Climate Change Impacts on Wetlands of Bangladesh and Migration

Presented at: Leicester Friends of the Earth and Global Justice Seminar;
21 June 2017

Presented by: Dr. S. I. Chowdhury, Programme Dev. Manager, Bangladesh Youth and Cultural Shomiti, Leicester, U.K

This Presentation is based on
"Climate change impacts on wetlands of Bangladesh, its biodiversity and ecology, and actions and programs to reduce risks"
by:
Kibria, G. & A. K. Yousuf Haroon 2017

Wetlands of Bangladesh
(lakes, rivers, floodplains, fish ponds, rice fields, dams, drainage channels, estuaries)

- Wetlands encompass haors, baors, beels, rivers, fish ponds, flooded rice lands, floodplains, Kaptai lake, the Sundarbans, St. Martin's Coral Island

- 50% of total land area is wetlands (7-8 million ha)

- Three-quarters of the population rely on wetlands

- Wetlands support agriculture (rice), fishing, duck rearing, aquaculture/fish farming, snail collection, bird hunting, fuelwood, wild food/vegetable, water, traditional medicines, sand extraction, and ecotourism & livelihoods

Images & Brief Accounts of Wetlands of Bangladesh

Haors
Saucer shaped depressions, 411 haors;114,116 ha; in Sunamgonj, Sylhet, Moulvibazar, Hobigonj, Netrokona & Kishoreganj]

Baors
Dead arms of rivers; 5,488 ha; in Comilla, Dhaka, Faridpur, Pabna

Beels
Low lying depressions across Bangladesh; main beels are Chalan beel, Chand Beel and Arial beel

Rivers
700 rivers & streams; 480,000 ha

Rice Lands
Across Bangladesh, 10.5 million ha

Fish ponds & dighies'
across Bangladesh, 371,309 ha

Sundarbans mangrove
140,000 ha, Khulna, Bagerhat

St. Martin Islands
800 ha

Climate Change (CC)
(long-term changes in climate & weather patterns)

Examples	Rise in Temperatures
	Sea-level rise
	Ocean acidification (decrease in pH)
	Increase in the frequency & intensity of extreme events (cyclones, floods, storms, bush/forest fires)
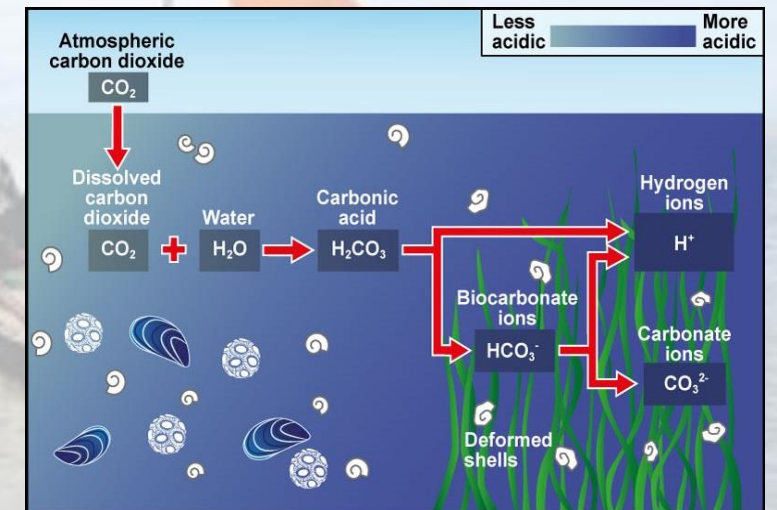
CC Impacts on Ecology & Biodiversity of Wetlands
(Rise in Temperatures: Effects on Fish & Aquatic Weeds)

Rise in Temperatures

Hilsa fish

Water hyacinth

Negative: Increase in rivers & lakes water temperatures

Negative: Reduced dissolved oxygen in water bodies (oxygen solubility is inversely related with temperature)

Negative: Accelerated growth of harmful algal blooms & water quality problems

Negative: Impair growth & reproduction, enhanced diseases of aquatic organisms (fish) & fish kills due to low water quality
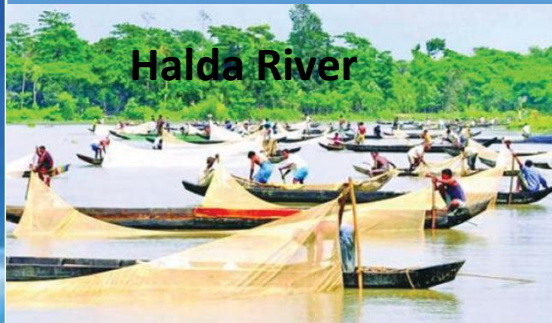
Negative: Enhanced bioaccumulation potential of toxins (pesticides, metals) in aquatic organisms (such as fish)

