

CLIMATE CHANGE AND ITS COLLISION ON FISHERIES RESOURCE IN SUNDARBAN REGION OF SOUTH 24 PARGANA, WEST BENGAL

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Abstract

Sundarban is the world heritage site in the world. It's located on south 24 pargana district of west Bengal state. The area entirely covers with mangrove forests. in the present time Sundarban is highly penetrable to effects of climate change in fisheries because its economics, underfeeding and social dependencies of fisheries sector. Climate change effects on fresh water culture fisheries in Sundarban may be negative. Climate change fell back upon the rainy season, Increases the precipitation, creates the flood and increases the fish habitat and if we take the appropriate adaptation technique, it will boost up the production of inland capture fisheries. In coastal area soil water salinity and sea level rises have both positive and negative effects. soil water salinity and sea level rises may increase the shrimp, prawn, Hilsa and others brackish water fish and sell or carapace fish culture area, which will increase the production of high assessment fish products. Climate change in addition affects the mangrove region of Bangladesh. As termination of climate change, P^H change; temperature increase may affects the marine fish species and also increase the occurrences of intensive tropical cyclone and tumour in the Bay of Bengal. The others scenario has been found in Bengal delta is industrial effects. The greenhouse gases in the atmosphere are causing global climate change and destroyed the huge numbers of fish and fishers.

Key words:-Sundarban, 24 pargana, West Bengal, climate change, fisheries, sea level rises.

INTRODUCTION

Climate conducted revolutionize is represents the cumulative outcome of the environment. Globally through endemically-scale circumstances and sympathetic their manifestation at local scales can empower local Management. Climate change may unswervingly intuition fishery production along countless pathways. Fish reproduction, growth and migration patterns are all affected by temperature, rainfall and hydrology. Climate change is likely to unfavourably affect both the fresh water and marine fisheries in the Sundarban. This vulnerability was due to the collective effect of predicted warming, the relative importance of fisheries to national economics and diet, and limited community capacity to prospective impacts and opportunities. Sundarban, West Bengal, India, a developing country, is primarily deltaic flood plain; elevations throughout the region do not exceed 5 m. The fisheries sector of contributed all earning comes from local contribution. In region the total fish production was 2000 metric tonne (2015), fisheries sector provides more than 10million people with at least 44% of their average per capita protein intake. In Asia, India (sundarban, West Bengal), Bangladesh including Pakistan, Laos PDR and Nepal has the lowest adaptive capacity for climate change in fisheries.

The purpose of the review is to present current Knowledge regarding climate change and its potential effects on fisheries resource at sundarban region in West Bengal.

CAUSES OF CLIMATE CHANGE

Global atmospheric concentrations of green house gases like carbon dioxide, methane and nitrous oxide have increased as a result of human activities since 1750 A.D (as consequence of the industrial revolution). The global increase of carbon dioxide is primarily due to the use of land and fossil fuel, an increase of methane and nitrous oxide are due to agriculture. In 2005, the global atmospheric carbon dioxide, methane and nitrous oxide centralization were 379 ppm, 1732 ppb and 319 ppb respectively. Iraq –Kuwait water battle also important to the creation of water and sea pollution. The atmospheric concentration of carbon dioxide and methane in 2005, exceeds by far the natural range of the last 650,000 years and the growth rate of nitrous oxide has been approximately constant since 1980. Rising concentration of the green house gases in the atmosphere are causing global climate change. In the year 1900 to recent time the maximum industrialization has been established in the delta region of the Bhagirathi river as well as Hooghly, Nadia, Howrah, North 24 pargana and South 24 pargana district of West Bengal.

EFFECT ON FRESHWATER FISHES IN BANGLADESH

Fish is a poikilothermic animal that cannot regulate their body temperature through physiological course of action and this is regulated by environmental process. Fish physiology like growth, reproduction and activity are directly prejudiced by the change of temperature. Increase of world temperature rise is thought to be ranged from 0.3°C to 6.4°C at 2090-2099 relatively to 1980-1999. The temperate and polar latitudes are predicted to experience a higher temperature change than tropical and sub tropical latitudes. Due to the location of SUNDARBAN at West Bengal and Bangladesh in lower latitude, its temperature change is little compare to polar and temperate zone. With rising environmental temperature, the physiological activity of the fishes also increases. Enhance of physiological activity increases the Biological oxygen demand. But the solubility of the oxygen in water the wrong way round related to temperature and salinity. Thus, dissolved oxygen availability in water will decreased, resulting the reduction of growth and reproduction success of fishes and preventing them from dealing as effectively with the other ecological changes. Increased temperature and decreased level of dissolved oxygen might cause harmful effect for pond fish culture at the sundarban of West Bengal and Bangladesh both. There are two reasons underlying this effect. Firstly, increased temperature increases the metabolic activity of fishes. Secondly, increases temperature increases the Evapo-transpiration of water, which reduces the surface and volume of water in the fish pond.

oxygen deliberation in the pond reaches before sunrise. As a consequence, fishes face hypoxic condition, frequent Occurrence of which will cause the reduction of the growth rate and reproductive output of culture species. It is assumed that if the global climate change cannot be controlled, its negative impact will be reflected on our aquaculture production. EFFECT ON OPEN WATER FISHERIES RESOURCES Open water that contributing nearly 2000 metric tonne of fish in 2015 is very important for fisheries sector in west Bengal. Open water is inundated during the flood stages and isolated from the main channel during the dry season. Regular flooding ensures the reproductive success of the fish species. Change in annual average temperature and precipitation over Bangladesh assessed by Different Global Circulation Models (GCM) is shown in table 1.

