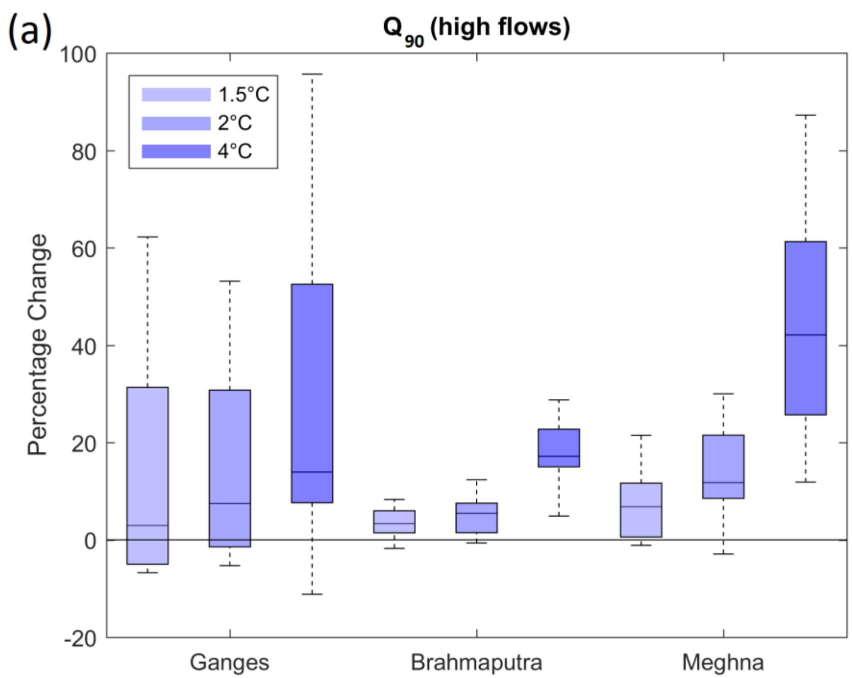
Flood peak is increasing at Bahadurabad Station on Brahmaputra- Jamuna River



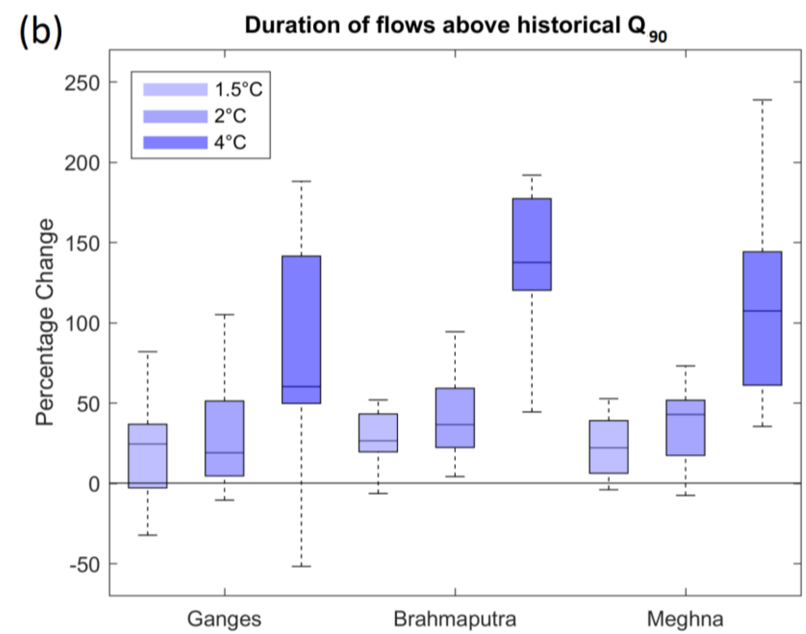
River Name	Location	RHWL (mPWD)	Danger Level (mPWD)	18-07 06:00 AM	19-07 06:00 AM	20-07 06:00 AM	21-07 06:00 AM	22-07 06:00 AM	23-07 06:00 AM	24-07 06:00 AM
Jamuna	Bahadurabad	20.84	19.50	21.15	21.10	20.73	20.80	20.89	20.91	20.92