Negative: Expansion of invasive water weeds *Eichhornia* spp. (water hyacinth) in waterways
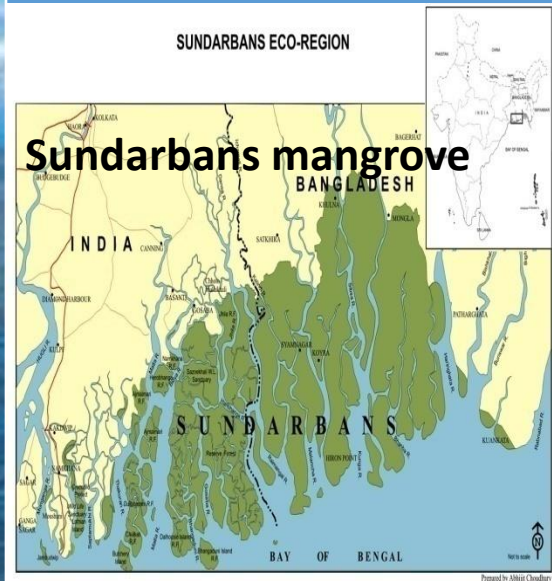
CC Impacts on Ecology & Biodiversity of Wetlands
(Sea-Level Rise: Effects on Water, Agriculture, Fish, the Sundarbans)

Sea-Level Rise (SLR)	**Negative:** Contamination of surface & groundwater with chloride (salt)
Halda River	**Negative:** Salinization of agricultural lands
	Negative: Loss/shift of natural breeding grounds of native fish species (rohu, catla, mrigal) in the Halda River, Chittagong
Sundarbans mangrove	**Negative:** The complete loss of the Sundarbans mangrove due to 1 m SLR
	Negative: Replacement of the most dominant, freshwater-loving important *Sundari* trees by salt tolerant trees such as *Goran*
	Negative: Affect livelihood of millions depending on wetlands for water, food, wood, timber, medicines, honey, fruits, and fisheries

CC Impacts on Ecology & Biodiversity of Wetlands
(Ocean acidification: Effects on corals, molluscs, seaweeds)

| Ocean acidification (OA) (decline in water pH)	**Negative:** OA would affect organisms requiring calcium carbonate for their skeletons & shells (corals, molluscs, pteropods, & some phytoplankton); shells become weak & brittle
Corals	**Negative:** Corals, echinoderms & molluscs are very sensitive to a decline in water pH
Oysters	**Negative:** OA may cause significant consequences on biodiversity of St. Martin's Coral Island (corals, molluscs, crabs, marine algae, seaweeds)
	Negative: Loss of biodiversity in St. Martin's Island would mean loss of seafood security, tourism revenues & livelihoods of poor people associated with fishing and tourism
Seaweeds	**Positive:** OA would enhance the productivity of seaweeds in the St. Martin's Island since Carbon di-oxide is a major ingredient for photosynthesis of plants

CC Impacts on Ecology & Biodiversity of Wetlands
(Extreme events-Floods: Effect on water, fish, WQ)

Extreme events (floods)

Bangladesh has experienced extreme floods during 1974, 1987, 1988, 1998, 2004, and 2007 (shown as red bars) & CC would increase flooded areas by 25%
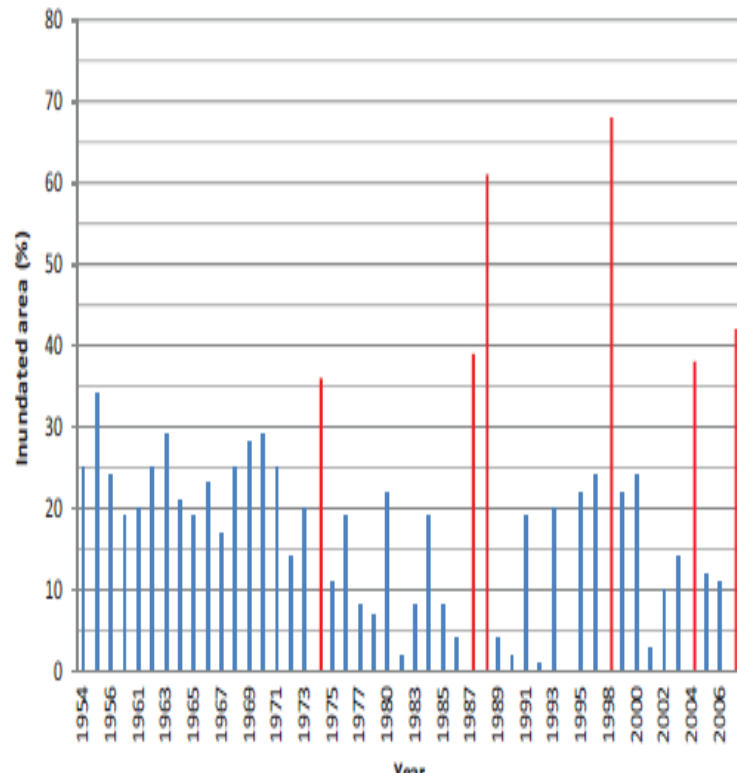
Negative: CC would increase flooded areas by at least 25% with a global temperature rise of 2°C