Table 1. GCM estimates of temperature and precipitation changes in sundarban in West Bengal.

YEAR	Temperature change (°C)			Precipitation change (%)		
	annual	Dec-Jan-Feb(Dry seasons)	Jun-July-Aug(Wet seasons)	Annual	Dec-Jan-Feb(dry seasons)	Jun-July-Aug(Wet seasons)
Base line average	2278mm	35mm	1350mm
2030	1.0	1.1	0.8	+3.8	-1.3	+4.8
2050	1.4	1.6	1.1	+5.6	-1.8	+6.8
2100	2.4	2.7	1.9	+9.7	-3.1	+11.8

Table 1 indicates that annual temperature will rise by 1-2.4°C and precipitation will increase by 3.8-9.7% from 1995-2100 AD in West Bengal. It is also represented that in winter, temperature will be increased by 1.1-2.7°C, but the precipitation reduced by 3%, and finally evapotranspiration will increase. In Ichhamati-Matla-Saptamukhi rivers system, 2-3°C increase of ambient temperature would increase evapotranspiration by 10-15%. As Ganges-Brahmaputra-Matla-Ichhamati-Saptamukhi river system of West Bangle and Ganga-Buriganga-Brahmaputra-Meghna-Yamuna River system of Bangladesh both are situated in the same geographical region, thus we can predict the same type of environmental changes in Bangladesh as predict to West Bengal. In winter, the increase of evapo-transpiration and reduction of the volume and favourable fish habitats, increases the fish kill and challenge the survival of open water fishes including next year spawning broods. GCM estimates that temperature will increase by 0.8-1.9°C and precipitation will increase by 4.8-11.8% in monsoon. In Bhagirathi- Ichhamati- Matla-Saptamukhi- Ganges- Brahmaputra and Meghna rivers, 2°C rise of temperature, increase 10% of Precipitation and also increase the river runoff of 19%, 13% and 11% for Bhagarathi-Ichhamati-Matla-Saptamukhi-Ganga-Brahmaputra and Meghna respectively. This additional runoff with higher nutrient levels increase the floodplain area and productivity, which extend the feeding ground of fish. If the open water

stocking program is introduced in the monsoon, it can bring a revolution in the fish production. On the other hand, increased water runoff create flood situation and destroy the aquaculture infrastructure and reduced the closed water aquaculture production.

Temperature increment may also stimulate the growth of aquatic macrophyte and increase of 2-3°C could cause a 300-500% increment of aquatic macrophyte. Higher production of aquatic macrophytes can decrease the productivity of water, reduce the fish habitat and oxygen supply which will create the anoxic condition for fishes. This can lead to fish kill. Open water of sundarban might face this problem.

EFFECT ON COASTAL AREA

The main impacts of climate change on coastal area at sundarban West Bengal are sea level rise, reduction of freshwater availability by salinity intrusion and increasing cyclone frequency. Water salinity of the coastal area of West Bengal varies from 0-25 ppt. Water salinity and its distribution in the coastal area are increasing with the increasing of sea level rise. Soil salinity in South Western part of sundarban is increasing because the area totally bounded with the sea water. Anthropogenesis problem is another problem of fish reduction in the sundarban region of West Bengal, India. (Table 2&3).

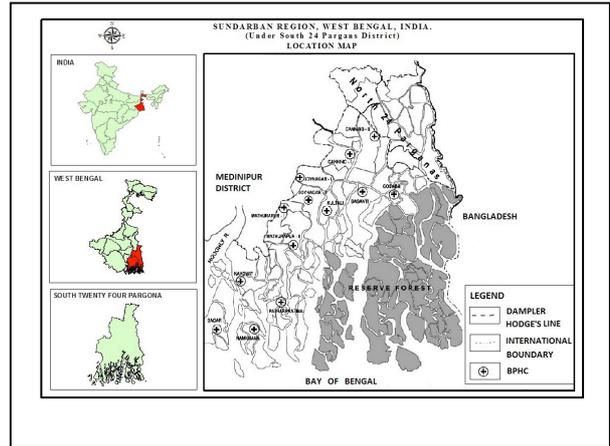
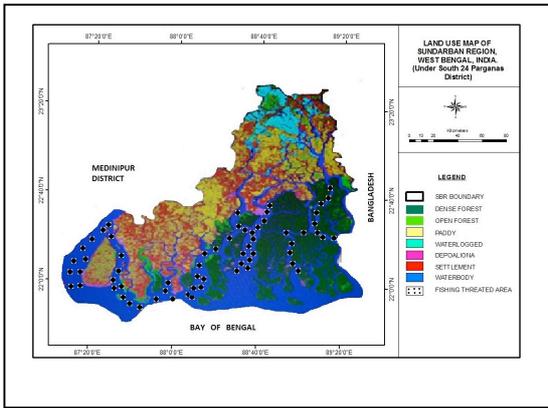
Table 2. Incising the Soil Salinity rate of Sundarban Region of West Bengal, India.