High flows and flood duration will be more increasing in the future

Q90 Flow



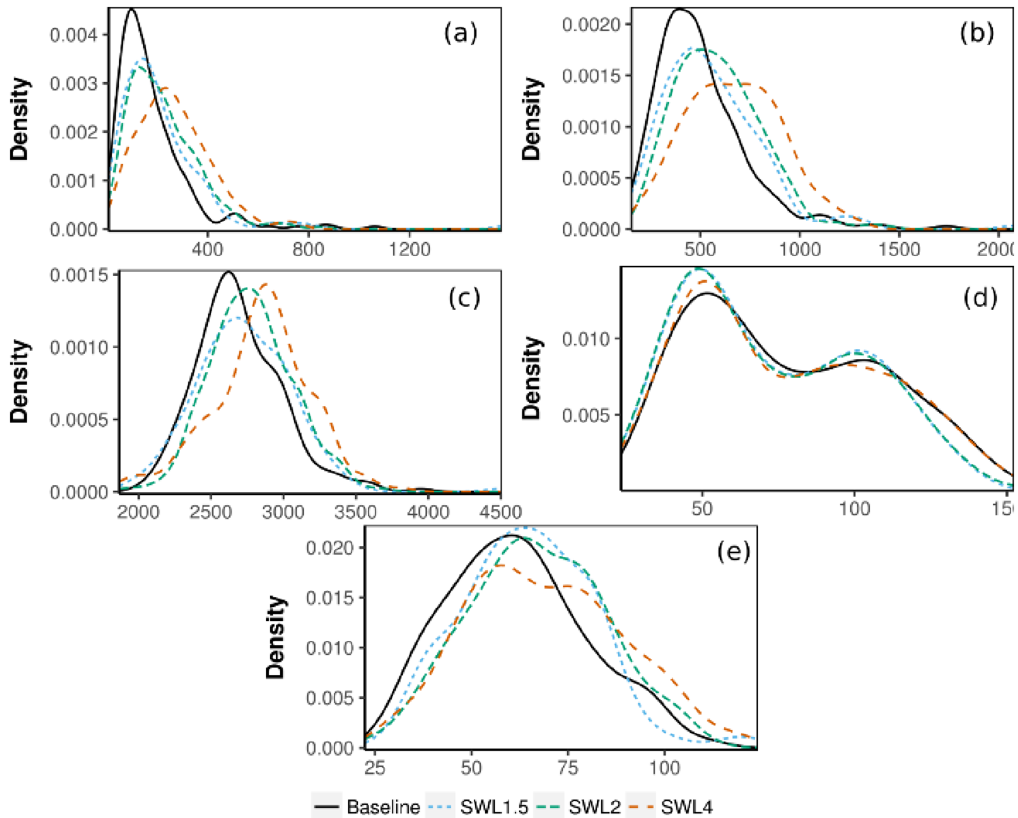
Duration of Q90



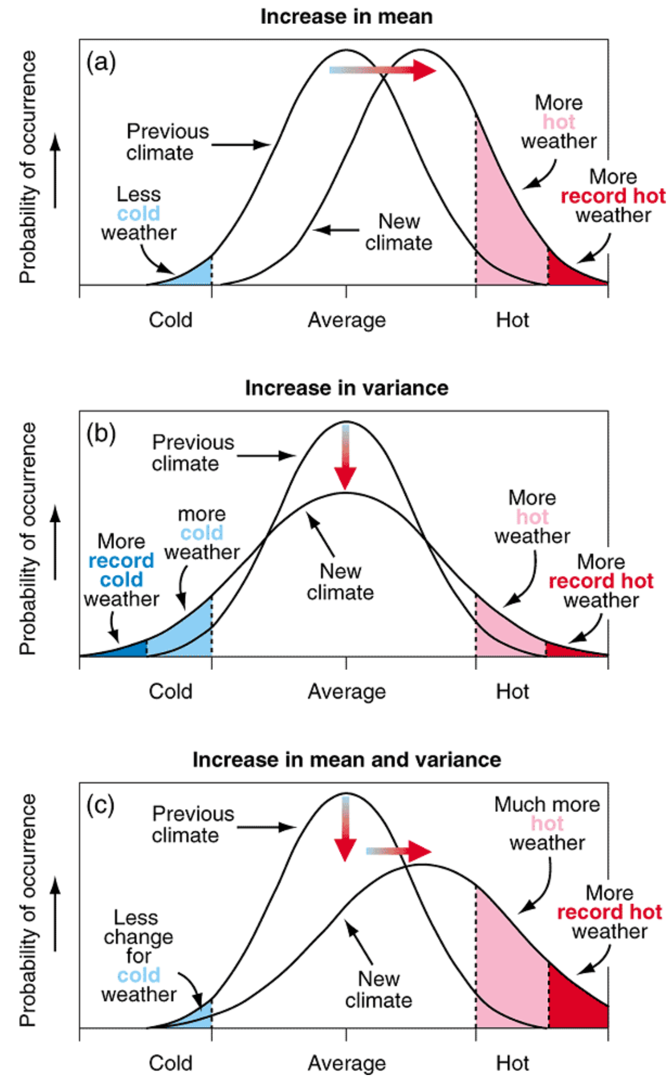
The ensemble-median values of the changes of Q90 flow at 1.5°C, 2°C, and 4°C are about 3%, 7%, and 14% for the Ganges; 4%, 5%, and 22% for the Brahmaputra; and 9%, 12%, and 42% for the Meghna, respectively

Mohammed et al., 2018