Negative: Extreme flood & rainfall events will increase run-off of contaminants/ pollutants into waterways, & therefore would deteriorate WQ

Negative: Large floods can injure larval & juvenile fish, may displace adult fish

Negative: Floods would cause loss/damage of property, lives, crops, vegetables, livestock

Positive: Floods would help recharge groundwater & re-establish connectivity between rivers, shallow lakes & wetlands

Positive: Floods would enhance migration of aquatic biodiversity & help dispersal of biota & seeds, enhance spawning of native fishes

Positive: Floods will improve water quality by flushing out salt from coastal rivers/lands, reducing problem of low dissolved oxygen, algal blooms & dilution of chemical & biological pollutants

Positive: Projected increase in rainfall would increase the amount of water available for agri. Irrigation, fisheries & aquaculture

Reducing CC Impacts: Some models

- **Climate smart agriculture** (Floating/hydroponics agriculture): A climate resilient adaptation to regular water in a flood prone country like Bangladesh

- **Climate smart aquaculture:** Herbivorous fish farming/aquaculture, integrated rice-fish-duck farming, integrated brackish water aquaculture-mangrove etc. have good potential to adapt to & mitigate CC effects.
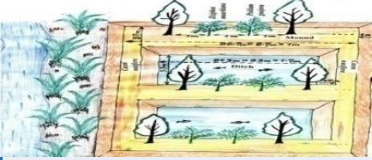
- **3F Models (Forestry, Food and Fish):** Simultaneous **F**orestry, **F**ood, **F**ish production would reduce livelihood vulnerability of the coastal communities

- **Rainwater harvesting:** Rainwater collected from roofs can help mitigate scarcity of drinking water along the entire southern coastal areas and reduce pressure on wetland's water resources

- **Renewable/Clean/Green energy:** Solar panels/power can be used in rural houses for lighting, irrigation pumping & small transports etc. It would reduce fossil fuel's use & health hazards associated with the use of forest wood, charcoal, cattle dung for cooking in rural Bangladesh

- **Afforestation/reforestation/mangrove restoration:** Afforestation/ reforestation/ conservation of mangroves would reduce impacts of disasters (cyclones/ storms/ floods) acting as live seawall, minimise soil erosion, enhance forest resources/biodiversity, water quality, fisheries, tourism, livelihoods & mitigate CC

Climate Change and Migration in Bangladesh

- Bangladesh is one of the countries most vulnerable to climate change impacts such as extreme weather events, due to its low-lying topography, high population density and widespread poverty.

- In a recent paper, "**Climate change and internal migration patterns in Bangladesh: an agent-based model**" _Behrooz Hassani-Mahmooei_ and _Brett W. Parris_ **predict between 3 and 10 million internal migrants over the next 40 years, depending on the severity of the hazards –drought, cyclone and floods**

Many advocates argue the crucial importance of climate changes as a partial explanation of the location of the first civilisation the migration of people and even the rise and falls of empires.

"A favourable climate is an essential condition of high civilisation" _Ellsworth Huntington._
"The districts where civilisations begun probably had at that time the most stimulating climate in the northern hemisphere" _C.E.P. Brooks_
<u>Contradictory view</u>

"The greater the ease of the environment, the weaker is the stimulus towards civilisation" _A.J. Toynbee_

N.B: This slide is not based on book chapter referred to before

11

Conclusions

- **Bangladesh is a climate risk hot spot (Global risk rank #1)**

- Climate change will impact Bangladesh severely

- **Local people** do not **have the skills/ technology/expertise to adapt** to **climate change** efficiently and effectively or managing increasing climate risks

- There is a need to conserve wetlands/ mangrove habitats (which are biodiversity 'hot spots', and act as major carbon sinks)

- An affective **awareness and education and community engagement** programs would be required to convey latest, scientific and evidence-based climate change information to local communities

- It will be essential to include climate change issues and implications in the **curriculum at primary, secondary and tertiary levels** of education in Bangladesh

THANK YOU FOR YOUR PATIENCE & ATTENTION

For further information about the paper *"Climate change impacts on wetlands of Bangladesh, its biodiversity and ecology, and actions and programs to reduce risks"*

Dr Golam Kibria: kibriagolamo@gmail.com

Dr A.K.Yousuf Haroon: dharoon@ymail.com