Area	Year 2000	Year 2009
SOUTH 24 PARGONA	0.32 MILLION HECTARE	0.35 MILLION HECTARE
MEDNIPUR	0.25 MILLION HECTARE	0.26 MILLION HECTARE
NORTH 24 PARGONA	0.12 MILLION HECTARE	0.15 MILLION HECTARE
HAWRAH	0.05 MILLION HECTARE	0.06 MILLION HECTARE

Table 3. Soil salinity range in South Eastern part of sundarban area of West Bengal.

Salinity range Ec:ds/m	Year 2000(hectare)%	Year 2009(hectare)%
2-4	6.5	66.1
8-12	60.1	54.8
12-16	36.5	36.4
16+	18	23.4

Cyclone, Sidr (15 Nov., 2007) and Aila (27 May, 2009) hit South and South East part of sundarban in West Bengal annihilate the coastal embankment infrastructure and increase the salinity. This salinity interruption together with sea level rising creates harmful effect on existing fish species. Water salinity exceeds the expected salinity level that particularly necessary for fresh water fish production. So, salinity interruption endangered fresh water fisheries, at the same time, creating opportunities for catching and cultivating brackish and marine species. sundarban of both West Bengal - Bangladesh coastal area is important for Penaeus monodon (Indian Tiger Shrimp) production. Increase salinity increases the culture area for P. monodon whose growth reaches maximum at 5-25 ppt. But the P. monodon is highly vulnerable for diseases. P. indicus (Indian White Shrimp) and P. vannamei



We can also introduce *Chanos chanos* (Milk Fish), *Mugil cephalus* (Mullet) and *Tilapia nilotica* (Tilapia) for coastal culture fisheries. For adaptive income generation of other works are cage culture of some fishes, pen culture, shell fish culture and sea weed culture. Hilsa also the river mouth fish located in mouth of Bhagirathi, Ichhamati, Matla, Saptamukhi river. The Sundarban mangrove forest that located in the Gangetic delta (Bhagirathi-Ganges-Brahmaputra-Meghna) of India and Bangladesh is the largest single chunk of continuous mangrove forest in the world. Over 120 species of fish are commonly caught by commercial fishermen in the Sundarban area. Sundarban is highly vulnerable for sea level rise and will be disappeared by 1 meter rise of the sea level. The Sundarban also have been playing a very important role as a protecting wall against the devastating cyclones and tidal surges by deflecting and plummeting energy. The mangrove also supports offshore and deep sea fisheries by playing a significant role as nursery ground for many deep sea fishes and shrimps including the *P. monodon*, which is the major species of the industrial bottom trawl fishery of Bangladesh.

EFFECT ON BAY OF BENGAL

Average tropical sea surface temperature is predicted to increase by 50-80% of the average atmospheric change over the same period. Increased temperature may affect the distribution pattern of some fish species where some of them may migrate to the higher latitude for cooler place. Sea level rise may obliterate the mangrove forest as well as destroy the marine fish nursery ground. Atmospheric CO₂ attentiveness is thought to be increased from 380 ppm to 540-979 ppm by the end of the century and this will cause the average ocean pH to drop by 0.4-0.5 compared to pre industrial period. Fish embryos and larvae are more sensitive to pH change than juvenile and adults. Eggs of the pelagic fishes might be more vulnerable to pH change. improved level of dissolved CO₂ also reduces the pH of animal tissue and it may affect the marine fish physiology. Global warming may cause changes in the regional climate of the Bay of Bengal and can cause increase in the occurrence of intense tropical cyclone and surge. There is some evidence that regional frequencies of tropical cyclones peak intensity may be increased by 5% to 10% and precipitation rates may be increase by 20% to 30%. Cyclone Sidr and Aila affected the coastal fishery and fishing ground.

CONCLUSION

Fisheries are the third largest export sector in West Bengal. So, West Bengal economy is vulnerable to climate change impact, which could affect our food security and level of poverty by elevating stress on fisheries production. But the detailed effects on climate change affecting the fisheries sector is yet uncertain. It might bring economic hardship or might increase the opportunity to higher fish production through adaptive measure and increase the economic growth.

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