Shift of the Probability density functions (PDFs) for extreme precipitation indices - (a) R99p, (b) R95p, (c) PRCPTOT, (d) CWD and, (e) CDD

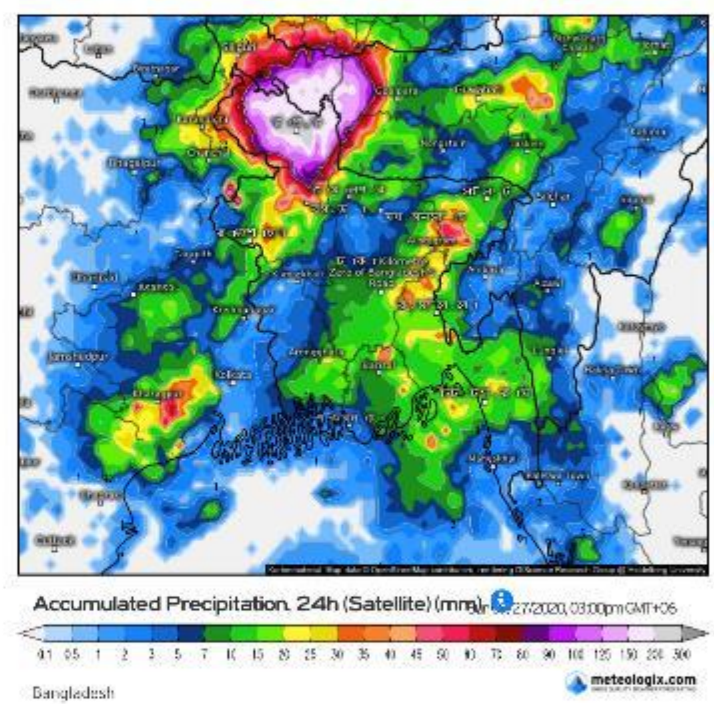


Khan et al., 2020



Recent Urban Flooding Events

- Highest ever rainfall in 60 years: Rangpur city under knee-deep water
  - Dhaka Tribune on 27 September 2020
- 433mm rainfall is recorded by BMD in 12 hours



Sustainable Development Goals

Goal-6: Ensure availability and sustainable management of water and sanitation for all

- **Targets within Goal 6:**
- 6.1By 2030 achieve universal and equitable access to **safe and affordable drinking** water for all.
- 6.2 By 2030 achieve access to **adequate and equitable sanitation and hygiene** for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.
- 6.3 By 2030 improve water quality by **reducing pollution, eliminating dumping and minimising release of hazardous chemicals and materials,** halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.
- 6.4 By 2030 substantially increase **water-use efficiency** across all sectors, ensure sustainable withdrawals and supply of freshwater to address water scarcity, and substantially reduce the number of people suffering from water scarcity.

Sustainable Development Goals (SDGs)

Goal-6: Ensure availability and sustainable management of water and sanitation for all

- **Targets within Goal 6:**
- 6.5 By 2030 **implement integrated water resource management** at all levels, including through trans-boundary cooperation as appropriate.
- 6.6 By 2030 **protect and restore water-related ecosystems,** including mountains, forests, wetlands, rivers, aquifers and lakes.
- 6.a By 2030 expand **international cooperation and capacity-building** support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies.
- 6.b Support and strengthen the **participation of local communities** in improving water and sanitation management.

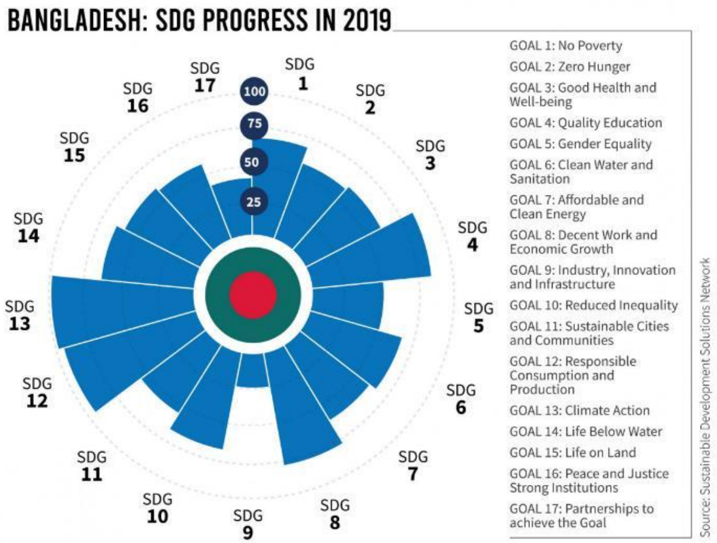
Action plan proposed by Bangladesh

- Bangladesh would **ensure access to safe, adequate and equitable water supply** for all with a target of improving water supply coverage to 100% both (in urban and rural area) by **2020**;

- Bangladesh would **ensure 90% hygienic sanitation coverage**, with special attention to physically challenged and socially excluded population, by **2030**.

- Ensuring **safe yield from ground water sources of water and their preservation** and conservation by 2020 through appropriate actions (The Water Act is already in place) and continuous monitoring up to 2030;

- Percentage of population using a **handwashing facility with water and soap, disaggregated by** location (home, school, health center.



Thank you – Questions ?

- **2021** – Valuing Water
- **2020** – Water &Climate Change
- **2019** – Leaving No One Behind
- **2018** – Nature for Water
- **2017** – Why Waste Water?
- **2016** – Better Water, Better Jobs
- **2015** – Water and Sustainable Development
- **2014** – Water and Energy
- **2013** – International Year of Cooperation
- **2012** – Water and Food Security
- **2011** – Water for cities
- **2010** – Clean Water for a Healthy World
- **2009** – Trans-boundary Waters
- **2008** – Sanitation
- **2007** – Coping With Water Scarcity
- **2006** – Water and Culture
- **2005** – Water for Life
- **2004** – Water and Disasters
- **2003** – Water for Future